

Curriculum Vitae for Richard Allan Cairncross

Associate Professor
 Department of Chemical and Biological Engineering
 Drexel University
 Philadelphia, PA 19104
 (215) 895-2230 (Office) (215) 895-5837 (Fax)
cairncross@drexel.edu (work email)

102 Quaint Rd.
 Media, PA 19063
 (610) 717-6720 (cell)
cairncross@gmail.com (personal email)

Education

University of Rochester, Rochester, NY

B.S. Chemical Engineering, May 1989

University of Minnesota, Minneapolis, MN

Ph.D., Chemical Engineering, September 1994

Advisors: L. E. Scriven and L. F. Francis

Dissertation: 'Solidification Phenomena During Drying of Sol-to-Gel Coatings'

Professional Experience

Drexel University Department of Chemical Engineering, Philadelphia, PA

Associate Professor (9/03 - Present)

Assistant Professor (9/97 - 8/03)

United States Department of Agriculture, Eastern Regional Research Center, Wyndmoor, PA

Visiting Researcher (9/15-Present)

Environmental Fuel Research, LLC,

Partner and director of research (8/13-Present)

Universidad de El Salvador, facultad de agronomía, Fulbright lectureship, San Salvador, El Salvador

Visiting Professor (3/10-6/10)

University of Minnesota Department of Bio-Based Products, St. Paul, MN

Visiting Associate Professor (Sabbatical Appointment) (9/04 - 8/05)

IBM T.J. Watson Research Center, Yorktown Heights, NY

Visiting Scientist (6/97-8/97)

University of Delaware Department of Mechanical Engineering, Newark, DE

Adjunct Professor (9/97 - 6/03)

Visiting Assistant Professor (11/95 - 8/97)

Sandia National Laboratories, Albuquerque, NM

Postdoctoral Appointee (10/94-10/95)

University of Minnesota, Dept. of Chemical Eng. and Mats. Science, Minneapolis, MN

Graduate Research Assistant (9/89-9/94)

E. I. Du Pont De Nemours & Company, Inc., Rochester, NY

Chemical Engineering Intern (6/87 - 9/87, and 1/88 - 8/88)

University of Rochester Department of Biochemistry, Rochester, NY

Laboratory Assistant (1/87 - 5/87)

University of Rochester Department of Chemistry, Rochester, NY

Teaching Assistant (9/86 - 12/86)

Publications

Published in Refereed Journals

1. 'Identification of Sulfur-Containing Impurities in Biodiesel Produced From Brown Grease', Michael Hughes, Kerby C Jones, Megan E Hums, Richard A Cairncross, Victor T Wyatt, *Journal of the American Oil Chemists' Society*, (2018) 95(4) 407-420. DOI: 10.1002/aocs.12048
2. 'Longitudinal Study of Wastewater Greases and Their Potential for the Production of Biofuels', Megan E Hums, Hiral Amin, Ya-Chi Tsao, Mira S Olson, Sabrina Spatari, Richard A Cairncross, *Energy & Fuels*, (2018) 32(2) 1831-1842. DOI: 10.1021/acs.energyfuels.7b03550
3. 'Life Cycle Assessment of Biodiesel Produced from Grease Trap Waste', Megan E. Hums, Richard A. Cairncross, & Sabrina Spatari, *Environmental Science and Technology*, (2016) 50(5), 2718-2726. DOI: 10.1021/acs.est.5b02667
4. 'Reaction Model Describing Antioxidant Depletion in Polyethylene-Clay Nanocomposites Under Thermal Aging,' I. Ahmad, C.Y. Li, G. Hsuan, R.A. Cairncross, *Polymer Degradation and Stability*, (2014) 110, 318-335.
5. 'Nanofiber Cathode Catalyst Layer Model for a Proton Exchange Membrane Fuel Cell,' D. Dever, R.A. Cairncross, Y.A. Elabd, *Journal of Fuel Cell Science and Technology*, (2014) 11 (August).
6. 'Esterification of Free Fatty Acids to Fatty Acid Alkyl Esters in a Bubble Column Reactor for Use as Biodiesel,' C.J. Stacy, C.A. Melick, and R.A. Cairncross, *Fuel Processing Technology* (2014) 124, 70-77. DOI: 10.1016/j.fuproc.2014.02.003
7. 'Water Transport in Polylactide and Polylactide/Montmorillonite Composites,' A. Du, G. Gelves, U. Sundararaj, R.A. Cairncross, *Journal of Polymers and the Environment*, (2012) 21(11) 8-15.
8. 'Synthesis and Water Sorption of Standard and End-capped Polylactides: the Effect of Morphology,' D. Koo, A. Du, G.R. Palmese & R.A. Cairncross *Polymer Chemistry* (2012) 3(3) 718-726.
9. 'Moisture Management in Polylactides: The Effect of Heat Treatment,' D. Koo, A. Du, G.R. Palmese, & R.A. Cairncross *Polymer* (2012) 53(5) 1115-1123.
10. 'Water Transport and Clustering Behavior in Homopolymer and Graft Copolymer Polylactide,' A. Du, D. Koo, F. Theryo, M.A. Hillmyer, and R.A. Cairncross, *Journal of Membrane Science*, (2012) 396: 50-56.
11. 'Depletion Mechanism of Antioxidants in MDPE-Clay Nanocomposites under Thermal Aging,' Wai-Kuen Wong, Shan Cheng, Christopher Y. Li, Iftekhar Ahmad, Richard Cairncross, and Y. Grace Hsuan, *Polymer Degradation and Stability*, (2012), 97(2) 192-199.
12. 'Liquid Water Transport in Polylactide Homo and Graft Copolymers,' E.M. Davis, G. Theryo, M.A. Hillmyer, R.A. Cairncross, and Y.A. Elabd, *ACS Applied Materials & Interfaces*, (2011) 3(10) 3997-4006.
13. 'The Effect of Heat Treatment on Water Sorption in Polylactide and Polylactide Composite via the Change in Their Glass Transition State and Isothermal Crystallization Kinetics,' A. Du, D. Koo, M. Ziegler & R.A. Cairncross, *Journal of Polymer Science B: Polymer Physics*, (2011) 49(12) 873-881.

14. 'Synthesis of Polylactide with Varying Molecular Weight and Aliphatic Content: Effect on Moisture Sorption,' V.M. Singh, D. Koo, G.R. Palmese & R.A. Cairncross, *Journal of Applied Polymer Science*, (2011) **120**(5) 2543-2549.
15. 'Effect of Biomass Species and Plant Size on Cellulosic Ethanol: A Comparative Process and Economic Analysis,' H.-J. Huang, D.R. Petrolia, S. Ramaswamy, A.-D. Waleed, U. Tschirner, & R.A. Cairncross, *Biomass and Bioenergy*, (2009) **33** (2) 234-246.
16. 'Diffusion in multi-component polymeric systems: Diffusion of non-volatile species in thin films,' M. Muller, M. Kind, R. Cairncross, & W. Schabel, *The European Physical Journal Special Topics*, (2009) **166** 103-106.
17. 'Sliding Wear Properties of HVOF Thermally Sprayed Nylon-11 and Nylon-11/Ceramic Composites on Steel,' L. Jackson, Ivosevic, R. A. Cairncross and R. Knight, *Journal of Thermal Spray Technology*, (2007) **16** (5-6) 927-932.
18. 'Melting and Degradation of Nylon-11 Particles during HVOF Combustion Spraying,' M. Ivosevic, R. Knight, & R.A. Cairncross, *Journal of Applied Polymer Science*, (2007) **105** (2) 827-837.
19. 'Moisture Sorption and Transport in Polylactide,' R.A. Cairncross, S. Ramaswamy, & R. O'Connor, *International Polymer Processing*, (2007) **22** (1) 33-37.
20. 'Effect of Substrate Roughness on Splating Behavior of HVOF Sprayed Polymer Particles: Modeling and Experiments,' M. Ivosevic, V. Gupta, R.A. Cairncross, R. Knight, & T.E. Twardowski, *Journal of Thermal Spray Technology*, (2006) **15** (4) 725-730.
21. 'Effect of Reinforcement Size on the Scratch Resistance and Crystallinity of HVOF Sprayed Nylon-11/Ceramic Composite Coatings,' S. Niezgoda, V. Gupta, R. Knight, R.A. Cairncross, & T.E. Twardowski, *Journal of Thermal Spray Technology*, (2006) **15** (4) 731-738.
22. '3D Predictions of Thermally Sprayed Polymer Splats: Modeling Particle Acceleration, Heating and Deformation upon Impact with a Flat Substrate,' M. Ivosevic, R. Knight, and R.A. Cairncross, *International Journal of Heat and Mass Transfer*, (2006) **49** (19-20) 3285-3297.
23. 'A Discrete Particle Transport Model for Predicting Coating Patterns in Electrostatic Spray,' S.A. Colbert & R.A. Cairncross, *Journal of Electrostatics*, (2006) **64** (3-4) 234-246.
24. 'Characterization of Superhydrophobic Materials using Multiresonance Acoustic Shear Wave Sensors,' S.J. Kwoun, R.M. Lec, R.A. Cairncross, P. Shah, & C.J. Brinker, *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, (2006) **53**(8) 1400-1403.
25. 'Moisture Sorption, Transport, and Hydrolytic Degradation in Polylactide,' R.A. Cairncross, J.G.Becker, S. Ramaswamy, & R. O'Connor, *Applied Biochemistry and Biotechnology* (2006) **129-132** 774-785.
26. 'A Computer Simulation for Predicting Electrostatic Spray Coating Patterns,' S.A. Colbert & R.A. Cairncross, *Powder Technology*, (2005) **151** (1-3) 77-86.
27. 'Static Wetting on Flexible Substrates: A Finite Element Formulation,' S. Madasu and R.A. Cairncross, *International Journal for Numerical Methods in Fluids*, (2004) **45** (3) 301-319.
28. 'Multi-Layer Mathematical Model for Drying of a Water Based Emulsion Coating Applied on a Silicone-Coated Paper Substrate,' A. Jain, R.A. Cairncross, K.N. Christodoulou and E. Rozenbaum, *Drying Technology Journal* (2003) **21** (10) 1991-2006.

29. 'Effect of Substrate Flexibility on Dynamic Wetting: A Finite Element Model,' S. Madasu and R.A. Cairncross, *Computer Methods in Applied Mechanics and Engineering*, (2003) **192** (25) 2671-2702.
30. 'Guidelines for Dryer Design Based on Results from Non-Fickian Model,' M. Vinjamur and R.A. Cairncross, *Journal of Applied Polymer Science* (2003) **87** (3) 477-486.
31. 'A Non-Fickian Non-Isothermal Model to Predict Anomalous Trapping Skinning Behavior During Drying of Polymer Coatings,' M. Vinjamur and R.A. Cairncross, *AIChE Journal* (2002) **48** (11) 2444-2458.
32. 'Desorption Overshoot in Polymer-Penetrant Systems: Asymptotic and Computational Results,' D.A. Edwards and R.A. Cairncross, *SIAM Journal of Applied Mathematics* (2002) **63** (1) 98-115.
33. 'Experimental Investigations of Trapping Skinning,' M. Vinjamur and R.A. Cairncross, *Journal of Applied Polymer Science* (2001) **83** 2269-2273.
34. 'A High Airflow Drying Experimental Set-up to Study Drying Behavior of Polymer Solvent Systems,' M. Vinjamur and R.A. Cairncross, *Drying Technology Journal* (2001) **19** 1591-1612.
35. 'Formation of Interfacial Voids in Composites with a Weakly Bonded Viscoplastic Matrix,' V.M. Harik and R.A. Cairncross, *Mechanics of Materials*, (2000) **32** (12) 807-820.
36. 'A Finite Element Method for Free-Surface Flows of Incompressible Fluids in Three Dimensions, Part I: Boundary-Fitted Mesh Motion,' R.A. Cairncross, P.R. Schunk, T.A. Baer, R.R. Rao, and P.A. Sackinger, *International Journal for Numerical Methods in Fluids*, (2000) **33** (3) 375-403.
37. 'A Finite Element Method for Free-Surface Flows of Incompressible Fluids in Three Dimensions, Part II: Dynamic Wetting Lines,' T.A. Baer, R.A. Cairncross, P.R. Schunk, R.R. Rao, and P.A. Sackinger, *International Journal for Numerical Methods in Fluids*, (2000) **33** (3) 405-427.
38. 'Optimization of Single-Zone Drying of Polymer Solution Coatings Using Mathematical Modeling,' P.E. Price and R.A. Cairncross, *Journal of Applied Polymer Science*, (2000) **78** (1) 149-165.
39. 'Evolution of Interfacial Voids Around a Cylindrical Inclusion,' V.M. Harik and R.A. Cairncross, *Journal of Applied Mechanics* (1999) **66** (2) 310-314.
40. 'Optimization of Single-Zone Drying of Polymer Solution Coatings to Avoid Blister Defects,' P.E. Price and R.A. Cairncross, *Drying Technology Journal* (1999) **17** (7-8) 1303-1311.
41. 'Pore Evolution and Solvent Transport During Drying of Gelled Sol-to-Gel Coatings: Predicting Springback,' R.A. Cairncross, P.R. Schunk, K.S. Chen, J. Samuel, S. Prakash, C.J. Brinker, and A.J. Hurd, *Drying Technology Journal* (1997) **15** (6-8) 1815-1826.
42. 'Anomalous Behavior During Leveling of Thin Coating Layers with Surfactant,' L.W. Schwartz, R.A. Cairncross, and D.E. Weidner, *Physics of Fluids A* (1996) **8** (7) 1693-1695.
43. 'Modeling Drying of Viscoelastic Polymer Coatings,' R.A. Cairncross and C.J. Durning, *AIChE Journal* (1996) **42** (9) 2415-2425.
44. 'Predicting Drying in Coatings that React and Gel: Drying Regime Maps,' R.A. Cairncross, L.F. Francis, and L.E. Scriven, *AIChE Journal* (1996) **42** (1) 55-67.
45. 'Modeling and Design of an Industrial Dryer with Convective and Radiant Heating,' R.A. Cairncross, S. Jeyadev, R.F. Dunham, K. Evans, L.F. Francis, and L.E. Scriven, *Journal of Applied Polymer Science* (1995) **58** (8) 1279-1290.

46. 'Thermal Gravimetric Analysis of Drying Sol-Gel Coatings: Comparison to Theoretical Predictions,' R.A. Cairncross, A. Limbert, L.F. Francis, and L.E. Scriven, in *Sol-Gel Processing and Applications*, edited by Y.A. Attia, Plenum Press, New York (1994) 111-118.
47. 'Competing Drying and Reaction Mechanisms in the Formation of Sol-to-Gel Films, Fibers, and Spheres,' R.A. Cairncross, L.F. Francis, and L.E. Scriven, *Drying Technology Journal* (1992) **10** (4) 893-923. Received Marcel Dekker Best Paper Award at the International Drying Symposium, 1994.

Invited Papers

48. 'The Roles of Geomembranes in Algae Production at Landfills,' Y.G. Hsuan, M.S. Olson, S. Spatari, R. Cairncross, & S. Kilham, *Geosynthetics Magazine* (2012) June/July, 34-41.
49. 'Residual Solvent in Drying Coatings,' R.A. Cairncross, *Adhesives Age* (2002) **45** (7) 37-41.
50. 'A One-Dimensional Model for Viscoelastic Diffusion in Polymers,' C.J. Durning, P.H. Tang, and R.A. Cairncross, in *Advances in the Flow and Rheology of Non-Newtonian Fluids*, edited by D.A. Singer, D. De Kee, and R.P. Chhabra (1999) 1489-1515.
51. 'Sol-Gel Derived Ceramic Films: Fundamentals and Applications,' C.J. Brinker, A.J. Hurd, P.R. Schunk, C.S. Ashley, R.A. Cairncross, J. Samuel, K.S. Chen, C. Scotto, and R.A. Schwartz, a chapter in *Metallurgical and Ceramic Coatings*, edited by K.H. Stern, Chapman and Hall, (1996) 112-151.
52. 'Solidification Processes: a Critical Assessment,' R. A. Cairncross, L. E. Scriven, and Colleagues, invited contribution to *Industrial Coatings Research* (1995) **3** 1-25.

Reports

53. 'Extraction of Lipids from Wastewater to Produce Biofuels,' R.A. Cairncross, M.S. Olson, S. Spatari, *Water Environment & Reuse Foundation (WERF) Final Report*, U3R13 (2016).
54. 'A Finite Element Formulation for Modeling Dynamic Wetting on Flexible Substrates and in Deformable Porous Media,' R. A. Cairncross and S. Madasu, P. Randall Schunk, *Sandia Report*, SAND2004 (2004).
55. 'GOMA - A Full-Newton Finite Element Program for Free and Moving Boundary Problems with Coupled Fluid/Solid Momentum, Energy, Mass, and Chemical Species Transport: User's Guide,' P.R. Schunk, P.A. Sackinger, R.R. Rao, K.S. Chen, and R.A. Cairncross, *Sandia Report SAND95-2937* (1996), **SAND97-2404**, October (1997).
56. 'Drying in Deformable Partially Saturated Porous Media: Sol-Gel Coatings,' R.A. Cairncross, P.R. Schunk, K.S. Chen, J. Samuel, S. Prakash, C.J. Brinker, and A.J. Hurd, *Sandia Report SAND96-2149* (1996).

Conference Proceedings

57. 'A Reaction-Diffusion Model Describing Antioxidant Depletion in PE-Clay Nanocomposites Under Thermal Aging,' I. Ahmad, S. Cheng, C. Wong, G. Hsuan, C.Y. Li, & R.A. Cairncross, proceedings of *ANTEC@NPE2012*, Orlando, FL, April 2-4, 2012.
58. 'Use Oxidative Induction Time to Evaluate Antioxidants in Polyethylene Clay Nanocomposite,' S. Cheng, W. K. Wong, I. Ahmad, Y. G. Hsuan, C. Y. Li, & R. Cairncross, proceedings of *North American Thermal Analysis Society 38th Annual Conference*, Philadelphia (2010)

59. 'Diseño de un Reactor para la Producción de Biodiesel de los Ácidos Grasos', C.A. Melick, M. Mohammed, and R.A. Cairncross, proceedings of *Congreso Latinoamericano de Estudiantes de Ingeniería Química XV*, San Salvador, El Salvador (2009)
60. 'Melting and Degradation of Nylon-11 Particles during HVOF Combustion Spraying', M. Ivosevic, R. A. Cairncross and R. Knight, proceedings of the *International Thermal Spray Conference*, Beijing (2007)
61. 'Sliding Wear Properties of HVOF Thermally Sprayed Nylon-11 and Nylon-11/Ceramic Composites on Steel,' L. Jackson, Ivosevic, R. A. Cairncross and R. Knight, proceedings of the *International Thermal Spray Conference*, Beijing (2007)
62. 'Effect of Substrate Roughness on Splatting Behavior of HVOF Sprayed Polymer Particles: Modeling and Experiments,' M. Ivosevic, V. Gupta, R.A. Cairncross, R. Knight, & T.E. Twardowski, proceedings of the *International Thermal Spray Conference*, (2006) – received Best Paper award from ITSC.
63. 'Effect of Reinforcement Size on the Scratch Resistance and Crystallinity of HVOF Sprayed Nylon-11/Ceramic Composite Coatings,' S. Niezgodna, V. Gupta, R. Knight, T.E. Twardowski, & R.A. Cairncross, proceedings of the *International Thermal Spray Conference*, (2006).
64. 'HVOF Sprayed Multi-Scale Polymer/Ceramic Composite Coatings,' V. Gupta, S. Niezgodna, R. Knight, T.E. Twardowski, & R.A. Cairncross, proceedings of the *International Thermal Spray Conference*, (2006).
65. 'The Study of Interaction of Superhydrophobic (SH) Materials with Fluids using TSM Sensors,' S.J. Kwoun, R.A. Cairncross, R.M. Lec, C.J. Brinker, & P. Shah, proceedings of *IEEE IFCS Conference* (2005) 78-83.
66. 'Modeling of the Solvent-Free Thermal Spray Deposition of Polymer and Polymer-Ceramic Composite Coatings,' M. Ivosevic, R.A. Cairncross, & R. Knight, proceedings of the *American Society for Composites Technical Conference* (2005)
67. 'Thermal Spraying of Polymer and Metal Particles: Comparison of Particle Heating and Deformation,' M. Ivosevic, R.A. Cairncross, & R. Knight, proceedings of the *Material Science and Technology Conference* (2005).
68. 'Impact Modeling of Thermally Sprayed Polymer Particles,' M. Ivosevic, R.A. Cairncross, & R. Knight, proceedings of *International Thermal Spray Conference*, (2005).
69. 'Properties of HVOF Sprayed Multi-Scale Polymer/Silica Composite Coatings,' V. Gupta, R. Knight, M. Ivosevic, S. Taghizadeh, R.A. Cairncross, & T.E. Twardowski, proceedings of *International Thermal Spray Conference*, (2005).
70. 'Comparative Numerical Analysis of Metal and Polymer Droplet Impact Spreading,' M. Ivosevic, R.A. Cairncross, & R. Knight, proceedings of *International Thermal Spray Conference*, (2004).
71. 'Application of lubrication theory to ovum through the human fallopian tube', F. Kellogg, R.A. Cairncross, M. Marcolonogo, *Proceedings of the IEEE 30th Annual Northeast Bioengineering Conference* (IEEE Cat. No.04CH37524) (2004) 158-159.
72. 'A Mathematical Model of Particle Transport in Electrostatic Spray Coating', S.C. Colbert and R.A. Cairncross*, *Proceedings of the AIChE Annual Meeting*, (2003).
73. 'A Mathematical Model of Particle Transport in Electrostatic Spray Coating', S.C. Colbert and R.A. Cairncross, *Proceedings of Multiphase Flow*, (2003).

74. 'A Finite Element Model for Dynamic Wetting on Flexible Solids using Arbitrary Lagrangian Eulerian (ALE) Mesh Motion', S. Madasu and R.A. Cairncross, *Proceedings of Moving Boundaries*, (2003).
75. 'Modeling Drying of Aqueous Pressure Sensitive Adhesive Coatings,' V.R. Gundabala, A.C. Jain, & R.A. Cairncross, *Proceedings of the Pressure Sensitive Tape Council Tech XXVI*, (2003).
76. 'Drying of a Coating Applied on Silicone-Coated Paper Substrate,' A. Jain, R.A. Cairncross, K.N. Christodoulou and E. Rozenbaum, *Proceedings of the Adhesion Society Annual Meeting* (2003).
77. 'The Fate of Residual Solvent in Drying Coatings: Can it Get Trapped and How?,' R.A. Cairncross, *Proceedings of the Pressure Sensitive Tape Council Tech XXV Meeting* (2002).
78. 'Multi-Layer Mathematical Model for Drying of a Water Based Emulsion Coating Applied on a Silicone-Coated Paper Substrate,' A. Jain, R.A. Cairncross, K.N. Christodoulou and E. Rozenbaum, *Drying 2002* (2002).
79. 'A Non-Fickian Non-Isothermal Model to Predict Anomalous Trapping Skinning Behaviour During Drying of Polymer Coatings,' M. Vinjamur and R.A. Cairncross, *Proceedings of the European Coating Symposium* (2001).
80. 'A High Airflow Drying Experimental Set-up to Study Drying Behavior of Polymer Solvent Systems,' M. Vinjamur and R.A. Cairncross, *Drying 2000* (2000).
81. 'Constitutive Modeling of Interfacial Plastic Fracture,' V.M. Harik and R.A. Cairncross, *Proceedings of the Fourth International Conference on Constitutive Laws for Engineering Materials* (1999) 301-304.
82. 'Optimization of Single-Zone Drying of Polymer Solution Coatings to Avoid Blister Defects,' P.E. Price and R.A. Cairncross, *Drying '98* (1998) 1822-1829.
83. 'Modeling Drying During Low-Speed Coating of Porous and Continuous Films,' R.A. Cairncross, *Proceedings of the Society for Imaging Science and Technology* (1997) 554-558.
84. 'Non-Deterministic Analysis of a Liquid Polymeric-Film Drying Process,' K.S. Chen and R.A. Cairncross, *Proceedings of the Society for Imaging Science and Technology* (1997) 548-553.
85. 'Three Dimensional Simulations of Coating Flows: Methods for Large Free Surface Deformations and Moving Three-Phase Lines,' R.A. Cairncross, P.R. Schunk, P.A. Sackinger, and R.R. Rao, *Proceedings of the Society for Imaging Science and Technology* (1997) 464-468.
86. 'Pore Evolution and Solvent Transport During Drying of Gelled Sol-to-Gel Coatings: Predicting Springback,' R.A. Cairncross, P.R. Schunk, K.S. Chen, J. Samuel, S. Prakash, C.J. Brinker, and A.J. Hurd, *Drying '96* (1996) 1295-1302
87. 'Conjugate Problems in Coating Processes,' P.R. Schunk, P.A. Sackinger, R.R. Rao, K.S. Chen, and R.A. Cairncross, *Proceedings of the Society for Imaging Science and Technology* (1996) 577-579.
88. 'Pore Evolution and Solvent Transport During Drying of Gelled Sol-to-Gel Coatings,' R.A. Cairncross, P.R. Schunk, K.S. Chen, J. Samuel, S. Prakash, C.J. Brinker, and A.J. Hurd, *Proceedings of the Society for Imaging Science and Technology* (1996) 569-573.
89. 'Recent Advances in Theoretical Modeling of Deposition, Drying, and Shrinkage in Sol-Gel Coating Processes,' R.A. Cairncross, K.S. Chen, P.R. Schunk, C.J. Brinker, and A.J. Hurd, *Proceedings of the American Ceramics Society National Meeting* (1995).

Patent

90. 'Acidic Methanol Stripping Process that Reduces Sulfur Content of Biodiesel from Waste Greases', R.A Cairncross, C.J. Stacy, and M.E. Hums filed by Drexel University and Environmental Fuel Research, LLC (2014) DREX-1188USP, patent pending . 62/128,789. (2015)
91. 'Method and Apparatus for a Mechanical Dryer for Drying Thick Polymer Layers on a Substrate,' Kent J. Evans, Warren R. Smith, Robert F. Dunham, Timothy J. Leenhouts, Barbara D. Ceglinski, and R. A. Cairncross, filed by Xerox Corporation (1993), issued (1995), U.S. patent #5,394,622.

Presentations at Professional Meetings

*(Speaker indicated by *)*

1. 'Using Engineering Models to Develop Improved Kite Systems for Atmospheric Monitoring' I. Snyder, D.K. Stout, G. Bland, and R.A. Cairncross* American Geophysical Union Fall Meeting, virtual, December 2020.
2. 'Desulfurization of Biodiesel: What Works and What Doesn't' R.A. Cairncross* and D.F. Wilson, Biodiesel Production Technology Summit, virtual, September 2020
3. 'Deep Desulfurization via Polarity Based Adsorbent' D.J. Wilson* and R.A. Cairncross* exhibit at National Biodiesel Board Annual Conference, Tampa, FL, January 2020
4. 'Air Quality Profiling Using Kites as Lifting Systems for Sensors or Air Samplers' K. Hudson, S. O'Dwyer, G. Bland*, and R.A. Cairncross, American Geophysical Union Fall Meeting, San Francisco, CA, December 2019
5. 'Mapping Air Quality with Kite-Based Sensors' A. Bhagwat, A Kloiber, D. Omo-Lamai, J. Lim, M. Taing, S. O'Dwyer, and R.A. Cairncross, EPA National Student Design Expo, Boston, MA, June 2019
6. 'Design of Remotely Controlled Kites for Environmental Monitoring' D. Olega and R.A. Cairncross* American Geophysical Union Fall Meeting, Washington, DC, December 2018.
7. 'Environmental Impacts of the Production of Biodiesel from Waste Greases' M.E. Hums*, R.A. Cairncross, S. Spatari, Next Generation Scientists for Biodiesel, National Biodiesel Conference, Tampa, FL, January 2016
8. 'Brown Grease to Biodiesel – Ten Years on the Path from University Research to Company Formation and (hopefully) Commercialization,' R.A. Cairncross*, presentation at TechConnect World Annual Meeting, Washington DC, May 2016
9. 'Evaluation of Techniques for Reducing Sulfur Content of Biodiesel Produced from Grease Trap Waste and Sewage Scum Grease.' R.A. Cairncross*, M.E. Hums, and S. Spatari, American Oil Chemists Society Annual Meeting, Salt Lake City, 2016
10. 'Extraction of Lipids from Wastewater to Produce Biofuels,' R.A. Cairncross*, workshop presentation at WEFTEC2015, Chicago, IL, September 2015
11. 'Extraction of Lipids from Wastewater to Produce Biofuels,' M.E. Hums, R.A. Cairncross*, S. Spatari, and M.S. Olson, presented at WEFTEC 2014 – the Water Quality Event, New Orleans, 2014.

12. 'Life Cycle Assessment for the Production of Biodiesel from Trap Grease', M.E. Hums*, R.A. Cairncross, S. Spatari, poster presented at International Symposium on Sustainable Systems and Technology (ISSST), Cincinnati, 2013
13. 'Mathematical Model Describes Antioxidant Depletion in PE-Clay Nanocomposites,' Iftexhar Ahmad*, S. Cheng, G. Hsuan, R. Cairncross, poster presented at *ANTEC 2013*, Cincinnati, April 2013.
14. 'Well-to-Wheel Life Cycle Assessment for the Production of Biodiesel From Trap Grease,' M. Hums*, C.J. Stacy, R.A. Cairncross, & S. Spatari, *AICHE National Meeting*, Pittsburgh, October 28-November 1, 2012.
15. 'Water Permeation In Polylactide and Polylactide/Montmorillonite Composites: Experimental Results Versus Theoretical Prediction,' A. Du*, G.A. Gelves, D. Koo, M. Ziegler, U. Sundararaj, & R.A. Cairncross, *AICHE National Meeting*, Minneapolis, October 16-20, 2011.
16. 'Novel Design for an Acid Catalyzed Bubble Reactor for Biodiesel Production,' C. Stacy*, B. Preston*, & R.A. Cairncross, National Council for Undergraduate Research, Ithaca, April 2011.
17. 'Water Transport in Polylactide and Polylactide-Montmorillonite Nanocomposites,' A. Du, D. Koo, M. Ziegler, G. Gelves, & R.A. Cairncross, ICCE, Shanghai, July 24-30, 2011.
18. 'Depletion Mechanisms of Antioxidants in Polyethylene/clay Nanocomposites,' S.Cheng, C. Wong, I. Ahmad, R.A. Cairncross, G. Hsuan, & C.Y. Li, CMMI Grantees Conference, Atlanta, January 2011.
19. 'Water Transport in Polylactide and Polylactide-Montmorillonite Nanocomposites,' A. Du, D. Koo, M. Ziegler, G. Gelves, & R.A. Cairncross, Thermal Analysis Society of Delaware Valley, Philadelphia, November, 2010.
20. 'Production of Biodiesel From Alternative Feedstocks – a Bubble Reactor for Converting Oils Containing Free-Fatty-Acids to Biodiesel,' R.A. Cairncross, C. Melick and M. Mohammed, *AICHE National Meeting*, Salt Lake City, November 7-12, 2010.
21. 'The Effect of Heat Treatment, Morphology and Crystallinity On Water Sorption in Polylactide (PLA),' A. Du, D. Koo, M. Ziegler and R.A. Cairncross, *AICHE National Meeting*, Salt Lake City, November 7-12, 2010.
22. 'Teaching Renewable Energy in El Salvador,' R.A. Cairncross, *AICHE National Meeting*, Salt Lake City, November 7-12, 2010.
23. 'La Situación de Energía Renovable en El Salvador,' R.A. Cairncross*, Agricultural Engineers Day, Universidad de El Salvador, San Salvador, El Salvador, May, 2010.
24. 'Combustibles de Biomasa,' R.A. Cairncross*, Earth Day Renewable Energy Panel Discussion sponsored by USA Embassy in El Salvador, Universidad CentroAmericana, San Salvador, El Salvador, April 20, 2010.
25. 'Biodiesel – Un Biocombustible Renovable: Producción de Fuentes Alternativas,' R.A. Cairncross*, Earth Day Renewable Energy Symposium sponsored by USA Embassy in El Salvador, Universidad Catolica, Santa Ana, El Salvador, April 19, 2010.
26. 'Biodiesel – Un Biocombustible Renovable: Producción de Fuentes Alternativas,' R.A. Cairncross*, Earth Day Renewable Energy Symposium sponsored by USA Embassy in El Salvador, Universidad Jose Matías Delgado, San Salvador, El Salvador, April 19, 2010.

27. 'Water Transport Mechanisms in Polylactide by Quartz Crystal Microbalance/ Heat Conduction Calorimetry', A. Du*, D. Koo, and R. Cairncross, *AIChE National Meeting*, Nashville, November 8-12 2009.
28. 'Synthesis and Water Sorption of Various End-Capped Polylactides', D. Koo*, A. Du, V.M. Singh, G.R. Palmese, & R.A. Cairncross, *AIChE National Meeting*, Nashville, November 8-12 2009.
29. 'Modeling of a Continuous Two-Phase Bubble Column Reactor for the Production of Biodiesel From Free Fatty Acids', R.A. Cairncross*, M. Mohammed, C.A. Melick, *AIChE National Meeting*, Nashville, November 8-12 2009.
30. 'Liquid Water Transport in Polylactide Using Time-Resolved FTIR-ATR Spectroscopy', E.M. Davis*, G. Theryo, M.A. Hillmyer, R.A. Cairncross, & Y.A. Elabd, *AIChE National Meeting*, Nashville, November 8-12 2009.
31. 'Relationship between moisture sorption and morphology of polylactide determined by quartz crystal microbalance', D.H. Koo*, A. Du, & R.A. Cairncross, *ACS National Meeting*, Salt Lake City, March 22-26, 2009.
32. 'Novel Reactor Design for Biodiesel Production', R.A. Cairncross, N.P. Cernansky, B. Schwartzbach, K. Nicosia, M. Petraghani, N. John, & S. Wilrigs, *EPA National Sustainable Design Expo*, Washington DC, April 18-20, 2009.
33. 'Novel Reactor Design for Biodiesel Production', C.A. Melick, M. Mohammed, J. Lucchesi, R.A. Cairncross*, and N.P. Cernansky, poster presented at *Advanced BioFuels Development Summit*, Washington DC, April 20-21, 2009.
34. 'Sorption and Diffusion of Water in Bio-Based Polymer Films', R.A. Cairncross*, *Thermal Analysis Society of Delaware Valley Symposium in Honor of Allan Smith*, Philadelphia, March 27, 2009.
35. 'Novel Reactor Design for the Production of Biodiesel from Free Fatty Acids', C.A. Melick, M. Mohammed, & R.A. Cairncross*, *AIChE National Meeting*, Philadelphia, November 2008.
36. 'Moisture Sorption In Polylactide with Varying Molecular Weight and Varying Aliphatic Content', V.M. Singh, R.A. Cairncross*, & Giuseppe Palmese, *AIChE National Meeting*, Philadelphia, November 2008.
37. 'Sliding Wear Behavior of HVOF Thermally Sprayed Nylon-11/Ceramic Composites on Steel,' L. Jackson, M. Ivosevic, R. A. Cairncross and R. Knight*, *16th International Federation of Heat Treating and Surface Engineering Conference*, Brisbane Australia, October 10 – November 1, 2007.
38. 'Sorption and Diffusion of Moisture in Bio-Based Polymer Films,' J.A. Meisner & R.A. Cairncross*, *ACS National Meeting*, Boston, MA, August 19-24, 2007.
39. 'Absorption and Diffusion in Bio-Based Polymer Films,' J.A. Meisner, S. Ramaswamy, R. O'Connor, A.L. Smith, & R.A. Cairncross*, *AIChE National Meeting*, San Francisco, CA November 12-17, 2006.
40. 'Thermal Spraying of Nylon-11 and Nylon-11/Silica Coatings: Modeling and Characterization of Coating Microstructure,' R.A. Cairncross*, M. Ivosevic, V. Gupta, S. Niezgoda, R. Knight, & T.E. Twardowski, *AIChE National Meeting*, San Francisco, CA November 12-17, 2006.

41. 'Hydrolytic Degradation of Polylactide and Production of Water-Soluble Hydrolyzate Species,' D. Wojdyla, U. Tschirner, R.A. Cairncross, S. Ramaswamy*, *AICHE National Meeting*, San Francisco, CA November 12-17, 2006.
42. 'Analysis of Lignocellulose to Fuel Ethanol Biorefinery,' H.-J. Huang*, S. Ramaswamy, A.-D. Waleed, U. Tschirner, & R.A. Cairncross, *AICHE National Meeting*, San Francisco, CA November 12-17, 2006.
43. 'Renewable Energy: Biodiesel, Solar, and Other Options,' F.M. Haas* and R.A. Cairncross*, *Engineers without Borders Mid-Atlantic Professionals Regional Conference*, Glassboro, NJ, 14 October 2006.
44. 'Effect of Shear Thinning on Droplet Spreading,' M. Ivosevic, R. Knight, & R.A. Cairncross*, *International Coating Science and Technology Symposium*, Denver, CO September 10-13, 2006
45. 'Absorption and Diffusion in Bio-Based Polymer Films,' J.A. Meisner, S. Ramaswamy, R. O'Connor, A.L. Smith, & R.A. Cairncross*, *International Coating Science and Technology Symposium*, Denver, CO September 10-13, 2006
46. 'Thermal Spraying of Multi-Scale Composite Coatings,' V. Gupta, M. Ivosevic, R.A. Cairncross*, & R. Knight, *International Coating Science and Technology Symposium*, Denver, CO September 10-13, 2006
47. 'Design of a Trap Grease Upgrader for BioFuel Processing,' J.M. Haas, J.M. Chapman, D.I. Crawford, V. Nguyen, P.D. Powell, R.A. Cairncross, & N.P. Cernansky, *EPA National Sustainable Design Expo*, Washington, DC, 9-10 May 2006.
48. 'Thermal Spray of Multi-Scale Polymer/Ceramic Coatings,' M. Ivosevic, R. Knight, R.A.Cairncross*, & T.W. Twardowski, *NSF DMII Grantees Conference*, St. Louis, MO, July 2006.
49. 'Moisture Sorption and Diffusion in Polylactide,' R.A. Cairncross*, J.G.Becker, S. Ramaswamy, & R. O'Connor, *USDA Grantees Conference*, Arlee, VA, February, 2006.
50. 'Solvent-Free Thermal Spraying of Polymer Particles,' M. Ivosevic*, R. Knight, & R.A. Cairncross, *APS Fluids Meeting*, Chicago, IL, 20-22 November 2005.
51. 'Moisture Sorption and Diffusion in Polylactide,' R.A. Cairncross*, J.G.Becker, S. Ramaswamy, & R. O'Connor, *AICHE National Meeting*, Cincinnati, OH, 30 October-4 November 2005.
52. 'Mechanisms of Moisture Transport in Bio-Based Polyester Coatings,' R.A. Cairncross*, J.G.Becker, S. Ramaswamy, & R. O'Connor, *European Coating Symposium*, Bradford, UK, 7-9 September 2005.
53. 'Modeling Transport, Impact, and Spreading of Thermally Sprayed Polymer Particles,' M. Ivosevic, R. Knight, & R.A. Cairncross*, *European Coating Symposium*, Bradford, UK, 7-9 September 2005.
54. 'Moisture Sorption, Transport, and Hydrolytic Degradation in Polylactide,' R.A. Cairncross*, J.G.Becker, S. Ramaswamy, & R. O'Connor, *Biotechnology for Fuels and Chemicals*, Denver, CO, 1-5 May 2005.
55. 'Impact Modeling of HVOF Sprayed Polymer Particles,' M. Ivosevic, R. Knight, & R.A. Cairncross*, *12th International Coating Science and Technology Symposium*, Rochester, NY, 20-22 September 2004.

56. 'A Discrete Particle Transport Model for Predicting Coating Patterns in Electrostatic Spray', S.A. Colbert* & R.A. Cairncross, *12th International Coating Science and Technology Symposium*, Rochester, NY, 20-22 September 2004.
57. 'Effect of Moisture Sorption on Microstructure and Properties of Paper', A.C. Jain* & R.A. Cairncross, *12th International Coating Science and Technology Symposium*, Rochester, NY, 20-22 September 2004.
58. 'Impact Modeling of HVOF Sprayed Polymer Particles', M. Ivosevic* & R.A. Cairncross, *Flow-3D World Users Conference*, Chicago, IL, 20-21 September 2004.
59. 'Unit Cell Model of Paper Structure', A.C. Jain* & R.A. Cairncross, *Progress in Paper Physics Seminar*, Trondheim, Norway, 21-24 June 2004.
60. 'Thermal Spray of Multi-Scale Polymer/Ceramic Coatings', M. Ivosevic, R. Knight, R.A. Cairncross*, V. Barghava, & T.W. Twardowski, *NSF DMII Grantees Conference*, Dallas, TX, 5-8 January 2004.
61. 'Swelling and Moisture Transport in Paper: From a Single Fiber Model to Macroscopic Properties', A.C. Jain and R.A. Cairncross*, *AIChE Annual Meeting*, San Francisco, CA, 16-21 November 2003.
62. 'A Mathematical Model of Particle Transport in Electrostatic Spray Coating', S.C. Colbert and R.A. Cairncross*, *AIChE Annual Meeting*, San Francisco, CA, 16-21 November 2003.
63. 'A Mathematical Model of Particle Transport in Electrostatic Spray Coating', S.C. Colbert and R.A. Cairncross*, *Multiphase Flow*, Sante Fe, NM, 3-5 November 2003.
64. 'A Finite Element Model for Dynamic Wetting on Flexible Solids using Arbitrary Lagrangian Eulerian (ALE) Mesh Motion', S. Madasu and R.A. Cairncross*, *Moving Boundaries*, Sante Fe, NM, 4-6 November 2003.
65. 'Using WebCT to Enhance Lectures in Chemical Engineering Courses,' R.A. Cairncross*, *Regional WebCT Conference*, Philadelphia, PA, 20 May 2003.
66. 'Modeling Drying of Aqueous Pressure Sensitive Adhesive Coatings,' V.R. Gundabala, A.C. Jain, & R.A. Cairncross*, *Pressure Sensitive Tape Council Tech XXVI*, Washington, DC, 7-9 May 2003.
67. 'Drying of a Coating Applied on Silicone-Coated Paper,' A.C. Jain, R.A. Cairncross*, K.N. Christodoulou, and E.N. Rosenbaum, *Adhesion Society Annual Meeting*, Myrtle Beach, SC, 23-25 February 2003.
68. 'Thermal Spray of Multi-Scale Polymer/Ceramic Coatings', R.A. Cairncross*, R. Knight, & T.W. Twardowski, *NSF DMII Grantees Conference*, Birmingham, AL, 5-8 January 2004.
69. 'A Mathematical Model of Particle Transport in Electrostatic Spray Coating,' S. Colbert, and R.A. Cairncross*, *AIChE Annual Meeting*, Indianapolis, IA, 3-8 November 2002.
70. 'Moisture Transport Through Paper: A Simplified Model,' A.C. Jain, R.A. Cairncross*, K.N. Christodoulou, and E.N. Rosenbaum, *AIChE Annual Meeting*, Indianapolis, IA, 3-8 November 2002.
71. 'Model of Water Evaporation Stage in Drying of Latex Film Coatings,' V. Gundabala*, and R.A. Cairncross, *11th International Coating Science and Technology Symposium*, Minneapolis, MN, 23-25 September 2002.

72. 'Numerical Technique for Modeling Dynamic Wetting on Flexible Substrates Using Arbitrary Lagrangian Eulerian (ALE) Mesh Motion,' S. Madasu*, and R.A. Cairncross, *11th International Coating Science and Technology Symposium*, Minneapolis, MN, 23-25 September 2002.
73. 'Mathematical Model for Drying Adhesive Coating on Silicone-Coated Paper,' A.C. Jain*, and R.A. Cairncross, *11th International Coating Science and Technology Symposium*, Minneapolis, MN, 23-25 September 2002.
74. 'A Mathematical Model of Particle Transport in Electrostatic Spray Coating,' S. Colbert*, and R.A. Cairncross, *11th International Coating Science and Technology Symposium*, Minneapolis, MN, 23-25 September 2002.
75. 'Multi-Layer Mathematical Model for Drying of Water Based Emulsion Coating Applied on Silicone-Coated Paper Substrate,' A.C. Jain, R.A. Cairncross*, K.N. Christodoulou, and E.N. Rosenbaum, *13th International Drying Symposium*, Beijing, China, 27-30 August 2002.
76. 'The Fate of Residual Solvent in Drying Coatings: Can it Get Trapped and How?,' R.A. Cairncross*, *Pressure Sensitive Tape Council Tech XXV*, Atlanta, GA, 1-3 May 2002.
77. 'The Effect of Substrate Stiffness on Dynamic Wetting: A Finite Element Model,' S. Madasu* and R.A. Cairncross, *APS Fluid Mechanics Division Meeting*, San Diego, CA, 18-20 November 2001.
78. 'Diffusion-Limited Drying in Glassy Polymer Coatings: Experiments and Theory of Anomalous Solvent Transport,' M. Vinjamur, V. Vadapalli, and R.A. Cairncross*, *AIChE National Meeting*, Reno, NV, 4-9 November 2001.
79. 'A Mathematical Model of Drying for Polymer Coatings on Hygroscopic Porous Substrates,' A.C. Jain* and R.A. Cairncross, *AIChE National Meeting*, Reno, NV, 4-9 November 2001.
80. 'A Finite Element Model of Dynamic Wetting on Flexible Substrates: Sensitivity of Contact Line Location to Substrate Stiffness,' S. Madasu and R.A. Cairncross*, *AIChE National Meeting*, Reno, NV, 4-9 November 2001.
81. 'A Non-Fickian Non-Isothermal Model to Predict Anomalous Trapping Skinning Behavior During Drying of Polymer Coatings,' M. Vinjamur and R.A. Cairncross*, *4th European Coating Symposium*, Brussels, Belgium, 1-4 October 2001.
82. 'A Finite Element Procedure for Modeling Dynamic Wetting on Flexible Substrates,' S. Madasu* and R.A. Cairncross, *AIChE National Meeting*, Los Angeles, CA, 12-17 November 2000.
83. 'Experimental and Theoretical Investigation of Oscillations in Jets Extruded from Rectangular Slots,' A.C. Jain* and R.A. Cairncross, *AIChE National Meeting*, Los Angeles, CA, 12-17 November 2000.
84. 'A Non-Isothermal, Non-Fickian Diffusion Model for Skinning Behavior of Polymer Coatings,' M. Vinjamur* and R.A. Cairncross, *10th International Coating Science and Technology Symposium*, Scottsdale, AZ, 25 September, 2000.
85. 'A Finite Element Procedure for Modeling Wetting on Flexible Substrates,' S. Madasu* and R.A. Cairncross, *10th International Coating Science and Technology Symposium*, Scottsdale, AZ, 27 September, 2000.

86. 'A High Airflow Drying Experimental Set up to Study Drying Behavior of Polymer Solvent Systems,' M. Vinjamur* and R.A. Cairncross, *12th International Drying Symposium*, Eindhoven, Netherlands, August 28-30, 2000.
87. 'An Experimental Method for Studying Diffusion-Limited Drying of Polymer Solvent Coatings,' M. Vinjamur and R.A. Cairncross*, *AIChE National Meeting*, Dallas, TX, 1 November 1999.
88. 'Constitutive Modeling of Interfacial Plastic Fracture,' V.M. Harik* and R.A. Cairncross, *4th International Conference on Constitutive Laws for Engineering Materials*, Troy, NY, August 1999.
89. 'Influence of Solvation Forces on the Evolution of Pore-Size Distributions in Mesoporous Ceramic Coatings,' R.A. Cairncross* and L.J Douglas Frink, *AIChE National Meeting*, Miami, FL, 16 November 1998.
90. 'Optimization of Single-Zone Drying of Polymer Solution Coatings to Avoid Blister Defects,' P.E. Price and R.A. Cairncross*, *11th International Drying Symposium*, Thessaloniki, Greece, 19 August 1998.
91. 'High Airflow Drying Experimental Setup for Measuring Evaporation Rate of Polymer/Solvent Coatings,' T. Winward and R.A. Cairncross*, *9th International Coating Science and Technology Symposium*, Newark, DE, 17-20 May 1998.
92. 'Bead Laydown in Three Dimensions: The Kinematic Paradox Revisited,' T.A. Baer*, P.R. Schunk, R.A. Cairncross, R.R. Rao, and P.R. Sackinger, *9th International Coating Science and Technology Symposium*, Newark, DE, 17-20 May 1998.
93. 'Incorporating Molecular Detail in a Macroscopic Model of Drying in Mesoporous Ceramic Coatings,' R.A. Cairncross* and L.J.D. Frink, *AIChE National Meeting*, Los Angeles, CA, 21 November 1997.
94. 'Full Newton, Finite Element Simulation of Viscous Incompressible Flows with Free and Moving Boundaries on Distributed Memory Computers,' P.A. Sackinger*, R.R. Rao, R.A. Cairncross, and P.R. Schunk, *AIChE National Meeting*, Los Angeles, CA, 21 November 1997.
95. 'Three Dimensional Simulations of Coating Flows: Methods for Large Free Surface Deformations and Moving Three-Phase Lines,' R.A. Cairncross*, P.R. Schunk, P.A. Sackinger, and R.R. Rao, *AIChE National Meeting*, Los Angeles, CA, 21 November 1997.
96. '3D Computational Fluid Dynamics of Coating flows: Methods for Dealing with Large Free-Surface Deformations and Moving Contact Lines,' R.A. Cairncross*, P.R. Schunk, P.A. Sackinger and R.R. Rao, *Imaging Science and Technology Annual Conference*, Minneapolis, MN, 18-23 May 1997.
97. 'Modeling Drying During Low-Speed Coating of Porous and Continuous Films,' R.A. Cairncross*, *Imaging Science and Technology Annual Conference*, Minneapolis, MN, 18-23 May 1997.
98. 'Non-Deterministic Analysis of a Coated-Polymeric-Liquid-Film Drying Process,' K.S. Chen* and R.A. Cairncross, *Imaging Science and Technology Annual Conference*, Minneapolis, MN, 18-23 May 1997.
99. 'Pore Evolution and Solvent Transport During Drying of Gelled Sol-Gel Coatings: Predicting 'Springback',' R.A. Cairncross*, P.R. Schunk, K.S. Chen, S. Prakash, J. Samuel, A.J. Hurd, and C.J. Brinker, *10th International Drying Symposium*, Krakow, Poland, 30 July - 2 August 1996.

100. 'Pore Evolution and Solvent Transport During Drying of Gelled Sol-Gel Coatings,' R.A. Cairncross*, P.R. Schunk, K.S. Chen, S. Prakash, J. Samuel, A.J. Hurd, and C.J. Brinker, *Imaging Science and Technology Annual Conference*, Minneapolis, MN, 19-22 May 1996.
101. 'A Theoretical Study of Optimum Thin Film Drying,' P.E. Price and R.A. Cairncross*, *International Symposium on Coating Science and Technology, AICHE National Meeting*, New Orleans, LA, 25-29 February 1996.
102. 'Uncertainty/Sensitivity Analysis of a Polymeric-film-coating Drying Process,' K.S. Chen* and R.A. Cairncross, *International Symposium on Coating Science and Technology, AICHE National Meeting*, New Orleans, LA, 25-29 February 1996.
103. 'Pore Evolution and Solvent Transport During Drying of Gelled Sol-to-Gel Coatings,' R.A. Cairncross*, P.R. Schunk, K.S. Chen, S. Prakash, J. Samuel, A.J. Hurd, and C.J. Brinker, *International Symposium on Coating Science and Technology, AICHE National Meeting*, New Orleans, LA, 25-29 February 1996.
104. 'From Multiphysics to Moving Contact Lines: Conjugate Problems in Coating Processes,' P.R. Schunk*, P.A. Sackinger, R.R. Rao, K.S. Chen, and R.A. Cairncross, *International Symposium on Coating Science and Technology, AICHE National Meeting*, New Orleans, LA, 25-29 February 1996.
105. 'A Coherent Finite-Element Analysis of Flexible Blade Coating of a Deformable Substrate,' K.S. Chen*, P.R. Schunk, and R.A. Cairncross, *International Symposium on Coating Science and Technology, AICHE National Meeting*, New Orleans, LA, 25-29 February 1996.
106. 'Pore Evolution and Solvent Transport During Drying of Gelled Sol-to-Gel Coatings,' R.A. Cairncross*, P.R. Schunk, K.S. Chen, S. Prakash, J. Samuel, and C.J. Brinker, *AICHE National Meeting*, Miami, FL, 12-17 November 1995.
107. 'Recent Advances in Theoretical Modeling of Deposition, Drying and Shrinkage in Sol-Gel Coating Processes,' R.A. Cairncross*, K.S. Chen, P.R. Schunk, C.J. Brinker, and A.J. Hurd, *American Ceramic Society Annual Meeting*, Minneapolis, MN, 30 April - 3 May 1995.
108. 'Predictions of Desorption from Viscoelastic Polymer Coatings,' R.A. Cairncross*, and C.J. Durning, *AICHE National Meeting*, San Francisco, CA, 12-18 November 1994.
109. 'Modeling and Design of Industrial Dryers to Eliminate Bubble Defects,' R.A. Cairncross*, L.F. Francis, and L.E. Scriven, *International Drying Symposium*, Broadbeach, Queensland, Australia, 1-4 August 1994.
110. 'Skinning Phenomena in Drying Coatings: An Assessment,' R.A. Cairncross*, L.F. Francis, L.E. Scriven, and P.E. Price, *International Symposium on Coating Science and Technology, AICHE National Meeting*, Atlanta, GA, 17-21 April 1994.
111. 'Modeling and Design of an Industrial Dryer to Eliminate Blister Defects,' R.A. Cairncross*, L.F. Francis, L.E. Scriven, S. Jeyadev, R.F. Dunham, and K. Evans, *International Symposium on Coating Science and Technology, AICHE National Meeting*, Atlanta, GA, 17-21 April 1994.
112. 'Measuring Surface Tension and Viscosity of Drying Coatings by Light Scattering from Capillary Waves,' R.A. Cairncross and A.J. Hurd*, *International Symposium on Coating Science and Technology, AICHE National Meeting*, Atlanta, GA, 17-21 April 1994.
113. 'Interpreting Experimental Results with Computer-Aided Predictions of the Sol-Gel Dip Coating Process,' P.R. Schunk*, C.J. Brinker, A.J. Hurd, and R.A. Cairncross, *International*

Symposium on Coating Science and Technology, AIChE National Meeting, Atlanta, GA, 17-21 April 1994.

114. 'Competition between Drying and Reaction Kinetics in Deposited Solutions of Random Network Polymers,' R.A. Cairncross*, L.F. Francis, and L.E. Scriven, *AIChE National Meeting, St. Louis, MO, 7-12 November 1993.*
115. 'Gelation and Cracking in Drying of Sol-to-Gel Films: Comparison of Theory and Experiment,' R.A. Cairncross*, L.F. Francis, L.E. Scriven, and A.J. Hurd, *AIChE National Meeting, St. Louis, MO, 7-12 November 1993.*
116. 'Experimental Studies of Drying and Solidification in Sol-Gel Derived Coatings,' R.A. Cairncross, A. Limbert, L.F. Francis*, and L.E. Scriven, *Fine Particle Society Annual Meeting, Chicago, IL, 27 August 1993.*
117. 'Drying and Gelation in Sol-to-Gel Films: Theoretical Studies,' R.A. Cairncross*, L.F. Francis, and L.E. Scriven, *American Ceramic Society Annual Meeting, Cincinnati, OH, 18-22 April 1993.*
118. 'Drying and Gelation in Sol-to-Gel Films: Experimental Studies,' R.A. Cairncross, L.F. Francis*, and L.E. Scriven, *American Ceramic Society Annual Meeting, Cincinnati, OH, 18-22 April 1993.*
119. 'Competing Drying and Reaction Mechanisms in the Formation of Sol-to-Gel Films, Fibers, and Spheres,' R.A. Cairncross*, L.F. Francis, and L.E. Scriven, *International Drying Symposium, Montreal, Canada, 2-5 August 1992.*
120. 'Mechanisms Controlling Drying Profiles of Dip Coated Sol-to-Gel Films,' R.A. Cairncross*, L.F. Francis, and L.E. Scriven, *International Symposium on Coating Science and Technology, AIChE National Meeting, New Orleans, LA, 30 March - 2 April 1992.*
121. 'Drying and Reaction Mechanisms Controlling Structure and Property Distribution in Sol-Gel Films,' R.A. Cairncross*, L.F. Francis, and L.E. Scriven, *American Ceramic Society Annual Meeting, Minneapolis, MN, 12-16 April 1992.*
122. 'Theory and Modeling of Drying in Sol-Gel Films,' R.A. Cairncross*, L.F. Francis, and L.E. Scriven, *AIChE National Meeting, Los Angeles, CA, 17-22 November 1991.*

Funded Proposals

1. Slot coating Perovskite PV (NSF-CMII co-PI 25% with Baxter), 2019-2021, \$568,652
2. 'Mapping Air Quality with Kite-Based Sensors' (EPA P3, Principal PI 100%) 2018, \$15,000
3. 'Extraction of Lipids from Wastewater to Produce Biofuels' (Water Environment Research Foundation: Principal PI 35%) 2014, \$149,932.
4. 'Biofuel Production from Grease Trap Waste' (SBIR EPA funding: Principal PI 100% on subcontract), 2014, \$99,000.
5. 'Sustainable Engineering - A Multidisciplinary Curriculum for Training Engineers-of-the-Future' (Fulbright Lectureship in El Salvador: Principal PI 100%), 2010, \$30,000.
6. 'Producing Fuels from Landfill Wastes: Using Algae to Convert Landfill Gases and Landfill Leachate into Oil and Biodiesel' (Drexel Engineering Cities Initiative Grant: Principal PI 20% with Olson, Spataro, Kilham, and Hsuan), 2009-2010, \$4,000.
7. 'Depletion Mechanisms of Antioxidants in Polyethylene-Clay Nanocomposites' (NSF: co-PI 30% with Hsuan, Li) 2008-2013, \$340,000. REU supplement \$6,000.
8. 'Novel Reactor Design for Efficient Production of Biodiesel from High Free-Fatty-Acid Oils' (EPA P3 Award – Phase II: principal PI 75% with Cernansky) 2008-2010, \$74,960.
9. 'Moisture Management in Polylactide and Polylactide Copolymers' (USDA-USDOE Biomass Initiative: principal PI 25% with Palmese, Elabd, Ramaswamy, Hillmyer) 2006-2010, \$1,312,393.
10. 'Novel Reactor Design for Efficient Production of Biodiesel from High Free-Fatty-Acid Oils' (EPA P3 Award – Phase I: principal PI 75% with Cernansky) 2007-2008, \$9,975.
11. 'Liquid Fuels from Biomass: An Integrated Biorefinery Approach' (Initiatives for Renewable Energy and the Environment: co-PI 5% with Valentas, Eidman, von Keitz, Polasky, Tschirner & Ramaswamy) 2005-2008, \$512,990
12. 'Moisture Degradation Kinetics of Poly Lactic Acid (PLA)' (Initiatives for Renewable Energy and the Environment: co-PI 33% with Ramaswamy and Ruan) 2004-2005, \$46,000.
13. 'Sabbatical Research: Water Diffusion and Hydrolytic Degradation Reactions in Poly(lactic acid)' (USDA Research Strengthening Award) 2004-2005, \$80,025
14. 'Mechanisms Responsible for Blastocyst Attachment' (Drexel Synergy: co-PI 5% with Marcolongo, Wapner, Woodlan, Chaiken, & Robertson) 2004-2005, \$20,000
15. 'Collaborative Proposal: Thermal Spray of Multiscale Polymer/Ceramic Composite Coatings' (NSF *DMII 0209319*: principal PI 50% with Knight and collaboration with Twardowski at Philadelphia University) 2002-2006, \$314,642
16. 'GOALI: Modeling Drying of Polymer-Impregnated Composites' (NSF *CTS 9908630*: principal PI 80% with Christodoulou (industrial partner)) 2000-2002, \$117,053
17. 'Acquisition of a High Performance Parallel Computer: Multidisciplinary Need to Advance Computing in Engineering' (NSF-MRI: co-PI 20% with Farouk (PI), Katsinis, Zavaliangos and Zerva) 1999-2002, \$300,000
18. 'Experimental Simulation of Drying and Skinning of Polymer/Solvent Coatings in Industrial Dryers' (3M Non-Tenured Faculty Award: principal PI 100%) 1998-2001, \$20,000

19. 'High Airflow Drying Experiment' (*Avery-Dennison*: principal PI 100%) 1998, \$10,000
20. 'Capillary Elastohydrodynamics in Manufacturing Processes' (*DOE-DP PECASE Award*: principal PI 100%) 1997-2003, \$250,000
21. 'Characterization of Mechanism causing Diffuse Spot Defects during Drying of Lithographic Printing Plate Coatings' (*E.I. DuPont/Delaware Research Partnership*: principal PI 100%) 1997, \$50,000
22. 'Experimental Simulation of Drying and Skinning of Polymer/Solvent Coatings in Industrial Dryers' (*3M Non-Tenured Faculty Award*: principal PI 100%) 1997, \$10,000
23. 'Sol-Gel Film' (*Sandia National Laboratories*: principal PI 100% while visiting faculty at University of Delaware) 1995-1997, \$149,981

Funded Proposals through Environmental Fuel Research, LLC

24. 'Desulfurization of Biodiesel Produced from Low-Quality Feedstocks' (SBIR Phase I USDA funding), 2017, \$100,000 with \$27,636 subcontract to Drexel (Olson PI on subaward).
25. 'Purification of Brown Grease for Fuel Production' (SBIR Phase I DOE funding), 2017, \$150,000 with \$34,458 subcontract to Drexel (Olson PI on subaward).
26. 'Biofuel Production from Grease Trap Waste' (SBIR Phase II EPA funding), 2015, \$300,000 with \$55,243 subcontract to Drexel (Olson PI on subaward).
27. 'Biofuel Production from Grease Trap Waste' (SBIR Phase I EPA funding), 2014, \$99,000 with \$26,145 subcontract to Drexel (Cairncross PI on subaward).

Students Supervised

Drexel University

PhD Research Projects:

- Qiaoyi Zhang (co-advising with Jason Baxter): “Slot Coating of Perovskite Photovoltaics” (PhD anticipated 2023)
- Megan Hums: “Environmental Impacts of Biofuels produced from wastes” (PhD 2016)
- Iftekhar Ahmad: “Modeling Anti-oxidant Transport and Degradation in Polyethylene Nanocomposites” (Ph.D. 2015)
- Dennis Dever (co-advisor with Elabd): “Modeling Transport in Fuel Cells” (Ph.D., 2014)
- An Du: “Moisture Sorption and Diffusion in Polylactide” (Ph.D. 2012)
- Donhun Koo: “Synthesis of End-Capped Polylactide and Effects of Microstructure and Sorption” (Postdoctoral Researcher 2008-2010)
- Steven Colbert: “Mathematical Modeling of Particle Transport in Electrospray coating” (Ph.D. 2007)
- Milan Ivosevic (co-advisor with Knight): “Modeling Thermal Spraying of Polymer Ceramic Composites” (Ph.D. 2006)
- Amitkumar Jain: “Drying Moisture Transport in Paper & Paper Coatings” (Ph.D. 2004)
- Srinath Madasu: “Wetting on Flexible Substrates: A Finite Element Formulation” (Ph.D. 2002)
- Madhu Vinjamur: “Trapping Skinning: An Anomalous Drying Behavior of Polymer Solvent Systems” (Ph.D. 2001)

MS Research Projects:

- Gregory Manoukian: “Technoeconomic analysis of Desulfurization of Crude Biodiesel from Contaminated Waste Grease Feedstocks” (2019)
- Minhazzudin Mohammed: “Modeling Bubble Column Biodiesel Reactor” (MS 2011)
- Joshua Meisner: “Moisture Transport in Bio-Based Polymers” (MS 2011)
- Christopher Vander Neut: “Life Cycle Analysis of Algae Bioreactors” (MS 2010)
- Vishesh Singh: “Synthesis of Modified PLA Polymers with Improved Moisture Barrier Properties” (M.S. 2009)
- Varun Gupta: “Thermal Spraying of Multi-Scale Composite Coatings” (M.S. 2006)
- Frank Kellogg (co-advisor with Marcolongo) “Ovum Transport in Fallopian Tubes” (MS 2003)
- Amitkumar Jain: “Study of Oscillating Jets Extruded from Rectangular Slots” (M.S. 2001)
- Venkata Gundabala: “A Particle Dynamics Model for Water Evaporation Stage during Latex Film Formation” (M.S. 2002)
- Vatsalla Vadapalli: “Simplified Method for Predicting Residual Solvent Content in Polymer Coatings” (M.S. 2001)

Undergraduate Research Projects (co-op students and STAR scholars indicated):

1. Isabella Snyder – development of a pitch equilibrium and stability model for kite systems (2020) STAR
2. Madison Lentz – application of sensors for datalogging with kite systems (2020) (co-op)
3. Jaydepp Dave – construction of a Janus kite (2020)
4. Ali Khan – application of raspberry pi camera system for livestreaming video from kites (2020)

5. Zohair Hasan – application of raspberry pi camera system for livestreaming video from kites (2020)
6. Kira Hudson – datalogging with kites for environmental monitoring (2019) STAR
7. Shannon O’Dwyer – developing a tubing system for air monitoring with kites (2018-2019)
8. Atharva Bhagwat – environmental monitoring with kite systems (2018-2019)
9. Darrell Omo-Lamai – environmental monitoring with kite systems (2019)
10. Anna Kloiber – construction of stabilized platforms for kite aerial photography (2019)
11. Matthew Taing – aerial imaging with kites and drones (2019)
12. Jesse Lim – assessing mechanisms for enabling steerable kites (2018-2019)
13. Chongshi Wang – desulfurization of crude biodiesel (2018-2019) (co-op)
14. Darius Olega – implementing flight control systems on stunt kites (2018) STAR
15. Jesse Efyomow – optimizing adsorptions systems for desulfurization of biodiesel (2018-2019)
16. Vincent Spina – nanofiltration of biodiesel (2017) STAR
17. Abinishaa Sivaraj – reactive desulfurization of biodiesel (2017) STAR
18. Tyler Lister– analysis of contaminants in biodiesel (2016) (co-op)
19. Lindsay Fitzer – analysis of biodiesel composition (2015-2016)
20. Edwin Guillermo – methods for washing biodiesel (2015) STAR
21. Zachary Gibbins – enzymatic processing of grease (2015) STAR
22. Adam Moody – vacuum distillation of biodiesel (2015) STAR
23. Travis Scott – process model for several grease to biodiesel processing scenarios (2015)
24. Devin Peck – hydrolysis of acyl glycerides to free fatty acids (2015)
25. Robert Beverly – vapor liquid equilibria in biodiesel solutions (2015) STAR
26. James Moran – water quality of wastewater separated from waste greases (2015)
27. Jinhao Wang – longitudinal study of waste grease composition (2014-2015) (co-op)
28. Brian Rummell – modeling sedimentation and floatation in particulate suspensions (2014)
29. Paul Gardiner – gas chromatography of lipids (2014)
30. Tapiwa Ndvolo – bubble column reactor biodiesel production (2014) STAR
31. Kelsey O’Hare – grease to biodiesel processing (2014) STAR
32. Laura Hrabar – lipid extraction from sewage scum (2014)
33. Linette Figueroa – lipid extraction from sewage scum (2014)
34. Lyndsay Fitzer – analysis of lipid composition (2014)
35. Maxine Morris – methods for extracting lipids from waste greases (2013-2014)
36. Julia Vieira dos Santos: Fractional crystallization of waste lipids (2013)
37. Louis Sacks: Pre-treatment of greases for biodiesel production (2013) STAR
38. Gabrielle Arnold: Antioxidant depletion in polyethylene nanocomposites (2013)
39. Susan Budhoo: analysis of lipid and biodiesel quality (2012-2013)
40. Alex Wartenberg: developing a surrogate for trap grease (2013)
41. Juan Sebastian Alvarez: biodiesel production (2013) STAR
42. Alvenne Goh: Measuring oxidation induction time in polyethylene nanocomposites (2012)
43. Kyle Mattson: Analysis of Algae Bioreactors (2011)
44. Jaqueline Brigugilio: Extraction of Lipids from Trap Grease (2011-2012)
45. Eric Lister: Techniques for Measuring Conversion in Biodiesel Reactors (2011-2012)
46. Megan Sparaco: Measurement of Mass Transfer in Bubble Column Reactors (2011)
47. Patrick Kritz: 2-Step Biodiesel Reactions (2011)
48. Rebecca Peltzman: purification of trap grease for conversion to biodiesel. (2011)
49. Colin Stacy: Improvements in Design of Bubble Column Biodiesel Reactor (2010-2012) STAR (co-op)

50. Mary Zeigler: Effect of Microstructure on Moisture Sorption in Polylactide and Composites (2010)
51. Kelsey Gold: Biodiesel Quality (2010) STAR
52. Huong (Kate) Ngo: Biodiesel Reactions (2009)
53. Brittany Preston: NMR Analysis of Biodiesel Reactions from Mixed Feedstocks (2009-2010)
54. Christopher Van Der Neut: Biodiesel Production from Algae (2009)
55. Christopher Kasian: Water Permeation in Bio-Based Polymers (2009)
56. Shuiqiang Lin: Design of small-scale bubble reactor for biodiesel production (2009)
57. Eric Wargo and Dean Galarowicz: Continuous Bubble Column Reactor for Biodiesel Production (2008)
58. Jared Lucchesi: Sparging in Bubble-Column Reactor (2008)
59. Lisa Leone: Catalysts for Biodiesel Production (2007)
60. Minhazuddin (Roman) Mohammed: Biodiesel from high-FFA oils (2007)
61. Corey Melick: Biodiesel from high-FFA oils (2007) STAR
62. Lauren Jackson: Wear Testing of Thermally-Sprayed Polymer and Composite Coatings (2006)
63. Harren Bray: Degradation of Nylon-11 during Thermal Spraying (2006)
64. Roy Stoflet: Thermal Spraying of Polymer Particles on Rough Surfaces (2005-2006)
65. Emily Housel: Biorefining: Liquid Fuels From Renewable Resources (2005)
66. Jeremy Baldoni: Splattering During Thermal Spraying of Polymers (2005)
67. Steve Niezgoda: Thermal Spraying of Composites (2005)
68. Nicole Tantala: Thermal And Mechanical Quality Control Of Carbon-Epoxy Composites (2004)
69. Shadbeh Taghizadeh: Characterization of Polymer/Ceramic Composite Powders and Coatings (2004)
70. Matthew Chalker: Molten Polymer Droplet Deformation During Thermal Spraying and Post-Deposition Heat Treatment (2004)
71. Shannon Lafferty: Melt Properties of Nylon 11 (2004)
72. Andrew Fallis: Fiber Swelling, Shrinkage and Collapse in Drying and Moisturization of Paper (2003)
73. Cristin Yavorsky (co-advisor with Knight): Thermal Spraying of Polymer-Ceramic Composites (2003)
74. Lee Laim (co-advisor with Knight): Thermal Spraying of Polymer-Ceramic Composites (2003)
75. Frank Kellogg (co-advisor with Marcolongo): Ovum Transport in Fallopian Tubes (2003)
76. Steven Sinclair: Multicomponent Diffusion in (2002-2003)
77. Andrea Wang: Experimental Procedures for High Airflow Drying Experiment (2001)
78. Yinka Abdul: Case Hardening in Food Substances (2001)
79. David Hopely: Solid-Liquid Extraction (1999)
80. Nestor Santos: Diffusional plateaus in drying polymer/solvent coatings (1999)
81. Steve Willoughby: Asymptotic analysis of externally limited drying (1999)
82. Brant Bulgarelli: Dynamics of flow in flexible tubes (1998)
83. Jenna Vebrosky: Pore-size evolution due to molecular adsorption in mesoporous ceramics (1998)

High School Student Research Projects:

- Vinay Hiremath: Moisture Permeation in Bio-Based Polymers (2009)
- Jeff Mercanti: Model-Based Estimation Diffusion Parameters From Macroscopic Experimental Data (2002)

- Wyatt Ochadlick (co-advisor with Knight): Thermal Spraying of Polymer-Ceramic Composites (2003)

University of Delaware

Undergraduate Research Projects:

- Kevin Agnew: Construction of High airflow drying experiment (1997)
- Thomas Winward: Calibration of High airflow drying experiment (1997)

Courses Taught

Drexel University Courses

Instructor for:

- CHE 201 Process Material Balances (F03, S03)
- CHE 202 Process Energy Balances (Su09, Su10, Su11, Su 12, Su 13)
- CHE 304 Mass Transfer (W17 W18, W19)
- CHE 305 Process Separations (F97, S97, F98, S98, F99, Sp17)
- CHE 310 Transport Phenomena (F00, F01, F02)
- CHE 311 Fluid Flow and Transport (F00, S00, F01, S01, F02, S02)
- CHE 334 ChE Lab III (W97, W98)
- CHE 335, 350 CHE Statistics (F18, Sp18, F19)
- CHE 399 EWB El Salvador Project (S06, F07, W08)
- CHE 371 Engineering Economics and Professional Practice (W19, Su19)
- CHE 400 Renewable Energy Tech (S06, W07)
- CHE 400 Sustainable Engineering (W12, W13)
- CHE 430 Introduction to Sustainable Engineering (W14,W16)
- CHE 480 Biodiesel Laboratory Module (F16)
- CHE 481 Process Design I (F05, F06, F07, F08, F09, F10, F11)
- CHE 482 Process Design II (W05, W06, W07, W08, W09, W10, W11)
- CHE 483 Process Design III (S05, S06, S07, S08, S09, S10, S11)
- CHE 502 Graduate Mathematical Methods in Chemical Engineering (F19)
- CHE 525 Transport Phenomena 1 (W00, W01, W02, W03)
- CHE 626 Transport Phenomena II (S12, S13, S14, S16)
- UNIV 101 Freshman Seminar (F03, W03)
- UNIV 241 Great Works: Energy Alternatives (W09)
- ENGR 101 Engineering Design Lab I (F12, F13, F14, F16)
- ENGR 102 Engineering Design Lab II (W12, W13, W14, W16)
- ENGR 103 Engineering Design Lab III (S12, S13, S14, S16)
- Developing Biofuels Module for ENGR 102-103 (2013)

Recitation Instructor for:

- TDEC 212 Materials II (W97, W98, W99)
- TDEC 121 Chemical and Biological Foundations of Engineering (W99, S99)

Advisor for Senior Design Teams:

1. 'Electrochemical Renewable Diesel' (2020) Chemical & Biological Engineering
2. 'Bagasse Biofuel' (2019) Chemical & Biological Engineering
3. 'Brown Grease Biodiesel' (2019) Chemical & Biological Engineering
4. 'Direct Air Capture of CO₂' (2017-2018) Chemical & Biological Engineering.
5. 'Bagasse Wastewater Processing' (2017-2018) Chemical & Biological Engineering.
6. 'Trap Grease to Energy and Chemicals' (2017-2018) Chemical & Biological Engineering.
7. 'Grape Pomace to Butanol' (2016-2017) Chemical & Biological Engineering.
8. 'Biodiesel from Coffee Waste' (2014-2015) Chemical & Biological Engineering.
9. 'Biodiesel from Sewage Scum Grease' (2014-2015) Chemical & Biological Engineering.
10. 'Biodiesel from Brown Grease' (2013-2014) Chemical & Biological Engineering.
11. 'Synthesis of Diesel from Biomass Sorghum' (2013-2014) Chemical & Biological Engineering.
12. 'Biodiesel production using Algae and Landfill Leachate' (2013-2014) Chemical & Biological Engineering.
13. 'Dissolved Air Flootation Equipment for Separating Wastewater from Trap Grease' (2013-2014) Mechanical Engineering & Mechanics.
14. 'Acetic Acid from Natural Gas' (2012-2013) Chemical & Biological Engineering.
15. 'Production of Bio-Oils using Algae and Landfill Waste Streams' (2011-2012) Chemical & Biological Engineering.
16. 'Nitrogen & Phosphorous Capture from Animal Wastes' (2011-2012) Chemical & Biological Engineering.
17. 'Small Scale Waste Grease to Biodiesel' (2011-2012) Chemical & Biological Engineering.
18. 'Uranium Enrichment of Spent Fuel' (2010-2011) Chemical & Biological Engineering.
19. 'Plasma Processing of Municipal Solid Waste to Produce Electricity' (2010-2011) Chemical & Biological Engineering.
20. 'Production of Propylene Glycol from Waste Glycerin' (2010-2011) Chemical & Biological Engineering.
21. 'Biodiesel Production from High-Free-Fatty-Acid Feedstock' (2009-2010) Chemical & Biological Engineering.
22. 'Algae Oil Production from Landfill Waste Streams' (2009-2010) Chemical & Biological Engineering.
23. 'Sustainable Water Supply System for Miramar, El Salvador' (2009-2010) Environmental Engineering
24. 'Design of a Continuous Bubble-Column Reactor for Biodiesel Production,' (2008-2009) Mechanical Engineering and Mechanics.
25. 'Algae Production of Oil for Biodiesel' (2008-2009) Chemical & Biological Engineering.
26. 'Landfill Gas Conversion' (2008-2009) Chemical & Biological Engineering.
27. 'Design of a Continuous Bubble-Column Reactor for Biodiesel Production,' (2007-2008) Mechanical Engineering and Mechanics.
28. 'Biodiesel from Trap Grease,' (2007-2008) Chemical & Biological Engineering.
29. 'Biobutanol,' (2007-2008) Chemical & Biological Engineering.
30. 'Thermal Depolymerization of Waste Plastics,' (2007) Chemical & Biological Engineering.
31. 'Sodium Borohydride Recycling from MetaBorate,' (2006-2007) Chemical & Biological Engineering.
32. 'Sodium Borohydride Production from Borax,' (2006-2007) Chemical & Biological Engineering.
33. 'Production of Biodiesel from Trap Grease Feedstock,' (2005-2006) Chemical & Biological Engineering.

34. 'Biodiesel Production by Base Catalyzed Transesterification of Soybean Oil.' (2005-2006)
Chemical & Biological Engineering

Advisor for Freshman Design Teams:

- Kite-based Environmental Monitoring and Mapping System (2018)
- Engineers Without Borders local rainwater catchment and distribution project (2018)
- Ten teams working on indoor kite projects (2017)
- Eight teams working on Arduino sensors for juggling equipment (2016)
- Eight teams working on biodiesel educational modules (2013)
- 'Purification of Trap Grease' (2010-2011)
- 'Purification of Biodiesel' (2010-2011)
- 'The RPG (Rapid Pumping of Gas),' (2002-2003)
- 'Scratch Repair of Cellular Phone Displays,' (2002-2003)
- 'The Development of a Hydrogen Fueling Infrastructure,' (2000-2001)
- 'Better Roads for a Better Tomorrow: Fixed Anti-Icing Sprinkler System,' (1998-1999)
- 'Temporary Anti-Icing Agent Dissemination System Via Rubber Hosing,' (1997-1998)
- 'Renewable Approach to Drexel Transportation,' (2005-2006)

Universidad de El Salvador Courses

Instructor for:

- Energia Renovable (S10)

University of Minnesota Courses

Coordinator and Lecturer for ChEn 8702 Finite Element Methods of Computer Aided Analysis

Recitation Instructor for ChEn 5101 Principles of Chemical Engineering

Teaching Assistant for:

- ChEn 8101 Graduate Fluid Mechanics
- ChEn 8102 Coating Process Fundamentals
- ChEn 5501 Process Evaluation and Design

University of Rochester Courses

Teaching Assistant for Freshman Chemistry Laboratory (Sp 1986)

Short Courses

- Disrupting the Current Paradigm to Achieve Next Generation Resource Recovery, *WEFTEC 2015*, Chicago, IL, September 2015.
- Sustainability Across the Curriculum Workshop, Drexel University, December 2010.
- Drying of Coatings in the 'Science and Technology of Coating and Drying Processes' at the *International Society of Coating Science and Technology Symposium*, Rochester, NY, September 2004.

- Drying of Coatings in the 'Select Topics of Coating and Drying Short Course' at the *International Society of Coating Science and Technology Symposium*, Scottsdale, AZ, September 2000.

University Service

University

- Fall 2020 Planning Task Force: Academic Sub-group (2020)
- Senate Committee on Academic Affairs: Graduate Subcommittee (2018-present)
- BS/MS Task Force (2019)
- Strategic Plan Implementation Task Force (2014)
- Sustainability Institute Working Group (2010-2012)
- Fulbright Student Scholar Committee (2009-present)
- Provost Council on Academic Sustainability (2009-2010)
- Sustainability Across the Curriculum (2009-2010)
- Drexel Green Research Committee, co-chair (2008-2009)
- Library Advisory Committee (2002-2004)

College of Engineering

- COVID-19 Response and Reentry Advisory Council (2020)
- Graduate Committee (2017-present)
- Energy & Environment Initiative Task Force, chair (2012-2014)
- Strategic Planning Engineering Education subcommittee (2012-2013)
- Shale Gas Working Group, chair (2012)
- Masters of Sustainable Engineering Committee (2010-2014)
- Engineers without Borders Student Chapter Advisor (2006-present)
- Software Engineering Committee (1999)
- College of Engineering Dean Search Committee (1998-1999)
- College of Engineering Computing and Networking Committee (1997)

Chemical Engineering Department

- Chemical Engineering MS-CHE advisor (2017-present)
- Chemical Engineering Undergraduate Committee (2005-2018)
- Graduate Advisor (2003-2008)
- Chemical Engineering Web-Site Manager (1999-2004)
- AIChE Student Chapter Advisor (1998-2003)
- Chemical Engineering Graduate Committee (1997-2013, 2017-present)

Professional Service

Member of:

- American Institute of Chemical Engineers
- American Geophysical Union
- Engineers Without Borders
- American Physical Society
- American Society of Engineering Education
- International Society of Coating Science and Technology

- Society of Imaging Science and Technology
- American Ceramics Society

Conference Chair:

- Symposium Chair for 13th International Coating Process Science and Technology Symposium, Denver, CO (2006)
- Symposium Co-Chair for 12th International Coating Process Science and Technology Symposium, Rochester, NY (2004)

Session Chair or Co-Chair:

- American Geophysical Union Annual Meeting, Tethered Systems Poster Session (2019, 2020)
- Engineers without Borders, Eastern Regional Workshop, Student Sustainability Challenge, Glassboro, NJ (2007)
- European Coating Symposium, Bradford, UK (2005)
- 11th International Coating Process Science and Technology Symposium, Minneapolis, MN (2002)
- 10th International Coating Process Science and Technology Symposium, Scottsdale, AZ (2000)
- 9th International Coating Process Science and Technology Symposium, Newark, DE (1998)
- AIChE Spring National Meeting, 8th International Coating Process Science and Technology Symposium, New Orleans, LA (1996)
- International Drying Symposium, Krakow, Poland (1996)

Reviewer:

- Renewable Energy Journal
- Fuel
- Drying Technology Journal
- AIChE Journal
- Industrial & Engineering Chemistry
- Journal of Colloid and Interface Science
- International Journal for Numerical Methods in Fluids
- Journal of Applied Polymer Science
- Journal of Polymer Science
- Applied Biochemistry and Biotechnology
- Chemical Engineering Science
- Journal of Membrane Science
- National Science Foundation
- American Chemical Society - Petroleum Research Fund

Committee Membership:

- American Kiteflyers Association (AKA) Flight Technology Committee (2020)
- Organizing committee for the International Coating Process Science and Technology Symposia held in Newark, DE, May 1998, Scottsdale, AZ, September 2000, Minneapolis, MN, September 2002, Rochester, NY, September 2004, and Denver, CO 2006
- Steering committee for the International Society of Coating Science and Technology (1998 - present)

Sustainable Development Service

Organization Membership

- Engineers Without Borders Mid-Atlantic Professionals – Treasurer (2007-2010).

- Advisor for student chapter of Engineers Without Borders at Drexel University (2006-present).

Travel and Project Work

- San Luis de Yacupungu, Ecuador, Assessment Trip, December 2019
- Las Delicias, El Salvador Water Supply Project. Implementation trip to begin tank construction June 2012
- Miramar, El Salvador, Health Assessment with Drexel Nursing students, June, 2010.
- Las Delicias, El Salvador Water Supply Project. Assessment trip July 2009.
- Masaya, Nicaragua. Exploration trip for project opportunities with Drexel Engineering Cities Initiative, May 2009.
- Rugerero, Rwanda Health and Sanitation Project. Implementation trip with EWB-MAP September 2008.
- Miramar, El Salvador Water Supply Project. Assessment trips with EWB-Drexel students September 2007, March 2008, July 2009, September 2010, June 2014. Implementation Trips June 2015, September 2015.

Presentations

- 'EWB-MAP El Salvador Water Project,' Pennsylvania Society of Professional Engineers meeting, Media, PA, January 2010.
- 'EWB-MAP Rwanda Health and Sanitation Project,' MAGPI consortium meeting of five high schools, University of Pennsylvania, March, 2009.
- 'EWB and Sustainable Development,' Widener University, January 21, 2009.
- 'EWB and Sustainable Development,' Merion High School, October 14, 2008.
- 'EWB Drexel El Salvador Water Project,' WWOAP annual meeting, West Chester, March 2008.
- 'Solar Pasteurization Challenge,' EWB Regional Workshop, Rowan University, October, 2007.
- 'Biodiesel Processes,' EWB Regional Workshop, Rowan University, October, 2006.

Other Service

- CTY Event for Philadelphia High School Students – Biodiesel Demonstration: October 2008, October 2009.
- Advisor for Drexel Energy Club (2007-2009)
- Mentor for Drexel Mentorship Program (2002, 2003)
- A.J. Drexel Scholars Day Interviewer (2000-2004)
- Judge for AIChE Mid-Atlantic Student Conference Paper Competition (1999)
- Discussed Careers in Science and Engineering with students from Stanford High School, Hockessin, DE (1998).

Awards

- Fulbright Lectureship on Renewable Energy – University of El Salvador, March-June 2010.
- 2008 P³ Phase II Award (People, Prosperity and the Planet), U.S. Environmental Protection Agency, 2008.
- L.E. Scriven Young Investigator Award at the 13th International Coating Science and Technology Symposium, 2006.
- Carl Dahlquist Award for Best Paper at the Pressure Sensitive Tape Council Tech XXV Meeting, 2002.
- 3M Non-Tenured Faculty Award, 1996, 1998, & 1999.

- Sandia National Laboratories Award for Excellence, 1998.
- Presidential Early Career Award for Scientists and Engineers (PECASE) 1996.
- U.S. Department of Energy Defense Programs Young Scientist and Engineer Award, 1996.
- U.S. Department of Energy Basic Engineering Sciences Award for Sustained Outstanding Research in Metallurgy and Ceramics, 1995.
- Marcel Dekker, Inc. Best Paper Award (Drying Technology: An International Journal), 1994.
- Dissertation Fellowship (University of Minnesota), Fall 1993 to Spring 1994
- OSSP summer research program at Sandia National Laboratories, Summer 1993
- American Chemical Society Chemistry Achievement Award, 1989.
- Shelby A. Miller Prize in Design (Best Design Project), AIChE, Rochester Section, 1989.
- Tau Beta Pi Engineering Honor Society, initiated 1988.