ASHLEE N. FORD VERSYPT

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EDUCATION

2005-2012 **University of Illinois at Urbana-Champaign** — Urbana, IL
Ph.D. (2012) and **M.S.** (2009) in Chemical Engineering
Minor in Computational Science & Engineering
Ph.D. Dissertation: "Modeling of Controlled-Release Drug Delivery from Autocatalytically Degrading Polymer Microspheres"
M.S. Thesis: "Biodegradable Polymeric Drug Delivery: Parallel Simulation & Optimal Drug Release Profiles"
Advisor: Prof. Richard D. Braatz

2001-2005 **University of Oklahoma** — Norman, OK
B.S. in Chemical Engineering, *summa cum laude*
Minor in Mathematics
Honors Thesis: "Simulations of Flow of Water around Carbon Nanotubes"
Advisor: Prof. Dimitrios V. Papavassiliou

HONORS, AWARDS, & FELLOWSHIPS

2013 Frederick A. Howes Scholar in Computational Science (awarded to 1-2 recent alumni of the DOE Computational Science Graduate Fellowship annually for outstanding leadership, character, and technical achievement)
Selected to attend Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute, The Ohio State University
Selected to attend Research Collaboration Workshop for Women in Applied Mathematics, Dynamical Systems with Applications to Biology & Medicine, Institute for Mathematics & Its Applications, University of Minnesota
2012 SIAM Conference on the Life Sciences Student Travel Award
2010 AIChE Women's Initiatives Committee Travel Award
2009 Hanratty Travel Grant, UIUC Dept. of Chemical & Biomolecular Engineering
2008 AIChE Computing & Systems Technology Division Travel Grant
2006-2010 Department of Energy Computational Science Graduate Fellowship
2006 National Science Foundation Graduate Research Fellowship (declined)
2005 Outstanding Chemical Engineering Senior, OU College of Engineering
Outstanding Senior Researcher and Al Clark Chemical Engineering Prize, OU School of Chemical, Biological, & Materials Engineering
Undergraduate Research Opportunities Program, OU Honors College
2004 Tau Beta Pi Engineering Honor Society
F. Mark Townsend Scholarship and Program of Excellence Research Scholarship, OU School of Chemical, Biological, & Materials Engineering
2002 PACE Award (recognizes freshmen for outstanding accomplishments in four areas: participation, academics, community service, and excellence in leadership), OU University College
2001-2005 Oklahoma Academic Scholar/Regents Scholar (ACT 99.5th Percentile, academic scholarship for in-state students), Oklahoma State Regents for Higher Education/OU Scholars Program

RESEARCH EXPERIENCE

2012-Present **Massachusetts Institute of Technology** Cambridge, MA
Postdoctoral Research Associate, Dept. of Chemical Engineering
Advisor: Prof. Richard D. Braatz

Project A: Developed a control-relevant, dynamic mathematical model for simultaneous heat and mass transfer in a continuous thin-film pharmaceutical manufacturing process. Collaborated with an industrial and academic team to design control systems for quality-by-design pharmaceutical manufacturing.
Collaborators: Novartis-MIT Center for Continuous Manufacturing, Prof. Bernhardt L. Trout (MIT) and Prof. Allan S. Meyerson (MIT)

Project B: Formulated dynamic models and process analytical tools for the control of a novel bench-scale device for rapid, on-demand manufacturing of single doses of biotherapeutics.
Collaborators: MIT Center for Biomedical Innovation's Biomanufacturing Research Program, Prof. J. Christopher Love (MIT), Prof. Michael S. Strano (MIT), Prof. Rajeev J. Ram (MIT), Prof. Steven M. Cramer (Rensselaer Polytechnic Institute), and Prof. Pankaj Karande (Rensselaer Polytechnic Institute)

2005-2012 **University of Illinois at Urbana-Champaign** Urbana, IL
Graduate Research Assistant, Dept. of Chemical & Biomolecular Engineering
Advisor: Prof. Richard D. Braatz
Thesis Committee Members: Prof. Daniel W. Pack (formerly UIUC, now University of Kentucky), Prof. Christopher V. Rao (UIUC), and Prof. Narayana R. Aluru (UIUC)

Project A: Proposed and solved novel, computationally-tractable, mechanistic mathematical models that predict controlled-release drug delivery from biodegradable polymer spheres composed of PLGA. Models surpassed existing models in their ability to capture sphere-size-dependent and drug-size-dependent drug release dynamics reported experimentally in the literature. Collaborated with experimentalists for validation of models. Proposed and verified numerical algorithms suitable for treating diffusion with a spatially and temporally dependent diffusivity.
Collaborator: Prof. Daniel W. Pack (formerly UIUC, now University of Kentucky)

Project B: Formulated a dynamic transport model used for optimal control of the spatial distribution of growth factors (morphogens) delivered to stem cells for growing engineered tissues.

Project C: Led a team of 7 undergraduate research students that fabricated polymer particles for high school classroom experiments. Wrote documentation for high-school-level lesson plans, which was published as the Nanoscale Drug Delivery Module: Teacher's Edition and Student's Edition books.

2007 **Brookhaven National Laboratory** Upton, NY
DOE CSGF Practicum Researcher, Computational Science Center
Advisor: Dr. James W. Davenport (Director BNL CSC)
Project: Performed molecular dynamics simulations to investigate the interactions between aromatic rings and glucose molecules in cellulose and enzymes that degrade cellulosic feedstocks for biofuels. Engaged with researchers in an interdisciplinary center focused on high performance computing.

2004-2005 **University of Oklahoma** Norman, OK
Undergraduate Research Assistant, School of Chemical, Materials, & Biological Engineering
Advisor: Prof. Dimitrios V. Papavassiliou
Project: Simulated flow of water through configurations of carbon nanotubes using computational fluid dynamics software to investigate how nanoscale hydrophobicity reduces bulk drag forces.

TEACHING & MENTORING EXPERIENCE

2013 **Mentor** for Association of Women in Science mentoring circle, Mass-AWIS Chapter
2012-2013 **Mentor** for Women in Science & Engineering mentoring program, MIT SWE Chapter
Postdoctoral mentor for Coffee with Grads Program, MIT Dept. of Chemical Engineering
2010-2011 **Research supervisor** for 7 undergraduate students over 3 terms, UIUC
2010 **Teaching assistant** for CHBE 431 Process Design, UIUC

2009	**Certificate in Foundations of Teaching**, UIUC Center for Teaching Excellence
	Graduate mentor for Professional & Leadership Development for Women course, UIUC College of Engineering
2006-2011	**Tutor** for chemical engineering undergraduate courses, UIUC Dept. of Chemical & Biomolecular Engineering

PROFESSIONAL SERVICE

Journal referee for IEEE Transactions on Biomedical Engineering, Drug Delivery Letters, Current Drug Delivery, Polymer Engineering & Science, and ASEE Computers in Education Journal

Conference session co-chair for Bringing Industrial Applications into the Classroom Session, ASEE Annual Meeting, 2013; Mathematical & Computational Biosystems Engineering Session, AIChE Annual Meeting, 2011; Applied Mathematics & Numerical Analysis Poster Session, AIChE Annual Meeting, 2011

Organizer for Path of Professorship future faculty workshop for MIT female graduate students and postdoctoral researchers, MIT Office of the Dean for Graduate Education, Cambridge, MA, 2012

Organizer for Symposium on Emerging Topics in Control & Modeling: Biomedical Applications student-led research symposium with nation-wide participation and 12 invited keynote speakers, UIUC Beckman Institute and Coordinated Science Laboratory, Urbana, IL, 2009-2010

Internal vice-president for UIUC Dept. of Chemical & Biomolecular Engineering Graduate Student Advisory Council, 2009

Organizer for UIUC Dept. of Chemical & Biomolecular Engineering Graduate Research Symposium, 2007

COMMUNITY ENGAGEMENT & K-12 OUTREACH EXPERIENCE

2013	**Guest lecturer** for Girls' Angle Math Club for Girls, Cambridge, MA
2012	**Workshop developer** for Clean Water through Chemical Engineering session for Changing the World through STEM Expo, Girl Scouts of Eastern Massachusetts, Boston, MA
2012-Present	**Girl Scout liaison** for SWE Boston Professional Section, Boston, MA
2011-2012	**Guest instructor** for middle school science classes and after-school programs at a Boys & Girls Club, Illinois Researchers in Partnership with K-12 Science Educators, Champaign, IL
2011	**Instructor** for session on water filtration for middle school teachers at a teachers' enrichment program, UIUC
2010-2012	**Lesson plan writer and tester** for hands-on engineering activities in middle school and high school science classes, UIUC
2002-Present	**Instructor** for >10 Girl Scout science and engineering badge workshops in OK, IL, and MA

ACADEMIC PROFESSIONAL DEVELOPMENT

2013	NextProf future faculty workshop for women in engineering, University of Michigan
2012	Path of Professorship future faculty workshop for women, MIT
	Negotiating the Ideal Faculty Position future faculty workshop for underrepresented groups in science and engineering, Rice University
2011	Introduction to Science Education graduate course for scientists and engineers, UIUC
2010	Women Graduate Students in Chemical Engineering: Development for an Academic Career workshop, AIChE Women's Initiatives Committee, AIChE Annual Meeting
2009	College Teaching & Academic Careers graduate course, UIUC

MANUSCRIPTS IN PREPARATION

11. **A. N. Ford Versypt**, D. W. Pack, and R. D. Braatz, "Theoretical Drug Release from PLGA Microspheres during Simultaneous Hindered Diffusion and Autocatalytic Degradation Coupled by Analytical Acidic Polymer End Group Concentration Profiles," (To Be Submitted Dec. 2013 to Journal of Controlled Release).
10. **A. N. Ford Versypt** and R. D. Braatz, "Analysis of Finite Difference Discretization Schemes for Diffusion in Spheres with Variable Diffusivity," (To Be Submitted Nov. 2013 to International Journal of Heat and Mass Transfer).
9. **A. N. Ford Versypt**, D. W. Pack, and R. D. Braatz, "Analytical Expression for Predicting Concentration of Acidic Polymer End Groups in PLGA Microspheres during Simultaneous Diffusion and Autocatalytic Degradation," (To Be Submitted Oct. 2013 to Journal of Controlled Release).

REFEREED JOURNAL PUBLICATIONS

8. A. Mesbah, **A. N. Ford Versypt**, X. Zhu, and R. D. Braatz, "Nonlinear Model-Based Control of a Thin-Film Dryer for Continuous Pharmaceutical Manufacturing," (Submitted to Industrial and Engineering Chemistry Research 2013).
7. **A. N. Ford Versypt**, D. W. Pack, and R. D. Braatz, "Mathematical Modeling of Drug Delivery from Autocatalytically Degradable PLGA Microspheres—A Review," Journal of Controlled Release, 165, 29-37, 2013.
6. M. Kishida, **A. N. Ford Versypt**, D. W. Pack, and R. D. Braatz, "Optimal Control of 1D Cellular Uptake in Tissue Engineering," Optimal Control Applications and Methods, DOI: 10.1002/oca.2047, (In Press 2012).
5. M. Jiang, M. H. Wong, Z. Zhu, J. Zhang, L. Zhou, K. Wang, **A. N. Ford Versypt**, T. Si, L. Hasenberg, Y. E. Li, R. D. Braatz, "Towards Achieving a Flattop Crystal Size Distribution by Continuous Seeding and Controlled Growth," Chemical Engineering Science, 77, 2-9, 2012.
4. **A. N. Ford** and D. V. Papavassiliou, "Flow around Surface-Attached Carbon Nanotubes," Industrial and Engineering Chemistry Research, 45, 1797-1804, 2006.

REFEREED CONFERENCE PROCEEDINGS

3. J. J. Versypt and **A. N. Ford Versypt**, "Mapping Rural Students' STEM Involvement: Case Studies of Chemical Engineering Undergraduate Enrollment in the States of Illinois and Kansas," Proceedings of the ASEE Annual Conference, Atlanta, GA, 2013.
2. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Multi-Scale Modeling of PLGA Microparticle Drug Delivery Systems," Proceedings of the 21st European Symposium on Computer Aided Process Engineering (ESCAPE-21), Chalkidiki, Greece, 1475-1479, 2011.
1. M. Kishida, **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Optimal Control of Cellular Uptake in Tissue Engineering," Proceedings of the American Control Conference, Seattle, WA, 2118-2123, 2008.

UNREFEREED PUBLICATIONS

3. **A. N. Ford** and D. Khvostichenko, "Filtration Fun Lesson Plan," Illinois Researchers in Partnership with K-12 Science Educators, University of Illinois at Urbana-Champaign, Urbana, IL, 2011. Available for free download at http://irise.illinois.edu/lessons/lessons.html
2. D. J. Hoelzle, **A. N. Ford**, R. D. M. Gregg, M. J. Johnson, and J. P. Kemmerer, "Symposium on Emerging Topics in Control and Modeling: Biomedical Systems [Conference Reports]," IEEE Control Systems Magazine, 30, 132-134, 2010.
1. **A. N. Ford**, "Girl Scout STEM Workshop: Experience with 6th-10th Grade Girls in Rural Oklahoma," Proceedings of the ASEE North Midwest Sectional Conference, Milwaukee, WI, 2009.

BOOKS

2. R. D. Braatz, **A. N. Ford Versypt**, L. M. Goh, and U. Ravaioli, *Nanoscale Drug Delivery Module: Teacher's Edition*, Materials World Modules, Northwestern University, Evanston, IL, 2012.
1. R. D. Braatz, **A. N. Ford Versypt**, L. M. Goh, and U. Ravaioli, *Nanoscale Drug Delivery Module: Student's Edition*, Materials World Modules, Northwestern University, Evanston, IL, 2012.

INVITED PRESENTATIONS

2. **A. N. Ford Versypt**, "Mathematical Modeling of Pharmaceuticals: Predictive Design for Better Medicines," Howes Scholar Award Seminar, DOE CSGF Annual Program Review, Arlington, VA, July 2013.
1. **A. N. Ford Versypt**, "Mathematical Modeling of Pharmaceuticals: Predictive Design for Better Medicines," Computational Research in Boston and Beyond Seminar Series, MIT, Cambridge, MA, April 2013.

PRESENTATIONS AT THE UPCOMING AICHE ANNUAL MEETING

1. **A. N. Ford Versypt**, "Systems Biomedicine and Pharmaceutics," Meet the Faculty Candidate Poster Session, Continental 4/5/6, 2-4 PM, Sunday, November 3, 2013.
2. A. Mesbah, **A. N. Ford Versypt**, X. Zhu, and R. D. Braatz, "Nonlinear Model Predictive Control for a Continuous Pharmaceutical Manufacturing System: A Comparison of Control Strategies for a Thin-Film Formation Process," Continental 4, 10:24-10:43 AM, Wednesday, November 6, 2013.
3. **A. N. Ford Versypt**, D. W. Pack, and R. D. Braatz, "Mechanistic Modeling of PLGA Microsphere Drug Delivery: Analytical Autocatalytic Degradation of Polymer and Hindered Diffusion of Drug," Continental 6, 12:30-12:50 PM, Thursday, November 7, 2013.
4. **A. N. Ford Versypt** and R. D. Braatz, "Analysis of Finite Difference Schemes for Diffusion in Spheres with Variable Diffusivity," Continental 7, 1:10-1:30 PM, Thursday, November 7, 2013.

OTHER PRESENTATIONS

24. A. T. Layton, J. Arciero, L. Ellwein, **A. N. Ford Versypt**, and E. Makrides, "Modeling Autoregulation in the Kidney," Research Collaboration Workshop for Women in Applied Mathematics, Dynamical Systems with Applications to Biology & Medicine, Institute for Mathematics & Its Applications, University of Minnesota, Minneapolis, MN, September 2013.
23. **A. N. Ford Versypt**, "Mathematical Modeling of Pharmaceuticals: Predictive Design for Better Medicines," Workshop for Young Researchers in Mathematical Biology, Mathematical Biosciences Institute, The Ohio State University, Columbus, OH, August 2013.
22. A. Mesbah, **A. N. Ford Versypt**, X. Zhu, and R. D. Braatz, "Nonlinear Model Predictive Control of a Thin-Film Manufacturing Process," Process Systems Engineering Consortium Meeting, Cambridge, MA, June 2013.
21. J. J. Versypt and **A. N. Ford Versypt**, "Mapping Rural Students' STEM Involvement: Case Studies of Chemical Engineering Undergraduate Enrollment in the States of Illinois and Kansas," ASEE Annual Conference, Atlanta, GA, June 2013.
20. **A. N. Ford Versypt,** D. W. Pack, and R. D. Braatz, "Modeling of Drug Delivery from PLGA Microspheres Using Reaction-Diffusion Equations with Hindered Diffusion," AIChE Annual Meeting, Pittsburgh, PA, October 2012.
19. J. J. Versypt and **A. N. Ford Versypt**, "Mapping Rural Students' STEM Participation," UIUC College of Education Graduate Student Conference, Champaign, IL, March 2012.
18. **A. N. Ford Versypt,** D. W. Pack, and R. D. Braatz, "Modeling of Dynamic Hindered Diffusion of Drugs from Biodegradable PLGA Microspheres with Evolving Porous Structure," AIChE Annual Meeting, Minneapolis, MN, October 2011.
17. **A. N. Ford**, D. W. Park, and R. D. Braatz, "Multi-Scale Modeling of PLGA Microparticle Drug Delivery Systems," Process Systems Engineering Consortium Meeting, Amherst, MA, June 2011.

16. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Multi-Scale Modeling of PLGA Microparticle Drug Delivery Systems," 21st European Symposium on Computer Aided Process Engineering (ESCAPE-21), Chalkidiki, Greece, May 2011.
15. **A. N. Ford** and J. J. Versypt, "Industry's Unique Role in Increasing Rural Students in the STEM Pipeline," AIChE Spring Meeting, Chicago, IL, March 2011.
14. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Design of PLGA Microparticle Drug Delivery Systems Using a Reaction-Diffusion Model," AIChE Annual Meeting, Salt Lake City, UT, November 2010.
13. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Modeling of Controlled-Release Drug Delivery from Autocatalytically Degrading Polymer Microparticles," UIUC Chemical and Biomolecular Engineering Graduate Research Symposium, Urbana, IL, October 2010.
12. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Design of PLGA Microparticle Drug Delivery Systems Using a Mechanistic Reaction-Diffusion Model," DOE CSGF Annual Conference, Washington, DC, June 2010.
11. **A. N. Ford** and R. D. Braatz, "Design of PLGA Microparticle Drug Delivery Systems Using Mechanistic Reaction-Diffusion Model," AIChE Annual Meeting, Nashville, TN, November 2009.
10. **A. N. Ford**, "Girl Scout STEM Workshop: Experience with 6th-10th Grade Girls in Rural Oklahoma," AIChE Annual Meeting, Nashville, TN, November 2009. Video and transcript **featured on AIChE ChemE on Demand website**.
9. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Multiscale Modeling of Polymer Microsphere Drug Delivery," Process Systems Engineering Consortium Meeting, Santa Barbara, CA, March 2009.
8. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Multiscale Modeling of Polymer Microsphere Drug Delivery," AIChE Annual Meeting, Philadelphia, PA, November 2008.
7. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "A Mechanistic Modeling Approach to the Design and Evaluation of Polymeric Drug Delivery Systems," AIChE Annual Meeting, Philadelphia, PA, November 2008.
6. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "A Mechanistic Modeling Approach to the Design and Evaluation of Polymeric Drug Delivery Systems," UIUC Chemical and Biomolecular Engineering Graduate Research Symposium, Urbana, IL, October 2008.
5. **A. N. Ford** and R. D. Braatz, "Modeling Autocatalytic Controlled-Release Drug Delivery from PLGA Microspheres," Process Systems Engineering Consortium Meeting, Amherst, MA, May 2008.
4. R. D. Braatz, P. D. Arendt, **A. N. Ford**, and D. W. Pack, "Design of Polymer Microparticles for Controlled Release," Process Systems Engineering Consortium Meeting, Amherst, MA, May 2008.
3. M. Kishida, **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Optimal Control of Cellular Uptake Rate in Tissue Scaffolds," AIChE Annual Meeting, Salt Lake City, UT, November 2007.
2. D. V. Papavassiliou and **A. N. Ford**, "Simulations of Flow around Multi-wall Carbon Nanotubes," AIChE Annual Meeting, Cincinnati, OH, November 2005.
1. **A. N. Ford** and D. V. Papavassiliou, "Simulations of the Flow of Water around Carbon Nanotubes," Mid-America Region AIChE Student Conference, Manhattan, KS, April 2005, 5th place.

POSTERS

9. C. Li, S. Sant, **A. N. Ford Versypt**, A. Khademhosseini, R. L. Mass, "In Vitro Manipulation of a Morphogen Distribution in Early Odontogenesis," International/American/Canadian Association for Dental Research General Session, Seattle, WA, March 2013.
8. **A. N. Ford Versypt**, D. W. Pack, and R. D. Braatz, "Modeling of Controlled-Release Drug Delivery from Polymer Microspheres Using Reaction-Diffusion Equations with Hindered Diffusion," SIAM Conference on the Life Sciences, San Diego, CA, August 2012.
7. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Mechanistic Modeling of PLGA Microparticle Drug Delivery Systems," Controlled Release Society Illinois Student Chapter Symposium, Chicago, IL, May 2010.

6. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Mechanistic Modeling of PLGA Microparticle Drug Delivery Systems," AIChE Annual Meeting, Nashville, TN, November 2009.
5. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Modeling Autocatalytic Controlled-Release Drug Delivery from PLGA Microspheres," DOE CSGF Annual Conference, Washington, D.C., July 2009.
4. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Modeling Drug Delivery for Design of PLGA Microparticles," AIChE Annual Meeting, Philadelphia, PA, November 2008.
3. **A. N. Ford**, J. J. Sestrich, E. Frankfurt, and S. Joy, "Performance of Parallel Simulations for Drug Delivery from Polymer Matrices," DOE CSGF Poster Session, Scientific Discoveries in Advanced Computing Conference, Seattle, WA, July 2008.
2. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Modeling Controlled-Release Drug Delivery from PLGA Microspheres," AIChE Annual Meeting, Salt Lake City, UT, November 2007.
1. **A. N. Ford**, D. W. Pack, and R. D. Braatz, "Modeling Controlled-Release Drug Delivery from PLGA Microspheres," UIUC Chemical & Biomolecular Engineering Graduate Research Symposium, Urbana, IL, October 2007.