Curriculum Vitae: **Richard D. Braatz, Edwin R. Gilliland Professor**
77 Massachusetts Avenue, Cambridge, MA 02139
Voice: +1-617-253-3112, Fax: +1-617-258-0546
E-mail: braatz@mit.edu, http://web.mit.edu/braatzgroup

I. PERSONAL HISTORY AND PROFESSIONAL EXPERIENCE

A. Education

California Institute of Technology, Ph.D., Chemical Engineering, 1993
California Institute of Technology, M.S., Chemical Engineering, 1991
Oregon State University, B.S. with Honors, Chemical Engineering, 1988

B. Honors and Awards (Google Scholar h-index ≥ 75, total citations ≥ 20,000)

Elected to the National Academy of Engineering, 2019
Separations Division Innovation Award, American Institute of Chemical Engineers, 2019
Fellow, American Institute of Chemical Engineers, 2018
Automatica Paper Prize, 2017
Excellence in Review Award, Industrial & Engineering Chemistry Research, 2015
Excellence in Education Award, International Society of Automation, 2015
Outstanding Reviewer, Chemical Engineering Science, 2015
AIChE CAST Computing in Chemical Engineering Award, 2014
AIChE PD2M Award for Outstanding Contribution to QbD for Drug Substance, 2013
Excellence in Technical Innovation Award, International Society of Automation, 2013
Distinguished Lecturer, IEEE Control Systems Society, 2013
Academy of Distinguished Engineers, Oregon State University, 2012
Control Systems Society Transition to Practice Award, Institute of Electrical and Electronics Engineers, 2011
Edwin R. Gilliland Professor of Chemical Engineering, MIT, 2010-date
Research Collaboration Award, The Council for Chemical Research, 2009
Fellow, American Association for the Advancement of Science, 2008
Journal of Process Control Prize Paper Award (for theory/methodology), 2008
Journal of Process Control Prize Paper Award (for a survey), 2008
Fellow, International Federation of Automatic Control, 2008
Fellow, Institute of Electrical and Electronics Engineers, 2007
AIChE Excellence in Process Development Research Award, 2006
Millennium Chair of Chemical and Biomolecular Engineering, UIUC, 2006-2010
Lindsay Distinguished Lecturer, Texas A&M University, 2005-2006
Antonio Ruberti Young Researcher Prize, Institute of Electrical and Electronics Engineers, 2005
IEEE Transactions on Control Systems Technology Outstanding Paper Award, 2005
CAST Outstanding Young Researcher Award, American Institute of Chemical Engineers, 2005
Curtis W. McGraw Research Award, Engineering Research Council, 2004
CAST Directors' Award, American Institute of Chemical Engineers, 2003, 2015, 2018
University Scholar, University of Illinois, 2002-2005
Beckman Associate, UIUC Center for Advanced Study, 2002
Ernest W. Thiele Lectureship, University of Notre Dame, 2001
Donald P. Eckman Award, American Automatic Control Council, 2000

Council of Outstanding Early Career Engineers, Oregon State University, 2000
Dean's Teaching Fellow, UIUC College of Liberal Arts and Sciences, 2000
Xerox Award for Faculty Research, UIUC College of Engineering, 1999
Advisors List for Advising Excellence, UIUC College of Engineering, 1999, 2002
Teaching Excellence Award, UIUC School of Chemical Sciences, 1997
DuPont Young Faculty Award, 1995
Hertz Doctoral Thesis Prize, John and Fannie Hertz Foundation, 1994
Hertz Fellow, 1991

C. List of Academic Positions since Final Degree

Affiliate Faculty, Center for Computational Science and Engineering, MIT, 2020-date
Affiliate Faculty, Schwarzman College of Computing, MIT, 2020-date
Research Officer, Department of Chemical Engineering, MIT, 2017-date
MIT Technical Lead, Clean Energy Smart Manufacturing Innovation Institute (CESMII), 2016-date
Affiliate Faculty, Leaders for Global Operations, MIT, 2016-date
Affiliate Faculty, Center for Computational Engineering, MIT, 2015-date
Graduate Officer, Department of Chemical Engineering, MIT, 2015-2016
Adjunct Professor, KAIST, 2013-date
Affiliate Faculty, Sociotechnical Systems Research Center, MIT, 2013-date
Affiliate Faculty, Center for Biomedical Innovation, MIT, 2013-date
Affiliate Faculty, MIT Energy Initiative, 2011-date
Graduate Admissions Officer, Department of Chemical Engineering, MIT, 2011-2015
Affiliate Faculty, Novartis-MIT Center for Continuous Manufacturing, 2010-date
Edwin R. Gilliland Professor of Chemical Engineering, Massachusetts Institute of Technology (MIT), 2010-date
Adjunct Professor, Department of Chemical and Biomolecular Engineering, UIUC, 2010-2015
Adjunct Professor, Department of Electrical and Computer Engineering, UIUC, 2010-2015
Visiting Scholar, School of Engineering and Applied Sciences, Harvard University, 2009-2010
Affiliate Faculty, Institute for Advanced Computing Applications and Technologies (IACAT), UIUC, 2008-2012
Affiliate Faculty, Institute for Genomic Biology, UIUC, 2006-2010
Millennium Chair of Chemical and Biomolecular Engineering, UIUC, 2006-2010
Affiliate Faculty, Department of Mechanical Science and Engineering, UIUC, 2006-2010
Affiliate Faculty, Department of Electrical and Computer Engineering, UIUC, 2005-2010
Affiliate Faculty, Department of Mechanical and Industrial Engineering, UIUC, 2005-2006
Affiliate Faculty, Department of Bioengineering, UIUC, 2004-2010
Affiliate Faculty, Beckman Institute for Advanced Science and Technology, UIUC, 2004-2010
Applied Mathematics Faculty, UIUC, 2003-2012
Research Faculty, Center for Nanoscale Science and Technology, UIUC, 2003-2012
Visiting Professor of Chemical Engineering, Massachusetts Institute of Technology, 2002-2003
Professor of Chemical and Biomolecular Engineering, UIUC, 2002-2010
Beckman Associate, Center for Advanced Study, UIUC, 2001-2002
Affiliate Faculty, Bioengineering Program, UIUC, 2000-2004
Associate Professor of Chemical Engineering, UIUC, 2000-2002

Affiliate Faculty, Biotechnology Center, UIUC, 2000-2010
Senior Research Scientist, National Center for Supercomputing Applications (NCSA), UIUC, 1997-2002
Computational Science and Engineering Faculty, UIUC, 1995-2012
Assistant Professor of Chemical Engineering, Univ. of Illinois at Urbana-Champaign (UIUC), 1994-2000

D. Other Professional Employment (not including consulting)
Visiting Research Scientist, DuPont Company, Wilmington, DE, 1993-1994
Visiting Research Scientist, Norwegian University of Science and Technology, Trondheim, 1993
Research Engineer, Chevron Research Company, Richmond, CA, 1988

E. Invited Lectures
1. Avery-Dennison Research Center, Pasadena, California, 1991.
2. Department of Chemical Engineering, Graduate Student Seminar Series, California Institute of Technology, Pasadena, California, 1992.
3. Department of Chemical Engineering, The Ohio State University, Columbus, OH, 1993.
4. Department of Chemical Engineering, University of Massachusetts, Amherst, MA, 1993.
5. Department of Chemical Engineering, University of Illinois, Urbana, IL, 1993.
6. Department of Chemical Engineering, Case Western Reserve University, Cleveland, OH, 1993.
7. Department of Chemical Engineering, Rice University, Houston, TX, 1993.
8. Department of Chemical Engineering, University of California, Berkeley, CA, 1993.
9. Department of Chemical Engineering, University of California, Santa Barbara, CA, 1993.
10. Department of Chemical Engineering, University of Pittsburgh, PA, 1993.
11. Department of Chemical Engineering, University of Trondheim, Norway, 1993.
12. Department of Control Engineering, University of Stuttgart, Germany, 1993.
13. Shell Westhollow Research Center, Houston, TX, 1993.
14. DuPont Experimental Station, Wilmington, DE, 1993.
15. 1st Annual Midwest Process Control Workshop, Systems and Control Center, School of Chemical Engineering, Purdue University, West Lafayette, IN, 1994.
16. DuPont Experimental Station, Wilmington, DE, 1994.
17. Decision and Control Laboratory, Coordinated Science Laboratory, University of Illinois, Urbana, IL, 1994.
18. International Paper Research Center, Mobile, AL, 1995.
19. Systems and Control Center, School of Chemical Engineering, Purdue University, West Lafayette, IN, 1995.
20. Weyerhaeuser Workshop on Modeling and Control of Kamyr Digesters and Paper Machines, Weyerhauser Research Center, Tacoma, WA, 1995.
21. Department of Chemical Engineering, University of Cincinnati, OH, 1996.
22. Complexity Seminar Series, Department of Mathematics, University of Illinois, Urbana, IL, 1997.
23. Merck Research Center, Rahway, NJ, 1997.
24. Centre National de la Recherche Scientifique (CNRS), Paris, France, 1997.
25. Department of Chemical Engineering, Northwestern University, Evanston, IL, 1998.
26. Merck Research Center, Rahway, NJ, 1998.

27. Center for Process Analytical Chemistry, University of Washington, Seattle, WA, 1998.
28. CIC TechForum98, Beckman Institute of Advanced Science and Technology, University of Illinois, IL, 1998.
29. Department of Chemical Engineering, University of Notre Dame, IN, 1999.
30. Bristol-Myers Squibb Research Center, New Brunswick, NJ, 1999.
31. American Institute of Chemical Engineers (AIChE), Illinois Chapter, Champaign, IL, 1999.
32. Systems and Control Center, School of Chemical Engineering, Purdue University, West Lafayette, IN, 1999.
33. Refining Technology Group, Amoco Oil Company, BP Amoco, Naperville, IL, 1999.
34. Merck Research Center, Rahway, NJ, 1999.
35. University of Florida, Gainesville, FL, 2000.
36. FBRM Users Forum, Orlando, FL, 2000.
37. International Paper Technology Center, Cincinnati, OH, 2000.
38. Abbott Laboratories, Chicago, IL, 2000.
39. Science and Engineering Education Scholars Program Workshop, University of Illinois, Urbana, IL, 2000.
40. Control 2000 Symposium, University of Illinois, Urbana, IL, 2000.
41. Department of Chemical Engineering, National University of Singapore, Singapore, 2000.
42. DuPont Singapore, Singapore, 2000.
43. Glaxo Wellcome Manufacturing, Singapore, 2000.
44. Department of Chemical Engineering, National University of Singapore, Singapore, 2000.
45. Kyoto University, Kyoto, Japan, 2000.
46. International Paper Technology Center, Cincinnati, OH, 2000.
47. International Conference on Chemical Process Control 6, Tucson, Arizona, 2001.
48. NUS-UIUC Joint Symposium, Department of Chemical Engineering, National University of Singapore, Singapore, 2001.
49. Annual Conference for NSF K-12 Mathematics, Science, and Implementation Projects, Washington, DC, 2001.
50. Decision and Control Laboratory, Coordinated Science Laboratory, University of Illinois, Urbana, IL, 2001.
51. FBRM Users Conference, Barcelona, Spain, 2001.
52. Annual Meeting of the Association for Crystallization Technology, Northbrook, Illinois, 2001.
53. Department of Chemical Engineering, University of California at Los Angeles, 2001.
54. Merck Research Center, Rahway, NJ, 2001.
55. **Plenary Lecture**, American Control Conference, Arlington, Virginia, 2001.
56. International Conference on Materials for Advanced Technologies, Symposium D: Crystallization and Interfacial Processes, Singapore, 2001.
57. International Conference on Materials for Advanced Technologies, Symposium H: Materials Science and Engineering Education in New Millennium, Singapore, 2001.
58. GlaxoSmithKline, Singapore, 2001.
59. Department of Chemical and Process Engineering, University of Sheffield, UK, 2001.
60. 2nd Pan American Workshop on Process Systems Engineering, Guaruja, Brazil, 2001.
61. **Ernest W. Thiele Lecture**, "Advances in the Control of Complex Chemical Systems", University of Notre Dame, IN, 2001.
62. "ChemViz II: Chemistry Visualization," Supercomputing2001, Denver, CO, 2001.

63. “Advances in the Control of Complex Chemical Systems,” Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 2001.
64. “Robust Identification and Control of Batch Processes,” Process Design, Operations, and Control Seminar, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 2001.
65. “Paracetamol Crystallization using FBRM and ATR-FTIR: Metastability and Agglomeration,” FBRM Users Forum, Charleston, SC, 2002.
66. “Model Based Experimental Design and Optimization for Crystallization of a Pharmaceutical Compound,” FBRM Users Forum, Charleston, SC, 2002.
67. “Challenges, Theory, and Applications of Process Control,” Department of Chemical Engineering, University of South Carolina, Columbia, SC, 2002.
68. “Advances in the Control of Complex Chemical Systems,” Department of Chemical Engineering, University of Massachusetts, Amherst, MA, 2002.
69. “Advances in the Control of Complex Chemical Systems,” Chemical Process Modeling and Control Research Center, Lehigh University, Bethlehem, PA, 2002.
70. “Control of Sheet and Film Processes,” Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, October 18, 2002.
71. “Fault Detection and Diagnosis Applied to Whole Chemical Plants,” United Technologies Corporation Fuel Cells, South Windsor, Connecticut, October 29, 2002.
72. “Theory and Practice of Fault Detection and Diagnosis,” United Technologies Research Corporation, Connecticut, October 29, 2002.
73. “Systems Engineering of Nanomaterials Manufacturing Processes,” Process Design, Operations, and Control Seminar, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, November 21, 2002.
74. “Advances in Crystallization Modeling and Control,” Merck, Rahway, NJ, February 24, 2003.
75. “Fundamentals of Crystallization Control,” Crystallization Training Seminar: Fundamentals of Batch Crystallization Design - A High-Tech Approach, Mettler-Toledo, New York, February 25, 2003.
76. “Measurement of Particle Size Distribution in Suspension Polymerization using Laser Backscattering and Process Video Microscopy,” Lasentec Users Forum, New York, February 26, 2003.
77. “Control of Sheet and Film Processes,” Systems Research Institute, Polytechnic University, Brooklyn, NY, February 27, 2003.
78. “Advances in the Control of Particulate Processes,” Department of Chemical Engineering, Chemistry, and Materials Science, Polytechnic University, Brooklyn, NY, February 28, 2003.
79. “Advances in the Control of Complex Chemical Systems,” Department of Chemical Engineering, University of California at Santa Barbara, CA, April 17, 2003.
80. “Advances in Crystallization Modeling and Control,” Sepracor, Inc., MA, May 20, 2003.
81. “Advances in Crystallization Control,” Institute of Chemical and Engineering Sciences, Singapore, June 13, 2003.
82. **Keynote Lecture**, “Multiscale Systems Engineering with Applications to Electronics Devices,” Center for Process Systems Engineering Inaugural Symposium, Georgia Institute of Technology, Atlanta, GA, September 9, 2003.

83. "Experimental Design and Control Strategies for Batch Crystallization," Annual Meeting of the Association for Crystallization Technology, Groton, CT, September 15-17, 2003.
84. "Multiscale Systems Engineering with Applications to Electronic Devices," Center for Nanoscale Science and Technology and Decision and Control Laboratory, Coordinated Science Laboratory, University of Illinois, Urbana, IL, October 8, 2003.
85. "Multiscale Systems Engineering with Applications to Microelectronics," Department of Chemical Engineering, University of Delaware, Newark, DE, December 5, 2003.
86. **Semi-plenary Lecture**, "Advances in the Modeling and Control of Batch Crystallizers," IFAC Symposium on Advanced Control of Chemical Processes, Hong Kong, January 14, 2004.
87. "Multiscale Systems and Control with Applications to Electronic Devices," Department of Chemical Engineering, National Taiwan University, Taipei, Taiwan, January 16, 2004.
88. "Multiscale Systems and Control," Center for Process Systems Engineering Consortium Meeting, Imperial College, London, United Kingdom, April 23, 2004.
89. "Advances in Crystallization Control," Bristol Myers Squibb Research Center, New Brunswick, NJ, June 10, 2004.
90. "Modeling and Control of Multiscale Systems," Annual Meeting of the McMaster Advanced Control Consortium, McMaster University, Canada, June 23, 2004.
91. **Keynote Lecture**, "Perspectives on the Dynamics and Control of Multiscale Systems," International IFAC Symposium on Dynamics and Control of Process Systems, Cambridge, MA, July 5-7, 2004.
92. "Multiscale Systems Theory with Application to Electronic Devices," Department of Chemical and Materials Engineering, University of Alberta, Edmonton, Canada, July 26-27, 2004.
93. "Advances in Crystallization using Laser Backscattering and ATR-FTIR Spectroscopy: Automation, Metastability, and Control," Institute of Chemical and Engineering Sciences, Singapore, August 6, 2004.
94. "New Technologies for the Modeling and Control of Industrial Crystallization," Kraft Foods, Chicago, IL, January 31, 2005.
95. "Uncertainty Quantification of Highly Nonlinear Processes," Laboratory for Product and Process Design, University of Illinois at Chicago, February 1, 2005.
96. "Multiscale Systems Theory with Applications to Microelectronic Devices," Illinois Institute of Technology, Chicago, IL, February 2, 2005.
97. "Multiscale Systems Theory with Applications to Microelectronic Processes," Ecole Polytechnique de Montréal, Quebec, Canada, February 17, 2005.
98. E. J. Hukkanen and R. D. Braatz, "Use of Process Analytical Technologies in Polymerization Processes," Mettler-Toledo AutoChem Real Time Analytics Users' Forum, New York, February 27-March 2, 2005.
99. "Chemometrics, Modeling, and Control in Pharmaceutical Crystallization," FDA Center for Drug Evaluation and Research, Department of Health & Human Services, U.S. Food and Drug Administration, Rockville, MD, March 29, 2005.
100. U. Ravaioli and R. D. Braatz, "Designing Simulations for Nanoscience Applications," National Center for Learning and Technology in Nanoscale Science and Engineering, webcast, May 16, 2005.

101. "Applications of Statistics to Multiscale Systems," Gordon Conference on Statistics in Chemistry and Chemical Engineering**,** Mount Holyoke College, South Hadley, MA, July 19, 2005.
102. "Applications of ATR-FTIR Spectroscopy and Laser Backscattering to the Design of Batch Crystallization Recipes," Annual Conference of the British Association for Crystal Growth, University of Sheffield, United Kingdom, September 4-6, 2005.
103. "Applications of ATR-FTIR Spectroscopy and Laser Backscattering to the Design of Batch Crystallization Recipes," AstraZeneca, Loughborough, United Kingdom, September 7, 2005.
104. "Applications of Statistics to Multiscale Systems," SIGENE, Norwegian University of Life Sciences, Ås, Norway, October 24, 2005.
105. **Annual Industry Lecture**, "Modeling and Simulation of Multiscale Chemical Systems," Norwegian Chemical Society, Oslo, Norway, October 25, 2005.
106. "Applications of Statistics to Multiscale Chemical Systems," Norwegian University of Science and Technology, Trondheim, Norway, October 27, 2005.
107. "Multiscale Systems Theory with Microelectronics Applications," Department of Engineering Cybernetics, Norwegian University of Science and Technology, Trondheim, Norway, October 27, 2005.
108. Richard C. Alkire and Richard D. Braatz, "Multiscale Modeling and Experiments on the Effect of Additives on Shape Evolution during Electrodeposition," Joint National Institute for Nanotechnology/Center for Nanoscale Science and Technology Workshop, University of Illinois, October 31, 2005.
109. "Multiscale Systems Approach to Electrochemical Processes," Department of Chemical and Biomolecular Engineering, University of Pennsylvania, Philadelphia, PA, November 16, 2005.
110. "Multiscale Predictive Modeling of Complex Systems," University of Oklahoma, Norman, OK, November 30, 2005.
111. "Multiscale Modeling of Complex Reacting Systems," School of Chemical, Biochemical, and Materials Engineering, University of Oklahoma, Norman, OK, December 1, 2005.
112. "Multiscale Simulation and Analysis of Microelectronics Processes," Lehrstuhl für Prozesstechnik, Aachen University, Germany, December 8, 2005.
113. "Multiscale Systems Theory with Applications to Microelectronic Processes," Engineering Cybernetics Seminar Series, University of Stuttgart, Germany, December 9, 2005.
114. "A Multiscale Systems Approach to Microelectronic Processes," International Conference on Chemical Process Control 7, Lake Louise, Alberta, Canada, January 9, 2006.
115. "Advances in Modeling, Monitoring, and Control of Pharmaceutical Crystallization," Schering-Plough Research Institute, Union, NJ, February 10, 2006.
116. "Multiscale Systems and Control," Symposium on Trends in Systems and Control Theory, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany, March 1-2, 2006.
117. "Advances in Modeling, Monitoring, and Control of Pharmaceutical Crystallization," Global Pharmaceutical Research and Development, Abbott Laboratories, Illinois, March 7, 2006.
118. "A Multiscale Systems Approach to Microelectronic Processes," University of Loughborough, United Kingdom, March 27, 2006.

119. "Multiscale Modeling of Complex Reacting Systems," School of Chemical Engineering and Analytical Science, The University of Manchester, Manchester, United Kingdom, March 29, 2006.
120. **Distinguished Lecturer**, "Multiscale Systems Theory with Applications to Microelectronic Processes," Lindsay Lecture Series, Department of Chemical Engineering, Texas A&M University, College Station, TX, April 7, 2006.
121. "Modeling, Design, and Control of Multiscale Processes with Application to Batch Organic Crystallization," Process Chemistry & Engineering, Royal Society of Chemistry, Newcastle, United Kingdom, April 10, 2006.
122. "Multiscale Systems Theory with Microelectronics Applications," Ecole Polytechnique Lausanne, Switzerland, April 13, 2006.
123. "A Multiscale Systems Approach to Microelectronic Processes," Carnegie Mellon University, Pittsburgh, PA, April 25, 2006.
124. "Online Monitoring of Crystallization Processes with Application to Batch Recipe Design," Process Crystallization in the Pharmaceutical and Chemical Industry, American Chemical Society ProSpectives Series, Philadelphia, PA, April 26-27, 2006.
125. "Advances in Modeling, Monitoring, and Control of Pharmaceutical Crystallization," Sepracor, Inc., MA, May 8, 2006.
126. "Advances in Modeling, Monitoring, and Control of Pharmaceutical Crystallization," Eli Lilly, IN, May 23, 2006.
127. "Online Monitoring of Crystallization Processes with Application to Batch Recipe Design," TAP Pharmaceuticals, Lake Forest, IL, August 10, 2006.
128. "Modeling and Design of Multiscale Chemical Systems," WebCAST lecture, American Institute of Chemical Engineers, Computing and Systems Technology Division, September 29, 2006.
129. "Challenges in the Scale-up of Crystallization for Specialty Products from Laboratory R&D through to Manufacturing Scale," 14th Larson Workshop, Association for Crystallization Technology, Princeton, NJ, October 10, 2006.
130. "Design of Crystallization Processes from Laboratory R&D to the Manufacturing Scale," Crystallization Process Development: Case Studies & Research, American Chemical Society ProSpectives Series, Boston, MA, February 26, 2007.
131. "Design of Crystallization Processes from Laboratory R&D to the Manufacturing Scale," Crystallization Process Development: Case Studies & Research, Pfizer, Groton, CO, February 28, 2007.
132. "Control of Polymorphism," TAP Pharmaceuticals, Lake Forest, IL, May 23, 2007.
133. R. D. Braatz (speaker) and L. Goh, "Five Non-Intuitive Things about the Nanoscale," NCLT Center-wide Meeting, Northwestern University, Evanston, IL, May 25, 2007.
134. **Keynote Lecture**, Z. K. Nagy, M. Fujiwara, and R. D. Braatz, "Recent Advances in the Modelling and Control of Cooling and Antisolvent Crystallization of Pharmaceuticals," 8th International IFAC Symposium on Dynamics and Control of Process Systems, Cancun, Mexico, June 6-8, 2007.
135. "Modeling and Design of Multiscale Chemical Systems," Department of Chemical Engineering, University of Texas at Austin, September 11, 2007.
136. "Process Analytical Technology for Crystallization Processes," Process Analytical Technology **Plenary Session**, AIChE Annual Meeting, Salt Lake City, UT, November 2007.

137. K. Chen, N. Nair, M. S. Strano, and R. D. Braatz (speaker). "Parameter Identification for Chirality-selective Single-walled Carbon Nanotube Chemical Reaction Networks," CAST **Plenary Session**, AIChE Annual Meeting, Salt Lake City, November 2007.
138. "Modeling and Design for Drug Delivery, Tissue Engineering, and Crystallization" Bend Research, Bend, OR, November 12, 2007.
139. "Advances in Crystallization Modeling and Control," Bend Research, Bend, OR, November 12, 2007.
140. "Modeling of Controlled Release Microspheres," Regenerative Biology and Tissue Engineering Theme, Institute for Genomic Biology, December 19, 2007, noon.
141. "Advances in PAT for Pharmaceutical Crystallization," Bristol-Myers Squibb Research Center, New Brunswick, NJ, February 19, 2008.
142. "Process Analytical Technology for Pharmaceutical Crystallization," Bristol-Myers Squibb Research Center, New Brunswick, NJ, February 19, 2008.
143. "Modeling and Design of Multiscale Chemical Systems," University of Waterloo, Canada, March 20, 2008.
144. **Plenary Lecture**, "Advances in the Control of Pharmaceutical Crystallization Processes," 19th China Process Control Conference, Beijing, China, July 23-26, 2008.
145. "Modeling and Design of Multiscale Chemical Systems," Tennessee Technological University, Cookeville, TN, September 16, 2008.
146. "Modeling of Pharmaceutical and Biomedical Systems," Tennessee Technological University, Cookeville, TN, September 16, 2008.
147. "Mathematical Modeling and Design of Biomolecular Systems," Department of Bioengineering, University of Illinois at Chicago, January 23, 2009.
148. Richard D. Braatz (speaker) and Paul J. A. Kenis, "Screening, Optimization, and Modeling of Protein and Pharmaceutical Crystallization within High-throughput Microfluidic Platforms," Symposium on Recent Challenges in Crystallisation Science and Engineering, Institute of Process Research and Development, University of Leeds, United Kingdom, March 24, 2009.
149. "Multiscale Simulation and Systems Engineering," Beckman Institute of Advanced Science and Technology, Urbana, Illinois, April 6, 2009.
150. "Robust Optimal Control of Distributed Parameter Systems," Institut für Automatik (Automatic Control Laboratory), Eidgenössische Technische Hochschule (Swiss Federal Institute of Technology), Zürich, Switzerland, April 20, 2009.
151. "Advances in Pharmaceutical and Protein Crystallization," Institut für Verfahrenstechnik (Institute for Process Engineering), Eidgenössische Technische Hochschule (Swiss Federal Institute of Technology), Zürich, Switzerland, April 21, 2009.
152. "Robust Optimal Control of Distributed Parameter Systems," Institut für Systemtheorie und Regelungstechnik (Institute for Systems Theory and Automatic Control), University of Stuttgart, Germany, April 22, 2009.
153. "PAT and Direct Design Approaches to Crystallisation," Glaxo Smith Kline, Stevenage, United Kingdom, April 24, 2009.
154. "Crystallisation Modeling," Glaxo Smith Kline, Stevenage, United Kingdom, April 24, 2009.
155. "Robust Optimal Control of Distributed Parameter Systems," Cymer Center for Control Systems and Dynamics, University of California at San Diego, CA, May 8, 2009.

156. "In-situ Process Video Microscopy, FBRM, and Kinetics Modeling of Emulsions," Procter and Gamble, Cincinnati, Ohio, June 4, 2009.
157. "Process Analytical Technology with Application to Industrial Crystallization," Procter and Gamble, Cincinnati, Ohio, June 4, 2009.
158. V. R. Subramanian (speaker), V. Boovaragavan, V. Ramadesigan, K. Chen, and R. D. Braatz. "Model Reformulation and Design of Lithium-Ion Batteries," Foundations of Computer-Aided Process Design, Breckenridge, CO, June 7-12, 2009.
159. R. D. Braatz (speaker), K. Chen, N. Nair, and M. S. Strano, "Modeling and Design of Carbon Nanotube-based Sensors," Purdue University, West Lafayette, Indiana, July 17, 2009.
160. R. D. Braatz (presenter), L. Goh, K. Kim, D. Reid, M. Rasche, and M. Fujiwara, "Interactive Simulations for Illustrating "Nano" Concepts: Nanoparticles, Nanowires, and Nanoporous Materials," Addressing the Challenges of Nanoscale Science and Engineering Education Symposium on Undergraduate Nano-Education, University at Albany, NY, August 6, 2009 (poster).
161. Contributor to "Nano 101" Session, 8th Annual NanoBusiness Conference, Chicago, Illinois, September 8, 2009. http://nanobusiness2009.com/index.php/program
162. "Computer-Aided Design of Spatially Controlled Release in Stem Cell Tissue Engineering," Topics in Bioengineering Seminar Series, School of Engineering and Applied Sciences, Harvard University, September 22, 2009.
163. "Robust Optimal Control of Finite-time Distributed Parameter Systems," Universite Catholiqué de Louvain, Belgium, October 13, 2009.
164. "Robust Optimal Control of Finite-time Distributed Parameter Systems," Optimization in Engineering Center, Katholieke Universiteit Leuven, Belgium, October 15, 2009.
165. "Robust Optimal Control of Finite-time Distributed Parameter Systems," Institute for Automation Engineering, Otto-von-Guericke-University, Magdeburg, Germany, October 22, 2009.
166. "Advances in Pharmaceutical and Protein Crystallization," Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany, October 23, 2009.
167. "Advances in Pharmaceutical and Protein Crystallization," Department of Chemical Engineering, University of Loughborough, England, October 26, 2009.
168. "Design and Control of Multiscale Chemical Systems," Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, MA, November 6, 2009.
169. "Multiscale Simulation in Science and Engineering," COMSEF **Plenary Session**: Opportunities for Chemical Engineering in Petascale Computing, AIChE Annual Meeting, Nashville, TN, November 9, 2009.
170. "The Role of Automatic Process Control in QbD," Emerging Topics **Plenary Session**, Topical I: Comprehensive Quality by Design in Pharmaceutical Development and Manufacture, AIChE Annual Meeting, Nashville, TN, November 11, 2009.
171. "Interactive Computational Engineering and Science Software for Nanoscale Applications," Education **Plenary Session**, International Conference for High Performance Computing, Networking, Storage and Analysis (SC09), Portland OR, November 15, 2009.
172. M. Kishida, D. W. Pack, and R. D. Braatz (speaker), "Computer-based Design for Stem Cell Tissue Engineering," Synthetic Biology: Building on Nature's Inspiration, 7th Annual National Academies Keck Futures Initiative (NAKFI) Conference, The National Academies, Irvine, California, November 19-22, 2009 (poster).

173. “Advances in Pharmaceutical Crystallization,” Boehringer-Ingelheim, Connecticut, January 15, 2010.
174. “Design and Control of Multiscale Chemical Systems,” Department of Chemical and Biological Engineering, Tufts University, Medford, Massachusetts, February 8, 2010.
175. “Computer-Aided Design of Spatially Controlled Release in Stem Cell Tissue Engineering,” Department of Chemical and Biological Engineering, Rensselaer Polytechnic Institute, Troy, New York, April 30, 2010.
176. “Computer-Aided Design of Spatially Controlled Release in Stem Cell Tissue Engineering,” Bio-Interest Group Seminar Series, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, August 30, 2010.
177. “Spatially Controlled Release in Stem Cell Tissue Engineering,” Percivia, Cambridge, Massachusetts, February 4, 2011.
178. “Advances in Pharmaceutical Crystallization,” Sunovion Pharmaceuticals, Marlborough, Massachusetts, February 24, 2011.
179. “Design and Control of Multiscale Chemical Systems,” Alchemy 2011: Energise the Future, National Institute of Technology, Tiruchirapalli, India, March 18, 2011 (via skype).
180. “Robust Optimal Control of Finite-time Distributed Parameter Systems,” Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, Cambridge, Massachusetts, April 5, 2011.
181. “Estimation and Modeling of Crystal Size and Shape Evolution Using In Situ Tools,” Millennium Pharmaceuticals, Cambridge, Massachusetts, May 5, 2011.
182. R. Lakerveld, R. D. Braatz, and P. I. Barton, “A Plant-wide Control Strategy for Continuous Pharmaceutical Manufacturing,” Novartis, East Hanover, New Jersey, May 19, 2011 (poster).
183. “Process Systems Engineering and Intensification,” Eni-MIT Workshop, Milan, Italy, June 29, 2011.
184. “NanoSystems Engineering: Analysis, Design, and Control at the Nanoscale,” Institut für Chemie- und Bioingenieurwissenschaften (Institute for Chemical and Bioengineering), Eidgenössische Technische Hochschule (Swiss Federal Institute of Technology), Zürich, Switzerland, August 26, 2011.
185. “Efficient Polynomial-time Outer Bounds on State Trajectories for Uncertain Polynomial and Rational Systems,” Institut für Systemtheorie und Regelungstechnik (Institute for Systems Theory and Automatic Control), University of Stuttgart, Germany, September 27, 2011.
186. **Keynote Speaker**, “Advances in Pharmaceutical Crystallization: Control of Polymorphic Identity, Shape, and Size Distribution,” International Congress on Pharmaceutical Engineering Science, Graz, Austria, September 29, 2011.
187. “Fault-Tolerant Model Predictive Control of Refining,” BP, Naperville, Illinois, November 16, 2011.
188. “Process Intensification,” Eni-MIT Joint Steering Committee Meeting, Cambridge, Massachusetts, November 18, 2011.
189. “Quality by Design Approaches for Pharmaceutical and Biopharmaceutical Manufacturing Processes,” Annual Biomanufacturing Summit, Massachusetts Institute of Technology, Cambridge, Massachusetts, November 18, 2011.

190. “Frontiers of Process Monitoring and Control of Industrial Systems,” Pall Corporation Executive Briefing, Massachusetts Institute of Technology, Cambridge, Massachusetts, November 21, 2011.
191. “Control of Nano and Microchemical Systems,” in Session on “Non-traditional Application Domains: Success Stories and Challenges,” International Conference on Chemical Process Control VIII, Savannah, Georgia, January 11-13, 2012.
192. “Advances in Pharmaceutical Crystallization: Control of Polymorphic Identity, Shape, and Size Distribution,” Millennium Pharmaceuticals, Cambridge, Massachusetts, January 20, 2012.
193. “Systems Nanotechnology: Identification, Estimation, and Control at the Nanoscale,” Mork Family Department of Chemical Engineering and Materials Science, University of Southern California, Los Angeles, January 26, 2012.
194. “Advanced Control Techniques from Other Fields, Their Applicability, and Impact on Energy Storage,” ARPA-E Workshop, Washington, DC, February 8, 2012.
195. “Chemical Engineering from Fish Oil to Systems Nanotechnology,” School of Chemical, Biological, and Environmental Engineering, Oregon State University, Corvallis, Oregon, February 24, 2012.
196. “Abstracting Knowledge from Data: Fault Detection, Diagnosis, and Feedback Control,” Data Analytics for the Energy Industry Workshop, The Royal Society of Chemistry, London, United Kingdom, March 20, 2012.
197. “Systems and Control of Lithium-ion Batteries,” United Technologies Research Corporation, South Windsor, Connecticut, March 27, 2012.
198. **Julia Sung Distinguished Lecture**, “Advances in Pharmaceutical Crystallization: Control of Polymorphic Identity, Shape, and Size Distribution,” Department of Chemical and Biological Engineering, University of British Columbia and the Vancouver Chapter of IEEE, Vancouver, British Columbia, Canada, March 29, 2012.
199. R. Lakerveld (speaker), J. M. B. Evans, B. Benyahia, R. D. Braatz, and P. I. Barton, “Implementing Continuous Manufacturing: The Synergy Between Plant-wide Control, Modeling, and QbD,” Pharma QbD Forum, Berlin, Germany, April 24-25, 2012.
200. “Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems,” Perspectives in Control Theory and Systems Biology - A Fest Colloquium on the Occasion of Frank Allgöwer’s 50th birthday, Stuttgart, Germany, June 11, 2012.
201. **Semi-plenary Lecture**, “Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems,” American Control Conference, Montréal, Quebec, Canada, June 27, 2012.
202. “Data-driven Methods for Fault Detection and Diagnosis,” BP, Naperville, Illinois, July 26, 2012.
203. “Systems Nanotechnology: Moving From Nano-Science to Nano-Products,” Future Innovation in Process Systems Engineering, Aldemar-Olympian Village, Western Peloponnese, Greece, August 29-31, 2012.
204. “Systems Nanotechnology: Estimation, Design, and Control of Nanoscale Systems,” School for Engineering of Matter, Transport, and Energy, Arizona State University, Tempe, Arizona, September 10, 2012.
205. R. Lakerveld (speaker), B. Benyahia, P. L. Heider, H. Zhang, S. Mascia, J. M. B. Evans, R. D. Braatz, and P. I. Barton, “Case Study: The Application of a Plant-wide Control Strategy for a Continuous Pharmaceutical Process at the Novartis-MIT Center for Continuous

Manufacturing," The University of Heidelberg International QbD/PAT Conference 2012, Heidelberg, Germany, September 26-27, 2012.

206. **Plenary Lecture**, "Control of Molecular Purity, Crystal Structure, and Particle Size Distribution in Pharmaceutical Crystallization," IEEE Multi-Conference on Systems and Control (MSC), Dubrovnik, Croatia, October 2-5, 2012.
207. "Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems," Center for Control, Dynamical-Systems, and Computation, University of California, Santa Barbara, October 12, 2012.
208. "Control of Molecular Purity, Crystal Structure, and Particle Size Distribution in Pharmaceutical Crystallization," Department of Chemical and Biomolecular Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, October 22-23, 2012.
209. **Keynote Lecture**, "Systems Nanotechnology: Estimation, Design, and Control of Nanoscale Systems," Fall Symposium of the Korean Institute of Chemical Engineers, Pushan, South Korea, October 24, 2012.
210. **Plenary Lecture**, R. D. Braatz (speaker), "Looking to the Future in Continuous Pharmaceutical Manufacturing," Plenary Session on the Next Frontier in the Application of Quality by Design, AIChE Annual Meeting, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Lecture described in AIChE ChEnected news on October 31, 2012. The presentation is available on-line in AIChE ChemE on Demand at http://www.aiche.org/resources/chemeondemand/conference-presentations/looking-future-continuous-pharmaceutical-manufacturing.
211. "Computational Engineering and Science Software for Nanoscale Explorations," SIAM Computational Science and Engineering Conference, Boston, Massachusetts, February 27, 2013.
212. R. Lakerveld (speaker), B. Benyahia, P. L. Heider, H. Zhang, S. Mascia, J. M. B. Evans, R. D. Braatz, and Paul I. Barton, "A Plant-wide Control Strategy for an Integrated Continuous Pharmaceutical Pilot Plant," 10th Annual PAT and Quality by Design, London, United Kingdom, March 18-20, 2013.
213. "Design of a Novel Continuous Pharmaceutical Crystallizer," Millennium Pharmaceuticals, Cambridge, Massachusetts, May 17, 2013.
214. "Control in Continuous Pharmaceutical Manufacturing," U.S. Food and Drug Administration, White Oak campus, Silver Spring, Maryland, June 4, 2013.
215. "An Overview on Multiscale Modeling and Simulation I," Summer School of the International Max Planck Research Graduate School, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany, September 2, 2013.
216. "An Overview on Multiscale Modeling and Simulation II," Summer School of the International Max Planck Research Graduate School, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany, September 2, 2013.
217. "Perspectives on Modeling and Control of Li-ion Batteries," Systems and Control Seminar Series, Department of Electrical Engineering, Otto-von-Guericke University Magdeburg, Germany, September 4, 2013.
218. "Perspectives on Modeling and Control of Li-ion Batteries," Technische Universität Braunschweig, Germany, September 6, 2013.
219. "Design and Control of Multiscale Chemical Systems," ABB Corporate Research Centre, Bangalore, India, September 10, 2013.

220. “Fast Model Predictive Control,” ABB Corporate Research Centre, Bangalore, India, September 10, 2013.
221. **Keynote Address**, “Optimization and Control Using Population Balance Models,” 5th International Conference on Population Balance (PB) Modelling 2013 (PBM-2013), Bangalore, India, September 11, 2013.
222. “An Introduction to Time Series Analysis,” BP, September 16, 2013.
223. “Systems Nanotechnology: Engineering Nanomaterials for Chemical, Pharmaceutical, and Biological Applications,” Department of Chemical Engineering, Purdue University, West Lafayette, Indiana, October 29, 2013.
224. “A Roadmap for the Multiscale Simulation of Lithium-ion Batteries,” Materials for a Sustainable Energy Future Workshop III: Batteries and Fuel Cells, Institute for Pure & Applied Mathematics, University of California at Los Angeles, November 6, 2013.
225. “Control in Continuous Pharmaceutical Manufacturing,” Novartis, Basel, Switzerland, 3 pm, November 11, 2013.
226. “Systems Nanotechnology: Engineering Nanomaterials for Chemical, Pharmaceutical, and Biological Applications,” Department of Chemical Engineering, University of Massachusetts, Amherst, November 19, 2013.
227. **Plenary Lecture**, S. Streif, K.-K. K. Kim, P. Rumschinski, M. Kishida, D. E. Shen, R. Findeisen, and R. D. Braatz (speaker), “Robustness Analysis, Prediction and Estimation for Uncertain Biochemical Networks,” Computer Applications in Bio Technology and 10th International Symposium on Dynamics and Control of Process Systems, Mumbai, India, December 16-20, 2013.
228. “Process Control in Continuous Manufacturing,” PreCon Workshop on Control Strategy for Continuous Manufacturing, 28th International Forum and Exhibition on Process Analytical Technology (Process Analysis & Control), aka IFPAC 2014 Annual Meeting, Arlington, Virginia, January 20, 2014.
229. Richard Lakerveld (speaker), Brahim Benyahia, Patrick L. Heider, Haitao Zhang, Aaron Wolfe, Christopher J. Testa, Sean Ogden, Devin R. Hersey; Sal Mascia, James M. B. Evans, Richard D. Braatz, and Paul I. Barton, “Plant-wide Control for Integrated Continuous Pharmaceutical Manufacturing,” SMi Quality by Design. London, UK, February 25, 2014.
230. “Control of Molecular Purity, Crystal Structure, and Particle Size Distribution in Pharmaceutical Crystallization,” Department of Chemical Engineering, University of Rhode Island, Kingston, Rhode Island, February 27, 2014.
231. “Ideas on Integration of OSIsoft into Chemical Engineering Curricula,” OSIsoft Users Conference, San Francisco, California, March 27, 2014.
232. “Dynamic Modeling of Pharmaceutical Manufacturing Processes,” Boehringer-Ingelheim Pharmaceuticals Inc., Ridgefield, Connecticut, April 30, 2014.
233. “Continuous Slug-Flow Crystallization,” Millennium Pharmaceuticals, Cambridge, Massachusetts, May 23, 2014.
234. “Systems Technology in Biologics QbD Implementation,” Workshop on PAT and QbD in Biopharmaceutical Industry, Biopharmaceutical Process and Quality Consortium 3rd Biopharmaceutical Summit, University of Massachusetts, Lowell, May 30, 2014.
235. “Control of Molecular Purity, Crystal Structure, and Particle Size Distribution in Pharmaceutical Crystallization,” Beijing University of Chemical Technology, China, June 30, 2014.

236. "Control of Molecular Purity, Crystal Structure, and Particle Size Distribution in Pharmaceutical Crystallization," Tianjin University, China, July 1, 2014.
237. **Plenary Speaker**, "Robust Optimal Control of Finite-time Distributed Parameter Systems," International Conference on Mechatronics and Control, Jinzhou, China, July 5, 2014. http://icmc.bhu.edu.cn/pageples.asp
238. "Robust Optimal Control of Finite-time Distributed Parameter Systems," Harbin Institute of Technology, China, July 8, 2014.
239. **Plenary Lecture**, "Advances in the Design and Control of Continuous Pharmaceutical Crystallizers," British Association for Crystal Growth Annual Conference, University of Leeds, United Kingdom, July 15, 2014, 8:50 am. Will be paid 1000 pounds for travel.
240. "Robust Optimal Control of Finite-time Nonlinear Distributed Parameter Systems," Workshop on Uncertain Dynamical Systems, Amsterdam, The Netherlands, August 20-22, 2014.
241. "Controlling Pharmaceutical Quality," **Plenary Session**, FDA/PQRI Conference on Evolving Product Quality, Bethesda, Maryland, September 16, 2014.
242. "Mathematical Modeling, Design, and Control of Continuous Viral Vaccine Manufacturing," Sanofi-Pasteur, Toronto, Canada, September 18, 2014.
243. "Advances in the Design and Control of Continuous Pharmaceutical Crystallizers," Clemson University, South Carolina, September 25, 2014.
244. "Multiscale Simulation of Chemically Reacting Systems," **Schiesser Lecture in Scientific Computing**, Lehigh University, Bethlehem, Pennsylvania, October 15, 2014.
245. "Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems," Department of Electrical Engineering, Universidad de Concepción, Chile, November 3, 2014.
246. "Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems," Pontificia Universidad Católica de Valparaíso, Chile, November 4, 2014.
247. **Distinguished Lecture**, "Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems," XXI Congress of ACCA (Asociación Chilena de Control Automático), Faculty of Engineering, Universidad Central de Santiago de Chile, Santiago, Chile, November 7, 2014.
248. "A First-Principles Model-based Approach to Real-time Release," Real Time Parametric Release BioMAN Annual Summit, Cambridge, November 14, 2014.
249. **CAST Lecture**, "From Molecules to Manufacturing Plants: A Journey Across Time and Length Scales," AIChE Annual Meeting, Atlanta, Georgia, November 18, 2014.
250. "Advanced Control of Manufacturing Processes," Brewer Science, East Hanover, Missouri, December 12, 2014.
251. "Theoretical Analysis of Temperature-Induced Nucleation in Dual Impinging Jet Mixers," SY-BIO Workshop, University of Texas at Dallas, March 25-26, 2015.
252. **Keynote Lecture**, "Advances in Biopharmaceutical Manufacturing," 15th IFAC/IEEE/IFIP/IFORS Symposium on Information Control Problems in Manufacturing," Ottawa, Canada, May 11, 2015.
253. "Process Intensification in Reaction Engineering and Crystallization," 25/50/75 Celebration for Professor H. Scott Fogler, University of Michigan, Ann Arbor, May 16, 2015.
254. Zhilong Zhu, You Peng, T. Alan Hatton (speaker), Kamal Samrane, Allan S. Myerson, and Richard D. Braatz, "Crystallization of Calcium Sulphate during Phosphoric Acid Production: Modeling Particle Shape and Size Distribution," International Symposium on

Innovation and Technology in the Phosphate Industry, Marrakesh, Morocco, May 18-20, 2015.

255. "Continuous Pharmaceutical Manufacturing: Quality-by-Design, Systems Integration, and Control," Modernization in Manufacturing session, ISPE/FDA/PQRI Quality Manufacturing Conference, Washington, DC, June 1, 2015.
256. "Quality by Design and Data Analytics for Biopharmaceutical Manufacturing," GlaxoSmithKline, Philadelphia, PA, July 29, 2015.
257. **Plenary Lecture**, "Perspectives on Process Monitoring of Industrial Systems," IFAC Symposium on Fault Detection, Supervision, and Safety for Technical Processes (SAFEPROCESS), Paris, France, September 2-4, 2015.
258. "Optimal Control via Linear and Bilinear Matrix Inequalities," University of Pavia, Italy, September 14-16, 2015. Summer course.
259. "Dynamic Optimization and Control of Uncertain Systems," BP, September 15, 2015.
260. **Semi-Plenary Lecture**, "Nonlinear Model Predictive Control of Systems with Probabilistic Time-invariant Uncertainties," 5th IFAC Conference on Nonlinear Model Predictive Control, Seville, Spain, September 17, 2015.
261. "Robust Nonlinear Model Predictive Control for Industrial Systems," Industrial Session, 5th IFAC Conference on Nonlinear Model Predictive Control, Seville, Spain, September 19, 2015.
262. **Keynote Lecture**, "Control Systems Technology in the Advanced Manufacturing of Biologic Drugs," IEEE Multi-Conference on Systems and Control, Novotel Manly Pacific, Sydney, Australia, September 21-23, 2015 (oral presentation cancelled due to visa issues; peer-reviewed paper in conference proceedings).
263. "Recent Advances in Continuous Slug-flow Crystallization," Association for Crystallization Technology Workshop, Philadelphia, Pennsylvania, October 6, 2015.
264. "Continuous Biopharmaceutical Manufacturing: Quality-by-Design, Systems Integration, and Control," Conagen, Bedford, Massachusetts**,** October 26, 2015.
265. "Prediction and Real-time Control of Product Quality Attributes," BioProcess International Conference & Exhibition, Cambridge, Massachusetts, October 29, 2015.
266. "Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems," Control, Instrumentation and Robotics Seminar Series, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, November 2, 2015.
267. "Recent Advances in Continuous Slug-flow Crystallization," Crystallization and Evaporation **Plenary Session**, AIChE Annual Meeting, Salt Lake City, November 9, 2015.
268. "Advanced Manufacturing of Pharmaceuticals," Session on Process Monitoring & Control - I. Intelligence Based Manufacturing Trends – Control Strategy for Continuous Manufacturing, IFPAC Annual Meeting & Thirteenth International Forum on Process Analytical Technology, Arlington, Virginia, January 25, 2016.
269. "Continuous Biopharmaceutical Manufacturing: Quality-by-Design, Systems Integration, and Control," Executive SmartLab Exchange, San Diego, California, February 23, 2016.
270. "Fast Robust Model Predictive Control of Advanced Manufacturing Systems," IEEE Control Systems Forum, February 25, 2016.
271. "Strategies to Accelerate Process Control Adoption in the Pharmaceutical Industry," FDA-AIChE Workshop on Adopting Continuous Manufacturing: Overcoming the Perceived Obstacles, March 1, 2016, Bethesda, Maryland.

272. "Advanced Control of Manufacturing Processes," Saint Gobain, Northboro, Massachusetts, March 24, 2016.
273. Kristen Severson, Marco Reis, and Richard D. Braatz (speaker), "Challenges and Research Directions in Big Data," Big Data **Plenary Session**, AIChE Spring National Meeting and 12th Global Congress on Process Safety, Houston, Texas, April 11, 2016.
274. "Advances in Process Control and Data Analytics," Dow Chemical Company, Houston, Texas, April 14, 2016.
275. "Control of Molecular Purity, Crystal Structure, and Particle Size Distribution in Pharmaceutical Crystallization," Boehringer-Ingelheim, Connecticut, April 18, 2016.
276. "Design for Product Quality Assurance in End-to-End Pharmaceutical Manufacturing," ISPE Continuous Manufacturing Conference, Baltimore, Maryland, April 20-21, 2016.
277. "Closing Presentation: Examining Novel Continuous Manufacturing Processes and Equipment," American Biomanufacturing Summit, San Diego, CA, May 11, 2016.
278. "Smart Manufacturing of Pharmaceuticals," Intelligent based Manufacturing (IbM) University Lecture Series, Pfizer, webinar, June 21, 2016.
279. **Keynote Lecture**, "Advanced Manufacturing of Biopharmaceuticals" 13th International Conference on Informatics in Control, Automation and Robotics, Lisbon, Portugal, July 29-31, 2016.
280. "Plant-Wide Process Control Model for Biological Manufacturing," Process Characterization, Qualification and Control Conference, 8th Annual Bioprocessing Summit, Boston, August 19, 2016.
281. "Fast Robust Model Predictive Control of Advanced Manufacturing Systems," Laboratory for Dynamics and Control of Nanosystems, University of Texas at Dallas, September 19, 2016.
282. "Emerging and Enabling Technologies in Control of Continuous Bioprocesses," Second International Symposium on Continuous Manufacturing of Pharmaceuticals, Cambridge, Massachusetts, September 27, 2016.
283. "Challenges and Research Directions in Big Data," Department of Chemical Engineering, University of Kyoto, Japan, October 4, 2016.
284. "Lecture 1: Introduction to Stochastic Chemical Kinetics," University of Kyoto, Japan, October 5, 2016.
285. "Lecture 2: Kinetic Monte Carlo Simulation," University of Kyoto, Japan, October 6, 2016.
286. "Lecture 3: KMC Simulation on Solid Surfaces," University of Kyoto, Japan, October 6, 2016.
287. "Lecture 4: Introduction to Multiscale Simulation," University of Kyoto, Japan, October 7, 2016.
288. "Case Study: Transitioning from Batch Processing to Continuous Manufacturing," 8th Annual Life Science Manufacturing & Quality Forum, San Antonio, Texas, October 13, 2016.
289. "Recent Advances in Continuous Slug-flow Crystallization," Northeast Section of the American Chemical Society Process Chemistry Symposium, Cambridge, Massachusetts, October 20, 2016.
290. "Introduction to Anomaly Detection," Decision Analytics DRL workshop on Anomaly Detection, BP, webinar, December 5, 2016.

291. "Systems Nanotechnology: Engineering Nanomaterials for Chemical and Biological Applications," Department of Chemical and Biological Engineering, University of Wisconsin, Madison, December 6, 2016.
292. "Challenges and Opportunities in Biopharmaceutical Manufacturing Control," Session on Grand Challenges. International Conference on Chemical Process Control, Tucson, Arizona, January 10, 2017.
293. "Modeling and Control of the Continuous Manufacturing of Large and Small-molecule Pharmaceuticals," 36th Anniversary Commemorative Lecture Series, Amgen, Cambridge, Massachusetts, February 16, 2017.
294. "Challenges and Opportunities in Biopharmaceutical Manufacturing Control," Advanced Manufacturing Technology in the Pharma/Bio Industry Session, IFPAC Annual Meeting, Bethesda, Maryland, February 27 – March 2, 2017. March 1, 2017. Abstract 219.
295. "Process Modelling and Real-Time Control for Manufacturing Biopharmaceuticals on Demand" 8th Annual Biotherapeutics Analytical Summit, Process Analytics and Characterization Conference, North Bethesda, Maryland, March 21-22, 2017.
296. Kristen Severson and Richard D. Braatz, "The Data Analytics Triangle," 3rd Big Data Analytics Topical Sessions, AIChE Spring National Meeting, San Antonio, Texas, March 29-31, 2017.
297. "Process Modeling and Control of Continuous Pharmaceutical Manufacturing," Pfizer, Groton, CT, May 3, 2017.
298. "Bioreactor Modeling for Process Intensification," BioMAN Workshop on Process Intensification for Biomanufacturing," Massachusetts Institute of Technology, Cambridge, Massachusetts, May 16, 2017.
299. "Continuous Manufacturing of (Bio)Pharmaceuticals," CPhI Connect, Philadelphia, Pennsylvania, May 17, 2017.
300. "Advances and Research Directions in Smart Manufacturing," MIT Club of the Delaware Valley, Philadelphia, Pennsylvania, May 17, 2017.
301. "Advanced Manufacturing of Biopharmaceuticals," Department of Chemical and Biological Engineering, Drexel University, Philadelphia, Pennsylvania, May 19, 2017.
302. "Challenges and Directions in Big Data," OSIsoft, San Leandro, May 22, 2017.
303. "The Data Analytics Triangle: Best Practices for Selecting Machine Learning Methods," OSIsoft, San Leandro, May 22, 2017.
304. "Smart Manufacturing of Biopharmaceuticals," OSIsoft, San Leandro, May 22, 2017.
305. **Plenary Lecture**, "Advanced Control of Pharmaceutical Crystallization," 6th International Symposium on Advanced Control for Industrial Processes, Taipei, Taiwan, May 29, 2017.
306. "A Vision of Advanced Manufacturing," 2040 Visions of Process Systems Engineering, Cambridge, Massachusetts, June 2, 2017.
307. "Advanced Pharmaceutical Manufacturing," The Power of Amgen Science and Technology: Experience Firsthand, Amgen, Cambridge, Massachusetts, June 2, 2017.
308. "Integrated Control and Monitoring of Continuous Biomanufacturing," Continuous Biomanufacturing: Current Success and Future Trend, University of Oxford, United Kingdom, June 26, 2017.
309. **Featured Presentation**, "Process Modeling and Real-Time Control for On-Demand, Continuous Biomanufacturing," 3rd Annual Conference on Continuous Processing in Biopharmaceutical Manufacturing Conference, 9th Annual Bioprocessing Summit, August 21-22, 2017, Boston, Massachusetts.

310. "Sparse Data-driven Models for the Manufacture of a Monoclonal Antibody," BioMAN Workshop on Setting Specifications for Biotherapeutic Products, Cambridge, Massachusetts, September 12, 2017.
311. **Distinguished Lecture**, "Systems Nanotechnology: Analysis, Design, and Control of Nanoscale Systems," Department of Chemical Engineering, University of Utah, Salt Lake City, Utah, September 18, 2017.
312. "Control and Systems Theory for Advanced Manufacturing," Workshop on Emerging Applications of Control and Systems Theory (EACST) in Honor of Vidyasagar's 70th Birthday, University of Texas at Dallas, September 28-29, 2017.
313. **Plenary Lecture**, "New Directions in the Control of Advanced Manufacturing Systems," 17th International Conference on Control, Automation and Systems, Jeju Island, South Korea, October 18-21, 2017.
314. "New Directions in the Control of Advanced Manufacturing Systems," Seoul National University, October 21, 2017.
315. "Continuous Biopharmaceutical Manufacturing: Modeling, Design, and Fully Automated Control," ISPE Biopharmaceutical Manufacturing Conference, San Francisco, California, December 5, 2017.
316. **Keynote Speaker**, "A Fully Automated Biopharmaceutical Manufacturing Plant: Process Design, Modeling, and Control," Single-use Technologies and Continuous Processing, San Diego, California, January 8, 2018.
317. Panelist, A Chemical Sciences Roundtable Workshop on "Data Science: Opportunities to Transform Chemical Sciences and Engineering," NAS Building, Washington, DC, February 27-28, 2018.
318. "Lowering the Barrier for Regulatory Approval of Disruptive Technologies," Disruptive Downstream Technologies Conference, San Diego, June 22, 2018.
319. **Plenary Speaker**, "Optimal Control of Uncertain Systems," Future Innovation in Process Systems Engineering VI, Porto Carras Meliton Resort Hotel, Chalkidiki, Greece, June 25, 2018.
320. "Population Balance Models for Crystal Nucleation and Growth," Advanced School on Fluid Dynamics Effects on Particle Formation in Crystallization Processes, Udine, Italy, July 3, 2018.
321. "Coupling with CFD: Potentials and Pitfalls," Advanced School on Fluid Dynamics Effects on Particle Formation in Crystallization Processes, Udine, Italy, July 4, 2018.
322. "Optimal Design of Pharmaceutical Crystallizers I," Advanced School on Fluid Dynamics Effects on Particle Formation in Crystallization Processes, Udine, Italy, July 4, 2018.
323. "Optimal Design of Pharmaceutical Crystallizers II," Advanced School on Fluid Dynamics Effects on Particle Formation in Crystallization Processes, Udine, Italy, July 6, 2018.
324. "The Emerging Role of Big Data, Data Analytics, and Machine Learning in the Process Industries," Workshop on Data Analytics and Machine Learning, 10th IFAC Symposium on Advanced Control of Chemical Processes, Shenyang, China, July 24, 2018.
325. "Kalman's Impact on Process Control, Estimation, and System Identification: Contributions to Chemical Process Systems," IFAC Symposium on Advanced Control of Chemical Processes, July 25, 2018.
326. Panelist, "Integrated Continuous Manufacturing of Pharmaceuticals," Session on Integration, Continuous Manufacturing for the Modernization of Pharmaceutical

Production, National Academies of Science, Engineering, and Medicine, Washington DC, July 30-31, 2018.

327. "Challenges and Opportunities in Big Data," AIChE Webinar, August 8, 2018. https://www.aiche.org/academy/webinars/challenges-and-opportunities-big-data
328. Panelist, Applying Industry 4.0 Concepts to Improve Biologics Manufacturing, BioProcess International Conference & Exhibition, Boston, MA, September 7, 2018.
329. "Design and Implementation of Fully Automated Biomanufacturing Unit Operations," BioProcess International Conference & Exhibition, Boston, MA, September 7, 2018.
330. "Therapeutic Protein Crystallization for Capture, Purification, Storage, and Formulation," BioMAN Workshop on Process Intensification for Protein Therapeutics, Cambridge, Massachusetts, September 11, 2018.
331. "Perspectives on Modeling, Prediction, and Control of Lithium-ion Batteries," Department of Energy Resources Engineering, Stanford University, October 8, 2018.
332. "Mathematical Modeling of Blown Film extrusion," Dow Chemical Company, Midland, Michigan, October 12, 2018.
333. **Keynote and Panelist**, "Industrial Internet of Things (IIoT) Applications and Industry 4.0," AIChE Annual Meeting, Pittsburgh, Pennsylvania, October 30, 2018.
334. "Systems and Control in Advanced Manufacturing," Control@MIT, Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, November 2, 2018.
335. "Advanced Data Analytics and Control of Pharmaceutical Manufacturing," AstraZeneca, November 23, 2018.
336. "Modeling Approaches to Support Continuous Manufacturing of Biopharmaceuticals," GlaxoSmithKline, King of Prussia, Pennsylvania, November 27, 2018.
337. "Robust Data Analytics in Biopharmaceutical Manufacturing," MIT AI in Life Sciences and Healthcare Conference, Cambridge, Massachusetts, December 4, 2018.
338. "Perspectives on Modeling, Prediction, and Control of Lithium-ion Batteries," Institute of Energy and Process Systems Engineering, Technical University of Braunschweig, Germany, January 17, 2019.
339. "Advanced Manufacturing of Biopharmaceuticals," École Polytechnique Fédérale de Lausanne, Switzerland, January 21, 2018.
340. "Advanced Analytics One: Data-Centric View of Manufacturing Processes," MIT SMART Manufacturing Leadership Program, Cambridge, Massachusetts, January 30, 2019.
341. "Advanced Analytics Two: Monitoring and Control," MIT SMART Manufacturing Leadership Program, Cambridge, Massachusetts, January 31, 2019.
342. "Data Analytics Methods," MIT SMART Manufacturing Leadership Program, Cambridge, Massachusetts, January 31, 2019.
343. "Advanced Battery Management Systems Design via Data-driven, First-principles, and Hybrid Approaches," MITEI Low-Carbon Energy Center Battery Storage Workshop, Cambridge, Massachusetts, April 1, 2019.
344. "MIT and the Department of Chemical Engineering," Joint FAU-MIT Workshop on the Design of Particulate Products by Continuous Processes, Massachusetts Institute of Technology, Cambridge, MA, April 4, 2019.
345. "Modeling and Optimization at MIT," Joint FAU-MIT Workshop on the Design of Particulate Products by Continuous Processes, Massachusetts Institute of Technology, Cambridge, MA, April 4, 2019.

346. "Model-based Design and Control of the Manufacturing of Continuous Particulate Products," Joint FAU-MIT Workshop on the Design of Particulate Products by Continuous Processes, Massachusetts Institute of Technology, Cambridge, MA, April 5, 2019.
347. Opening talk, "Data Science Education Using Real Data," Data Science Workshop Development, OSIsoft, San Francisco, California, April 8, 2019.
348. "Modeling Approaches to Support Continuous Manufacturing of Biopharmaceuticals," Merck, Kenelworth, April 16, 2019.
349. "Challenges and Opportunities in Big Data," McMaster Advanced Control Consortium Meeting and Workshop, Hamilton, Ontario, Canada, May 15, 2019.
350. Panelist, "Current Buzz," McMaster Advanced Control Consortium Meeting and Workshop, Hamilton, Ontario, Canada, May 16, 2019.
351. "Digital Approaches for Process Development," U.S. Food and Drug Administration, White Oak campus, Silver Spring, Maryland, June 3, 2019.
352. "Machine Learning for Energy: Data Analytics for Anomaly Detection," Annual ENI-MIT Meeting, Milan, Italy, June 12, 2019.
353. Panelist, "Embracing Change: How Innovative Companies are Advancing Continuous Biopharma Manufacturing," MassBio Forum, Cambridge, Massachusetts, June 12, 2019.
354. "Optimal Control via Linear and Bilinear Matrix Inequalities," University of Pavia, Italy, July 1-4 2019. Summer course.
355. "Perspectives on Modeling, Prediction, and Control of Lithium-ion Batteries," University of Pavia, Italy, July 2, 2019.
356. "Continuous Viral Vector Manufacturing Based on Mechanistic Modeling and Novel Process Analytics," CBER Advanced Manufacturing Workshop, U.S. Food and Drug Administration, White Oak campus, Silver Spring, Maryland, July 9, 2019.
357. "Process Systems," The Future of Cyber Assisted Chemical Engineering Education, Breckenridge, Colorado, July 19-20, 2019.
358. "New Directions in the Control of Advanced Manufacturing Systems," Department of Chemical and Biological Engineering, Hong Kong University of Science and Technology, Kunming, China, July 30, 2019.
359. **Plenary**, "New Directions in the Control of Advanced Manufacturing Systems," 30th Chinese Process Control Conference, Kunming, China, August 1, 2019.
360. "Applying Industry 4.0 Concepts to Biologics Manufacturing," 11th Annual Bioprocessing Summit, 2nd Annual Digital Biomanufacturing, Cambridge Healthtech Institute, Boston, Massachusetts, August 14, 2019.
361. **Keynote Presentation**, "Process Control as an Enabling Technology for Continuous Vaccine Production," 11th Annual Bioprocessing Summit, 5th Annual Process Characterization and Control, Cambridge Healthtech Institute, Boston, Massachusetts, August 15, 2019.
362. "Mathematical Modeling, Real-time Sensing, and Parameter Estimation for Protein Crystallization in Droplet-based Systems," Max Planck Summer School on Particulate Systems: From Theory to Application, Magdeburg, Germany, August 28, 2019.
363. "Modeling, Sensing, Design, and Control of the Continuous Manufacturing of Protein Crystals," Max Planck Summer School on Particulate Systems: From Theory to Application, Magdeburg, Germany, August 28, 2019.
364. Weike Sun and Richard D. Braatz, "Smart Data Analytics for Biomanufacturing Process Modeling and Advanced Process Control," PAT & Advanced Process Controls Workshop,

16th Annual BioProcess International (BPI) Conference & Exposition, Boston, Massachusetts, September 9, 2019.

365. "Digital Transformation and Bioprocessing 4.0 – The Path to Smart Manufacturing," 16th Annual BioProcess International (BPI) Conference & Exposition, Boston, Massachusetts, September 11, 2019.
366. Round Table, New and Emerging Technology "What Gap Does Your Technology Fill," 16th Annual BioProcess International (BPI) Conference & Exposition, Boston, Massachusetts, September 11, 2019.
367. Panelist, "Digitalisation and Bioprocessing 4.0 – Strategies, Enabling Technologies and Analytics to Align and Transform Bioprocessing in a Digital Era," 16th Annual BioProcess International (BPI) Conference & Exposition, Boston, Massachusetts, September 12, 2019.
368. "Process Control, Automation, and Real-Time Release Testing for Continuous Processing," 16th Annual BioProcess International (BPI) Conference & Exposition, Boston, Massachusetts, September 12, 2019.
369. "Perspectives on Modeling, Prediction, and Control of Lithium-ion Batteries," Robert Frederick Smith School of Chemical and Biomolecular Engineering, Cornell University, Ithaca, New York, September 23, 2019.
370. "Systems and Control Theory for Advanced Manufacturing," University of California San Diego, Dynamic Systems and Control Series, Department of Mechanical and Aerospace Engineering, October 25, 2019.
371. "Process Design and Control for Continuous Viral Vaccine Manufacturing," Leaders in Innovation Seminar Series, MassBiologics, Boston, Massachusetts, November 8, 2019.
372. "Control of Polymorphism and Crystal Size Distribution in Pharmaceutical Crystallization," **Separations Division Plenary Session.** *AIChE Annual Meeting*, Orlando, Florida, November 11, 2019. Abstract 69c.
373. Richard D. Braatz and Weike Sun (speaker), "Big Data Analytics in the Advanced Manufacturing of Biopharmaceuticals," Next Gen Manufacturing topical: Big Data Analytics session. *AIChE Annual Meeting*, Orlando, Florida, November 11, 2019.
374. Panelist and Speaker, Data Science Education in Chemical Engineering session. *AIChE Annual Meeting*, Orlando, Florida, November 13, 2019.
375. "CACHE Initiatives in Process Systems," CACHE 50th Anniversary: The Future of Cyber-Assisted Chemical Engineering Education session. *AIChE Annual Meeting*, Orlando, Florida, November 13, 2019.
376. Gregory Rutledge, David Nicholson, Marat Andreev, Matthew Dobbins, J. Carl Pirkle, Jr., and Richard Braatz, "Multi-Scale Modeling of Semi-Crystalline Structure Development in Polymer Processing," Dow Chemical, Houston, Texas, December 12, 2019.
377. "New Directions in Advanced Manufacturing Systems," Dow Chemical, Midland, Michigan, December 13, 2019.
378. "State and Trends in AI/ML in the Process Industries," Accelerating Digitalization through Disruptive AI Innovation, AspenTech Tech Summit, Boston, Mass., January 21, 2020.
379. "New Directions in the Control of Advanced Manufacturing Systems," Visitors of Excellence María de Maeztu Program, Institut de Robòtica i Informàtica Industrial, Polytechnical University of Catalonia, Barcelona, Spain, January 27, 2020.
380. Opening lecture, "Smart Process Analytics and Machine Learning," Symposium on Artificial Intelligence in Chemical Engineering, Institute for Chemical and Bioengineering, Swiss Federal Institute of Technology (ETH Zurich), Switzerland, February 5, 2020.

381. Opening lecture on Control and Analytics, "Modeling, Data Analytics, and Machine Learning for Process Development and Verification," National Academies Workshop on Innovations in Pharmaceutical Manufacturing, NAS Building, Washington, DC, February 27, 2020. Summary published in National Academies of Sciences, Engineering, and Medicine, *Innovations in Pharmaceutical Manufacturing: Proceedings of a Workshop–in Brief*, The National Academies Press, Washington, DC, 2020. https://doi.org/10.17226/25814
382. "Digital Transformation and Bioprocessing 4.0 – The Path to Smart Manufacturing," BioProcess International – Manufacturing Strategy & Technology, Webinar, June 22, 2020.
383. Panel Presenter and Discussant, "Ingredients for Industrial Intelligence: Machine learning and data analytics vs. systems theory and modeling," IFAC World Congress, Berlin, Germany, July 14, 2020.
384. **Keynote Lecture**, "Systems and Control Theory for Advanced Manufacturing," Chinese Control and Decision Conference, Hefei, China, August 21, 2020. Virtual
385. "Smart Process Data Analytics: Automated Data Analytics for Manufacturing Processes," Academic Partner Seminar, Dow Chemical, October 8, 2020. Virtual
386. **Keynote Speaker**, "Advances in Process Control, Modeling, and Analytics for Biomanufacturing," PharmSci 360, New Orleans, Louisiana, November 2, 2020. Virtual
387. "Machine Learning for Lithium-ion Batteries," Second Batteries and Supercaps Virtual Symposium: Advanced Computational Methods in Battery Research, Chemistry Europe, November 12, 2020. Virtual
388. "Machine Learning for Lithium-ion Batteries," Medtronic, Minneapolis, Minnesota, November 12, 2020. Virtual
389. Weike Sun and Richard D. Braatz (presenter), "Recognizing and Avoiding Big Data Analytics Traps in Applications," Big Data and Applications in Advanced Modeling and Manufacturing session, AIChE Annual Meeting, San Francisco, California, November 17, 2020, Abstract 224b. virtual
390. "Protein Crystallization for Drug Product Formulation," Intensified Bioseparations via Crystallization," Fall Workshop on Process Intensification: Downstream, Formulation and Product Development, Center for Biomedical Innovation, Cambridge, Massachusetts, November 18, 2020.
391. **Plenary Lecture**, "Industry 4.0 and Digital Transformation in Chemical Engineering," 14th Mediterranean Congress of Chemical Engineering, Barcelona, Spain, November 19, 2020. virtual
392. "Developing Advanced Battery Prediction Techniques with Machine Learning," Wards Intelligence FOCUS: Electrification 2020, November 19, 2020. virtual
393. "State-of-Health (SOH) Estimation for Lithium-ion Batteries," KAIST, South Korea, November 26, 2020. virtual
394. "Machine Learning-based Identification, Prediction, and Control of Lithium-ion Batteries," Advanced Battery Management Workshop, IEEE Conference on Decision and Control, Jeju, South Korea, December 12, 2020. virtual
395. "Advanced Control in Vaccine Manufacturing," COVID-19 Focus Session: Vaccines, IEEE Conference on Decision and Control, Jeju, South Korea, December 18, 2020. virtual
396. "Mathematical Modeling of Bioreactors for Recombinant Protein Production," John Lawrence Seminar Series in Biosciences, Lawrence Berkeley National Laboratory, Biological Systems and Engineering Division, January 5, 2021. Virtual

397. **Plenary Talk**, "Advanced Process Analytics and Control in (Bio)pharmaceutical Manufacturing," Thirty-Fifth International Forum for Process Analytics & Control (IFPAC), March 1, 2021. Abstract ID 153.
398. "Using AI and Machine Learning in Product and Process Design," The Future of Manufacturing Symposium, MIT Industrial Liaison Program, Cambridge, MA, March 2, 2021. Virtual
399. "Industry 4.0 and Digital Transformation in Biomanufacturing," 8th Annual Biologics Manufacturing Asia 2021, March 16, 2021. Virtual
400. "Advanced Process Analytics and Control in (Bio)pharmaceutical Manufacturing," Sanofi Pasteur Vaccine Analytics and Bioprocess Technology Seminar Series, March 17, 2021. Virtual
401. **Keynote Lecture**, Advanced Manufacturing of (Bio)pharmaceutical Products, 2020 Research Day, Department of Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, Tallahassee, Florida. meet faculty on Thursday and Friday, April 2, 2021. Video
402. "Machine Learning and Multiscale Modeling Methods for Early Prediction and Accelerated Design of Lithium-Ion Batteries," Optimizing Marine Battery 6 Kickoff Meeting, April 9, 2021.
403. "Current Trends and Future Directions in Continuous Manufacturing," Sanofi CMC Scientific Webinar Series on CM, May 7, 2021.
404. "Advances in Recombinant Adeno-Associated Virus Manufacturing and Analytics," U.S. Food and Drug Administration, May 11, 2021.
405. "The Smart Data Analytics Initiative for Biomanufacturing Processes," Bioman Meeting on Data Analytics along the Biomanufacturing Life Cycle, May 18, 2021.
406. "Machine Learning-based Identification, Prediction, and Control of Lithium-ion Batteries," University of Bayreuth, Germany, May 20, 2021. virtual
407. "Pharma 4.0: Advanced Manufacturing of (Bio)Pharmaceutical Products," Control Systems and Data Science towards Industry 4.0 Workshop Series, May 20, 2021.
408. "Protein Capture by Continuous Crystallization and Precipitation," P4 New Technology II - Downstream Processing, NIIMBL Annual Meeting, July 15, 2021.
409. "Crystallization of a Nonreplicating Rotavirus Vaccine Candidate," Advances in Purification & Recovery, 13th Annual Bioprocessing Summit, Boston, Massachusetts, August 19, 2021.
410. **Plenary Lecture**, "Modeling, Sensing, Design, and Control of Crystallizing Proteins," 21st International Symposium on Industrial Crystallization, Potsdam, Germany, August 30 – September 2, 2021. Virtual.
411. "Advanced Process Analytics and Control in (Bio)pharmaceutical Manufacturing," Annual IFPAC/INDUNIV Summer Summit, September 1, 2021. virtual
412. "Operation and Modelling of Industrial Crystallization Processes," Tutorial C: Modeling, Monitoring and Control of Crystallization Systems, 21st International Symposium on Industrial Crystallization, Potsdam, Germany, September 2, 2021. virtual

F. Offices Held in Professional Societies and Nonprofit Corporations

- Chapter Advisor, Zeta Chapter, Alpha Chi Sigma, 2000-2002
- Chair, Technical Committee on Industrial Process Control, IEEE Control Systems Society, 2002-2010

- Program Coordinator, Systems and Process Control (Area 10b), American Institute of Chemical Engineers, 2005
- Director, CAST Executive Committee, American Institute of Chemical Engineers, 2005-2007
- Chair, WebCAST Committee, American Institute of Chemical Engineers, 2006-2007
- Director, American Automatic Control Council, 2006-2007
- Chair, Awards Subcommittee for IEEE Transactions in Control Systems Technology Outstanding Paper Award, 2009-2011
- Board of Governors, IEEE Control Systems Society, 2010
- Second Vice Chair, CAST division, American Institute of Chemical Engineers, 2010
- Chair, Awards Committee, CAST division, American Institute of Chemical Engineers, 2010
- First Vice Chair, CAST division, American Institute of Chemical Engineers, 2011
- Chair, CAST division, American Institute of Chemical Engineers, 2012
- Past Chair, CAST division, American Institute of Chemical Engineers, 2013
- Board of Directors, Smart Manufacturing Leadership Coalition (a 501c6 organization), 2016-date
- Vice President and President Elect, American Automatic Control Council, Incorporated (a 501c3 organization), 2016-2017
- President, American Automatic Control Council, Incorporated (a 501c3 organization), 2018-2019
- Past President, American Automatic Control Council, Incorporated (a 501c3 organization), 2019-date

G. Editorships and Advisory Boards of Journals, Other Learned Publications, or Programs

Institute of Electrical and Electronic Engineers

- IEEE Control Systems Society Conference Editorial Board, 1997-2000
- Associate Editor, IEEE Conference on Decision and Control, 1997-2000
- Associate Editor, American Control Conference, 1998-2000
- Associate Editor, Joint IEEE Conference on Decision and Control and the European Control Conference, 2005
- Associate Editor, IEEE Transactions on Automatic Control, 2008-2010
- Associate Editor, IEEE Control Systems Magazine, 2010
- Deputy Editor, IEEE Control Systems Magazine, 2010-2011
- Editor-in-Chief, IEEE Control Systems Magazine, 2012-2014
- Senior Editor, IEEE Life Sciences Letters, 2014-2017

International Federation of Automatic Control

- Associate Editor, Journal of Process Control, 2000-2013
- Associate Editor, Automatica, 2002-2018
- Editor, Special Issue on Advanced Control of Chemical Processes, Journal of Process Control, 2010-2014
- Editorial Board, Annual Reviews in Control, 2015-date
- Editorial Board, IFAC-PapersOnLine, 2017-2000

International Journal of Robust and Nonlinear Control

- Editor, Special Issue on Chemical Process Control, 2007

Optimal Control Applications and Methods

- Editor at Large, 2007-date

Computers and Chemical Engineering
- Editorial Advisory Board, 2010-date
- Editor, Special Issue in Honor of Manfred Morari, 2011-2014
- Co-editor, Special Issue on Pharmaceutical Manufacturing, 2017-2019

American Automatic Control Council
- AIChE Society Review Chair, 2005
- Editor, Invited Papers, 2007

American Chemical Society
- Advisory Board, Industrial Engineering and Chemistry Research, 2005-2007

The Control Handbook, Second Edition, CRC Press
- Editorial Board, 2008-2011

University of California at Santa Barbara
- Advisory Board, Computational Science and Engineering IGERT Program, 2006

University of Illinois at Urbana-Champaign
- Advisory Board, Informatics and Computation Ubiquitous throughout Baccalaureate Education Program, 2007-2010

University of Illinois at Chicago, Purdue University, and Colorado School of Mines
- Advisory Board, Integrating Cognition and Measurement with Conceptual Knowledge - Establishing the Validity and Diagnostic Capacity of Concept Inventories, NSF Award #DRL-0918552, 2010-2012

CACHE Corporation (a 501c3 organization)
- Academic Trustee, 2013-2021

Advanced Manufacturing National Program Office, White House-chartered Interagency Team (hosted by NIST)
- Advanced Manufacturing Partnership 2.0 (AMP 2.0) Technology Work Team, 2014

Springer Nature
- Editorial Board, Birkhäuser Control Engineering Series, 2014-date

American Institute of Chemical Engineers
- Associate Editor, AIChE Webinar Committee, 2016-2018

International Conference on Informatics in Control, Automation and Robotics
- Advisory Board, Doctoral Consortium, July 29, 2016

Handbook of Model Predictive Control
- Advisory Board, 2016-2018

Processes
- Editor, Topical Collection on Process Data Analytics, 2016-date

Springer Nature
- Editorial Board, BMC Chemical Engineering, 2018-2020

Chinese Academy of Engineering
- Editorial Board, Engineering, 2020-June 2022

Research Council of Norway
- Advisory Board for the Innovation Project on Optimizing Marine Battery Operations, 2021-date

H. Review Panels / Advisory Boards
- UIUC/Hertz Fellowship Review Panel, 1994-2002, 2004-2010

- Ted Peterson Student Paper Award Panel, CAST Division, American Institute of Chemical Engineers, 1996
- Pulp and Paper Technical Association of Canada (PAPTAC) Review Panel, 1996-2002
- Computational Science and Engineering Proposal Review Panel, UIUC, 1997-1998, 2001-2002, 2008-2009
- Shen Postdoctoral Fellowship Award Panel, UIUC, 1999
- Alpha Chi Sigma (ΑΧΣ) Outstanding Student Award Panel, Zeta Chapter, 1999
- Peer Review Panel, National Science Foundation, Phase I Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs
- CAST Directors' Award Panel, American Institute of Chemical Engineers, 2002, 2004, 2006, 2007
- Control Engineering Practice Award Panel, American Automatic Control Council, 2003
- Best Student Paper Award Panel, American Automatic Control Council, 2003-2005
- Best Student Paper Award Panel, IEEE Conference on Decision and Control, 2003-2005
- Hugo O'Schuck Award Panel, American Automatic Control Council, 2004, 2016
- Chair, CAST Directors' Award Panel, American Institute of Chemical Engineers, 2004
- CAST Division Awards Committee, American Institute of Chemical Engineers, 2005-2007, 2015-2017
- Advanced Placement Chemistry Virtual Laboratories Review Panel, The College Board, 2006-2009
- IEEE Control Systems Field Award Committee, 2007-2010
- Review Panel, U.S. Department of Energy, 2008, 2019, 2020
- External Evaluator, Department of Chemical Engineering, Queen's University, Ontario, Canada, 2008-2009
- Journal of Process Control Best Paper Prize Selection Committee, International Federation of Automatic Control, 2009-2011, 2012-2014
- Peer Review Panel, National Science Foundation, Process and Reaction Engineering Program, Chemical, Bioengineering, Environmental and Transport Systems (CBET) Division
- IEEE Control Systems Society Fellow Selection Committee, 2009-2010
- IEEE Control Systems Society Award Committee, 2009-2011
- Chair, Awards Subcommittee on TCST Outstanding Paper Award, 2009-2011
- Technology Review Panel, Catalan Institution for Research and Advanced Studies (ICREA), 2009-2010
- Awards Committee, CAST division, American Institute of Chemical Engineers, 2005-2014, 2015-2017
- Award Subcommittee, R.H. Wilhelm Award in Chemical Reaction Engineering, American Institute of Chemical Engineers, 2010
- Beckman Institute for Advanced Science and Technology Seed Proposal Panel, UIUC, 2010
- Panel Leader, Centre Proposal Review Panel, Research Council of Norway, 2011
- Natural Sciences and Engineering Research Council of Canada, 2014
- IFAC Applications Paper Prize Selection Committee, 2014
- Manfred Thoma Medal Selection Committee, International Federation of Automatic Control, 2015-2017
- Conagen Scientific Advisory Board, 2015-2018
- ExxonMobil Process Technology Capabilities Assessment Panel, 2016
- Pfizer Pharmaceutical Sciences Scientific Advisory Panel, 2017

- Peer Review Panel, National Science Foundation, Dynamics, Control, and Systems Diagnostics (DCSD) Program, Division of Civil, Mechanical, and Manufacturing Innovation
- IEEE Control Systems Society Transition to Practice Award, 2019
- External Evaluator, PhD Program in Pharmaceutical Engineering, Virginia Commonwealth University, 2019
- Peer Review Panel, National Science Foundation, Designing Materials to Revolutionize and Engineer our Future (DMREF) Program, Multi-directorate, Materials Genome Initiative
- Scientific Advisory Committee, Center for Utilization of Biological Engineering in Space (CUBES), a NASA Science and Technology Research Institute, University of California Berkeley, 2019-date
- Scientific Advisory Board, Repligen, 2019-date
- Roadmap Projects RFP-2 Waves I and III Evaluation Panels, Clean Energy Smart Manufacturing Innovation Institute, 2019 and 2020
- Chair, Process/Controls Technology Working Group, Clean Energy Smart Manufacturing Innovation Institute, 2017
- Lead, Data Analytics Affinity Group, Clean Energy Smart Manufacturing Innovation Institute, 2017-date
- Lead, Advanced Model Predictive Control and Optimization Affinity Group, Clean Energy Smart Manufacturing Innovation Institute, 2017-date
- SM for Chemical Processing Affinity Group, Clean Energy Smart Manufacturing Innovation Institute, 2017-date
- SM Platform Advisory Committee, Clean Energy Smart Manufacturing Innovation Institute, 2018-2020
- SM Platform Standing Committee, Clean Energy Smart Manufacturing Innovation Institute, 2020-date
- Alternate MIT Representative, Technical and Governing Activities Committees, National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL), 2017-date
- Awards Committee for the AIChE PD2M Award recognizing Outstanding Contribution to QbD for Drug Substance, 2020-2021
- Artificial Intelligence for Energy Storage Workshops, Joint Center for Energy Storage Research, U.S. Department of Energy Innovation Hub, August 17, October 29, 2020
- Expert Community (evaluates award nominations), Global Energy Prize, 2020-date

I. Industrial Consulting, Collaborations, and/or Support (Abridged)

- Avery-Dennison – designed and implemented the first profile controller on an adhesive coating machine (1990-1991)
- DuPont – designed algorithms for sensor fusion and process control (1993-1994, 1995)
- International Paper Company – supervised the design and implementation (w/students) of fault detection and diagnosis systems for two large-scale industrial facilities worth $600 million (1996-2001)
- International Sematech – constructed simulation models and designed optimal control for rapid thermal annealing during ultrashallow junction formation in microelectronic devices (1998-2000, with students and Prof. E.G. Seebauer)
- Procter and Gamble – supervised the design of algorithms and software implementation (w/students) for the modeling and optimal control of chemical processes (2000-2003); consulting and research support on emulsion crystallization (2009-2010)

- Abbott Laboratories – consulted on in-situ sensor technologies for pharmaceutical crystallizers and chemical reactors (2002, 2006-2007); research support for crystallization modeling and novel crystallizer designs (2009-2010)
- Dow Chemical – consulted on fault diagnosis algorithms for large-scale chemical plants (2002, 2016) and collaborative research in multiscale modeling of blown film extrusion (2018-date)
- Merck – consulted and supervised the design and implementation (w/students) of modeling, sensor, and control algorithms on pharmaceutical crystallizers (1997-2005); collaborating on continuous viral vaccine manufacturing (2019)
- United Technologies Corporation – consulted with UTC Power (then UTC Fuel Cells) on the design and implementation of fault diagnosis systems for fuel cell power plants (2002-2003); research support by UTC Power and Sikorsky Aircraft Corporation for developing procedures for the optimal design of maintenance schedules (2004-2009)
- IBM – constructed simulation models for the copper electrodeposition process for making interconnects for microelectronic devices (2002-2008, with students and Dr. R.C. Alkire who was project lead)
- Sepracor/Sunovion Pharmaceuticals – consulted on the modeling and design of batch pharmaceutical crystallizers (2003, 2006, 2011)
- Bristol-Myers Squibb – consulted and collaborated on the modeling and design of batch pharmaceutical crystallizers (2004, 2008-2017)
- U.S. Food and Drug Administration – provided input on process analytical technologies for pharmaceutical crystallization and continuous manufacturing processes (2004-2005, 2012-2018)
- Pfizer – consulted or collaborated on crystallizer design and control (2006-2007, 2010-2011); served on Pharmaceutical Sciences Scientific Advisory Panel on Flexible API Supply Technologies (2017)
- Eli Lilly – supports research projects in pharmaceutical crystallization (2007-2009) and coauthored a commentary on synthesis, workup, and isolation on drug substance for continuous pharmaceutical manufacturing (2014-2015)
- Bend Research – supports research projects in pharmaceutical crystallization (2008-2009)
- OSIsoft – supports research projects in process control (2008-2010)
- GlaxoSmithKline – consulted on pharmaceutical process analytical technology (2009), coauthored a commentary on control systems engineering in continuous pharmaceutical manufacturing (2014-2015), and consulting on biopharmaceutical manufacturing (2018)
- Novartis – supported control of continuous pharmaceutical manufacturing facilities and collaborated on research (2010-2019)
- Millennium/Takeda Pharmaceuticals – supported research on continuous crystallization technology (2011-2015) and on machine learning in pharmaceutical manufacturing (2020-date)
- Boehringer-Ingelheim – consulted on pharmaceutical crystallization technology (2010, 2014, 2016)
- BP – supports development of methods for the design of fault-tolerant model predictive control systems (2011-date)
- Aegerion Pharmaceuticals – consulted on pharmaceutical crystallization (2011-2012)
- Biogen – consulting on process technologies (2012-2016)

- Industrial Machine Automation (IMA) – consulted on continuous pharmaceutical manufacturing (2013)
- Greene, Tweed & Co. – consulted on crystallization technology (2013-2014)
- Brewer Science – consulting on advanced manufacturing (2014)
- Vertex Pharmaceuticals –coauthored a commentary on control systems engineering in continuous pharmaceutical manufacturing (2014-2015)
- AstraZeneca – coauthored a commentary on synthesis, workup, and isolation on drug substance for continuous pharmaceutical manufacturing (2014-2015)
- Conagen – Scientific Advisory Board, consulting on biologics manufacturing (2015-2018)
- Emerson – collaborating on advanced control technology (2015-2018)
- Saint-Gobain – consulted on advanced manufacturing process control (2016-2018)
- Alkermes – consulting on continuous crystallization (2016)
- Continuus – consulting on polymerization reaction modeling (2016-2018)
- ExxonMobil – external panelist for Process Technology Capabilities Assessment (2016)
- Amgen – co-advised Master theses on equipment selection for continuous pharmaceutical manufacturing and optimization of process development workflows, and collaborated on first-principles modeling and control of continuous pharmaceutical manufacturing processes (2016-date)
- Bates White – consulted on the economics of continuous pharmaceutical manufacturing (2017)
- Sanofi-Pasteur – collaborating on viral vaccine manufacturing (2016-2019)
- Arconic – training in process data analytics (2017-2019)
- Repligen – collaborating on continuous viral vaccine manufacturing, data consulting, and Scientific Advisory Board (2019-date)
- Havila, Equinor, Corvus Energy, and SINTEF Energy – advise on optimizing marine battery operations (2021-date)
- A Biotechnology Startup Company – Scientific Advisory Board, September 2021-date

II. PUBLICATIONS

A. Doctoral Thesis

- *Robust Loopshaping for Process Control*, California Institute of Technology, Pasadena, California, 1993.

B. Books/Compilations

1. E. L. Russell, L. H. Chiang, and R. D. Braatz. *Data-driven Methods for Fault Detection and Diagnosis in Chemical Processes*, Springer-Verlag, London, 2000.
2. A. P. Featherstone, J. G. VanAntwerp, and R. D. Braatz. *Identification and Control of Sheet and Film Processes*, Springer-Verlag, London, 2000. reviewed by B. Wayne Bequette, *IEEE Control Systems*, 22(3), 102-103, 2002, and Peter Wellstead, *International Journal of Robust and Nonlinear Control*, 13, 1177-1180, 2003.
3. L. H. Chiang, E. L. Russell, and R. D. Braatz. *Fault Detection and Diagnosis in Industrial Systems*, Springer-Verlag, London, 2001. Chinese translation available from China Machine Press, Beijing, China. Has been used in courses at universities in the United

States, United Kingdom, Denmark, China, Sweden, and Finland. reviewed by Thomas McAvoy, *Journal of Process Control*, 12, 453-454, 2002, and Joe Au, *Measurement Science and Technology*, 12, 1745, 2001.)

4. R. D. Braatz, A. N. Ford Versypt, and L. M. Goh. *Nanoscale Drug Delivery Module: Teacher's Edition*, Materials World Modules, Northwestern University, Evanston, Illinois, 2012. Available at http://www.materialsworldmodules.org/index.php/modules-and-user-support/list-of-modules/nanoscale-drug-delivery-module.
5. R. D. Braatz, A. N. Ford Versypt, and L. M. Goh. *Nanoscale Drug Delivery Module*, Materials World Modules, Northwestern University, Evanston, Illinois, 2012. Available at http://www.materialsworldmodules.org/index.php/modules-and-user-support/list-of-modules/nanoscale-drug-delivery-module.

C. Book Chapters

1. R. D. Braatz. Internal model control. In *The Control Handbook*, W. S. Levine, editor, CRC Press, Boca Raton, Florida, pp. 215-224, 1996 (invited).
2. R. D. Braatz. Internal model control. In *Control Systems Fundamentals*, W. S. Levine, editor, CRC Press, Boca Raton, Florida, pp. 215-224, 2000 (invited reprint).
3. R. D. Braatz (contributor). Materials and processing. In *Control in an Information Rich World: Report of the Panel on Future Directions in Control, Dynamics, and Systems*, R. M. Murray, editor, SIAM Press, Philadelphia, Pennsylvania, pp. 63-70, 2003 (invited).
4. Z. K. Nagy and R. D. Braatz. Recent advances in the optimal control of batch processes. In *Recent Research Developments in Chemical Engineering*, Volume 5, Transworld Research Network, pp. 99-127, 2003 (invited).
5. R. D. Braatz, M. Fujiwara, T. Wubben, and E. Rusli. Crystallization: Particle size control. In *Encyclopedia of Pharmaceutical Technology*, James Swarbrick, editor, 3rd edition, Marcel Dekker, New York, pp. 858-871, 2006 (invited).
6. E. J. Hukkanen, J. G. VanAntwerp, and R. D. Braatz. Identification and control of polymerization reactors. In *Identification and Control: The Gap between Theory and Practice*, Ricardo S. Sánchez-Peña, Joseba Quevedo Casín, and Vicenç Puig Cayuela, editors, Springer Verlag, London, Chapter 1, pp. 3-41, 2007 (invited).
7. R. D. Braatz, R. C. Alkire, and E. G. Seebauer. Multiscale modeling and design of electrochemical systems. In *Electrochemical Surface Modification – Thin Films, Functionalization and Characterization*, *Advances in Electrochemical Science and Engineering*, R. C. Alkire, D. M. Kolb, J. Lipkowski, and P. N. Ross, editors, Wiley-VCH, Weinheim, Germany, Volume 10, Chapter 4, pp. 289-334, 2008 (invited).
8. R. D. Braatz and M. Hovd. Process control and automation. In *Enciclopedia degli Idrocarburi* (*Encyclopaedia of Hydrocarbons*), Istituto Della Enciclopedia Italiana Fondata da Giovanni Treccani, Rome, Italy, Volume V: Instruments, Chapter 6.5, pp. 389-411, 2009 (invited).
9. M. Kishida and R. D. Braatz. Internal model control. In *The Control Handbook*, 2nd edition, *Control System Fundamentals*, W. S. Levine, editor, CRC Press, Boca Raton, Florida, Chapter 9.7, 2011 (invited).
10. Z. K. Nagy and R. D. Braatz. Nonlinear model predictive control for batch processes. In *The Control Handbook*, 2nd edition, *Control System Applications*, W. S. Levine, editor, CRC Press, Boca Raton, Florida, Chapter 15, 2011 (invited).

11. I. Craig, C. Alrich, R. Braatz, et al. Control in the Process Industries. In *The Impact of Control Technology*, T. Samad and A. Annaswamy, editors, IEEE Control Systems Society, 2011. Available for download at http://ieeecss.org/main/IoCT-report (invited).
12. R. D. Braatz, M. Fujiwara, Z. K. Nagy, T. Wubben, and E. Rusli. Crystallization: Particle size control. In *Encyclopedia of Pharmaceutical Science and Technology*, James Swarbrick, editor, 4th edition, Taylor and Francis, New York, pp. 785-798, 2013 (invited).
13. R. D. Braatz. Advanced control of pharmaceutical crystallization. In *The Impact of Control Technology*, Second Edition, edited by T. Samad and A. Annaswamy, IEEE Control Systems Society, 2014. Available for download at http://ieeecss.org/general/impact-control-technology-2nd-edition.
14. M. Jiang, N. C. S. Kee, X. Y. Woo, L. M. Goh, J. D. Tice, L. Zhou, R. B. H. Tan, C. F. Zukoski, M. Fujiwara, Z. K. Nagy, P. J. A. Kenis, and R. D. Braatz. Role of automatic process control in Quality by Design. In *Comprehensive Quality by Design for Pharmaceutical Product Development and Manufacture*, edited by G. V. Reklaitis, C. Seymour, and S. García-Munoz, and John Wiley & Sons Ltd, Hoboken, New Jersey, Chapter 3, pages 25-54, 2017 (invited).
15. R. Lakerveld, P. L. Heider, K. D. Jensen, R. D. Braatz, K. F. Jensen, A. S. Myerson, and B. L. Trout. End-to-end continuous manufacturing: Integration of unit operations. In *Continuous Manufacturing of Pharmaceuticals*, edited by P. Kleinebudde, J. Khinnast, and J. Rantanen, Wiley, New York, Chapter 13, pages 447-483, 2017 (invited).
16. J. A. Paulson, S. Streif, R. Findeisen, R. D. Braatz, and A. Mesbah. Fast stochastic model predictive control of end-to-end continuous pharmaceutical manufacturing. In *Process Systems Engineering for Pharmaceutical Manufacturing*, edited by Ravendra Singh and Zhihong Yuan, Elsevier, Amsterdam, Netherlands, Chapter 14, pages 353-378, 2018 (invited).
17. K. Severson, J. G. VanAntwerp, V. Natarajan, C. Antoniou, J. Thömmes, and R. D. Braatz. A systematic approach to process data analytics in pharmaceutical manufacturing: The data analytics triangle and its application to the manufacturing of a monoclonal antibody. In *Multivariate Analysis in the Pharmaceutical Industry*, edited by A. P. Ferreira, J. C. Menezes, and M. Tobyn, Elsevier, Chapter 12, 295-312, 2018
18. J. A. Paulson, S. Streif, R. Findeisen, R. D. Braatz, and A. Mesbah. Fast stochastic model predictive control of end-to-end continuous pharmaceutical manufacturing. In *Process Systems Engineering for Pharmaceutical Manufacturing*, edited by Ravendra Singh and Zhihong Yuan, Elsevier, Amsterdam, Netherlands, Chapter 14, pages 353-378, 2018 (invited).
19. E. Harinath, L. C. Foguth, J. A. Paulson, and R. D. Braatz. Model predictive control of polynomial systems. In *Handbook of Model Predictive Control*, edited by Saša V. Raković and William S. Levine, Birkhäuser, 221-237, 2019 (invited).
20. Z. K. Nagy, M. Fujiwara, and R. D. Braatz. Monitoring and advanced control of crystallization processes. In *Handbook of Industrial Crystallization*, 3rd edition, edited by A. Myerson, D. Erdemir, and A. Y. Lee, Cambridge University Press, United Kingdom, Chapter 11, 313-3455, 2019 (invited).
21. J. Carl Pirkle, Jr., Michael L. Rasche, Richard D. Braatz, and Mo Jiang. Slug-flow continuous crystallization: Fundamentals and process intensification. In *The Handbook of Continuous Crystallization*, edited by Nima Yazdanpanah and Zoltan Nagy, Royal Society of Chemistry, London, United Kingdom, Chapter 5, 219-247, 2020 (invited).

22. Anastasia Nikolakopoulou, Matthias von Andrian, and Richard D. Braatz. Fast model predictive control of modular systems for continuous manufacturing of pharmaceuticals. In *Optimization of Pharmaceutical Processes*, edited by Antonios Fytopoulos, Rohit Ramachandran, and Panos Pardalos, in press (invited).
23. Xiaoxiang Zhu, Lifang Zhou, and Richard D. Braatz. Method of characteristics for the efficient simulation population balance models. In *Optimization of Pharmaceutical Processes*, edited by Antonios Fytopoulos, Rohit Ramachandran, and Panos Pardalos, in press (invited).

D. Journal Papers

1. R. D. Braatz and M. Morari. Robust control for a noncollocated spring-mass system. *J. of Guidance, Control and Dynamics*, 15:1103-1110, 1992.
2. R. D. Braatz, M. L. Tyler, M. Morari, F. R. Pranckh, and L. Sartor. Identification and cross-directional control of coating processes. *AIChE J.*, 38:1329-1339, 1992. Reprinted in Part C of the PSE Virtual Issue of AIChE Journal, as one of the most cited papers in the journal on *Process Identification, State Estimation and Control*.
3. D. Laughlin, M. Morari, and R. D. Braatz. Robust performance of cross-directional basis-weight control in paper machines. *Automatica*, 29:1395-1410, 1993.
4. R. D. Braatz and M. Morari. Minimizing the Euclidean condition number. *SIAM J. on Control and Optim.*, 32:1763-1768, 1994.
5. R. D. Braatz, P. M. Young, J. C. Doyle, and M. Morari. Computational complexity of μ calculation. *IEEE Trans. on Automatic Control*, 39:1000-1002, 1994.
6. J. H. Lee, R. D. Braatz, M. Morari, and A. Packard. Screening tools for robust control structure selection. *Automatica*, 31:229-235, 1995.
7. R. D. Braatz, J. H. Lee, and M. Morari. Screening plant designs and control structures for uncertain systems. *Comput. Chem. Eng.*, 20:463-468, 1996.
8. R. D. Braatz, M. Morari, and S. Skogestad. Loopshaping for robust performance. *Int. J. of Robust and Nonlinear Control*, 6:805-823, 1996.
9. M. Hovd, R. D. Braatz, and S. Skogestad. SVD controllers for H2, H-infinity, and mu-optimal control. *Automatica*, 33:433-439, 1997.
10. I. G. Horn, J. R. Arulandu, C. J. Gombas, J. G. VanAntwerp, and R. D. Braatz. Improved filter design in internal model control. *Ind. Eng. Chem. Res.*, 35:3437-3441, 1996.
11. R. D. Braatz and M. Morari. On the stability of systems with mixed time-varying parameters. *Int. J. of Robust and Nonlinear Control*, 7:105-112, 1997.
12. E. L. Russell, C. P. H. Power, and R. D. Braatz. Multidimensional realization of large scale uncertain systems for multivariable stability margin computation. *Int. J. of Robust and Nonlinear Control*, 7:113-125, 1997.
13. E. Rios-Patron and R. D. Braatz. On the identification and control of dynamical systems using neural networks. *IEEE Trans. on Neural Networks*, 8:452, 1997.
14. R. D. Braatz and J. G. VanAntwerp. Advanced cross-directional control. *Pulp & Paper Canada*, 98(7):T237-239, July 1997.
15. A. P. Featherstone and R. D. Braatz. Control-oriented modeling of sheet and film processes. *AIChE J.*, 43:1989-2001, 1997.
16. A. P. Featherstone and R. D. Braatz. Integrated robust identification and control of large scale processes. *Ind. Eng. Chem. Res.*, 37:97-106, 1998.

17. C. L. Mangun, M. A. Daley, R. D. Braatz, and J. Economy. Effect of pore size on adsorption of hydrocarbons in phenolic-based activated carbon fibers. *Carbon*, 36:123-131, 1998.
18. A. P. Featherstone and R. D. Braatz. Input design for large scale sheet and film processes. *Ind. Eng. Chem. Res.*, 37:449-454, 1998.
19. E. L. Russell and R. D. Braatz. Model reduction for the robustness margin computation of large scale uncertain systems. *Comput. Chem. Eng.*, 22:913-926, 1998.
20. S. H. Chung and R. D. Braatz. Teaching antiwindup, bumpless transfer, and split-range control. *Chem. Eng. Edu.*, 32:220-223, 1998.
21. R. D. Braatz and O. D. Crisalle. Robustness analysis for systems with ellipsoidal uncertainty. *Int. J. of Robust and Nonlinear Control*, 8:1113-1117, 1998.
22. R. D. Braatz and M. R. Johnson. Process control laboratory education using a graphical operator interface. *Comp. Appl. Eng. Edu.*, 6:151-155, 1998.
23. J. G. VanAntwerp, R. D. Braatz, and N. V. Sahinidis. Globally optimal robust process control. *J. of Process Control*, 9:375-383, 1999.
24. S. H. Chung, D. L. Ma, and R. D. Braatz. Optimal seeding in batch crystallization. *Can. J. of Chem. Eng.*, 77:590-596, 1999.
25. A. P. Featherstone and R. D. Braatz. Modal-based cross-directional control. *Tappi J.*, 82:203-207, 1999.
26. D. L. Ma, S. H. Chung, and R. D. Braatz. Worst-case performance analysis of optimal batch control trajectories. *AIChE J.*, 45:1469-1476, 1999.
27. C. L. Mangun, R. D. Braatz, J. Economy, and A. J. Hall. Fixed bed adsorption of acetone and ammonia onto oxidized activated carbon fibers. *Ind. Eng. Chem. Res.*, 38:3499-3504, 1999.
28. R. D. Braatz and E. L. Russell. Robustness margin computation for large scale systems. *Comput. Chem. Eng.*, 23:1021-1030, 1999.
29. S. H. Chung, D. L. Ma, and R. D. Braatz. Optimal model-based experimental design in batch crystallization. *Chemom. Int. Lab. Syst.*, 50:83-90, 2000.
30. J. G. VanAntwerp and R. D. Braatz. Fast model predictive control of sheet and film processes. *IEEE Trans. on Control Syst. Tech.*, 8:408-417, 2000.
31. J. G. VanAntwerp and R. D. Braatz. A tutorial on linear and bilinear matrix inequalities. *Journal of Process Control*, 10:363-385, 2000.
32. J. G. VanAntwerp and R. D. Braatz. Model predictive control of large scale processes. *Journal of Process Control*, 10:1-8, 2000.
33. L. H. Chiang, E. L. Russell, and R. D. Braatz. Fault diagnosis in chemical processes using Fisher discriminant analysis, discriminant partial least squares, and principal component analysis. *Chemom. Int. Lab. Syst.*, 50:243-252, 2000.
34. E. L. Russell, L. H. Chiang, and R. D. Braatz. Fault detection in industrial processes using canonical variate analysis and dynamic principal component analysis. *Chemom. Int. Lab. Syst.*, 51:81-93, 2000.
35. T. Togkalidou, R. D. Braatz, B. K. Johnson, O. Davidson, and A. Andrews. Experimental design and inferential modeling in pharmaceutical crystallization. *AIChE J.*, 47:160-168, 2001.
36. J. G. VanAntwerp, A. P. Featherstone, and R. D. Braatz. Robust cross-directional control of large scale sheet and film processes. *Journal of Process Control*, 11:149-178, 2001.

37. R. Gunawan, E. L. Russell, and R. D. Braatz. Comparison of theoretical and computational characteristics of dimensionality reduction methods for large scale uncertain systems. *Journal of Process Control*, 11:543-552, 2001.
38. D. L. Ma and R. D. Braatz. Worst-case analysis of finite-time control policies. *IEEE Trans. on Control Syst. Tech.*, 9:766-774, 2001.
39. T. Togkalidou, M. Fujiwara, S. Patel, and R. D. Braatz. Solute concentration prediction using chemometrics and ATR-FTIR spectroscopy. *J. of Crystal Growth*, 231:534-543, 2001.
40. E. L. Russell and R. D. Braatz. The average-case identifiability and controllability of large scale systems. *J. of Process Control*, 12:823-829, 2002.
41. R. D. Braatz, M. Fujiwara, D. L. Ma, T. Togkalidou, and D. K. Tafti. Simulation and new sensor technologies for industrial crystallization: A review. *Special Issue on Crystallization and Interfacial Processes*, *Int. J. of Modern Physics B*, 16:346-353, 2002 (invited).
42. R. Gunawan, D. L. Ma, M. Fujiwara, and R. D. Braatz. Identification of kinetic parameters in a multidimensional crystallization process. *Special Issue on Crystallization and Interfacial Processes*, *Int. J. of Modern Physics B*, 16:367-374, 2002.
43. D. L. Ma, D. Tafti, and R. D. Braatz. Compartmental modeling of multidimensional crystallization. *Special Issue on Crystallization and Interfacial Processes*, *Int. J. of Modern Physics B*, 16:383-390, 2002.
44. D. L. Ma, D. K. Tafti, and R. D. Braatz. High-resolution simulation of multidimensional crystal growth. *Special Issue in Honor of William R. Schowalter*, *Ind. Eng. Chem. Res.*, 41:6217-6223, 2002 (invited).
45. D. L. Ma, D. K. Tafti, and R. D. Braatz. Optimal control and simulation of multidimensional crystallization processes. *Special Issue on Distributed Parameter Systems*, *Comput. Chem. Eng.*, 26:1103-1116, 2002 (invited).
46. S. Ang and R. D. Braatz. Experimental projects for the process control laboratory. *Chem. Eng. Edu*., 36:182-187, 2002. Invited reprint in *CACHE News*, Volume 55, Fall, 2002.
47. T. Togkalidou, H.-H. Tung, Y. Sun, A. Andrews, and R. D. Braatz. Solution concentration prediction for pharmaceutical crystallization processes using robust chemometrics and ATR FTIR spectroscopy. *Org. Process Res. Dev.*, 6:317-322, 2002.
48. M. Fujiwara, P. S. Chow, D. L. Ma, and R. D. Braatz. Paracetamol crystallization using laser backscattering and ATR-FTIR spectroscopy: Metastability, agglomeration, and control. *Crystal Growth & Design*, 2:363-370, 2002.
49. D. L. Ma, J. G. VanAntwerp, M. Hovd, and R. D. Braatz. Quantifying the potential benefits of constrained control for a large scale system. *Special Section on Cross Directional Control*, *IEE Proceedings - Control Theory and Applications*, 149:423-432, 2002.
50. R. D. Braatz. Advanced control of crystallization processes. *Annual Reviews in Control*, 26:87-99, 2002 (invited).
51. M. Fujiwara, J. C. Pirkle, Jr., T. Togkalidou, D. L. Ma, R. Gunawan, and R. D. Braatz. A holistic approach to materials process design. *J. of Materials Edu.*, 24:65-70, 2002 (invited).
52. L. H. Chiang and R. D. Braatz. Process monitoring using causal map and multivariate statistics: Fault detection and identification. *Chemom. Int. Lab. Syst.*, 65:159-178, 2003.
53. J. C. Pirkle, Jr. and R. D. Braatz. Dynamic modeling of blown film extrusion. *Polymer Engineering & Science*, 43:398-418, 2003.

54. M. Hovd, D. L. Ma, and R. D. Braatz. On the computation of disturbance rejection measures. *Ind. Eng. Chem. Res.*, 42:2183-2188, 2003. Reprinted in *Modeling, Identification, and Control*, 25:45-56, 2004.
55. D. L. Ma and R. D. Braatz. Robust identification and control of batch processes. *Special Issue on 2nd Pan American Workshop in Process Systems Engineering*, *Comput. Chem. Eng.*, 27:1175-1184, 2003 (invited).
56. Z. K. Nagy and R. D. Braatz. Robust nonlinear model predictive control of batch processes. *AIChE J.*, 49:1776-1786, 2003. Reprinted in Part C of the PSE Virtual Issue of AIChE Journal, as one of the most cited papers in the journal on *Process Identification, State Estimation and Control*.
57. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Maximum a posteriori estimation of transient enhanced diffusion energetics. *AIChE J.*, 49:2114-2123, 2003.
58. Z. K. Nagy and R. D. Braatz. Worst-case and distributional robustness analysis of finite-time control trajectories for nonlinear distributed parameter systems. *IEEE Trans. on Control Syst. Tech.*, 11:494-504, 2003.
59. T. O. Drews, R. D. Braatz, and R. C. Alkire. Parameter sensitivity analysis of Monte Carlo simulations of copper electrodeposition with multiple additives. *J. Electrochem. Soc.*, 150:C807-C812, 2003.
60. R. Gunawan, M. Y. L. Jung, R. D. Braatz, and E. G. Seebauer. Parameter sensitivity analysis applied to modeling transient enhanced diffusion and activation of boron in silicon. *J. Electrochem. Soc.*, 150:G758-G765, 2003.
61. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Ramp-rate effects in transient enhanced diffusion and dopant activation. *J. Electrochem. Soc.*, 150:G838-G842, 2003.
62. E. J. Hukkanen and R. D. Braatz. Measurement of particle size distribution in suspension polymerization using in situ laser backscattering. *Sensors & Actuators B*, 96:451-459, 2003.
63. T. J. McAvoy and R. D. Braatz. Controllability limitations for processes with large singular values. *Ind. Eng. Chem. Res.*, 42:6155-6165, 2003.
64. K. Dev, M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Mechanism for coupling between properties of interfaces and bulk semiconductors. *Phys. Rev. B*, 68:195311, 2003.
65. M. Kamrunnahar, R. D. Braatz, and R. C. Alkire. Parameter sensitivity analysis of pit initiation at single sulfide inclusions in stainless steel. *J. Electrochem. Soc*., 151:B90-B97, 2004.
66. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. A simplified picture for transient enhanced diffusion of boron in silicon. *J. Electrochem. Soc.*, 151:G1-G7, 2004.
67. Z. K. Nagy and R. D. Braatz. Open-loop and closed-loop robust optimal control of batch processes using distributional and worst-case analysis. *Journal of Process Control*, 14:411-422, 2004.
68. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Optimal control of rapid thermal annealing in a semiconductor process. *J. of Process Control*, 14:423-430, 2004.
69. M. Hovd and R. D. Braatz. Handling state and output constraints in MPC using time-dependent weights. *Modeling, Identification, and Control*, 25:67-84, 2004.
70. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Effect of near-surface band bending on dopant profiles in ion-implanted silicon. *J. Appl. Phys.*, 95:1134-1139, 2004.

71. T. O. Drews, E. G. Webb, D. L. Ma, J. Alameda, R. D. Braatz, and R. C. Alkire. Coupled mesoscale-continuum simulations of copper electrodeposition in a trench. *AIChE J.*, 50:226-240, 2004.
72. J. G. VanAntwerp and R. D. Braatz. Discussion on design of cross-directional controllers with optimal steady-state performance. *European J. of Control*, 10:28-29, 2004 (invited).
73. R. C. Alkire and R. D. Braatz. Electrochemical engineering in an age of discovery and innovation. *AIChE J.*, 50:2000-2007, 2004 (invited, cover article).
74. E. Rusli, S. Ang, and R. D. Braatz. A quadruple tank process control experiment. *Chem. Eng. Edu.*, 38:171-181, 2004. Reprinted in *CACHE News*, 59, Fall 2004 (invited).
75. J. C. Pirkle, Jr. and R. D. Braatz. Comparison of the dynamic thin shell and quasi-cylindrical models for blown film extrusion. *Polymer Engineering & Science*, 44:1267-1276, 2004.
76. T. O. Drews, R. D. Braatz, and R. C. Alkire. Coarse-grained kinetic Monte Carlo simulation of copper electrodeposition with additives. *Int. J. Multiscale Computational Engineering*, 2:313-327, 2004.
77. T. Togkalidou, H.-H. Tung, Y. Sun, A. Andrews, and R. D. Braatz. Parameter estimation and optimization of a loosely-bound aggregating pharmaceutical crystallization using in-situ infrared and laser backscattering measurements. *Ind. Eng. Chem. Res.*, 43:6168-6181, 2004.
78. R. Gunawan, I. Fusman, and R. D. Braatz. High resolution algorithms for multidimensional population balance equations. *AIChE J.*, 50:2738-2749, 2004.
79. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Pair diffusion and kick-out: Contributions to diffusion of boron in silicon. *AIChE J.*, 50:3248-3256, 2004.
80. E. Rusli**,** T. O. Drews, and R. D. Braatz. Systems analysis and design of dynamically coupled multiscale reactor simulation codes. *ISCRE Special Issue*, *Chem. Eng. Sci.*, 59:5607-5613, 2004.
81. R. D. Braatz, R. C. Alkire, T. O. Drews, and E. Rusli. Multiscale systems engineering with applications to chemical reaction processes. *ISCRE Special Issue*, *Chem. Eng. Sci.*, 59:5623-5628, 2004.
82. H. An, J. W. Eheart, and R. D. Braatz. Stability-oriented programs for regulating water withdrawals in riparian regions. *Water Resources Research*, 40:W12301, 2004.
83. M. Y. L. Jung, C. T. M. Kwok, R. D. Braatz, and E. G. Seebauer. Interstitial charge states in boron-implanted silicon. *J. Appl. Phys.*, 97:063520, 2005.
84. T. O. Drews, S. Krishnan, J. Alameda, D. Gannon, R. D. Braatz, and R. C. Alkire. Multi-scale simulations of copper electrodeposition onto a resistive substrate. *IBM J. Res. & Dev.*, 49:49-63, 2005.
85. M. Fujiwara, Z. K. Nagy, J. W. Chew, and R. D. Braatz. First-principles and direct design approaches for the control of pharmaceutical crystallization. *Journal of Process Control*, 15:493-504, 2005 (invited).
86. C. T. M. Kwok, K. Dev, R. D. Braatz, and E. G. Seebauer. A method for quantifying annihilation rates of bulk point defects at surfaces. *J. Appl. Phys.*, 98:013524, 2005.
87. E. J. Hukkanen, J. A. Wieland, D. E. Leckband, A. Gewirth, and R. D. Braatz. Multiple-bond kinetics from single-molecule pulling experiments: Evidence of multiple NCAM bonds. *Biophysical J.*, 89:3434-3445, 2005.
88. R. Vaidyanathan, M. Y. L. Jung, R. D. Braatz, and E. G. Seebauer. Measurement of defect-mediated diffusion: The case of silicon self-diffusion. *AIChE J.*, 52:366-370, 2006.

89. R. D. Braatz, R. C. Alkire, E. G. Seebauer, E. Rusli, R. Gunawan, T. O. Drews, and Y. He. Perspectives on the design and control of multiscale systems. *DYCOPS Special Issue*, *J. of Process Control*, 16:193-204, 2006 (invited).
90. E. Rusli, T. O. Drews, D. L. Ma, R. C. Alkire, and R. D. Braatz. Robust nonlinear feedback-feedforward control of a coupled kinetic Monte Carlo-finite difference simulation. *J. of Process Control*, 16:409-417, 2006.
91. G. X. Zhou, M. Fujiwara, X. Y. Woo, E. Rusli, H.-H. Tung, C. Starbuck, O. Davidson, Z. Ge, and R. D. Braatz. Direct design of pharmaceutical antisolvent crystallization through concentration control. *Crystal Growth & Design*, 6:892-898, 2006.
92. T. O. Drews, A. Radisic, J. Erlebacher, R. D. Braatz, P. C. Searson, and R. C. Alkire. Stochastic simulation of the early stages of kinetically limited electrodeposition. *J. Electrochem. Soc.*, 153:C434-C441, 2006.
93. X. Y. Woo, R. B. H. Tan, P. S. Chow, and R. D. Braatz. Simulation of mixing effects in antisolvent crystallization using a coupled CFD-PDF-PBE approach. *Crystal Growth & Design*, 6:1291-1303, 2006.
94. R. D. Braatz, R. C. Alkire, E. G. Seebauer, T. O. Drews, E. Rusli, M. Karulkar, F. Xue, Y. Qin, M. Y. L. Jung, and R. Gunawan. A multiscale systems approach to microelectronic processes. *Special Issue on Chemical Process Control*, *Comput. Chem. Eng.*, 30:1643-1656, 2006 (invited).
95. E. G. Seebauer, K. Dev, M. Y. L. Jung, R. Vaidyanathan, C. T. M. Kwok, J. W. Ager, E. E. Haller, and R. D. Braatz. Control of defect concentrations within a semiconductor through adsorption. *Phys. Rev. Lett.*, 97:055503, 2006.
96. N. Nair, M. L. Usrey, W.-J. Kim, R. D. Braatz, and M. S. Strano. Deconvolution of the photo-absorption spectrum of single-walled carbon nanotubes with (n,m) resolution. *Analytical Chemistry*, 78:7689-7696, 2006.
97. X. Zhang, M. Yu, C. T. M. Kwok, R. Vaidyanathan, R. D. Braatz, and E. G. Seebauer. Precursor mechanism for interaction of bulk interstitial atoms with Si(100). *Phys. Rev. B*, 74:235301, 2006.
98. J. G. VanAntwerp, A. P. Featherstone, B. A. Ogunnaike, and R. D. Braatz. Cross-directional control of sheet and film processes. *Automatica*, 43:191-211, 2007.
99. X. Li, T. O. Drews, E. Rusli, F. Xue, Y. He, R. D. Braatz, and R. C. Alkire. The effect of additives on shape evolution during electrodeposition. Part I: Multiscale simulation with dynamically coupled kinetic Monte Carlo and moving-boundary finite-volume codes. *J. Electrochem. Soc.*, 154:D230-240, 2007. Correction *J. Electrochem. Soc.*, 154:S15, 2007.
100. Z. K. Nagy and R. D. Braatz. Distributional uncertainty analysis using power series and polynomial chaos expansions. *Special Issue on Advanced Control of Chemical Processes*, *J. of Process Control*, 17:229-240, 2007.
101. E. Rusli, F. Xue, T. O. Drews, P. Vereecken, P. Andracacos, H. Deligianni, R. D. Braatz, and R. C. Alkire. Effect of additives on shape evolution during electrodeposition. Part II: Parameter estimation from roughness evolution experiments. *J. Electrochem. Soc*., 154:D584-D597, 2007.
102. M. W. Hermanto, M.-S. Chiu, X. Y. Woo, and R. D. Braatz. Robust optimal control of polymorphic transformation in batch crystallization. *AIChE J.*, 53:2643-2650, 2007.
103. T. O. Drews, R. D. Braatz, and R. C. Alkire. Monte Carlo simulation of kinetically-limited electrodeposition on a surface with metal seed clusters. *Special Issue in honor of Dieter Kolb*, *Z. Phys. Chem.*, 221:1287-1305, 2007.

104. J. G. VanAntwerp and R. D. Braatz. Discussion on GPC robust design using linear and/or bilinear matrix inequalities. *European J. of Control*, 13:468-472, 2007 (invited).
105. N. Nair, W.-J. Kim, R. D. Braatz, and M. S. Strano. Dynamics of surfactant-suspended single walled carbon nanotubes in a centrifugal field. *Langmuir*, 24:1790-1795, 2008.
106. Z. K. Nagy, J. W. Chew, M. Fujiwara, and R. D. Braatz. Comparative performance of concentration and temperature controlled batch crystallizations. *Festschrift honoring Prof. Dale Seborg*, *Journal of Process Control*, 18:399-407, 2008 (invited).
107. C. T. M. Kwok, K. Dev, E. G. Seebauer, and R. D. Braatz. Maximum a posteriori estimation of activation energies that control silicon self-diffusion. *Automatica*, 44:2241-2247, 2008.
108. Y. Qin, X. Li, F. Xue, P. Vereecken, P. Andricacos, H. Deligianni, R. D. Braatz, and R. C. Alkire. The effect of additives on shape evolution during copper electrodeposition. Part III. Trench infill for on-chip interconnects. *J. Electrochem. Soc*., 155:D223-233, 2008.
109. Z. K. Nagy, M. Fujiwara, X. Y. Woo, and R. D. Braatz. Determination of the kinetic parameters for the crystallization of paracetamol from water using metastable zone width experiments. *Ind. Eng. Chem. Res.*, 47:1245-1252, 2008.
110. Z. Zheng, R. Stephens, R. D. Braatz, R. C. Alkire, and L. R. Petzold. A hybrid multiscale kinetic Monte Carlo method for simulation of copper electrodeposition. *J. Comput. Phys.*, 227:5184-5199, 2008.
111. R. Gunawan, I. Fusman, and R. D. Braatz. Parallel high resolution finite-volume simulation of particulate processes. *AIChE J.*, 54:1449-1458, 2008.
112. Z. K. Nagy, M. Fujiwara, and R. D. Braatz, Modelling and control of combined cooling and antisolvent crystallization processes. *Special Issue on Dynamics and Control of Process Systems*. *J. of Process Control*, 18:856-864, 2008 (invited).
113. M. W. Hermanto, N. C. Kee, R. B. H. Tan, M.-S. Chiu, and R. D. Braatz. Robust Bayesian estimation of the kinetics of the polymorphic crystallization of L-glutamic acid crystals. *AIChE J.*, 54:3248-3259, 2008.
114. N. C. S. Kee, X. Y. Woo, L. M. Goh, E. Rusli, G. He, V. Bhamidi, R. B. H. Tan, P. J. A. Kenis, C. F. Zukoski, and R. D. Braatz. Design of crystallization processes from laboratory research and development to the manufacturing scale: Part I. *Am. Pharm. Rev.*, 11(6):110-115, 2008 (invited).
115. N. C. S. Kee, X. Y. Woo, L. M. Goh, E. Rusli, G. He, V. Bhamidi, R. B. H. Tan, P. J. A. Kenis, C. F. Zukoski, and R. D. Braatz. Design of crystallization processes from laboratory research and development to the manufacturing scale. Part II. *Am. Pharm. Rev.*, 11(7):66-74, 2008 (invited).
116. X. Y. Woo, R. B. H. Tan, and R. D. Braatz. Modeling and computational fluid dynamics-population balance equation-micromixing simulation of impinging jet crystallizers. *Crystal Growth & Design*, 9:156-164, 2009.
117. X. Y. Woo, Z. K. Nagy, R. B. H. Tan, and R. D. Braatz. Adaptive concentration control of cooling and antisolvent crystallization with laser backscattering measurement. *Crystal Growth & Design*, 9:182-191, 2009.
118. M. W. Hermanto, R. D. Braatz, and M.-S. Chiu. High-order simulation of polymorphic crystallization using weighted essentially non-oscillatory methods. *AIChE J.*, 55:122-131, 2009.

119. C. T. M. Kwok, R. D. Braatz, S. Paul, W. Lerch, and E. G. Seebauer. Mechanistic benefits of millisecond annealing for diffusion and activation of boron in silicon. *J. Appl. Phys.*, 105:art. no. 063514, 2009.
120. N. C. S. Kee, R. B. H. Tan, and R. D. Braatz. Selective crystallization of the metastable alpha-form of L-glutamic acid using concentration feedback control. *Crystal Growth & Design*, 9:3044-3051, 2009.
121. N. C. S. Kee, P. D. Arendt, R. B. H. Tan, and R. D. Braatz. Selective crystallization of the metastable anhydrate form in the enantiotropic pseudo-dimorph system of L-phenylalanine using concentration feedback control. *Crystal Growth & Design*, 9:3052-3061, 2009.
122. M. W. Hermanto, M.-S. Chiu, and R. D. Braatz. Nonlinear model predictive control for the polymorphic crystallization of L-glutamic acid crystals. *AIChE J.*, 55:2631-2645, 2009.
123. T. Jin, Y. Ito, X. Luan, S. Dangaria, C. Walker, M. Allen, A. Kulkarni, C. Gibson, R. Braatz, X. Liao, and T. Diekwisch. Elongated polyproline motifs facilitate enamel evolution through matrix subunit compaction. *PLoS Biology*, 7(12):e1000262, 2009.
124. K. Chen, R. Vaidyanathan, E. G. Seebauer, and R. D. Braatz. General expression for effective diffusivity of foreign atoms migrating via a fast intermediate, *J. Appl. Phys.*, 107:026101, 2010.
125. C. T. M. Kwok, R. D. Braatz, S. Paul, W. Lerch, and E. G. Seebauer. An improved model for boron diffusion and activation in silicon. *AIChE J.*, 56:515-521, 2010.
126. J. C. Pirkle, Jr. and R. D. Braatz. A thin-shell two-phase microstructural model for blown film extrusion. *J. of Rheology*, 54:471-505, 2010.
127. V. R. Subramanian and R. D. Braatz. Current needs in electrochemical engineering education. *Electrochemical Society Interface*, 19(1):37-38, 2010 (invited).
128. L. M. Goh, K. J. Chen, V. Bhamidi, G. He, N. C. S. Kee, P. J. A. Kenis, C. F. Zukoski, and R. D. Braatz. A stochastic model for nucleation kinetics determination in droplet-based microfluidic systems. *Crystal Growth & Design*, 10:2515-2521, 2010.
129. J. C. Pirkle, Jr., M. Fujiwara, and R. D. Braatz. A maximum-likelihood parameter estimation for the thin-shell quasi-Newtonian model for a laboratory blown film extruder. *Special Issue in Honor of Thomas Edgar*, *Ind. Eng. Chem. Res.*, 47:8007-8015, 2010.
130. M. Kishida and R. D. Braatz. Worst-case analysis of distributed parameter systems with application to the 2D reaction-diffusion equation. *Special Issue on Optimal Process Control*, *Optimal Control Applications & Methods*, 31:433-449, 2010 (invited).
131. K. Chen, N. Nair, M. S. Strano, and R. D. Braatz. Identification for chirality-dependent adsorption kinetics in single-walled carbon nanotube reaction networks. *Special Issue on Nanoscale Simulation of Molecular and Biological Systems*, *J. of Computational & Theoretical Nanoscience*, 7:2581-2585, 2010 (invited).
132. V. Ramadesigan, R. N. Methekar, V. R. Subramanian, F. Latinwo, and R. D. Braatz. Optimal porosity distribution for minimized Ohmic drop across a porous electrode. *J. Electrochem. Soc.*, 157:A1328-A1334, 2010.
133. M. W. Hermanto, R. D. Braatz, and M.-S. Chiu. Integrated batch-to-batch and nonlinear model predictive control for polymorphic crystallization in pharmaceutical crystallization. *AIChE J.*, 57:1008-1019, 2011.
134. N. C. S. Kee, R. B. H. Tan, and R. D. Braatz. Semiautomated identification of the phase diagram for enantiotropic crystallizations using ATR-FTIR spectroscopy and laser backscattering. *Special Issue in Honor of C. C. Yu*, *Ind. Eng. Chem. Res.*, 50:1488-1495, 2011 (invited).

135. N. C. S. Kee, P. D. Arendt, L. M. Goh, R. B. H. Tan, and R. D. Braatz. Nucleation and growth kinetics estimation for *L*-phenylalanine hydrate and anhydrate crystallization. *CrystEngComm*, 13:1197-1209, 2011 (invited).
136. W. Y. Woo, R. B. H. Tan, and R. D. Braatz. Precise tailoring of the crystal size distribution by controlled growth and continuous seeding from impinging jet crystallizers. *CrystEngComm*, 13:2006-2014, 2011 (invited).
137. J. C. Pirkle, Jr. and R. D. Braatz. Instabilities and multiplicities in non-isothermal blown film extrusion including the effects of crystallization. *Special Issue in Honor of Thomas McAvoy*, *J. of Process Control*, 21:405-414, 2011 (invited).
138. R. N. Methekar, P. W. C. Northrup, K. Chen, R. D. Braatz, and V. R. Subramanian. Kinetic Monte Carlo simulation of surface heterogeneity in graphite electrodes for lithium-ion batteries: Passive layer formation. *J. Electrochem. Soc.*, 158:A363-A370, 2011.
139. V. Ramadesigan, V. Boovaragavan, M. Arabandi, N. A. Burns, K. Chen, R. D. Braatz, and V. R. Subramanian. Parameter estimation and capacity fade analysis of lithium-ion batteries using reformulated models. *J. Electrochem. Soc.*, 158:A1048-A1054, 2011.
140. Z. W. Ulissi, J. Zhang, A. A. Boghossian, N. F. Reuel, S. F. E. Shimizu, R. D. Braatz, and M. S. Strano. Applicability of birth-death Markov modeling for single molecule counting using single-walled carbon nanotube fluorescent sensor arrays. *J. Phys. Chem. Lett.*, 2:1690-1694, 2011.
141. A. A. Boghossian, J. Zhang, F. T. Le Floch, Z. W. Ulissi, P. Bojo, J.-H. Han, J.-H. Kim, J. R. Arkalgud, N. F. Reuel, R. D. Braatz, and M. S. Strano. The chemical dynamics of nanosensors capable of single molecule detection. *J. Chem. Phys.*, 135:art no. 084124, 2011.
142. V. Ramadesigan, P. W. C. Northrop, S. De, S. Santhanagopalan, R. D. Braatz, V. R. Subramanian. Modeling and simulation of lithium-ion batteries from a systems engineering perspective. *J. Electrochem. Soc.*, 159:R31-R45, 2012.
143. Z. K. Nagy and R. D. Braatz. Advances and new directions in crystallization control. *Annu. Rev. Chem. Biomol. Eng.*, 3:55-75, 2012 (invited).
144. K. K. K. Kim, E. Rios-Patron, and R. D. Braatz. Robust nonlinear internal model control of Wiener systems. *Special Issue in Honor of Kenneth Muske*, *J. of Process Control*, 22:1468-1477 (invited).
145. M. Jiang, M. H. Wong, Z. Zhu, J. Zhang, L. Zhou, K. Wang, A. N. Ford Versypt, T. Si, L. M. Hasenberg, Y.-E. Li, and R. D. Braatz. Towards achieving a flattop crystal size distribution by continuous seeding and controlled growth. *Chem. Eng. Sci.*, 77:2-9, 2012.
146. K. Chen, L. M. Goh, G.W. He, P. J. A. Kenis, C. F. Zukoski, and R. D. Braatz. Identification of nucleation rates in droplet-based microfluidic systems. *Chem. Eng. Sci.*, 77:235-241, 2012.
147. L. Goh, M. Kishida, and R. D. Braatz. On the analysis of robust stability of metabolic pathways. *IEEE Control Systems*, 32(4):92-94, 2012.
148. Z. W. Ulissi, M. S. Strano, and R. D. Braatz. Control of nano and microchemical systems. *Special Issue on Chemical Process Control*, *Comput. Chem. Eng.*, 51:149-156, 2013 (invited). CACE Most Downloaded Articles, Sept 2012 – Aug 2013.
149. M. Kishida, A. N. Ford Versypt, D. W. Pack, and R. D. Braatz. Optimal control of one-dimensional cellular uptake in tissue engineering. *Optimal Control Applications & Methods*, 34:680-695, 2013.

150. L. Zhou, M. Su, B. Benyahia, A. Singh, P. I. Barton, B. L. Trout, A. S. Myerson, and R. D. Braatz. Mathematical modeling and design of layer crystallization in a concentric annulus with and without recirculation. *AIChE Journal*, 59:1308-1321, 2013.
151. E. P. Chang, R. D. Braatz, and A. T. Hatton. Pervaporation of emulsion droplets for the templated assembly of spherical particles: A population balance model. *AIChE Journal*, 59:3975-3985, 2013.
152. K.-K. K. Kim and R. D. Braatz. Generalised polynomial chaos expansion approaches to approximate stochastic model predictive control. MPC Special Issue, *International Journal of Control*, 86:1324-1337, 2013.
153. M. L. Rasche and R. D. Braatz. The pitfalls of readily available solutions: Physically consistent global analysis of species transport from a spherical particle. *IEEE Control Systems*, 33(5):54-56, 2013.
154. K.-K. K. Kim, D. E. Shen, Z. K. Nagy, and R. D. Braatz. Wiener's polynomial chaos for the analysis and control of nonlinear dynamical systems with probabilistic uncertainties. *IEEE Control Systems*, 33(5):58-67, 2013.
155. M. Molaro and R. D. Braatz. Speeding up Matlab® programs by orders of magnitude. *IEEE Control Systems*, 33(6):135+, 2013.
156. S. Mascia, P. L. Heider, H. Zhang, R. Lakerveld, B. Benyahia, P. I. Barton, R. D. Braatz, C. L. Cooney, J. M. B. Evans, T. F. Jamison, K. F. Jensen, A. S. Myerson, and B. L. Trout. End-to-end continuous manufacturing of pharmaceuticals: Integrated synthesis, purification, and final dosage formation. *Angewandte Chemie*, 52(47):12359-12363, 2013. **Hot Paper. Research Highlight in *Nature***, 502:274, 2013 (doi:10.1038/502274d).
157. R. Lakerveld, B. Benyahia, R. D. Braatz, and P. I. Barton. Model-based design of a plant-wide control strategy for a continuous pharmaceutical plant. *AIChE Journal*, 59:3671-3685, 2013.
158. R. Lakerveld, B. Benyahia, P. L. Heider, H. Zhang, R. D. Braatz, and P. I. Barton. Averaging level control to reduce off-spec material in a continuous pharmaceutical pilot plant. *Processes*, 1:330-348, 2013.
159. 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.
160. M. Kishida, P. Rumschinski, R. Findeisen, and R. D. Braatz. Efficient polynomial-time outer bounds on state trajectories for uncertain polynomial systems using skewed structured singular values. *IEEE Trans. on Automatic Control*, 59:3063-3068, 2014.
161. M. Kishida and R. D. Braatz. Skewed structured singular value-based approach for the construction of design spaces: Theory and applications. *IET Control Theory & Applications*, 8(14):1321-1327, 2014.
162. Q.-L. Su, R. D. Braatz, and M.-S. Chiu. Modeling and Bayesian parameter estimation for semibatch pH-shift reactive crystallization of L-glutamic acid. *AIChE Journal*, 60(8): 2828-2838, 2014.
163. K.-K. K. Kim and R. D. Braatz. Observer-based output feedback control of discrete-time Luré systems with sector-bounded slope-restricted nonlinearities. *Int. J. of Robust & Nonlinear Control*, 24:2458-2472, 2014.
164. K.-K. K. Kim, S. Skogestad, M. Morari, and R. D. Braatz. Necessary and sufficient conditions for robust reliable control in the presence of model uncertainties and system component failures. Manfred Morari Special Issue, *Comput. Chem. Eng.*, 70:67-77, 2014.

165. K.-K. K. Kim and R. D. Braatz. Computational complexity and related topics of robustness margin calculation using μ theory: A review of theoretical developments. Manfred Morari Special Issue, *Comput. Chem. Eng.*, 70:122-132, 2014.
166. K.-K. K. Kim, K. S. Cheong, K. Chen, and R. D. Braatz. Analysis of a synthetic gene switching motif: Systems and control approaches. ADCHEM Special Issue, *Journal of Process Control*, 24:341-347, 2014.
167. J. K. Scott, R. Findeisen, R. D. Braatz, and D. M. Raimondo. Input design for guaranteed fault diagnosis using zonotopes. *Automatica*, 50:1580-1589, 2014.
168. H. Jang, J. H. Lee, K.-K. K. Kim, and R. D. Braatz. Fast moving horizon estimation for a two-dimensional distributed parameter system. *Comput. Chem. Eng.*, 63:159-172, 2014.
169. A. N. Ford Versypt and R. D. Braatz. Analysis of finite difference discretization schemes for diffusion in spheres with variable diffusivity. *Comput. Chem. Eng.*, 71:241-252, 2014.
170. X. Zhu, D. W. Pack, and R. D. Braatz. Modelling intravascular delivery from drug-eluting stents with biodurable coating: Investigation of anisotropic vascular drug diffusivity and arterial drug distribution. *Computer Methods in Biomechanics and Biomedical Engineering*, 17(3):187-198, 2014.
171. J. Min, R. D. Braatz, and P. T. Hammond. Tunable staged release of therapeutics from layer-by-layer coatings with clay barrier interlayer. *Biomaterials*, 35(8), 2507-2517, 2014. **Ranked as Highly Cited Paper by ISI Web of Science in September 2016 as being in the top 1% in the field of materials science.**
172. Q.-L. Su, R. D. Braatz, and M.-S. Chiu. Concentration control for semi-batch pH-shift reactive crystallization of L-glutamic acid. ADCHEM Special Issue, *Journal of Process Control*, 24:415-421, 2014.
173. M. Jiang, X. Zhu, M. C. Molaro, M. L. Rasche, H. Zhang, K. Chadwick, D. M. Rainmondo, K.-K. K. Kim, L. Zhou, Z. Zhu, M. H. Wong, D. O'Grady, D. Hebrault, J. Tedesco, and R. D. Braatz. Modification of crystal shape through deep temperature cycling. David Himmelblau and Gary Powers Memorial Special Issue, *Ind. Eng. Chem. Res.*, 53:5325-5336, 2014.
174. B. Suthar, V. Ramadesigan, S. De, R. D. Braatz, and V. R. Subramanian. Optimal charging profiles for mechanically constrained lithium-ion batteries. *Physical Chemistry Chemical Physics*, 16:277-287, 2014.
175. X. Zhu and R. D. Braatz. 2D contribution map for fault identification. *IEEE Control Systems*, 33(5):72-77, 2014.
176. M. Jiang, Z. Zhu, E. Jimenez, J. Xu, C. Papageorgiou, J. Waetzig, A. Hardy, and R. D. Braatz. Continuous-flow tubular crystallization in slugs spontaneously induced by hydrodynamics. *Crystal Growth & Design*, 14:851-860, 2014.
177. A. Mesbah, A. N. Ford Versypt, X. Zhu, and R. D. Braatz. Nonlinear model-based control of thin-film drying for continuous pharmaceutical manufacturing. John Congalidis Memorial Special Issue, *Ind. Eng. Chem. Res.*, 53(18):7447-7460, 2014.
178. H. T. Zhang, R. Lakerveld, P. L. Heider, M. Y. Tao, M. Su, C. J. Testa, A. N. D'Antonio, P. I. Barton, R. D Braatz, B. L. Trout, A. S. Myerson, K. F. Jensen, and J. M. B. Evans. Application of continuous crystallization in an integrated continuous pharmaceutical pilot plant. *Crystal Growth & Design*, 14(5):2148-2157, 2014.
179. X. Zhu and R. D. Braatz. Modeling and analysis of drug-eluting stents with biodegradable PLGA coating: Consequences on intravascular drug delivery. *Journal of Biomechanical Engineering*, 136(11):111004, 2014.

180. P. W. C. Northrop, B. Suthar, V. Ramadesigan, S. Santhanagopalan, R. D. Braatz, and V. R. Subramanian. Efficient simulation of lithium-ion battery models for enabling electric transportation. *J. Electrochem. Soc.*, 161(8):E3149-E3157, 2014.
181. B. Suthar, P. W. C. Northrop, R. D. Braatz, and V. S. Subrahmanian. Optimal charging profiles with minimal intercalation-induced stresses for lithium-ion batteries using reformulated pseudo 2-dimensional models. *J. Electrochem. Soc.*, 161(11):F3144-F3155, 2014.
182. X. Zhu and R. D. Braatz. A mechanistic model for drug release in PLGA biodegradable stent coatings coupled with polymer degradation and erosion. *Journal of Biomedical Materials Research: Part A*, 103(7):2269-2279, 2015.
183. I. R. Baxendale, R. D. Braatz, B. K. Hodnett, K. F. Jensen, M. D. Johnson, P. Sharratt, J.-P. Sherlock, and A. J. Florence. Achieving continuous manufacturing: Technologies and approaches for synthesis, work-up and isolation of drug substance. *Journal of Pharmaceutical Sciences*, 104(3):781-791, 2015.
184. A. T. Myerson, M. Krumme, M. Nasr, H. Thomas, and R. D. Braatz. Control systems engineering in continuous pharmaceutical processing. *Journal of Pharmaceutical Sciences*, 104(3):832-839, 2015.
185. B. Jiang, D. Huang, X. Zhu, F. Yang, and R. D. Braatz. Canonical variate analysis-based contributions for fault identification. *Journal of Process Control*, 26:17-25, 2015.
186. J. A. Paulson, A. Mesbah, X. Zhu, M. C. Molaro, and R. D. Braatz. Control of self-assembly in micro- and nanoscale systems. *Journal of Process Control*, 27:38-49.
187. B. Jiang, X. Zhu, D. Huang, J. A. Paulson, and R. D. Braatz. A combined canonical variate analysis and Fisher discriminant analysis (CVA-FDA) approach for fault diagnosis. *Comput. Chem. Eng.*, 77:1-9, 2015.
188. Y. Son, Q. H. Wang, J. Paulson, C.-J. Shih, A. Rajan, K. Tvrdy, S. Kim, B. Alfeeli, R. Braatz; and M. Strano. Layer number dependence of MoS_2 photoconductivity using photocurrent spectral atomic force microscopic imaging. *ACS Nano*, 9:2843-2855, 2015.
189. L. L. Simon, H. Pataki, G. Marosi, F. Meemken, K. Hungerbühler, A. Baiker, S. Tummala, B. Glennon, M. Kuentz, G. Steele, H. J. M. Kramer, J. W. Rydzak, Z. Chen, J. Morris, F. Kjell, R. Singh, R. Gani, K. V. Gernaey, M. Louhi-Kultanen, J. O'Reilly, N. Sandler, O. Antikainen, J. Yliruusi, P. Frohberg, J. Ulrich, R. D. Braatz, T. Leyssens, M. von Stosch, R. Oliveira, R. B. H. Tan, H. Wu, M. Khan, D. O'Grady, A. Pandey, R. Westra, E. Delle-Case, D. Pape, D. Angelosante, Y. Maret, O. Steiger, M. Lenner, K. Abbou-Oucherif, Z. K. Nagy, J. D. Litster, V. K. Kamaraju, and M.-S. Chiu. Assessment of recent process analytical technology (PAT) trends: A multiauthor review. *Org. Process Res. Dev.*, 19:3-62, 2015.
190. M. Kishida, D. W. Pack, and R. D. Braatz. Optimal spatial field control for controlled release. *Optimal Control Applications and Methods*, online on January 19, 2015, DOI: 10.1002/oca.2159.
191. M. Kishida and R. D. Braatz. Ellipsoidal bounds on state trajectories for discrete-time systems with linear fractional uncertainties. *Optimization and Engineering*. DOI: 10.1007/s11081-014-9255-9. Online on March 2014.
192. L. H. Chiang, B. Jiang, X. Zhu, D. Huang, and R. D. Braatz. Diagnosis of multiple and unknown faults using the causal map and multivariate statistics. *Journal of Process Control*, 28:27-39, 2015.

193. Mo Jiang, C. D. Papageorgiou, J. Waetzig, A. Hardy, M. Langston, and R. D. Braatz. Indirect ultrasonication in continuous slug-flow crystallization. *Crystal Growth & Design*, 15(5):2486–2492, 2015.
194. K. A. Severson, J. G. VanAntwerp, V. Natarajan, C. Antoniou, J. Thömmes, and R. D. Braatz. Elastic net with Monte Carlo sampling for data-based modeling in biopharmaceutical manufacturing facilities. *Comput. Chem. Eng.*, 80:30-36, 2015.
195. R. Lakerveld, B. Benyahia, P. L. Heider, H. Zhang, A. Wolfe, C. Testa, S. Ogden, D. R. Hersey, S. Mascia, J. M. B. Evans, R. D. Braatz, and P. I. Barton. The application of an automated control strategy for an integrated continuous pharmaceutical pilot plant. *Organic Process Research & Development*, online on August 1, 2014. DOI: 10.1021/op500104d.
196. M.-J. Kim, R. D. Braatz, J. T. Kim, and C.-K. Yoo. "Indoor air quality control for improving passenger health in subway platforms using an outdoor air quality dependent ventilation system," Indoor air quality control for improving passenger health in subway platforms using an outdoor air quality dependent ventilation system. *Building and Environment*, 92:407-417, 2015.
197. You Peng, Zhilong Zhu, Richard D. Braatz, and Allan S. Myerson. Gypsum crystallization during phosphoric acid production: Modeling and experiments using the mixed-solvent-electrolyte thermodynamic model. *Ind. Eng. Chem. Res.*, 54(32):7914-7924, 2015.
198. H. Jang, J. H. Lee, and R. D. Braatz. State estimation of the time-varying and spatially localized concentration of signal molecules from the stochastic adsorption dynamics on the carbon nanotube-based sensors and its application to tumor cell detection. *PLoS ONE*, 10(11): e0141930.
199. B. Jiang, X. Zhu, D. Huang, and R. D. Braatz. Canonical variate analysis-based monitoring of process correlation structure using causal feature representation. *Journal of Process Control*, 32:109-116, 2015.
200. M. Jiang, C. Gu, and R. D. Braatz. Understanding temperature-induced primary nucleation in dual impinging jet mixers. *Special Issue on Continuous Crystallisation*, *Chem. Eng. Process.: Process Intensification*, 97:187-194, 2015 (invited).
201. J. C. Pirkle, Jr., L. C. Foguth, S. J. Brenek, K. Girard, and R. D. Braatz. Computational fluid dynamics modeling of mixing effects for crystallization in coaxial nozzles. *Special Issue on Continuous Crystallisation*, *Chem. Eng. Proc.: Process Intensification*, 97:213-232, 2015 (invited).
202. M. Jiang, D. Li, H.-H. Tung, and R. D. Braatz. Effect of jet velocity on crystal size distribution from antisolvent and cooling crystallizations in a dual impinging jet mixer. *Special Issue on Continuous Crystallisation*, *Chem. Eng. Proc.: Process Intensification*, 97:242-247, 2015 (invited).
203. M. Kishida and R. D. Braatz. Quality-by-Design by skewed spherical structured singular value. *IET Control Theory & Applications*, 9(15):2202-2210, 2015.
204. A. N. Ford Versypt, P. D. Arendt, D. W. Pack, and R. D. Braatz. Derivation of an analytical solution to a reaction-diffusion model for autocatalytic degradation and erosion in polymer microspheres. *PLOS ONE*, 10(8):art no. e0135506, 2015.
205. L. Zhang, S. Zhuang, and R. D. Braatz. Switched model predictive control of switched linear systems: Feasibility, stability and robustness. *Automatica*, 67:8-21, 2016.
206. H. Jang, J. H. Lee, and R. D. Braatz. Estimation of local concentration from measurements of stochastic adsorption dynamics using carbon nanotube-based sensors. *Korean J. Chem. Eng.*, 33(1):33-41, 2016.

207. Indrani Bhattacharyya, Mark C. Molaro, Richard D. Braatz, and Gregory C. Rutledge. Free surface electrospinning of aqueous polymer solutions from a wire electrode. *Chemical Engineering Journal*, 289:203-211, 2016.
208. S. Streif, K.-K. K. Kim, P. Rumschinski, M. Kishida, D. E. Shen, R. Findeisen, and R. D. Braatz. Robustness analysis, prediction and estimation for uncertain biochemical networks: An overview. *Journal of Process Control*, 42:14-34, 2016 (invited).
209. M. S. Reis, R. D. Braatz, and L. H. Chiang. Big data challenges and future research directions. *Chem. Eng. Prog.*, 112(3):46-50, March 2016 (invited).
210. Jouha Min, Ki Young Choi, Erik C. Dreaden, Robert F. Padera, Richard D. Braatz, Myron Spector, and Paula T. Hammond. Designer dual therapy nanolayered implant coatings eradicate biofilms and accelerate bone tissue repair. *ACS Nano*, 10(4):4441-4450, 2016. **Cover article**.
211. Q.-L. Su, M. W. Hermanto, R. D. Braatz, and M.-S. Chiu. Just-in-time-based extended prediction self-adaptive control for batch processes. *Journal of Process Control*, 43:1-9, 2016.
212. H. Jang, K. K. K. Kim, R. D. Braatz, R. B. Gopaluni, and J. H. Lee. Regularized maximum likelihood estimation of sparse stochastic monomolecular biochemical reaction networks. *Comput. Chem. Eng.*, 90:111-120, 2016.
213. M. Kishida and R. D. Braatz. On the analysis of the eigenvalues of uncertain matrices by μ and ν: Applications to bifurcation avoidance and convergence rates. *IEEE Transactions on Automatic Control*, 61(3):748-753.
214. M. Torchio, L. Magni, R. B. Gopaluni, R. D. Braatz, and D. M. Raimondo. LIONSIMBA – A Matlab framework based on a finite volume model suitable for Li-ion battery design, simulation, and control. *J. Electrochem. Soc.*, 163(7):A1192-A1205, 2016.
215. Darin O. Bellisario, Joel A. Paulson, Richard D. Braatz, and Michael S. Strano. An analytical solution for exciton generation, reaction, and diffusion in nanotube and nanowire-based solar cells. *The Journal of Physical Chemistry Letters*, 7(14):2683-2688, 2016.
216. M. J. Kim, R. D. Braatz, J. T. Kim, and C. K. Yoo. Economical control of indoor air quality in underground metro station using an iterative dynamic programming-based ventilation system. *Indoor and Building Environment*, 25:949-961, 2016.
217. A. Tulsyan, Y. Tsai, R. B. Gopaluni, and R. D. Braatz. State-of-charge estimation in Li-ion batteries: A particle filter approach. *Journal of Power Sources*, 331:208-223, 2016.
218. J. K. Scott, D. M. Raimondo, G. R. Marseglia, and R. D. Braatz. Constrained zonotopes: A new tool for set-based estimation and fault detection. *Automatica*, 69:126-136, 2016.
219. Mo Jiang and Richard D. Braatz. Integrated control of continuous (bio)pharmaceutical manufacturing. *Am. Pharm. Rev.*, 19(6):110-115 (invited).
220. M. L. Rasche, M. Jiang, and R. D. Braatz. Mathematical modeling and optimal design of multi-stage slug-flow crystallization. *Comput. Chem. Eng.*, 95:240-248, 2016.
221. Dongying Erin Shen and Richard D. Braatz. Polynomial chaos-based robust design of systems involving probabilistic uncertainties. *AIChE Journal*, 62(9):3310-3318, 2016.
222. Kristen Severson, Paphonwit Chaiwatanodom, and Richard D. Braatz. Perspectives on process monitoring of industrial systems. *Annual Reviews in Control*, 42:190-200, 2016 (invited).
223. D. M. Raimondo, G. R. Marseglia, R. D. Braatz, and J. K. Scott. Closed-loop input design for guaranteed fault diagnosis using set-valued observers. *Automatica*, 74:107-117, 2016.

224. K.-K. K. Kim and R. D. Braatz. Robust static and fixed-order dynamic output feedback control of discrete-time parametric uncertain Luré systems: Sequential SDP relaxation approaches. *Optimal Control Applications & Methods*, 38(1):36-58, 2017.
225. Marcello Torchio, Lalo Magni, Richard D. Braatz, and Davide M. Raimondo. Design of piecewise affine and linear time varying based model predictive control strategies for advanced battery management systems. *J. Electrochem. Soc.*, 164(4):A949-A959, 2017.
226. M. Jiang, G. Chen, and R. D. Braatz. Analysis of focused indirect ultrasound via high-speed spatially localized pressure sensing and its consequences on nucleation. *Chem. Eng. Proc.: Process Intensification*, 117:186-194, 2017.
227. Theodora Kourti, Rapti Madurawe, Kurt Brorson, David Doleski, Dolores Hernán Pérez de la Ossa, Jean Hu-Primmer, Christian Airiau, Gretchen A. Allison, Richard D. Braatz, Yanxi Tan Cain, Lawrence de Belder, Steve Hammond, Jun Huang, Christopher Hwang, Gordon (Randy) Lambertus, Catherine MacConnell, Steve Miller, Christine M. V. Moore, David Pappa, Wyatt Roth, Vidya Swaminathan, Kelly Swinney, Kelly Tolton, and Andre Walker. Continuous manufacturing. *Pharmaceutical Engineering*, 37(3):35-42, May/June 2017 (invited).
228. Kristen Severson, Brinda Monian, J. Christopher Love, and Richard D. Braatz. A method for learning a sparse classifier in the presence of missing data for high-dimensional biological datasets. *Bioinformatics*, 33(18):2897-2905, 2017.
229. A. Mesbah, J. A. Paulson, R. Lakerveld, and R. D. Braatz. Model predictive control of an integrated continuous pharmaceutical manufacturing pilot plant. *Org. Process Res. Dev.*, 21(6):844-854, 2017.
230. B. Jiang and R. D. Braatz. Fault detection of process correlation structure using canonical variate analysis-based correlation features. *Journal of Process Control*, 58:131-138, 2017.
231. Nima Yazdanpanah, Christopher J. Testa, Siva R. K. Perala, Keith D. Jensen, Richard D. Braatz, Allan S. Myerson, and Bernhardt L. Trout. Continuous heterogeneous crystallization on excipient surfaces. *Crystal Growth & Design*, 17(6):3321-3330, 2017.
232. Fridolin Röder, Richard D. Braatz, and Ulrike Krewer. Multi-scale simulation of heterogeneous surface film growth mechanisms in lithium-ion batteries. Focus Issue on Mathematical Modeling of Electrochemical Systems at Multiple Scales in Honor of John Newman, *J. Electrochem. Soc.*, 164(11):E3335-3344, 2017.
233. Q.-L. Su, M. W. Hermanto, R. D. Braatz, and M.-S. Chiu. Integrated B2B-NMPC control for a semi-batch pH-shift reactive crystallization of L-glutamic acid. *AIChE Journal*, 63(11):5007-5018, 2017.
234. Kristen Severson, Mark C. Molaro, and Richard D. Braatz. Principal component analysis of process datasets with missing values. Special Issue on Process Data Analytics, *Processes*, 5(3):38, 2017. **Cover article**.
235. Mo Jiang, Kristen Severson, J. Christopher Love, Helena Madden, Patrick Swan, Li Zang, and Richard D. Braatz. Opportunities and challenges of real-time release testing for biopharmaceutical manufacturing. *Biotechnology and Bioengineering*, 114(11):2445-2456, 2017.
236. P. M. Desai, V. Puri, D. Brancazio, B. S. Halkude, J. E. Hartman, A. V. Wahane, A. R. Martinez, K. D. Jensen, E. Harinath, R. D. Braatz, J.-H. Chun, and B. L. Trout. Tablet coating by injection molding technology – Optimization of coating formulation attributes and coating process parameters. *European Journal of Pharmaceutics and Biopharmaceutics*, 122:25-36, 2018.

237. Vibha Puri, David Brancazio, Eranda Harinath, Alexander R. Martinez, Parind M. Desai, Keith D. Jensen, Jung-Hoon Chun, Richard D. Braatz, Allan S. Myerson, and Bernhardt L. Trout. Demonstration of pharmaceutical tablet coating process by injection molding technology. *International Journal of Pharmaceutics*, 535(1–2):106–112, 2018.
238. K. K. K. Kim, E. Ríos Patrón, and R. D. Braatz. Stability representation and unified stability analysis for dynamic artificial neural network models. *Neural Networks*, 98:251-262, 2018.
239. Moo Sun Hong, Kristen Severson, Mo Jiang, Amos E. Lu, J. Christopher Love, and Richard D. Braatz. Challenges and opportunities in biopharmaceutical manufacturing control. Special Issue on Foundations of Computer Aided Process Operations / Chemical Process Control, *Comput. Chem. Eng.*, 110:106-114, 2018.
240. Mo Jiang and Richard D. Braatz. Low-cost noninvasive real-time imaging for tubular continuous-flow crystallization. *Chem. Eng. Techn.*, 41(1):143-148, 2018.
241. M. L. Rasche, B. W. Zeiger, K. S. Suslick, and R. D. Braatz. Mathematical modelling of the evolution of the particle size distribution during ultrasound-induced breakage of aspirin crystals. *Chem. Eng. Res. Des.*, 132:170-177, 2018.
242. A. Nikdel, R. D. Braatz, and H. M. Budman. A systematic approach for finding the objective function and active constraints for dynamic flux balance analysis. *Bioprocess and Biosystems Engineering*, 41(5):641-655, 2018.
243. J. M. Schall, J. S. Mandur, R. D. Braatz, and A. S. Myerson. Nucleation and growth kinetics for combined cooling and antisolvent crystallization in an MSMPR system – Estimating solvent dependency. *Crystal Growth & Design*, 18(3):1560-1570, 2018.
244. Qiugang Lu, Benben Jiang, R. Bhushan Gopaluni, Philip D. Loewen, and Richard D. Braatz. Locality preserving discriminative canonical variate analysis for fault diagnosis. *Comput. Chem. Eng.*, 117:309-319, 2018.
245. Cezar A. da Rosa and Richard D. Braatz. Multiscale modeling and simulation of macromixing, micromixing, and crystal size distribution in radial mixers/crystallizers. *Ind. Eng. Chem. Res.*, 57(15):5433-5441, 2018.
246. Cezar A. da Rosa and Richard D. Braatz. OpenCrys: Open-source software for the multiscale modeling of combined antisolvent and cooling crystallization in turbulent flow. *Ind. Eng. Chem. Res*., 57(34):11702-11711, 2018.
247. Qiugang Lu, Benben Jiang, R. Bhushan Gopaluni, Philip D. Loewen, and Richard D. Braatz. Sparse canonical variate analysis approach for process monitoring. *Journal of Process Control*, 71, 90-102, 2018.
248. Laura E. Crowell, Amos E. Lu, Kerry R. Love, Alan Stockdale, Steven M. Timmick, Di Wu, Yu (Annie) Wang, William Doherty, Alexandra Bonnyman, Nicholas Vecchiarello, Chaz Goodwine, Lisa Bradbury, Joseph R. Brady, John J. Clark, Noelle A. Colant, Aleksander Cvetkovic, Neil C. Dalvie, Diana Liu, Yanjun Liu, Craig A. Mascarenhas, Catherine B. Matthews, Nicholas J. Mozdzierz, Kartik A. Shah, Shiaw-Lin Wu, William S. Hancock, Richard D. Braatz, Steven M. Cramer, and J. Christopher Love. On-demand manufacturing of clinical-quality biopharmaceuticals. *Nature Biotechnology*, 36:988-995, 2018.
249. Ulrike Krewer, Fridolin Röder, Eranda Harinath, Richard D. Braatz, Benjamin Bedürftig, and Rolf Findeisen. Dynamic models of Li-ion batteries for diagnosis and operation – A review and perspective. *J. Electrochem. Soc.*, 165(16):A3656-A3673, 2018.

250. F. Röder, R. D. Braatz, and U. Krewer. Direct coupling of continuum and kinetic Monte Carlo models for multiscale simulation of electrochemical systems. *Comput. Chem. Eng.*, 121:722-735, 2019.
251. Lauren Farias, Jeferson A. de Souza, Richard D. Braatz, and Cezar A. da Rosa. Coupling of the population balance equation into a two-phase model for the simulation of combined cooling and antisolvent crystallization using OpenFOAM. *Comput. Chem. Eng.*, 123, 246-256, 2019.
252. Kristen A. Severson, Peter M. Attia, Norman Jin, Benben Jiang, Zi Yang, Nicholas Perkins, Michael H. Chen, Muratahan Aykol, Patrick K. Herring, Dimitrios Fraggedakis, Martin Z. Bazant, Stephen J. Harris, William C. Chueh, and Richard D. Braatz. Data-driven prediction of battery cycle life before capacity degradation. *Nature Energy*. 4:383-391, 2019. **Cover article**. The paper is discussed by Maitane Berecibar, "Accurate predictions of lithium-ion battery life," *Nature*, 568(7752):325-326, April 18, 2019.
253. Mo Jiang and Richard D. Braatz. Designs of continuous-flow crystallizers: Developments and practice. *CrystEngComm*, 21:3534-3551, 2019 (invited).
254. Jennifer Schall, Gerard Capellades, Jasdeep Mandur, Richard D. Braatz, and Allan S. Myerson. Incorporating solvent-dependent kinetics to design a multi-stage, continuous, combined cooling/antisolvent crystallization process. *Org. Process Res. Dev.*, 23(9), 1960-1969, 2019.
255. Domenico Coluccia, Davide Fissore, Antonello Barresi, and Richard D. Braatz. A new mathematical model for monitoring the temporal evolution of the ice crystal size distribution during freezing in pharmaceutical solutions. *European Journal of Pharmaceutics and Biopharmaceutics*, 148:148-159, 2020.
256. Muratahan Aykol, Jens S. Hummelshøj, Abraham Anapolsky, Koutarou Aoyagi, Martin Z. Bazant, Thomas Bligaard, Richard D. Braatz, Scott Broderick, Daniel Cogswell, John Dagdelen, Walter Drisdell, Edwin Garcia, Krishna Garikipati, Vikram Gavini, William E. Gent, Livia Giordano, Carla P. Gomes, Rafael Gomez-Bombarelli, Chirranjeevi Balaji Gopal, John M. Gregoire, Jeffrey C. Grossman, Patrick Herring, Linda Hung, Thomas F. Jaramillo, Laurie King, Ha-Kyung Kwon, Ryosuke Maekawa, Andrew M. Minor, Joseph H. Montoya, Tim Mueller, Colin Ophus, Krishna Rajan, Rampi Ramprasad, Brian Rohr, Daniel Schweigert, Yang Shao-Horn, Yoshinori Suga, Santosh K. Suram, Venkatasubramanian Viswanathan, Jay F. Whitaker, Adam P. Willard, Olga Wodo, Chris Wolverton, and Brian D. Storey. The Materials Research Platform: Defining the requirements from user stories. *Matter*, 1(6):1433-1438, 2019.
257. Joel A. Paulson, Edward A. Buehler, Richard D. Braatz, and Ali Mesbah. Stochastic model predictive control with joint chance constraints. Special issue on Model Predictive Control, *International Journal of Control*, 93(1):126-139, 2020.
258. Hongbo Zhao, Brian D. Storey, Richard D. Braatz, and Martin Z. Bazant. Learning the physics of pattern formation from images. *Phys. Rev. Lett.*, 124(6):060201, 2020.
259. Shin-Hyuk Kim, Jay H. Lee, and Richard D. Braatz. Multi-phase particle-in-cell coupled with population balance equation (MP-PIC-PBE) method for multiscale computational fluid dynamics simulation. *Comput. Chem. Eng.*, 134:106686, 2020.
260. Y. Wan, V. Puig, C. Ocampo-Martinez, Y. Wang, E. Harinath, and R. D. Braatz. Fault detection for uncertain LPV systems using probabilistic set-membership parity relation. *Journal of Process Control*, 87:27-36, 2020.

261. Peter M. Attia, Aditya Grover, Norman Jin, Kristen A. Severson, Todor M. Markov, Yang-Hung Liao, Michael H. Chen, Bryan Cheong, Nicholas Perkins, Zi Yang, Patrick K. Herring, Muratahan Aykol, Stephen J. Harris, Richard D. Braatz, Stefano Ermon, William C. Chueh. Closed-loop optimization of fast-charging protocols for batteries with machine learning. *Nature*, 578:397-402, 2020. https://rdcu.be/b1U6H
262. Suryanarayana Kolluri, Sai Varun Aduru, Manan Pathak, Richard D. Braatz, and Venkat R. Subramanian. Real-time nonlinear model predictive control (NMPC) strategies using physics-based models for advanced lithium-ion battery management systems (BMS). *J. Electrochem. Soc.*, 167(6):063505, 2020.
263. A. Pozzi, M. Torchio, R. D. Braatz, and D. M. Raimondo. Optimal charging of an electric vehicle battery pack: A real-time sensitivity-based model predictive control approach. *Journal of Power Sources*, 461:228133, 2020.
264. Patrick Herring, Chirranjeevi Balaji Gopal, Muratahan Aykol, Joseph H. Montoya, Abraham Anapolsky, Peter M. Attia, William Gent, Jens S. Hummelshøj, Linda Hung, Ha-Kyung Kwon, Patrick Moore, Daniel Schweigert, Kristen A. Severson, Santosh Suram, Zi Yang, Richard D. Braatz, and Brian D. Storey. BEEP: A python library for battery evaluation and early prediction. *SoftwareX*, 11:100506, 2020.
265. Weike Sun, Antonio R. Paiva, Peng Xu, Anantha Sundaram, and Richard D. Braatz. Fault detection and identification using Bayesian recurrent neural networks. *Comput. Chem. Eng.*, 141:106991, 2020.
266. Ali Mesbah, Joel A. Paulson, and Richard D. Braatz. An internal model control design method for failure-tolerant control with multiple objectives. *Comput. Chem. Eng.*, 140:106955, 2020.
267. Elçin Içten, Andrew Maloney, Matthew G. Beaver, Dongying Erin Shen, Xiaoxiang Zhu, Lauren R. Graham, Jo Anna Robinson, Seth Huggins, Ayman Allian, Roger Hart, Shawn D. Walker, Pablo Rolandi, and Richard D. Braatz. A virtual plant for integrated continuous manufacturing of a carfilzomib drug substance intermediate. Part 1: CDI-promoted amide-bond formation. Special Issue on Flow Chemistry, *Org. Process Res. Dev.*, online on July 14, 2020, in press. DOI: 10.1021/acs.oprd.0c00187
268. Elçin Içten, Andrew Maloney, Matthew G. Beaver, Xiaoxiang Zhu, Dongying Erin Shen, Jo Anna Robinson, Andrew T. Parsons, Ayman Allian, Seth Huggins, Roger Hart, Pablo Rolandi, Shawn D. Walker, and Richard D. Braatz. A virtual plant for integrated continuous manufacturing of a carfilzomib drug substance intermediate. Part 2. Enone synthesis via a Barbier-type Grignard process. Special Issue on Flow Chemistry, *Org. Process Res. Dev.*, online on July 14, 2020, in press. DOI: 10.1021/acs.oprd.0c00188
269. Andrew J. Maloney, Elçin Içten, Gerard Capellades, Matthew G. Beaver, Xiaoxiang Zhu, Lauren Graham, Derek B Brown, Daniel J. Griffin, Rahul Sangodkar, Ayman Allian, Seth Huggins, Roger Hart, Pablo Rolandi, Shawn D. Walker, and Richard D. Braatz. A virtual plant for integrated continuous manufacturing of a carfilzomib drug substance intermediate. Part 3: Manganese-catalyzed asymmetric epoxidation, crystallization, and filtration. Special Issue on Flow Chemistry, *Org. Process Res. Dev.*, online on July 14, 2020, in press. DOI: 10.1021/acs.oprd.0c00189
270. Weike Sun and Richard D. Braatz. Opportunities in tensorial data analytics for chemical and biological manufacturing processes. Process Analytics and Machine Learning Special Issue, Comput. Chem. Eng., 143:107099, 2020. https://doi.org/10.1016/j.compchemeng.2020.107099

271. Krishna Shah, Akshay Subramaniam, Lubhani Mishra, Taejin Jang, Martin Z. Bazant, Richard D. Braatz, and Venkat R. Subramanian, Perspective: Challenges to moving to multiscale battery models – Where Electrochemistry meets and demands more from Math. *J. Electrochem. Soc.*, 167(13):133501, 2020 (invited). **Editor's Choice**.
272. Moo Sun Hong, Weike Sun, Amos E. Lu, and Richard D. Braatz. Process analytical technology and digital biomanufacturing of monoclonal antibodies. *Am. Pharm. Rev.*, 23(6):122-125, September/October 2020 (invited).
273. Weike Sun and Richard D. Braatz. Smart process analytics for predictive modeling. *Comput. Chem. Eng.*, 144:107134, 2021.
274. Sirish L. Shah, Bhavik R. Bakshi, Jinfeng Liu, Christos Georgakis, Benoit Chachuat, Richard D. Braatz, and Brent R. Young. Meeting the challenge of water sustainability: The role of process systems engineering. *AIChE J.*, 67(2):e17113, 2021.
275. Moo Sun Hong and Richard D. Braatz. Mechanistic modeling and parameter-adaptive nonlinear model predictive control of a microbioreactor. *Comput. Chem. Eng.*, 147:107255, 2021. https://doi.org/10.1016/j.compchemeng.2021.107255
276. Moo Sun Hong, Kawaljit Kaur, Nishant Sawant, Sangeeta B. Joshi, David B. Volkin, and Richard D. Braatz. Crystallization of a non-replicating rotavirus vaccine candidate. *Biotechnology and Bioengineering*, 118(4):1750-1756, 2021.
277. Amos E. Lu, Andrew J. Maloney, Neil C. Dalvie, Joseph R. Brady, Kerry R. Love, J. Christopher Love, and Richard D. Braatz. Modeling of copy number stability in Pichia pastoris. *Biotechnology & Bioengineering*, 118(5);1832-1839, 2021.
278. Andreas L. Gimpel, Georgios Katsikis, Sha Sha, Andrew John Maloney, Moo Sun Hong, Tam Nguyen, Jacqueline Wolfrum, Stacy L. Springs, Anthony J. Sinskey, Scott R. Manalis, Paul W. Barone, and Richard D. Braatz. Analytical methods for process and product characterization of recombinant adeno-associated virus-based gene therapies. *Molecular Therapy: Methods & Clinical Development*, 20:740-754, 2021.
279. Muratahan Aykol, Chirranjeevi Balaji Gopal, Abraham Anapolsky, Patrick K. Herring, BRuis van Vlijmen, Marc D. Berliner, Martin Z. Bazant, Richard D. Braatz, William C. Chueh, and Brian D. Storey. Perspective: Blending physics and machine learning for predicting battery lifetime. *J. Electrochem. Soc.*, 168(3):030525, 2021.
280. Hongbo Zhao, Richard D. Braatz, and Martin Z. Bazant. Image inversion with uncertainty quantification for pattern-forming systems. *J. Comput. Phys.*, 436:110279, 2021.
281. Moo Sun Hong, M. Lourdes Velez-Suberbie, Andrew J. Maloney, Andrew Biedermann, Kerry R. Love, J. Christopher Love, Tarit K. Mukhopadhyay, and Richard D. Braatz. Macroscopic modeling of bioreactors for recombinant protein producing Pichia pastoris in defined medium. *Biotechnology & Bioengineering*, 118:1199-1212, 2021.
282. Nicholas J. Mozdzierz, Yongkyu Lee, Moo Sun Hong, Moritz H. P. Benisch, Michael L. Rasche, Uku Erik Tropp, Mo Jiang, Richard D. Braatz. Mathematical modeling and experimental validation of continuous slug-flow tubular crystallization with ultrasonication-induced nucleation and spatially varying temperature. Special Issue on Continuous Crystallization. *Chemical Engineering Research and Design*, 169:275-287, 2021.
283. Christoph Herwig, Frank B. Nygaard, Michelangelo Canzoneri, Stacy L. Springs, Jacqueline M. Wolfrum, Richard D. Braatz, Stefan Robert Kappeler, and Valentin Steinwandter. Data science for Pharma 4.0^{TM}, drug development, and production – Part 1. *Pharmaceutical Engineering*, 41(2): 40-47, March-April 2021 (invited).

https://ispe.org/pharmaceutical-engineering/march-april-2021/data-science-pharma-40tm-drug-development-production

284. Stefan R. Kappeler, Frank Nygaard, Michelangelo Canzoneri, Stacy L. Springs, Jacqueline M. Wolfrum, Richard D. Braatz, Valentin Steinwandter, and Christoph Herwig. Data science for Pharma 4.0^{TM}, drug development, and production – Part 2. *Pharmaceutical Engineering*, 41(3): 43-49, May-June 2021 (invited). https://ispe.org/pharmaceutical-engineering/may-june-2021/data-science-pharma-40tm-drug-development-production-part
285. Sha Sha, Andrew J. Maloney, Georgios Katsikis, Tam Nguyen, Caleb Neufeld, Jacqueline Wolfrum, Paul W. Barone, Stacy Springs, Scott R. Manalis, Anthony J. Sinskey, and Richard D. Braatz. Cellular pathways of recombinant adeno-associated virus production for gene therapy. *Biotechnology Advances*, 49:107764, 2021.
286. Kevin M. Tenny, Richard D. Braatz, Yet-Ming Chiang, and Fikile R. Brushett. Leveraging neural networks and genetic algorithms for determining electrode properties in redox flow batteries. *J. Electrochem. Soc.*, 68(5):050547.
287. Jungjin Park, Hongbo Zhao, Stephen Dongmin Kang, Kipil Lim, Chia-Chin Chen, Young-Sang Yu, Richard D. Braatz, David A. Shapiro, Jihyun Hong, Michael F. Toney, Martin Z. Bazant, and William C. Chueh. Fictitious phase separation in lithium layered oxides driven by electro-autocatalysis. *Nature Materials*, March 8, 2021. https://doi.org/10.1038/s41563-021-00936-1
288. Tam N. T. Nguyen, Sha Sha, Moo Sun Hong, Andrew J. Maloney, Paul W. Barone, Caleb Neufeld, Jacqueline Wolfrum, Stacy L. Springs, Anthony J. Sinskey, and Richard D. Braatz. Mechanistic model for production of recombinant adeno-associated virus via triple transfection of HEK293 cells. *Molecular Therapy – Methods & Clinical Development*, 21:642-655, 2021. **Cover article.** https://doi.org/10.1016/j.omtm.2021.04.006
289. B. Bedürftig, M. Oldenburger, T. Hüfner, E. Richter, R. D. Braatz, A. Gruhle, and R. Findeisen. Measuring the reversible heat of lithium-ion cells via current pulses for modeling of temperature dynamics. *Journal of Power Sources*, 506:230110, 2021.
290. Dongying E. Shen, Yiming Wan, Sergio Lucia, Rolf Findeisen, and Richard D. Braatz. Polynomial chaos-based H_2-optimal output-feedback control of systems with probabilistic parametric uncertainties. *Automatica*, 131:109743, 2021.
291. Moo Sun Hong, Amos E. Lu, Rui Wen Ou, Jacqueline Wolfrum, Stacy C. Springs, Anthony J Sinskey, and Richard D. Braatz. Model-based control for column-based continuous viral inactivation of biopharmaceuticals. *Bioengineering & Biotechnology*, 118(8):3215-3224, 2021. https://doi.org/10.1002/bit.27846
292. Jinwoo Park, Jae Hyun Cho, and Richard D. Braatz. Mathematical modeling and analysis of microwave-assisted freeze-drying in biopharmaceutical applications. *Comput. Chem. Eng.*, 153:107412, 2021. https://doi.org/10.1016/j.compchemeng.2021.107412
293. Shinhyuk Kim, Richard D. Braatz, and Jay H. Lee. Multi-scale fluid dynamics simulation based on MP-PIC-PBE method for PMMA suspension polymerization. *Comput. Chem. Eng.*, 152: 107391, 2021.

E. Patents/Patent Application Publications

1. R. D. Braatz and J. G. VanAntwerp. Fast Model Predictive Ellipsoid Control Process, U.S. Patent #6,064,809, May 16, 2000.

2. E. G. Seebauer, R. D. Braatz, M. Y. L. Jung, and R. Gunawan. Methods for Controlling Dopant Concentration and Activation in Semiconductor Structures, U.S. Patent #7,846,822, December 7, 2010. **130+ citations**
3. A. S. Myerson, R. D. Braatz, S. T. Ferguson, M. Su, B. L. Trout, L. Zhou, and N. Y. Panah. Devices and Methods for Crystallizing a Compound. U.S. Patent Application Publication No. US 2016/0289173 A1. October 6, 2016.
4. Vibha Puri, Parind M. Desai, Keith D. Jensen, David Brancazio, Eranda Harinath, Alexander Racine Martinez, Jung-Hoon Chun, Richard Dean Braatz, Allan S. Myerson, and Bernhardt Levy Trout. Pharmaceutical Tablet Coating Process by Injection Molding Process Technology. U.S. Patent Application Publication No. 2017/0354609 A1. December 14, 2017.
5. J. Christopher Love, Kerry R. Love, Laura Crowell, Alan Stockdale, Richard Dean Braatz, Amos E. Lu, Steven Cramer, Steven Timmick, Nicholas Vecchiarello, Chaz Goodwine, and Craig A. Mascarenhas. Systems and Methods for Manufacturing Biologically-Produced Products. International Publication No. WO2018183971A1, April 10, 2018; WO2018183972A2, October 4, 2018; WO2018183972A3, January 3, 2019. Australian Patent Publication No. AU2018243777A1, October 17, 2019. Canadian Patent Publication No. CA3058647A1, October 4, 2018. Singapore Patent Publication No. SG11201908879RA. U.S. Patent Publication No. US 2020/0224144 A1, July 16, 2020.
6. J. C. Love, K. R. Love, S. Cramer, S. Timmick, N. Vecchiarello, C. Goodwine, L. Crowell, A. Stockdale, R. D. Braatz, and A. E. Lu. Systems and Methods for Using Behavior Data of Impurities and Target Proteins to Design Downstream Processes. International Publication No. WO 2018183972 A2, October 4, 2018. U.S. Patent Publication No. 2020/0251186 A1, August 6, 2020.
7. Kristen Ann Severson, Richard Dean Braatz, William C. Chueh, Peter M. Attia, Normal Jin, Stephen J. Harris, and Nicolas Perkins. Data-Driven Model for Lithium-Ion Battery Capacity Fade and Lifetime Prediction. U.S. Patent Application Publication No. US20190113577A1, April 18, 2019.
8. J. Christopher Love, Craig A. Mascarenhas, Amos E. Lu, and Richard D. Braatz. Filtration Systems and Methods for Manufacturing Biologically-produced Products. U.S. Publication No. US20190070564 A1, March 7, 2019. International Publication No. WO 2019147310 A2, August 1, 2019, Canadian Patent Application Publication No. CA3073738 (A1), August 1, 2019; WO2019147310 A3, November 7, 2019; Australian Patent Publication No. AU2018404665 (A1), February 27, 2020, Singapore Patent Publication No. 11202000986S, March 30, 2020; Chinese Patent Publication No. CN111050887 (A), April 21, 2020; Korea Patent Publication No. KR20200042532 (A), April 23, 2020. European Patent Application Publication No. EP 3675988 A2, August 7, 2020.

F. Proceedings Papers

1. R. D. Braatz and M. Morari. mu-sensitivities as an aid for robust identification. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 231-236, 1991.
2. R. D. Braatz and M. Morari. Robust control for a noncolocated spring-mass system. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 2061-2062, 1992.

3. R. D. Braatz, M. L. Tyler, M. Morari, F. R. Pranckh, and L. Sartor. Identification and cross-directional control of coating processes: Theory and experiments. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1556-1560, 1992.
4. R. D. Braatz, P. M. Young, J. C. Doyle, and M. Morari. Computational complexity of mu calculation. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1682-1683, 1993.
5. M. Hovd, R. D. Braatz, and S. Skogestad. On the structure of the robust optimal controller for a class of problems. *Proceedings of the IFAC World Congress*, Elsevier Science, Tarrytown, NY, vol. IV, 27-30, 1993.
6. R. D. Braatz. A reconciliation between quantitative feedback theory and robust multivariable control. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 3374-3378, 1994.
7. R. D. Braatz, J. H. Lee, and M. Morari. Screening plant designs and control structures for uncertain systems. *IFAC Workshop on the Integration of Process Design and Control*, Baltimore, Maryland, 242-247, 1994.
8. R. D. Braatz, M. Morari, and S. Skogestad. Robust reliable decentralized control. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 3384-3388, 1994.
9. R. D. Braatz, B. A. Ogunnaike, J. S. Schwaber, and W. C. Rose. Autoregulation in industrial processes. *Proceedings of the IFAC Symposium on Modeling and Control in Biomedical Systems*, Galveston, TX, 127-128, 1994.
10. R. D. Braatz, B. A. Ogunnaike, J. S. Schwaber, and W. C. Rose. Autoregulatory feedback in industrial process designs. *Foundations of Computer Aided Process Design*, edited by L. T. Biegler and M. F. Doherty, AIChE Symposium Series, vol. 91, no. 304, AIChE Press, New York, 317-320, 1995.
11. M. Hovd, R. D. Braatz, and S. Skogestad. SVD controllers for H_2, H-infinity, and mu-optimal control. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1233-1237, 1994.
12. A. P. Featherstone and R. D. Braatz. Control relevant identification of sheet and film processes. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 2692-2696, 1995.
13. R. D. Braatz and J. G. VanAntwerp. Advanced cross-directional control. *Control Systems '96 Preprints*, Halifax, Nova Scotia, Canada, 15-18, 1996.
14. R. D. Braatz, B. A. Ogunnaike, and A. P. Featherstone. Identification, estimation, and control of sheet and film processes. *Proceedings of the IFAC World Congress*, Elsevier Science Inc., Tarrytown, NY, 319-324, 1996.
15. R. D. Braatz and J. G. VanAntwerp. Robust cross-directional control of large scale paper machines. *Proceedings of the IEEE International Conference on Control Applications*, IEEE Press, Piscataway, NJ, 155-160, 1996.
16. A. P. Featherstone and R. D. Braatz. An integrated identification and control procedure for sheet and film processes. *Proceedings of the 34th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, 970-979, 1996.
17. R. D. Braatz. The current status of sheet and film process control. *Fifth International Conference on Chemical Process Control*, edited by J. C. Kantor, C. E. Garcia, and B. Carnahan, AIChE Symposium Series, vol. 93, no. 316, AIChE Press, New York, 327-330, 1997.

18. R. D. Braatz. Session summary: Poster session. *Fifth International Conference on Chemical Process Control*, edited by J. C. Kantor, C. E. Garcia, and B. Carnahan, AIChE Symposium Series, vol. 93, no. 316, AIChE Press, New York, 352, 1997.
19. J. G. VanAntwerp, R. D. Braatz, and N. V. Sahinidis. Globally optimal robust reliable control of large scale paper machines. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1473-1477, 1997.
20. J. G. VanAntwerp, R. D. Braatz, and N. V. Sahinidis. Robust nonlinear control of plasma etching. *Proceedings of the Electrochemical Society*, Montreal, Canada, vol. 10, 454-462, 1997.
21. J. G. VanAntwerp, R. D. Braatz, and N. V. Sahinidis. Globally optimal robust control for systems with nonlinear time-varying perturbations. *Comput. Chem. Eng.*, vol. 21, S125-S130, 1997.
22. A. P. Featherstone and R. D. Braatz. Integrated robust identification and control of large scale processes. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1225-1229, 1998.
23. E. Rios-Patron and R. D. Braatz. Global stability analysis for discrete-time nonlinear systems. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 338-342, 1998.
24. E. L. Russell and R. D. Braatz. Fault isolation in industrial processes using Fisher discriminant analysis. *Foundations of Computer-Aided Process Operations*, edited by J. F. Pekny and G. E. Blau, AIChE Symposium Series, vol. 94, no. 320, AIChE Press, New York, 380-385, 1998.
25. J. G. VanAntwerp and R. D. Braatz. Model predictive control of large scale processes. *Dynamics and Control of Process Systems*, Elsevier Science, Kidlington, United Kingdom, 153-158, 1999.
26. E. Rios-Patron and R. D. Braatz. Robust nonlinear control of a pH neutralization process. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 119-124, 1999.
27. T. Togkalidou and R. D. Braatz. Inferential modeling in pharmaceutical crystallization. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 2548-2552, 1999.
28. D. L. Ma, S. H. Chung, and R. D. Braatz. Worst-case performance analysis of optimal batch control trajectories. *Proceedings of the European Control Conference*, IFAC, Germany, paper F1011-2, 1999.
29. J. G. VanAntwerp and R. D. Braatz. Linear and bilinear matrix inequalities in chemical process control. *Proceedings of the European Control Conference*, IFAC, Germany, paper F1011-4, 1999.
30. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. New physics for modeling transient enhanced diffusion in RTP. *Rapid Thermal and Other Short-Time Processing Technologies II*, The Electrochemical Society, vol. 2000-9, 15-20, 2000.
31. D. L. Ma and R. D. Braatz. Robust batch control of multidimensional crystal growth. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1737-1741, 2000.
32. J. G. VanAntwerp, D. L. Ma, and R. D. Braatz. When is constrained control necessary for large scale processes? *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 4244-4248, 2000.

33. T. Togkalidou and R. D. Braatz. A bilinear matrix inequality approach to the robust nonlinear control of chemical processes. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 2548-2552, 2000.
34. T. Togkalidou, M. Fujiwara, S. Patel, and R. D. Braatz. A robust chemometrics approach to inferential modeling of particulate processes. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1732-1736, 2000.
35. M. Hovd and R. D. Braatz. On the computation of disturbance rejection measures. *Proceedings of the International Symposium on Advanced Control of Chemical Processes*, Elsevier Science, Kidlington, United Kingdom, vol. 1, 63-68, 2000.
36. R. D. Braatz, M. Fujiwara, T. Togkalidou, D. L. Ma, S. D. Patel, E. M. Tsui, C. G. Lentz. Teaching the design of particulate processes. *Proceedings of the Educational Topical Conference*, *AIChE Annual Meeting*, Los Angeles, CA, paper 60b, 2000.
37. S. Ang, M. R. Johnson, and R. D. Braatz. Control of a multivariable pH neutralization process. *Proceedings of the Educational Topical Conference*, *AIChE Annual Meeting*, Los Angeles, CA, paper 61a, 2000.
38. R. D. Braatz, M. Fujiwara, T. Togkalidou, D. L. Ma, S. D. Patel, E. M. Tsui, and C. G. Lentz. Laboratory development for teaching process design. *Proceedings of the ASEE IL/IN Sectional Conference*, West Lafayette, IN, paper S4-2, 2001.
39. M. Hovd and R. D. Braatz. On the use of soft constraints in MPC controllers for plants with inverse response. *Proceedings of the 6th IFAC Symposium on Dynamics and Control of Process Systems*, Jejudo Island, Korea, paper C104, 2001.
40. M. Hovd and R. D. Braatz. Handling state and output constraints in MPC controllers using time-dependent weights. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 2418-2423, 2001.
41. R. Gunawan, E. L. Russell, and R. D. Braatz. Robustness analysis of multivariable systems with time delays. *Proceedings of the European Control Conference*, Porto, Portugal, 1882-1887, 2001.
42. R. D. Braatz and S. Hasebe. Particle size and shape control in crystallization processes. *Sixth International Conference on Chemical Process Control*, edited by In J. B. Rawlings, B. A. Ogunnaike, and J. W. Eaton, AIChE Symposium Series, vol. 98, no. 326, AIChE Press, New York, pages 307-327, 2002.
43. M. Fujiwara, D. L. Ma, T. Togkalidou, D. K. Tafti, and R. D. Braatz. Identification of pharmaceutical crystallization processes. *Proceedings of the 15th IFAC World Congress*, Elsevier Science, Oxford, United Kingdom, paper T-Fr-A11 1, 2002.
44. K. Lee, J. H. Lee, M. Fujiwara, D. L. Ma, and R. D. Braatz. Run-to-run control of multidimensional crystal size distribution in a batch crystallizer. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 1013-1018, 2002.
45. R. Gunawan, M. Y. L. Jung, R. D. Braatz, and E. G. Seebauer. Systems analysis applied to modeling dopant activation and TED in rapid thermal annealing. *Proceedings of the 10th IEEE International Conference on Advanced Thermal Processing of Semiconductors*, IEEE Press, Vancouver, Canada, 107-110, 2002.
46. T. Togkalidou, H. Tung, Y. Sun, A. T. Andrews, and R. D. Braatz. Model-based experimental design for cooling crystallization of a pharmaceutical compound. *Proceedings of the 15th International Symposium on Industrial Crystallization*, *Chemical Engineering Transactions*, edited by A. Chianese, Sorrento, Italy, vol. 1, 1497-1502, 2002.

47. R. D. Braatz, R. C. Alkire, E. G. Seebauer, T. O. Drews, R. Gunawan, and M. Y. L. Jung. Systems engineering of materials manufacturing processes at the nanoscale. *Proceedings of the 3rd Chemical Engineering Conference for Collaborative Research in Eastern Mediterranean*, Thessaloniki, Greece, paper W-4.3, 2003.
48. R. Gunawan, M. Y. L. Jung, R. D. Braatz, and E. G. Seebauer. Systems analysis applied to modeling dopant activation and TED in rapid thermal annealing. *Proceedings of the 7th International Workshop on the Fabrication, Characterization, and Modeling of Ultra Shallow Doping Profiles in Semiconductors*, Santa Cruz, CA, 293-298, 2003.
49. Z. K. Nagy, J. W. Chew, M. Fujiwara, and R. D. Braatz. Automated direct design of pharmaceutical crystallization. *Proceedings of the Topical Conference on Discovery, Development, and Delivery of Medicines*, *AIChE Annual Meeting*, San Francisco, CA, paper 1c, 2003.
50. T. O. Drews, A. Radisic, J. Erlebacher, R. D. Braatz, P. C. Searson, and R. C. Alkire, Atomic-scale Kinetic Monte Carlo simulations of copper nucleation: Investigation of attachment limited rate laws. *Proceedings of the Topical Conference on Electrodeposition Processes*, *AIChE Annual Meeting*, San Francisco, CA, paper 189a, 2003.
51. T. O. Drews, F. Xue, X. Li, H. Deligianni, P. Vereecken, E. Cooper, P. Andricacos, R. D. Braatz, and R. C. Alkire. Parameter estimation of a copper electrodeposition additive mechanism using data obtained from a D-optimal experimental design. *Proceedings of the Topical Conference on Electrodeposition Processes*, *AIChE Annual Meeting*, San Francisco, CA, paper 189b, 2003.
52. X. Y. Woo, R. Tan, and R. D. Braatz. Deforming mesh finite volume modeling of semi-batch mixing effects in antisolvent crystallization. *Proceedings of the Topical Conference on Discovery, Development, and Delivery of Medicines*, *AIChE Annual Meeting*, San Francisco, CA, paper 366d, 2003.
53. X. Y. Woo, P. S. Chow, R. B. H. Tan, and R. D. Braatz. CFD modeling of semibatch mixing effects in antisolvent crystallization. *Proceedings of the Second Asian Particle Technology Symposium*, Penang, Malaysia, paper SING-2, 2003.
54. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Optimal control of transient enhanced diffusion. *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, Hong Kong, 603-608, 2004.
55. E. Rusli, T. O. Drews, D. L. Ma, R. C. Alkire, and R. D. Braatz. Nonlinear feedback control of a coupled kinetic Monte Carlo-finite difference simulation. *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, Hong Kong, 597-602, 2004.
56. Z. K. Nagy, J. W. Chew, M. Fujiwara, and R. D. Braatz. Advances in the modeling and control of batch crystallizers. *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, *Hong Kong*, 83-90, 2004.
57. J. Buell, D. Harnisch, B. C. Bruce, S. Comstock, and R. D. Braatz. New tools supporting new partnerships: Technology development with the NSF GK-12. *Proceedings of the Society for Information Technology & Teacher Education International Conference*, edited by C. Crawford et al., Association for the Advancement of Computing in Education, Chesapeake, VA, 4614-4618, 2004.
58. D. Harnisch, S. Comstock, B. Bruce, J. Buell, and R. Braatz. Development of professional learning communities: Factors within the NSF GK-12 program. *Proceedings*

of the Society for Information Technology & Teacher Education International Conference, edited by C. Crawford et al., Association for the Advancement of Computing in Education, Chesapeake, VA, 2887-2891, 2004.

59. R. D. Braatz, M. Fujiwara, E. J. Hukkanen, J. C. Pirkle, Jr., T. Togkalidou, and R. Gunawan. A holistic approach to chemical process design and development. *Proceedings of the ASEE Annual Conference and Exposition*, Salt Lake City, UT, paper 1413.1, 2004.
60. E. Rusli, T. O. Drews, and R. D. Braatz. Control systems analysis of a multiscale simulation code for copper electrodeposition. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 4243-4248, 2004.
61. R. D. Braatz, R. C. Alkire, E. Seebauer, E. Rusli, R. Gunawan, T. O. Drews, X. Li, and Y. He. Perspectives on the dynamics and control of multiscale systems. *Proceedings of the International Symposium on Dynamics and Control of Process Systems*, Cambridge, MA, paper 96, 2004.
62. T. O. Drews, E. Rusli, Y. He, X. Li, R. C. Alkire, and R. D. Braatz. Simulation of copper nanostructure formation by coupling kinetic Monte Carlo simulation, continuum models, and the level set method. *Proceedings of the Topical Conference on Coupling Theory, Molecular Simulations and Computational Chemistry to the Physical World*, *AIChE Annual Meeting*, Austin, TX, paper 439a, 2004.
63. Y. He, J. R. Gray, R. C. Alkire, and R. D. Braatz. Predictor-corrector methods for dynamically coupling multiscale simulation codes. *Proceedings of the Topical Conference on Coupling Theory, Molecular Simulations and Computational Chemistry to the Physical World*, *AIChE Annual Meeting*, Austin, TX, paper 439b, 2004.
64. E. Rusli and R. D. Braatz. Design of an optimal overlap algorithm for dynamically coupling continuum and noncontinuum codes in multiscale simulation. *Proceedings of the Topical Conference on Coupling Theory, Molecular Simulations and Computational Chemistry to the Physical World*, *AIChE Annual Meeting*, Austin, TX, paper 439g, 2004.
65. E. Rusli, T. O. Drews, D. L. Ma, R. C. Alkire, and R. D. Braatz. Nonlinear feedback-feedforward control of a coupled KMC-finite difference simulation. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 2548-2553, 2005.
66. E. J. Hukkanen and R. D. Braatz. Identification of particle-particle interactions in suspension polymerization reactors. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 925-930, 2005.
67. E. J. Hukkanen and R. D. Braatz. Worst-case and distributional robustness analysis of the full molecular weight distribution during free radical bulk polymerization. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 3115-3120, 2005.
68. E. J. Hukkanen, J. Wieland, D. Leckband, and R. D. Braatz. Maximum likelihood estimation of multiple-bond kinetics from single-molecule pulling experiments. *Proceedings of the American Control Conference*, IEEE Press, Piscataway, NJ, 3265-3270, 2005.
69. M. Karulkar, Y. He, R. C. Alkire, and R. D. Braatz. Guidelines for the design of multiscale simulation codes. *Proceedings of the Topical Conference on Multiscale Analysis in Chemical, Materials and Biological Processes*, *AIChE Annual Meeting*, Cincinnati, OH, paper 503a, 2005.
70. C. T. M. Kwok, K. Dev, E. G. Seebauer, and R. D. Braatz. Maximum a posteriori estimation of energetics in silicon self-diffusion. *Proceedings of the Joint IEEE*

Conference on Decision and Control and European Control Conference, IEEE Press, Piscataway, NJ, 2058-2063, 2005.

71. R. D. Braatz, R. C. Alkire, and E. G. Seebauer. A multiscale systems approach to microelectronic processes. In *Proceedings of the International Conference on Chemical Process Control*, Lake Louise, Alberta, Canada, paper 55, 2006.
72. Z. K. Nagy and R. D. Braatz. Distributional uncertainty analysis of a batch crystallization process using power series and polynomial chaos expansions. In *Proceedings of the 8th IFAC Symposium on Advanced Control of Chemical Processes,* Gramado, Brazil, 655-660, 2006.
73. E. Rusli, J. H. Lee, and R. D. Braatz. Optimal distributional control of crystal size and shape. *Proceedings of the Fifth World Congress on Particle Technology*, Orlando, FL, paper 240f, 2006.
74. K. Dev, C. T. M. Kwok, R. Vaidyanathan, R. D. Braatz, and E. G. Seebauer. Controlling dopant diffusion and activation through surface chemistry. *Ion Implantation Technology – 16th International Conference on Ion Implantation Technology*, edited by K. J. Kirkby, R. M. Gwilliam, A. Smith, and D. Chivers, American Institute of Physics, New York, Vol. 866, 50-54, 2006.
75. Z. K. Nagy, M. Fujiwara, and R. D. Braatz. Optimal control of combined cooling and anti-solvent pharmaceutical crystallization. *BIWIC 2006 – 13th International Workshop on Industrial Crystallization*, P.J. Jansen, J. H. Ter Horst, and S. Jiang, editors, Delft University Press, Delft, The Netherlands, 16-23, 2006.
76. M. W. Hermanto, R. D. Braatz, and M.-S. Chiu. Run-to-run temperature control for polymorphic transformation in pharmaceutical crystallization with uncertainties. *Proceedings of the Sixth World Congress on Intelligent Control and Automation*, Dalian, China, vol. 2, 6441-6445, 2006.
77. M. W. Hermanto, R. D. Braatz, and M.-S. Chiu. A run-to-run control strategy for polymorphic transformation in pharmaceutical crystallization. *Proceedings of the IEEE International Conference on Control Applications*, Munich, Germany, 2121-2126, 2006.
78. Z. K. Nagy, M. Fujiwara, and R. D. Braatz, Recent advances in the modelling and control of cooling and antisolvent crystallization of pharmaceuticals. *Preprints of the 8th International Symposium on Dynamics and Control of Process Systems*, Cancun, Mexico, vol. 2, 29-38, 2007.
79. M. W. Hermanto, R. D. Braatz, and M.-S. Chiu. Optimal control of polymorphic transformation in batch pharmaceutical crystallization. *Proceedings of the IEEE International Conference on Control Applications*, Singapore, 146-151, 2007.
80. 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.
81. J. Isom, S. P. Meyn, and R. D. Braatz. Piecewise linear dynamic programming for constrained POMDPs. *Proceedings of the 23rd AAAI Conference on Artificial Intelligence*, Chicago, IL, 291-297, 2008.
82. J. G. VanAntwerp and R. D. Braatz. Statistical process control laboratory exercises for all engineering disciplines. *Proceedings of the ASEE Annual Conference*, Pittsburgh, PA, paper 1675, 2008.
83. M. Kishida and R. D. Braatz. Robustness analysis of distributed parameter systems with application to the 2D reaction-diffusion equation. *Proceedings of the 19th International*

Symposium on Mathematical Theory of Networks and Systems, Blacksburg, VA, paper SSRussell1.4, 2008.

84. M. Kishida and R. D. Braatz. Internal model control of infinite dimensional systems. *Proceedings of the IEEE Conference on Decision and Control*, Cancun, Mexico, 1434-1441, 2008.
85. V. R. Subramanian, V. Boovaragavan, V. Ramadesigan, K. Chen, and R. D. Braatz. Model reformulation and design of lithium-ion batteries. *Design for Energy and the Environment: Proceedings of the Seventh International Conference on Foundations of Computer-Aided Process Design*, edited by M. M. El-Halwagi and A. A. Linninger, CRC Press, Boca Raton, FL, 987-1006, 2009.
86. M. Kishida and R. D. Braatz. Optimal spatial field control of distributed parameter systems. *Proceedings of the American Control Conference*, St. Louis, MO, 32-37, 2009.
87. M. Kishida and R. D. Braatz. RBF-based 2D optimal spatial control of the 3D reaction-convection-diffusion equation. *Proceedings of the European Control Conference*, Budapest, Hungary, Paper TuA7.4, 2009.
88. V. Ramadesigan, V. Boovaragavan, M. Arabandi, K. Chen, H. Tuskamoto, R. D. Braatz, and V. Subramanian. Parameter estimation and capacity fade analysis of lithium-ion batteries using first-principles-based efficient reformulated models. *ECS Transactions*, 19(16), 11-19, 2009.
89. J. D. Isom, R. E. LaBarre, and R. D. Braatz. Polynomial-time solution of change detection problems. *Proceedings of the Joint 48th IEEE Conference on Decision and Control and 28th Chinese Control Conference*, Shanghai, P.R. China, 4631-4636, 2009.
90. M. Kishida, D. W. Pack, and R. D. Braatz. State-constrained optimal spatial field control for controlled release in tissue engineering. *Proceedings of the American Control Conference*, Baltimore, Maryland, 4361-4366, 2010.
91. R. N. Methekar, V. Boovaragavan, M. Arabandi, V. Ramadesigan, V. R. Subramanian, F. Latinwo, and R. D. Braatz. Optimal spatial distribution of microstructure in porous electrodes for Li-ion batteries. *Proceedings of the American Control Conference*, Baltimore, Maryland, 6600-6605, 2010.
92. R. N. Methekar, V. Ramadesigan, V. R. Subramanian, and R. D. Braatz. Optimum charging profile for lithium-ion batteries to maximize energy storage and utilization. *ECS Transactions*, 25(35), 139-146, 2010.
93. M. Kishida and R. D. Braatz. Structured spatial control of the reaction-diffusion equation with parametric uncertainties. *Proceedings of the IEEE International Symposium on Computer-Aided Control System Design*, Yokohama, Japan, 1097-1102, 2010.
94. Z. K. Nagy and R. D. Braatz. Distributional uncertainty analysis using polynomial chaos expansions. *Proceedings of the IEEE International Symposium on Computer-Aided Control System Design*, Yokohama, Japan, 1103-1108, 2010.
95. 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*, edited by E. N. Pistokopoulos, M. C. Georgiadis, and A. C. Kokossis, *Computer-Aided Chemical Engineering*, 29:1475-1479, 2011.
96. R. N. Methekar, P. W. C. Northrop, K. Chen, R. D. Braatz, and V. R. Subramanian. Kinetic Monte Carlo simulation of surface heterogeneity in graphite electrodes for lithium-ion batteries: Passive layer formation. *Proceedings of the American Control Conference*, San Francisco, California, 1512-1517, 2011.

97. K. K. K. Kim and R. D. Braatz. Observer-based output feedback control of discrete-time Lur'e systems with sector-bounded slope-restricted nonlinearities. *Proceedings of the American Control Conference*, San Francisco, California, 2566-2571, 2011.
98. K. Chen, M. Kishida, N. Nair, M. S. Strano, and R. D. Braatz. Parameter identifiability in parallel reaction networks with application to single-walled carbon nanotubes. *Proceedings of the American Control Conference*, San Francisco, California, 2873-2878, 2011.
99. K. K. K. Kim and R. D. Braatz. Robust static and fixed-order dynamic output feedback control of discrete-time Lur'e systems. *Proceedings of the IFAC World Congress*, Milan, Italy, 227-232, 2011.
100. M. Kishida and R. D. Braatz. Robust anti-windup compensation for normal systems with application to the reaction-diffusion equation. *Proceedings of the IFAC World Congress*, Milan, Italy, 7316-7321, 2011.
101. M. Kishida, P. Rumschinski, R. Findeisen, and R. D. Braatz. Efficient polynomial-time outer bounds on state trajectories for uncertain polynomial systems using skewed structured singular values. *Proceedings of the Joint Symposium on Computer-Aided Control System Design and Systems with Uncertainty*, Denver, Colorado, 216-221, 2011.
102. K. K. K. Kim, E. Rios Patron, and R. D. Braatz. Universal approximation with error bounds for dynamic artificial neural network models: A tutorial and some new results. *Proceedings of the Joint Symposium on Computer-Aided Control System Design and Systems with Uncertainty*, Denver, Colorado, 834-839, 2011.
103. K. K. K. Kim, E. Rios Patron, and R. D. Braatz. Standard representation and stability analysis of dynamic artificial neural networks: A unified approach. *Proceedings of the Joint Symposium on Computer-Aided Control System Design and Systems with Uncertainty*, Denver, Colorado, 840-845, 2011.
104. M. Kishida and R. D. Braatz. Ellipsoid bounds on state trajectories for discrete-time systems with time-invariant and time-varying linear fractional uncertainties. *Proceedings of the 50th IEEE Conference on Decision and Control and European Control Conference*, Orlando, Florida, 5671-5676, 2011.
105. Z. W. Ulissi, M. S. Strano, and R. D. Braatz. Control of nano and microchemical systems. *Foundations of Computer-Aided Process Operations - Chemical Process Control VIII*, CACHE Corporation, Austin, TX, January 8-13, 2012, 11 pages.
106. Z. W. Ulissi, M. C. Molaro, M. S. Strano, and R. D. Braatz. Systems nanotechnology: Identification, estimation, and control of nanoscale systems. *Proceedings of the American Control Conference*, Montreal, Quebec, 1-8, June 2012.
107. K. K. K. Kim and R. D. Braatz. Probabilistic analysis and control of uncertain dynamic systems: Generalized polynomial chaos expansion approaches. *Proceedings of the American Control Conference*, Montreal, Quebec, 44-49, June 2012.
108. K. Chen, L. Goh, G. He, P. J. A. Kenis, C. F. Zukoski III, and R. D. Braatz. Identification of nucleation rates in droplet-based microfluidic systems. *Proceedings of the American Control Conference*, Montreal, Quebec, 863-868, June 2012.
109. M. Kishida and R. D. Braatz. A model-based approach for the construction of design spaces in Quality-by-Design. *Proceedings of the American Control Conference*, Montreal, Quebec, 1513-1518, June 2012.
110. S. De, P. W. C. Northrop, V. Ramadesigan, R. D. Braatz, and V. R. Subramanian. Model-based simultaneous optimization of multiple design parameters for lithium-ion batteries

for maximization of energy density. *Proceedings of the American Control Conference*, Montreal, Quebec, 4275-4280, June 2012.

111. Q. L. Su, R. D. Braatz, and M.-S. Chiu. Concentration control for semi-batch pH-shift reactive crystallization of L-glutamic acid. *Proceedings of the 8th IFAC Symposium on Advanced Control of Chemical Processes*, Singapore, 228-233, July 2012.
112. K.-K. K. Kim, K. S. Cheong, K. Chen, and R. D. Braatz. Parameter estimation, analysis, and design of synthetic gene switching models: System behavior- and performance-based approaches. *Proceedings of the 8th IFAC Symposium on Advanced Control of Chemical Processes*, Singapore, 946-951, July 2012.
113. K. K. Kim and R. D. Braatz. On the robustness of interconnected or networked uncertain linear multi-agent systems. *Proceedings of the 20th International Symposium on Mathematical Theory of Networks and Systems*, Melbourne, Australia, July 9-13, 2012, Paper SE-04.4.
114. K.-K. Kim and R. D. Braatz. Convex stability conditions for interconnected or networked linear multi-agent systems. *Proceedings of the 3rd IFAC Workshop on Distributed Estimation and Control in Networked Systems*, Santa Barbara, California, September 14-15, 2012.
115. K.-K. K. Kim and R. D. Braatz. Generalized polynomial chaos expansion approaches to approximate stochastic receding horizon control with applications to probabilistic collision checking and avoidance. *Proceedings of the IEEE Conference on Control Applications*, Dubrovnik, Croatia, 350-355, October 2012.
116. H. Jang, K.-K. K. Kim, J. H. Lee, and R. D. Braatz. Fast moving horizon estimation for a distributed parameter system. *12th International Conference on Control, Automation and Systems*, Jeju Island, Korea, 533-538, October 2012.
117. K. K. K. Kim and R. D. Braatz. Continuous- and discrete-time D-stability, joint D-stability, and their applications: μ theory and diagonal stability approaches. *Proceedings of the IEEE Conference on Decision and Control*, Hawaii, 2896-2901, December 2012.
118. M. Kishida and R. D. Braatz. Inversion-based output regulation of chemotaxis using a constrained influx of chemical signaling molecules. *Proceedings of the American Control Conference*, Washington, DC, 3449-3454, June 17-19, 2013.
119. J. K. Scott, R. Findeisen, R. D. Braatz, and D. M. Raimondo. Design of active inputs for set-based fault diagnosis. *Proceedings of the American Control Conference*, Washington, DC, 3567-3572, June 17-19, 2013.
120. K.-K. K. Kim and R. D. Braatz. Convex relaxation of sequential optimal input design for a class of structured large-scale systems: Process gain estimation. *Proceedings of the American Control Conference*, Washington, DC, 3912-3917, June 17-19, 2013.
121. B. Suthar, V. Ramadesigan, P. W. C. Northrop, R. D. Braatz, S. Santhanagopalan, and V. R. Subramanian. Optimal control and state estimation of lithium-ion batteries using reformulated models. *Proceedings of the American Control Conference*, Washington, DC, 5370-5375, June 17-19, 2013.
122. K.-K. K. Kim and R. D. Braatz. Robustness analysis of uncertain linear descriptor systems: Unified approaches using gLFTs, LMIs, and μ. *Proceedings of the American Control Conference*, Washington, DC, 5877-5882, June 17-19, 2013.
123. M. Kishida and R. D. Braatz. Quality-by-Design by using the skewed spherical structured singular value. *Proceedings of the American Control Conference*, Washington, DC, 6688-6693, June 17-19, 2013.

124. K.-K. K. Kim and R. D. Braatz. Semidefinite programming relaxation of optimum active input design for fault detection and isolation: Model-based finite horizon prediction. *Proceedings of the European Control Conference*, Zürich, Switzerland, 1934-1939, July 17-19, 2013.
125. K.-K. K. Kim, D. M. Raimondo, and R. D. Braatz. Optimum input design for fault detection and diagnosis: Model-based prediction and statistical distance measures. *Proceedings of the European Control Conference*, Zürich, Switzerland, 1940-1945, July 17-19, 2013.
126. A. Mesbah and R. D. Braatz. Design of multi-objective control systems with optimal failure tolerance. *Proceedings of the European Control Conference*, Zürich, Switzerland, 2963-2968, July 17-19, 2013.
127. D. M. Raimondo, R. D. Braatz, and J. K. Scott. Active fault diagnosis using moving horizon input. *Proceedings of the European Control Conference*, Zürich, Switzerland, 3131-3136, July 17-19, 2013.
128. D. M. Raimondo, G. R. Marseglia, R. D. Braatz, and J. K. Scott. Fault-tolerant model predictive control with active fault isolation. *Proceedings of the 2nd International Conference on Control and Fault-Tolerant Systems*, Nice, France, Paper ThB1.4, October 9-11, 2013.
129. L. Zhang and R. D. Braatz. On switched MPC of a class of switched linear systems with modal dwell time. *Proceedings of the IEEE Conference on Decision and Control*, Florence, Italy, Paper TuA03.4, December 10-13, 2013.
130. A. Mesbah, M. Kishida, and R. D. Braatz. Design of multi-objective failure-tolerant control systems for infinite-dimensional systems. *Proceedings of the IEEE Conference on Decision and Control*, Florence, Italy, Paper WeB13.1, December 10-13, 2013.
131. K.-K. K. Kim and R. D. Braatz. A characterization of solutions for general copositive quadratic Lyapunov inequalities. *Proceedings of the IEEE Conference on Decision and Control*, Florence, Italy, Paper WeC05.2, December 10-13, 2013.
132. J. K. Scott, G. R. Marseglia, L. Magni, R. D. Braatz, and D. M. Raimondo. A hybrid stochastic-deterministic input design method for active fault diagnosis. *Proceedings of the IEEE Conference on Decision and Control*, Florence, Italy, Paper ThC12.4, December 10-13, 2013.
133. K.-K. K. Kim and R. D. Braatz. Computational complexity of robust control: A review of theoretical and algorithmic developments. *Proceedings of the IEEE Conference on Decision and Control*, Florence, Italy, Paper FrA14.4, December 10-13, 2013.
134. S. Streif, K.-K. K. Kim, P. Rumschinski, M. Kishida, D. E. Shen, R. Findeisen, and R. D. Braatz. Robustness analysis, prediction and estimation for uncertain biochemical networks. *Proceedings of the International Conference on Dynamics and Control of Process Systems*, Mumbai, India, Paper WeM1P.1, December 18-20, 2013.
135. R. B. Gopaluni and R. D. Braatz. State of charge estimation in Li-ion batteries using an isothermal pseudo two-dimensional model. *Proceedings of the 10th IFAC International Conference on Dynamics and Control of Process Systems*, Mumbai, India, 135-140, 2013.
136. H. Jang, J. H. Lee, and R. D. Braatz. Maximum-likelihood parameter estimation for detecting local concentration from a carbon nanotube-based sensor. *Proceedings of the International Conference on Dynamics and Control of Process Systems*, Mumbai, India, Paper ThM2T1.2, December 18-20, 2013.

137. S. Streif, D. Hast, R. D. Braatz, and R. Findeisen. Certifying robustness of separating inputs and outputs in active fault diagnosis for uncertain nonlinear systems. *Proceedings of the International Conference on Dynamics and Control of Process Systems*, Mumbai, India, Paper FrA3T3.6, December 18-20, 2013.
138. A. Mesbah, S. Streif, R. Findeisen, and R. D. Braatz. Stochastic nonlinear model predictive control with probabilistic constraints. *Proceedings of the American Control Conference*, Portland, Oregon, 2425-2431, 2014.
139. R. Lakerveld, B. Benyahia, P. L. Heider, H. Zhang, A. Wolfe, C. Testa, S. Ogden, D. R. Hersey, S. Mascia, J. M. B. Evans, R. D. Braatz, and P. I. Barton. The application of an automated plant-wide control strategy for a continuous pharmaceutical pilot plant. *Proceedings of the American Control Conference*, Portland, Oregon, 3524-3529, 2014.
140. K. K. K. Kim, H. Jang, B. Gopaluni, J. H. Lee, and R. D. Braatz. Sparse identification in chemical master equations for monomolecular reaction networks. *Proceedings of the American Control Conference*, Portland, Oregon, 3710-3715, 2014.
141. M. Kishida and R. D. Braatz. Non-existence conditions of local bifurcation for rational systems with structured uncertainties. *Proceedings of the American Control Conference*, Portland, Oregon, 5097-5102, 2014.
142. J. A. Paulson, D. M. Raimondo, R. Findeisen, R. D. Braatz, and S. Streif. Guaranteed active fault diagnosis for uncertain nonlinear systems. *Proceedings of the European Control Conference*, Strasbourg, France, 926-931, 2014.
143. G. R. Marseglia, J. K. Scott, L. Magni, R. D. Braatz, and D. M. Raimondo. Hybrid stochastic-deterministic approach for active fault diagnosis using scenario optimization. *Proceedings of the IFAC World Congress*, Cape Town, South Africa, 1102-1107, 2014.
144. S. Streif, F. Petzke, A. Mesbah, R. Findeisen, and R. D. Braatz. Optimal experimental design for probabilistic model discrimination using polynomial chaos. *Proceedings of the IFAC World Congress*, Cape Town, South Africa, 4103-4109, 2014.
145. A. Mesbah, S. Streif, R. Findeisen, and R. D. Braatz. Active fault diagnosis for nonlinear systems with probabilistic uncertainties. *Proceedings of the IFAC World Congress*, Cape Town, South Africa, 7079-7084, 2014.
146. H. Jang, K.-K. K. Kim, J. H. Lee, and R. D. Braatz. Regularized maximum likelihood estimation of sparse stochastic monomolecular biochemical reaction networks. *Proceedings of the IFAC World Congress*, Cape Town, South Africa, 9551-9556, 2014.
147. M. Kishida and R. D. Braatz. Volume maximization of consistent parametric uncertainty sets for linear fractional models. *Proceedings of the IEEE Conference on Decision and Control*, Los Angeles, California, 1905-1910, 2014.
148. J. A. Paulson, A. Mesbah, S. Streif, R. Findeisen, and R. D. Braatz. Fast stochastic model predictive control of high-dimensional systems. *Proceedings of the IEEE Conference on Decision and Control*, Los Angeles, California, 2802-2809, 2014.
149. E. Harinath, L. C. Foguth, and R. D. Braatz. Robust optimal control for the maximization of design space. *Proceedings of the American Control Conference*, 3886-3891, 2015.
150. L. Zhou, X. Zhu, and R. D. Braatz. Controlled seeding from multiple micromixers for tailoring the product size distribution in a semi-continuous crystallizer design. *Proceedings of the American Control Conference*, 4295-4300, 2015.
151. A. Mesbah, J. A. Paulson, R. Lakerveld, and R. D. Braatz. Plant-wide model predictive control of a continuous pharmaceutical pilot plant. *Proceedings of the American Control Conference*, 4301-4307, 2015.

152. M. Torchio, N. A. Wolff, D. M. Raimondo, L. Magni, U. Krewer, R. B. Gopaluni, J. A. Paulson, and R. D. Braatz. Real-time model predictive control for the optimal charging of a Li-ion battery. *Proceedings of the American Control Conference*, 4536-4541, 2015.
153. B. Suthar, D. Sonawane, R. D. Braatz, and V. R. Subramanian. Optimal low temperature charging of lithium-ion battery. *Proceedings of the International Symposium on Advanced Control of Chemical Processes*, Whistler, British Columbia, Canada, 1217-1222, 2015.
154. L. Foguth, J. Paulson, R. D. Braatz, and D. M. Raimondo. Fast robust model predictive control of high-dimensional systems. *Proceedings of the European Control Conference*, Linz, Austria, 2009-2014, 2015.
155. Kristen Severson, Paphonwit Chaiwatanodom, and Richard D. Braatz. Perspectives on process monitoring of industrial systems. *Proceedings of the 9th IFAC Symposium on Fault Detection, Supervision, and Safety for Technical Processes*, Paris, France, *IFAC-PapersOnLine*, 48(21):931-939, 2015.
156. Joel A. Paulson, Eranda Harinath, Lucas C. Foguth, and R. D. Braatz. Nonlinear model predictive control of systems with probabilistic time-invariant uncertainties. *Proceedings of the 5th IFAC Conference on Nonlinear Model Predictive Control*, Seville, Spain, 16-25, 2015.
157. Amos E. Lu, Joel A. Paulson, Nicholas J. Mozdzierz, Alan Stockdale, Ashlee N. Ford Versypt, Kerry R. Love, J. Christopher Love, and Richard D. Braatz. Control systems technology in the advanced manufacturing of biologic drugs. *Proceedings of the IEEE Conference on Control Applications*, Sydney, Australia, 1505-1515, 2015.
158. H. Jang, J. H. Lee, and R. D. Braatz. State estimation for a carbon nanotube-based sensor array system. *Proceedings of the 15th International Conference on Control, Automation and Systems*, Busan, Korea, October 13-16, 2015. Paper TP01-12.
159. Zhilong Zhu, You Peng, T. Alan Hatton, Kamal Samrane, Allan S. Myerson, and Richard D. Braatz. Crystallization of calcium sulphate during phosphoric acid production: modeling particle shape and size distribution. *Procedia Engineering*, 138:390-401, 2016.
160. Fridolin Röder, Richard D. Braatz, and Ulrike Krewer. Multi-scale modeling of solid electrolyte interface formation in lithium-ion batteries. *European Symposium on Computer Aided Process Engineering*, edited by Zdravko Kravanja and Miloš Bogataj, *Computer Aided Chemical Engineering*, 38:157-162, 2016.
161. Eranda Harinath, Lucas C. Foguth, Joel A. Paulson, and Richard D. Braatz. Nonlinear model predictive control using polynomial optimization methods. *Proceedings of the American Control Conference*, Boston, Massachusetts, 1-6, 2016.
162. Amos E. Lu, Joel A. Paulson, and Richard D. Braatz. pH and conductivity control applied to a buffer make-up system within an integrated bio-manufacturing plant. *Proceedings of the American Control Conference*, Boston, Massachusetts, 1741-1746, 2016.
163. T. Mühlpfordt, J. A. Paulson, R. D. Braatz, and R. Findeisen. Output feedback model predictive control with probabilistic uncertainties for linear systems. *Proceedings of the American Control Conference*, Boston, Massachusetts, 2035-2040, 2016.
164. Eranda Harinath, Lucas C. Foguth, and Richard D. Braatz. A robust dual-mode MPC approach to ensuring critical quality attributes in Quality-by-Design. *Proceedings of the American Control Conference*, Boston, Massachusetts, 2041-2046, 2016.
165. Rolf Findeisen, Martha Grover, Christian Wagner, Michael Maiworm, Murti V. Salapaka, Richard D. Braatz, and S.O. Reza Moheimani. Control on a molecular scale: A

perspective. *Proceedings of the American Control Conference*, Boston, Massachusetts, 3069-3082, 2016.

166. Joel A. Paulson, Venkatasailanathan Ramadesigan, Venkat Subramanian, and Richard D. Braatz. Control systems analysis and design of multiscale simulation models. *Proceedings of the American Control Conference*, Boston, Massachusetts, 3083-3085, 2016.
167. Eranda Harinath, Lucas C. Foguth, and Richard D. Braatz. Maximization of ellipsoidal design space for continuous-time systems: A robust optimal control approach. *Proceedings of the American Control Conference*, Boston, Massachusetts, 3850-3855, 2016.
168. Marcello Torchio, Davide Raimondo, Lalo Magni, Maria Serra, Richard D. Braatz, and Carlos Ocampo-Martinez. Fast model predictive control for hydrogen outflow regulation in ethanol steam reformers. *Proceedings of the American Control Conference*, Boston, Massachusetts, 5044-5049, 2016.
169. Joel A. Paulson, Mark C. Molaro, Darin O. Bellisario, Michael S. Strano, and Richard D. Braatz. Mathematical modeling and analysis of carbon nanotube photovoltaic systems. *Proceedings of the 11th IFAC Symposium on Dynamics and Control of Process Systems*, Trondheim, Norway, 442-447, 2016.
170. Marcello Torchio, Lalo Magni, Richard D. Braatz, and Davide M. Raimondo. Optimal health-aware charging protocol for lithium-ion batteries: A fast model predictive control approach. *Proceedings of the 11th IFAC Symposium on Dynamics and Control of Process Systems*, Trondheim, Norway, 827-832, 2016.
171. Lucas Foguth, Richard D. Braatz, and Davide Martino Raimondo. Active fault diagnosis for hybrid systems. *Proceedings of the 22nd International Symposium on Mathematical Theory of Networks and Systems*, Minneapolis, Minnesota, paper WeA08.2, 2016.
172. Marcello Torchio, Lalo Magni, Richard D. Braatz, and Davide M. Raimondo. Optimal charging of a Li-ion cell: A hybrid model predictive control approach. *Proceedings of the IEEE Conference on Decision and Control*, 4053-4058, 2016.
173. Moo Sun Hong, Kristen Severson, Mo Jiang, Amos E. Lu, J. Christopher Love, and Richard D. Braatz. Challenges and opportunities in biopharmaceutical manufacturing control, Sessions on Grand Challenges. *Proceedings of the Foundations of Computer Aided Process Operations / Chemical Process Control*, Paper 117, 2017.
174. Manan Pathak, Dayaram Sonawane, Shriram Santhanagopalan, Richard D. Braatz, and Venkat R. Subramanian. Analyzing and minimizing capacity fade through optimal model-based control – Theory and experimental validation. *ECS Transactions*, 75(23):51-75, 2017.
175. Hiroshi Takase, Richard D. Braatz, and Shinji Hasebe. Development of an efficient solution algorithm for optimal structure synthesis of ternary distillation processes using a stepwise VLE description. *Proceedings of the 82nd SCEJ Annual Meeting*, Paper ID J223, March 6-8, 2017.
176. Sergio Lucia, Marcello Torchio, Davide Martino Raimondo, Reinhardt Klein, Richard D. Braatz, and Rolf Findeisen. Towards adaptive health-aware charging of Li-ion batteries: A real-time predictive control approach using first-principles models. *Proceedings of the American Control Conference*, Seattle, Washington, 4717-4722, 2017.

177. Sergio Lucia, Joel Paulson, Rolf Findeisen, and Richard D. Braatz. On stability of stochastic linear systems via polynomial chaos expansions. *Proceedings of the American Control Conference*, Seattle, Washington, 5089-5094, 2017.
178. Yiming Wan, Eranda Harinath, and Richard D. Braatz. Probabilistic robust parity relation for fault detection using polynomial chaos. *Proceedings of the IFAC World Conference*, Toulouse, France, 1042-1047, 2017.
179. Dongying E. Shen, Sergio Lucia, Yiming Wan, Rolf Findeisen, and Richard D. Braatz. Polynomial chaos-based H_2-optimal static output feedback control of systems with probabilistic parametric uncertainties. *Proceedings of the IFAC World Conference*, Toulouse, France, 3595-3600, 2017.
180. J. E. Tabora, J. Sweeney, N. Domagalski, M. Mellmer, and R. D. Braatz. Implementation of a Monte Carlo population balance model in the development of pharmaceutical batch crystallization. *Proceedings of the 20th International Symposium on Industrial Crystallization*. Dublin, Ireland, Paper 51, 2017.
181. R. Geyyer, Z. Zhu, S. Palis, R. D. Braatz, and A. Kienle. Multidimensional modeling of continuous crystallization. *Proceedings of the 20th International Symposium on Industrial Crystallization*. Dublin, Ireland, Poster 59, 2017.
182. Hiroshi Takase, Richard D. Braatz, and Shinji Hasebe. Optimal structure synthesis of ternary distillation processes using a stepwise VLE description. *Computer Aided Chemical Engineering*, 40, 739-756, 2017.
183. Yiming Wan, Eranda Harinath, and Richard D. Braatz. A piecewise polynomial chaos approach to stochastic linear quadratic regulation for systems with probabilistic parametric uncertainties. *Proceedings of the IEEE Conference on Decision and Control*, Melbourne, Australia, 505-510, 2017.
184. Joel A. Paulson, Tor Askel N. Heirung, Richard D. Braatz, and Ali Mesbah. Closed-loop active fault diagnosis for stochastic linear systems. *Proceedings of the American Control Conference*, Milwaukee, Wisconsin, 735-741, 2018.
185. Yiming Wan and Richard D. Braatz. Mixed polynomial chaos and worst-case synthesis approach to robust observer based linear quadratic regulation. *Proceedings of the American Control Conference*, Milwaukee, Wisconsin, 6798-6803, 2018.
186. Yiming Wang, Dongying E. Shen, Sergio Lucia, Rolf Findeisen, and Richard D. Braatz. Robust static H-infinity output-feedback control using polynomial chaos. *Proceedings of the American Control Conference*, Milwaukee, Wisconsin, 6804-6809, 2018.
187. Benben Jiang, Weike Sun, and Richard D. Braatz. An information-theoretic framework for fault detection evaluation and design of optimal dimensionality reduction methods. *IFAC-PapersOnLine*, 51(14):1311-1316, 2018.
188. Y. Wan, V. Puig, C. Ocampo-Martinez, Y. Wang, and R. D. Braatz. Probability-guaranteed set-membership state estimation for polynomially uncertain linear time-invariant systems. *Proceedings of the IEEE Conference on Decision and Control*, 2291-2296, 2018.
189. Matthias von Andrian and Richard D. Braatz. Offset-free input-output formulations of stochastic model predictive control based on polynomial chaos theory. *Proceedings of the American Control Conference*, 360-365, 2019.
190. Anastasia Nikolakopoulou, Matthias von Andrian, and Richard D. Braatz. Supervisory control of a compact modular reconfigurable system for continuous-flow pharmaceutical manufacturing. *Proceedings of the American Control Conference*, 2158-2163, 2019.

191. Matthias von Andrian and Richard D. Braatz. Stochastic dynamic optimization and model predictive control based on polynomial chaos theory and symbolic arithmetic. *Proceedings of the American Control Conference*, 3399-3404, 2020.
192. Anastasia Nikolakopoulou, Matthias von Andrian, and Richard D. Braatz. Fast model predictive control of startup of a compact modular reconfigurable system for continuous-flow pharmaceutical manufacturing. *Proceedings of the American Control Conference*, 2778-2783, 2020.
193. Pedro Reyero, Carlos Ocampo-Martinez, Rolf Findeisen, and Richard D. Braatz. Nonlinearity measures for distributed parameter and descriptor systems. *Proceedings of the IFAC World Congress*, Berlin, Germany, Paper-ID 3724, 2020.
194. Matthias von Andrian and Richard D. Braatz. Fast stochastic model predictive control of unstable dynamical systems. *Proceedings of the IFAC World Congress*, Berlin, Germany, Paper-ID 3811, 2020.
195. David Pérez Piñeiro, Anastasia Nikolakopoulou, Johannes Jäschke, and Richard D. Braatz. Self-optimizing control of a continuous-flow pharmaceutical manufacturing plant. *Proceedings of the IFAC World Congress*, Berlin, Germany, Paper-ID 4289, 2020.
196. Anastasia Nikolakopoulou, Moo Sun Hong, and Richard D. Braatz. Feedback control of dynamic artificial neural networks using linear matrix inequalities. *Proceedings of the IEEE Conference on Decision and Control*, 2210-2215, 2020.
197. Pedro Reyero, Carlos Ocampo-Martinez, and Richard D. Braatz. Nonlinear dynamical analysis for an ethanol steam reformer: A singular distributed parameter system. *Proceedings of the IEEE Conference on Decision and Control*, 23-29, 2020.
198. Pedro Reyero-Santiago, Xinwei Yu, Carlos Ocampo-Martinez, and Richard D. Braatz. A reduced-order model for real-time NMPC of ethanol steam reformers. *Proceedings of the IFAC Symposium on Advanced Control of Chemical Processes*, Venice, Italy, in press.
199. Sandra C. Wells, Anastasia Nikolakopoulou, and Richard D. Braatz. State feedback control of discrete-time Lur'e systems with sector-bounded slope-restricted nonlinearities. *Proceedings of the American Control Conference*, 2378-2383, 2021.
200. Anastasia Nikolakopoulou, Moo Sun Hong, and Richard D. Braatz. Output feedback control and observer design of dynamic neural networks using linear matrix inequalities. *Proceedings of the American Control Conference*, 2607-2612, 2021.
201. Hoang Hai Nguyen, Tim Zieger, Sandra C. Wells, Anastasia Nikolakopoulou, Richard D. Braatz, and Rolf Findeisen. Stability certificates for neural network learning-based controllers using robust control theory. *Proceedings of the American Control Conference*, 3555-3560, 2021.
202. Hoang Hai Nguyen, Tim Zieger, Richard D. Braatz, and Rolf Findeisen. Robust control theory based stability certificates for neural network approximated nonlinear model predictive control. *7th IFAC Conference on Nonlinear Model Predictive Control*. Paper ID 68, in press.

G. Editorial Columns

1. R. D. Braatz and Oscar D. Crisalle. Special issue: Chemical process control. *Int. J. of Robust & Nonlinear Control*, 17:1161-1162, 2007.
2. G. Y. Masada and R. D. Braatz. 2010 American Control Conference. *IEEE Control Systems*, 30(6):124-132, 2010.

3. R. D. Braatz. The efficiency of the Power of One (or Zero). *IEEE Control Systems*, 32(1):6-7, 2012.
4. R. D. Braatz. Control problems of our times: Health care and energy efficiency. *IEEE Control Systems*, 32(1):8-9, 2012.
5. R. D. Braatz. The rise and fall of popular control problems. *IEEE Control Systems*, 32(2): 6-7, 2012.
6. R. D. Braatz. Control of the small. *IEEE Control Systems*, 32(2):8-9, 2012.
7. R. D. Braatz. Feedback $\subset$control. *IEEE Control Systems*, 32(3):6-7, 2012.
8. R. D. Braatz. Control at a distance: Magnetic targeting of drugs. *IEEE Control Systems Magazine*, 32(3):8-9, 2012.
9. R. D. Braatz. On precision robotics and a world-class control engineer. *IEEE Control Systems*, 32(4):6-7, 2012.
10. R. D. Braatz. Vehicle control. *IEEE Control Systems*, 32(4): 8-9, 2012.
11. R. D. Braatz. Control engineering and the birth of aviation. *IEEE Control Systems*, 32(5):6-7, 2012.
12. R. D. Braatz. Unmanned aerial vehicles. *IEEE Control Systems*, 32(5):8-9, 2012.
13. R. D. Braatz. On internal stability and unstable pole-zero cancellations. *IEEE Control Systems*, 32(5):15-16, 2012.
14. R. D. Braatz. Chasing impact factors, or making an impact on technology? *IEEE Control Systems*, 32(6):6-7, 2012. Reprinted in CACHE News, Summer 2016.
15. R.D. Braatz. Feedback control in art, adaptation, and canals. *IEEE Control Systems*, 32(6):8-9, 2012.
16. R. D. Braatz. Guide for prospective authors for IEEE Control Systems Magazine. *IEEE Control Systems*, 33(1):6-7, 2013.
17. R. D. Braatz. Control of fluids. *IEEE Control Systems*, 33(1):8-9, 2013.
18. R. D. Braatz. The management of social networks. *IEEE Control Systems*, 33(2):6-7, 2013.
19. R. D. Braatz. Uncertainties and nonlinearities. *IEEE Control Systems*, 33(2):8-9, 2013.
20. R. D. Braatz. How much mathematics does a control engineer need to know? *IEEE Control Systems*, 33(2):19+, 2013.
21. R. D. Braatz. Control science or control engineering? *IEEE Control Systems*, 33(3):6-7, 2013.
22. R. D. Braatz. Estimation and uncertainties. *IEEE Control Systems*, 33(3):8-9, 2013.
23. R. D. Braatz. Teaching mathematics to control engineers. *IEEE Control Systems*, 33(3):66-67, 2013.
24. R. D. Braatz. The first Nobel Prize in control engineering. *IEEE Control Systems*, 33(4):6-7, 2013. Adapted version titled "The first Nobel Prize in process control" published in CACHE News, Winter 2016.
25. R. D. Braatz. Control education. *IEEE Control Systems*, 33(4):8-10, 2013.
26. R. D. Braatz. Commemorating Norbert Wiener's 120th anniversary. *IEEE Control Systems*, 33(4):61, 2013.
27. R. D. Braatz. The "Nobel Prize in Engineering" awarded for the design of a feedback control system. *IEEE Control Systems*, 33(5):6-7, 2013.
28. R. D. Braatz. Sampling. *IEEE Control Systems*, 33(5):8-10, 2013.
29. R. D. Braatz. A call for high quality perspectives papers. *IEEE Control Systems*, 33(6):6, 2013.

30. R. D. Braatz. Micro and nano systems. *IEEE Control Systems*, 33(6):7-9, 2013.
31. R. D. Braatz. Norbert Wiener, his collaborators, and the definition of the Wiener number. *IEEE Control Systems*, 33(6):136-137, 2013.
32. R. D. Braatz. Control of manufacturing processes. *IEEE Control Systems*, 34(1):6, 2014.
33. R. D. Braatz. Unmanned flight. *IEEE Control Systems*, 34(1):7-9, 2014.
34. R. D. Braatz. Simon van der Meer's Nobel Prize in control engineering. *IEEE Control Systems*, 34(2):6, 2014.
35. R. D. Braatz. Hybrid electric vehicles and oscillators. *IEEE Control Systems*, 34(2):7-8, 2014.
36. R. D. Braatz. Writing papers on control theory. *IEEE Control Systems*, 34(2):75, 2014.
37. R. D. Braatz and Z. K. Nagy. 8th IFAC International Symposium on Advanced Control of Chemical Processes (ADCHEM 2012), Singapore, July 10–13, 2012. *Journal of Process Control*, 24:2-3, 2014.
38. R. D. Braatz. Do you have a control tool or a control toolbox? *IEEE Control Systems*, 34(3):6-7, 2014.
39. R. D. Braatz. Networks and precision control. *IEEE Control Systems*, 34(3):8-9, 2014.
40. R. D. Braatz. Introducing new editorial board members. *IEEE Control Systems*, 34(3):20+, 2014.
41. R. D. Braatz. Teaching Statistics in Selected Chemical Engineering Departments. *CACHE News*, Summer 2014
42. R. D. Braatz. Scilab textbook companions. *IEEE Control Systems*, 33(3):76, 2014.
43. R. D. Braatz. Reproducible research. *IEEE Control Systems*, 33(4):6-7, 2014.
44. R. D. Braatz. Cooperative control. *IEEE Control Systems*, 33(4):8-11, 2014.
45. R. D. Braatz. Implications of the changing research enterprise. *IEEE Control Systems*, 33(4):21+, 2014.
46. R. D. Braatz. Papers receive more citations after rejection. *IEEE Control Systems*, 33(4):22-23, 2014.
47. R. D. Braatz. Perceptions of science and engineering. *IEEE Control Systems*, 33(5):6-7, 2014.
48. R. D. Braatz. Renewable energy and optimization-based control. *IEEE Control Systems*, 33(5):8-10, 2014.
49. R. D. Braatz. IEEE Control Systems Magazine operations from 2012 to 2014. *IEEE Control Systems*, 33(6):6-7, 2014.
50. R. D. Braatz. Power networks. *IEEE Control Systems*, 33(6):8-11, 2014.
51. R. D. Braatz and J. H. Lee. Special Issue in Honor of Manfred Morari's 60th Birthday, *Comput. Chem. Eng.*, 70:1-2, 2014.
52. R. D. Braatz. ACC 2015 in Chicago. *IEEE Control Systems*, 34(1):142-149, 2015.
53. R. D. Braatz. 2015 American Control Conference. *IEEE Control Systems*, 34(6):93-100, 2015.
54. R. D. Braatz. American Control Conference 2015. *IFAC Newsletter*, 2015(6):2, 2015.
55. R. D. Braatz and T. A. Badgwell. New Conference on Foundations of Process Analytics and Machine Learning (FOPAM). *CACHE News*, Winter 2018.
56. Richard D. Braatz, Jordan M. Berg, Zongli Lin, and Frank Allgöwer. Welcome to the ACC2018, *Proceedings of the American Control Conference*, Milwaukee, Wisconsin, pp. 1-5, 2018.

57. Gintaras Reklaitis, Richard Braatz, and Marianthi Ierapetritou. Special issue on pharmaceutical engineering. *Comput. Chem. Eng.*, 129:106461, 2019.
58. Richard D. Braatz, Thomas A. Badgwell, and Phillip R. Westmoreland. FOPAM 2019. *CACHE News*, Summer 2019.
59. Richard D. Braatz, Douglas Lawrence, Andrea Serrani, and Frank Allgöwer. Welcome to the ACC2019, *Proceedings of the American Control Conference*, Philadelphia, Pennsylvania, pp. 1-5, 2019.
60. Richard D. Braatz and Chung Choo Chung. IEEE Conference on Decision and Control 2020 Preview. *IEEE Control Systems*, 40(5):103-106, 2020.
61. Richard D. Braatz. New data analytics tools can improve bioprocess workflows – If applied correctly. *Bioprocess International*, 18(10):61, October 2020. https://bioprocessintl.com/manufacturing/information-technology/new-data-analytics-tools-can-improve-bioprocess-workflows-if-applied-correctly/
62. Richard D. Braatz and Chung Choo Chung. Welcome from the 2020 CDC General Chairs. *Proceedings of the IEEE Conference on Decision and Control*, pp. 4-5, December 2020.
63. Richard D. Braatz, Thomas A. Badgwell, and Phillip R. Westmoreland. Foundations in process analytics and machine learning (FOPAM). Process Analytics and Machine Learning Special Issue, *Comput. Chem. Eng.*, 146:107225, 2021.
64. Richard D. Braatz and Chung Choo Chung. The 59th IEEE Conference on Decision and Control. *IEEE Control Systems*, 41(3), 103-110, 2021.

H. Selected Software

1. (one of 17 contributors) Manfred Morari and N. Lawrence Ricker. Model predictive control toolbox, Version 1. The MathWorks, Inc., Natick, Massachusetts, 1995-2003.
2. Richard D. Braatz. Model predictive control of an adhesive coater. University of Illinois, Urbana-Champaign, 2002. http://web.mit.edu/braatzgroup/coater.zip
3. Leo H. Chiang, Evan L. Russell, and Richard D. Braatz. Open-loop and the closed-loop simulations for the Tennessee Eastman process. University of Illinois, Urbana-Champaign, 2003. https://github.com/camaramm/tennessee-eastman-profBraatz; http://web.mit.edu/braatzgroup/TE_process.zip
4. S. Pamidighantam, L. A. Bievenue, and R. D. Braatz. ChemViz: Chemistry visualization and computation of molecular structure, Version 2.0. University of Illinois, Urbana-Champaign, 2003.
5. X. Y. Woo, R. B. H. Tan, and R. D. Braatz. Simulation of mixing effects in crystallization processes using a coupled CFD-PDF-PBE approach, Version 1.0, University of Illinois, Urbana-Champaign, 2007.
6. R. Gunawan, I. Fusman, and R. D. Braatz. ParticleSolver: Simulation of particles undergoing nucleation, growth, and aggregation, Version 2.0. University of Illinois, Urbana, 2008.
7. L. Goh, J. Pazmino, E. Rusli, J. A. Washington, S. Im, M. Fujiwara, and R. D. Braatz. Interactive educational materials for teaching "Nano" concepts, Version 1.5. University of Illinois, Urbana, 2008.
8. Marcello Torchio, Lalo Magni, R. Bhushan Gopaluni, Richard D. Braatz, and Davide M. Raimondo. LIONSIMBA - Lithium-ION SIMulation BAttery Toolbox. University of

Pavia, Italy and Massachusetts Institute of Technology, Cambridge, Massachusetts, August 27, 2016. https://github.com/lionsimbatoolbox/LIONSIMBA/

9. Ashlee N. Ford Versypt and Richard D. Braatz. Finite difference discretization schemes for diffusion in spheres with variable diffusivity. Massachusetts Institute of Technology, Cambridge, Massachusetts, May 22, 2017. https://github.com/ashleefv/FD_spheres_variable_diffusivity
10. Kristen Severson, Brinda Monian, J. Christopher Love, and Richard D. Braatz. A method for learning a sparse classifier in the presence of missing data for high-dimensional biological datasets, 2017. http://web.mit.edu/braatzgroup/MissingDataClassification.zip
11. Kristen Severson, Mark C. Molaro, and Richard D. Braatz. Principal component analysis of process datasets with missing values, Massachusetts Institute of Technology, Cambridge, Massachusetts, 2017. http://web.mit.edu/braatzgroup/ProcessesMissingDataTools.zip
12. Cezar A. da Rosa and Richard D. Braatz. Open-source software for the multiscale modeling of combined antisolvent and cooling crystallization in turbulent flow using OpenFOAM. Massachusetts Institute of Technology, Cambridge, Massachusetts, July 16, 2018. https://github.com/darosacezar/openCrys
13. Kristen A. Severson, Peter M. Attia, Norman Jin, Benben Jiang, Zi Yang, Nicholas Perkins, Michael H. Chen, Muratahan Aykol, Patrick K. Herring, Dimitrios Fraggedakis, Martin Z. Bazant, Stephen J. Harris, William C. Chueh, and Richard D. Braatz. Battery fast-charging parameter spaces. April 7, 2019. https://github.com/petermattia/battery-parameter-spaces
14. Shin-Hyuk Kim, Jay H. Lee, and Richard D. Braatz. mppicPbeCryFoam. January 7, 2020, https://github.com/KAIST-LENSE/MP-PIC-PBE_CryFoam
15. MPC quadratic dynamic matrix controller with soft constraints. January 24, 2020. https://www.mathworks.com/matlabcentral/fileexchange/73301-mpc-quadratic-dynamic-matrix-controler-with-soft-constraints
16. M. von Andrian and R. D. Braatz. Stochastic model predictive control. January 27, 2020, https://www.mathworks.com/matlabcentral/fileexchange/74043-stochastic-model-predictive-control-mpc?s_tid=prof_contriblnk
17. Weike Sun and Richard D. Braatz. Smart Process Analytics for Predictive Modeling, April 10, 2020, https://github.com/vickysun5/SmartProcessAnalytics
18. Weike Sun and Richard D. Braatz. Python code for ALVEN, July 4, 2020. https://github.com/vickysun5/ALVENcode
19. Moo Sun Hong and Richard D. Braatz. Mechanistic modeling and parameter-adaptive nonlinear model predictive control of a microbioreactor. February 2021. https://web.mit.edu/braatzgroup/MicrobioreactorHong.zip
20. Shin-Hyuk Kim, Jay H. Lee, and Richard D. Braatz. MP-PIC-PBE_PolyFoam. July 13, 2021. https://github.com/KAIST-LENSE/mppicPbePolyFoam
21. Tam N.T. Nguyen and Richard D. Braatz. AAV triple transfection mechanistic model. July 30, 2021. https://github.com/tamntnguyen/AAV-Triple-Transfection-Mechanistic-Model
22. Marc D. Berliner and Richard D. Braatz. PETLION. https://github.com/MarcBerliner/PETLION.jl.

I. Meeting Abstracts

1. R. D. Braatz, M. Morari, and J. H. Lee. Necessary, and sufficient loop-shaping bounds for robust performance. *AIChE Annual Meeting*, Los Angeles, CA, 1991. Paper 154d.

2. J. H. Lee, R. D. Braatz, M. Morari, and A. Packard. Screening tools for robust control structure selection. *AIChE Annual Meeting*, Los Angeles, CA, 1991. Paper 152p.
3. R. D. Braatz. Identification and control of coating processes. *4th Nordic Workshop on Process Control*, Chalmers Technical University, Gothenburg, Sweden, August, 1992.
4. R. D. Braatz, M. Morari, and S. Skogestad. Advances in robust loopshaping. *AIChE Annual Meeting*, Miami Beach, FL, 1992. Paper 127a.
5. R. D. Braatz, K. J. Åström, and M. Morari. Robust automatic tuning of PID controllers. *AIChE Annual Meeting*, St. Louis, MO, 1993. Paper 149c.
6. R. D. Braatz, F. J. Doyle III, M. A. Henson, B. A. Ogunnaike, M. Pottmann, and J. S. Schwaber. Novel process technologies from biological inspiration. *Workshop on Novel Control Techniques from Biological Inspiration, Conference on Neural Information Processing Systems*, Vale, CO, December, 1994. Paper 149c.
7. R. D. Braatz, B. A. Ogunnaike, and J. S. Schwaber. Failure tolerant globally optimal linear control via parallel design. *AIChE Annual Meeting*, San Francisco, CA, 1994. Paper 232b.
8. R. D. Braatz. Control of sheet and film processes. *Third SIAM Conference on Control and Its Applications*, St. Louis, MO, April 27-29, 1995.
9. R. D. Braatz and G. Mijares. Control relevant identification and estimation. *AIChE Annual Meeting*, Miami Beach, FL, 1995. Paper 183a.
10. R. D. Braatz and J. H. Lee. Physical consistency in control structure selection and the integration of design and control. *AIChE Spring National Meeting*, New Orleans, LA, 1996. Paper 79d.
11. R. D. Braatz and J. G. VanAntwerp. Model predictive control of large scale processes. *AIChE Spring National Meeting*, New Orleans, LA, February 27, 1996. Paper 81c.
12. R. D. Braatz. Robustness margin computation for large scale systems. *AIChE Annual Meeting*, Chicago, IL, 1996. Paper 141d.
13. A. P. Featherstone and R. D. Braatz. Control relevant identification of structured large scale systems. *Second Midwest Process Control Workshop*, University of Michigan, Ann Arbor, MI, April 27, 1996.
14. E. L. Russell and R. D. Braatz. Multidimensional realization of large scale uncertain systems. *Second Midwest Process Control Workshop*, University of Michigan, Ann Arbor, MI, April 27, 1996.
15. J. G. VanAntwerp and R. D. Braatz. Model predictive control of large scale paper machines. *Second Midwest Process Control Workshop*, University of Michigan, Ann Arbor, MI, April 27, 1996.
16. E. L. Russell and R. D. Braatz. Analysis of large scale systems with model uncertainty, actuator and state constraints, and time delays. *AIChE Annual Meeting*, Chicago, IL, November 1996. Paper 45a.
17. E. L. Russell and R. D. Braatz. The average-case identifiability of large scale systems. *AIChE Annual Meeting*, Los Angeles, CA, 1997. Paper 215a.
18. R. D. Braatz, M. R. Johnson, K. M. Schmitt, Ian G. Horn, N. Perna, and J. Wentz. Process control laboratory education using a graphical operator interface constructed with Data Translation data acquisition software. *ASEE Summer School for Chemical Engineering Faculty*, Snowbird, UT, 1997.
19. A. P. Featherstone and R. D. Braatz. Design of experiments for the robust identification of sheet and film processes. *AIChE Annual Meeting*, Los Angeles, CA, 1997. Paper 192c.

20. E. Rios and R. D. Braatz. Stability analysis of generic nonlinear systems. *AIChE Annual Meeting*, Los Angeles, CA, 1997. Paper 214g.
21. R. D. Braatz and J. Alameda. Chemical engineering workbench. *NCSA Campus Day*, University of Illinois, Urbana, IL, May, 1998.
22. E. Rios-Patron and R. D. Braatz. Performance analysis and optimization-based control of nonlinear systems with general dynamics. *AIChE Annual Meeting*, Miami Beach, FL, 1998. Paper 227g.
23. R. D. Braatz. A general framework for the analysis and control of nonlinear dynamical systems modelled by dynamic ANNs. *ANNCBT/IWGGEC Workshop on Adaptive Computation*, Beckman Institute, University of Illinois, Urbana, IL, 1999.
24. R. D. Braatz. Interaction between design and control for large scale systems. *AIChE Annual Meeting*, Dallas, TX, 1999. Paper 222b.
25. L. H. Chiang, E. L. Russell, and R. D. Braatz. Fault detection using canonical variate analysis and dynamic PCA. *AIChE Annual Meeting*, Dallas, TX, 1999. Paper 224f.
26. D. L. Ma, S. H. Chung, and R. D. Braatz. Worst-case analysis of batch and semibatch control trajectories. *AIChE Annual Meeting*, Dallas, TX, 1999. Paper 215a.
27. D. L. Ma, T. Togkalidou, and R. D. Braatz. Multidimensional crystal growth from solution. *AIChE Annual Meeting*, Dallas, TX, 1999. Paper 132c.
28. J. G. VanAntwerp and R. D. Braatz. Robust control of large scale paper machines. *AIChE Annual Meeting*, Dallas, TX, 1999. Paper 276h.
29. R. Gunawan, E. L. Russell, and R. D. Braatz. Model reduction of large scale uncertain systems. *AIChE Annual Meeting*, Dallas, TX, 1999. Paper 225i.
30. M. Y. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Detailed modeling of transient enhanced diffusion in implanted Si. *AIChE Annual Meeting*, Dallas, TX, 1999. Paper 189d.
31. M. Y. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Fast-ramp annealing for reducing implant-induced transient enhanced diffusion. *American Vacuum Society Meeting, 47th International Symposium: Vacuum, Thin Films, Surfaces/Interfaces, and Processing*, Boston, 2000. Paper Ms-ThM3.
32. M. Y. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Fast-ramp annealing for reducing implant-induced transient enhanced diffusion. *AIChE Annual Meeting*, Los Angeles, CA, 2000. Paper 217h.
33. R. D. Braatz, D. L. Ma, T. Togkalidou, M. Fujiwara, S. D. Patel, and D. K. Tafti. Modeling and control of multidimensional crystallization. *AIChE Annual Meeting*, Los Angeles, CA, 2000. Paper 253h.
34. M. Y. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Surface Fermi level pinning: an electrical "valve" in transient enhanced diffusion. *Materials Research Society Spring Meeting*, San Francisco, CA, 2001. Paper J4.21.
35. D. L. Ma, D. Tafti, and R. D. Braatz. Compartmental modeling of multidimensional crystallization. *International Conference on Materials for Advanced Technologies*, Symposium D: Crystallization and Interfacial Processes, Singapore, 2001. Paper D203-018.
36. R. Gunawan, D. L. Ma, M. Fujiwara, and R. D. Braatz. Identification of kinetic parameters in a multidimensional crystallization process. *International Conference on Materials for Advanced Technologies*, Symposium D: Crystallization and Interfacial Processes, Singapore, 2001. Paper 303-010.
37. R. D. Braatz, M. Fujiwara, D. L. Ma, T. Togkalidou, and D. K. Tafti. Simulation and new sensor technologies for industrial crystallization: A review and some new results.

International Conference on Materials for Advanced Technologies, Symposium D: Crystallization and Interfacial Processes, Singapore, 2001. Paper DI6-002.

38. M. Fujiwara, J. C. Pirkle Jr., T. Togkalidou, D. L. Ma, R. Gunawan, and R. D. Braatz. A holistic approach to materials process design. *International Conference on Materials for Advanced Technologies*, Symposium H: Materials Science and Engineering Education in New Millenium, Singapore, 2001. Paper H4-04-IN.
39. L. H. Chiang and R. D. Braatz. Causal map for process monitoring. *The Gordon Conference on Statistics in Chemistry and Chemical Engineering*, Williams College, Williamstown, MA, July 22-27, 2001.
40. T. O. Drews, J. Alameda, R. D. Braatz, and R. C. Alkire. Parameter estimation and multi-scale simulations of surface roughness evolution during copper electrodeposition. *Symposium on Fundamental Aspects of Electrodeposition and Dissolution*, *Electrochemical Society Meeting*, San Francisco, California, 2001.
41. L. H. Chiang and R. D. Braatz. Process monitoring using causal map and multivariate statistics. *AIChE Annual Meeting*, Reno, NV, 2001. Paper 282e.
42. T. O. Drews, E. Rusli, E. G. Webb, J. Alameda, R. D. Braatz, and R. C. Alkire. A multi-scale model of copper electrodeposition in on-chip interconnects: Nonlinear systems analysis for linked multi-scale codes. *AIChE Annual Meeting*, Reno, NV, 2001. Paper 298e.
43. D. L. Ma, D. K. Tafti, and R. D. Braatz. Compartmental modeling of multidimensional crystallization. *AIChE Annual Meeting*, Reno, NV, 2001. Paper 287b.
44. T. O. Drews, J. Alameda, R. D. Braatz, and R. C. Alkire. Integration of linked continuum-mesoscale codes with experimental data: The role of additives during copper electrodeposition. *AIChE Annual Meeting*, Reno, NV, 2001. Paper 127e.
45. D. L. Ma, P. S. Chow, M. Fujiwara, and R. D. Braatz. Identification of crystallization kinetics for acetaminophen via laser backscattering and ATR-FTIR spectroscopy. *223rd American Chemical Society National Meeting*, *Abstracts of Papers of the American Chemical Society*, 223:231-IEC Part 1, April 7, 2002.
46. R. Braatz, S. Pamidighantam, R. Lewis, and L. Bievenue. ChemViz: Using computation and scientific visualization to teach quantum chemistry concepts. *Teaching with Instructional Technologies*, Urbana, IL, 2002.
47. L. Bievenue, R. Lewis, S. Pamidighantam, and R. Braatz. Using computation and scientific visualization to teach quantum chemistry concepts. *Alliance All-Hands Meeting*, Urbana, IL, 2002.
48. T. O. Drews, S. Krishnan, J. Alameda, D. Gannon, R. D. Braatz, and R. C. Alkire. Multi-scale simulations of copper electrodeposition onto a resistive substrate. *Gordon Conference on Electrodeposition*, Colby-Sawyer College, New London, NH, August 11-16, 2002.
49. T. O. Drews, S. Krishnan, J. Alameda, D. Gannon, R. D. Braatz, and R. C. Alkire. Multi-scale simulations of copper electrodeposition onto a resistive substrate. *202nd Meeting of the Electrochemical Society*, Salt Lake City, UT, October 20-25, 2002. Paper 413.
50. M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Mathematical approaches to optimal control of transient enhanced diffusion. *American Vacuum Society 49th International Symposium*, Denver, CO, November 4, 2002. Paper MS-MoA4.
51. K. Dev, M. Y. L. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Measurement of Fermi level pinning kinetics at Si-SiO_2 interfaces: Implications for CMOS transistor

manufacture. *AVS 49th International Symposium*, Denver, CO, November 5, 2002. Paper EL+SC-TuM10.

52. T. O. Drews, S. Krishnan, J. Alameda, D. Gannon, R. D. Braatz, and R. C. Alkire. Multi-scale simulations of copper electrodeposition onto a resistive substrate. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 196h.
53. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Maximum a posteriori estimation of transient enhanced diffusion kinetics. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 256d.
54. R. Gunawan, M. Y. L. Jung, E. G. Seebauer, and R. D. Braatz. Optimal control of transient enhanced diffusion. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 261c.
55. Z. K. Nagy and R. D. Braatz. Robust EKF-based nonlinear model predictive control of batch processes. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 243b.
56. Z. K. Nagy, M. Fujiwara, and R. D. Braatz. Theoretical and experimental comparison of temperature-, concentration-, and growth rate-controlled batch crystallization. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 149c.
57. M. Y. Jung, R. Gunawan, R. D. Braatz, and E. G. Seebauer. Systems analysis applied to modeling transient enhanced diffusion in transistor manufacture. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 196e.
58. E. J. Hukkanen, T. O. Drews, R. C. Alkire, and R. D. Braatz. Parameter sensitivity analysis for stochastic simulation codes, with application to a multiscale simulation code. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 279e.
59. J. Alameda, R. C. Alkire, R. D. Braatz, R. Bramley, T. O. Drews, D. Gannon, M. Gower, S. Hampton, B. Jewett, S. Krishnan, M. Kamrunahar, H. Rehn, and R. Wilhelmson. The Alliance Science Portal. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 250a.
60. E. J. Hukkanen and R. D. Braatz. Measurement and control of suspension polymerization using in situ laser backscattering and video microscopy. *AIChE Annual Meeting*, Indiana, IN, November 2002. Paper 149f.
61. R. Kruse, L. Page, and R. D. Braatz. Computer-based visualization in secondary chemistry education. *Supercomputing2002*, Baltimore, MD, November 16, 2002.
62. T. O. Drews, E. Hukkanen, R. D. Braatz, and R. C. Alkire. Parameter sensitivity analysis of stochastic simulation codes. *SIAM Conference on Computational Science and Engineering*, San Diego, CA, February 10-13, 2003.
63. R. Braatz, L. Bievenue, and J. Moran. ChemViz. *Symposium on Molecular Modeling and Visualization Tools in Science Education*, *National Association of Researchers in Science Teaching (NARST) Annual Meeting*, Philadelphia, PA, March 23, 2003.
64. S. Pamidighantam, L. Bievenue, and R. D. Braatz. Visualizing chemistry for high school and undergraduate education. *Alliance All-Hands Meeting*, Urbana, IL, April 30, 2003.
65. R. C. Alkire, R. D. Braatz, L. Petzold, J. Alameda, D. Gannon, A. Rossi, and S. Hampton. Multiscale grid-based computational science and engineering. *Alliance All-Hands Meeting*, Urbana, IL, April 30, 2003.
66. T. O. Drews, R. C. Alkire, and R. D. Braatz. Multiscale simulations of nanofabricated structures: Application to copper electrodeposition for microelectronics applications in electronic devices. *Nanotechnology Industry Workshop*, Center for Nanoscale Science and Technology, Urbana, IL, May 9, 2003.

67. E. Rusli, T. O. Drews, R. D. Braatz, and R. C. Alkire. Nonlinear feedback control of a stochastic multiscale code for simulating thin films and trenches. *Nanotechnology Industry Workshop*, Center for Nanoscale Science and Technology, Urbana, IL, May 9, 2003.
68. R. Gunawan, M. Y. L. Jung, R. D. Braatz, and E. G. Seebauer. Nanosystems engineering applied to transient-enhanced diffusion modeling. *Nanotechnology Industry Workshop*, Center for Nanoscale Science and Technology, Urbana, IL, May 9, 2003.
69. T. O. Drews, R. D. Braatz, and R. C. Alkire. Multi-scale simulations of nanofabricated structures: Application to copper electrodeposition for microelectronics applications. *204th Meeting of the Electrochemical Society*, Orlando, FL, October 12-17, 2003. Session A1. Abstract 41.
70. T. O. Drews, J. Erlebacher, R. D. Braatz, P. C. Searson, and R. C. Alkire. Atomic-scale kinetic Monte Carlo simulations of copper nucleation: Investigation of attachment-limited rate laws. *204th Meeting of the Electrochemical Society*, Orlando, FL, October 12-17, 2003. Session J1.
71. T. O. Drews, F. Xue, X. Li, H. Deligianni, P. Vereecken, E. Cooper, P. Andricacos, R. D. Braatz, and R. C. Alkire. Parameter estimation of a copper electrodeposition additive mechanism using data obtained from a D-optimal experimental design. *204th Meeting of the Electrochemical Society*, Orlando, FL, October 12-17, 2003. Abstract 698.
72. R. Gunawan, I. Fusman, and R. D. Braatz. High resolution algorithms for multidimensional population balance equations with nucleation and size-dependent growth. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 453a.
73. R. D. Braatz, R. C. Alkire, E. G. Seebauer, T. O. Drews, R. Gunawan, M. Y. L. Jung, and E. Rusli. Multiscale systems engineering with applications to microelectronics. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 434a.
74. E. Rusli, T. O. Drews, X. Li, R. C. Alkire, and R. D. Braatz. Nonlinear feedforward-feedback control of a coupled mesoscale-continuum simulation code. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 439c.
75. T. O. Drews, R. D. Braatz, and R. C. Alkire. Multi-scale simulations of nanofabricated structures: Application to copper electrodeposition for microelectronics applications. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 339a.
76. T. O. Drews, X. Li, F. Xue, H. Deligianni, P. Vereecken, E. Cooper, P. Andricacos, R. D. Braatz, and R. C. Alkire. Parameter estimation of a copper electrodeposition additive mechanism using a multi-scale simulation code. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 439l.
77. E. J. Hukkanen and R. D. Braatz. Modeling and control of suspension polymerization: Theory and experiments. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 339e.
78. E. J. Hukkanen and R. D. Braatz. An HPC approach to the simulation and parameter estimation of polymerization reactions. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 439ac.
79. E. J. Hukkanen and R. D. Braatz. Nonlinear control of suspension polymerization: Theory and experiments. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 440e.
80. E. Rusli, T. O. Drews, R. C. Alkire, and R. D. Braatz. Understanding the numerical stability and accuracy of dynamically coupled multiscale simulation codes: A control

systems approach. *AIChE Annual Meeting*, San Francisco, CA, November 16-21, 2003. Paper 444f.

81. J. Moran, R. Braatz, M. Fujiwara, D. Chapman, and L. Bievenue. ChemViz: Chemistry visualization and computation of molecular structure. *Symposium on Approaches to Integrating Science Research and Science Education Using Molecular Models*, *American Association for the Advancement of Science Annual Meeting*, Seattle, WA, February 16, 2004.
82. E. Rusli, T. O. Drews, X. Li, R. C. Alkire, and R. D. Braatz. Perspectives on the design and control of multiscale systems. *Nanotechnology in Homeland Security Workshop*, Center for Nanoscale Science and Technology, Urbana, IL, May 6-7, 2004.
83. X. Woo, R. D. Braatz, and R. B. H. Tan. A study of mixing effects in antisolvent crystallization by coupled CFD and population balance modeling. *5th International Symposium on Mixing in Industrial Processes*, Seville, Spain, June 1-4, 2004.
84. E. Rusli**,** T. O. Drews, and R. D. Braatz. Systems analysis and design of dynamically coupled multiscale reactor simulation codes. *18th International Symposium on Chemical Reaction Engineering*, Chicago, Illinois, June 6-9, 2004.
85. R. D. Braatz, R. C. Alkire, E. Rusli, and T. O. Drews. Multiscale systems engineering with applications to chemical reaction processes. *18th International Symposium on Chemical Reaction Engineering*, Chicago, Illinois, June 6-9, 2004.
86. T. O. Drews, R. D. Braatz, and R. C. Alkire, Kinetic Monte Carlo simulations of the growth of nanoscale metal clusters by electrodeposition. *Prairie Chapter of the American Vacuum Society Annual Meeting*, Urbana, IL, June 14, 2004.
87. E. Rusli, T. O. Drews, X. Li, R. C. Alkire, and R. D. Braatz. Multiscale systems engineering with applications to chemical reaction processes, *Prairie Chapter of the American Vacuum Society Annual Meeting*, Urbana, IL, June 14, 2004.
88. X. Woo, R. B. H. Tan, and R. D. Braatz. Coupled CFD-PBE simulation of mixing effects in antisolvent pharmaceutical crystallization. *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 230a.
89. J. C. Pirkle, Jr., M. Fujiwara, and R. D. Braatz. Dynamics and parameter sensitivity analysis for a two-phase microstructural model for dynamic blown-film extrusion: Theory and experiments. *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 340e.
90. K. Dev, C. T. M. Kwok, R. D. Braatz, and E. G. Seebauer. New mechanisms for controlling transistor junction formation through surface chemistry. *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 366e.
91. E. Rusli, M. Fujiwara, J. H. Lee, and R. D. Braatz. Run-to-run control of the crystal size distribution during solution crystallization using laser backscattering and ATR-FTIR spectroscopy. *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 411a.
92. E. J. Hukkanen and R. D. Braatz. Robust distribution control of suspension polymerization. *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 418e.
93. J. Isom and R. D. Braatz. Economic design of stateless control charts for deteriorating systems, *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 429e.
94. Y. He, J. R. Gray, R. D. Braatz, and R. C. Alkire. Modulized coupled simulation of localized pit initiation in stainless steel. *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 435b.
95. C. T. M. Kwok, K. Dev, E. G. Seebauer, and R. D. Braatz. Optimal model-based experimental design and Bayesian parameter estimation of the surface annihilation

probability in transient enhanced diffusion. *AIChE Annual Meeting*, Austin, TX, November 7-12, 2004. Paper 436b.

96. R. Vaidyanathan, K. Dev, M. Y. L. Jung, C. T. M. Kwok, R. D. Braatz, and E. G. Seebauer. Defect engineering in silicon at the nanoscale through surface chemistry. *Nanotechnology Workshop 2005*, Center for Nanoscale Science and Technology, Urbana, IL, May 5-6, 2005.
97. J. Isom and R. D. Braatz. Economic design of control charts for deteriorating systems. *Gordon Conference on Statistics in Chemistry and Chemical Engineering*, Mount Holyoke College, South Hadley, MA, July 17-22, 2005.
98. **Opening talk:** R. D. Braatz. Computational aspects of multiscale simulations of electrochemical systems. *Symposium on Multiscale Simulations of Electrochemical Systems - Computational Aspects*, *208th Meeting of the Electrochemical Society*, Los Angeles, CA, October 16-21, 2005. Abstract 1086.
99. R. Vaidyanathan, K. Dev, R. D. Braatz, and E. G. Seebauer. Control of defect concentrations in silicon through surface chemistry. *AIChE Annual Meeting*, Cincinnati, OH, November 2005. Paper 135a.
100. K. S. Cheong, S. Farooq, and R. D. Braatz. A model of the Darwinian evolution of cancer progression. *AIChE Annual Meeting*, Cincinnati, OH, November 2005. Paper 173c.
101. X. Y. Woo, R. B. H. Tan, and R. D. Braatz. Design of industrial-scale crystallizers to include the effects of macromixing and micromixing on the crystal size distribution. *AIChE Annual Meeting*, Cincinnati, OH, November 2005. Paper 243g.
102. M. Fujiwara, T. J. Wubben, X. Y. Woo, and R. D. Braatz. Direct design of batch recipes and concentration control in antisolvent crystallization. *AIChE Annual Meeting*, Cincinnati, OH, November 2005. Paper 394g.
103. M. Karulkar, F. Xue, T. O. Drews, Y. He, X. Li, E. Rusli, R. C. Alkire, R. D. Braatz. Multiscale systems engineering with application to copper electrodeposition. *AIChE Annual Meeting*, Cincinnati, OH, November 2005. Paper 565e.
104. X. Y. Woo, R. B. H. Tan, and R. D. Braatz. Simulation of mixing effects in antisolvent crystallization using a coupled CFD-micromixing-PBE approach. *AIChE Annual Meeting*, Cincinnati, OH, November 2005. Paper 529b.
105. E. Seebauer, K. Dev, C. T. M. Kwok, and R. D. Braatz. Controlling ultrashallow junction formation through surface chemistry. *AIChE Annual Meeting*, Cincinnati, OH, November 2005. Paper 586a.
106. A. N. Ford and R. D. Braatz. Multiscale systems engineering in micro-, nano-, and biotechnology. *CNST Nanotechnology Workshop*, Urbana, IL, May 4, 2006.
107. R. D. Braatz, M. Fujiwara, N. C. S. Kee, X. Y. Woo, E. Rusli, and R. B. H. Tan. Research on the controlled crystallization of pharmaceuticals. *27th Annual General Meeting of the International Fine Particle Research Institute*, Santa Barbara, CA, June 28, 2006 (invited).
108. J. Isom and R. D. Braatz, Design of maintenance policies for the infrastructure for mitigating disasters. *Conference on Dynamics of Disasters*, Athens, Greece, October 5-7, 2006.
109. N. C. S. Kee, R. B. H. Tan, and R. D. Braatz. Selective crystallization of the metastable alpha form of L-glutamic acid through concentration feedback control. *AIChE Annual Meeting*, San Francisco, November 2006. Paper 684b.
110. X. Y. Woo, R. B. H. Tan, and R. D. Braatz. Modeling and simulation of impinging jet crystallization. *AIChE Annual Meeting*, San Francisco, November 2006. Paper 57a.

111. X. Y. Woo, R. B. H. Tan, and R. D. Braatz. A systematic design approach to tailor crystal size distribution for mixing-sensitive crystallization processes. *AIChE Annual Meeting*, San Francisco, November 2006. Paper 457g.
112. K. S. Cheong, S. Farooq, and R. D. Braatz. Modeling cellular immortality in cancer cells. *AIChE Annual Meeting*, San Francisco, November 2006. Paper 442l.
113. L. Goh, J. Pazmino, E. Rusli, J. A. Washington, S. Im, M. Fujiwara, and R. D. Braatz. Interactive educational materials for teaching "nano" concepts, *Workshop on Nanoscale Science and Engineering Education*, Arlington, Virginia, January 11-12, 2007.
114. V. Maynard, M. Hsu, J. Krajcik, R. Braatz, L. M. Goh, K. Chen, and R. DeWald. Introduction to the nanoscale, *Workshop on Nanoscale Science and Engineering Education*, Arlington, Virginia, January 11-12, 2007.
115. L. Goh, J. Pazmino, J. A. Washington, M. Fujiwara, and R. D. Braatz. The chemistry of metal and semiconductor nanoparticles. *American Chemical Society 233rd National Meeting and Exposition*, Chicago, IL, March 25-29, 2007. Abstract 1668.
116. X.-H. Li, R. D. Braatz and R. Alkire. Numerical simulation of superfilling during copper electrodeposition in small trenches. *211th Electrochemical Society Meeting*, Chicago, IL, May 8, 2007, Abstract 837.
117. M. Karulkar, R. C. Alkire and R. D. Braatz. Simulation of copper nucleation on gold: investigating the effects of additives. *211th Electrochemical Society Meeting*, Chicago, IL, May 8, 2007, Abstract 945.
118. A. N. Ford, D. W. Pack, and R. D. Braatz. Modeling autocatalytic controlled-release drug delivery from PLGA microspheres. *AIChE Annual Meeting*, Salt Lake City, November 2007. Paper 516ap.
119. 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, November 2007. Paper 96d.
120. L. M. Goh, K. J. Chen, G.H. He, V. Bhamidi, P. J. A. Kenis, C. F. Zukoski, and R. D. Braatz. Nucleation kinetics determination in high-throughput microfluidic systems. *AIChE Annual Meeting*, Salt Lake City, November 2007. Paper 353d.
121. N. Kee, R. B. H. Tan, and R. D. Braatz. Selective crystallization of the metastable anhydrate form in the enantiotropic pseudo-dimorph system of L-phenylalanine using feedback concentration control. *AIChE Annual Meeting*, Salt Lake City, November 2007. Paper 410c.
122. L. M. Goh and R. D. Braatz. Simulation of the solution concentration field within an evaporating hanging droplet. *AIChE Annual Meeting*, Salt Lake City, November 2007. Paper 467e.
123. K. Chen, R. Vaidyanathan, E. G. Seebauer, and R. D. Braatz. Asymptotic behavior of reaction-diffusion PDEs in dopant diffusion. *AIChE Annual Meeting*, Salt Lake City, November 2007. Paper 410c.
124. R. D. Braatz. Multiscale modeling and design. *India-American Frontiers of Engineering Symposium*, Irvine, CA, February 28-March 1, 2008 (poster).
125. R. D. Braatz and P. Dutta. Frontiers in chemical and automotive manufacturing. *India-American Frontiers of Engineering Symposium*, Irvine, CA, February 28-March 1, 2008 (introductory talk to session).
126. **Opening talk:** R. C. Alkire and R. D. Braatz. Multiscale modeling and design of electrochemical systems. *Symposium on Multiscale Simulations of Electrochemical Systems*

– *Computational Aspects*, *213th Meeting of the Electrochemical Society*, Phoenix, Arizona, May 18-23, 2008. Abstract 878.

127. M. Karulkar, M. Willis, R. Braatz, and R. Alkire. Kinetically-limited electrodeposition of copper on gold in the presence of additives: Multi-scale phenomena during nucleation and overgrowth on a resistive strip. *213th Meeting of the Electrochemical Society*, Phoenix, Arizona, May 18-23, 2008. Abstract 879.
128. N. Nair, R. D. Braatz, and M. S. Strano. Facilitating density-based electronic-type separation of carbon nanotubes via chemical reactions: A modeling study. *236th American Chemical Society Meeting*, Philadelphia, PA, August 17-21, 2008. Abstract INOR 136.
129. N. Nair, R. D. Braatz, and M. S. Strano. Dynamics of surfactant-suspended single walled carbon nanotubes in a centrifugal field. *236th American Chemical Society Meeting*, Philadelphia, PA, August 17-21, 2008. Abstract INOR 618.
130. M. L. Rasche, K. K. Kim, D. Reid, L. M. Goh, M. Fujiwara, H.-S. Hahm, U. Ravaioli, and R. D. Braatz. Interactive software and design projects for teaching critical concepts in nanoscale science and technology. *Global NSEE Workshop*, Arlington, VA, November 13-14, 2008.
131. 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, Pennsylvania, November 2008. Paper 135a.
132. N. Nair, W. J. Kim, R. D. Braatz, and M. Strano. Dynamics of surfactant-suspended single walled carbon nanotubes in a centrifugal field. *AIChE Annual Meeting*, Philadelphia, PA, November 2008. Paper 188g.
133. M. L. Rasche and R. D. Braatz. Modeling transport processes within a high-throughput evaporation platform. *AIChE Annual Meeting*, Philadelphia, PA, November 2008. Paper 473e.
134. 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. Paper 572h.
135. A. N. Ford, D. W. Pack, and R. D. Braatz. Multiscale modeling of polymer microsphere drug delivery. *AIChE Annual Meeting*, Philadelphia, PA, November 2008. Paper 653a.
136. M. Hermanto, K. C. Shen, R. D. Braatz, and M. S. Chiu. Modelling and simulation of the crystallization of L-glutamic acid polymorphs. *AIChE Annual Meeting*, Philadelphia, PA, November 2008. Paper 712d.
137. N. Kee, X. Y. Woo, R. B. H. Tan, and R. D. Braatz. Precise tailoring of the crystal size distribution by optimal seeding time profiles. *AIChE Annual Meeting*, Philadelphia, PA, November 2008. Paper 744e.
138. M. Kishida, A. N. Ford, D. W. Pack, and R. D. Braatz. Optimal control of cellular uptake in tissue engineering. *University of Illinois Interdisciplinary Conference*, Urbana, IL, January 26, 2009.
139. V. Boovaragavan, V. Ramadesigan, M. Arabandi, V. Subramanian, K. Chen, R. Braatz, and H. Tsukamoto. Parameter estimation and capacity fade analysis from discharge curves of lithium-ion batteries using efficient reformulated physics based models. *215th Electrochemical Society Meeting*, San Francisco, CA, May 27, 2009. Abstract 251.
140. R. D. Braatz. Emerging problems in integrated biomedical microsystems. *Special Session on Modeling and Control of Micro and Nanosystems*, *American Control Conference*, St. Louis, MO, June 2009.

141. M. Kishida and R. D. Braatz. Optimal 3D spatial field control of nonlinear spatially distributed systems with state feedback. *IFAC Workshop on Control of Distributed Parameter Systems*, Toulouse, France, July 20-24, 2009. Abstract 27.
142. V. Boovaragavan, R. Methekar, V. Ramadesigan, V. Subramanian and R. Braatz. Dynamic optimization of lithium-ion batteries - Current profiles for improved utilization. *216th ECS Meeting*, Vienna, Austria, October 4-9, 2009. Abstract 241.
143. V. Ramadesigan, V. Boovaragavan, R. Methekar, M. Arabandi, V. Subramanian and R. Braatz. Towards model-based optimal design of lithium-ion batteries. *216th ECS Meeting*, Vienna, Austria, October 4-9, 2009. Abstract 242.
144. V. Ramadesigan, V. Boovaragavan, R. Methekar, V. Subramanian, K. Chen, and R. Braatz. Modeling capacity fade of lithium-ion batteries: Challenges in identifying and quantifying possible mechanisms. *216th ECS Meeting*, Vienna, Austria, October 4-9, 2009. Abstract 720.
145. J. C. Pirkle, Jr., V. Subramanian, and R. D. Braatz. Expediting the numerical simulation of lithium-ion battery models. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 374g.
146. V. Ramadesigan, V. Boovaragavan, R. N. Methekar, V. Subramanian, K. Chen, R. D. Braatz, and J. C. Pirkle, Jr. Modeling capacity fade of lithium-ion batteries: Challenges in identifying and quantifying possible mechanisms. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 200c.
147. V. Boovaragavan, R. N. Methekar, V. Ramadesigan, V. Subramanian, and R. D. Braatz. Dynamic optimization of lithium-ion batteries: Current profiles for improved utilization. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 356e.
148. A. N. Ford, D. W. Pack, and R. D. Braatz. Mechanistic modeling of PLGA microparticle drug delivery systems. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 178l.
149. A. N. Ford, D. W. Pack, and R. D. Braatz. Design of PLGA microparticle drug delivery systems using mechanistic reaction-diffusion model. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 261d.
150. V. Subramanian, V. Ramadesigan, V. Boovaragavan, R. N. Methekar, M. Arabandi, and R. D. Braatz. Towards model-based optimal design of lithium-ion batteries. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 143c.
151. J. C. Pirkle, Jr., M. Fujiwara, and R. D. Braatz. Model identification of blown film extrusion. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 374b.
152. N. A. Burns, R. Basavaraj, V. Ramadesigan, F. Latinwo, R. D. Braatz, V. R. Subramanian, Identification of dominant mechanisms for capacity fade of lithium-ion batteries. *AIChE Annual Meeting*, Nashville, TN, November 8-13, 2009. Abstract 63j.
153. R. Methekar, V. Ramadesign, V. Subramanian, K. Chen, and R. D. Braatz. Continuum and multi-scale modeling of performance curves and capacity fade in lithium-ion batteries. *TMS Annual Meeting and Exhibition*, Seattle, WA, February 14-18, 2010.
154. V. Ramadesigan, R. Methekar, V. Subramanian, F. Latinwo, and R. Braatz. Optimal design of electrode material properties for lithium-ion batteries. *217th ECS Meeting*, Vancouver, BC, Canada, April 25-30, 2010. Abstract 249.
155. R. Methekar, V. Ramadesigan, V. Subramanian, and R. Braatz. Maximization of energy storage and minimization of capacity fade in lithium-ion battery pack. *217th ECS Meeting*, Vancouver, BC, Canada, April 25-30, 2010. Abstract 393.

156. V. Subramanian, V. Ramadesigan, R. Methekar, K. Chen, and R. Braatz. Continuum and multiscale modeling of performance curves and capacity fade in lithium-ion batteries. *217th ECS Meeting*, Vancouver, BC, Canada, April 25-30, 2010. Abstract 1242.
157. V. Ramadesigan, R. N. Methekar, R. D. Braatz, and V. R. Subramanian. Modeling and simulation of lithium ion batteries from systems engineering perspective. *218th ECS Meeting*, Las Vegas, NV, October 10-15, 2010. Abstract 226.
158. J. Vernille, J. E. Tabora, A. Rogers, J. Albrecht, R. D. Braatz, and M. Fujiwara. Crystallization development of a pharmaceutical API through implementation of real-time supersaturation feedback control. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 141b.
159. X. Zhu, D. W. Pack, and R. D. Braatz. Intravascular delivery from drug-eluting stents: Effect of anisotropic diffusivity and drug loading on arterial drug distribution. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 639f.
160. A. Rogers, J. Albrecht, J. Vernille, J. Tabora, F. Ricci, M. Fujiwara, and R. D. Braatz. Automated crystallization platform: Integrating hardware, software, and PAT to expedite the process of crystallization development. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 355d.
161. J. C. Pirkle, Jr. and R. D. Braatz. Non-isothermal blown film extrusion including crystallization: Instabilities, multiplicities, and mapping of stable operating regions. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 289d.
162. 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. Abstract 288f.
163. B. Zeiger, M. L. Rasche, R. D. Braatz, and K. S. Suslick. Sonofragmentation: Experimental observations and population-balance modeling. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 164f.
164. R. Lakerveld, R. D. Braatz, and P. I. Barton. A plant-wide control strategy for continuous pharmaceutical manufacturing. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 444c.
165. V. Ramadesigan, R. N. Methekar, S. De, R. D. Braatz, and V. Subramanian. Estimation of state of charge of a lithium-ion battery pack. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 327f.
166. R. N. Methekar, K. Chen, P. Northrop, R. D. Braatz, and V. Subramanian. Kinetic Monte Carlo simulation of surface heterogeneity for lithium-ion batteries: Passive layer formation and simulation of capacity fade. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 636c.
167. V. Ramadesigan, J. C. Pirkle Jr., S. De, P. Northrop, R. N. Methekar, R. D. Braatz, and V. Subramanian. Modeling and simulation of lithium ion batteries from systems engineering perspective. *AIChE Annual Meeting*, Salt Lake City, UT, November 2010. Abstract 375z.
168. V. R. Subramanian, R. N. Methekar, V. Ramadesigan, and R. D. Braatz. Systems engineering of lithium ion batteries. *ASME International Mechanical Engineering Congress & Exposition*, Vancouver, British Columbia, Canada, November 12-18, 2010. Abstract IMECE2010-39928.
169. P. Northrop, R. Methekar, V. Subramanian, K. Chen, and R. Braatz. Kinetic Monte Carlo simulation of surface heterogeneity for lithium-ion batteries: Passive layer formation and

simulation of capacity fade. *219th ECS Meeting*, Montreal, Canada, May 1-6, 2011. Abstract 470.

170. V. Ramadesigan, R. Braatz, G. Sikha, and V. Subramanian. Optimal design of electrode properties for Li-ion batteries using physics-based efficient reformulated models. *219th ECS Meeting*, Montreal, Canada, May 1-6, 2011. Abstract 1603.
171. V. Ramadesigan, R. Methekar, R. Braatz, and V. Subramanian. Dynamic optimization for maximization of energy storage and minimization of capacity fade. *219th ECS Meeting*, Montreal, Canada, May 1-6, 2011. Abstract 1624.
172. M. L. Rasche, B. W. Zeiger, K. S. Suslick, and R. D. Braatz. Modeling the evolution of the particle size distribution during ultrasound-induced breakage. *18th International Symposium on Industrial Crystallization*, Zürich, Switzerland, September 13-16, 2011. Poster. Abstract 127.
173. M. Jiang, M. Fujiwara, M. H. Wong, Z. Zhu, J. Zhang, L. Zhou, K. Wang, A. N. Ford, T. Si, L. M. Hasenberg, and R. D. Braatz. Achieving a target crystal size distribution by continuous seeding and controlled growth. *18th International Symposium on Industrial Crystallization*, Zürich, Switzerland, September 13-16, 2011.
174. M. Jiang, L. Zhou, X. Zhu, M. Molaro, D. O'Grady, D. Hebrault, J. Tedesco, and R. D. Braatz. In-situ identification of two-dimensional growth and dissolution kinetics for rod-like crystals. *18th International Symposium on Industrial Crystallization*, Zürich, Switzerland, September 13-16, 2011. Poster.
175. K. Chen, L. M. Goh, G.W. He, V. Bhamidi, P. J. A. Kenis, C. F. Zukoski, and R. D. Braatz. Identification of bounds on nucleation rates in droplet-based microfluidic systems. *18th International Symposium on Industrial Crystallization*, Zürich, Switzerland, September 13-16, 2011.
176. P. Northrop, V. Subramanian, and R. Braatz. Coupling of Kinetic Monte-Carlo simulations with continuum level models to examine capacity fade. *220th ECS Meeting*, Boston, Massachusetts, October 9-14, 2011. Abstract 672.
177. V. Ramadesigan, P. Northrop, V. Subramanian, and R. Braatz. Continuous and discrete approaches for modeling capacity fade in lithium-ion batteries. *220th ECS Meeting*, Boston, Massachusetts, October 9-14, 2011. Abstract 736.
178. V. Ramadesigan, P. Northrop, S. De, S. Santhanagopalan, R. Braatz, and V. Subramanian. Multiscale modeling and simulation of lithium-ion batteries from systems engineering perspective. *220th ECS Meeting*, Boston, Massachusetts, October 9-14, 2011. Abstract 747.
179. J. E. Tabora, S. Murugesan, J. Vernille, M. L. Rasche, M. Fujiwara, and R. D. Braatz. Implementation of a high-resolution population balance solver to model pharmaceutical crystallizations. *AIChE Annual Meeting*, Minneapolis, Minnesota, October 16-21, 2011. Abstract 83b.
180. L. Zhou, K.-N. Ma, H. Feng, and R. D. Braatz. Optimal control of antisolvent and cooling crystallization. *AIChE Annual Meeting*, Minneapolis, Minnesota, October 16-21, 2011. Abstract 83c.
181. A. N. Ford, 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, Minnesota, October 16-21, 2011. Abstract 101h.
182. M. Jiang, M. Molaro, M. L. Rasche, H. Zhang, K. Chadwick, L. Zhou, M. Wong, Z. Zhu, D. Hebrault, D. O'Grady, J. Tedesco, and R. D. Braatz. Estimation and modeling of crystal

size and shape evolution using in situ tools. *AIChE Annual Meeting*, Minneapolis, Minnesota, October 16-21, 2011. Abstract 548a.

183. X. Zhu and R. D. Braatz. Mathematical modeling of intravascular drug delivery in drug-eluting stents with biodegradable coating. *AIChE Annual Meeting*, Minneapolis, Minnesota, October 16-21, 2011. Abstract 621e.
184. V. Ramadesigan, P. Northrop, S. De, G. Sikha, R. Braatz, and V. Subramanian. Model based optimal design of electrode architecture of lithium-ion batteries. *221st ECS Meeting*, Seattle, Washington, May 6-10, 2012. Abstract 1047.
185. R. D. Braatz and R. C. Alkire. Keynote 5: An overview of multiscale simulation algorithms: Guidelines and pitfalls to avoid. *Summer School on Molecular and Multiscale Simulation*, National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, 2012.
186. E. P. Chang, R. D. Braatz, and T. A. Hatton. Controlled emulsion droplet solvent evaporation for the continuous and consistent production of particles. *Association in Solution III - Self-Assembly: From Bio-Colloids to Nano-Engineering*. Bifröst University, Iceland, July 22-27, 2012. Poster 9.
187. P. Northrop, R. Braatz, and V. Subramanian. Simultaneous coupling of kinetic Monte-Carlo simulations with continuum models to examine capacity fade. *Pacific Rim Meeting on Electrochemical and Solid-State Science (PRiME 2012)*, *Joint International Meeting of the 222nd ECS Meeting and the 2012 Fall Meeting of the Electrochemical Society of Japan*, Honolulu, Hawaii, October 7-12, 2012. Abstract #730.
188. V. Ramadesigan, P. Northrop, R. Braatz, and V. Subramanian. Dynamic optimization using efficient reformulated models for maximizing energy storage and life of lithium-ion batteries. *Pacific Rim Meeting on Electrochemical and Solid-State Science (PRiME 2012)*, *Joint International Meeting of the 222nd ECS Meeting and the 2012 Fall Meeting of the Electrochemical Society of Japan*, Honolulu, Hawaii, October 7-12, 2012. Abstract #1082.
189. J. C. Pirkle, Jr., L. C. Foguth, S. Brenek, K. Girard, and R. D. Braatz. Modeling and simulation of coaxial crystallizers by dynamically coupled population balance, macromixing, and micromixing models. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 23d.
190. Q.-L. Su, M. W. Hermanto, R. D. Braatz, M.-S. Chiu. A new extended prediction self-adaptive control (EPSAC) strategy for batch control. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 713g.
191. R. D. Braatz. Looking to the future in continuous pharmaceutical manufacturing. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 43a.
192. M. Kishida and R. D. Braatz. A model-based approach for the construction of design spaces in Quality-by-Design. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 146a. The presentation is available on-line in AIChE ChemE on Demand at http://www.aiche.org/resources/chemeondemand/conference-presentations/model-based-approach-construction-design-spaces-quality-design
193. 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, Pennsylvania, October 28 – November 2, 2012. Abstract 258a.
194. X. Zhu and R. D. Braatz. A predictive model for coupled polymer degradation, erosion, and drug release in PLGA biodegradable stent coatings. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 351e.

195. H. Jang, J. H. Lee, and R. D. Braatz. Design of a parameter and state estimation method for detecting local concentration on the surface of a carbon-nanotube based sensor. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 647a.
196. M. Jiang, X. Zhu, M. Molaro, M. L. Rasche, D. M. Raimondo, K.-K. Kim, H. Zhang, K. Chadwick, L. Zhou, Z. Zhu, M. Wong, D. O'Grady, D. Hebrault, J. Tedesco. and R. D. Braatz. A multidimensional population balance model for growth and dissolution identified from a designed temperature-cycling experiment. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 604g.
197. B. W. Bequette and R. D. Braatz. Overview of CAST activities and programming. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 16a.
198. A. A. Boghossian, J. Zhang, F. Le Floch-Yin, Z. Ulissi, P. Bojo, J.-H. Han, J.-H. Kim, J. Arkalgud, N. F. Reuel, R. D. Braatz, and M. S. Strano. The chemical dynamics of nanosensors capable of single-molecule detection. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2012. Abstract 759e.
199. L. C. Foguth, B. Benyahia, R. Lakerveld, P. I. Barton, and R. D. Braatz. Quality-by-Design for continuous pharmaceutical manufacturing. *Symposium on Continuous Pharmaceutical Manufacturing*, Cambridge, MA, November 13, 2012. Poster.
200. R. Lakerveld, B. Benyahia, P. L. Heider, H. Zhang, S. Mascia, J. M. B. Evans, R. D. Braatz, and P. I. Barton. Plant-wide control for continuous pharmaceutical manufacturing. *Symposium on Continuous Pharmaceutical Manufacturing*, Cambridge, MA, November 13, 2012. Poster.
201. R. Lakerveld, B. Benyahia, P. L. Heider, H. Zhang, A. Wolfe, C. Testa, S. Ogden, D. R. Hersey, S. Mascia, J. M. B. Evans, R. D. Braatz, and P. I. Barton. Plant-wide control of an integrated continuous pharmaceutical pilot plant. *9th European Congress of Chemical Engineering*, World Forum, The Hague, The Netherlands, April 21-25, 2013.
202. V. Ramadesigan, B. Suthar, P. Northrop, S. Santhanagopalan, R. Braatz, and V. Subramanian. Optimal control of Li-ion batteries based on reformulated models. *223rd ECS Meeting*, Toronto, Canada, May 16, 2013. Abstract 293.
203. B. Suthar, V. Ramadesigan, P. Northrop, S. Santhanagopalan, R. Braatz, and V. Subramanian. Real time state estimation of reformulated lithium-ion battery model for advanced battery management systems (BMS). *223rd ECS Meeting*, Toronto, Canada, May 16, 2013. Abstract 294.
204. P. Northrop, V. Subramanian, and R. Braatz. Integration of a Kinetic Monte Carlo algorithm with continuum models to examine capacity fade. *223rd ECS Meeting*, Toronto, Canada, May 14, 2013. Abstract 414.
205. H. Jang, R. D. Braatz, and J. H. Lee. Integrated parameter and state estimation method for carbon nanotube-based nanosensor arrays distributed on 2D field. *9th World Congress on Chemical Engineering*, Seoul, Korea, August 18-23, 2013, Abstract FrO-T405-4.
206. J. Min, P. T. Hammond, and R. D. Braatz. Modeling pH-induced release of polyanions from weak polyelectrolyte multilayer films. *Biomedical Engineering Society* (*BMES*) *Annual Meeting*, Seattle, Washington, September 25-28, 2013. Abstract 230.
207. X. Zhu, L. Zhou, and R. D. Braatz. Efficient simulation of population balance models by an improved method of characteristics approach. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 199a.
208. L. Zhou, M. Su, B. Benyahia, A. Singh, P. I. Barton, B. L. Trout, A. S. Myerson, and R. D. Braatz. Mathematical modeling and design of layer crystallization in a concentric annulus

with and without recirculation. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 241a.

209. B. K. Suthar, V. Ramadesigan, S. De, R. D. Braatz, and V. R. Subramanian. Optimal charging profile for mechanically constrained lithium ion battery. *224th ECS Meeting*, October 27 – November 1, 2013. Abstract 253.
210. E. Chang, R. D. Braatz, and T. A. Hatton. Evaporation of emulsion droplets for the templated assembly of spherical particles: A population balance model. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 300g.
211. 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. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 432g.
212. A. Mesbah, R. Lakerveld, and R. D. Braatz. Plant-wide model predictive control of a continuous pharmaceutical manufacturing process. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 443a.
213. M. Jiang and R. D. Braatz. Mathematical modeling and analysis of cooling crystallization within dual-impinging-jet mixers. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 536a.
214. A. N. Ford Versypt and R. D. Braatz. Analysis of finite difference schemes for diffusion in spheres with variable diffusivity. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 651c.
215. A. N. Ford Versypt and R. D. Braatz. Mechanistic modeling of PLGA microsphere drug delivery: Analytical autocatalytic degradation of polymer and hindered diffusion of drug. *AIChE Annual Meeting*, San Francisco, California, November 3-8, 2013. Abstract 666a.
216. M. Jiang and R. D. Braatz. Design criteria for the crystallization of pharmaceuticals within dual-impinging-jet mixers. *AAPS Annual Meeting & Exposition*, San Antonio, Texas, November 10-13, 2013. Abstract T3289.
217. P. W. C. Northrop, V. R. Subramanian, and R. D. Braatz. Integration of a 2+1D kinetic Monte Carlo algorithm with continuum models for SEI layer analysis of lithium-ion batteries. *225th ECS Meeting*, Orlando, Florida, May 11-16, 2014. Abstract 549.
218. B. Suthar, P. W. C. Northrop, S. De, V. Ramadesigan, R. D. Braatz, and V. R. Subramanian. Optimal charging profile for mechanically constrained lithium-ion batteries using reformulated pseudo two dimensional models. *225th ECS Meeting*, Orlando, Florida, May 11-16, 2014. Abstract 321.
219. L. Zhou, M. Su, S. T. Ferguson, Y. Youn, B. Benyahia, A. Singh, P. I. Barton, B. L. Trout, A. S. Myerson, and R. D. Braatz. Modeling and design of layer/falling film solution crystallization. *International Symposium for Continuous Manufacture of Pharmaceuticals*, Cambridge, Massachusetts, May 20-21, 2014
220. A. Mesbah and R. D. Braatz. Dynamic modeling and control of a pharmaceutical thin-film drying process. *International Symposium for Continuous Manufacture of Pharmaceuticals*, Cambridge, Massachusetts, May 20-21, 2014.
221. B. Suthar, P. W. C. Northrop, R. D. Braatz, and V. R. Subramanian. Optimal charging profile for lithium-ion batteries at subzero temperatures. *2014 ECS and SMEQ Joint International Meeting*, October 5-10, 2014. Abstract #42081.

222. J. Min, R. D. Braatz, and P. T. Hammond. Tunable staged release of therapeutics from layer-by-layer coating with clay interlayer barrier. *Biomedical Engineering Society* (*BMES*) *Annual Meeting*, San Antonio, Texas, October 22-25, 2014.
223. J. Min, P. T. Hammond, and R. D. Braatz. Modeling release behaviors of stimuli-responsive polyelectrolyte multilayer films. *Biomedical Engineering Society* (*BMES*) *Annual Meeting*, San Antonio, Texas, October 22-25, 2014.
224. J. Min, R. D. Braatz, and P. T. Hammond. Tunable staged release of therapeutics from layer-by-layer coating with clay interlayer barrier. *Real Time Release: The Path to Efficient Supply of High Quality Biopharmaceuticals?*, Cambridge, Massachusetts, November 14, 2014.
225. A. Mesbah, J. A. Paulson, and R. D. Braatz. Stochastic output feedback control of nonlinear systems with probabilistic uncertainties: Application to control of polymorphic transformations in batch crystallization. *AIChE Annual Meeting*, Atlanta, Georgia, November 16-21, 2014. Abstract 206a.
226. M. Jiang, Z. Zhu, E. Jimenez, J. Xu, C. Papageorgiou, J. Waetzig, A. Hardy, and R. D. Braatz. Continuous-flow tubular crystallization in slugs spontaneously induced by hydrodynamics. *AIChE Annual Meeting*, Atlanta, Georgia, November 16-21, 2014. Abstract 321b. Best presentation in session.
227. J. Min, P. T. Hammond, and R. D. Braatz. Mathematical modeling of macromolecular release of stimuli-responsive polyelectrolyte multilayer films. *AIChE Annual Meeting*, Atlanta, Georgia, November 16-21, 2014. Abstract 527a. Best presentation in session.
228. J. K. Scott, R. D. Braatz, and D. M. Raimondo. Input design for active fault diagnosis using zonotopes. *AIChE Annual Meeting*, Atlanta, Georgia, November 16-21, 2014. Abstract 587e.
229. J. Paulson, A. Mesbah, and R. D. Braatz. Stochastic model predictive control of high-dimensional systems: An end-to-end continuous pharmaceutical manufacturing case study. *AIChE Annual Meeting*, Atlanta, Georgia, November 16-21, 2014. Abstract 610b.
230. M. Jiang and R. D. Braatz. Cooling crystallization within dual-impinging-jet mixers: Mathematical modeling, theory analysis, and experimental validation. *AIChE Annual Meeting*, Atlanta, Georgia, November 16-21, 2014. Abstract 755b.
231. Richard D. Braatz, "Control of Multiscale Dynamical Systems," SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 20, 2015.
232. Jouha Min, Richard D. Braatz, Myron Spector, and Paula T. Hammond. 'Two-in-One' multilayer coatings for prosthesis-related infections. American Chemical Society Annual Meeting, Boston, Massachusetts, August 19, 2015. Abstract PMSE 353.
233. J. Min, K. Y. Choi, R. F. Padera, R. D. Braatz, M. Spector, and P. T. Hammond. Two-in-one multilayer coatings for prosthesis-related infection. *Gordon Research Conference on Biomaterials and Tissue Engineering*, Girona, Spain, July 19-24, 2015.
234. Nicholas J. Mozdzierz, Amos E. Lu, Alan Stockdale, John J. Clark, Noelle A. Colant, Joel A. Paulson, Richard D. Braatz, Kerry R. Love, and J. Christopher Love. Designing a microbial cultivation platform for continuous biopharmaceutical production. *Integrated Continuous Biomanufacturing II*, Berkeley, California, November 1-5, 2015. Poster 37.
235. J. Min, R. D. Braatz, and Paula T. Hammond. 'Two-in-one' multilayer coatings for prosthesis-related infections. *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 11f.

236. Joel A. Paulson, Edward A. Buehler, Richard D. Braatz, and Ali Mesbah. Stochastic model predictive control with bounded inputs and joint state chance constraints: Application to a continuous acetone-butanol-ethanol fermentation process. *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 204f.
237. Mo Jiang and R. D. Braatz. Recent advances in continuous slug-flow crystallization. *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 224a.
238. Kristen Severson, Jeremy G. VanAntwerp, Venkatesh Natarajan, Chris Antoniou, Jörg Thömmes, and Richard D. Braatz. Elastic net with Monte Carlo sampling for data-based modeling in biopharmaceutical manufacturing facilities. *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 243a (poster). **CAST Director's Award**.
239. J. K. Scott, D. M. Raimondo, G. R. Marseglia, and R. D. Braatz. Constrained zonotopes: A new tool for set-based computations. *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 246s (poster).
240. Mo Jiang, C. D. Papageorgiou, J. Waetzig, A. Hardy, M. Langston, and R. D. Braatz. Indirect ultrasonication in continuous slug-flow crystallization. *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 294b.
241. M. L. Rasche, M. Jiang, and R. D. Braatz. Dynamic modeling and control of multi-stage slug-flow crystallization. *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 730e.
242. Kristen Severson, Jeremy G. VanAntwerp, Venkatesh Natarajan, Chris Antoniou, Jörg Thömmes, and Richard D. Braatz. A case study of data analytics for the manufacturing of a monoclonal antibody, *AIChE Annual Meeting*, Salt Lake City, November 8-13, 2015. Abstract 759a.
243. Kristen Severson, Jeremy G. VanAntwerp, Venkatesh Natarajan, Chris Antoniou, Jörg Thömmes, and Richard D. Braatz. Elastic net with Monte Carlo sampling for data-based modeling in biopharmaceutical manufacturing facilities. *8th Annual Biomanufacturing Summit: Cell and Gene Therapy Products: Meeting the Biomanufacturing Challenges*, Cambridge, MA, November 18-19, 2015 (poster).
244. J. Min, K. Y. Choi, E. C. Dreaden, R. D. Braatz, M. Spector, and Paula T. Hammond. 'Two-in-one' multilayer coatings for prosthesis-related infections. *2015 MRS Fall Meeting and Exhibit*, Boston, Massachusetts, November 29 – December 4, 2015. Abstract F6.04 (poster).
245. Eranda Harinath, Mo Jiang, Joel A. Paulson, Lucas Foguth, Dongying Erin Shen, and Richard D. Braatz Control systems engineering for continuous pharmaceutical manufacturing. *Second International Symposium on Continuous Manufacturing of Pharmaceuticals*, Cambridge, Massachusetts, September 26-27, 2016 (poster).
246. P. M. Desai, V. Puri, D. Brancazio, A. R. Martinez, J. E. Hartman, K. D. Jensen, E. Harinath, R. D. Braatz, J.-H. Chun, A. S. Myerson, B. L. Trout. Tablet coating by injection molding technology. *AAPS Annual Meeting and Exposition*, Denver, Colorado, November 13-17, 2016 (poster). Abstract 22W0100.
247. Joel A. Paulson, T. Alan Hatton, and Richard D. Braatz. An efficient method for deriving normalization constants for eigenfunctions of Sturm-Liouville problems and its application to the Graetz Problem for diffusive and convection heat/mass transfer. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 22h.

248. Jouha Min, Richard Braatz, Myron Spector, and Paula Hammond. Nanolayer multi-therapy scaled delivery from implant surface. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 136h.
249. Mo Jiang, Charles D. Papageorgiou, Josh Waetzig, Andrew Hardy, Marianne Langston, and Richard D. Braatz. Process intensification for continuous slug-flow pharmaceutical crystallization. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 286e.
250. Kristen Severson, Brinda Monian, J. Christopher Love, and Richard D. Braatz. A method for learning a sparse classification model in the presence of missing data. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 341f.
251. Jouha Min, Ki Young Choi, Eric Dreaden, Robert Padera, Richard Braatz, Myron Spector, and Paula Hammond. Designer dual therapy nanolayered implant coatings eradicate biofilms and accelerate bone tissue repair. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 404b.
252. Mo Jiang and Richard D. Braatz. Cooling crystallization within micromixers: Mathematical modeling, theoretical analysis, and experimental validation. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 579b.
253. Zhilong Zhu, You Peng, Kamal Samrane, Allan S. Myerson, and Richard D. Braatz. A multidimensional population balance model for predicting crystal size and aspect ratio in the production of phosphogypsum. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 597a.
254. R. D. Braatz and M. A. Henson. Applied statistics and data analytics. *ASEE Summer School for Chemical Engineering Faculty*, Raleigh, North Carolina, July 29 – August 2, 2017.
255. You Peng, Zhilong Zhu, Kamal Samrane, Richard D. Braatz, and Allan S. Myerson. Crystallization of calcium sulfate dihydrate during phosphoric acid production in the presence of magnesium ions. *AIChE Annual Meeting*, San Francisco, California, November 13-18, 2016. Abstract 656a.
256. Fridolin Röder, Ulrike Krewer, Richard D. Braatz. Multi-scale simulation of surface film growth mechanisms in lithium-ion batteries. *68th Annual Meeting of the International Society of Electrochemistry*, Providence, Rhode Island, August 27 – September 1, 2017.
257. Kristen Severson, Paphonwit Chaiwatanodom, Mark C. Molaro, and Richard D. Braatz. Semi-supervised anomaly detection for production oil wells. *AIChE Annual Meeting*, Minneapolis, Minnesota, California, October 29 – November 3, 2017. Abstract 19g.
258. Mo Jiang, J. Carl Pirkle, Jr., and Richard D. Braatz. Theoretical analysis and process design for dual-impinging jet cooling crystallization. *AIChE Annual Meeting*, Minneapolis, Minnesota, California, October 29 – November 3, 2017. Abstract 186j.
259. Tor Aksel N. Heirung, Joel A. Paulson, Richard D. Braatz, and Ali Mesbah. A tractable method for closed-loop active fault diagnosis of stochastic linear systems. *AIChE Annual Meeting*, Minneapolis, Minnesota, California, October 29 – November 3, 2017. Abstract 284c.
260. Mo Jiang, Chen Gu, and Richard D. Braatz. Pinducer analysis for the design of a nucleation subsystem for continuous slug-flow crystallization. *AIChE Annual Meeting*, Minneapolis, Minnesota, California, October 29 – November 3, 2017. Abstract 472a.

261. Mo Jiang and Richard D. Braatz. Advanced scalable continuous manufacturing platform for pharmaceuticals and chemicals based on slug flow. *IFPAC Annual Meeting*, North Bethesda, Maryland, February 11-14, 2018. Session CIII.
262. Gregory C. Rutledge, Richard D. Braatz, George Rodriquez, and Andy H. Tsou. Discovery and design of additives for novel polymer morphology and performance. Materials Genome Initiative Principal Investigators Meeting, College Park, Maryland, March 26-27, 2018. Extended abstract and poster.
263. P. Desai, V. Puri, D. Brancazio, B. Halkude, J. Hartman, A. Wahane, A. Martinez, K. Jensen, E. Harinath, R. Braatz, J.-H. Chun, and B. L. Trout. Tablet coating by injection molding technology: Characterization of coating materials for optimal process and product performance. *8th World Congress on Particle Technology*, Orlando, Florida, April 22-26, 2018. Abstract 51c.
264. Richard D. Braatz, Stacy Springs, and Paul Barone. Data analytics, modeling, and control of biopharmaceutical manufacturing. *NIIMBL National Meeting*, Washington, DC, May 16, 2018. Poster.
265. Michael Forsuelo, Benben Jiang, Kristen A. Severson, Peter Attia, Aditya Grover, Norman Jin, Zi Yang, Nick Perkins, Michael Chen, Todor Markov, Bryan Cheong, Muratahan Aykol, Patrick K. Herring, Stephen J. Harris, Stefano Ermon, William C. Chueh, and Richard D. Braatz. Machine learning and porous electrode theory driven capacity fade modeling and optimal fast charging. *Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, San Francisco, May 31, 2018. Poster.
266. Weike Sun, Benben Jiang, and Richard D. Braatz. Concurrent canonical variate analysis for process operating condition deviations and dynamic anomalies monitoring. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 136h.
267. Weike Sun and Richard D. Braatz. Review and comparative study of nonlinear PCA fault detection methods. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 183a. **CAST Director's Award**.
268. Mo Jiang, Boxuan Li, Amos E. Lu, Thomas D. Roper, Frank Gupton, and Richard Braatz. Single-step continuous purification from liquid-liquid-solid mixture: Design and experimental implementation for an HIV drug intermediate. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 200x.
269. J. A. Paulson, E. Harinath, L. Foguth, and R. D. Braatz. Perspectives on the control of advanced manufacturing systems. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 257a.
270. Richard D. Braatz. Industrial Internet of Things (IIoT) Applications and Industry 4.0. AIChE Annual Meeting, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 287c.
271. L. Foguth, E. Harinath, J. Paulson, and R. D. Braatz. Integrated quality by design for continuous pharmaceutical manufacturing: Accounting for dynamics and feedback. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 328f.
272. Jonggeol Na, Jong Woo Kim, Kyeongsu Kim, Eranda Harinath, Mo Jiang, Jong Min Lee, Bernhardt L. Trout, and Richard D. Braatz. Stochastic multiscale model-based predictive control via polynomial chaos theory: Manufacturing of thin films for pharmaceutical applications. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 456f.

273. Moo Sun Hong and Richard D. Braatz. Mechanistic modeling and parameter-adaptive nonlinear model predictive control of a microbioreactor. *AIChE Annual Meeting*, Pittsburgh, Pennsylvania, October 28 – November 2, 2018. Abstract 667e.
274. Moo Sun Hong and Richard D. Braatz. Mechanistic modeling and parameter-adaptive nonlinear model predictive control of a microbioreactor. *Driving Innovation in Cell and Gene Therapy Manufacturing*, Cambridge, Massachusetts, December 11-12, 2018. Poster.
275. Weike Sun and Richard D. Braatz. Smart data analytics in biomanufacturing. *Driving Innovation in Cell and Gene Therapy Manufacturing*, Cambridge, Massachusetts, December 11-12, 2018. Poster.
276. Weike Sun, Kristen A. Severson, and Richard D. Braatz. Smart data analytics in biomanufacturing. *MIT Stephen A. Schwarzman College of Computing Launch*, Massachusetts Institute of Technology, Cambridge, Massachusetts, February 28, 2019. Poster.
277. P. Attia, A. Grover, N. Jin, K. Severson, B. Cheong, J. Liao, M. H. Chen, N. Perkins, Z. Yang, P. H. Herring, M. Aykol, S. J. Harris, R. D. Braatz, S. Ermon, and W. C. Chueh. Closed-loop optimization of battery fast charging procedures. *International Battery Association 2019*, La Jolla, San Diego, California, March 3-8, 2019. Poster. *ECS Meeting Abstracts*, Abstract MA2019-03 227.
278. Moo Sun Hong, Nicholas J. Mozdzierz, Mo Jiang, and Richard D. Braatz. Improving biopharmaceutical stability and minimizing cold-chain burden using continuous protein crystallization. *Joint FAU-MIT Workshop on the Design of Particulate Products by Continuous Processes*, Massachusetts Institute of Technology, Cambridge, MA, April 6, 2019. Poster.
279. Mo Jiang and Richard D. Braatz. Exploiting a multiphase flow instability for manufacturing therapeutic protein crystals. *NIIMBL Technology Workshop on Process Intensification*, Boston, Massachusetts, April 25, 2019.
280. Moo Sun Hong, Nicholas J. Mozdzierz, Mo Jiang, and Richard D. Braatz. Improving biopharmaceutical stability and minimizing cold-chain burden using continuous protein crystallization. *NIIMBL Technology Workshop on Process Intensification*, Boston, Massachusetts, April 25, 2019. Poster.
281. Sai Varun Aduru, Manan Pathak, Suryanarayana Kolluri, Richard D. Braatz, and Venkat R. Subramanian. Nonlinear model predictive control strategies for optimal charging of a lithium-ion battery. *235th ECS Meeting*, Dallas, Texas, May 26-30, 2019. *ECS Meeting Abstracts*, Abstract MA2019-01 106.
282. Benben Jiang, Marc Berliner, Michael Forsuelo, Kristen A. Severson, Hongbo Zhao, Dimitrios Fraggedakis, Martin Z. Bazant, Richard D. Braatz, Peter Attia, Norman Jin, Nick Perkins, Zi Yang, Michael Chen, Stephen J. Harris, William C. Chueh, Muratahan Aykol, and Patrick K. Herring. Machine learning for prediction of battery cycle life. *Second Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, San Francisco, May 29-30, 2019. Poster.
283. Weike Sun and Richard D. Braatz. Smart process data analytics for model prediction. *Foundations of Process Analytics and Machine Learning* (FOPAM), Raleigh, North Carolina, August 6-9, 2019. Abstract ID 5. Poster.
284. Weike Sun, Antonio R. Paiva, Peng Xu, Anantha Sundaram, and Richard D. Braatz. Fault detection and identification using Bayesian recurrent neural networks. *Foundations of*

Process Analytics and Machine Learning (FOPAM), Raleigh, North Carolina, August 6-9, 2019. Abstract ID 11. Poster.

285. Fabian Mohr, Weike Sun and Richard D. Braatz. Smart process data analytics for supervised classification. *Foundations of Process Analytics and Machine Learning* (FOPAM), Raleigh, North Carolina, August 6-9, 2019. Abstract ID 38. Poster.
286. Kristen A. Severson, Peter M. Attia, Norman Jin, Benben Jiang, Zi Yang, Nicholas Perkins, Michael H. Chen, Muratahan Aykol, Patrick K. Herring, Dimitrios Fraggedakis, Martin Z. Bazant, Stephen J. Harris, William C. Chueh, and Richard D. Braatz. Data-driven prediction of battery cycle life before capacity degradation. *Foundations of Process Analytics and Machine Learning* (FOPAM), Raleigh, North Carolina, August 6-9, 2019. Abstract 35. Poster.
287. Amos E. Lu (and Richard D. Braatz and co-workers). Digital transformation in biomanufacturing. *Integrated Continuous Biomanufacturing IV*, Brewster (Cape Cod), Massachusetts, October 6-10, 2019.
288. Richard D. Braatz. An integrated approach to modelling, data, and control for pharmaceutical manufacturing. *AIChE Annual Meeting*, Orlando, November 10–15, 2019. Abstract 11f.
289. David P. Piñeiro, Anastasia Nikolakopoulou, Johannes Jäschke, Truls Gundersen, and Richard D. Braatz. Self-optimizing control of a continuous pharmaceutical manufacturing plant. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 29b.
290. Moo Sun Hong, Amos E. Lu, and Richard D. Braatz. A systematic model-based approach for the design and control of protein crystallization. *AIChE Annual Meeting*, Orlando, Florida November 10–15, 2019. Abstract 29d. **Session Best Presentation**
291. Richard D. Braatz and Weike Sun (speaker). Big data analytics in the advanced manufacturing of biopharmaceuticals. Big Data Analytics session. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 52b (invited).
292. Richard D. Braatz. Control of polymorphism and crystal size distribution and in pharmaceutical crystallization. **Separations Division Plenary Session.** *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 69c.
293. Elçin Içten Gençer, Xiaoxiang Zhu, Matthew Beaver, Ayman Allian, Seth Huggins, Pablo Rolandi, Roger Hart, Shawn Walker, Andrew Maloney, Gerard Capellades Mendez, and Richard D. Braatz. A virtual plant for synthetic continuous manufacturing via integrated systems-based modeling. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 126f.
294. Moo Sun Hong, M. Lourdes Velez-Suberbie, Andrew J. Maloney, Andrew Biedermann, Kerry R. Love, J. Christopher Love, Tarit K. Mukhopadhyay, and Richard D. Braatz. Macroscopic modeling of bioreactors for recombinant protein producing Pichia pastoris in defined medium. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 175am. Poster. **FP&BE Poster Award**
295. Corinne L. Carpenter, Gregory C. Rutledge, and Richard D. Braatz. Accelerated design of molecular additives for polymer crystallization. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 181ar. Poster.
296. Matthew R. Dobbins, J. Carl Pirkle, Jr., Marat Andreev, Gregory C. Rutledge, and Richard D. Braatz. Mathematical modeling of blown film extrusion using the discrete slip-link rheological model. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 181bq. Poster.

297. Weike Sun and Richard D. Braatz. Smart process data analytics: Automated and robust data analytics for manufacturing processes. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 193a.
298. Shin Hyuk Kim, Richard D. Braatz, and Jay H. Lee. Multiphase particle-in-cell coupled population balance equation method for multiscale computational fluid dynamics. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 336c.
299. Weike Sun and Richard D. Braatz. Probabilistic PCA for multivariate process monitoring and comparison with PCA. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 370b. Poster.
300. Domenico Colucci, Davide Fissore, and Richard D. Braatz. Mathematical modeling of the freezing of pharmaceutical solutions. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 471e.
301. Richard D. Braatz. CACHE perspective. Data Science Education in Chemical Engineering Panel Discussion. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 516b (invited).
302. Moo Sun Hong, Amos E. Lu, Jaehan Bae, Jong Min Lee, and Richard D. Braatz. A droplet-based evaporative crystallization system for protein crystallization kinetics estimation. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 558cd. Poster.
303. Richard D. Braatz. CACHE Initiatives in Process Systems. CACHE 50th Anniversary: The Future of Cyber-Assisted Chemical Engineering Education session. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 571e (invited).
304. Elçin Içten Gençer, Xiaoxiang Zhu, Matthew Beaver, Ayman Allian, Seth Huggins, Pablo Rolandi, Roger Hart, Shawn Walker, Andrew Maloney, Gerard Capellades Mendez, and Richard D. Braatz. Process control strategy for synthetic continuous manufacturing. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 577f.
305. Matthias von Andrian, Anastasia Nikolakopoulou, and Richard D. Braatz. Autonomous design of advanced control systems for modular chemical systems. *AIChE Annual Meeting*, Orlando, Florida, November 10–15, 2019. Abstract 705e.
306. Weike Sun, Kristen A. Severson, and Richard D. Braatz. Smart data analytics in drug manufacturing. *AI Powered Discovery and Manufacturing*, Cambridge, Massachusetts, February 27-28, 2019, 2020. Poster.
307. Hongbo Zhao, Brian D. Storey, Richard Braatz, and Martin Bazant. Inverse learning of material physics through in-situ image data and continuum modeling. *Bulletin of the American Physics Society*, *APS March Meeting*, Denver, Colorado, March 4, 2020. Abstract M34.00007.
308. Hongbo Zhao, Brian D. Storey, Richard Braatz, and Martin Bazant. Inverse learning of material physics through in-situ image data and continuum modeling. *Bulletin of the American Physics Society*, *APS March Meeting*, Denver, Colorado, March 4, 2020. Abstract M34.00007.
309. Benben Jiang, Kristen A. Severson, Fabian Mohr, Marc D. Berliner, Patrick A. Asinger, Supratim Das, Dimitrios Fraggedakis, Peter M. Attia, Will E. Gent, Aditya Grover, Norman Jin, Bruis Vlijmen, Xiao Cui, Vivek Lam, Nicholas Perkins, Zi Yang, Michael H. Chen, Patrick Herring, Chirranjeevi B. Gopal, Muratahan Aykol, Stephen J. Harris, Stefano Ermon, William C. Chueh, Martin Z. Bazant, Richard D. Braatz, Machine learning-based prediction and classification of battery lifetimes. *Third Annual Toyota Research Institute*

Accelerated Materials Design and Discovery (AMDD) Workshop and Conference, May 28, 2020.

310. Patrick A. Asinger, Fabian Mohr, Marc D. Berliner, Benben Jiang, Daniel A. Cogswell, Debbie Zhuang, Martin Z. Bazant, Richard D. Braatz, William E. Gent, Vivek Lam, Xiao Cui, Bruis van Vlijmen, Gabriel B. Crane, William C. Chueh, Chirranjeevi B. Gopal, and Patrick Herring. BEEP: A python library for battery evaluation and early prediction. *Third Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, May 28, 2020.
311. Marc D. Berliner, Hongbo Zhao, Supratim Das, Michael Forsuelo, William H. Chueh, Martin Z. Bazant, and Richard D. Braatz. *Third Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, May 28, 2020.
312. Daniel A. Cogswell, Fabian Mohr, Marc D. Berliner, Richard D. Braatz, and Martin Z. Bazant. Electrochemically resolved acoustic emissions for battery formation and cycling. *Third Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, May 28, 2020.
313. Jarrod Lund, Williams Wang, Richard Braatz, and R. Edwin Garcia. Data driven thermodynamic property prediction in phase diagram space. *Third Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, May 28, 2020.
314. Hongbo Zhao, Haitao Deng, Brian Storey, William C. Chueh, Richard D. Braatz, and Martin Z. Bazant. *Third Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, May 28, 2020.
315. Supratim Das, Michael Forsuelo, Daniel A. Cogswell, Debbie Zhuang, Tao Gao, Richard D. Braatz, William C. Chueh, and Martin Z. Bazant. *Third Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, May 28, 2020.
316. Peter M. Attia, Aditya Grover, Norman Jim, Kristen A. Severson, Todor Markov, Jerry Liao, Michael H. Chen, Bryan Cheong, Nicholas Perkins, Zi Yang, Patrick K. Herrig, Muratahan Aykol, Stephen J. Harris, Richard D. Braatz, Stefano Ermon, and William C. Chueh. *Third Annual Toyota Research Institute Accelerated Materials Design and Discovery (AMDD) Workshop and Conference*, May 28, 2020.
317. Moo Sun Hong and Richard D. Braatz. Optimal design and control of advanced biomanufacturing systems. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 3ci.
318. Elizabeth M. Cummings Bende, Andrew J. Maloney, Dragana Boszinovski, Jose Sangerman, Amos E. Lu, Moo Sun Hong, Nili Persits, Anastasia Artamonova, Rui Wen Ou, Weike Sun, Jacqueline Wolfrum, Paul W. Barone, Rajeev J. Ram, Stacy Springs, Richard Braatz, and Anthony J. Sinskey. Process development, characterization, and understanding in an integrated continuous monoclonal antibody manufacturing testbed. *AIChE Annual Meeting*, San Francisco, California, November 16-20, 2020. Abstract 8e.
319. Sha Sha, Tam Nguyen, Andrew J. Maloney, Caleb Neufeld, Georgios Katsikis, Paul W. Barone, Jacqueline Wolfrum, Stacy Springs, Scott Manalis, Anthony J. Sinskey, and Richard Braatz. A mechanistic analysis of recombinant adeno-associated virus productivity

in biomanufacturing. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 157v. poster

320. Andreas Gimpel, Georgios Katsikis, Sha Sha, Andrew J. Maloney, Moo Sun Hong, Tam Nguyen, Jacqueline Wolfrum, Stacy Springs, Anthony J. Sinskey, Scott Manalis, Paul W. Barone, and Richard Braatz. Process analytical technologies for recombinant adeno-associated virus-based gene therapy. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 157aa. poster
321. Matthew R. Dobbins, J. Carl Pirkle, Jr., Marat Andreev, David A. Nicholson, Gregory C. Rutledge, and Richard D. Braatz. Model of nonisothermal blown film extrusion using the perturbation expansion technique. Mathematical modeling of blown film extrusion using the discrete slip-link rheological model. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 161y. poster
322. Nathan Volchko, Gregory C. Rutledge, and Richard D. Braatz. Heterogeneous nucleation mechanisms in polyolefins: Experiments linked with molecular simulations. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 161av. poster
323. Moo Sun Hong, Amos E. Lu, and Richard D. Braatz. Digitalization of biopharmaceutical manufacturing. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. November 20, Abstract 195e.
324. Weike Sun and Richard D. Braatz. Recognizing and avoiding big data analytics traps in applications. Big Data and Applications in Advanced Modeling and Manufacturing session. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 224b.
325. Anastasia Nikolakopoulou and Richard D. Braatz. Automated optimization and control of modular chemical systems. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 334v. poster
326. Andrew J. Maloney, Elizabeth M. Cummings Bende, Dragana Bozinovski, Amos Enshen Lu, Jose Sangerman, Moo Sun Hong, Anastasia Artamonova, Rui Wen Ou, Weike Sun, Jacqueline Wolfrum, Paul W. Barone, Stacy C. Springs, Anthony J. Sinskey, and Richard D. Braatz. Process control strategy development for an integrated continuous platform for monoclonal antibody manufacturing. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 367d.
327. Hongbo Zhao, Brian D. Storey, Richard Braatz, and Martin Z. Bazant. Inverse learning of material physics through image data and continuum modeling. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 477d.
328. Moo Sun Hong, Amos E. Lu, Andrew J. Maloney, Elizabeth M. Cummings Bende, Dragana Bozinovski, Jose Sangerman, Anastasia Artamonov, Rui Wen Ou, Paul W. Barone, Jacqueline Wolfrum, Stacy Springs, Anthony J. Sinskey, and Richard Braatz. First-principles dynamic simulation of an integrated continuous biomanufacturing platform. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 542e.
329. Andrew J. Mahoney, Amos E. Lu, Neil C. Dalvie, Joseph R. Brady, Kerry Routenberg Love, J. Christopher Love, and Richard Braatz. Modeling of copy number variability in Pichia pastoris. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 620b.
330. Tam Nguyen, Sha Sha, Andrew J. Maloney, Caleb Neufeld, Jacqueline Wolfrum, Stacy Springs, Paul W. Barone, Anthony J. Sinskey, and Richard Braatz. Mathematical modeling of gene therapy manufacturing. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 667d.

331. Anastasia Nikolakopoulou and Richard D. Braatz. Polynomial NARMAX-based nonlinear model predictive control of modular chemical system. *AIChE Annual Meeting*, San Francisco, California, November 15-20, 2020. Abstract 716c.
332. K. Shah, A. Subramaniam, L. Mishra, T. Jang, M. Bazant, R. Braatz, and V. R. Subramanian. Challenges in moving to multiscale battery models – Where electrochemistry meets and demands more from math. *Pacific Rim Meeting on Electrochemical and Solid-State Science (PRiME 2020)*, October 4-9, 2020. Abstract F03-1604.
333. Iris E. Hwang, Georgios Katsikis, Sha Sha, Vincent Agache, Paul W. Barone, Jacqueline Wolfrum, Stacy C. Springs, Anthony J. Sinskey, Richard D. Braatz, and Scott R. Manalis. Measuring the DNA cargo of viruses using nanofluidics. *73rd Annual Meeting of the APS Division of Fluid Dynamics*, November 22-24, 2020. Abstract J13.00004.
334. Tam Nguyen, Sha Sha, Moo Sun Hong, Andrew J. Maloney, Paul W. Barone, Caleb Neufeld, Jacqueline Wolfrum, Stacy L. Springs, Anthony J. Sinskey, and Richard D. Braatz. Mechanistic model for production of recombinant adeno-associated virus via triple transfection of HEK293 cells. *Bioman Meeting on Data Analytics along the Biomanufacturing Life Cycle*, May 18-20, 2021. Poster.
335. Moo Sun Hong, Amos E. Lu, Rui Wen Ou, Jacqueline Wolfrum, Stacy L. Springs, Anthony J. Sinskey, and Richard D. Braatz. Model-based control for continuous viral inactivation of biopharmaceuticals. *Bioman Meeting on Data Analytics along the Biomanufacturing Life Cycle*, May 18-20, 2021. Poster.
336. Tam N. T. Nguyen, Sha Sha, Moo Sun Hong, Andrew J. Maloney, Paul W. Barone, Caleb Neufeld, Jacqueline Wolfrum, Stacy L. Springs, Anthony J. Sinskey, and Richard D. Braatz. Mechanistic model for production of recombinant adeno-associated virus via triple transfection of HEK293 cells. *Bioman Meeting on Data Analytics along the Biomanufacturing Life Cycle*, May 18-20, 2021. Poster.
337. Fabian Mohr and Richard D. Braatz. Smart data analytics for biomanufacturing processes. *Bioman Meeting on Data Analytics along the Biomanufacturing Life Cycle*, May 18-20, 2021. Poster.
338. Seongkyu Yoon, Richard D. Braatz, David McNally, Wenzhen Huang, Sarah Kostanski, and Yong Suk Lee. PC2.2-160 Building Cooperative Biomanufacturing Workforce Training Network (BioTnet). *NIIMBL Annual Meeting*, Washington, DC, July 14-16, 2021. Poster
339. Richard D. Braatz, David McNally, Anthony Grippe, and Shashi Kudugunti. Continuous Cell Culture for Viral Vaccines, *NIIMBL Annual Meeting*, July 14-16, 2021. Poster.
340. Supratim Das, Michael Forsuelo, Debbie Zhuang, Richard Braatz, William C. Chueh, and Martin Z. Bazant. Theory of formation cycling of graphite by understanding primary and secondary SEI. 240th ECS Meeting (October 10-14, 2021) (Batteries and Energy Storage), Abstract A03-0415.
341. Moo Sun Hong, Amos E. Lu, Jaehan Bae, Jong Min Lee, and Richard D. Braatz. Design and control of novel droplet-based system for estimating protein crystallization kinetics. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021.
342. Joachim Schaefer and Richard D. Braatz. Interactive software for teaching multivariable data analytics. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 241e.

343. Weike Sun, Fabian Mohr, Pil Rip Jeon, Moo Sun Hong, and Richard D. Braatz. Smart process analytics and machine learning. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 259e.
344. Dragana M. Bozinovski, Elizabeth M. Cummings Bende, Andrew J. Maloney, Jose Sangerman, Alexis B. Dubs, Amos E. Lu, Moo Sun Hong, Nili Persits, Anastasia Artamonova, Rui Wen Ou, Weike Sun, Jacqueline Wolfrum, Paul W. Barone, Rajeev J. Ram, Stacy Springs, Richard Braatz and Anthony J. Sinskey. Biomanufacturing and testbed development for the continuous production of monoclonal antibodies. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 293c.
345. Tam N. T. Nguyen, Sha Sha, Caleb Neufeld, Paul W. Barone, Jacqueline Wolfrum, Stacy L. Springs, Anthony J. Sinskey, and Richard D. Braatz. Model-based design of recombinant adeno-associated viral vector production. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 293f.
346. Richard D. Braatz, Weike Sun, and Brian W. Anthony. Teaching process data analytics and machine learning. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 449a.
347. Keynote Talk. Richard D. Braatz, Moo Sun Hong, Amos E. Lu, and Weike Sun. Integrated Quality by Design in (bio)pharmaceutical manufacturing. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 541d.
348. Moo Sun Hong, Amos E. Lu, Rui Wen Ou, Jacqueline Wolfrum, Stacy C. Spring, Anthony J. Sinskey, and Richard Braatz. Model-based control for column-based continuous viral inactivation of biopharmaceuticals. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 493c.
349. Moo Sun Hong and Richard D. Braatz. Process modeling and control of digital biopharmaceutical manufacturing. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021. Abstract 584a.
350. Anastasia Nikolakopoulou and Richard D. Braatz. Optimization and control of modular chemical systems for continuous manufacturing of pharmaceuticals. *AIChE Annual Meeting*, Boston, Massachusetts, November 7-12, 2021.

J. Videos and Other Press (abridged)

1. Challenges, Theory and Applications in Process Control. American Control Conference, June 27, 2001, https://ethw.org/Archives:Challenges,_Theory_and_Applications_in_Process_Control
2. Moving Past Trial-and-Error with Richard Braatz. Massachusetts Institute of Technology, Cambridge, Massachusetts, February 13, 2012. https://www.youtube.com/watch?v=xG0NU97EO8k
3. Alumni Stories: Richard Braatz. Oregon State University, Corvallis, Oregon, May 21, 2012. https://www.youtube.com/watch?v=HJn2kdTx6_k
4. An Overview of Multiscale Simulation Algorithms, Guidelines and Pitfalls to Avoid. Molecular and Multiscale Simulation Summer School, June 18, 2002. https://nanohub.org/resources/14323
5. Systems Nanotechnology: Identification, Estimation, and Control of Nanoscale Systems. IEEE Control Systems Society Presentation Library, 2012. http://ieeecss.org/presentations/grid?field_cc_pres_type_ref_target_id=289

6. A Roadmap for the Multiscale Simulation of Lithium-ion Batteries. National Science Foundation Mathematical Sciences Institute, November 6, 2013. https://mathinstitutes.org/videos/videos/3089
7. Richard Braatz: Why It's Important. Smartlab Exchange, San Diego, California, April 22, 2016. https://www.youtube.com/watch?v=vuB--t6bC38
8. Advanced Manufacturing of Biopharmaceuticals. 13th International Conference on Informatics in Control, Automation and Robotics, July 29-31, 2016. https://vimeo.com/179200315
9. Richard Braatz, Principal Investigator and Prof. of Chemical Engineering, Novartis-MIT Center. Generis Group, American Biomanufacturing Summit, San Diego, California, October 17, 2017. https://www.youtube.com/watch?v=HplZu7Xy4yE
10. A Sampling of Data Education in ChE Curricula. Data Science: Opportunities to Transform Chemical Sciences and Engineering, National Academies of Sciences, Engineering, and Medicine, February 27-28, 2018. https://vimeo.com/262996450
11. Predictions for "Industry 4.0" with Dow's Leo Chiang and MIT's Richard Braatz. AIChE ChEnected, AIChE Fall Annual Meeting, Pittsburgh, Pennsylvania, November 1, 2018. https://www.youtube.com/watch?v=6-Foaox8hWI
12. NSF DMREF Project: A New Approach to Design of Polymer Morphology, Materials Research Society Meeting, November 21, 2018. https://www.youtube.com/watch?v=gziLEWFYu7w
13. Accelerated Materials Design & Discovery: Data Driven Battery Design. Toyota Research Institute, December 2018. https://vimeo.com/user24801969/review/292772163/1bcbcdd18e
14. Anton Simeonov, Literature Review: Advanced Biologic Therapies and Advanced Biologics Manufacturing, *Genetic Engineering & Biotechnology News*, January 18, 2019. https://www.genengnews.com/topics/drug-discovery/literature-review-advanced-biologic-therapies-and-advanced-biologics-manufacturing/
15. AI Accurately Predicts the Useful Life of Batteries. Toyota Research Institute, March 25, 2019. https://www.tri.global/news/researchers-use-ai-to-accurately-predict-the-usefu-2019-3-25; https://corporatenews.pressroom.toyota.com/releases/mit-stanford-and-toyota-research-institute-use-ai-to-accurately-predict-the-useful-life-batteriesie.htm?view_id=43431; https://youtu.be/WCYIHnmiIAE
16. Embracing Change: How Innovative Companies are Advancing Continuous Biopharma Manufacturing. MassBio, June 12, 2019. https://www.ustream.tv/recorded/122327075
17. New Members of the National Academy of Engineering, *Angewandte Chemie Int. Ed.*, 58:10791, 2019. https://onlinelibrary-wiley-com.libproxy.mit.edu/doi/full/10.1002/anie.201907431
18. Podcast: Improving battery charging, and harnessing energy from the air. Nature Podcast, February 19, 2020. https://www.nature.com/articles/d41586-020-00482-x
19. Optimizing fast charging using machine learning. Toyota Research Institute. February 19, 2020. https://www.tri.global/news/new-machine-learning-method-from-stanford-with-to-2020-2-19
20. Katherine Ellen Foley, The US wants to use Covid-19 to insource drug manufacturing, Quartz Media, July 26, 2020. https://qz.com/1884683/covid-19-could-bring-the-drug-supply-chain-to-the-us/

21. MIT-Spain "la Caixa Foundation" Seed Fund Report. MISTI (MIT International Science & Technology Initiatives), July 27, 2020. https://www.youtube.com/watch?v=eR4xxmpKW04&feature=youtu.be
22. Vivienne Raper, Bioprocessing Warms to Artificial Intelligence, *Genetic Engineering & Biotechnology News*, vol. 40, no. 8, August 3, 2020. https://www.genengnews.com/insights/bioprocessing-warms-to-artificial-intelligence/
23. Zachary Brennen, The Next Unprecedented Vaccine Hurdle: Making Hundreds of Millions of Doses. *Politico*, August 12, 2020. https://www.politico.com/news/2020/08/12/coronavirus-vaccine-challenges-394444
24. Arghya Bhowmik and Tejs Vegge, AI Fast Track to Battery Fast Charge, *Joule*, 4(4):717-719, April 15, 2020. https://doi.org/10.1016/j.joule.2020.03.016
25. Daniel Oberhaus, AI Is Throwing Battery Development into Overdrive. *Wired*, October 12, 2020. https://www.wired.com/story/ai-is-throwing-battery-development-into-overdrive/
26. Suzanne Oliver, Electric-Car Batteries Get a Boost from Artificial Intelligence. *The Wall Street Journal*, November 3, 2020. https://www.wsj.com/articles/electric-car-batteries-get-a-boost-from-artificial-intelligence-11604422792
27. Gareth John Macdonald, Viral Testing in the Era of Continuous Biomanufacturing and COVID-19. *Genetic Engineering & Biotechnology News*, 40(12 Supplement):13-15, December 3, 2020. https://www.genengnews.com/topics/bioprocessing/viral-testing-in-the-era-of-continuous-biomanufacturing-and-covid-19/
28. Gareth John Macdonald, Machine Learning for Better Bioprocess Data Analysis. *Genetic Engineering & Biotechnology News*, January 12, 2021. https://www.genengnews.com/topics/bioprocessing/machine-learning-for-better-bioprocess-data-analysis/
29. Glennda Chui, In a Leap for Battery Research, Machine Learning Gets Scientific Smarts. *Science Daily*, March 8, 2021. https://www.sciencedaily.com/releases/2021/03/210308111910.htm
30. Roxanne Khamsi. The world needs more vaccines, faster. A tiny tube could make all the difference. *National Geographic*, August 11, 2021. https://www.nationalgeographic.com/science/article/the-world-needs-more-vaccines-faster-a-tiny-tube-could-make-all-the-difference. Also, *MIT Daily*, August 13, 2021.
31. Mike May, Accelerating Biopharma Storage with Microwaves, *Genetic Engineering & Biotechnology News*, August 10, 2021. https://www.genengnews.com/topics/bioprocessing/speeding-up-biopharma-storage-with-microwaves/

III. RESIDENT INSTRUCTION

A. Supervision of Graduate Students

1. Andrew Paul Featherstone, Ph.D. 1997, "Control Relevant Identification of Large Scale Sheet and Film Processes," Manufacturing Solutions Leader, Packaging Dynamics
2. Evan Lee Russell, Ph.D. 1998, "Process Monitoring of Large Scale Systems," Control Technology Manager, ExxonMobil
3. Jeremy Glen VanAntwerp, Ph.D. 1999, "Globally Optimal Robust Control for Large Scale Sheet and Film Processes," Professor, Department of Engineering, Calvin College

4. Ernesto Rios-Patron, Ph.D. 2000, “A Generic Framework for Nonlinear Analysis and Control,” Chief Engineering Officer, Americas Mining Corporation - Grupo México
5. Leo Hao-Tien Chiang, Ph.D. 2001, “Fault Detection and Diagnosis for Large Scale Systems,” Senior Research Specialist, Dow Chemical Company
6. David Lei Ma, Ph.D. 2002, “Simulation and Optimization of Multidimensional Crystallization Processes,” Senior Research Engineer, Pratt & Whitney
7. Timokleia Togkalidou, Ph.D. 2002, “Robust Nonlinear Control using Bilinear Matrix Inequalities with Application to a Batch Crystallization Process,” General Chemical State Laboratory of Greece, Athens
8. Rudiyanto Gunawan, Ph.D. 2003, “Simulation and Optimal Control of Transient Enhanced Diffusion,” Assistant Professor of Chemical and Bioengineering, Swiss Federal Institute of Technology (ETH Zürich), soon to move to Associate Professor at the University at Buffalo
9. Michael Yoo Lim Jung, Ph.D. 2003, “New Surface and Optically Stimulated Physics for Modeling Diffusion in Si” (primary advisor: Prof. E. G. Seebauer), Patent Agent, Walnut, CA
10. Timothy Owen Drews, Ph.D. 2004, “Multiscale Simulation of Nanofabricated Structures: Application to Copper Electrodeposition for Electronic Devices,” Senior Software Engineer, GE Oil and Gas
11. Eric John Hukkanen, Ph.D. 2004, “A Systems Approach to the Modeling and Control of Molecular, Microparticle, and Biological Distributions,” Principal Scientist, DuPont
12. Effendi Rusli, Ph.D. 2006, “Modeling and Control of Nucleation and Growth Processes with Application to Electrodeposition and Crystallization Processes,” Engineer, PT Lautan Luas Tbk, Indonesia
13. Xing Yi Woo, Ph.D. 2007, “Modeling and Simulation of Antisolvent Crystallization: Mixing and Control,” Consultant, The Jackson Laboratory
14. Xiaohai Li, Ph.D. 2007, “Multiscale Simulation and Model-based Optimal Design of Copper Electrodeposition,” R&D Engineer, Synopsys, Hillsboro, Oregon
15. Charlotte Tsz Mei Kwok, Ph.D. 2007, “Advanced Methods for Defect Engineering in Silicon” (primary advisor: Prof. E. G. Seebauer), Research Scientist, Taiwan Semiconductor Manufacturing Company
16. Mohan Karulkar, Ph.D. 2007, “Additive-assisted Copper Nucleation on Gold: The Role of Multiscale Modeling” (primary advisor: Prof. R. C. Alkire), Principal Staff Member, Sandia National Laboratories
17. Martin Wijaya Hermanto, Ph.D. 2009, “Optimal Control of Solvent-Mediated Polymorphic Transformations,” Chemometrician, GlaxoSmithKline, Singapore
18. Joshua David Isom, Ph.D. 2009, “Exact Solution of Bayes and Minimax Change Detection Problems,” R&D, Process Data Technologies Group, Air Products & Chemicals
19. Nicholas Chung Shen Kee, Ph.D. 2009, “Design and Modeling of Pharmaceutical Polymorphic Crystallization Processes,” Lead PAT Specialist, Merck, Singapore
20. Masako Kishida, Ph.D. 2010, “Robust Optimal Boundary and Spatial Field Control of Distributed Parameter Systems” (Mechanical Science and Engineering), Associate Professor, National Institute of Informatics in Tokyo, Japan
21. Ashlee Nicole Ford Versypt, Ph.D. 2012, “Modeling of Controlled-Release Drug Delivery from Autocatalytically Degrading Polymer Microspheres,” Assistant Professor of Chemical Engineering, Oklahoma State University

22. Kwang Ki Kim, Ph.D. 2013, “Model-Based Robust and Stochastic Control, and Statistical Inference for Uncertain Dynamical Systems” (Aerospace Engineering), Assistant Professor of Electrical Engineering, Inha University, South Korea
23. Qinglin Su, Ph.D. 2014 (National University of Singapore), “Modeling, Monitoring, and Control of pH-shift Reactive Crystallization” (primary advisor: Min-Sen Chiu), Process Systems Engineering Lead, Continuus
24. Lifang Zhou, Ph.D. 2014, “Mathematical Modeling and Design of Novel Semi-continuous and Continuous Crystallizations,” Reservoir Engineer, Saudi Aramco
25. Xiaoxiang Zhu, Ph.D. 2014, “Mathematical Modeling and Simulation of Intravascular Drug Delivery from Drug-Eluting Stents with Biodegradable PLGA Coating,” Research Scientist, Amgen
26. Mo Jiang, Ph.D. 2015, “Pharmaceutical Crystallization Design Using Micromixers, Multiphase Flow, and Controlled Dynamic Operations,” Assistant Professor, Virginia Commonwealth University
27. Michael L. Rasche, Ph.D. 2015, “Mathematical Modeling, Simulation, and Optimal Design of Pharmaceutical Crystallizers,” Adjunct Assistant Professor of Mathematics, University of North Carolina at Asheville
28. Zachary Ward Ulissi, Ph.D. 2015, “Modeling and Simulation of Stochastic Phenomena in Carbon Nanotube-Based Single Molecule Sensors,” Assistant Professor, Carnegie Mellon University
29. Hong Jang, Ph.D. 2015 (KAIST), “State and Parameter Estimation for Inherent Stochastic Nanobiosystems,” postdoc at KAIST
30. Mark Christopher Molaro, Ph.D. 2016, “Computational Statistical Methods in Chemical Engineering,” Data Scientist, Element Analytics
31. Jouha Min, Ph.D. 2016, “Modeling of Molecular Release from Layer-by-Layer Polyelectrolyte Polymeric Films,” postdoc at Harvard Medical School
32. Lucas Foguth, Ph.D. 2016, “Integration of Quality-by-Design into Control Systems Design for Continuous Pharmaceutical Manufacturing,” Officer, U.S. Navy – June 2012
33. Joel Anthony Paulson, Ph.D. 2016, “Modern Control Methods for Chemical Process,” postdoc at University of California, Berkeley
34. You Peng, Ph.D. 2017, “Crystallization of Calcium Sulphate during Phosphoric Acid Production: Improving Filtration through Improvement in Particle Shape and Size Distribution,” Process Modeling, Dow Chemical
35. Zhilong (Peter) Zhu, Ph.D. 2017, “Multidimensional Population Balance Modeling and Optimization of Continuous Reactive Crystallization,” Senior Strategy Consultant/Data Scientist, IBM
36. Dongying (Erin) Shen, Ph.D. 2017, “Optimal Control of Dynamical Systems with Time-invariant Probabilistic Parameter Uncertainties,” Control Engineer, Amgen
37. Kristen Ann Severson, Ph.D. 2018, “Machine Learning for Applications in Chemical and Biological Engineering,” Postdoctoral Associate, IBM
38. Nicholas J. Mozdzierz, Ph.D. 2018, “Developing Scalable and Modular Technologies for Continuous Biopharmaceutical Production,” Postdoctoral Researchers, Novartis Basel
39. Amos Enshen Lu, Ph.D. 2019, “Systems Engineering for Biomanufacturing,” postdoctoral associate, MIT
40. Matthias Freiherr von Andrian-Werburg, Ph.D., 2020, “Fast Stochastic Model Predictive Control under Parametric Uncertainties”

41. Weike Sun, Ph.D. 2020, “Advanced Process Data Analytics,” consulting company
42. Andrew John Maloney, Ph.D. 2021, “Case Studies in the Modeling and Control of Continuous Pharmaceutical Manufacturing Processes,” Research Scientist, Amgen
43. Moo Sun Hong, Ph.D. 2021, “Model-Based Design and Control of Biopharmaceutical Manufacturing Processes,” Postdoc, MIT
44. Paphonwit Chaiwatanodom, Ph.D. 2021, Fault Detection and Identification of Large-scale Dynamical Systems,” self-employed

1. Andrew P. Featherstone, M.S. 1995, “Control Relevant Identification of Structured Large Scale Systems”
2. Evan L. Russell, M.S. 1996, “Multidimensional Realization and Model Reduction of Large Scale Uncertain Systems”
3. Jeremy G. VanAntwerp, M.S. 1997, “Globally Optimal Robust Control for Systems with Nonlinear Time-Varying Perturbations”
4. Ernesto Rios-Patron, M.S. 1997, “Nonlinear Stability Analysis of Discrete and Continuous Time Systems with Applications to Artificial Neural Networks”
5. Leo H.-T. Chiang, M.S. 1999, “Chemometrics and Discriminant Analysis for Fault Diagnosis”
6. David L. Ma, M.S. 1999, “Worst-case Performance Analysis of Optimal Batch Control Trajectories”
7. Timokleia Togkalidou, M.S. 1999, “Inferential Modeling in Pharmaceutical Crystallization”
8. Rudiyanto Gunawan, M.S. 2000, “Dimensionality Reduction and Robustness Analysis of Large Scale Systems”
9. Irene Fusman, M.S. 2002, “High Resolution Simulation of Multi-Dimensional Crystal Growth with Aggregation,” Senior Process Engineer, Armored AutoGroup
10. Effendi Rusli, M.S. 2003, “Nonlinear Control of a Kinetic Monte Carlo-Finite Difference Simulation”
11. Joshua Isom, M.S. 2004, “Economic Design of Stateless Control Charts for Deteriorating Systems,” Systems and Software Engineer, Sikorsky Aircraft
12. Xiaohai Li, M.S. 2004, “Simulation of Shape Evolution in Moving Boundary Systems”
13. Mohan Karulkar, M.S. 2004, “Multiscale Simulation of Copper Electrodeposition Along a Resistive Substrate”
14. Charlotte T. M. Kwok, M.S. 2005, “Systems-Based Modeling of a New Method for Defect Engineering in Transistor Junction Fabrication”
15. Li May Goh, M.S. 2007, “Dynamic Analysis of Pharmaceutical and Biological Systems from the Nano- to Microscale,” Research Engineer, General Electric
16. Paul D. Arendt, M.S. 2008, “Controlled Drug Release Delivery Optimization of Polymer Micro Spheres and Growth of Crystals with Desired Microstructures” (General Engineering), Data Modeling Analyst, CNA
17. Kwang-Ki Kim, M.S. 2009, “Robust Control for Systems with Sector-Bounded, Slope-Restricted, and Odd Monotonic Nonlinearities Using Linear Matrix Inequalities” (Aeronautical Engineering)
18. Ashlee N. Ford, M.S. 2009, “Biodegradable Polymeric Drug Delivery: Parallel Simulation and Optimal Drug Release Profiles”

19. Xiaoxiang Zhu, M.S. 2010, “Modeling and Simulation of Coronary Stents: Intravascular Drug Delivery and Arterial Drug Distribution”
20. Michael L. Rasche, M.S. 2010, “Computational Fluid Dynamics and Population Balance Modeling of Particulate Systems”
21. Lifang Zhou, M.S. 2010, “Optimal Control of Antisolvent and Cooling Crystallization”
22. Folarin Latinwo, M.S. 2011, “Robust Optimization Techniques and Design of Li-ion Batteries,” Postdoctoral Scholar in Chemical and Biological Engineering, Princeton University
23. Jochen Cremer, M.S., 2016, “Inversion-based Internal Model Control of Chemotaxis” (Process Systems Engineering, University of Aachen), Graduate Student in Electrical and Electronic Engineering, Imperial College London
24. Kevin Peng, MS and MBA 2017, “An Equipment Selection Methodology for Continuous Manufacturing of Small-Molecule Drugs,” Research Engineer, Amgen
25. Moritz Hans Peter Benisch, 2017, “Dynamic Modeling, Simulation, Optimisation, and Control of Countercurrent Slug Flow Crystallization” (Chemical and Bioengineering, ETH Zurich, Switzerland), Accenture Switzerland
26. Maria Dominique Bautista Rustia, M.S. Mechanical Engineering and M.B.A., 2018, “Augmenting Drug Process Development Capacity through Applications of Lean Principles and High Throughput Technology,” Operations Associate, McKinsey & Company
27. Stanislas Marie Buiatti, M.S. 2018, “Multiscale Modeling and Simulation of Crystallization Using OpenFOAM” (Chemical Engineering and Biotechnology, Ecole Polytechnique Lausanne, Switzerland), Ph.D. Student, Ecole Polytechnique Lausanne, Switzerland
28. Michael Forsuelo, M.S. 2019, “Lifetime Prediction for Lithium-ion Batteries Undergoing Fast Charging Protocols,” Graduate Student, Massachusetts Institute of Technology
29. Hillary Rae Doucette, M.S. Electrical Engineering and Computer Science and M.B.A., 2019, “Commercial Technology Transfer Optimization for Drug Substance Process Development,” Amgen
30. Ketan Kumar, M.S. Chemical Engineering and M.B.A., 2020, “Product Management Framework for the Development of Automation Solutions for Biologics Drug Substance Manufacturing”
31. Andreas L. Gimpel, M.S. 2020, “A Systematic Workflow for the Investigation of Crystallization as a Separation Process for Biomanufacturing of rAAV-based Gene Therapies,” (Chemical and Bioengineering, ETH Zürich, Switzerland), PhD student at ETH
32. Joachim Schaeffer, M.S. Energy Science and Technology, 2021, “Advanced Feature Design for Battery Lifetime Prediction,” ETH Zürich, PhD student at Technischen Universität Darmstadt

1. Kaylee W. Schickel, 2014-date
2. Anastasia Nikolakopoulou, 2015-date
3. Andrew John Maloney, 2016-date
4. Tam Ngoc Thanh Nguyen, 2017-date
5. Marc Dylan Berliner, 2018-date
6. Matthew Robert Dobbins, 2018-date
7. Fabian Mohr, 2018-date
8. Patrick Asinger, 2019-date

9. Rohan Patrick Kadambi, 2019-date
10. Julia Rose Provenzano, 2020-date
11. Alexis Breanna Dubs, 2020-date
12. Krystian Kamil Ganko, 2020-date
13. Pavan Krishna Inguva, 2020-date
14. Elias Machado Roberty, 2020-date, MS in Engineering and Management, Predictive Analytics Applications for Oil and Gas Processing Facilities
15. Joachim Schaeffer, 2021-date, PhD student at Technischen Universität Darmstadt
16. Lois Eileen Nersesian, 2021-date, MBA, MSChE, with Levi Retsef and Mark DiMartino
17. Andrew C. Mikkelson, 2021-date, MBA, MSChE, with Levi Retsef and Jeremy Conner
18. Flemming Holtorf, 2021-date, with Alan Edelman
19. Prakitr Srisuma, CSE/ME, 2021-date, with George Barbastathis

B. Supervision of Postdoctoral Fellows/Research Associates

1. Jay Alameda, 1997-2000, Senior Research Programmer, National Center for Supercomputing Applications
2. Mst Kamrunnahar, 2001-2003, Research Associate, Center for Neural Engineering, Department of Engineering Science and Mechanics, Pennsylvania State University
3. Pui Shan (Ann) Chow, 2001, Senior Research Fellow, Institute of Chemical and Engineering Sciences, Singapore
4. Zoltan K. Nagy, 2001-2003, Professor of Chemical Engineering, Purdue University
5. Yuan (Eric) He, 2003-2005 (joint with Prof. R. Alkire), Vice President of Engineering, XTAL Inc.
6. Mitsuko Fujiwara, 1999-2011, self-employed
7. J. Carl Pirkle Jr., 2000-2020
8. Hong Chen, 2005-2006, Engineer, XTAL Inc.
9. Lisa Bievenue, 2006-2008, Project Coordinator, University of Illinois at Urbana-Champaign
10. Kejia Chen, 2008-2009, Data Scientist, Google
11. Richard Lakerveld, 2010-2012 (joint with Prof. P. I. Barton), Assistant Professor, Hong Kong University of Science and Technology
12. Masako Kishida, 2010-2012, Associate Professor, National Institute of Informatics, Tokyo, Japan
13. Brahim Benyahia, 2011-2012 (joint with Prof. P. I. Barton), Senior Lecturer, University of Loughborough
14. Joseph K. Scott, 2012-2013, Assistant Professor, Clemson University
15. Ashlee N. Ford Versypt, 2012-2014, Assistant Professor, Oklahoma State University
16. Stefan Streif, 2013, Professor, Technische Universität Chemnitz
17. Ali Mesbah, 2012-2014, Assistant Professor, University of California, Berkeley
18. Eranda Harinath, 2013-2018, Control Engineering, Sanofi
19. Jasdeep Singh Mandur, 2014-2017, Research & Development, Merck
20. Michael L. Rasche, 2015-2017
21. Mo Jiang, 2015-2017, Assistant Professor, Virginia Commonwealth University
22. Yiming Wan, 2015, 2016-2018, Assistant Professor, Huazhong University of Science and Technology

23. Cezar Augusto da Rosa, 2015-2016, Professor, University Federal Rio Grande, Brazil
24. Sergio Lucia, 2016, Junior Professor, Technical University of Berlin
25. Benben Jiang, 2016-date
26. Gerard Capellades Mendez, 2018
27. Elizabeth Cummings Bende, 2018-date (joint with Anthony Sinskey and Stacy Springs)
28. Arie Havasov, 2018-2019, Senior Associate Process Modeling Scientist, Pfizer
29. Corinne Carpenter, 2018-2019, nference
30. Sha Sha, 2019-date (joint with Anthony Sinskey)
31. Amos E. Lu, 2019-2020
32. Mutti-Ur Rehman, 2020-date
33. Giacomo Galuppini, 2020-date
34. Frederik Doerr, 2020-date
35. Keon Ho, 2020-date
36. Jinwoo Park, 2020-date
37. Hamza Ismail, 2020-date
38. Sanket Diwale, 2020-date
39. Moo Sun Hong, 2021-date
40. Damdae Park, October 15, 2021 through July 14, 2022
41. Yi Zhang, December 1, 2021-November 31, 2022
42. Shin Hyuk Kim, 2021-

C.1. Service on Ph.D. Examination Committees

UIUC: N. Agarwal (Mechanical Science and Engineering), H. An (Civil and Environmental Engineering), N. Andrews, L. Ang, M. Balmas, X. Bao, K. Benak (Material Science and Engineering), Paul Blowers, Lyndon Brown (Computer and Electrical Engineering), Kyle Carmarda, G. Channell, K. S. Cheong (prelim only), Leo Chiang (Chair), Y. P. G. Chua (Chair), M. Daley (Material Science and Engineering), A. Dalton, J. DesNoyer, Kapil Dev, P. Dimitrakopoulos, T. Drews, Steven Duke, E. Eliadis, A. Ee Lui (Chair), Andrew Featherstone (Chair), M. Forrest (prelim only), Ashlee N. Ford (Chair), Kevin Furman, Joshua Gray, Rudiyanto Gunawan (Chair), C. Gupta, Rebecca Harman-Baker (Computer Science), Guangwen He, Alice Hollister, J. Z. Hua, E. Hukkanen (Chair), Joshua Isom (Chair), Suzanne Jogun, Michael Jung, Mohan Karulkar, Nicholas C. S. Kee, Y. Kondratenko, Rebecca Kruse (Chemistry), Charlotte Kwok, James Ledbetter, X. Li (Chair), H.-H. Lin (Mechanical and Industrial Engineering), D. Lubomirsky, M. Luebbers, E. Lui, Diana Llera-Rodriguez, David Lei Ma (Chair), E. Metsi, Nitish Nair (MIT), S. W. Daniel Ong, Rakesh Parekh, Yan Qin, Michael Rasche (Chair), Ernesto Rios-Patron (Chair), Effendi Rusli (Chair), Evan Russell (Chair), Supreet Saini, Wolfgang Schmidt, Joseph Shectman (Mechanical and Industrial Engineering), Ryan Stephens, Kalena Stovall, S. Talreja, W. L. Tang (Chair), Fred Thomas, Tina Togkalidou (Chair), Jeremy VanAntwerp (Chair), Dirk Van Hyning, Xing Yi Woo (Chair), Feng Xue, Rama Vaidyanathan, Yannis Voudouris, Matthew Willis, Kang Wu, C. Yeung, Jennifer L. Younker, P. Zamora, L. L. Zhan Zhu

MIT partial list: Nitish Nair, Spencer Schaber, Lifang Zhou (advisor), Xiaoxiang Zhu (advisor), Stuart Harwood, Kamil Khan, Mo Jiang (advisor), Zachary Ulissi (co-advisor), Sivaraman Ramaswamy, Brandon J. Reizman, Qing Xu, Mark C. Molaro (advisor), Lee William

Drahushuk, Jouha Min (co-advisor), Joel A. Paulson (advisor), Lucas Foguth (advisor), Tsai-ta Christopher Lai, Jicong Li, Raymond Smith (presider), Matthew Johnson, Dongying (Erin) Shen (advisor), You Peng (co-advisor), Zhilong Zhu (advisor), Mary Catherine "Catie" Bartlett, Kristen A. Severson (advisor), Elizabeth (Liza) M. Y. Lee, Garrett Ryan Dowdy, Amos E. Lu (advisor), Jennifer M. Schall, Suzane Martins Cavalcanti, Matthias E. Freiherr von Andrian-Werburg (advisor), Michael Forsuelo (advisor), Weike Sun (advisor), Kehang Han (presider), Yili Qian (Mechanical Engineering), Rohit Kannan, Nian Liu, Supratim Das (presider), Andrew John Maloney (advisor), Paphonwit Chaiwatanodom (advisor), Kosi C. Aroh, Moo Sun Hong (advisor), Hongbo Zhao (presider)

Kaylee Schickel (advisor), Anastasia Nikolakopoulou (advisor), Tam Ngoc Thanh Nguyen (advisor), Qingying (Jennie) Zeng, Yen-Ting Wang, Xiaorui Dong, Surya Effendy, Hamid Doosthosseini, Marc Dylan Berliner (advisor), Matthew Robert Dobbins (advisor), Fabian Mohr (advisor), Patrick Asinger (advisor), Rohan Patrick Kadambi (advisor), Julia Rose Provenzano (advisor), Alexis (Lexi) Breanna Dubs (advisor), Krystian Kamil Ganko (advisor), Pavan Krishna Inguva (advisor), Chinmay Shripad Gangal

Washington University in St. Louis: Venkatasailanathan Ramadesigan, Paul W.C. Northrop, BharatKumar Suthar

KAIST: Hong Jang, Shin-Hyuk Kim

Otto-von-Guericke-Universität Magdeburg: Daniel Hast

C.2. External Examiner on Ph.D. Theses

- Cheng Cheng, Chemical and Biomolecular Engineering, National University of Singapore
- Calin-Cristian Cormos, Chemistry and Chemical Engineering, Babes-Bolyai University Cluj-Napoca, Romania
- Zhang Yong, Electrical and Computer Engineering, National University of Singapore
- Vinay Kumar Kariwala, Chemical and Materials Engineering, University of Alberta
- Ana-Maria Cormos, Chemistry and Chemical Engineering, Babes-Bolyai University, Cluj-Napoca, Romania
- Guangwen (Wen) He, Chemical and Biomolecular Engineering, National University of Singapore
- Hok Chung Alex Chen, Chemical Engineering, The University of Queensland, Australia
- Christian Lindenberg, Mechanical and Process Engineering, Swiss Federal Institute of Technology (ETH), Zürich
- Huang Wen, Chemical and Biomolecular Engineering, National University of Singapore
- Marcello Torchio, Computer Science Engineering, University of Pavia, Italy
- Giovanni Maria Maggioni, Mechanical and Process Engineering, , Swiss Federal Institute of Technology (ETH), Zürich
- Fridolin Röder, Technical University of Braunschweig, Germany
- Shin Hyuk Kim, KAIST, South Korea
- Jarrod Lund, Materials Engineering, Purdue University

C.3. Visiting Faculty/Scientists

- Rudiyanto Gunawan, Department of Chemical and Biological Engineering, University at Buffalo (December 2010)
- Rolf Findeisen, Institute for Automation Engineering, Laboratory for Systems Theory and Automatic Control, Otto-von-Guericke University Magdeburg, Germany (August 2011, Summer 2012, Summer 2013, Summer 2017)
- Davide M. Raimondo, Dipartimento di Informatica e Sistemistica, Universita' degli Studi di Pavia, Italy (2012)
- Lixian Zhang, Research Center of Intelligent Control and Systems. Harbin Institute of Technology, China (2012-2013)
- R. Bhushan Gopaluni, Department of Chemical and Biological Engineering, University of British Columbia, Vancouver, Canada (2012-2013)
- Yanyang Wu, East China University of Science and Technology, Shanghai, China (2013-2014)
- Jeremy G. VanAntwerp, Calvin College, Grand Rapids, Michigan (2013-2014)
- Jingcai Cheng, Institute of Process Engineering, Chinese Academy of Sciences, Beijing (2014-2015)
- Saima Noor, COMSATS Institute of Information Technology, Pakistan (2015-2016)
- Hector Budman, University of Waterloo (2015)
- Carlos Ocampo-Martinez, Technical University of Catalunya (2015)
- Brijesh Dixit, Indian Railways (2016)
- Jong Min Lee, Seoul National University, South Korea (2016-2017)
- Ulrike Krewer, Technical University of Braunschweig (2017)

E. Courses Taught (with recent instructor and course scores received by students)

E.1 University of Illinois at Urbana-Champaign

1. The Chemical Engineering Profession
2. Introduction to Chemical Engineering
3. Chemical Rate Processes and Reactor Design
4. Chemical Process Control and Dynamics
5. Open-ended Experimental Design/Process Development
6. Applied Mathematics in Chemical Engineering (graduate)
7. Large-scale Systems Theory (graduate)
8. Chemical Reaction Engineering (graduate)
9. Advanced Topics in Heat and Mass Transfer (graduate)
10. Electrochemical Engineering (undergraduate and graduate)
11. Optimal Control (graduate)
12. Systems Engineering (graduate)

E.2 Massachusetts Institute of Technology

1. Systems Engineering (10.551, graduate, Spring 2003 and Spring 2011-date)
2. Advanced Systems Engineering (10.552, graduate, Fall 2011, Fall 2017)

3. Materials Systems Engineering Seminar (10.985, graduate, Spring 2011-date)
4. Numerical Methods (10.34, graduate, 2012-2014, 2018)
5. Analysis of Transport Phenomena (10.50, graduate, Fall 2015)
6. Process Data Analytics (10.354/10.554, undergraduate/graduate, Fall 2019)

IV. SERVICE (PUBLIC, PROFESSIONAL/DISCIPLINARY, AND UNIVERSITY)

1. Institute of Electrical and Electronic Engineers (IEEE)

Fellow, 2007-date; Senior Member, 2005-2007; Member, 1994-2005; Control Systems Society, 1994-date; Conference Editorial Board, Control Systems Society, 1997-2000; Robust Control Working Group, 1996-1999; Participant at the IEEE CSS/NSF Workshop on New Directions in Control Engineering Education, 1998; CSS Technical Committee on Robust Control (TCRC), 1999-2009; International Programme Committee, IEEE International Conference on Control Applications (CCA), 2000-2002; International Programme Committee, IEEE Computer-Aided Control System Design Conference, 2000-2002; Chair of the Technical Committee on Industrial Process Control, Control Systems Society (CSS), 2002-2011; Technical Committee on Industrial Process Control (named was changed to Process Control), Control Systems Society (CSS), 2002-date; CSS Technical Activities Board, 2002-2010; Associate Editor for Nonlinear Systems, Emerging Control Theory and Applications, Biological Systems, and Applications, Joint IEEE Conference on Decision and Control and the European Control Conference (CDC-ECC'05), 2005; IEEE Control Field Award Committee, 2007-2010; Chair for Session on Distributed Parameter Systems III, IEEE Conference on Decision and Control, 2008; IEEE Control Systems Society Award Committee, 2009-2011; Chair, Awards Subcommittee on Transactions in Control Systems Technology Outstanding Paper Award, 2009-2011; IEEE Control Systems Society Fellow Selection Committee, 2009-2010; CSS Technical Committee on Systems with Uncertainty, 2009-date; Participant, International Workshop on the Impact of Control: Past, Present, and Future, Berchtesgaden, Germany, October 18-21, 2009; CSS Board of Governors, 2010; Associate Editor, IEEE Control Systems Magazine, 2010; Deputy Editor-in-Chief, IEEE Control Systems Magazine, 2010-2011; International Program Committee, IEEE International Symposium on Computer-Aided Control System Design, 2010; Co-organizer and Co-chair for Session on Uncertainty Analysis and Robust Model Based Control, IEEE International Symposium on Computer-Aided Control System Design, 2010; International Program Committee, Joint Symposium on Computer-Aided Control System Design and Systems with Uncertainty, 2011; Co-organizer for Session on Robust Model-based Control: Part I, IEEE International Symposium on Computer-Aided Control System Design and Systems with Uncertainty, 2011; Co-organizer for Session on Robust Model-based Control: Part II, IEEE International Symposium on Computer-Aided Control System Design and Systems with Uncertainty, 2011; Task Force on Promotion of CSS Publications, 2011-2012; Editor-in-Chief, IEEE Control Systems Magazine, 2012-2014; Liaison Representative, IEEE Technical Activities Board Magazine Committee, 2012-2014; Publication Activities Board, 2012-2014; International Program Committee, Joint Symposium on Computer-Aided Control System Design and Systems with Uncertainty, 2013; Senior Editor, IEEE Life Sciences Letters, 2014-2017; Co-Organizer for Session on New Directions in Robust Optimal Control, IEEE Conference on Decision and Control, 2014; Session Chair, SY-BIO Workshop, 2015; International Program Committee, IEEE Conference on Norbert Wiener in the 21st Century, 2016; ACC representative, CSS Ad-hoc Committee on Conference Publications, 2016; International Program Committee, IEEE

Conference on Control Technology and Applications, 2018; IEEE Control Systems Society Transition to Practice Award, 2019-date; IEEE Senior Member Application Review Panel, 2019; General Chair, IEEE Conference on Decision and Control, Jeju Island, South Korea, 2020; Member, IEEE Technical Committee on Distributed Parameter Systems, 2020-date; Session Chair, Embedded Convex Optimization for Control, IEEE Conference on Decision and Control, December 14, 2020; Co-presenter, Lithium-ion Battery Management Systems Workshop, IEEE Conference on Decision and Control, December 12-13, 2020; Program Committee, IEEE Conference on Decision and Control, 2021

2. American Automatic Control Council (AACC)

Arrangements for the Model Predictive Control Workshop (for Manfred Morari and Evanghelos Zafiriou), American Control Conference, 1991; Chair for Session on Control Relevant Identification and Fault Detection, American Control Conference, 1994; Organizer and Chair for Session on Control of Uncertain Systems, American Control Conference, 1994; Chair for Session on Process Monitoring, American Control Conference, 1995; Chair for Session on Statistical Process Monitoring, American Control Conference, 1995; Co-chair for Session on Control of Sheet and Film Forming Processes, American Control Conference, 1997; Chair for Session on Parameter Identification, American Control Conference, 1998; Chair for Session on Control of Particulate Systems, American Control Conference, 2000; Chair for Session on Novel Formulations of Model Predictive Control, American Control Conference, 2001; Program Committee, American Control Conference, 2003-2005, 2007-2009, 2011; Organizer and Presenter (with Jay H. Lee and Babatunde A. Ogunnaike), Workshop on Advanced Process Control, American Control Conference, 2004; Co-Chair for Session on Process Control and Identification, American Control Conference, 2004; Co-Chair for Session on Scheduling and Discrete Event Systems, American Control Conference, 2004; Co-Chair for Session on Sliding Mode Control II, American Control Conference, 2004; AIChE Society Review Chair, 2005; Chair for Session on Modeling and Identification of Process Control, American Control Conference, 2005; Director, 2006-2007 (acting director for many subsequent years); Vice-Chair for Invited Sessions, American Control Conference, 2007; Organizing Committee, American Control Conference, 2007, 2010, 2015; Chair for Session on Biomedical Systems, 2007; Chair for Session on Nonlinear Estimation, 2007; Chair for Session on Modeling and Simulation, American Control Conference, 2008; Organizer and Presenter (with Jay H. Lee and Joseph Lu), Workshop on Model Predictive Control with Applications, American Control Conference, 2008; Organizer and Presenter (with Mayuresh Kothare and Murti Salapaka), Special Session on Modeling and Control of Micro and Nanosystems, American Control Conference, 2009; Co-Chair for Session on Dynamic Optimization, 2009; Chair for Session on Observers for Nonlinear Systems, 2009; Co-Chair for Session on Stochastic Adaptive Control, 2009; Steering Committee, 2007-2019; Program Chair, American Control Conference, 2010; Chair for Plenary Session on Sampling, American Control Conference, 2010; Chair for Semiplenary Session on Control as a Key Technology for Radical Innovation in Wind Energy Generation, 2010; Chair for Semiplenary Session on Cooperative Control and Mobile Sensor Networks in the Ocean, 2010; Presenter, Workshop on Ideas and Technology of Control Systems, American Control Conference, June 29, 2010; Member, Board of Directors Committee on Society Reimbursement, 2011; Richard E. Bellman Control Heritage Award Subcommittee, 2011-2012, 2014; IFAC 2020 World Congress Bid Committee, 2011-2013; ACC Return Target Policy Assessment Committee, 2012-2013; Donald P. Eckman Award Subcommittee, 2013; Chair for Session on Identification:

Optimal Input Design and Convex Methods, 2013; General Chair, American Control Conference, 2015; Chair for Plenary Session on Energy Efficient Buildings: A Systems Approach, 2015; Chair for Semiplenary Session on New Directions in Advanced Control of Semiconductor Manufacturing, 2015; Chair for Semiplenary Session on Magnetic Control of Therapy to Hard-to-Reach Disease Targets, 2015; Vice President, 2016-2017; O. Hugo Schuck Best Paper Award Committee, 2016; Nominating Committee, 2016-date; Chair, Professional Ethics Committee, 2017; President, 2018-2019; Professional Ethics Committee, 2018; Chair, Publication Partnerships Committee, 2018-2019; Past President, 2020-date; Chair, Nominating Committee, 2020-date

3. International Federation of Automatic Control (IFAC)

Co-chair for Session on Multivariable and Robust Control, IFAC World Congress, 1996; International Programming Committee, 6th IFAC Symposium on Dynamics and Control of Process Systems (DYCOPS), 1999-2001; Area Chair for Biochemical and Materials Processing System Modeling and Control, 6th IFAC Symposium on Dynamics and Control of Process Systems, 2000-2001; International Programming Committee, 7th IFAC Symposium on Advanced Control of Chemical Processes (ADCHEM), 2003; Chair for Session on Pharmaceutical Process Control, IFAC World Congress, 2002; International Programming Committee, IFAC Workshop on Time Delay Systems, Rocquencourt, France, September 2003; Co-chair for Session on Microelectronics Manufacturing Process Simulation and Control, IFAC Symposium on Advanced Control of Chemical Processes, Hong Kong, 2003; Technical Area Chair for Particulate and Polymer Processes, 6th IFAC Symposium on Dynamics and Control of Process Systems, Boston, 2004; Chair for Session on Batch Process Modeling and Control, 6th IFAC Symposium on Dynamics and Control of Process Systems, Boston, 2004; Member, Technical Committee on Chemical Process Control, 2005-date; Area Chair for Batch Process Modeling and Control, IFAC Symposium on Advanced Control of Chemical Processes, Gramado, Brazil, 2006; Chair for Session on Identification and Diagnosis of Mechatronic Systems, IFAC World Congress, 2008; Fellow, International Federation of Automatic Control, 2008; International Program Committee, IFAC Symposium on Advanced Control of Chemical Processes, Instanbul, Turkey, July 12-15, 2009; Journal of Process Control Best Paper Selection Committee, 2009-2011; 2012-2014; International Program Committee, IFAC Symposium on Dynamics and Control of Process Systems, 2010; Chair for Session on Process Control Applications I, IFAC World Congress, 2011; Vice-Chair, Technical Committee on Chemical Process Control, 2012-2017; Chair, International Program Committee, IFAC Symposium on Advanced Control of Chemical Processes, Singapore, July 10-13, 2012; International Program Committee, IFAC Symposium on Fault Detection, Supervision and Safety of Technical Processes (SAFEPROCESS), 2012, 2015, 2021; Technical Committee on Biosystems and Bioprocesses (TC 8.4), 2012-date; International Program Committee, 12th Computer Applications in Bio Technology (CAB), 2013; International Program Committee, International Symposium on Dynamics and Control of Process Systems, December 18-20, 2013; IFAC Applications Paper Prize Selection Committee, 2014; International Program Committee, IFAC Symposium on Advanced Control of Chemical Processes, Whistler, Canada, June 7-10, 2015; International Program Committee, IFAC Symposium on Dynamics and Control of Process Systems and Computer Applications in Bio Technology, June 6-8, 2016; Manfred Thoma Medal Selection Committee, 2015-2017; International Programme Committee, 6th IFAC Conference on Foundations of Systems Biology, October 9-12, 2016; Chair, Technical Committee on Chemical

Process Control, 2017-2020; Member, Technical Committee on Biological and Medical Systems (TC 8.2), 2017-date; Member, Technical Committee on Optimal Control (TC 2.4), 2017-date; Member, Technical Committee on Robust Control (TC 2.5), 2017-date; Member, Technical Committee on Distributed Parameter Systems (TC 2.6), 2017-date; International Programming Committee, IFAC Symposium on Advanced Control of Chemical Processes (ADCHEM), Shenyang, China, July 25-27, 2018; Panelist, "Kalman's Impact on Process Control, Estimation, and System Identification," IFAC Symposium on Advanced Control of Chemical Processes (ADCHEM), Shenyang, China, July 25, 2018; Area Chair, Robust Model Predictive Control, 6th IFAC International Conference on Nonlinear Model Predictive Control, Madison, Wisconsin, August 19-22, 2018; International Program Committee, 6th IFAC International Conference on Nonlinear Model Predictive Control, Madison, Wisconsin, August 19-22, 2018; Chair, Young Author Award Prize Competition Committee, International Conference on Advanced Control of Chemical Processes, 2018; Chair, Keynote Session on Data Analytics and Process Monitoring, International Conference on Advanced Control of Chemical Processes, 2018; International Program Committee, IFAC Workshop on Control of Smart Grid and Renewable Energy Systems (CSGRES), Jeju, Korea, June 10-12, 2019; International Program Committee, IFAC Symposium on Dynamics and Control of Process Systems including Biosystems, Florianópolis, Brazil, April 23-26, 2019; International Program Committee, IFAC World Congress, Berlin, Germany, July 12-17, 2020; Editor for TC 6.1 Power and Process System - Chemical Process Control, IFAC World Congress, Berlin, Germany, July 12-17, 2020; Associate Editor for TC 8.2 Robust Control, IFAC World Congress, Berlin, Germany, July 12-17, 2020; Vice Chair of the Conference Board (CC5-CC9, applications), 2020-date; International Programming Committee, IFAC Symposium on Advanced Control of Chemical Processes (ADCHEM), Venice, Italy, June 13-16, 2021; IFAC Technical Committee on Fault Detection, Supervision & Safety of Technical Processes (SAFEPROCESS, TC 6.4); Chair, Quality Control Task Force, IFAC Conferences Board, 2020-date; International Program Committee, Workshop Series on Control Systems and Data Science towards Industry 4, Hong Kong, 2021; International Program Committee, IFAC Workshop on Control Applications of Optimization (CAO), Gif-sur-Yvette (Paris-Saclay), France, July 18-22, 2022

4. American Institute of Chemical Engineers (AIChE)

Fellow, 2018-date; Life Member, 2011-date; Senior Member, 1998-2018; Member, 1991-1998; Computing and Systems Technology (CAST) Division, 1993-date; Co-chair for Session on Control Relevant Identification and Estimation, Fall Annual Meeting, 1995; Chair for Poster Session, International Conference on Chemical Process Control (CPC V), 1996; Co-chair for Session on Design and Control, Spring National Meeting, 1996; Area 10b Acting Representative to the CAST Executive Committee, Spring National Meeting, St. Louis, 1996; Chair for Session on Plant-wide and Decentralized Control, Fall Annual Meeting, 1996; Chair for Session on Robust Control, Fall Annual Meeting, 1997; Chair for Session on Plant-wide Control, Fall Annual Meeting, 1998; Co-chair for Session on Topics in Systems and Process Control, Fall Annual Meeting, 1999; Vice-Chair for Session on Advances in Process Control, Fall Annual Meeting, 2001; Chair for Session on Control with Advances in Process Control II, Fall Annual Meeting, 2002; CAST Directors' Award Panel, 2002, 2004, 2006, 2007, 2010; Chair, CAST Directors' Award Panel, 2004; CAST Division Programming Board, 2003-2005; Chair for Session on Advances in Process Control, Fall Annual Meeting, 2003; CAST Executive Committee, 2003-2007, 2010-2013; National Programming Committee, 2003-2005; WebCAST

Committee, 2003-2010; Chair for Session on Modeling and Control for Microelectronics Manufacturing, Fall Annual Meeting, 2004; Program Coordinator for Systems and Process Control (Area 10b), 2005; Chair for Session on Hybrid Multiscale Simulation, Fall Annual Meeting, 2005; Chair for Session on Recent Developments in Systems and Process Control, Fall Annual Meeting, 2005; Director of CAST Division, 2005-2007; CAST Awards Committee, 2005-2013; 2015-date; Chair for Session on Nonlinear Process Control, Fall Annual Meeting, 2006; WebCAST Committee Chair, 2006-2007; EPBC Dissemination Working Group, 2007-2008; Co-chair for Systems and Process Control Centennial Session, 2008; Computing Practice Award Nominations Committee, 2008; Chair for Session on Modeling and Identification, 2009; Second Vice Chair, CAST division, 2010; Chair, CAST Awards Committee, 2010; Awards Subcommittee, R.H. Wilhelm Award in Chemical Reaction Engineering, 2010; Chair for Tentative Session on Modeling and Identification, 2010; Technical Advisory Committee, International Conference on Chemical Process Control, 2010-2012, 2015-2017; First Vice Chair, CAST division, 2011; Chair for Session in Honor of Manfred Morari's 60th Birthday I, Fall Annual Meeting, 2011; Chair for Session in Honor of Manfred Morari's 60th Birthday II, Fall Annual Meeting, 2011; Chair, Nominations Committee, CAST division, 2011, 2013; Chair, CAST division, 2012; Council of Division and Forum Officers, 2012; Chair, Nominations Committee for the David Himmelblau Award for Innovations in Computer-Based Chemical Engineering Education, 2012; AIChE's Speakers Corner, 2012-date; Past Chair, CAST division, 2013; Nominations Committee, CAST division, 2014; Expert Panel, Pharmaceutical Discovery, Development and Manufacturing Forum Awards Ceremony, November 17, 2014; Associate Editor, Webinar Advisory Editors Committee, 2016-2017; Panelist, Session VI: Panel Discussion & Recap of Workshop, FDA-AIChE Workshop on Adopting Continuous Manufacturing, March 2, 2016; member, Particle Technology Form, 2016-date; Poster Judge, AIChE Beer Brewing Competition, 2018; Taste Judge, AIChE Beer Brewing Competition, 2018; Award Committee, AIChE Pharmaceutical Discovery, Development & Manufacturing (PD2M) Student Award, 2019; Panelist, Data Science Education in Chemical Engineering, AIChE Annual Meeting, Orlando, Florida, October 28 – November 2, 2019; Division 15 Poster Judge, AIChE Annual Meeting, Orlando, Florida, October 28 – November 2, 2019; Award Committee, PD2M Award Recognizing Outstanding Contribution to QbD for Drug Substance, 2020; Meeting Program Chair, AIChE Annual Meeting, Boston, Massachusetts, 2021; Session Chair, Academia-Industry Partnership: Preparing Students to be Leaders in Industry, AIChE Annual Meeting, Boston, Massachusetts, 2021; Session Chair, Academia-Industry Partnership: The Undergraduate Curriculum, AIChE Annual Meeting, Boston, Massachusetts, 2021

5. National Academy of Engineering/The National Academies

Member, 2019-date; Invited Participant, Tenth German-American Frontiers of Engineering Symposium, April 25-28, 2007; Organizing Committee, Indo-American Frontiers of Engineering (IAFOE) Symposium, Irvine, California, February 28-March 1, 2008; Co-Chair for Session on Manufacturing in the Chemical and Automotive Industries, IAFOE Symposium, 2008; Invited Participant, 7th Annual National Academies Keck Futures Initiative (NAKFI) Conference, The National Academies, Irvine, California, November 19-22, 2009; Invited Panelist, A Chemical Sciences Roundtable Workshop on "Data Science: Opportunities to Transform Chemical Sciences and Engineering," Washington, DC, February 27-28, 2018; Panelist, "Integrated Continuous Manufacturing of Pharmaceuticals," Session on Integration, Continuous Manufacturing for the Modernization of Pharmaceutical Production, National Academies of

Science, Engineering, and Medicine, Washington DC, July 30-31, 2018; Discussion leader in expert systems/data science/machine learning, Section 3 meeting, National Academy of Engineering, Washington, DC, October 7, 2019; Opening lecture on Control and Analytics, "Modeling, Data Analytics, and Machine Learning for Process Development and Verification," National Academies Workshop on Innovations in Pharmaceutical Manufacturing, Washington, DC, February 27, 2020; Virtual Workshop on Barriers to Innovations in Pharmaceutical Manufacturing, Board on Chemical Sciences and Technology of the National Academies, June 2-3, 2020; Reviewer, Innovations in Pharmaceutical Manufacturing on the Horizon: Technical Challenges, Regulatory Issues, and Recommendations, National Academies Press, Washington, DC, 2021; Section 3 Search Committee, 2020-date

6. National Center for Supercomputing Applications:
Intranet Advisory Committee (1998); Subcommittee on Grants and Contracts (1998); Local Anchor, Chemical Engineering Applications Technology Team (1997-2000); XSEDE User Requirements Evaluation and Prioritization (UREP) team (2016-date)

7. EFCE Working Party on Computer Aided Process Engineering
International Programming Committee, Joint International Symposium on Process Systems Engineering and European Symposium on Computer Aided Process Engineering, Trondheim, Norway, 1997; Subcommittee on Control and Operations, Joint International Symposium on Process Systems Engineering and European Symposium on Computer Aided Process Engineering, 1997; Chair for Session on Control Structure Design, Joint International Symposium on Process Systems Engineering and European Symposium on Computer Aided Process Engineering, 1997; International Program Committee, Joint Process Systems Engineering/European Symposium on Computer Aided Process Engineering, Garmisch-Partenkirchen, Germany, 2005-2006; International Scientific Committee, European Symposium on Computer Aided Process Engineering, Bucharest, Romania, May 27-30, 2007

8. Computer Aids in Chemical Engineering Education (CACHE) Corporation
Coauthor of "Experimental Projects for the Process Control Laboratory," CACHE News, Fall 2002 (invited reprint); Coauthor of "A Quadruple Tank Process Control Experiment," *CACHE News*, Fall 2004 (invited reprint); Academic Trustee, 2013-2021; Technical Advisory Committee, International Conference on Chemical Process Control, 2010-2012, 2015-2017; Lead, Statistics Activities (2013-2017); Member, Standing Committee on Awards (2014-date); Task Force on Education Module Development (a merger of multiple past task forces), 2014-date; Member, Teaching Resources Center Committee, 2016-2017; Coordinator, Session Proposals for the ASEE Summer School for Chemical Engineering Faculty, 2015-2017; Co-chair, Ad-hoc Committee on Data Analytics, 2017-2019; Founding Conference Chair, Foundations of Process Analytics and Machine Learning (FOPAM), 2017-2019; Chair, Standing Committee on Awards, 2018-date; Co-organizer, Pre-conference Workshop on Process Data Analytics and Machine Learning, FOPAM, 2019; Chair of Session on Data Analytics Education for Chemical Engineers, FOPAM, 2019; Co-chair, Task Force on Data Analytics, 2019-date; Task Force on Teaching Process Control, 2019-date; Nominating Committee, 2020; Committee to Define to New Member Category, 2020-2021; International Programming Committee, Joint Chemical Process Control (CPC) and Foundations of Computer-Aided Process Operation, San Antonio, Texas, January 8-12, 2021

9. American Society for Engineering Education (ASEE)

Member, 1996-date; Co-organizer for the Session on the Role of the Computer in Undergraduate Process Control Education, ASEE Summer School for Chemical Engineering Faculty, 1997; Co-organizer for the Session on Applied Statistics and Data Analytics, ASEE Summer School for Chemical Engineering Faculty, 2017; Leader for the Session on Computers in Chemical Engineering, ASEE Summer School for Chemical Engineering Faculty, 2017; Judge, Poster Session, ASEE Summer School for Chemical Engineering Faculty, 2017

10. Miscellaneous Chairs/Organization

Organizer for Workshop on Control Techniques from Biological Inspiration, Annual Conference on Neural Information Processing Systems, 1994; Co-Organizer for Second Midwest Process Control Workshop, 1996; Chair for Session on Process Control, Allerton Conference on Communication, Control, and Computing, 1996; Organizer and Session Moderator for the Third Midwest Process Control Workshop, 1999; Organizer and Session Moderator for the Control 2000 Symposium, 2000; Co-chair for Session on Biomineralization, Pharmaceuticals, and Food Crystallization, Symposium D: Crystallization and Interfacial Processes, International Conference on Materials for Advanced Technologies, 2001; Vice-Chairman for Session on Process Systems Engineering 3, 3rd Chemical Engineering Conference for Collaborative Research in Eastern Mediterranean, 2003; Afternoon Session Chair for Symposium B: Pharmaceuticals, Polymers, & Fine Chemicals, Annual Meeting of the British Association for Crystal Growth, 2005; Organizing Committee, Frontiers in Chemical Engineering Educational Workshop, AIChE Annual Meeting, 2005; International Advisory Board, Control of Particulate Processes VII, 2006; Co-Organizer for Process Systems Engineering Consortium Meeting, 2005, 2006, 2008, 2009, 2011 (all with corresponding workshops); Organizer and Moderator for Process Systems Engineering Consortium Meeting, 2007, 2010, 2013; Organizer for the Workshop on Advanced Crystallization Technologies, 2007; Co-organizer for Session on Recent Advances and Problems in Modeling Nucleation, 15th Larson Workshop, Association for Crystallization Technology, 2007; Co-Organizer for Workshop on Population Balance Modeling and Its Applications, 2008; Scientific Committee, International Symposium on Industrial Crystallization, 2008, 2011, 2014, 2017, 2019; Discussion Leader for Session on Best Practices for Curriculum/Course Development/Outreach to the General Public, Global NSEE Workshop, 2008; Steering Committee, Larson Workshops, Association for Crystallization Technology, 2009-2012; Organizer and Co-presenter for Workshop on Crystallization, Santa Barbara, California, 2009; Organizer and Chair for Session on High Throughput Screening and Microreactor Technology for Crystallization, 16th Larson Workshop, Association for Crystallization Technology, 2009; Organizer and Chair for Session on New and Emerging Technologies for Crystallization, 17th Larson Workshop, Association for Crystallization Technology, 2010; Co-presenter for Short Course on Pharmaceutical Crystallization and Downstream Processing: Batch and Continuous Processing, MIT, Cambridge, June 13-15, 2011; Organizer for the Quality by Design Workshop, 2011, 2013; Scientific Committee, Co-organizer for Session on Novel and Emerging Crystallization Technology, 18th Larson Workshop, Association for Crystallization Technology, 2012; Organizer for the Summer School on Molecular and Multiscale Simulation, National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, 2012; Panelist for Session II: Improving Scientific and Technical Knowledge to Support Continuous Manufacturing, Promoting Continuous Manufacturing in the Pharmaceutical Sector, The

Brookings Institution, Washington, DC, October 19, 2015 (discussions included in the *Promoting Continuous Manufacturing in the Pharmaceutical Sector: Meeting Summary*, The Brookings Institution, Washington, DC); Session Chair for the Workshop on Perspectives on Systems and Control, Zürich, Switzerland, May 19-20, 2016; Program Committee, Panelist, and Session Chair for the Keynote Lecture by Houria Siguerdidjane, 13th International Conference on Informatics in Control, Automation and Robotics, Lisbon, Portugal, July 29-31, 2016; Panelist, Second International Symposium on Continuous Manufacturing of Pharmaceuticals, Cambridge, MA, September 27, 2016; Panelist, Session on Data, Apps, Composability, Security, and Reference Architectures, NIST/OAGi Workshop: Enabling Composable Service-Oriented Manufacturing Systems, April 10-11, 2017; Panelist, Session on Summary, Convergence, and Directionally on Resolved, NIST/OAGi Workshop: Enabling Composable Service-Oriented Manufacturing Systems, April 10-11, 2017; Co-organizer and Chair of Session 9 of 2040 Visions of Process Systems Engineering, A Symposium at MIT on the Occasion of George Stephanopoulos' 70th Birthday and Retirement from MIT, June 1-2, 2017; Co-chair for session on Continuous Cell Culture/Perfusion Bioreactors, Continuous Biomanufacturing: Current Success and Future Trend, University of Oxford, United Kingdom, June 27, 2017; Chairperson for the session on Continuous Processing in Biopharmaceutical Manufacturing, The Bioprocessing Summit, Boston, MA, August 21, 2017; Scientific Committee, International Conference on Population Balance Modeling (PBM), Ghent, Belgium, 2018; Scientific Advisory Board, Continuous Biomanufacturing: Current Success and Future Trend, LMH, Oxford University, June 20-22, 2018; Chair, Disruptive Technologies Conference, San Diego, June 21-22, 2018; Poster Judge, McMaster Advanced Control Consortium Meeting and Workshop, Hamilton, Ontario, Canada, May 14, 2019; Regional Program Co-Chair, 19th International Conference on Control, Automation and Systems, Jeju, South Korea, October 15-18, 2019; Chair for session on Digitalization: Tools to Track, Visualize and Control Continuous Processes, Fourth ECI Conference on Integrated Continuous Biomanufacturing (ICB IV), Brewster (Cape Cod), Massachusetts, October 6-10, 2019; Panel Judge, Asia Pacific Bioprocessing Excellence Awards (ABEA), 2021; Discussant, Roundtable Discussion on Continuous Manufacturing in Biologics; Successes and Challenges, United States Pharmacopeia, May 26, 2021; Poster Judge, International Symposium on Industrial Crystallization, Potsdam, Germany, August 30 – September 2, 2021; Chair, Session on Automation, Control and PAT, Integrated and Continuous Manufacturing Symposium, 2022 ACS BIOT Meeting, San Diego, CA, March 20-24, 2022

11. Miscellaneous Society Memberships

Member, Society for Industrial and Applied Mathematics (SIAM), 1994-1998, 2019-date; Member, SIAG on Control & Systems Theory, 2020-date; Member, Technical Association of the Pulp and Paper Industry, 1995-1998; Member, Alpha Chi Sigma, 1994-date; Member, Materials Research Society, 2001-2002; Member, American Chemical Society, 2002-2003, 2006-2008; Member, Society of Manufacturing Engineers, 2003-2005; Member, ISA, 2003-2005; Senior Member, ISA, 2005-2008; Member, Electrochemical Society, 2005-2008, 2019-date; Member, American Association for the Advancement of Science (AAAS), 2007-2008; AAAS Fellow, 2008-date; American Association of Pharmaceutical Scientists (AAPS), 2018-date; American Physical Society (APS), 2019-date

12. Reviewer for

Science; PNAS; Nature Communications; Chemical Reviews; iScience; IEEE Transactions on Automatic Control; IEEE Control Systems Letters; Automatica; IEEE Transactions on Control of Network Systems; SIAM Journal on Control and Optimization; SIAM Journal on Applied Mathematics; Annual Reviews in Control; Systems & Control Letters; Applied Numerical Mathematics; Optimization Letters; Crystal Growth and Design; Journal of Applied Physics; Journal of Rheology; Rheologica Acta; Journal of Colloid and Interface Science; Electrochimica Acta; Analytical Chemistry; Journal of the Electrochemical Society; ECS Journal of Solid State Science and Technology; IEEE Transactions on Semiconductor Manufacturing; Journal of Microelectromechanical Systems; PLoS Computational Biology; PLoS ONE; Lab on a Chip; Journal of Computational Physics; Mathematical Programming Series B; Linear Algebra and its Applications; IEEE Transactions on Robotics & Automation; Journal of Mathematical Analysis and Applications; Journal of Crystal Growth; CrystEngComm; Biomicrofluidics; The Journal of Physical Chemistry B; The Journal of Physical Chemistry Letters; Physica E; Journal of Pharmaceutical Sciences; ChemComm; Macromolecular Theory & Simulations; Colloids and Surfaces A: Physicochemical and Engineering Aspects; AIChE Journal; IEEE Transactions on Control Systems Technology; Chemometrics and Intelligent Laboratory Systems; Journal of Process Control; Organic Process Research and Development; Journal of Biotechnology; Mathematical Biosciences; Biotechnology and Bioengineering; Molecular Pharmaceutics; Pharmaceutics; Biotechnology Progress; Engineering in Life Sciences; Drug Delivery Letters; Current Drug Delivery; Cell and Gene Therapy Insights; Microscopy and Microanalysis; European Journal of Pharmaceutical Sciences; Drug Discovery Today; Medical & Biological Engineering & Computing; Process Biochemistry; Processes; Polymers; Joule; Crystals; Applied Mathematical Modelling; IEEE/ASME Transactions on Mechatronics; IEEE Access; IEEE Transactions on Neural Networks; Journal of Physics and Chemistry of Solids; Journal of Energy Storage; International Journal of Modern Physics B; Computers & Chemical Engineering; Reviews in Chemical Engineering; Chemical Engineering Science; International Journal of Robust and Nonlinear Control; Spectroscopy Letters; Journal of Sensors; Polymer Engineering & Science; Journal of Applied Polymer Science; Polymer International; Particle & Particle Systems Characterization; Drying Technology; Optimal Control Applications & Methods; IET Control Theory and Applications; IET Science, Measurement & Technology; International Journal of Control; Optimization and Engineering; ASME Journal of Dynamical Systems, Measurement, and Control; International Journal of Modelling and Simulation; International Journal of Heat and Mass Transfer; Hydrological Processes; Asian Journal of Control; Journal of the Franklin Institute; IIE Transactions; European Journal of Control; Canadian Journal of Chemical Engineering; ESAIM Journal on Control, Optimization, and the Calculus of Variations; International Journal of Applied Mathematics & Computer Science; Reaction Chemistry & Engineering; Simulation: Transactions of the Society for Modeling and Simulation International; Chemical Engineering Journal; Chemical Engineering Research and Design - Part A: Transactions of the Institution of Chemical Engineers; Chemical Engineering and Processing: Process Intensification; Chemical Engineering and Technology; Advanced Power Technology; International Journal of Systems Science; International Journal of Intelligent Automation and Soft Computing; Environmental Science & Technology; Separation Science and Technology; Separation and Purification Technology; ISA Transactions; ASCE Journal of Natural Hazards; Resources, Conservation, and Recycling; Process Safety and Environmental Protection; Dynamics and Control; Journal of Complexity; IEEE Transactions on Industrial Electronics;

Particuology; Chemical Engineering Communications; Journal of Food Process Engineering; Chemical Engineering Education; Pharmaceutical Patent Analyst; Pulp & Paper Canada; Latin American Applied Research; Brazilian Journal of Chemical Engineering; Journal of Zhejiang University; Springer Verlag Lecture Notes on Control and Information Science Series; Prentice Hall (textbook review); McGraw-Hill (textbook review); Wiley (research monograph and textbook reviews); Cambridge University Press (textbook review); Oxford University Press (textbook review); Taylor & Francis/CRC Press (book review); IFAC World Congress; IEEE Conference on Decision and Control; IEEE International Conference on Control Applications; IEEE International Symposium on Intelligent Control; IEEE International Conference on Industrial Technology; International Conference on Informatics in Control, Automation and Robotics; IEEE Conference on Norbert Wiener in the 21st Century; American Control Conference; European Control Conference; International Symposium on Advanced Control of Chemical Processes; Foundations of Computer-Aided Process Design; Foundations of Computer-Aided Process Operations; International Conference on Foundations of Systems Biology in Engineering; Process Systems Engineering; International Conference on Chemical Process Control; International Symposium on Chemical Reaction Engineering; European Symposium on Computer Aided Process Engineering; IFAC Symposium on Dynamics and Control of Process Systems; IFAC Symposium on Dynamics and Control of Process Systems, including Biosystems; IFAC Symposium on Fault Detection, Supervision, and Safety of Technical Processes; IFAC Conference on Nonlinear Model Predictive Control (NMPC); IFAC Workshop on Time Delay Systems; IFAC Symposium on Advances in Control Education; World Congress of Chemical Engineering; NUMDIFF Conference on Numerical Treatment of Differential Equations; Mediterranean Conference on Control and Automation; ASME Annual Dynamic Systems and Control Conference; IEEE Symposium Series on Computational Intelligent Doctoral Consortium; International Conference on Control and Fault-Tolerant Systems; Indian Control Conference; AIChE Annual Meeting; National Science Foundation; U.S. Department of Energy; American Chemical Society Petroleum Research Fund; U.S. Office of Naval Research; U.S. Naval Sea Systems Command; U.S. Department of Agriculture; European Research Council; Swiss National Science Foundation; United Kingdom Engineering & Physical Sciences Research Council; Netherlands Foundation for Fundamental Research on Matter; Netherlands Organization for Scientific Research; National Sciences and Engineering Research Council of Canada; Research Council of Norway; Austrian Science Fund; A*Star Science and Engineering Research Council of Singapore; Chilean Comisión Nacional de Investigación Científica y Tecnológica; Italian Research Assessment VQR

B. University/Campus Service

1. Massachusetts Institute of Technology (MIT):
Campus: MITEI Steering Committee, Research Center for Environmental Protection at Hydrocarbon Energy Production Frontiers (2010-2014); Skolkovo Tech Faculty Search Committee, Energy sub-committee (2013-2015); Review panel, MIT Summer Research Program (2016); Research Financial Management Focus Group (2016); Faculty Search Committee, MIT Institute for Data, Systems, and Society (2017-2018); MISTI Global Seed Funds Evaluation Committee (2018-date); Faculty Working Group, Re-imagining Research Administration (2019); International Scientific Advisory Committee, MIT A+B Applied Energy Symposium (2019-2020); Reviewer, Abdul Latif Jameel Water and Food Systems Lab Seed Grant Program (2020);

CSE 6.0002 Steering Committee, 2020; Lead, Intelligent Processes Theme, MIT Machine Intelligence for Manufacturing and Operations, 2020
Chemical Engineering: Graduate Admissions Officer (2010-2015); Graduate Admissions Committee (2010-2018); Graduate Committee (2010-date); Qualifying Exam Committee, Transport Area (2010-2016); ACCESS Sub-committee (2011-2015); Class of 2014 Advisor (2011-2014); Awards Committee (2011-date); Faculty Search Committee (2013-date); Faculty Mentor for James W. Swan (2013-date); Class of 2017 Advisor (2014-2017); Graduate Officer (2015-2016); Long Range Planning Committee (2015-2016); Faculty Mentor for Heather Kulik (2015-date); Faculty Research Officer (2017-date); Class of 2020 Advisor (2017-date); Faculty Mentor for Connor Coley (2019-date); 10-ENG Advisor for Computing (that is, the Engineering Computation, Process Data Analytics, and Manufacturing Design concentrations) (2019-date)

2. University of Illinois at Urbana-Champaign (UIUC):
Campus: UIUC/Hertz Fellowship (1994-2002, 2004-2008); UIUC Senator (1999-2001); Research Computing Working Group for UIUC Information Technology Strategic Plan (2006-2007); Informatics PhD Development Committee (2008-2009); Named Faculty Appointment Committee (2009-2010);
College of Engineering: Placement (1994-1995); Executive Subcommittee on Strategic Planning for Computers and Networks (1994-1997); Library (1994-2001); Executive Subcommittee on Computers and Networks (1997-2001); Computational Science and Engineering Steering Committee, Chemical Engineering Representative (1999-2001); Chair for the Bioengineering Graduate Curriculum (2000-2001); Acting Departmental Representative on Administrative Committee and Department Heads Meeting (September 2003; April 2004; April 2009); Executive Subcommittee to Review GE/TE courses (Managing Advanced Technology in Industry and Case Studies in Advanced Technology Management in Industry), 2007; Chair, Executive Subcommittee to Review ECE courses Large-scale System Analysis, Power System Control, Power System Dynamics & Stability (2007); Chair, Executive Subcommittee to Review CS course Introduction to Bioinformatics (2007); Alternate Departmental Representative to the Executive Committee (served August 26, September 30, October 14 & 21, November 4, December 16, 2008; March 10, 2009); Internal Review Panel for Pre-proposals to the NSF Materials Research Instrumentation Program (2009);
College of Liberal Arts and Sciences: Faculty Mentor, LAS Teaching Academy (2001-2002); LAS Executive Committee (2003-2005); SCS Director Search Committee (2005-2006);
School of Chemical Sciences: Library (1994-1995); Graduate Student Recruitment (1994-1995); Coordinating Committee for Computer and Electronic Services (1998); Computer Center Advisory Committee (1997-2000); CANS Scientific Software Consultant Search (1999); Computer Applications and Network Services-Electronic Services (1999-2000); CANS Research Programmer Search (2001); Courses and Curricula (2000-2002); Chapter Advisor for the Zeta Chapter of Alpha Chi Sigma (2000-2002); Executive Committee (2004-2007); Endowed Professor Selection Committee (2006); Materials Chemistry Laboratory Review (2008);
Chemical Engineering/Chemical and Biomolecular Engineering: Graduate Student Awards (1994-1995); Shen Postdoctoral Fellowship (1994-1995, 1999); Graduate Recruiting (1994-1997); Grading Appeals (1996-1997); Workstation Manager (1995-1998); Renovation, Undergraduate Control Laboratories (1996-1999); Administrative (1994-2010); Administrative Squad C leader (1996-1997); Computer Facilities (1995-2002, 2003-2006); Undergraduate Advising (1994-2002, 2003-2009); Staff (2000-2010); Systems Bioinformatics (2001-2002);

Chair, Undergraduate Curriculum (2001-2002); Senior Staff (2002-2010); Development (2004-2006); Undergraduate Grievance Capricious Grading (2005-2006); Chair, Faculty Recruiting Committee, hired four faculty in the bio area, two in tissue engineering (2005-2009); Awards (2005-2007); Campaign Committee (2008); Chair, Grading Policy Committee (2008); Session Chair, Oral Qualifying Committee (2009);
Bioengineering: Reviewer for Senior Thesis (Brian Kritzberg, 2005); Participated in graduate recruiting (2005);
Mechanical Science and Engineering: Participated in interviews of potential faculty (2007)

Last Updated on 9/4/2021