

## CURRICULUM VITAE: Peter K. Kilpatrick

### Education:

University of Minnesota, Ph.D., Chemical Engineering, December 1983  
Occidental College, A.B., Chemistry, Summa cum laude, June 1978

### Professional Experience:

2018 – Present: Provost & Senior Vice President for Academic Affairs, Illinois Institute of Technology  
2008 – 2018: Matthew H. McCloskey Dean of Engineering, University of Notre Dame  
2004 – 2007: Founding Director, Biomanufacturing Training and Education Center, NCSU  
1999 – 2007: Department Head, Chem & BioMolec Engineering, NC State University, Raleigh, NC  
1996 - 1999: Associate Department Head, Chemical Engineering, NCSU  
1983 - 2007: Asst, Assoc, and Full Professor, Chemical Engineering, North Carolina State University, Raleigh

### Honors and Awards:

JW Hodgins Memorial Lecturer, McMaster University, Hamilton CA, March 11, 2015  
Honorary Doctorate, Pazmany Peter Catholic University, Budapest, Hungary, June 2013  
Magister Vitae Award, Pro-Life Group, University of Notre Dame, March 2013  
Sigma Xi Research Award, North Carolina State University, 1992  
AT&T Foundation Award for Excellence in the Education of Engineering Students, ASEE, 1991  
Alcoa Foundation Engineering Research Achievement Award, N C State University, 1990  
Outstanding Teacher Award, N C State University, 1989  
Minnesota, Mining, and Manufacturing (3M) Non-Tenured Faculty Award, 1984-1987  
Outstanding Senior in Chemistry, Occidental College, 1978  
Achievement Rewards for College Scientists (ARCS) Scholar, Occidental College, 1974-1978

### Recent Consultantships:

ExxonMobil, 1997, 2001, 2004, 2011, 2014  
Novozymes, 2006  
Procter and Gamble, 2005  
Baker and Hofstetler, 2004  
Kenyon and Kenyon, 2003-2004  
Shell Oil Company, 2001

### Society Memberships:

American Institute of Chemical Engineers  
American Chemical Society  
American Society of Engineering Education  
Phi Beta Kappa  
Sigma Xi

## **SELECTED ADMINISTRATIVE ACCOMPLISHMENTS AT ILLINOIS INSTITUTE OF TECHNOLOGY**

Led the development of University 5-year Strategic Plan: “Our Students and Their Success Comes First,” Board approved in October 20019

Hired four new deans, seven new department chairs, three new institute directors, one new academic director, and five new vice provosts; essentially rebuilding the leadership team in the Academy.

Drove the development of our Beacon online China Masters of Applied Science business, which has seven online masters programs in FY 21-22 generating \$4 Million in net tuition revenue and is estimated to generate greater than \$10 Million in new net tuition revenue by 2025, serving as a model for our revenue diversification business.

Reorganized Academy to develop synergy in student-facing staff members by integrating enrollment, student affairs, academic affairs, housing, and campus life under one umbrella.

Developed cross cutting themes to integrate the university, to include computing, technology, entrepreneurship, leadership, innovation, and design; in effect, de-siloing the university.

## **SELECTED ADMINISTRATIVE ACCOMPLISHMENTS: UNIVERSITY OF NOTRE DAME**

Faculty (T/TT, Teaching Professors, and Research Professors) grew by more than 70%; PhD enrollments by 50%; undergraduate enrollments grew by 60%; and faculty research expenditures increased more than 150% (to > \$50 Million); endowments and endowment commitments grew by more than \$100 Million in 10 years, all for College of Engineering at Notre Dame. Total endowment for College of Engineering now stands at \$330 Million.

Helped open three new engineering and science buildings in ten years comprising 300,000 nasf

Hired nearly 100 T/TT faculty in College of Engineering in 10 years (approximately 50 new net positions, the remainder replacements)

Co-developed (with Science and Business) and launched 1-year Masters program in Engineering, Science, and Technology Entrepreneurship in 2009 (current enrollment 40+ MS students per year generating more than \$400 K per year in net revenue)

Launched first ever Joint PhD program in history of Notre Dame (jointly with the Pontifical Catholic University (PUC) of Chile (#2 ranked University in Latin America) in Civil Engineering). Notre Dame has since forged joint PhD programs with other Departments at PUC and in Electrical Engineering and Computer Science and Engineering at Pazmany Peter Catholic University in Budapest, Hungary, and in Computer Science at UNICAMP in Campinas, Brazil. We now have 9 different joint PhD programs with three Universities and are working on others.

## **SELECTED ADMINISTRATIVE ACCOMPLISHMENTS: NC STATE UNIVERSITY**

Department of Chemical and Biomolecular Engineering (CBE) increased average number of PhD graduates per year per FTE from 0.5 to 0.8 over 7 year period

Facilitated 38 National Awards for Chemical and Biomolecular Engineering Faculty between 2000-2007, including two new inductions to the National Academy of Engineering and two new inductions to the American Association for the Advancement of Science

Increased Endowments and Endowment Commitments in Chemical and Biomolecular Engineering from \$6 to \$17 MM over 7 year period

Assisted in securing \$40 MM dollar capital commitment and \$6 MM recurring budget commitment from NC legislature for and serve as Founding Director of new Biomanufacturing Training and Education Center, 2004

Increased faculty size in CBE from 19 to 23 in 7 year period; grew and diversified research funding

Facilitated Peer Review of Teaching and University-wide Teaching Award to CBE Department in 2003; 11 of 20 CBE faculty have University Teaching Awards

#### **SELECTED NATIONAL AND INTERNATIONAL SERVICE**

Chairperson of Global Engineering Deans Council for two year term, 2015-2017.

Chairperson of Clover 2030 International Advisory Board for creating new models for Colleges of Engineering in Chile, 2014-Present.

Member, Board of Directors of American Institute of Chemical Engineers Foundation, 2011-2015.

Reviewed strategic plan and faculty hiring plan for *Pontificia Universidad de Catolica (PUC) de Chile*, School of Engineering, November 2013.

Organized 2013 Global Engineering Deans Council Annual Conference (GEDC) in Chicago with more than 230 participants and more than 40 invited speakers, Palmer House, Chicago, IL, October 2013.

Served on CONICYT (national research funding agency in Chile) decadal review, Santiago, Chile, November 2012.

Co-organized NSF Workshop on Foundational Grand Challenge in Engineering Education, Miami, FL, March 2012.

Served on Professional Progress Award Committee and Warren K Lewis Award Committee of AIChE four of five years, 2002-2007

Co-organized and co-chaired 82<sup>nd</sup> Annual American Chemical Society Colloid and Surface Science Symposium in Raleigh, NC, held June 2008 (500+ attendees)

Organized and chaired 7<sup>th</sup> International Conference on Petroleum Phase Behavior in Asheville NC (130 attendees), June 2007

Organized and Chaired National Academy of Engineering Regional Meeting on “Engineering Thin Films at the Nanoscale,” Featured Speakers: Milan Mrksich, Paul Weiss, and Ed Kramer, NC State University, May 22, 2002

**REFEREED JOURNAL PUBLICATIONS:** More than 100, with more than 4,000 Web of Science citations (more than 7,000 by Google Scholar)

**INVITED LECTURES:** More than 150 invited lectures on research, educational, and philosophical topics

## Scholarly Achievements: Publications

1. P. K. Kilpatrick and W. G. Miller, *Aggregation of double-tail sulfonate surfactants probed by Na-23 NMR*, J. Phys. Chem., **88**, 1649-1655 (1984).
2. P. K. Kilpatrick, F. D. Blum, H. T. Davis, A. H. Falls, E. W. Kaler, W. G. Miller, J. E. Puig, L. E. Scriven, Y. Talmon, and N. A. Woodbury, *Alcohol effects on transitions in liquid crystalline dispersions*, in *Microemulsions*, I. D. Robb, Ed., Plenum Press, New York, 1982, pp. 143-172.
3. W. G. Miller, F. D. Blum, H. T. Davis, E. I. Franses, E. W. Kaler, P. K. Kilpatrick, K. Nietering, J. E. Puig, and L. E. Scriven, *Fluid microstructures in sodium 4-(1'-heptylnonyl) benzene-sulfonate mixtures*, in *Surfactants in Solution*, Volume I, K. L. Mittal and B. Lindman, Eds., Plenum Press, New York, III, 175-191 (1984).
4. W. D. Covey, F. P. DeHaan, G. L. Delker, S. F. Dawson, P. K. Kilpatrick, G. B. Rattinger, and W. G. Read, *Electrophilic aromatic substitution. 7. A kinetic study of the aluminum chloride catalyzed desulfonylative benzylation of aromatics with phenyl- methanesulfonyl chloride in nitromethane*, J. Org. Chem., **49**, 3967-3970 (1984).
5. P. K. Kilpatrick, H. T. Davis, and L. E. Scriven, *Thermodynamic modeling of quaternary systems: oil-brine-surfactant-alcohol*, Soc. Pet. Eng. Journal, **25**, 330-342 (1985).
6. P. K. Kilpatrick, W. G. Miller, and Y. Talmon, *Staining and drying-induced artifacts in electron microscopy of surfactant-water mixtures. II. Change in phase behavior produced by variation in pH modifiers, stain, and concentration*, J. Colloid Interface Sci., **107**, 146-158 (1985).
7. D.-Y. Kuan, P. K. Kilpatrick, M. Sahimi, L. E. Scriven, and H. T. Davis, *Multicomponent CO<sub>2</sub>-water-hydrocarbon phase behavior modeling: a comparative study*, SPE Reservoir Engineering, **1**, 61-72 (1986).
8. T. Chang, R. W. Rousseau, and P. K. Kilpatrick, *Methanol synthesis reactions: Calculation of conversions using cubic equations of state*, Ind. Eng. Chem., Proc. Des. Dev., **25**, 477-481 (1986).
9. P. K. Kilpatrick, C. A. Gorman, H. T. Davis, L. E. Scriven, and W. G. Miller, *Patterns of phase behavior in ethoxylated alcohol-n-alkane-water-sodium chloride mixtures*, J. Phys. Chem., **90**, 5292-5299 (1986).
10. P. K. Kilpatrick and S.-H. Chang, *Saturated phase equilibria and parameter estimation of pure fluids with two lattice-gas models*, Fluid Phase Equilibria, **30**, 49-56 (1986).
11. R. Z. Guzman, R. G. Carbonell, and P. K. Kilpatrick, *The adsorption of proteins to gas-liquid interfaces*, J. Colloid Interface Sci., **114**, 536-547 (1986).
12. P. K. Kilpatrick, W. G. Miller, and Y. Talmon, *Staining and drying-induced artifacts in electron microscopy of surfactant-water mixtures. III. Evidence from optical microscopy and a negative-staining case*, in *Surfactants in Solution*, K. L. Mittal and P. Bothorel, eds., Plenum Press, New York, IV, 489-500 (1986).
13. A. Kassebi, R. W. Rousseau, and P. K. Kilpatrick, *Tall oil soap residuals in black liquor: The effects of solids content,  $\beta$ -sitosterol, acetic acid, and liquor source*, TAPPI Journal, **70**, 123-125 (1987).

14. P. K. Kilpatrick, H. T. Davis, L. E. Scriven, and W. G. Miller, *Microstructure in n-alkane-water-electrolyte mixtures with small ethoxylated alcohol amphiphiles*, J. Colloid Interface Sci., **118**, 270-285 (1987).
15. S. G. Kim, R. G. Carbonell, and P. K. Kilpatrick, *Calculation of electrostatic forces between charged surfaces in ionic solutions*, Proceedings of the 10th Korean Symposium on Science and Technology, Industrial Technology I, 273-279 (1987).
16. R. Guzman, D. E. Keller, J. L. Torres, P. K. Kilpatrick, and R. G. Carbonell, *Biospecific interactions of affinity-labelled surfactants*, Biol. Chem. Hoppe-Seyler, **318**, 760 (1987).
17. J. R. Hunter, R. Guzman, R. G. Carbonell, and P. K. Kilpatrick, *Adsorption of proteins at gas-liquid interfaces*, Biol. Chem. Hoppe-Seyler, **318**, 749 (1987).
18. P. K. Kilpatrick and M. A. Bogard, *Effects of oil type on liquid crystalline phase behavior in sodium n-dodecanoate-water-oil mixtures*, Langmuir, **4**, 790-796 (1988).
19. J. L. Torres, R. Z. Guzman, R. G. Carbonell, and P. K. Kilpatrick, *Affinity surfactants as reversibly bound ligands for high performance affinity chromatography*, Analytical Biochemistry, **171**, 411-418 (1988).
20. J. D. Powers, P. K. Kilpatrick and R. G. Carbonell, *Protein purification by affinity binding to unilamellar vesicles*, Biotech. Bioeng., **33**, 173-182 (1989).
21. D. E. Keller, J. L. Torres, R. G. Carbonell, and P. K. Kilpatrick, *Reversible conversion of octadecyl-bonded silica to ion exchange surfaces for protein separations*, Analytical Biochemistry, **176**, 191-198 (1989).
22. R. Guzman, J. L. Torres, R. G. Carbonell, and P. K. Kilpatrick, *Water soluble non-ionic surfactants for affinity separations*, Biotech. Bioeng., **33**, 1267-1276 (1989).
23. J. L. Torres, R. Guzman, R. G. Carbonell, and P. K. Kilpatrick, *Reversibly bound ligands for high performance affinity chromatography: Application to serum cholinesterase*, in Biotechnology of Plasma Proteins, J. F. Stoltz and C. Rivat, eds., Colloque INSERM **175**, 245-252 (1989).
24. J. D. Powers, P. K. Kilpatrick and R. G. Carbonell, *Purification of avidin from egg whites using affinity-modified unilamellar vesicles*, in Biological and Synthetic Membranes, A.R. Liss, ed., 237-246 (1989).
25. R. Z. Guzman, P. K. Kilpatrick, and R. G. Carbonell, *Affinity precipitation of avidin using ligand-modified surfactants*, ACS Symposium Series, **419**, Downstream Processing and Bioseparation: Recovery and Purification of Biological Products, J. F. Hamel, J. B. Hunter, and S. K. Sikdar, eds., pp. 212-236 (1990).
26. J. R. Hunter, P. K. Kilpatrick, and R. G. Carbonell, *Lysozyme adsorption at the air/water interface*, J. Colloid Interface Sci., **137**, 462-482 (1990).
27. R. Molinari, J. L. Torres, A. S. Michaels, P. K. Kilpatrick, and R. G. Carbonell, *Simultaneous ultrafiltration and affinity sorptive separation of proteins in a hollow fiber membrane module*, Biotech. Bioeng., **36**, 572-580 (1990).
28. J. D. Powers, P. K. Kilpatrick, and R. G. Carbonell, *Trypsin purification by affinity binding to small unilamellar vesicles*, Biotech. Bioeng., **36**, 506-519 (1990).

29. J. R. Hunter, P. K. Kilpatrick, and R. G. Carbonell,  *$\beta$ -Casein adsorption at the air-water interface*, J. Colloid Interface Sci., **142**, 429-447 (1991).
30. J. R. Hunter, R. G. Carbonell, and P. K. Kilpatrick, *Coadsorption of lysozyme and  $\beta$ -casein at the air-water interface*, J. Colloid Interface Sci., **143**, 37-53 (1991).
31. J. C. Blackburn and P. K. Kilpatrick, *Lytropic liquid crystal phase behavior and structure of cesium n-tetradecanoate-water mixtures*, J. Colloid Interface Sci., **149**, 450-471 (1992).
32. D. R. Zint and P. K. Kilpatrick, *Synthesis and aggregation properties of ionic amphiphilic side-chain siloxane polymers*, in Polymer and Fiber Science: Recent Advances, R. E. Fornes and R. D. Gilbert, eds., VCH, New York, pp. 215-232 (1992).
33. J. C. Blackburn and P. K. Kilpatrick, *Using deuterium nmr lineshapes to analyze lyotropic liquid crystalline phase transitions*, Langmuir, **8**, 1679-1687 (1992).
34. P. K. Kilpatrick, J. C. Blackburn, and T. A. Walter, *Location of solubilized oil in lyotropic surfactant liquid crystalline phases and the resulting effects on phase equilibria*, Langmuir, **8**, 2192-2199 (1992).
35. D. D. Powers, B. Willard, R. G. Carbonell, and P. K. Kilpatrick, *Affinity precipitation of proteins by surfactant-solubilized ligand-modified phospholipids*, Biotechnology Progress, **8**, 436-453 (1992).
36. D. E. Keller, R. G. Carbonell, and P. K. Kilpatrick, *Adsorption equilibrium and desorption rates of charged ethoxylated surfactants on octadecyl silica: role of electrostatics*, J. Colloid Interface Sci., **155**, 124-136 (1993).
37. J. C. Blackburn and P. K. Kilpatrick, *Transitional liquid crystalline phases between hexagonal and lamellar phases in ternary cesium n-tetradecanoate-water-additive mixtures*, J. Colloid Interface Sci., **157**, 88-99 (1993).
38. M. A. Jones, R. G. Carbonell, and P. K. Kilpatrick, *Bifunctional vesicles for enhancing enzyme-based immunoassays*, Biotechnology Progress, **9**, 242-258 (1993).
39. M. A. Jones, A. Singh, P. K. Kilpatrick, and R. G. Carbonell, *Preparation and characterization of ligand-modified labelled liposomes for solid phase immunoassays*, J. Liposome Research, **3**, 793-804 (1993).
40. M. A. Jones, P. K. Kilpatrick, and R. G. Carbonell, *Competitive immunoassays for biotin using bifunctional unilamellar vesicles*, Biotechnology Progress, **10**, 174-186 (1994).
41. D. D. Powers, R. G. Carbonell, and P. K. Kilpatrick, *Selective precipitation of antibodies with ligand-modified phospholipids*, Biotech. Bioeng., **44**, 509-522 (1994).
42. P. K. Kilpatrick, S. A. Khan, A. Tayal, and J. C. Blackburn, *A rheological study of lyotropic mesophases in the cesium n-tetradecanoate-water system*, ACS Symposium Series, **578**, Structure and Flow in Surfactant Solutions, C. A. Herb and R. K. Prud'homme, eds., pg. 229-238 (1994).
43. A. K. Singh, P. K. Kilpatrick, and R. G. Carbonell, *Non-competitive Immunoassays using Unilamellar Vesicles*, Biotechnology Progress, **11**, 333-341 (1995).
44. P. K. Kilpatrick, *Review of Colloid-Polymer Interactions: Particulate, Amphiphilic, and Biological Surfaces*, American Scientist, **83**, 95-96 (1995).

45. N. J. Lynch, P. K. Kilpatrick, and R. G. Carbonell, *Aggregation of Ligand-Modified Liposomes by Specific Interactions with Proteins I: Biotinylated Liposomes and Avidin*, *Biotech. Bioeng.*, **50**, 151-168 (1996).
46. N. J. Lynch, P. K. Kilpatrick, and R. G. Carbonell, *Aggregation of Ligand-Modified Liposomes by Specific Interactions with Proteins II: Biotinylated Liposomes and Anti-Biotin Antibody*, *Biotech. Bioeng.*, **50**, 169-183 (1996).
47. A. K. Singh, P. K. Kilpatrick, and R. G. Carbonell, *Application of Antibody and Fluorophore-Derivatized Liposomes to Heterogeneous Immunoassays for D-Dimer*, *Biotechnology Progress*, **12**, 272-280 (1996).
48. J. C. Blackburn and P. K. Kilpatrick, *Electrostatic modeling of liquid crystalline aggregates*, *Ind. Eng. Chem. Research*, **35**, 2823-2833 (1996).
49. P. U. Kenkare, C. K. Hall, and P. K. Kilpatrick, *The Effects of Salts on the Lower Consolute Boundary of a Non-Ionic Micellar Solution*, *J. Colloid Interface Sci.*, **184**, 456-468 (1996).
50. M. A. Jones, R. G. Carbonell, and P. K. Kilpatrick, *Model calculations of competitive immunosorbent enzyme assays using bifunctional unilamellar vesicles*, *Biotechnology Progress*, **12**, 519-526 (1996).
51. P. K. Kilpatrick, J. F. Lisi, and R. G. Carbonell, *Selective Precipitation of Antibody with Ligand-Modified Phospholipids: Effect of Lipid Chain Length*, *Biotechnology Progress*, **13**, 446-452 (1997).
52. J. D. McLean and P. K. Kilpatrick, *Comparison of Precipitation and Sequential Elution Chromatography in the Fractionation of Crude Oil Residua*, *Energy and Fuels*, **11**, 570-585 (1997).
53. J. D. McLean, and P. K. Kilpatrick, *Effects of Asphaltene Solvency on Stability of Water-in-Crude Oil Emulsions*, *J. Colloid Interface Sci.*, **189**, 242-253 (1997).
54. J. D. McLean, and P. K. Kilpatrick, *Effects of Asphaltene Aggregation and Resin-Asphaltene Interactions on Stability of Emulsions Generated from Water-Heptane-Toluene-Resin-Asphaltene Mixtures*, *J. Colloid Interface Sci.*, **196**, 23-34 (1997).
55. B. A. Musser and P. K. Kilpatrick, *Molecular Characterization of Paraffinic and Microcrystalline Wax in Crude Petroleum*, *Energy and Fuels*, **12**, 715-725 (1998).
56. J. D. McLean, P. M. Spiecker, A. P. Sullivan, and P. K. Kilpatrick, *The Role of Petroleum Asphaltenes in the Stabilization of Water-in-Oil Emulsions*, Chapter XII in **Structure and Dynamics of Asphaltenes**, E. Sheu and O. Mullins, eds., Plenum, New York, 377-422 (1998).
57. S. Singh, J. D. McLean, and P. K. Kilpatrick, *Fused Ring Aromatic Solvency in the Destabilization of Water-in-Asphaltene-Heptane-Toluene Emulsions*, *J. Dispersion Sci. Tech.*, **20**, 279-293 (1999).
58. J. M. Biales, Y. D. Wan, P. K. Kilpatrick, and G. W. Roberts, *Separation of Fischer-Tropsch Wax from Catalyst Using Near-Critical Fluid Extraction: Analysis of Process Feasibility*, *Energy and Fuels*, **13**, 667-677 (1999).
59. P. K. Kilpatrick and P. M. Spiecker, *Asphaltene Emulsions*, in **Encyclopedia of Emulsion Technology**, J. Sjoblom, ed., Dekker, New York, Chapter 30, 707-730 (2000).

60. A. P. Sullivan and P. K. Kilpatrick, *The Role of Inorganic Solids in the Enhancement of Emulsion Stability in Asphaltene-Oil-Water Mixtures*, Industrial and Engineering Research, **41**, 3389-3904 (2002).
61. M. K. Poindexter, N. N. Zaki, P. K. Kilpatrick, S. C. Marsh, and D. H. Emmons, *Factors Contributing to Petroleum Foaming – Part I: Crude Oil Systems*, Energy and Fuels, **16**, 700-710 (2002).
62. N. N. Zaki, M. K. Poindexter, and P. K. Kilpatrick, *Factors Contributing to Petroleum Foaming – Part II: Synthetic Crude Oil Systems*, Energy and Fuels, **16**, 711-717 (2002).
63. P. M. Spiecker, K. L. Gawrys, and P. K. Kilpatrick, *Aggregation and solubility behavior of asphaltenes and their subfractions*, Journal of Colloid and Interface Science, **267**, 178-193 (2003).
64. P. M. Spiecker, K. L. Gawrys, C. L. Trail, and P. K. Kilpatrick, *Effects of petroleum resins on asphaltene aggregation and water-in-oil emulsion formation*, Colloids and Surfaces A: Physicochem Eng Aspects, **220**, 9-27 (2003).
65. K. L. Gawrys, P. M. Spiecker, and P. K. Kilpatrick, *The Role of Asphaltene Solubility and Chemistry on Asphaltene Aggregation*, Petroleum Science and Technology **21**, 461-489 (2003).
66. N. N. Zaki, R. G. Carbonell, and P. K. Kilpatrick, *A Novel Process for Demulsification of Water-in-Crude Oil Emulsions by Dense Carbon Dioxide*, Ind Eng Chem Research, **42**, 6661-6672 (2003).
67. K. L. Gawrys and P. K. Kilpatrick, *Asphaltene Aggregation: Techniques for Analysis*, Instrumentation Sci. Tech., **32**, 247-253 (2004).
68. P. M. Spiecker and P. K. Kilpatrick, *Interfacial Rheology of Petroleum Asphaltenes at the Oil-Water Interface*, Langmuir, **20**, 4022-4032 (2004).
69. M.-H. Ese and P. K. Kilpatrick, *Stabilization of Water-in-Oil Emulsions by Naphthenic Acids and Their Salts: Model Compounds, Role of pH, and Soap:Acid Ratio*, Journal Dispersion Sci. Tech., **25**, 253-261 (2004).
70. K. L. Gawrys and P. K. Kilpatrick, *Asphaltenic aggregates are polydisperse oblate cylinders*, J. Colloid Interface Science, **288**, 325-334 (2005).
71. X. Yang and P. K. Kilpatrick, *Asphaltenes and waxes do not interact synergistically and co-precipitate in solid organic deposits*, Energy and Fuels, **19**, 1360-1375 (2005).
72. K. Akbarzadeh, D. C. Bressler, J. Wang, K. L. Gawrys, M. R. Gray, P. K. Kilpatrick, and H. W. Yarranton, *Association Behavior of Pyrene Compounds as Models for Asphaltenes*, Energy and Fuels, **19**, 1268-1271 (2005).
73. M. B. Smith, J. Tong, J. Genzer, D. Fischer, and P. K. Kilpatrick, *Effects of synthetic amphiphilic alpha-helical peptides on the electrochemical and structural properties of supported hybrid bilayers on gold*, Langmuir, **22**, 1919-1927 (2006).
74. K. L. Gawrys, G. Blankenship, and P. K. Kilpatrick, *Solvent entrainment in and flocculation of asphaltenic aggregates probed by small-angle neutron scattering*, Langmuir, **22**, 4487-4497 (2006).
75. K. L. Gawrys, G. Blankenship, and P. K. Kilpatrick, *On the distribution of chemical properties and aggregation of solubility fractions in asphaltenes*, Energy and Fuels, **20**, 705-714 (2006).



76. F. Rakotonradany, H. Fenniri, P. Rahmi, K. L. Gawrys, P. K. Kilpatrick, and M. R. Gray, *Hexabenzocoronene model compounds for asphaltene fractions: Synthesis & characterization*, Energy and Fuels, **20**, 2439-2447 (2006).
77. M. B. Smith, K. Efimenko, D. A. Fischer, S. E. Lappi, P. K. Kilpatrick, and J. Genzer, *A Study of the Packing Density and Molecular Orientation of Bimolecular Self-Assembled Monolayers of Aromatic and Aliphatic Organosilanes on Silica*, Langmuir, **23**, 673-683 (2007).
78. P. K. Kilpatrick, *7<sup>th</sup> International Conference on Petroleum Phase Behavior and Fouling*, Energy and Fuels, **21**, 1197-1198 (2007).
79. V. J. Verruto and P. K. Kilpatrick, *Preferential Solvent Partitioning within Asphaltenic Aggregates Dissolved in Binary Solvent Mixtures*, Energy and Fuels, **21**, 1217-1225 (2007).
80. X. Yang, V. J. Verruto, and P. K. Kilpatrick, *Dynamic Asphaltene-Resin Exchange at the Oil/Water Interface: Time-Dependent W/O Emulsion Stability for Asphaltene/Resin Model Oils*, Energy and Fuels, **21**, 1343-1349 (2007).
81. S. Gupta, S. Huda, P. K. Kilpatrick and O. D. Velev, *Characterization and Optimization of Gold Nanoparticle Based Silver Enhanced Immunoassays*, Analytical Chemistry, **79**, 3810-3820 (2007).
82. A. P. Sullivan, N. N. Zaki, J. Sjöblom, and P. K. Kilpatrick, *The Stability of Water-in-Crude and Model Oil Emulsions*, Canadian Journal of Chemical Engineering, **85**, 793-807 (2007).
83. X. C. Tombokan, R. M. Aguda, D. A. Danehower, P. K. Kilpatrick and R. G. Carbonell, *Three Component Phase Behavior of the Sclareol-Ethyl Lactate-Carbon Dioxide System for Gas AntiSolvent Applications*, Journal of Supercritical Fluids, **45**, 146-155 (2008).
84. S. Gupta, R. Alargova, P. K. Kilpatrick, and O. D. Velev, *On-Chip Electric Field Driven Assembly of Biocomposites from Live Cells and Functionalized Particles*, Soft Matter, **4**, 726-730 (2008).
85. V. J. Verruto and P. K. Kilpatrick, *Water-in-Model Oil Emulsions Studied by Small-Angle Neutron Scattering: Interfacial Film Thickness and Composition*, Langmuir, **24**, 12807-12822 (2008).
86. S. Turgman-Cohen, M. B. Smith, D. A. Fischer, P. K. Kilpatrick, and J. Genzer, *Asphaltene Adsorption onto Self-Assembled Monolayers of Mixed Aromatic and Aliphatic Trichlorosilanes*, Langmuir, **25**, 6260-6269 (2009).
87. V. J. Verruto, R. K. Le, and P. K. Kilpatrick, *Adsorption and Molecular Rearrangement of Amphoteric Species at Oil-Water Interfaces*, Journal of Physical Chemistry B, **113**, 13788-13799 (2009).
88. S. Turgman-Cohen, D. A. Fischer, P. K. Kilpatrick, and J. Genzer, *Asphaltene Adsorption onto Self-Assembled Monolayers of Alkyltrichlorosilanes of Varying Chain Length*, ACS Applied Materials and Interfaces, **1**, 1347-1357 (2009).
89. M. B. Smith, D. J. McGillvray, J. Genzer, M. Losche, and P. K. Kilpatrick, *Neutron Reflectometry of Supported Hybrid Bilayers with Inserted Peptide*, Soft Matter, **6**, 862-865 (2010).
90. Gupta, S., R. G. Alargova, P. K. Kilpatrick, and O. D. Velev, *On-Chip Dielectrophoretic Coassembly of Live Cells and Particles into Responsive Biomaterials*, Langmuir, **26**, 3441-3452 (2010).

91. Kilpatrick, P. K., *Water-in-Crude Oil Emulsion Stabilization: Review and Unanswered Questions*, Energy and Fuels, **26**, 4017-4026 (2012).
92. Gupta, S., P. K. Kilpatrick, E. Melvin, and O. D. Velev, *On-Chip Latex Agglutination Immunoassay Readout by Electrochemical Impedance Spectroscopy*, Lab on a Chip, **12**, 4279-4286 (2012).
93. Rytting, B. M., I. D. Singh, M. R. Harper, A. S. Mennito, Y. Zhang, and P. K. Kilpatrick, *Ultra-pure Vanadyl Petroporphyrins*, Energy & Fuels, **32**, 5711-5724 (2018).
94. Qian, K., T. R. Fredriksen, A. S. Mennito, Y. Zhang, M. R. Harper, S. Merchant, J. D. Kushnerick, B. M. Rytting, and P. K. Kilpatrick, *Evidence of Naturally Occurring Vanadyl Porphyrins Containing Multiple S and O Atoms*, Fuel, **239**, 1258-1264 (2019).
95. Zhang, Y., F. Schulz, B. M. Rytting, C. C. Walters, K. Kaiser, J. N. Metz, M. R. Harper, S. S. Merchant, A. S. Mennito, K. Qian, J. D. Kushnerick, P. K. Kilpatrick, and L. Gross, *Elucidating the Geometric Substitution of Petroporphyrins by Spectroscopic Analysis and Atomic Force Microscopy Molecular Imaging*, Energy & Fuels, **33**, 6088-6097 (2019).
96. Rytting, B. M., M. R. Harper, K. V. Edmond, Y. Zhang, and P. K. Kilpatrick, *High-Purity Vanadyl Petroporphyrins: Their Aggregation and Effect on the Aggregation of Asphaltenes*, Energy & Fuels, **34**, 164-178 (2019).
97. Rytting, B. M., M. R. Harper, K. V. Edmond, S. S. Merchant, Y. Zhang, and P. K. Kilpatrick, *Interfacial Phenomena of Purified Petroporphyrins and Their Impact on Asphaltene Interfacial Film Formation*, Energy & Fuels, **34**, 5444-5456 (2020).

### **Scholarly Achievements: Invited Research and Scholarly Presentations**

- Thermodynamic modeling of CO<sub>2</sub>-hydrocarbon-water mixtures: A comparative study, Gordon Research Conference on Flow on Fluids in Permeable Media, Tilton, NH, July 1983
- The exponentially-screened Flory-Huggins model of surfactant-oil-water mixtures, Department of Chemical Engineering, University of Bologna, Bologna, Italy, July 1984
- Macro- and microemulsions, Westvaco, Charleston, SC, January 1985
- Ion transport through liquid crystals, 3M Company, St. Paul, MN, May 1985
- Thermodynamic modeling of polar fluids with non-cubic equations of state, Department of Chemical Engineering, Clemson University, October 1985
- Liquid crystal-isotropic phase equilibria in soap-oil-water mixtures: Modeling and experiment, 3M Company, St. Paul, MN, August 1986
- Phase equilibria and structure in soap-oil-water mixtures, Max Planck Institut fuer Biophysikalische Chemie, Goettingen, West Germany, August 1987
- Phase equilibria and structure in soap-oil-water mixtures, Colgate-Palmolive Company, Piscataway, NJ, September 1987

Phase equilibria and structure in soap-oil-water mixtures, 3M Company, St. Paul, MN, September 1987

Application of quadrupole nmr spectroscopy to phase equilibria in lyotropic surfactant liquid crystal systems, Symposium on Rheology and Physical Properties of Disperse Surfactant Systems, Princeton University, NJ, January 1988

Affinity surfactants for specific protein purification, Department of Chemical Engineering, University of Washington, Seattle, WA, May 1988

Lyotropic surfactant liquid crystal phases: structure and patterns, Gordon Conference on Chemistry at Interfaces, Meriden, NH, July 1988

Patterns of liquid crystal phase behavior in alkali metal carboxylate-water-solubilize mixtures, DuPont de Nemours Co., Wilmington, DE, February 1989

Compositional analysis, interfacial tension, and phase equilibria of microstructured emulsions and emulsion precursors, Mobil Research and Development, Paulsboro, NJ, April 1989

Deuterium quadrupole NMR of hexagonal to biaxial ribbon phase transitions in alkali metal carboxylate-water-cosurfactant mixtures, Federation of Analytical Chemistry and Spectroscopy Societies Annual Meeting, Chicago, IL, October 1989

Protein purification by affinity binding to unilamellar vesicles, Department of Chemical Engineering, University of Delaware, Newark, DE, October 1989

Protein purification by affinity binding to unilamellar vesicles, School of Chemical Engineering, Georgia Institute of Technology, Atlanta, GA, October 1989

Phase equilibria and structure in lyotropic surfactant liquid crystals, Tennessee Eastman Chemical Co., Kingsport, TN, November 1989

Protein purification by affinity binding to unilamellar vesicles, Department of Chemical Engineering, Auburn University, Auburn, AL, January 1990

Protein purification by affinity binding to unilamellar vesicles, Membrane Science Center, University of Kentucky, Lexington, KY, February 1990

Protein purification by affinity binding to unilamellar vesicles, Department of Chemical Engineering, University of Pennsylvania, Philadelphia, PA, March 1990

Liquid crystallinity of surfactant-functionalized siloxane polymers, Symposium on Recent Advances in Fiber and Polymer Science, Raleigh, NC, March 1990

Use of functionalized vesicles for protein purification, Symposium on Advances in Membrane- Mimetic Chemistry and its Application, ACS Annual Meeting, Atlanta, GA, April 1991

Use of affinity surfactants for protein purification, Symposium on Complex Fluids, ACS Annual Meeting, Atlanta, GA, April 1991

Selective purification of proteins by ligand-modified phospholipids, Department of Chemical Engineering, Clemson University, Clemson, SC, October 1991

Affinity Precipitation of Antibodies with Ligand-Modified Phospholipids, Symposium on New Methods in Protein Purification, ACS Annual Meeting, San Francisco, CA, April 1992

The Use of Affinity Surfactants in Biotechnology: An Overview, Department of Chemistry, North Carolina State University, September 1992

Microemulsions: An Overview, Department of Wood and Paper Science, North Carolina State University, October 1992

Selective precipitation of proteins by ligand-modified phospholipids, Department of Food Science, North Carolina State University, January 1993

Selective precipitation of proteins by ligand-modified phospholipids, Department of Chemical Engineering, University of South Carolina, March 1993

Order-order transitions in lyotropic surfactant liquid crystalline phases, Symposium on Rheology of Surfactant Solutions, ACS Annual Meeting, Chicago, IL, August 1993

Fundamentals of Crude Oil Emulsions, Plenary Lecture, Conference on Environmental Issues and Solutions in Exploration, Production, and Refining, Houston, TX, March 1994

The Use of Ligand-Modified Phospholipids in Biotechnology, Department of Chemical Engineering, Case Western Reserve Institute, Cleveland, OH, April 1994

Novel Techniques in Protein Affinity Purification: Use of Peptide Libraries and Affinity Precipitation, Plenary Lecture at *Gordon Research Conference on Separations*, New London, NH, August 1994

Effects of Asphaltene Solvency on Emulsion Stability in Water-in-Crude Oil Emulsions, Lead Lecture at *Symposium on Asphaltenes and Macromolecule Phenomena in Petroleum Production, Transportation, and Processes*, 26th Annual Meeting of the Fine Particle Society, Chicago, IL, August 1995

The Role of Solvency in the Stabilization of Emulsions by Asphaltenes, 1st International Symposium on *The Chemistry, Physics, and Engineering of Petroleum Emulsions*, National AIChE Meeting, Houston, TX, March 10-13, 1997

Molecular Characterization of Paraffinic and Micro-Crystalline Waxes Precipitated from Crude Petroleum, International Symposium on *Thermodynamics of Wax Precipitation from Petroleum*, National AIChE Meeting, Houston, TX, March 10-13, 1997

Detailed Characterization of Asphaltenes from a Variety of Crudes, 2nd International Symposium on *Thermodynamics of Heavy Oils and Asphaltenes*, National AIChE Meeting, Houston, TX, March 10-13, 1997

The Role of Asphaltenes and Waxes in the Stabilization of Water-in-Oil Emulsions, Exxon Corporate Research, Annandale, NJ, August 11, 1997

Selective Precipitation of Proteins by Ligand-Modified Phospholipids, Program in Molecular Biotechnology, UNC-Pembroke, Pembroke, NC, September 5, 1997

The Role of Asphaltenes, Inorganic Solids, and Waxes in the Stabilization of Water-in-Crude Oil Emulsions, Plenary Lecture at *Symposium on Recent Advances in Desalting*, National AIChE Meeting, New Orleans, March 6-10, 1998

Asphaltene-stabilized Water-in-Oil Emulsions, Symposium on International Colloid Chemistry, Bergen, Norway, August 26-27, 1998, in honor of Prof. Johan Sjoblom

Mechanisms of Emulsion Stabilization in Petroleum-Water Systems, PERF Discussion Group on Crude Quality: Impact on Refinery Environmental Systems, September 9, 1998

Fundamentals Of Asphaltenes: The Role Of Aggregation In Films, Emulsions, Foams, And Precipitation, Deepstar Asphaltene Workshop, Texaco EPTD, Houston, TX, September 28-29, 1998

The Role of Asphaltenes in Emulsion Stabilization, Asphaltene Workshop, BASF Technical Center, Charlotte, NC, November 20, 1998

Factors Influencing the Formation of Emulsions in DeepSea Spills, Chevron and MMS-sponsored *Deep Spill Workshop*, Honolulu, Hawaii, February 8-10, 1999

Effectively Handling Production Emulsions, 2<sup>nd</sup> Annual Industry Forum on *Production Separation Systems*, Aberdeen, Scotland, February 24-25, 1999

Molecular Aggregation and Self-Assembly of Asphaltene Films, Gordon Research Conference on *Chemistry of Supramolecules and Assemblies*, Henniker, NH, August 1-6, 1999

Adsorption and Viscoelastic Film Formation by Proteins and Asphaltenes, *Annual Nalco Chemical Company Symposium*, Naperville, IL, September 27, 1999

Invited Participation and short presentation at *Army Research Office Workshop on 'Templated Nanoscale Synthesis and Reactivity'*, Aberdeen, MD, October 20-21, 1999

The Role of Asphaltene Self Assembly in Viscoelastic Film Formation and Emulsion Stability, Statoil, Trondheim, Norway, December 6, 1999

On Correlating Water-in-Oil Emulsion Stability in Crude Oils and Asphaltene-Model Oil Mixtures, Statoil, Trondheim, Norway, December 6, 1999

The Role of Asphaltene Self Assembly in Viscoelastic Film Formation and Emulsion Stability, University of Bergen, Bergen, Norway, December 7, 1999

The Role of Asphaltene Self Assembly in Viscoelastic Film Formation and Emulsion Stability, ABB Corporate Research, Oslo, Norway, February 27, 2000

The Role of Resins and Asphaltenes in the Foaming of Petroleum, Exxon Corporate Research, Annandale, NJ, July 21, 2000

Determination of 3D solubility parameters of Petroleum Asphaltenes, 4<sup>th</sup> International Symposium On Thermodynamics of Heavy oils and Asphaltenes, Copenhagen, Denmark, August 28, 2000

Critical Electric Field Studies of Emulsion Stability in Asphaltene-Resin-Model Oil Mixtures, International Symposium on The Chemistry and Physics of Petroleum-Water Emulsions, Copenhagen, Denmark, August 31, 2000

The Role of Acidic Asphaltenes in Elastic Film Formation at Crude Oil-Water Interfaces, International Symposium on The Chemistry and Physics of Petroleum-Water Emulsions, Copenhagen, Denmark, August 31, 2000

Petroleum Emulsions: Types, Mechanisms, Tools, and Rules, Nalco-Exxon Symposium, Sugar Land, TX, September 20, 2000

Colloid Formation and Interfacial Activity of Asphaltenes in Petroleum, Virginia Polytechnic Institute, Department of Chemical Engineering, October 25, 2000

Wax and Asphaltene Deposition, Shell Oil Company, January 5, 2001

Water-in-Oil Emulsions Stabilized by Asphaltenes and Other Hydrophobic Discotic Film Formers, Nanoparticles 2001, Orlando, FL, February 26, 2001

The Use of Quadrupole NMR Spectroscopy in Measuring Liquid Crystal Phase Behavior in Water-Surfactant-Additive Mixtures, Molecular Simulation Seminar Series, NC State University, April 5, 2001

Asphaltene Chemistry and Aggregation Behavior: Correlation with Emulsion Stabilization, Norwegian Technical University, Trondheim, October 15, 2001

The Role of Asphaltene Chemistry on Aggregation, Interface Adsorption, and Emulsion Stability, Syncrude Corporate Research, Edmonton, Alberta, December 6, 2001

The Role of Asphaltene Chemistry on Aggregation, Interface Adsorption, and Emulsion Stability, Department of Chemical Engineering, University of Alberta, Edmonton, Alberta, December 7, 2001

Colloidal and Interfacial Phenomena in Petroleum: Emulsions in Heavy Petroleum Fluids and Their Mixtures, Koch Corporate Research, Wichita, Kansas, February 26, 2002

Colloidal and Interfacial Phenomena in Petroleum: Emulsions in Heavy Petroleum Fluids and Their Mixtures, AIChE National Meeting, Short Course on "*Colloidal and Interfacial Phenomena in Petroleum Production*," New Orleans, LA, March 10, 2002

Asphaltene Aggregation: Role of Solvent, Resins, Temperature, and Dimensionality, AIChE National Meeting, Symposium on "Petroleum Emulsions," New Orleans, LA, March 13, 2002

Aggregation and Solubility Behavior of Asphaltenes and Their Sub-fractions, ACS National Meeting; Symposium on *Conversion Chemistry of Petroleum Residua*, Boston, MA, August 21, 2002

An Overview of Petroleum Colloid and Emulsion Research at NC State University, Syncrude Corporate Research, Edmonton, Alberta, September 9, 2002

Water-in-Oil Emulsion Stabilization in Petroleum-Water Mixtures by Asphaltenes and Naphthenates, Plenary Lecture at 3<sup>rd</sup> World Emulsion Congress, Lyons, France, September 24-27, 2002

Short Course on *Colloidal and Interfacial Phenomena in Petroleum Production*, ExxonMobil Research and Engineering, Fairfax, VA, October 13-14, 2002

High Pressure CO<sub>2</sub> and Other Environmentally Benign Solvents for Novel De-Emulsification and Extraction Processes, ExxonMobil Research and Engineering Technology Seminar, Fairfax, VA, October 14, 2002 (with N. Zaki and R. G. Carbonell)

Petrocolloids: Mechanisms of Formation, Underlying Chemistry and Physics, and Means of Manipulating, Department of Chemical Engineering, University of Colorado, November 12, 2002

Asphaltene and Naphthenate Mechanisms of Emulsion Stabilization in water-in-crude oil Emulsions, ACS National Meeting, Symposium Honoring Clay Radke on his reception of ACS Award in Colloid and Surface Chemistry, New Orleans, LA, March 25, 2003 (with M.-H. Ese and K. L. Gawrys)

Asphaltene and Wax Chemistry: Role in Determining Organic Deposits, IQPC Conference of *Flow Assurance*, Houston, TX, May 16, 2003

Asphaltene and Naphthenate Mechanisms of Emulsion Stabilization in water-in-crude oil Emulsions, 4<sup>th</sup> International Conference on Petroleum Phase Behavior and Fouling, Trondheim, Norway, June 23-26, 2003 (with M.-H. Ese and K. L. Gawrys)

Fundamentals of Asphaltene and Wax Chemistry and Deposition Phenomena, Symposium on Organic Deposits, Ondeo Nalco Energy Services, SugarLand, TX, September 18-19, 2003

Colloidal and Interfacial Phenomena in the Petroleum Industry: Emulsions, Molecular Aggregation, Liquid Crystalline and Elastic Films, Department of Chemical and Biomolecular Engineering, Georgia Institute of Technology, November 5, 2003

Self-Assembled Bilayer Films on Gold: Incorporation of Helical Peptides and Resulting Electrical Properties, National Institute of Standards and Technology, Gaithersburg, Maryland, February 11, 2004

Biomanufacturing Training and Education Center at NC State University, International Society of Pharmaceutical Engineers, Local Section Meeting, Durham, NC, March 3, 2004

Biomanufacturing Training and Education Center at NC State University, NC State University Board of Visitors Meeting, March 26, 2004

Chemical Characteristics of Heavy Oil and Emulsion Forming Properties, 64<sup>th</sup> PERF Quarterly Meeting, Calgary, Canada, April 1, 2004

Biomanufacturing Training and Education Center, Department of Food Science, North Carolina State University, April 19, 2004

Biomanufacturing Training and Education Center at NC State University, Ottawa Life Sciences Council, Annual General Meeting, Ottawa, Canada, May 17, 2004

Mechanisms of Emulsion Stabilization in water-in-crude oil Emulsions, 5<sup>th</sup> International Conference on Petroleum Phase Behavior and Fouling, Banff, Canada, June 13-17, 2004

Biomanufacturing Training and Education Center (BTEC) at North Carolina State University, Presented at UNC-Pembroke Symposium on Biotechnology, July 29 2004

Research in Micro and Nanoscale Assembly at NC State in Chemical and Biomolecular Engineering, Invited Lecture at Louisburg College, October 30 2004

Biomanufacturing Training and Education Center (BTEC) at North Carolina State University, Presented at Gene Space 2004 (North Carolina), November 2, 2004

Asphaltene Aggregation and Stabilization of W/O Emulsions, Heavy oil Deposition 2004 Conference, Los Cabos, Mexico, November 17, 2004

Petrocolloids and Emulsion Stabilization in Petroleum Fluids, University of Houston Lecture, Department of Chemical Engineering, December 3, 2004

Biomanufacturing Training and Education Center (BTEC) at North Carolina State University, Presented at "Biotechnology in the Piedmont Triad" Advisory Committee Meeting, January 14 2005

High Pressure CO<sub>2</sub> and Other Environmentally Benign Solvents for Novel Extraction Processes, Presented at Western NC Biotechnology Advisory Group Meeting, Fletcher Research Station, NC, March 3, 2005

Biomanufacturing Training and Education Center (BTEC) at North Carolina State University, Presented for the Department of Crop Science at North Carolina State University, March 24, 2005

Comparison of SANS Models for Asphaltene Aggregation, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Clarkson University, Potsdam, NY, June 12-15, 2005

Small Angle Neutron Scattering Studies of Molecular Aggregates and Emulsions in Petroleum Colloids, Keynote Lecture, 6<sup>th</sup> International Conference on Petroleum Phase Behavior and Fouling, Amsterdam, Netherlands, June 19-23, 2005

The North Carolina Biomanufacturing Training and Education Center, Presented at GlaxoSmithKline Zebulon Plant, August 23, 2005

The North Carolina Biomanufacturing Training and Education Center (BTEC): A New Pilot Scale Paradigm in Biopharmaceutical Education, Presented at Technical University of Valencia, Valencia, Espana, October 21, 2005

The North Carolina Biomanufacturing Training and Education Center (BTEC): A New Pilot Scale Paradigm in (Bio-) Pharmaceutical Education, Biotechnology Community of Practice, ISPE Annual Meeting, Scottsdale AZ November 2005

Self Assembly of Ordered Mixed Monolayers and Bilayers, Invited Seminar at Drexel University, Philadelphia, PA, May 5 2006

Nanotechnology and Petroleum Colloids, 18 Lecture Short Course at PLAPIQUI, Department of Chemical Engineering, Bahia Blanca, Argentina, September 24-29, 2006

Nanoscale Self Assembly Processes at the Interface and in the Bulk in Asphaltenic Systems probed by SANS, 1<sup>st</sup> Annual Shell International Symposium, The Hague, Netherlands, November 2-3, 2006

An Overview of Emulsion Mechanisms and Methods for Probing Stability in Petroleum Fluids, PERF Annual Meeting, Houston, TX, March 8, 2007



The Use of SANS in Probing Nanoscale Self Assembly, Institut Francais du Petrol Conference on Heavy Oils, Lyons, France, April 12-13, 2007

Asphaltene Self Assembly, Nanoscale Aggregates and Solvent Entrainment, Department of Mechanical Engineering, University of Alberta, Edmonton, Alberta, CA, August 17, 2007

Nanoscale Phenomena in Petroleum Fluids: Self Assembly, Adsorption, and Interfacial Films, Department of Chemical Engineering, Michigan State University, Lansing, MI, October 23, 2008

Adsorption and Entanglement of Asphaltenes at Oil/Water Interfaces, Philadelphia, PA, AIChE Annual Meeting Symposium Honoring Ted Davis, November 19, 2008

Beauty and the Transcendentals, Schmitt Lecture, University of Notre Dame, December 2, 2008

Beauty, Intellectus, and Higher Education, Pazmany Lecture, Pazmany Peter Catholic University, Budapest, Hungary, October 13, 2009

Adsorption and Entanglement of Asphaltenes at Oil/Water Interfaces, Nalco Chemical, Sugarland, TX, September 6, 2010

Beauty, Science, and Our Eternal Destiny, Hesburgh Lecture, Kansas University, Lawrence, KS, November 8, 2010

Beauty, Science, and our Eternal Destiny, University of Iowa, Iowa City, IA, April 7, 2011

Asphaltenes and Asphaltene Emulsions, ExxonMobil, Clinton, NJ, June 7, 2011

Foundations of a Global Ethics for Engineering, NSF Workshop on Engineering Ethics for a Global Society, Doha, Qatar, October 24, 2011

Creation and Science: The Role of Beauty, Elegance, and Our Ultimate Destiny, St Albert the Great Lecture on Faith, Science, and Reason, Providence College, Providence, RI, November 8, 2011

Beauty: The Nature of Discovery in Science and Technology, Hesburgh Lecture, Houston, TX, April 1, 2012

An Overview of Emulsion Stabilization Mechanisms in Petroleum-Water Systems, Inaugural AIChE Forum on Flow Assurance, Houston, TX, Spring AIChE Meeting, April 1-4, 2012

The Nature of Discovery in Science and the Role of the Beautiful, Hesburgh Lecture, Minneapolis, MN, April 15, 2012

Retaining Students in Engineering, Talent Management Association Conference, San Francisco, CA, August 6-7, 2012

*Duc in Altum*: Building a Culture of Life in a Modern Catholic University, Catholic Medical Association, Minneapolis, MN, September 28-29, 2012

Engineering a Better World for the Future of Humankind, Baylor Technology and Human Flourishing Symposium, October 25-27, 2012

The Global Engineering Deans Council, Canadian National Council of Deans of Engineering and Applied Science, Edmonton, Canada, November 9, 2012

*Ask Anonymously* Panel Discussion, Notre Dame Campus Ministry, Notre Dame, March 21, 2013

The Nature of Discovery in Science and Technology and the Role of the Beautiful in Our Ascendance to God, Hesburgh Lecture, Our Lady of Mount Carmel Church, Newport Beach, CA, August 8, 2013

Charitable Defense: Apologetics, Theology on Tap Talk, Diocese of Ft Wayne-South Bend, Granger, IN, August 13, 2013

Petroleum Science and Engineering: The Role of Asphaltenes, Invited Seminar at the University of Utah, Department of Chemical Engineering, September 3, 2013

Petroleum Science and Engineering: The Role of Asphaltenes, Invited Seminar at the Ohio University, Corrosion Science Institute, November 22, 2013

Hot Topics and Burning Issues in Catholicism, Notre Dame Confirmation Class, December 3, 2013

Asphaltenes: Aggregation, Adsorption at Interfaces, and Emulsion Stabilization, Graduate Seminar at Rice University, Department of Chemical Engineering, February 27, 2014

Invited Panelist for “Bridging the Gap: Overcoming STEM Fatigue,” US News Stem Solutions, The National Conference, Washington, DC, April 23-25, 2014

Reaching Out to Others, Theology on Tap Talk, Diocese of Indianapolis, St Maria Goretti Parish, Carmel, IN, September 16, 2014

Asphaltenes: Aggregation, Adsorption, and Emulsion Stabilization, Graduate Seminar at Oklahoma State University, Department of Chemical Engineering, September 23, 2014

Spiritual Friendship, Talk to Rodzinka Student Group, University of Notre Dame, Notre Dame, IN, October 9, 2014

Asphaltenes and Petroporphyrins: Aggregation and Emulsion Stabilization, ExxonMobil Corporate Research Labs, Annandale, NJ, October 20, 2014

Science, Technology, Innovation, and Catholic Social Justice, Keynote Lecture at 2nd Social Congress on “For an Integral Human Development,” Pontifical Catholic University of Chile, Santiago, Chile, November 4-5, 2014

The Meaning and Purpose of Higher Education, 31<sup>st</sup> Annual J. W. Hodgins Lecture, McMaster University, March 10, 2015

### **Contributed Research Presentations:**

Over 90 other contributed research presentations at National and International Conferences in past 36 years.

## Masters and Doctoral Theses Directed and Completed

<i>Name of Student</i>	<i>Degree</i>	<i>Thesis Topic</i>
McKay Rytting	Ph.D., 2019	Ultrapure Petroporphyrins and their Self Assembly
Salomon Turgman-Cohen**	Ph.D., 2010	Adsorption on Self Assembled Monolayers
Shalini Gupta*	Ph.D., 2008	Novel On-Chip Biological Sensors
Vincent Verruto	Ph.D., 2008	Neutron Scattering of Emulsion Films
Matthew Smith	Ph.D., 2007	Self Assembled Mono and Bilayers
Keith L. Gawrys	Ph.D., 2005	Self Assembly of Asphaltenes by Scattering Methods
P. Matthew Spiecker	Ph.D., 2001	Asphaltene Characterization and Emulsions
Andrew P. Sullivan	Ph.D., 2000	Asphaltenes and Asphaltene Emulsions
Barbara Musser	Ph.D., 1999	Wax-Stabilized Emulsions/Characterization
David E. Keller#	Ph.D., 1997	Surfactant Adsorption on Silica
Joseph D. McLean	Ph.D., 1996	Asphaltene-Stabilized Emulsions
Anup K. Singh#	Ph.D., 1995	Fluor/Enzyme-Enhanced Immunoassay
Matthew A. Jones#	Ph.D., 1994	Enhanced Immunoassay
Nancy Lynch#	Ph.D., 1994	Affinity Precipitation
John C. Blackburn	Ph.D., 1992	Lytropic Surfactant Liquid Crystals
James Hunter#	Ph.D., 1990	Protein Adsorption
Johnny D. Powers#	Ph.D., 1989	Affinity Bioseparations
Sang-Guk Kim#	Ph.D., 1988	Electrostatic Theory
Roberto Guzman#	Ph.D., 1988	Affinity Bioseparations
Mark A. Bogard	M.S., 1986	Surfactant Liquid Crystals
Theodore A. Walter	M.S., 1986	Surfactant Liquid Crystals
C. Michael Hamilton#	M.S., 1989	Surfactant Adsorption
David Zint	M.S., 1991	Polymeric Surfactants
Sameer Anand#	M.S., 1993	Fluorescent Studies of Vesicles
David Steffen#	M.S., 1993	Polymer-Stabilized Vesicles
Dana McDiffett#	M.S., 2004	Thermodynamic Modelling of GAS Precipitation

(# co-advised with Ruben G. Carbonell; \* co-advised with Orlin Velev; \*\* co-advised with Jan Genzer)

## Technology Transfer: Patents

1. Purification by affinity binding to liposomes, P. K. Kilpatrick, R. G. Carbonell, and J. D. Powers, U. S. Patent No. 4,913,902, Issued April 3, 1990; Canadian Patent No. 1,309,804, Issued November 3, 1992.
2. Chromatography apparatus and method and material for making the same, R. G. Carbonell, P. K. Kilpatrick, J. L. Torres, and R. Guzman, U. S. Patent No. 5,045,190, Issued September 3, 1991.
3. Affinity precipitation of proteins using biospecific surfactants, R. G. Carbonell, P. K. Kilpatrick, and R. Guzman, U. S. Patent No. 5,112,770, Issued May 12, 1992.
4. Enhancement of immunosorbent assays with bifunctional vesicles, R. G. Carbonell, P. K. Kilpatrick, M. A. Jones, and A. Singh, U.S. Patent Application No. 07/795,910, filed November 19, 1991.
5. Continuation-in-Part for Precipitation of Multivalent Antiligands with Affinity Surfactants, R. G. Carbonell, P. K. Kilpatrick, and R. Guzman, U.S. Patent No. 5,167,925, Issued December 1, 1992.
6. Therapeutic, Production, and Immunostimulatory Uses of Biocidal Compositions, J. Mullerat, D. A. Hazlett, W. A. Curby, and P. K. Kilpatrick, U. S. Patent No. 5,830,511, Issued November 3, 1998.
7. Continuation in Part of Therapeutic, Production, and Immunostimulatory Uses of Biocidal Compositions, J. Mullerat, D. A. Hazlett, W. A. Curby, and P. K. Kilpatrick, U. S. Patent No. 6,004,587, Issued December 21, 1999.
8. Methods and Apparatus for Separating Fischer-Tropsch Catalysts from Liquid Hydrocarbon Product, G. W. Roberts and P. K. Kilpatrick, U.S. Patent No. 6,114,399, Issued September 5, 2000.
9. Methods and Apparatus for Separating Fischer-Tropsch Catalysts from Liquid Hydrocarbon Product, G. W. Roberts and P. K. Kilpatrick, U. S. Patent No. 6,217,830, Issued April 17, 2001.
10. Methods of Demulsifying Emulsions Using Carbon Dioxide, N. N. Zaki, P. K. Kilpatrick, and R. G. Carbonell, U. S. Patent No. 6,566,410, Issued May 20, 2003.
11. Precipitation of Resins and Fractionation of Crude Oil Using CO<sub>2</sub>, N. N. Zaki, P. K. Kilpatrick, and R. G. Carbonell, NCSU File No. 00-88; filed September 2000.
12. A Method of Bitumen and Heavy Residua Extraction and Asphalt Cleaning Using an Environmentally Benign Solvent and Recycling the Solvent By Treatment with Dense CO<sub>2</sub>, N. N. Zaki, R. G. Carbonell, and P. K. Kilpatrick, NCSU File No. 01-46; filed June 2001.