

## PROFESSIONAL VITA

NAME: Jan D. Miller

DATE & PLACE OF BIRTH: April 7, 1942, Dubois, Pennsylvania

ACADEMIC RANK: Ivor D. Thomas Distinguished Professor of Metallurgy, University of Utah, Salt Lake City, Utah 84112 (2000–present).

DEGREES: B.S. Mineral Preparation Engineering, The Pennsylvania State University, June 1964.  
M.S. Metallurgical Engineering, Colorado School of Mines, June 1966.  
Ph.D. Metallurgical Engineering, Colorado School of Mines, June 1969.

HONORARY DEGREES: Ph.D. Honorary Doctorate Degree (Doctor Honoris Causa), University of Pretoria, South Africa, April 2007.  
Ph.D. Honorary Doctorate Degree (Doctor Honoris Causa), Gdansk University of Technology, Gdansk, Poland, May 2010.

HONORARY PROFESSORIAL APPOINTMENTS: Honorary Professor, Central South University, Changsha, China (2007–present).  
Honorary Professor, Institute for Process Engineering, Chinese Academy of Sciences, Beijing, China (2011–present).  
Honorary Professor, Kunming University of Science and Technology, Kunming, Yunnan, China (2011–present).  
Honorary Professor, Qinghai University, School of Chemical Engineering, Qinghai, Xining, China (2012–present).

POSITIONS: Bethlehem Steel Fellow, Department of Metallurgy, Colorado School of Mines, Golden, Colorado (1964–68).  
Research Engineer, Extractive Metallurgical Research Division, Anaconda Company, Anaconda, Montana (1966).  
Assistant Professor of Metallurgy, University of Utah, Salt Lake City, Utah (1968–72).  
Consultant to various companies and government agencies (1968–present).  
Research Engineer, Lawrence Livermore Laboratory, Livermore, California (1972).  
Associate Professor of Metallurgy, University of Utah, Salt Lake City, Utah (1972–78).  
Professor of Metallurgy, University of Utah, Salt Lake City, Utah (1978–00).  
Adjunct Professor, Department of Chemical & Fuels Engineering, University of Utah (1985–present).  
Associate Director, Center for Advanced Coal Technology, University of Utah, Salt Lake City, Utah (1987–92).  
Director, USBM Generic Center for Comminution, University of Utah, Salt Lake City, Utah (1988–90).  
Director, Center for Coal Processing Technology (1997–99).  
Faculty Associate, NSF Engineering Research Center of Particle Science and Technology, University of Florida, Gainesville, Florida (1998–present).  
Ivor D. Thomas Professor of Metallurgy (endowed chair) (2000–present).  
Site Coordinator, DOE Center for Advanced Separations Technology (CAST), Virginia Tech, Blacksburg, Virginia (2002–present).  
Chair, Department of Metallurgical Engineering, University of Utah, Salt Lake City, Utah (2002–2013).

Consultant on Science and Technology Development Strategy, Yunnan  
Department of Technology and Science, Yunnan Province, China (2009–  
present).

**RESEARCH INTERESTS:** Mineral processing, phenomena involved in flotation separations including surface chemistry, particle/particle interaction and particle/bubble interaction. Research has focused on fine particle flotation in a centrifugal field with the air-sparged hydrocyclone, liberation phenomena, image analysis, and the flotation chemistry of sulfide, nonsulfide, and fossil energy minerals. Flotation research includes the study of auriferous pyrite and PGM sulfide minerals, the study of phosphate and trona ore in the case of nonsulfide minerals, and the study of coal, oil sands, and oil shale in the case of fossil energy minerals. Finally, an effort in the application of x-ray CT to process engineering is in progress with the installation of a microfocus x-ray CT system at the University of Utah.

A major research effort is in progress using the microCT to provide 3D analysis of multiphase particles at a resolution of 5 to 10 microns. Research topics involving multiphase particles include; mineral exposure, mineral liberation, coal washability, particle shape, pore network structure of packed particle beds, strength of porous particle structures, caking and agglomeration, etc. The microCT analyses of particulate systems are being used as a basis for lattice Boltzmann simulation of fluid flow in porous media, micro finite element analysis of porous structures, and the evaluation of particle breakage phenomena.

Surface chemistry research activities have been concerned with the adsorption of surfactants and polymers, particularly the characterization of self-assembled monolayers and LB monolayers by FTIR/IRS and Raman spectroscopy. Recently a laboratory has been dedicated to sum frequency spectroscopy for the examination of interfacial chemistry. The spectroscopic characteristics of interfacial water are now being studied at hydrophobic surfaces together with the development of advanced water-repellent coatings.

Surface force measurements are being accomplished by Atomic Force Microscopy using the colloidal probe technique. Considerable surface chemistry research efforts are now based on analysis by atomic force microscopy (AFM) and advanced instrumentation has been accommodated in the AFM laboratory. Recent accomplishments include the in-situ imaging of surface micelle structures and macromolecules. Equally important is the research on surface force measurements using the colloidal probe technique including the examination of hydrophobic forces and the effect of nanoscale roughness.

The complimentary results from surface spectroscopy, AFM surface force measurements, and AFM surface imaging are being analyzed using molecular dynamics simulation (MDS).

Hydrometallurgy, specifically the physical chemistry of leaching, cementation and solvent extraction. Research has involved electrochemistry of cementation and leaching reactions and technology for gold recovery from cyanide and noncyanide leach solutions. Recent research efforts are in the development of magnetic activated carbon for gold recovery and in the analysis of heap leaching technology.

With respect to environmental considerations, research efforts have been made to examine such topics as cleaning of waste coal fuels, air stripping to remove volatile organics from drinking and process water, water disinfection by ozone or chlorine sparging, dispersed oil removal from water, and contaminated soil remediation. Air-sparged hydrocyclone technology has been developed for de-inking flotation in the waste paper recycling industry and for the treatment of contaminated water. A Center of Excellence (COE) has been established for the development of modified activated carbons (MACs).

Finally, an energy research program has been initiated to develop more efficient energy carriers and advanced fuels. This program includes both the development of new catalysts and the use of new reactors for more efficient conversions of raw material (biomass, coal,

oil shale, etc.) into useful products. A major effort in improved technology for dimethyl ether (DME) production is in progress as well as improved technology for production of high density jet fuels.

HONORS AND AWARDS: Central Pennsylvania Coal Producer's Association Scholarship, 1960–64.  
Graduated with Distinction — The Pennsylvania State University, 1964.  
Bethlehem Steel Fellowship — Colorado School of Mines, 1964–68.  
Invited participant, Minerals Policy Forum, Department of the Interior, 1973.  
Invited as a distinguished extractive metallurgy professor to participate in Colorado School of Mines Centennial Celebration, 1974.  
Marcus A. Grossman Best Paper Award for “Surface Deposit Effects in the Kinetics of Copper Cementation by Iron” published in Metallurgical Transactions, presented by American Society of Metals and The Metallurgical Society, 1974.  
Eleventh recipient of the van Diest Gold Medal periodically awarded to outstanding alumni of the Colorado School of Mines who have distinguished themselves in the Mineral Industry, 1977.  
United Nations Expert, Mineral Processing Consultant to Centro de Investigacion Minera y Metallurgica, Santiago, Chile, 1978.  
Mellow Met Professor, University of Utah — Student Award for Excellence in Teaching Metallurgical Engineering, 1978, 1982, 1994, 2012.  
Taggart Best Paper Award for “Importance of Bitumen Viscosity in the Hot–Water Processing of Domestic Tar Sands,” MPD/SME American Institute of Mining, Metallurgical and Petroleum Engineers, 1985.  
Henry Krumb Lecturer, TMS/SME American Institute of Mining, Metallurgical and Petroleum Engineers, 1987.  
Stefanko Best Paper Award for “Selective Flotation of Fossil Resin from Wasatch Plateau High Volatile Bituminous Coal,” Coal Division, Society of Mining Engineers, AIME, 1988.  
Extractive Metallurgy Technology Best Paper Award for “Solvation Extraction and Electrodeposition of Gold from Cyanide Solutions,” The Metallurgical Society, AIME, 1988.  
Distinguished Research Award, University of Utah, June 1989, in recognition of research accomplishments contributing to the academic character of the university.  
Robert H. Richards Award, Society for Mining, Metallurgy and Exploration, AIME, February 1991 — for advancement in the art of mineral processing by prolific innovation of concepts reflecting the highest quality spirit of an educator, inventor, and dedicated researcher.  
Distinguished Member, Society of Mining, Metallurgy and Exploration, February 1992.  
Extractive and Processing Lecture Award, The Minerals, Metals and Materials Society, March 1992 — in recognition of his outstanding scientific leadership in the extraction and processing of nonferrous metals and for his lecture, “Fundamental Aspects of Gold Recovery from Alkaline Cyanide Solutions.”  
A. M. Gaudin Award, SME, Reno, Nevada, February 1993.  
National Academy of Engineering, Washington, D.C., 1993.  
Distinguished Achievement Medal — Colorado School of Mines, May 1994.  
Centennial Fellow of the College of Earth & Mineral Sciences, Penn State University, September 1996.  
AIME Mineral Industry Education Award — presented at the 126th AIME Annual Banquet, Denver, Colorado, February 1997.  
Faculty Fellow, University of Utah, 1999.

Best Paper Award for Fundamental Research, “Interaction Forces between Toner Surfaces,” M. A. D. Azevedo and J. D. Miller, 2000 TAPPI Recycling Symposium, Washington, DC, 5–8 March 2000.

College of Mines and Earth Sciences, University of Utah, Outstanding Teaching Award, 2000.

Stefanko Best Paper Award for, “Flue Gas Treatment for SO<sub>2</sub> Removal with Air-Sparged Hydrocyclone Technology,” J. D. Miller, R. Bokotko and J. Hupka, Coal and Energy Division, Society of Mining, Metallurgy, and Exploration, SME Annual Meeting, Cincinnati, Ohio, February 2003.

Frank Aplan Award, AIME, SME — for his outstanding and prolific contributions in research and education in mineral processing, surface chemistry and hydrometallurgy, AIME Annual Meeting, Denver, Colorado, October 2003.

Sigel Lecturer, Chemical Engineering Department, Michigan Technological University, 2003

Symposium and Proceedings Honoring Jan D. Miller, “Innovations in Natural Resource Processing,” 2005 SME Annual Meeting, 28 February–2 March 2005, C. A. Young, J. J. Kellar, M. L. Free, J. Drelich, and R. P. King, eds., SME, Littleton, Colorado, 2005.

Za Zaslugi Dla (Special Meritorious Recognition) Medal, Gdansk University of Technology, Gdansk, Poland, June 2005.

Taggart Best Paper Award for “Three Dimensional Analysis of Particulates in Mineral Processing Systems by Cone Beam X-ray Microtomography,” J. D. Miller and C. L. Lin, MPD/SME, 2005.

Utah Governor’s Medal Award for Science & Technology, 2006.

Honorary Doctorate Degree, University of Pretoria, Pretoria, South Africa, April 2007.

Honorary Professor Appointment, Central South University, Changsha, P.R. China, September 2007.

Lindsay Lecture, Chemical Engineering Department, Texas A&M University, 2007.

Certificate of Merit Award for “Trithiocarbonates for the Flotation of PGM Sulphides,” C. F. Vos, J. C. Davidtz, and J. D. Miller, Mine Managers Association, Republic of South Africa, 2007.

Distinguished Professor of Metallurgical Engineering, University of Utah, 2008.

2008 Old Timers Club Faculty Award, Old Timers Club/National Mining Association Coal Show, Las Vegas, Nevada, 22–24 September 2008.

Grand Prix Award, Industrial Technology, Science and Innovation Fair TECHNICON, for mobile cyclonic reactor, J. Hupka, R. Aranowski, A. Dargacz, and J. D. Miller, Gdansk, Poland, 23 October 2008.

John & Virginia Towers Distinguished Lecture, Materials Science and Engineering Department, Michigan Technological University, 2009.

Honorary Doctorate Degree, Doctor Honoris Causa, Gdansk University of Technology, Gdansk, Poland, May 2010.

Most Prolific Inventor Award, Technology Commercialization Award, University of Utah, January 2011.

Honorary Professor, Institute for Process Engineering, Chinese Academy of Sciences, Beijing, China, March 2011.

Honorary Professor, Kunming University of Science and Technology, Kunming, Yunnan, China, March 2011.

Honorary Professor, Qinghai University, School of Chemical Engineering, Qinghai Province, Xining, China, July 2012.

Legion of Honor Fifty Year Membership, SME, January 2013.

Milton E. Wadsworth 2012 Award, SME, MPD – for outstanding contributions to the fundamental theory and technology of hydrometallurgy, presented at the SME Annual Meeting, Denver, Colorado, February 2013.

National Academy of Inventors 2014 NAI Fellow – for demonstrating a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and the welfare of society. Induction at the 4<sup>th</sup> Annual Conference of the National Academy of Inventors, Pasadena, California, 2015.

Rosenblatt Prize for Excellence, University of Utah’s most prestigious award presented annually to a faculty member who displays excellence in teaching, research and administrative efforts, 2015.

Surface Innovations Prize – Institution of Civil Engineers, recognition for best paper in journal – “Molecular Features of Water Films Created with Bubbles at Silica Surfaces,” X. Wang, X. Yin, J. Nalaskowski, H. Du, and J.D. Miller, 2016.

Taggart Best Paper Award for “Opportunities for Plant-site 3D Coarse Particle Characterization with Automated High-Speed X-ray Tomography,” J. D. Miller and C. L. Lin, MPD/SME, 2016.

Faculty Recognition Award, U of U Career Services Office for contributions to students’ career development and exploration, 2017.

Foreign Experts Friendship Award, Yunnan Foreign Experts Administration, Kunming, Yunnan, China, 2017.

Lifetime Achievement Award, International Mineral Processing Congress (XXIX IMPC), Moscow, Russia 2018. Presented at SME Annual Meeting, Denver, CO, February 2019.

PR China International Science and Technology Cooperation Award, Beijing, China, 2018.

Outstanding US-China Friendship Professional Award, presented at the Chinese 150<sup>th</sup> Anniversary of Golden Spike Celebration, Salt Lake City, Ut, May 2019.

Chinese Government Friendship Award, Beijing, China, September 2019.

Listed in:

- Who's Who in Technology Today
- Men of Achievement
- Who's Who in Engineering
- Who's Who in the West
- Biography International
- American Men and Women of Science

Editorial Board Service:

- Hydrometallurgy, Elsevier
- Coal Preparation, Gordon and Breach
- AOSTRA Journal of Research
- Solvent Extraction and Ion Exchange, Dekker
- International Journal of Mineral Processing, Elsevier
- Minerals Engineering, Elsevier

TECHNICAL &  
PROFESSIONAL  
SOCIETY MEMBERSHIPS  
& RESPONSIBILITIES:

- Society for Mining, Metallurgy and Exploration (formerly Society of Mining Engineers):
- SME Program Chairman (1982–83)
  - Member, SME Board of Directors (1980–83)
  - Co-Chairman Third International Hydrometallurgy Symposium TMS/SME (1983).

- Chairman, Mineral Processing Division, SME, (1980–81)
- Member, SME Nominating Committee
- Member, MPD General Committee
- Past Chairman, MPD Program Committee
- Member, Richards Award Committee, SME
- Session Chairman, Leaching Processes, Solution Mining Symposium SME 1974
- Member, Editorial Committee, A. M. Gaudin Memorial Flotation Symposium SME 1976
- Past Chairman, Taggart Award Committee MPD/SME
- Past Chairman, SME Scholarship Committee
- Past Member, SME Educational Board
- Past Member, SME Book Publishing Committee
- Past Member, MPD Educational Committee
- Past Member, MPD Mineral Processing Fundamentals Committee
- AIME, Utah Section Student Affairs Chairman (1979–82)
- Member, Taggart Award Committee (1991– 94)
- Member, Metallurgical Processing Fundamentals Committee (1992–95)
- Member, Antoine M. Gaudin Award Committee (1994–95)
- Chairman, Antoine M. Gaudin Award Committee (1995)
- Member, Wadsworth Award Committee (1999–02)
- Member, Richards Award Committee (2001)
- Chairman, Wadsworth Award Committee (2002–03)
- Chairman, Richards Award Committee (2003–04)

The Minerals, Metals and Materials Society (formerly The Metallurgical Society)

- Past Chairman, EMD Awards Committee, EMD/TMS
- Past Chairman, Hydrometallurgy — Chemical Processing Committee, MPD/SME, EMD/TMS

American Chemical Society

- Session Chairman, Fourth Symposium on Separation Science

Engineering Foundation

- Session Chairman, Science and Technology of Processing Fine Coal
- Session arrangements, Advances in Comminution
- Session Chairman, Dispersion and Aggregation: Fundamentals and Applications (1992)
- Conference Chairman, Surface Characterization of Adsorption and Interfacial Reactions (1994)
- Member, Frank F. Aplan Board of Award (1994–97)
- Conference Chairman, Surface Characterization of Adsorption and Interfacial Reactions II (1998)
- Conference Co-chair, Environmental Technology for Oil Pollution: Remediation and Pollution Prevention (1999)

NAE

- NAE Nominating Committee (1999)

Fine Particle Society

- Session Chairman

International Association of Colloid and Interface Scientists

Society for Applied Spectroscopy

The Mining and Metallurgical Society of America

UNIVERSITY COMMITTEE  
ACTIVITIES:

- Faculty Advisor, Student Chapter AIME (1969–81)
- University Senate (1971–74)
- Faculty Relations Committee, College of Mines (1972–82, 1984–86, 1993–97, 1999–2002, 2014–2015)
- Past-Chairman, Faculty Relations Committee, College of Mines (1977–78).
- Curriculum Committee, College of Mines (1979–81)
- Advisory Committee, Placement & Career Information Center (1979–81).
- Outstanding Teaching Award Committee, College of Mines (1978–79, 1982–83).
- Marriott Library Review Committee, College of Mines (McGregor Fund) (2001–02)
- Editor of Mellow Met Newsletter (1979–00)
- HEW Fellowship Committee (1979–81).
- Central Analytical Facilities Committee (1980)
- University Credits and Admissions Committee (1981–84).
- Chairman, College Curriculum Committee (1985)
- Personnel and Elections, substitute (1985)
- UPTAC — University Promotion and Tenure Advisory Committee (1985–87, 2000–03)
- Semester/Quarter Calendar Committee (1985)
- Alumni Board (1985–present)
- PI Advisory Committee to President (1986)
- University Senate (1986–89)
- Internal Review Committee Dept. Chemistry (1987)
- Academic Senate (1988–91)
- Research Council (1991–present)
- Review Candidates for Vice President of Research (1992)
- McGregor Fund Chair (1992–1995)
- Honors Program Advisory Committee (1992–96)
- Goldwater Scholarship Committee (1993–94)
- Interdisciplinary Committee for Development of a Graduate Program in Environmental Engineering (1994–95)
- Executive Committee, Environmental Engineering Graduate Program (1994–present)
- College Teaching Awards Committee (1994–96)
- Sweet Candy Company Scholarship Committee (1995)
- Academic Freedom & Tenure Committee (1995–97)
- Graduate Council Review of Department of Pharmaceutics and Pharmaceutical Chemistry (1995–96 academic year)
- Review Committee for the Office of Sponsored Projects (1995–96 academic year)
- Kenneth Browning Handley Memorial Scholarship Committee Chairman (HPAC subcommittee) (1996)
- Environmental Engineering Admissions Committee Chairman (1995–98)
- Dean's Review Committee (1996)
- Faculty Search Committee (1996)
- Review Committee, University of Utah Funding Incentive Seed Grant Program (1996–01)
- College Distinguished Lecture Series Committee (1999–02)
- College Teaching Awards Committee Chair (2000–02)
- Sutton Geology & Geophysics Building Program Steering Committee (2004–05)
- College Council, College of Mines and Earth Sciences (2004–13)

College Executive Committee/College Space Committee, College of Mines and Earth Sciences (2004–13)  
College Loan Committee, College of Mines and Earth Sciences (2004–06)  
University Nanotechnology Committee (2005)  
Ivor Thomas Building, Design Committee (2005–06)  
USTAR Search Committee Subcommittee (2006–2007)  
Development Director Search Committee, CMES (2016–2017)  
RPT Committee, College of Mines and Earth Sciences (2019–2020)

COURSES TAUGHT: Met. E. 1610: Introduction to Extractive Metallurgy  
Met. E. 3620: Thermodynamics and Phase Equilibria  
Met. E. 5770: Electrometallurgy  
Met. E. 5660: Surfaces and Interfaces  
Met. E. 5670, 5680: Mineral Processing  
Met. E. 5700: Hydrometallurgy  
Met. E. 6730: Flotation Chemistry  
Met. E. 6740: Solution Concentration and Purification  
Correspondence Study Course, DCE, Elements of Metallurgy  
Met. E. 1001: Energy Resources (Previously listed as Liberal Education)

RESEARCH TOPICS: Solvent Extraction Chemistry, Intrinsic Reaction Kinetics  
Cementation Reactions  
Heterogeneous Reaction Kinetics in the Leaching of Sulfide and Oxide Minerals  
Coal and Fossil Resin Flotation Chemistry  
Water-Based Physical Separation Processes for Domestic Tar Sands  
Surface Chemistry in the Flotation of Nonreactive Ionic Solids  
Interaction of Unsaturated Collector Molecules at Mineral Interfaces  
Liberation Analysis  
High-Speed Video System for Motion Analysis of Particulate Systems  
Air-Sparged Hydrocyclone Technology  
X-Ray Computed Tomography for Process Engineering  
Selective Fossil Resin Flotation  
Surface Spectroscopy, In-Situ FT-IR/IRS, of Adsorbed Surfactants  
Deinking Flotation for Paper Recycle  
Soluble-Salt Flotation Systems  
Environmental Technology  
Langmuir Blodgett Films  
Interfacial Water Structure  
Atomic Force Microscopy — Surface Force Measurements by the Colloidal Probe Technique  
Phosphate Flotation Chemistry and Practice  
Flotation Fundamentals of Sulfide Mineral Flotation  
Plastics Recycling  
Water Treatment Processes  
Heap Leaching  
X-ray Micro CT for Particulate Structures and Flow through Porous Media  
Magnetic Activated Carbon  
Auriferous Pyrite Flotation  
Surfactant Surface Structures by AFM Imaging  
Hydrophobic Surfaces  
Advanced Fuels Technology



## RESEARCH CONTRACTS:

1. "Depression of Pyrite without the Use of Cyanide," EPA, \$12,633 (1969–70).
2. "An Electrokinetic Study of Calcium Fluoride," NSF \$14,100 (1970–71).
3. "Removal of Dissolved Contaminants from Mine Drainage," EPA, \$21,351 (1970–71).
4. "Removal of Bismuth from Lead Cake by Chloride Leaching," St. Joe Minerals Corp., \$10,000 (1972–73).
5. "Advanced Chemical Processing of Copper Sulfide Concentrates," NSF–RANN, \$500,000 (1973–77).
6. "Adsorption–Desorption Reactions in the Desulfurization of Coal by a Pyrite Flotation Technique," U.S.B.M., \$102,000 (1975–77).
7. "Copper Extraction from Ammonia Leach Liquors by Hydroxyoximes," U.S.B.M., \$23,000 (1975–77).
8. "Hot–Water Processing of Utah Tar Sand," NSF, ERDA, DOE, \$300,000 (1975–83).
9. "Coal Flotation Chemistry," DOE \$125,000 (1977–79).
10. "Hot–Water Processing of Domestic Tar Sands," DOE \$50,000–\$75,000 per annum since 1977.
11. "Complexation Reactions in Uranium Hydrometallurgy," IAEA, \$12,000 (1978–80).
12. "Flotation Separation Technology for Processing Alunite Ore," NSF, \$150,000 (1978–81).
13. "Hydrocyclone Design and Modification," Mineral Leasing Fund and MMRRI, \$10,000 (1978–80).
14. "Mathematical Modeling of Solvent Extraction Processes," State of Utah and NSF, \$60,000 (1978–81).
15. "Air–Sparged Hydrocyclone," Mining and Mineral Resources Research Institute, \$150,000 (1980–82).
16. "Glass Still and Video System," Institutional Funds \$11,500 (1980).
17. "High–Gradient Magnetic Separator," Institutional Funds, \$37,500 (1979), \$12,500 from NSF (1980).
18. "Activated Hydrogen Reduction," Mineral Leasing Funds, \$8,000 (1981).
19. "Particle Size Analyser," Institutional Funds, \$11,500 (1981).
20. "Workshop on Mineral Processing and Chemical Metallurgy," NSF, \$87,773 (1981).
21. "Coal Flotation with ASH," DOE, \$18,375 (1982).
22. "Enhanced Leaching by Modification of Reaction Product Layer," NSF, \$150,000 (1982–84).
23. "Fluid–Flow Behavior in an Air–Sparged Hydrocyclone," NSF, \$150,000 (1983–86).
24. "High–Speed Video System," Institutional Funds, \$30,000 (1983).
25. "Measurement and Prediction of Mineral Liberation during Grinding," USBM \$325,000 (1983–88).
26. "Study of Fluid–Flow Patterns and Particle Trajectories in the Hydrocyclone Using a High–Speed Motion Analyzer Video System," USBM \$250,000 (1983–88).
27. Mideast Peace Fellowship Support, \$5000 (1983–85).
28. "Air–Sparged Hydrocyclone Test Program for Gold Placers," National Minerals Associates, \$9,000 (1984).
29. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double–Bond Interaction of Adsorbed Unsaturated Collector Species," DOE \$355,000 (1984–89).
30. Chevron Unrestricted Mineral Processing and Extractive Metallurgy, Chevron, Total \$7,500 or \$2,500 each (1984).
31. "Air–Sparged Hydrocyclone Test Program for Resin Flotation from Fine Coal," American Resins, \$5,000 (1985–86).
32. "Autofocus Microscope/Computer–Driven Moving Stage," Special Research Instrumentation Fund, University of Utah, \$20,000 (1985–86).
33. "Carbon Dioxide for Fine Coal Flotation, DOE \$135,000 matching \$46,391 (1985–87).
34. "Carbon Dioxide Flotation of Fine Coal," Bethlehem Steel, \$20,000 (1985–86).
35. "Direct Reduction of Gold from Modified Alkyl Amine Aurocyanide Solutions," Mineral Leasing Funds, \$3,000 (1985).
36. "Exploratory Coal Flotation Research Program," Penelec, \$39,314 (1985–86).

## RESEARCH CONTRACTS, cont.

37. "Fluid-Flow Characterization and Modeling of Heavy-Media Cyclones for the Low-Gravity Cleaning of Fine Coal," United Coal Company, \$91,904 (1985-87).
38. "FTIR Spectroscopy," Institutional Funds, University of Utah, \$20,000 (1985-86).
39. "Gold Recovery from Alkaline Cyanide Solution," Mineral Leasing, University of Utah, \$5,200 (1985-86).
40. Chevron Unrestricted Mineral Processing and Extractive Metallurgy, Chevron, total \$7,500 per annum (1985).
41. "Advanced Coal Flotation Technology," MLF, \$2,000 (1986-87).
42. "Air-Sparged Hydrocyclone Test Program for the Recovery of Sulfur," J. D. Jones and Associates, \$50,000 (1986-88).
43. Chevron Unrestricted Mineral Processing and Extractive Metallurgy, Chevron, total \$7,500 per annum (1986).
44. "Coal Cleaning and Rheology," Penelec, \$39,000 (1986-87).
45. "Dispersed Phase Behavior in the Air-Sparged Hydrocyclone," NSF, \$100,000 (1986-88).
46. "Modified Amine Extraction of Anions from Alkaline Solution," NSF, \$173,000 (1986-89).
47. "Test Program for the Recovery of Silicon Carbide from Petroleum Coke Products," R. I. Lampus Company, \$5,256 (1986).
48. Chevron Unrestricted Mineral Processing and Extractive Metallurgy, Chevron, total \$7,500 per annum (1986).
49. "Air-Sparged Hydrocyclone Test Program for Verpol Plant," OMYA, Inc., \$5,000 (1987).
50. Center of Excellence for Advanced Coal Technology, State of Utah, \$150,000 (1987-90).
51. "Characterization and Hypochlorite Leaching of Low-Grade Carbonaceous Gold Ores," Newmont Gold, \$100,000 (1988-89).
52. "Volumetric Composition of Locked Particles by X-Ray Computed Tomography," USBM \$249,735 (1987-92).
53. Chevron Unrestricted Mineral Processing and Extractive Metallurgy, Chevron, total \$7,500 per annum (1988).
54. Cyanamid Grant \$10,000 per annum (1988-89).
55. "Air-Sparged Hydrocyclone Flotation of Fine Coal," \$120,000, Penelec, DOE (1989).
56. "Hot-Water Processing of Domestic Tar Sands," DOE \$250,000 (1990-91).
57. "Contaminated Soils," EG&G/INEL \$25,000 (1990-91).
58. "Amenability of Western Coal to Selective Resin Flotation," USBM \$49,944 (1990-91).
59. "Fossil Resin Recovery from Western Coal," DOE \$299,485 (1990-92).
60. "Multiphase Flow in ASH by X-Ray CT," NSF \$160,000 (1990-93).
61. "Multiphase Flow in ASH by X-Ray CT," DOE \$140,000 (1990-93).
62. "On-Line 3-D Belt Size Analyzer Development and Crushing Circuit Control," USBM \$112,704 (1990-92).
63. "Hot Water Processing of Domestic Tar Sand," DOE, ~\$250,000 (1991-92).
64. "Motion Visualization of Crushing, Screening and Grinding Machines," USBM, \$29,403 (1991-92).
65. "A Novel Procedure for the Preparation of Diamond and Diamond-Like Thin Films," University Research Committee, \$4,500 (1992-94).
66. "Gold Adsorption from Cyanide Solutions by Carbon," Mineral Leasing, fellowship (1991-92).
67. "Separation of Mercury from Gold in Alkaline Cyanide Solutions," U.S. Agency for International Development, fellowship (1991-92).
68. "Synthesis of Gold Solvent Extractants," fellowship, IPMI, LASPAU (1990-93).
69. "ASH Flotation of Iron Ore," CAPES, fellowship (1990-92).
70. "Hot Water Processing of Domestic Tar Sand," DOE, \$150,000 (1993-95).
71. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double Bond Interaction of Adsorbed Unsaturated Collector Species," DOE, \$360,000 (1989-93).
72. "Surface Chemistry of Deinking Flotation for Improved Waste Paper Recycling," NSF, \$210,000 (1993-96).

## RESEARCH CONTRACTS, cont.

73. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double Bond Interaction of Adsorbed Unsaturated Collector Species," DOE, \$300,000 (1993–96).
74. "Refining of Fossil Resin Flotation Concentrate from Western Coal," DOE, \$279,941 (1993–95).
75. Engineering Foundation Conference, "Surface Characterization of Adsorption and Interfacial Reactions," Kona, Hawaii, NSF, \$10,000 (1994).
76. "Air–Sparged Hydrocyclone Flotation Technology for Efficient Recovery of Florida Phosphate Minerals," FIPR, \$441,142 (1994–97).
77. "Advanced Process Technology from Mexican Wastepaper Recycling Plants and Pulp/Paper Plants," SCERP, \$87,000 (1994–95).
78. "Industrial Testing of Crusher Product Size Analyzer for Crushing Circuit Control," USBM, \$163,994 (1994–96).
79. "Investigation on the Water Repulsive Materials," NTT, \$15,000 (1994–99).
80. "U.S.–Mexico Cooperative Research: Pretreatment of Industrial Wastewater Streams for the Removal of Suspended Fine Particles and Dispersed Oil Droplets by Air–Sparged Hydrocyclone Flotation," NSF, \$17,900 (1994–96).
81. "Grant for Fossil Resin Industry," Dept. of Community and Economic Development, \$33,798 (1995–96).
82. "Removal of Chlorinated Hydrocarbon from Contaminated Water by ASH Technology," HSRC, \$139,036 (1995–96).
83. "State Center of Excellence Program — Center for Minerals Technology," State of Utah (Faculty Participant), \$480,000 (1995–98).
84. "Surface Chemistry Studies," U.S.–Japan, Weber State, \$14,253 (1995–96).
85. "Improved Technology for Recovery of Boron Materials from Saturated Salt Solutions," U.S.–Turkey Cooperative Research, NSF, \$23,670 (1996–99).
86. "Center for Coal Technology," Coal Processing Technology (Director), \$200,000 (1996–99).
87. "Atomic Force Microscopy for Study of Specially Prepared Surfaces Including Transferred Langmuir Blodgett Layers," DOE, URI, \$199,365 (1996–97).
88. "Coal Washability by X–ray CT," University Coal Research/DOE, \$594,571 (1996–99).
89. "Plastics Separation (PVC/PET) by Froth Flotation," Technology Innovation Grants Program, UURF, \$90,000 (1996–98).
90. "Coal Cleaning Opportunities for SO<sub>2</sub> Emission Reduction in the Border," SCERP/EPA, \$153,032 (1996–99).
91. "Improved Coarse Phosphate Flotation with Nonionic Polymers," FIPR, \$78,727 (1996–97).
92. "Acquisition of an X–Ray Microscale Computed Tomography Imaging System," NSF, \$350,000 + University of Utah Match, \$160,000 (1997–00).
93. "Electrophoresis Instrument," Research Instrumentation Funding, University of Utah, \$20,000 (1997–98).
94. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double Bond Interaction of Adsorbed Unsaturated Collector Species (The Flotation Chemistry of Nonsulfide Minerals)," DOE, \$300,000 (1997–01).
95. "Interfacial Chemistry Analysis of Wastepaper Deinking by Atomic Force Microscopy," NSF Program: Interfacial Trans & Separation Process, \$313,900 (1997–01).
96. "NSF–International Workshop on Multiphase Systems in Mineral and Chemical Processing," NSF, \$41,495 (1997–98).
97. "Surface Chemistry Aspects of Fluorosurfactants Removal from Wastewater," subcontract from APT, \$40,000 (1997–98).
98. "Surface Chemistry of Oil/Soil/Water Systems for Improved Oil Removal from Contaminated Soil by Air–Sparged Hydrocyclone Flotation," EPA/National Center for Environmental Research and Quality Assurance, \$315,706 (1997–00).

## RESEARCH CONTRACTS, cont.

99. "Accessories for AFM," Research Instrumentation Funding, University of Utah, \$20,000 (1998–99).
100. "The Analysis of Aqueous Dispersion and Aggregation Phenomena by Spectroscopic Examination of Interfacial Water," Engineering Research Center for Particle Science and Technology at the University of Florida, \$54,060 (1998–00).
101. "Colloid Stability at High Ionic Strength," DGE/EHR/NSF–NATO Postdoctoral Fellowship, \$49,800 (1998–99).
102. "Fatty Acid Flotation of Calcareous Phosphate Rock by Enzyme Autoxidation," U.S.–Egypt Joint Science & Technology Board, Cairo, Egypt (NSF), \$26,000 (1998–00).
103. Engineering Foundation Conference, "Surface Characterization of Adsorption and Interfacial Reactions II," Kona, Hawaii, NSF, \$20,000 (1998).
104. "Interfacial Properties of Hydrophobic Coatings: A Collaborative Research Program with NTT," UCON Air Force JIMT, \$13,425 (1998–99).
105. "U.S.–Turkey Cooperative Research: Recovery of Borax from Saturated Salt Solutions," NSF, \$28,950 (1998–00).
106. Engineering Foundation Conference, "Environmental Technology for Oil Pollution: Remediation and Pollution Prevention," Jurata, Poland, NSF, \$10,000 (1999).
107. "The Surface Chemistry of New Collectors for the Flotation Recovery of Strategic Materials from Sulfide Mineral Resources," U.S.–South Africa Cooperative Research, NSF, \$10,800 (1999–01).
108. "Upgrade of FTIR Spectroscopy Laboratory," University of Utah, \$18,000 (1999–00).
109. "Advanced Wastewater Treatment for the Fish Processing Industries near Ensenada, Baja California, Mexico," SCERP, \$82,000 (2000–01).
110. "Surface Area and Pore Size Analyzer," Research Instrumentation Funding, University of Utah, \$53,000 (2000–01).
111. "A Selective Collector for Phosphate Flotation," Technology Innovation Grant, University of Utah, \$69,400 (2000–02).
112. "Treatment of Cyanide Solutions and Slurries Using ASH Technology," DOE, \$319,351 (2000–03).
113. "Modification of Micellar Nanostructures at Lithographic Surfaces," University of Utah Seed Grant, \$31,930 (2000–01).
114. "A Selective Collector for Phosphate Flotation," FIPR, \$107,251 (2001–02).
115. "Segregation Effects of Cohesive Powders," NSF – Engineering Research Center for Particle Science and Technology at the University of Florida, \$167,510 (2001–05).
116. "Flotation Technology for the Trona Industry," U.S.–Turkey Cooperative Research, NSF, \$24,000 (2001–03)
117. "Alternative Disposal of Used Tires in the Border Region," SCERP, \$39,750 (2001–02).
118. "Characterization and Analysis of Copper Heap Leaching at Compania Minera Zaldivar, Placer Dome, \$348,750 (2001–04).
119. "Interfacial Chemistry Analysis of Wastepaper Deinking Processes with Fatty Alcohol Ethoxylates," U.S.–Egypt Science and Technology Program, NSF Joint Proposal, \$45,852 (2001–04).
120. "Removal of Metal Ions and Complexes from Aqueous Streams using Powdered Magnetic Activated Carbon," University of Utah Research Foundation, Technology Commercialization Project, \$69,050 (2001–02).
121. "Removal of Dissolved and Colloidal Contaminants from Fish Processing Wastewater near Ensenada, Baja California, Mexico, SCERP, \$75,000 (2002–03).
122. "Alternative Anode Reaction for Copper Electrowinning," Mining Industry for the Future Program, Office of Industrial Technology, DOE/INEEL, \$62,000 (2002–04).
123. "NER: In–Situ Second Harmonic Generation Studies to Describe Nanoscale Phenomena at the Surfaces of Microparticles," NSF/BES–Nanoscale Exploratory Research, \$90,000 (2002–04).

## RESEARCH CONTRACTS, cont.

124. "Flotation Technology for the Trona Industry," Technology Commercialization Project (TCP), University of Utah, \$34,700 (2002–04).
125. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double-Bond Reactions of Adsorbed Unsaturated Collector Species (The Flotation Chemistry of Nonsulfide Minerals)," DOE, \$305,635 (2002–05).
126. "Difficult to Float Phosphates," FIPR, \$10,000 (2002).
127. "Acquisition of a Sum Frequency Generator (SFG) Spectrometer for Surface Spectroscopic Studies Research and Student Training," NSF/IMR Program, \$174,650 (2002–04).
128. "Nanostructures of Surfactants at Solid–Liquid and Gas–Liquid Interfaces and their Influence on Interfacial Properties," NSF International Proposal and Australian Research Council (ARC), \$46,692 (2003–05).
129. "Flotation Technology for the Trona Industry," DOE CAST Consortium, Virginia Tech, \$182,480 (2003–06).
130. "XMT Analysis of Residual Copper Minerals in Exhausted Heaps," Compania Minera Zaldivar, Placer Dome, \$140,306 (2003–04).
131. "Recovery of Value-added Fossil Resins from El-Maghara Coal in Egypt," U.S.–Egypt Cooperative Research Program, NSF, \$29,822 (2003–05).
132. "Evaluation of a Novel Magnetic Activated Carbon Process for Gold Recovery," DOE SBIR/STTR Research Subcontract, Eriez Manufacturing, \$30,000 (2003–04).
133. "The Structure of Particle Beds and their Flow Behavior as Revealed by X-ray Computed Tomography (CT)," NSF - Engineering Research Center for Particle Science and Technology, University of Florida, \$38,510 (2003–05).
134. "AFM Study of Thin–Layer Degradation of Organic Compounds by Photocatalytic Oxidation," J. Nalaskowski, University of Utah Seed Grant, \$27,500 (2004–05).
135. "Biopolymers for Water Treatment," COEP Geobiotechnology Center Planning Grant, \$5,000 (2004–05).
136. "Measurements of Residual Saturations and Relative Permeabilities for Multiphase Flow in Porous Media Using X-ray Micro-CT (Computer Tomography), M. Deo, University of Utah Seed Grant, \$35,000 (2004–2005)
137. "PGM Recovery with the IGF Flotation Tech," Newmont, \$30,000 (2004–06).
138. "Mineral Liberation Analysis in 3D by X-ray MicroCT for the Evaluation of Particle Separation Efficiency," DOE CAST Consortium, Virginia Tech, \$100,000, 2004–06.
139. "Pore Scale Processes Fundamentally Influencing the Transport of Colloids in Porous Media," (Co–PI) NSF, \$495,563 (2004–07).
140. "Advanced Flotation Chemistry Technology for the Improved Recovery of Strategic Mineral Resources Containing Platinum Group Metals (PGMs)," NSF U.S.–South Africa Cooperative Research, \$56,356 (2004–06).
141. "Two–Dimensional Sol Gel Protein Imprinting," NSF Nanoscale: Exploratory Research, Subcontract from USU, \$41,133 (2004–05).
142. "Acquisition of Equipment for Direct Observation of Colloid Attachment-Detachment Dynamics and Direct Measurement of Colloid-Substratum Interaction and Adhesion Forces," (Co–PI) NSF/EAR – Instrumentation and Facilities, \$314,442 (2004–05).
143. "Atomic Force Microscopy Studies of Adhesion and Frictional Force in Lapping and Post–Lap Cleaning during Thin–Film Magnetic Recording Heads Production," Seagate Technology, \$43,348 (2004–06).
144. "Mineral Liberation Analysis in 3D by X-ray Micro CT," Rio Tinto Technology Group, \$48,348 (2004–06).
145. "Proof of Concept Testing of a Gold Process Using Magnetic Activated Carbon," (Co–PI) DOE SBIR/STTR, Phase II Research Subcontract, Eriez Manufacturing, \$116,685 (2004–06).
146. "Modified Activated Carbons (MAC) Technology," Center of Excellence, State of Utah, \$140,000 (2005–06).

## RESEARCH CONTRACTS, cont.

147. "Water Treatment for Reverse Osmosis (RO) Plant Operations," Newmont Mining Corporation, \$59,428 (2005–07).
148. "Development of a 3D Lattice-Boltzmann Model for Fluid Flow Simulation under Partially Saturated Conditions in Packed Particle Beds," DOE CAST II, Virginia Tech, \$153,668 (2005–07).
149. "Upgrade of Atomic Force Microscopy System," Research Instrumentation Funding, University of Utah, \$40,000 (2005–06).
150. "Catalytic Conversion of Lignin to High-Octane Gasoline Additive," (Co-PI) PureVision/DOE, \$125,000 (2006).
151. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double-Bond Reactions of Adsorbed Unsaturated Collector Species (The Flotation Chemistry of Nonsulfide Minerals)," DOE, \$345,000 (2005–08).
152. "Solid Superacid Catalysts for Synthesis of High-Performance Naphthenic Kerosene (Naphthenic Kerosene Process Catalysts)," J. D. Miller and W. Zmierczak, Fuels Development Group, \$180,000 (2006–08).
153. "A Study of Effect of Feed Characteristics on Fatty Acid Flotation of Florida Phosphates," FIPR, \$72,000 (2006–08).
154. "Micro-structural Analysis of Multi-phase Brittle Solids," B. Pariseau, J. D. Miller, and C. L. Lin, University of Utah Seed Grant, \$27,000 (2006-2007).
155. "X-ray Microtomography of Cores from the ZVI PRB, Fry Canyon, Utah," USGS, \$8,500 (2007).
156. "Synthesis of Dimethyl Ether (DME) and DME-derived Fuels and Chemicals," W. Zmierczak (PI) and J. D. Miller (Co-PI), Ambre Energy, \$2.2 million (2007–10).
157. "HPGR Metallurgical Performance," Phelps Dodge, \$58,000 (2007–08).
158. "Interfacial Chemistry of Surfactants and Water Soluble Polymers under High Shear Conditions," J. D. Miller (PI), University of Utah Seed Grant, \$24,000 (2008–09).
159. "Replacement of FTIR Spectrometer," Research Instrumentation Funding, University of Utah, \$53,760 (2007–08).
160. "Characterization of Dry Valley Phosphate Rock," J. D. Miller, E. Peterson, and C. L. Lin, Agrium U.S., Inc., \$15,000 (2008).
161. "High Resolution, High Contrast X-ray Micro CT Instrument (HRXMCT)," Phelps Dodge Mining Company, \$40,000 (2008–09).
162. "Characterization, Analysis and Simulation of Fine Coal Filtration," C. L. Lin and J. D. Miller, DOE CAST Consortium, Virginia Tech, \$192,000 (2008–10).
163. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double-Bond Reactions of Adsorbed Unsaturated Collector Species (The Flotation Chemistry of Nonsulfide Minerals)," DOE, \$390,000 (2008–11).
164. "Pore Scale Analysis of Oil Sands/Oil Shale Pyrolysis by X-ray Micro CT and LB Simulation," DOE/Clean and Secure Energy Program, \$89,946 (2008–10).
165. "Improving Crushed Ore Agglomeration," J. D. Miller (Co-PI), AMIRA, \$1.5 million (2009–12).
166. "Sedimentation Field-flow Fractionation (SdFFF) Instrument," Research Instrumentation Funding, University of Utah, \$46,000 (2010).
167. "Micro CT Analysis of Mineral Samples," Barrick Gold, \$13,270 (2010).
168. "Fundamentals for Improved Dewatering of Clays and Fine Tailings," FLSmidth, \$225,000 (2010–11).
169. "Further Pre-Commercial Optimization and Preparation of a Catalyst Candidate for Production of Dimethyl Ether in Slurry Reactors (Optimization of DME Catalyst)," W. W. Zmierczak and J. D. Miller, Ambre Energy, \$364,474 (2010–11).
170. "Nuclear Materials," J. D. Miller and M. Misra, Subcontract, DOE/UNR, \$138,836 (2010–11).
171. "Flat Plate Streaming Potential Instrument," Research Instrumentation Funding, University of Utah, \$40,000 (2011).

## RESEARCH CONTRACTS, cont.

172. "Micro CT Analysis of Mineral Samples II," Barrick Gold, \$13,270 (2011–12).
173. "Bauxite Flotation Technology," Yunnan Wenshan Aluminum Industry Co., \$94,000 (2011-2013).
174. "Assessment of the Current State of Shanxi, Da Tong City, Cetian Reservoir Sediment Problem and Clean-up Scope of Technical Service Work, J.D. Miller and X. Wang, Shanxi Department of Water Resources, \$300,000 (2011–2013).
175. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double-Bond Reactions of Adsorbed Unsaturated Collector Species (The Flotation Chemistry of Nonsulfide Minerals)," DOE, \$465,000 (2011–14).
176. "Soluble Salt Flotation Research," Intercontinental Potash Corp. (USA), \$76,829 (2011–12).
177. "Catalyst Preparation and Evaluation," J. D. Miller, Jantra-SF LLC, \$73,765 (2011–12).
178. "Reactive Transport Models with Geomechanics to Mitigate Risks of CO<sub>2</sub> Utilization and Storage," J.D. Miller and M. Deo, DOE, \$55,284 (2012-2015).
179. "Application of X-ray Computed Tomography (CT) for Coal Washability Analysis," A. V. Nguyen and J. D. Miller, ACARP, \$96,142 Australian (2012–13).
180. "Isolation and Characterization of RE Mineral Particles in Florida Phosphate Rock by DE Rapid Scan Radiography and HRXMT," Florida Industrial and Phosphate Research Institute (FIPR), \$87,000 (2013–2014).
181. "ICP Spectrometer for Elemental Analysis," Research Instrumentation Funding, University of Utah, \$75,000 (2013).
182. "Non-destructive Characterization of Borehole Coal Samples Using XCT Technology," University of Queensland/University of Utah, ACARP, \$80,000 (2014–2015).
183. "3D Microstructures of Floes and Consolidated Oil Sand Tailings and the Relationship to Water Recovery (University of Alberta/University of Utah), COSIA Tailings EPA, Canadian Tailings Research Working Group, \$55,636 (2014–2015).
184. "The Hydrophobic Character of Nonsulfide Mineral Surfaces as Influenced by Double-Bond Reactions of Adsorbed Unsaturated Collector Species (The Flotation Chemistry of Nonsulfide Minerals)," DOE, \$480,000 (2014–2017).
185. "Fundamental Surface Chemistry Aspects of Auriferous Pyrite Flotation with Carbon Dioxide," Newmont Mining Corporation, \$108,770 (2015–2017).
186. "On-Line High Speed Tomography for 3D Coarse Particle Characterization, A Geometallurgy Tool for Mine-to-Mill Optimization," Newmont Mining Corporation, \$30,000 (2015–2016).
187. "Fundamental Surface Chemistry Aspects of Polysaccharide Depressants in Mineral Flotation Systems," Kemira Chemicals, Inc., \$59,600 (2015–2016).
188. "Development and Demonstration of X-ray Tomography for On-line Characterization of Pebble Phosphate," Florida Industrial and Phosphate Research Institute (FIPR), \$101,916 (2015-2016).
189. "Replacement FTIR Spectrometer for Surface and Interface Research," Research Instrumentation Funding, University of Utah, \$39,405 (2016).
190. "Advanced HNT Nanocomposite Electrolyte for Lithium-Sulfur Batteries," University of Utah Seed Grant, \$17,500 (2016-2017).
191. "Exposed Surface Area Analysis of Coarse Particles Using High Resolution X-ray Microtomography (HRXMT)," Rio Tinto – Kennecott Copper, \$32,500 (2016-2017).
192. "Prediction of Particle Size Distribution and Washability for the Design of Optimum Coal Mining/Processing Operations from Borehole Sample Constituents Using XCT," University of Queensland/University of Utah, ACARP, \$57,666 (2016–2017).
193. "Fundamental Issues in the Depression of Talc by Polysaccharides," Newmont Mining Co., \$107,298 (2017 – 2018).

## RESEARCH CONTRACTS, cont.

194. “High-Conductivity Solid Polymer Electrolyte (SPE) for Next-Generation Lithium Batteries,” UTAG/USTAR, State of Utah, \$191,700 (2017–2018).
195. “X-ray Tomographic Liberation Analysis for Gangue Rejection in the Processing of Gold Ores,” Curtin University, \$60,600 (2017–2019).
196. “High Resolution X-ray Micro Tomographic Analysis for Prediction of HydroFloat Recovery,” AngloAmerican, \$60,000 (2017–2018).
197. “Surface Chemistry Research for Mineral Resources,” DOE/PNNL, \$78,884 (2018–2019).
198. “Multi-Scale Fluid-Solid Interactions in Architected and Natural Materials (MUSE),” DOE, Energy Frontier Research Center (EFRC), co-PI, \$600,000 (2018–2022).
199. “Development of HNT/SPE for High Voltage Lithium Batteries,” University of Utah Technology Venture Commercialization (TVC), \$33,000 (2018–2019).
200. “CO<sub>2</sub> Flotation of Pyrite,” Newmont Mining Co., \$160,000 (2019–2020).
201. “High Resolution X-ray Micro Tomographic Analysis for Prediction of HydroFloat Recovery, Project 2,” AngloAmerican, \$48,000 (2019–2020).
202. “Ultra-high Energy and Highly Safe All Solid State Li-sulfur Battery,” NASA STTR Phase I, Topic T15.03, Chemtronergy subcontract, \$50,000 (2019–2020).
203. “Temporal and Spatial Characterization of Respirable Coal Mine Dust Using Area Monitoring Devices and X-ray CT,” NIOSH, MTU subcontract, \$130,086 (2019–2021).
204. “X-ray Computed Tomography of Coarse Copper Ore Particles,” Tianjin Meiteng Technology Col, Ltd., \$70,000 (June–Nov. 2020).
205. “Surface Chemistry of Carbonaceous Materials, a Foundation for Improved Flotation Strategies at Penasquito,” Newmont Mining Co., \$209,675 (2020–2022).
206. “Solid State Li-Sulfur Battery Based on Novel Polymer Mineral Composite,” NASA STTR Phase II, Topic T15.03, Chemtronergy subcontract, \$300,000 (2021-2023).



## SEMINARS AND PRESENTATIONS:

International Symposium of Copper Extraction and Refining Las Vegas, Nevada, February 1976.  
U of U Metallurgy Undergraduate Seminar, Spring 1976.  
ACS Meeting, San Francisco, California, August 1976.  
BYU Chemistry Department, Seminar, October 1976.  
U of U Chemical Engineering Seminar, November 1976.  
AIChE Meeting, Chicago, Illinois, November 1976.  
South Dakota School of Mines, Metallurgy Department, Seminar, December 1976.  
University of California, Berkeley, California, Metallurgy Department, two Seminars, February 1977.  
AIME Annual Meeting, Atlanta, Georgia, March 1977.  
U.S.B.M. Coal Preparation Symposium, Pittsburgh, Pennsylvania, May 1977.  
Engineering Foundation Conference, Rindge, New Hampshire, June 1977.  
16th Annual Conference of Metallurgists, The Metallurgical Society of CIM, August 1977.  
Katholieke Universiteit te Leuven, Department Metaalkunde, Leuven, Belgium, September 1977.  
AIME Annual Meeting, three presentations by students, Denver, Colorado, February 1978.  
Engineering Foundation Conference, Asilomar, California, June 1978.  
NSF Workshop Beneficiation of Mineral Fines, Tuxedo, New York, August 1978.  
Centro Investigacion Minera y Metalurgica, Santiago, Chile, eight Seminars, October 1978.  
Instituto de Investigaciones Minero Metallurgico, Oruro, Bolivia, two seminars, October 1978.  
AIME Annual Meeting, two presentations, New Orleans, February 1979.  
International Mineral Processing Congress, Warsaw, Poland, June 1979.  
Wroclaw Technical University, 2 seminars, Wroclaw, Poland, June 1979.  
ASEE, Baton Rouge, Louisiana, June 1979.  
Engineering Foundation, Rindge, New Hampshire, August 1979.  
“Conserving and Researching Utah's Energy Resources,” University of Utah Symposium, September 1979.  
CIMM, 2 seminars, Santiago, Chile, October 1979.  
First Latin American Congress on Flotation, Concepcion, Chile, October 1979.  
South Dakota School of Mines and Technology, Seminar, Department of Metallurgy, October 1979.  
Virginia Polytechnic Institute and State University, Seminar, Department of Mineral Engineering,  
November 1979.  
AIChE Annual Meeting, 3 presentations, San Francisco, November 1979.  
Graduate Seminar, Fuels Engineering Dept., University of Utah, January 1980.  
AIME Annual Meeting, 3 presentations, two graduate students, one postdoc., Las Vegas, February 1980.  
Rocky Mountain Fuel Society, Salt Lake City, Utah, February 1980.  
Pacific Northwest Metals and Minerals Conference, Seattle, Washington, May 8, 1980.  
Chevron Research Co., Richmond, California, May 1980.  
The Pennsylvania State University, Departments of Material Science and Engineering and Mineral  
Engineering, July 1980.  
ISEC, Liege, Belgium, September 1980.  
Gdansk Technical University, Gdansk, Poland, September 1980.  
SME Fall Meeting, Minneapolis, Minnesota, October 22–24, 1980.  
AIChE, Houston, Texas, two presentations, April 5–9, 1981.  
Separation Science and Technology for Energy Application, Gathuburg, Tennessee, three presentations,  
May 5–8, 1981.  
Seminar, Dept. of Material Science & Eng., University of California, Berkeley, May 18, 1981.  
Engineering Foundation, New Hampshire, Summer 1981.  
Engineering Foundation, Santa Barbara, January 1982.  
Resources for the Future, Salt Lake City, Utah, September 11, 1981.

## SEMINARS & PRESENTATIONS, cont.

Production, Processing and Characteristics of Heavy Oils, Tar Sand Bitumens, Shale Oils and Coal Derived Liquids, Salt Lake City, Utah, October 17–30, 1981.

SME Fall Meeting, Denver, Colorado, November 1981.

Seminar VPI, Blacksburg, Virginia, January 21, 1982

AIME Annual Meeting, two presentations, February 15–17, 1982.

Rocky Mountain Fuel Symposium, Salt Lake City, Utah, February 18, 1982.

AIME Annual Meeting, Dallas, February, 1982.

Science and Technology of Synfuels, Colorado Springs, March 1–3, 1982.

Visiting Professor, Chevron Oil Field Research Company, Lahabra, California, March 1982.

183rd ACS National Meeting, Las Vegas, March 28–April 2, 1982

13th Annual Meeting Fine Particles Society, Chicago, April 12–14, 1982

7th Annual Powder and Bulk Solids Conference, Chicago, May 11–13, 1982.

DOE Workshop, Invited Speaker and Chairman, Washington, June 10, 11, 1982.

International Conference of Colloids and Surfaces, VPI, Blacksburg, Virginia, June 1982.

Italian–U.S. Workshop on Research Needs in Mineral Processing, sponsored by NSF, Pollanza, Italy, June 1982.

NATO Institute for Advanced Study, Cambridge University, England, July 1982.

Seminar at The Pennsylvania State University, September 1982.

Seminar at University of British Columbia, November 1982.

AMAX Foundation Lecturer, University of Nevada–Reno, December 1982.

Seminars and/or Presentations in Chile at CIMM and several plants in Chile, December 1982

Seminar, Materials Science Department, University of California at Berkeley — MnO<sub>2</sub>/SO<sub>2</sub>, January 28, 1983.

Rocky Mountain Fuel Society Symposium, Salt Lake City, February 1983.

AIME Annual Meeting, Atlanta, March 1983, Tech. Paper Bubble Attachment, 3rd International Hydrometallurgy Symposium.

University of Utah Graduate Seminar, “Parochial Review CuFeS<sub>2</sub> Leaching by Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>,” March 30, 1983

AMOCO seminar, Naperville, Illinois, April 6, 1983.

National Academy of Science National Research Council Tar Sand Workshop, Salt Lake City, Utah, April 14, 1983.

NSF Workshop, Research Needs in Non–Ferrous Extractive Metallurgy, Mexico City, April 18–21, 1983.

Southeastern Utah Section AIME, Moab, Utah, April 12, 1983.

3rd Separation Science Symposium, “Rate Processes in Solvent Extraction,” Gatlinburg, Tennessee, June, 1983.

Sir Ian Wark Symposium, “Surface Chemistry in Fluorite Flotation with Oleate,” Australia, July, 1983.

Fine Particle Society Meeting, “Bubble Formation at the Wall of an Air–Sparged Hydrocyclone,” J. D. Miller, K. R. Upadrashta, and S. Gopalakrishnan, and “Gas–Phase Transport of Flotation Reagents,” Honolulu, Hawaii, August (1983).

Colorado Section Society of Mining Engineers, Practical Hydromet '83 7th Annual Symposium on Uranium and Precious Metals, “Gold Recovery Technology,” Denver, August 1983.

International Solvent Extraction Conference, 2 papers, Denver, August, 1983.

Travel to China, 20 Lectures, Beijing, Changsha, September 1983.

SME Fall Meeting, 2 presentations, “Process Alternatives in Gold Recovery from Heap Leach Solutions,” and “Selectivity Considerations in Gold Solvent Extraction from Alkaline Cyanide Solutions,” Salt Lake City, October, 1983.

The Pennsylvania State University, “Gold Solvent Extraction from Alkaline Cyanide Solution,” University Park, October, 1983.

## SEMINARS & PRESENTATIONS, cont.

- 10th Interamerican Chemical Engineers Conference, 2 papers, "Solvent Extraction as Rate Process in Hydrometallurgy Systems," and "New Developments in Amine Solvent Extraction Systems," Santiago, Chile, November, 1983.
- MINTEK 50, International Conference on Recent Advances in Mineral Science and Technology, Johannesburg, South Africa, March 6, 1984.
- American Chemical Society Awards Symposium on Separation Science, April 8–10, 1984.
- University of California at Berkeley, Dept. of Materials Science and Mineral Engineering, April 26, 1984.
- Visiting Professor, Chevron Research Laboratory, Richmond, California, April 27, 1984.
- Electrochemical Society, Cincinnati, May 6–9, 1984.
- ASEE Meeting, Salt Lake City, Utah, June 25–29, 1984.
- 7th Meeting of Mining and Metallurgy, San Luis Potosi, LaPaz, Mahehuala, Mexico, July 6, 1984.
- 2nd Western Regional Conference on Precious Metals, Coal, Industrial Minerals and Environment, September 12–15, Rapid City, South Dakota, 1984
- South Dakota School of Mines and Technology, Dept. of Metallurgy and Metallurgical Engineering, Seminar, September 1984
- St. Joe Minerals Corp., Seminars, September 1984.
- The Pennsylvania State University, Department of Mineral Engineering, Seminar, October 1984.
- Leach and Garner Co., Attleboro, Massachusetts, Seminar, October 1984.
- Virginia Polytechnic Institute, Dept. of Mineral Engineering, Blacksburg, Virginia, Seminar, January 1985.
- Annual AIME Meeting, New York, New York, February 1985.
- SOHIO, Cleveland, Ohio, Air–Sparged Hydrocyclone and Tar Sands, March, 20, 1985.
- Fine Particle Society Meeting, Miami, Florida, Liberation and Fluorite Flotation Chemistry, April 22–25, 1985.
- Bethlehem Steel Corp., Bethlehem, Pennsylvania, Review of Research Activities, April 26, 1985.
- International Mineral Processing Congress, Cannes, France, Liberation and Air–Sparged Hydrocyclone, June 2–9, 1985.
- 8th Meeting of AIMMGM, Matehula, SLP, Mexico, Air–Sparged Hydrocyclone, given by J. Parga, July 1985.
- Engineering Foundation, Session Chairman, Henniker, New Hampshire, August 11–16, 1985.
- Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, Carbon Dioxide Flotation of Coal, September 17, 1985.
- Carnegie–Mellon University, Pittsburgh, Pennsylvania, Gold Solvent Extraction, September 18, 1985.
- SME Fall Meeting, Albuquerque, New Mexico, Gold Flotation from Colorado River Sand with the Air–Sparged Hydrocyclone, October 16–18, 1985.
- Separation Science Symposium, Knoxville, Tennessee, Solvation Extraction and Direct Reduction of Gold, October 20–24, 1985.
- The Pennsylvania State University, University Park, Pennsylvania, Fluorite Flotation Chemistry, October 25, 1985.
- NYSEG, Pennelec, UCC, Homer City, Pennsylvania, Low–Gravity Cleaning of Fine Coal, Heavy–Medium Cyclone, with K. R. Upadrashta, November 18–19, 1985.
- Engineering Foundation — Advances in Comminution, Kona, Hawaii, Liberation Analysis, December 8–13, 1985.
- Fuels Engineering Lecture, University of Utah, Salt Lake City, Utah, Hot–Water Processing of Domestic Tar Sands, February 12, 1986.
- SME/TMS, AIME Annual Meeting, New Orleans, February 1986.
- ACS Meeting, New York, 2 papers given by our research group on polymeric adsorbents and thermochemistry of fluorite/oleate system.
- Comminution Short Course, prepared course notes, Stockholm, Sweden, April 1986.

## SEMINARS & PRESENTATIONS, cont.

- International Conference Particle Technology, prepared paper, Nuremberg, Germany, April 1986.
- DOE Principal Investigators Meeting, Carbon Dioxide Flotation of Coal, Pittsburgh, PA, July 14–16, 1986.
- Fine Particle Society Annual Meeting, 3 papers presented from our research group, San Francisco, July 31–August 2, 1986.
- Plenary Speaker**, Process Chemistry Innovation for Gold Recovery from Alkaline Cyanide Solution, Gordon Conference, Colby Sawyer College, New London, New Hampshire, August 11–13, 1986.
- Canadian Institute of Mining and Metallurgy, 23rd Annual Meeting, Zinc–Dust Cementation of Silver from Alkaline Cyanide Solution: Analysis of Plant Data, Toronto, August 17, 1986.
- Flotation Chemistry and Gold Recovery, Nancy, France, September 10, 1986, 2 seminars.
- International Solvent Extraction Conference, ISEC 86, Solubility Losses in Modified Amine Extraction of Gold from Alkaline Cyanide, Munich, Germany, September 11–16, 1986.
- Special Seminar, High–Capacity Fine Coal Cleaning by Flotation with the Air–Sparged Hydrocyclone, University of Alabama, Tuscaloosa, Alabama, October 24, 1986.
- Plenary Speaker**, An Analysis of Innovative Process Technology in Hydrometallurgy, International Symposium on Process Innovation, TMS/AIME, Colorado Springs, Colorado, November 9–12, 1986.
- Applications of Surface Symposium, sponsored by Royal Australian Institute for Chemistry, 2 presentations, Perth, Australia, December 7–12, 1986.
- AIME Annual Meeting, 7 papers, Denver, Colorado, February 1987.
- DOE Review and Program Evaluation, Washington, DC, February 10, 1987.
- Henry Krumb Lecture**, Process Innovation in Hydrometallurgy, Local Section AIME, Sullivan, Missouri, March 20, 1987.
- International Conference Separation Science, Gold Solvent Extraction, Engineering Foundation and NSF, Schloss Elmau, Germany, April 26–30, 1987.
- USBM Metallurgical Research Center, Air–Sparged Hydrocyclone, Salt Lake City, Utah, May 14, 1987.
- Lignite Symposium, Lignite flotation, presented by Dr. Ye, Dallas, Texas, May 18–20, 1987.
- DOE Contractors Meeting, Carbon Dioxide Flotation, Pittsburgh, Pennsylvania, July 20, 1987.
- South Australian Institute of Technology, Dept. Chemical Technology, Seminar on Gold Recovery from Alkaline Cyanide Solution, Adelaide, Southern Australia, August 1987.
- Royal Australian Chemical Institute, Colloids and Surfaces, University of New South Wales, Coal Flotation, Sydney, Australia, August 24–29, 1987.
- Western Australia School of Mines, Seminar, Kalgoorlie, September 1987.
- Henry Krumb Lecture**, Gold Hydrometallurgy, Local Section AIME, Casper, Wyoming, September 10, 1987.
- International Conference on High–Sulfur Coal, Chemically Modified Coal Flotation, presented by Dr. Ye, Southern Illinois University, Carbondale, Illinois, September 28–October 1, 1987.
- 5th Symposium on Separation Science and Technology, Resin Technology for Gold Recovery, Knoxville, Tennessee, October 26–30, 1987.
- Henry Krumb Lecture**, Air–Sparged Hydrocyclone, Local Section AIME, Twin Cities, Minnesota, November 5, 1987.
- EPRI/DOE Workshop, State of the Art Review Microbubble Froth Flotation, Air–Sparged Hydrocyclone, Homer City, Pennsylvania, December 3, 1987.
- SME/TMS AIME Annual Meeting, 3 presentations, 8 total from research group, January 1988.
- Keynote Speaker**, 7th Australian Electrochemistry Conference, Sydney, Australia, February 14–19, 1988.
- “The Significance of Electrochemistry in the Analysis of Mineral Processing Phenomena,” J. D. Miller, University of New South Wales, Kensington, New South Wales, Australia, February 15–19, 1988.
- “Bubble–Attachment Time Measurements for Selected Rare–Earth Phosphate Minerals in Oleate Solutions,” W. M. Cross and J. D. Miller, TMS Annual Meeting: Symposium on Rare Earths, Extraction, Preparation and Applications, Las Vegas, Nevada, February 28, 1989.

## SEMINARS & PRESENTATIONS, cont.

- International Symposium on Precious and Rare Metals, Albuquerque, New Mexico, April 6–8, 1988.  
AME MINExpo International '88, Chicago, Illinois, April 24–28, 1988.  
“The Air–Sparged Hydrocyclone for Fine Coal Flotation,” MINExpo, American Mining Congress, Chicago, May 1988.  
Electrochemical Society Symposium, Atlanta, Georgia, May 15–20, 1988, paper presented by W. Cross.  
“The Effect of Potential Bias on the Hydrophobic Character of Lanthanum Fluoride Electrodes in Oleate Solutions,” W. M. Cross, R. Y. Wan and J. D. Miller, 173rd Meeting of the Electrochemical Society; Atlanta, Georgia, May 17, 1988.  
National Colloids and Surfaces Conference, The Pennsylvania State University, June 19–22, 1988, paper presented by J. Kellar.  
“Fossil Resins from Coal – A Wasted Resource and Target of Opportunity,” J.D. Miller, Coal – Targets of Opportunity Workshop, Washington, D.C., July 12–13, 1988.  
Fine Particle Society, Santa Clara, California, July 19–22, 1988, papers presented by Y. Ye and C. L. Lin.  
“The Hydrophobic Character of Pretreated Coal Surfaces,” R. Jin, Y. Ye, and J. D. Miller, The Surface Chemistry of Coal, 196th American Chemical Society National Meeting, Los Angeles, California, September 25–30, 1988, paper presented by R. Jin.  
“Quantitative In–Situ Analysis of Collector Adsorption Reactions by Internal Reflection FTIR Spectroscopy,” J. D. Miller and J. J. Kellar, Challenge in Mineral Processing, SME Topical Conference, Berkeley, California, December 1988.  
Challenges in Mineral Processing, SME/AIME, University of California, Berkeley, California, December 7–10, 1988.  
SME/TMS AIME Annual Meeting, Las Vegas, Nevada, February 27–March 2, 1989, 1 presentation, 6 total from research group (Cross, Kellar, Lin, Misra, Sibrell).  
“Characterization of Carbonaceous Matter from Carlin Gold Ores,” P. L. Sibrell, G. Ramadorai, and J. D. Miller, 1989 TMS Annual Meeting, Las Vegas, Nevada, February 1989.  
“Resin Flotation from Coal with Short Chain Alcohols,” presentation at International Symposium on Advanced in Fine Particle Processing, Boston, Mass., August 22–25, 1989.  
“In–Situ FTIR Internal Reflection Spectroscopy for the Study of Surfactant Adsorption Reactions Using Reactive Internal Reflection Elements,” J. J. Kellar, W. M. Cross, and J. D. Miller, presented by J. Kellar at the 6th Symposium on Separation Science and Technology for Energy Applications, sponsored by the Department of Energy and Oak Ridge National Laboratory, Knoxville, Tennessee, October 22–26, 1989.  
“Preliminary Analysis of Pyrite Rejection during Chemically Modified Fine Coal Flotation by Conditioning with Monopersulfate,” 3rd International Conference on Processing and Utilization of High Sulfur Coals, Ames, Iowa, November 14–17, 1989.  
“Infrared Spectroscopy for In–Situ Characterization of Surface Reactions,” J. D. Miller, J. J. Kellar and W. M. Cross, Advances in Coal and Mineral Processing Using Flotation, Engineering Foundation/SME Topical Conference, Palm Coast, Florida, December 3–8, 1989.  
“Residual Solvent Effect on the Viscosity of Bitumen from Whiterocks Tar Sand,” R. R. White, J. Y. Yang, J. Drelich, J. Hupka, J. D. Miller, F. V. Hanson, and A. G. Oblad, Rocky Mountains Fuel Society Meeting, Salt Lake City, Utah, February 1990.  
“The Stability of the PARGEN Simulator of Polished Section Data,” J. Bole, C. L. Lin, and J. D. Miller, TMS Annual Meeting, San Diego, California, February 1990.  
“Improved Molybdenite Flotation from Copper/Moly Concentrates,” presentation at 119th SME Annual Meeting, February 26–March 1, 1990.  
“Characterization of Resin Types from the Hiawatha Seam of the Wasatch Plateau Coal Field,” presentation at 119th SME Annual Meeting, February 26–March 1, Salt Lake City, Utah, 1990.

## SEMINARS & PRESENTATIONS, cont.

- “The Flotation Recovery of High-Purity Gibbsite Concentrates from a Brazilian Bauxite Ore,” L. R. M. Bittencourt, C. L. Lin, and J. D. Miller, Advanced Materials Symposium, SME Annual Meeting, Salt Lake City, Utah, February 1990.
- “Characterization of Resin Types from the Hiawatha Seam of the Wasatch Plateau Coal Field,” Q. Yu, K. Bukka, Y. Ye, and J. D. Miller, 119th SME/AIME Annual Meeting, Salt Lake City, Utah, Feb. 26–March 1, 1990.
- “Improved Molybdenite Flotation from Copper–Moly Concentrates,” W. Jang, Y. Ye, and J. D. Miller, 119th SME/AIME Annual Meeting, Salt Lake City, Utah, Feb. 26–March 1, 1990.
- “In-Situ Near Infrared Internal Reflection Spectroscopy of Collector Adsorption Reactions Using Reactive Internal Reflection Elements,” J. J. Kellar, W. M. Cross, and J. D. Miller, 119th SME/AIME Annual Meeting, Salt Lake City, Utah, Feb. 26–March 1, 1990.
- “Moderate Temperature Water Processing of Whiterocks Tar Sands, Oil Shale and Tar Sand,” J. Hupka, J. D. Miller, Y. Yang, J. Drelich, R. R. White, F. V. Hanson, and A. G. Oblad, DOE Contractors Review Meeting, Morgantown, West Virginia, Proceedings, April 18 and 19, 1990.
- “In-Situ Examination of Adsorbed Surfactants by FTIR/IRS Using Reactive Internal Reflection Elements,” J. D. Miller, J. J. Kellar, and W. Cross, I ACS Annual Meeting, Boston, Massachusetts, 23–25 April 1990.
- Invited Lecture** NSF–EPSCoR Seminar, “FTIR/IRS Spectroscopy for the In-Situ Analysis of Collected Adsorption Phenomena,” J. D. Miller, South Dakota School of Mines and Technology, Rapid City, South Dakota, Thursday 26 April 1990.
- “Fundamentals of Flotation,” J. D. Miller, 3rd Congress of Nonferrous Extractive Metallurgy, Universidad de Sonora, Hermosillo, Sonora, Mexico, 21–24 May 1990.
- “The Effect of Drop Size and Liquid Evaporation on the Contact Angle in the Polyethylene/Water/Air System,” J. Drelich, J. Hupka, and J. D. Miller, International Symposium on Contact Angles and Wetting Phenomena, Toronto, Ontario, Canada, June 21–23, 1990.
- “An Improved X-Ray CT Reconstruction Algorithm Suitable for Quantitative Analysis in Industry Applications,” A. B. Cortes, C. L. Lin, and J. D. Miller, Review of Progress in Quantitative NDE, 17th Annual Conference, La Jolla, California, July 1990.
- “Bitumen Flotation Kinetics from Digested Tar Sand Slurry,” J. Hupka, J. Drelich, and J. D. Miller, 21st Annual Meeting of the Fine Particle Society, San Diego, California, Aug. 21–25, 1990.
- “Scale-Up and Design of Large Air-Sparged Hydrocyclone,” Y. Yi, S. Gopalakrishnan, and J. D. Miller, 21st Annual Meeting of the Fine Particle Society, San Diego, California, Aug. 21–25, 1990.
- “Surfactant Adsorption Density Calculations from In-Situ Real Time NIR Spectroscopic Data,” J. J. Kellar and J. D. Miller, 17th Meeting Federation of Analytical Chemistry and Spectroscopy Societies, Cleveland, Ohio, October 1990.
- “Impact of Water Recycle on Water-Based Processing of Whiterocks Tar Sand,” J. Hupka, J. Drelich, J. D. Miller, R. R. White, F. V. Hanson, and A. G. Oblad, 1990 Eastern Oil Shale Symposium \* Oil Shale \* Tar Sands \* Heavy Oil, Lexington, Kentucky, Nov. 6–8, 1990.
- “Moderate Temperature Water-Based Bitumen Recovery from Tar Sand,” J. Hupka and J. D. Miller, 1990 Eastern Oil Shale Symposium \* Oil Shale \* Tar Sands \* Heavy Oil, Lexington, Kentucky, Nov. 6–8, 1990.
- “FTIR Spectroscopic Analysis of Surface Oxidation Reactions during Ozonation of Fossil Resins and Coal,” Q. Yu, Y. Ye, and J. D. Miller, Engineering Foundation Conference, Palm Coast, Florida, Dec. 1–5, 1990.
- “Preliminary Comparison of the Performance of the ASH–2C with the ASH–6C for Fine Coal Flotation,” J. D. Miller, Y. Ye, and S. Gopalakrishnan, Engineering Foundation Conference, Palm Coast, Florida, Dec. 1–5, 1990.

## SEMINARS & PRESENTATIONS, cont.

- “Adsorption of Gold by Carbon — Structural Considerations,” P. L. Sibrell and J. D. Miller, 1991 SME Annual Meeting, Denver, Colorado, February 1991.
- “The Nature of Gold Adsorption from Alkaline Cyanide Solutions by Carbon,” J. D. Miller and P. L. Sibrell, TMS Annual Meeting, New Orleans, 17–21 February 1991.
- Invited Speaker**, “The Status of Air–Sparged Hydrocyclone Flotation Technology,” 4th Asian Symposium on Mineral Processing, Manila, Philippines, 9–11 April 1991.
- “The Search for Adsorbed Gold Cyanide at Carbon Surfaces,” J. D. Miller, WORLD GOLD 91, Cairns, Australia, 22–25 April 1991.
- Invited Lecturer**, Short Course, “Selected Topics in Mineral Processing,” J. D. Miller, UFMG, Belo Horizonte, Brazil, 26 August–6 September 1991.
- “Conformation of Adsorbed Surfactant Species in the Alumina/Sodium Dodecyl Sulfate System as Determined by FTIR/IRS,” W. M. Cross, J. J. Kellar, and J. D. Miller, XVII International Mineral Processing Congress, Dresden, Germany, 23–28 September 1991.
- “In–Situ FTIR Internal Reflection Spectroscopy of Collector Adsorption Phenomena in Soluble Salt Flotation Systems,” M. R. Yalamanchili, J. J. Kellar, and J. D. Miller, XVII International Mineral Processing Congress, Dresden, Germany, 23–28 September 1991.
- “Fast Flotation of Fine Coal Flotation in the Air–Sparged Hydrocyclone,” J. D. Miller, S. Gopalakrishnan, Y. Ye, J. Hupka and J. Kosciukiewicz, Symposium on Physicochemical Problems of Mineral Processing, Sobotka near Wroclaw, Poland, 30 September–2 October 1991.
- “In–Situ FTIR Spectroscopy for the Study of Surfactant Adsorption Phenomena,” J. D. Miller, Special Seminar for the Faculty of Chemistry, Politechnike Gdanska, Gdansk, Poland, 3 October 1991.
- “Advances in Mineral Processing Technology,” Fourth International Conference on Separation Technology, Engineering Foundation, Kona Coast, Hawaii, 20–25 October 1991.
- “Preliminary Examination of Oil Bonding at Sand Surfaces and Its Influence on Hot Water Separation,” J. Hupka, M. Budzich, and J. D. Miller, 1991 Eastern Oil Shale Symposium, Lexington, Kentucky, 13–15 November 1991.
- Invited Speaker**, “Utah Fossil Resins — A Wasted Resource,” J. D. Miller, SME local meeting, Salt Lake City, Utah, 21 November 1991.
- “The Significance of Surface Charge in Soluble Salt Flotation Systems,” J. D. Miller, VPI, Blacksburg, Virginia, 21 November 1991.
- Annual Comminution Center Meeting, Michigan Technological University, research presentations, J. D. Miller, Houghton, Michigan, 16 December 1991.
- Invited Speaker, The John Butler Extractive Metallurgy Lecture Series**, Mackay School of Mines, University of Nevada–Reno, “Precious Metal Cementation Reactions,” 3 February; “The Influence of Carbon Structure on Gold Adsorption from Alkaline Cyanide Solutions,” 4 February; “Solvent Extraction for Gold Recovery from Alkaline Cyanide Solutions,” 5 February; “In–Situ FT–IR/IRS Analysis of Surfactant Adsorption Reactions Using Reactive Internal Reflection Elements,” 6 February; “The Significance of Surface Charge in Soluble–Salt Flotation Systems,” 10 February; “Air–Sparged Hydrocyclone Flotation,” 11 February 1992.
- SME Annual Meeting, six papers presented by researchers from our group, Phoenix, Arizona, 24–28 February 1992.
- Invited Speaker**, “The Search for Adsorbed Gold Cyanide on Carbon Surfaces,” J. D. Miller, University of California at Berkeley, 5 March 1992.
- The Extractive Metallurgy Lecture**, TMS Annual Meeting, San Diego, March 1992.
- Invited Speaker**, “The Status of Air–Sparged Hydrocyclone Flotation Technology,” J. D. Miller, University of Utah Graduate Seminar, 22 January 1992.

## SEMINARS & PRESENTATIONS, cont.

- “Dispersion and Aggregation of Newspaper Pulp for Fiber Recovery by Deinking with Air–Sparged Hydrocyclone Flotation,” Q. Yu, Y. Ye, and J. D. Miller, Engineering Foundation Conference; Dispersion and Aggregation: Fundamentals and Applications, Palm Coast, Florida, 16–20 March 1992.
- “The Potential of Air–Sparged Hydrocyclone Flotation in Environmental Technology,” Energy and Environment: Transitions in Eastern Europe, Prague, Czechoslovakia, 20–23 April, 1992.
- “Testing of Large Diameter Air–Sparged Hydrocyclones for Fine Coal Flotation at the Homer City Coal Preparation Plant,” J. D. Miller, Y. Ye, and S. Gopalakrishnan, COAL PREP 92, Cincinnati, Ohio, 5–7 May 1992.
- Five presentations by J. D. Miller and research assistants at the SME Annual Meeting, Reno, 14–19 February 1993.
- Three presentations by J. D. Miller and research assistants at the TMS Annual Meeting, Denver, 21–26 February 1993.
- “Solvent Extraction for Gold Recovery from Alkaline Cyanide Solutions,” Engineering Foundation Conference, Emerging Separation Technologies for Metals and Fuels, Palm Coast, Florida, 13–18 March 1993.
- “Deinking by ASH Flotation for Wastepaper Recycle,” American Chemical Society, Denver, 28–31 March 1993.
- “Fine Coal Flotation in 15–inch Diameter Air–Sparged Hydrocyclones,” Coal Prep 93, Lexington, Kentucky, 4–8 May 1993.
- “Mathematical Model of Fine Coal Flotation by the Air–Sparged Hydrocyclone,” International Mineral Processing Congress, Sydney, Australia, 23–28 May 1993.
- “X–ray CT Analysis of ASH Flotation,” DOE Contractor's Meeting, Pittsburgh, Pennsylvania, 23–26 June 1993.
- “**Keynote Lecture** on New Technology for Mineral Processing” and a series of seminars at Bandung Institute of Technology, Asia Pacific Minerals Conference 93, Bandung, Indonesia, 5–13 July 1993.
- “Noncyanide Alternatives to Gold Hydrometallurgy,” presented by R. Y. Wan, Wadsworth Symposium, Salt Lake City, Utah, 2–5 August 1993.
- “Fundamental Aspects of Soluble Salt Flotation,” Minerals Engineering 93, Cape Town, South Africa, 23–27 August 1993.
- “Flow Characteristics in ASH Flotation by X–ray CT,” TAPPI Engineering Conference, Orlando, Florida, 20–22 September 1993.
- Session Chairman on Coal Preparation, Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, 22–24 September 1993.
- Invited Speaker**, “New Separation Technologies,” ARMCO Mineral Processing Conference, Vina del Mar, Chile, 8–12 November 1993.
- “Preliminary Studies of Air–Sparged Hydrocyclone Technology for Phosphate Flotation,” Engineering Foundation Conference — Beneficiation of Phosphate, Theory and Practice, Palm Coast, Florida, 6–10 December 1993.
- General Conference Chairman, with J. J. Kellar, Engineering Foundation Conference — Surface Characterization of Adsorption and Interfacial Reactions, Kona, Hawaii, 9–14 January 1994.
- Five presentations by J. D. Miller and research assistants at the SME Annual Meeting, Albuquerque, New Mexico, 14–17 February 1994.
- “Bubble Size Distribution in Air–Sparged Hydrocyclone,” J. Hupka, R. P. Bokotko, D. Lelinski, and J. D. Miller (presenter), 12th International Coal Prep. Congress, Krakow, Poland, 23–27 May 1994.
- “Fundamental Aspects of Soluble Salt Flotation,” J. D. Miller, Lecture for Faculty of Chemistry, Technical University of Gdańsk, Gdańsk, Poland, 1 June 1994.



## SEMINARS & PRESENTATIONS, cont.

- “Air–Sparged Hydrocyclone Flotation for Environmental Technology,” J. Hupka (presenter) and J. D. Miller, *ACHEMA '94 (International Meeting on Chemical Engineering and Biotechnology)*, Frankfurt, Germany, 8–10 June 1994.
- “Surface Chemistry Control for Dispersed Oil Flotation,” D. Lelinski, J. Hupka, and J. D. Miller (presenter), *American Institute of Chemical Engineers 1994 Summer National Meeting*, Denver, Colorado, 14–17 August 1994.
- “Processing Technology for the Recovery of Fossil Resin from Western Coals,” J. D. Miller, Q. Yu, L. L. Li, and C. Garcia, *American Chemical Society 208th National Meeting*, Washington DC, 21–25 August 1994.
- “Solvent Refining of Coal Resin Concentrates,” J. D. Miller (presenter), Q. Yu, and L. L. Li, *Coal–Energy & the Environment, Pittsburgh Coal Conference (11th Annual International)*, Pittsburgh, Pennsylvania, 12–16 September 1994.
- “Preferential Breakage of Multiphase Particles and Its Influence on Liberation Phenomena,” R. C. Bradt (presenter), C. L. Lin, J. D. Miller, and G. Chi, *Minerals Engineering '94*, Lake Tahoe, Nevada, 26–28 September 1994.
- “Separation of Insolubles from Potash Ores by Air–Sparged Hydrocyclone Flotation,” M. R. Yalamanchili (presenter) and J. D. Miller, *Minerals Engineering '94*, Lake Tahoe, Nevada, 26–28 September 1994.
- “Fourier Transform Infrared Internal Reflection Spectroscopy (FTIR/IRS) for the Study of Surfactant Adsorption Phenomena,” seminar, the University of Nevada, Reno, 14 November 1994.
- “The Surface Chemistry of Soluble Salt Flotation,” RDTN Seminar of South Dakota School of Mines and Technology, Rapid City, South Dakota, 18 November 1994, EPSCOR.
- “Environmental Applications of Air–Sparged Hydrocyclone Technology,” Special Seminar, South Dakota School of Mines and Technology, Departments of Civil Engineering and Metallurgical Engineering, 17 November 1994.
- Invited Speaker**, “Air–Sparged Hydrocyclone Flotation and Its Potential Utilization for Gold Recovery,” and “Fundamental Aspects of Gold Recovery from Alkaline Cyanide Solutions by Cementation, Carbon Adsorption and Solvent Extraction,” *International Seminar (“The International Week of Gold”)*, Quito, Ecuador, 14–16 December 1994.
- “Mercury Removal from Alkaline Gold Cyanide Solutions,” J. D. Miller (presenter), E. A. Alfaro, M. Misra, and J. Lorengo, *Engineering Foundation Conference, Technological Solutions for Pollution Prevention in the Mining and Mineral Processing Industries*, Palm Coast, Florida, 22–27 January 1995.
- “Selective Flotation for the Removal of Radionuclides from Contaminated Soil,” J. D. Miller (presenter), Q. Yu, and Y. Q. Lu; “Selective Solvent Extraction of Gold from Alkaline Cyanide Solutions with Quaternary Ammonium Extractants,” C. A. Garcia and J. D. Miller (presenter), *TMS Symposium*, Las Vegas, Nevada, 12–16 February 1995.
- SME Annual Meeting, High Efficiency Coal Preparation*, ten presentations by J. D. Miller and research assistants, Denver, Colorado, 6–9 March 1995.
- “On–Line Washability Analysis for the Control of Coarse Coal Cleaning Circuits,” C. L. Lin, J. D. Miller (presenter), G. H. Luttrell, and G. T. Adel, *Symposium Paper, SME Annual Meeting, High Efficiency Coal Preparation*, Denver, Colorado, 6–9 March 1995.
- “Advanced Process Technology for Mexican Wastepaper Recycling Plants and Pulp/Paper Plants,” J. D. Miller (presenter), J. Parga, S. Gopalakrishnan, and D. Lelinski, *Spring Technical Conference of the Southwest Center for Environmental Research and Policy (SCERP)*, San Diego, California, 28–30 March 1995.
- “Advances in the Surface Chemistry of Froth Flotation by FTIR/IRS,” Poster, *Second DOE/OBES Conference on Separations Research*, Santa Fe, New Mexico, 7–9 June 1995.
- Four presentations by J. D. Miller and Research Group at the *69th ACS Colloid & Surface Science Symposium*, University of Utah, Salt Lake City, Utah, 11–14 June 1995 (co-chair of session on

## SEMINARS & PRESENTATIONS, cont.

- “Wetting and Interfacial Phenomena”). (1) “Colloidal Phase Regimes for Dodecylamine Hydrochloride in High Ionic Strength Brines,” M. A. D. Azevedo (presenter), W. H. Jang, M. R. Yalamanchili, and J. D. Miller. (2) “Wetting Characteristics of Newly Developed Water-Repulsive Materials,” G. Yamauchi (presenter), J. D. Miller, H. Saito, K. Takai, T. Ueda, Y. Takazawa, H. Yamamoto, and S. Nishi. (3) “The Mechanisms of Bitumen Release from Oil Sands in Alkaline Aqueous Solutions,” J. Drelich, D. Lelinski (presenter), and J. D. Miller. (4) “Examination of Self-Assembled Carboxylate Layers at a Fluorite Crystal Surface by Contact Angle Measurements and Ex-Situ FTIR/Internal Reflection Spectroscopy,” J. Drelich (presenter), W. H. Jang, A. Atia, and J. D. Miller.
- “The Kinetics of Fossil Resin Extraction from a Flotation Concentrate,” L. Li, Q. Yu, and J. D. Miller (presenter), 11th Annual Coal Preparation, Utilization & Environmental Control Contractors Conference, Pittsburgh, Pennsylvania, 12–14 July, 1995.
- “VOC Removal from Wastewater Streams Using Air-Sparged Hydrocyclone Stripping,” Poster, presented by D. Lelinski, Engineering Foundation Conference, Separation Technology VI: Advances and Opportunities in Environmental Separations, Snowbird, Utah, 22–27 July, 1995.
- “Issues in Mineral Processing Education,” J. D. Miller, Mineral Processing Golden Anniversary Mini-Symposium, “Mineral Processing: After 50 Years — Where We Have Been, Where We Are Going,” The Pennsylvania State University, University Park, Pennsylvania, 28–29 July, 1995.
- Two presentations by J. D. Miller and Research Group, UBC-McGill Bi-annual Joint Symposia, Fundamentals in Mineral Processing (in association with 34th CIM Conference of Metallurgists), Processing of Hydrophobic Minerals and Fine Coal, Vancouver, B.C., Canada, 20–24 August 1995 (Co-chair of session “Flotation in Oil Sand Extraction Processes”). (1) “Characterization of Interfacial Water at Hydrophilic and Hydrophobic Surfaces by In-Situ FTIR/Internal Reflection Spectroscopy,” M. R. Yalamanchili (presenter), A. Atia, J. Drelich, and J. D. Miller. (2) “Microscopic Observations of Bitumen Spreading at the Gas Bubble Surface,” J. Drelich, D. Lelinski (presenter), and J. D. Miller.
- “Molecular Orientation and Wetting Characteristics of Fatty Acid Monolayers as Examined by FT-IR/IRS and Contact Angle Measurements,” W. H. Jang (presenter), J. D. Miller, and J. Drelich, International Symposium, “Micelles, Microemulsions and Monolayers: Quarter Century Progress and New Horizons,” University of Florida, Gainesville, Florida, 21–25 August 1995.
- “Effect of Roughness on the Wetting Properties of PTFE Thin Films as Determined by Atomic Force Microscopy,” G. Yamauchi, S. Veeramasuneni (presenter), J. Drelich, M. R. Yalamanchili, J. D. Miller, K. Takai, H. Saito, and H. Takazawa, 26th Annual Fine Particle Society Meeting, Chicago, Illinois, 22–25 August 1995.
- “The Potential of Air-Sparged Hydrocyclones for Solution of Environmental Problems,” D. Lelinski (presenter), J. D. Miller, and J. R. Parga, 4th International Conference of Advanced Materials (ICAM-IV), Cancun, Mexico, 27 August–1 September 1995.
- “Contact Angle Measurements for Heterogeneous Surfaces Composed of Self-Assembled Organic Mono- and Submonolayers,” J. Drelich (presenter) and J. D. Miller, Second International Symposium, “Effects of Surface Heterogeneity in Adsorption and Catalysis on Solids,” Poland-Slovakia, 4–10 September 1995.
- “Axial Flow Reversal and its Significance in Air-Sparged Hydrocyclone (ASH) Flotation,” J. D. Miller (presenter), A. Das, and D. Yin, 12th Annual Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, 11–15 September 1995.
- “Thermogravimetric/Mass Spectrometric (TG/MS) Characterization of Toner Particles from Photocopied Wastepaper and the Impact of These Features on Flotation Deinking,” X. Nie (presenter) and J. D. Miller, 1995 TAPPI Pulping Conference, Chicago, Illinois, 1–5 October 1995.
- “The Ammoniacal Thiosulfate System for Precious Metal Recovery,” J. Li, J. D. Miller (presenter), R. Y. Wan, and M. LeVier, XIX International Mineral Processing Congress, San Francisco, California, 23–27 October 1995 (Co-chair of session “Precious Metals”).

## SEMINARS & PRESENTATIONS, cont.

- Three presentations by J. D. Miller and Research Group at the Engineering Foundation Conference, "Frontiers in Industrial Process Tomography," San Luis Obispo, California, 29 October–3 November 1995 (Co-chair of session "Separation and Reactor Technology"). (1) "Multiphase Flow Characteristics of Air–Sparged Hydrocyclone Flotation Using X–ray CT Analysis," J. D. Miller (presenter) and A. Das. (2) "X–ray CT for On–Line Washability Analysis in Coal Preparation Plants," C. L. Lin (presenter), J. D. Miller, G. H. Luttrell, and G. T. Adel. (3) "An X–ray CT Reconstruction Algorithm for Industrial Applications," A. B. Cortes, C. L. Lin (presenter), and J. D. Miller.
- "The Wetting Characteristics of PTFE Particulate Composites," G. Yamauchi (presenter), J. D. Miller, H. Saito, K. Takai, and H. Takazawa, "Advanced Materials and Technology for the 21st Century" (TMS), Honolulu, Hawaii, 13–15 December 1995.
- "The Use of Atomic Force Microscopy in Particle Science and Technology Research," M. R. Yalamanchili (presenter), S. Veeramasuneni, and J. D. Miller, Engineering Foundation Conference, "Particle Science and Technology in the 21st Century," Pune, India, 17–21 December 1995. (Rao attended; Dr. Miller was on the International Advisory Committee.)
- "Interaction Forces between Ink Particles, Cellulose Fibers and Mineral Fillers as Determined by AFM," M. A. D. Azevedo, M. R. Yalamanchili, J. Drelich, and J. D. Miller (presenter), 3rd Symposium Particle Adhesion Division of Adhesion Society, Myrtle Beach, South Carolina, 18–21 February 1996.
- Four presentations by J. D. Miller and associates at the 125th Annual SME Meeting, Phoenix, Arizona, 11–14 March 1996. (1) "Observations on the Adsorption of Gold from Chloride Solutions," X. Nie and J. D. Miller (presenter). (2) "Particle Interactions in High Ionic Strength Solutions," J. D. Miller, S. Veeramasuneni, M. A. D. Azevedo, and M. R. Yalamanchili (presenter). (3) "The Influence of Crystal Lattice Defects on the Flotation Behavior of Potassium and Rubidium Halides," S. Veeramasuneni (presenter), M. R. Yalamanchili, and J. D. Miller. (4) "Important Solution Chemistry Factors That Influence the Copper–Catalyzed Ammonium Thiosulfate Leaching of Gold," J. Li, J. D. Miller (presenter), and R. Y. Wan.
- "Removal of Hydrocarbons from Contaminated Water Using Air–Sparged Hydrocyclone Technology," J. D. Miller (presenter) and D. Lelinski, HSRC/WERC Joint Conference on the Environment, Albuquerque, New Mexico, 21–23 May 1996.
- "Influence of the Surface Charge on Particle Dispersion/Aggregation as Determined by Atomic Force Microscopy," S. Veeramasuneni (presenter) and J. D. Miller, 27th Annual Meeting of the Fine Particle Society, Symposium on Particles and Solid Surfaces: Detection, Adhesion, and Removal, Session II, Chicago, Illinois, 6–8 August 1996.
- Two presentations by J.D. Miller and associates at the Engineering Foundation Conference, Application of Surface Science to Advancing Flotation Technology, Naantali, Finland, 11–16 August 1996 (chair of session "Nonsulfide Surface Characterization"). (1) "Recent Contributions to the Analysis of Soluble Salt Flotation Systems," J. D. Miller (presenter), S. Veeramasuneni, and M. R. Yalamanchili. (2) "Flotation of Printing Ink from Process Water in an Air-Sparged Hydrocyclone," R. Bokotko, J. Hupka, and J.D. Miller (Poster).
- "Fine Coal Washability–Liberation Analysis by Cone–Beam X–Ray Microtomography," J. D. Miller and C. L. Lin, and "A Capillary Network Model for Filter Cake Based on Pore Structure Analysis," J. D. Miller and C. L. Lin, Posters, presented by J. D. Miller, 13th Annual International Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, 3–7 September 1996.
- "Water at Interfaces — Some Recent Experimental Results from Surface Spectroscopy," J. D. Miller, International Conference on Analysis and Utilization of Oil Wastes (AUZO '96), Gdansk, Poland, 8–12 September 1996 (Chair of session "Surface Chemistry and Chemistry of Dispersed Systems").
- Invited Speaker**, "Adsorption of Collector Colloids at the Surface of Colemanite as Characterized by Optical and Atomic Force Microscopy," S. Veeramasuneni, M. R. Yalamanchili, J. D. Miller, and M. S. Celik; and "Applications of Air–Sparged Hydrocyclone Technology," J. D. Miller and J. Hupka,

## SEMINARS & PRESENTATIONS, cont.

- presentations by J. D. Miller, VI International Mineral Processing Symposium, Kusadasi, Turkey, 24–26 September 1996.
- “Air–Sparged Hydrocyclone Technology for the Flotation of Fine Phosphate Rock — Pilot Plant Studies,” SME Regional Phosphate conference, Lakeland, Florida, 17–18 October 1996.
- “Wetting Characteristics of Different Types of Liquids on Particulate Composite Materials,” G. Yamauchi, J. D. Miller, K. Takai, H. Saito, and H. Takazawa, Poster presentation by G. Yamauchi, 14th European Chemistry at Interfaces Conference (XIV ECIC), Antwerp, Belgium, 21–25 October 1996.
- “Resin, the Jewel in King Coal's Crown,” J. D. Miller, Utah Department of Natural Resources Conference on the Future of Utah's Coal Industry, Salt Lake City, Utah, 5 December 1996.
- TMS Symposium (Extraction & Processing Division)/1997 TMS Annual Meeting, Global Exploitation of Heap Leachable Gold Deposits, Orlando, Florida, 9–13 February 1997 (Session Chair).
- Seven presentations by J. D. Miller and Research Group at the 1997 SME Annual Meeting, Denver, Colorado, 24–27 February 1997. (1) “Particle Size Segregation on a Belt Conveyor,” Y.–K. Yen, C. L. Lin, and J. D. Miller. (2) “Direct Three–Dimensional Liberation Analysis by Cone Beam X–Ray Microtomography,” C. L. Lin and J. D. Miller. (3) “Interaction Forces at High Ionic Strengths — The Interfacial Polar Interaction Theory,” S. Veeramasoneni, Y. Hu, M. R. Yalamanchili, and J. D. Miller. (4) “Flotation of Toner Particles and Mineral Filler Particles during De-inking of Laser Printed Wastepaper,” M. A. D. Azevedo, M. R. Yalamanchili, J. Drelich, and J. D. Miller. (5) “Adsorption of Oleate at the Surface of a TiO<sub>2</sub> Thin Film as Revealed by FT–IR Internal Reflection Spectroscopy,” J. Drelich, L. Chen, J. D. Miller, and S. Guruswamy. (6) “Thiourea Decomposition by Ferric Sulfate Oxidation in Gold–Leaching Systems,” J. Li and J. D. Miller. (7) “Wetting of Francolite and Quartz and Its Significance in the Flotation of Phosphate Rock,” Y. Lu, J. Drelich, and J. D. Miller.
- “Characterization of Mineral Particle Populations by X–Ray CT,” J. D. Miller (presenter) and C. L. Lin, Engineering Foundation Conference, Frontiers in Industrial Process Tomography–II, TU–Delft, The Netherlands, 9–12 April 1997 (Co-chair of Session “Characterization of Particulate Materials”).
- Two presentations by J. D. Miller and Research Group at the 1997 TAPPI Recycling Symposium, Chicago, Illinois, 14–16 April 1997: (1) “Magnetic Separation for Wastepaper Recycle Mills,” M. A. D. Azevedo and J. D. Miller and (2) “The Effect of Ink Types and Printing Processes on Flotation Deinking,” X. Nie and J. D. Miller.
- “A Short Course in Gold Ore Processing Technology,” J. D. Miller, D. Halbe, and M. Botz, Lima, Peru, 19 April–26 April, 1997.
- “Development of an On–Line Coal Washability Analyzer,” J. D. Miller and G. H. Luttrell (presenter), DOE/UCR, Pittsburgh, PA, 3–4 June 1997.
- Tar Sand Emulsion Conference, Shell, Edmonton, Alberta, Canada, 18–19 June 1997.
- “Structures and Surfaces of Multiphase Systems,” J. D. Miller, NSF International Workshop on Multiphase Systems in Mineral and Chemical Processing, Johannesburg and Capetown, S.A., 27 June–3 July 1997 (organized by P. King and J. D. Miller with assistance from the S.A. Institute of Mining & Metallurgy/U.S. participants supported by NSF).
- Two presentations by J. D. Miller and Research Group at IAP97 — Interfaces Against Pollution, Wageningen, The Netherlands, 10–13 August 1997: (1) “Surface–Chemistry Designed Selective Flotation Separation of PVC from PVC/PET Polymer Mixtures for the Plastics Recycling Industry,” J. Drelich, J. D. Miller, T. Payne, J. H. Kim, and R. Kobler. (2) “The Importance of Bitumen Spreading at Gas Bubble Surface in Bitumen Recovery from Oil Sands,” D. Lelinski, J. Drelich, and J. D. Miller.
- “Influence of Surfactants on the Interaction between Fossil Resin and Coal Surfaces in Water,” presented by J. Nalaskowski, Digital Instruments' 1997 International NanoScope® Users' Conference, University of California, Santa Barbara, 24–27 August 1997.
- “Coal Cleaning Opportunities for SO<sub>2</sub> Emission in the Border,” J. D. Miller and J. Drelich (presenter); J. R. Parga (collaborator), El Paso, TX, 10–12 September 1997.

## SEMINARS & PRESENTATIONS, cont.

34th Symposium on Physicochemical Problems of Mineral Processing, Polanica-Zdroj, Poland, 15–17 September 1997 (with Dr. Hupka).

Two papers and one poster presented by J. D. Miller and Research Group at the XX International Mineral Processing Congress, Aachen, Germany, 21–26 September 1997. (1) “Bubble Attachment Time Measurements at a Chalcopyrite Surface Using a High-Speed Video System,” J. Drelich, J. D. Miller (presenter), J.-S. Li, and R.-Y. Wan. (2) “Amine Flotation of Soluble Sulfate Salts,” M. Hancer, Y. Hu, M. C. Fuerstenau, and J. D. Miller (poster presentation). (3) “Computed Tomographic Techniques for the Analysis of Multiphase Mineral Processing Systems,” J. D. Miller (presenter) and C. L. Lin.

**Plenary Lecture**, “Aqueous Interfacial Phenomena as Revealed by FTIR/IRS,” J. D. Miller, 40th Annual Meeting of the Polish Chemical Society, Gdansk, Poland, 22–26 September 1997 (with Dr. Hupka).

“The Surface Chemistry of Pulping and Flotation for Mixed Office Wastepaper,” M. A. D. Azevedo (presenter), J. Drelich, and J. D. Miller, 4th Research Forum on Recycling, Chateau Frontenac, Quebec, QC Canada, 7–9 October 1997.

“Recovery of Coke Fines from Fly Ash by Cyclone Flotation,” 1997 International ASH Utilization Symposium, Lexington, KY, 20–22 October 1997.

“Applications of Fine Particles in the Paper Industry,” J. D. Miller, NSF US–Egypt Workshop for Preparation and Applications of Ultra-Fine Particulates, Cairo, Egypt, 15–17 November 1997.

“Surface Chemistry of Flotation Phenomena as Revealed by FTIR/IRS,” J. D. Miller, Engineering Foundation Conference – Development of Nonrenewable Resources: Challenges and Solutions, Cairo, Egypt, 16–21 November 1997.

Two presentations by J. D. Miller and Research Group at the Engineering Foundation Conference, Surface Characterization of Adsorption and Interfacial Reactions–II, Kona, Hawaii, 11–16 January 1998. J. D. Miller and J. J. Kellar, Co-Chairs. (1) “Effect of Temperature on Interaction Forces Between Silica Surfaces at the Point of Zero Charge,” S. Veeramasuneni, J. Nalaskowski, J. D. Miller, M. R. Yalamanchili, and A. Grabbe. (2) “Spectroscopic Analysis of Water at Hydrophobic Surfaces,” J. D. Miller, Y. Hu and S. Veeramasuneni.

“Further Considerations of Magnetic Deinking for Wastepaper Recycling Mills,” M. A. D. Azevedo (presenter) and J. D. Miller, 1998 TAPPI Recycling Symposium, New Orleans, Louisiana, 8–12 March 1998.

Three presentations by J. D. Miller and Research Group at the 1998 SME Annual Meeting, Orlando, Florida, 9–11 March 1998. (1) “Carboxyl Stretching Vibrations of Spontaneously Adsorbed and LB Transferred Calcium Carboxylates as Determined by FTIR Internal Reflection Spectroscopy,” Y. Lu (presenter) and J. D. Miller. (2) “In-Situ FTIR Spectroscopy Characterization of Water Structure Near a Hydrophilic Silica Surface,” Y. Hu, S. Veeramasuneni (presenter), Y. Lu, and J. D. Miller. (3) “Stripping of Volatile Organic Compounds from Contaminated Water with the Air-Sparged Hydrocyclone,” D. Lelinski (presenter) and J. D. Miller.

“Role of Surface Forces on Particle Adhesion and Removal from Solid Surfaces,” J. D. Miller and S. Veeramasuneni (presenter), Symposium on Particles on Solid Surfaces: Detection, Adhesion and Removal, 28th Annual Meeting of the Fine Particle Society, Dallas, Texas, 1–3 April, 1998.

“Spectroscopic Analysis of Water at Hydrophobic Surfaces — A Flotation Chemistry Perspective,” J. D. Miller, Y. Hu, and S. Veeramasuneni, 215th American Chemical Society National Meeting, Physical Chemistry Division, Symposium on Interfacial Water, Dallas, Texas, 29 March–2 April 1998 [Invited Speaker in area of Liquid/Solid Interfaces].

Water Science Seminar, Monsanto Co., St. Louis, Missouri, 30 April–1 May 1998.

“Removal of VOCs from Groundwater Using Air-Sparged Hydrocyclone Stripping Technology,” L. L. LaPlante (presenter), J. D. Miller, and D. Lelinski, First International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, 18–21 May 1998.

SEMINARS & PRESENTATIONS, cont.

- “Removal of VOCs from Groundwater Using Air–Sparged Hydrocyclone Stripping Technology,” L. L. LaPlante, J. D. Miller, and D. Lelinski (presented by Marcin Niewiadomski), 1998 Conference on Hazardous Waste Research, Snowbird, Utah, 18–21 May 1998.
- “ZPM Research Programs at the University of Utah,” meeting with ZPM, Santa Barbara, California, 26–27 May 1998.
- Coal Research Contractors Review Meeting, Pittsburgh, Pennsylvania, 2 June 1998 (represented by Gerald Luttrell).
- “Physicochemical Aspects of Fossil Resin Separation from Fine Coal,” J. Nalaskowski, J. Hupka, and J. D. Miller, poster presentation, Technological and Ecological Aspects in Complex Processing of Mineral Raw Materials; Theoretical and Practical Problems, Irkutsk, Russia, 15–18 June 1998.
- Two presentations by Research Group of J. D. Miller at the XIII Sympozjum Metod Rozdzielania Mieszanin, “Ars Separatoria,” Gniez, Poland, 15–18 June 1998: (1) “Direct Interfacial Force Measurements in Particle Separation Systems Using Atomic Force Microscopy,” J. Nalaskowski, S. Veeramasuneni, J. Hupka, and J. D. Miller. (2) “Photochemical Degradation of Pesticides Using Easily Separable Titanium Catalyst,” A. Zaleska, M. Wiergowski, J. Rzechula, Jan Hupka, M. Biziuk, and J. D. Miller, poster presentation.
- Two posters presented by J. D. Miller and Research Group at the Engineering Research Center, August Site Visit/Industrial Advisory Board Meeting, University of Florida, Gainesville, Florida, 1–4 August 1998: (1) “Cone Beam X–Ray Microtomography for Three–Dimensional Analysis of Multiphase Particulate Systems,” C. L. Lin and J. D. Miller. (2) “The Significance of FTIR Internal Reflection Spectroscopy in the Analysis of Particulate Systems,” J. D. Miller and M. Hancer.
- Two posters by Research Group of J. D. Miller at the International Symposium, Effects on Surface Heterogeneity in Adsorption and Catalysis on Solids, Torun, Poland, 9–16 August 1998. (1) “Adsorption Isotherms of Methoxychlor on TiO<sub>2</sub> as Photocatalyst,” A. Zaleska, J. Drelich, J. D. Miller and J. Hupka. (2) “Surface Characteristics of Microsphere–Supported TiO<sub>2</sub> Photocatalyst,” J. Rzechula, A. Zaleska, J. Hupka, J. Drelich, and J. D. Miller.
- Two presentations by Research Group of J. D. Miller at the International Symposium on Apparent and Microscopic Contact Angles, 216th American Chemical Society Meeting, Boston, Massachusetts, 23–27 August 1998. (1) “Surface Energy Determinations for High Energy Surfaces from Interfacial Polar Interaction Theory,” Y. Hu, S. Veeramasuneni and J. D. Miller. (2) “Hydrophobic Forces — Spectroscopic Analysis of Interfacial Water,” J. Nalaskowski, S. Veeramasuneni, and J. D. Miller.
- 15th Annual Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, 14–18 September 1998.
- Four presentations by J. D. Miller and Research Group at the VII International Mineral Processing Symposium, Istanbul, Turkey, 15–17 September 1998. (1) “Interaction Forces in the Flotation of Colemanite as Measured by Atomic Force Microscopy,” S. Veeramasuneni, J. Nalaskowski, and J. D. Miller. (2) “Surface Chemistry of Activation in the Flotation of Lime Depressed Pyrite,” Y. Hu, X. L. Zhang, G. Z. Qiu, and J. D. Miller. (3) “Further Considerations of the Spectral Characteristics of Interfacial Water at Hydrophobic Surfaces,” M. Hancer, M. S. Celik, and J. D. Miller. (4) “Flotation Mechanisms of Hydrated Soluble Salts,” M. Hancer, Y. Hu, and J. D. Miller.
- “Coal Cleaning Opportunities for SO<sub>2</sub> Emission in the Border,” J. D. Miller (presenter), C. L. Lin, and Jose R. Parga, 1998, SCERP Technical Conference, Border Solutions, A Partnership for the 21st Century, El Paso, Texas, 28–30 October, 1998.
- Two presentations by J. D. Miller and Research Group at the Engineering Foundation Conference, Beneficiation of Phosphate: Second International Conference, Palm Coast, Florida, 6–11 December, 1998. (1) “Improved Phosphate Flotation with Nonionic Polymers,” Y. Lu, N. Liu, X. Wang, and J. D. Miller (presenter). (2) “Plant–Site Evaluation of Air–Sparged Hydrocyclone Technology for Phosphate Flotation Separations,” X. Wang, J. D. Miller (presenter), Y. Lu, N. Liu, and D. Yin.

## SEMINARS & PRESENTATIONS, cont.

**Invited lecturer** to Engineering Research Center for Particle Science and Technology – Center's Visiting Eminent Scholars Program, University of Florida, Gainesville, Florida, 27 Jan–24 Feb 1999. Seminars: “Surfactant Adsorption Reactions by FTIR/IRS” (2/5/99), “The Flotation Chemistry of Soluble Salt Minerals” (2/10/99), “The Nature of Surface Forces as Determined by Atomic Force Microscopy” (2/17/99).

“In-Situ FT-IR/IRS and MLRS Examination of Adsorbed Oleate at Fluorite and Calcite Surfaces,” C. A. Young (presenter) and J. D. Miller, 1999 EPD Congress, 128<sup>th</sup> TMS Annual Meeting & Exhibition, San Diego, California, 28 February–4 March 1999.

“Internal Reflection Spectroscopy for FTIR Analysis of Carboxylate Adsorption by Semi-Soluble Salt Minerals,” J. D. Miller and J. J. Kellar (presenter), Advances in Flotation Technology, Symposium in Honor of M. C. Fuerstenau, 1999 SME Annual Meeting, Denver, Colorado, 1–3 March 1999.

Five presentations by J. D. Miller and Research Group at the 1999 SME Annual Meeting, Denver, Colorado, 1–3 March 1999. (1) “Filter Cake Structure as Revealed by 3D Simulation Using the Monte Carlo Method,” G. E. S. Valadao (presenter), C. L. Lin, and J. D. Miller. (2) “Noncyanide Leaching of an Auriferous Pyrite Ore from Ecuador,” G. Munoz (presenter) and J. D. Miller. (3) “Plant-Site Evaluations of the OPSA System for On-Line Particle Size Measurement from Moving Belt Conveyors,” C. L. Lin (presenter) and J. D. Miller. (4) “Reaction Kinetics for Gold Dissolution in Acid Thiourea Solution Using Formamidine Disulfide as an Oxidant,” J. Li and J. D. Miller (presenter). (5) “The Significance of Interfacial Water Structure in the Dodecylamine Flotation of Potassium Soluble Salt Minerals,” M. Hancer and J. D. Miller.

“Interaction Forces between Toner Surfaces,” M. A. D. Azevedo (presenter) and J. D. Miller, 1999 TAPPI Recycling Symposium, Atlanta, Georgia, 2–5 March 1999.

“Network Analysis of Filter Cake Pore Structure by High Resolution X-Ray Microtomography,” C. L. Lin (presenter) and J. D. Miller, First World Congress on Industrial Process Tomography, Buxton, Derbyshire, UK, 14–17 April 1999 [Invited member of academic advisory group].

“High Resolution X-Ray Microtomography Technique for Network and Pore Structure Analysis of Filter Cake,” C. L. Lin (presenter) and J. D. Miller, Engineering Foundation Conference, Solid Liquid Separation Systems, Kona, Hawaii, 18–23 April 1999.

“The Surface and Colloid Chemistry of Particle Flotation,” J. D. Miller, Short Course, Technical University of Gdansk, Gdansk, Poland, 26 April–9 May 1999.

“Computed Tomographic Techniques for the Spatial Characterization of Multiphase Systems,” J. D. Miller, Seminar, Technical University of Gdansk, Gdansk, Poland, 28 April 1999.

“Role of Interaction Forces in Contamination of Silicon Surfaces in SC2 Environments,” SCP Global Technologies 6th International Symposium, “Meeting the Surface Preparation Challenges of the New Millennium,” J. Nalaskowski (presenter), A. Datta, and J. D. Miller, Boise, Idaho, 10–12 May 1999.

“Hydrophobic Surface Forces and the Nature of Interfacial Water Structure,” J. D. Miller (Poster Presentation), Third DOE/BES Separations Research Workshop, Savannah, Georgia, 12–14 May 1999.

“Improved Phosphate Flotation with Nonionic Polymers,” Y. Lu, N. Liu, X. Wang, and J. D. Miller (presenter), Mineral Processing 99, Cape Town, South Africa, 5–6 August 1999.

**Invited Speaker**, “Flotation Technology,” J. D. Miller, Short Course, University of Pretoria, Pretoria, South Africa, 2 August 1999.

Three presentations by J. D. Miller and Research Group at the Engineering Foundation Conference, Environmental Technology for Oil Pollution: Remediation and Pollution Prevention, Jurata, Poland, 29 August–3 September 1999 (J. Hupka, and J. D. Miller, Co-chairs). (1) “Interaction Forces between Polyethylene Surfaces in Water in the Presence of Cationic and Anionic Surfactants,” J. Nalaskowski (presenter), J. Hupka, and J. D. Miller. (2) “Free and Emulsified Oil Removal by Bubble Accelerated Flotation (BAF),” R. V. M. Jovine, D. E. Morse, and J. D. Miller (presenter). (3) “Kinetics of Oil

## SEMINARS & PRESENTATIONS, cont.

Transfer from a Mineral Surface to an Air Bubble — Fundamental Aspects of Flotation for the Remediation of Oily Soils,” D. Lelinski, J. Drelich (presenter), and J. D. Miller.

“Influence of Dissolved Gas on the Interaction Forces between Hydrophobic Surfaces in Water — Atomic Force Microscopy Studies,” J. Nalaskowski (presenter), J. Hupka, and J. D. Miller, XXXVI Symposium on Physicochemical Problems in Mineral Processing, Polanica-Zdroj, Poland, 6–9 September 1999.

**Invited keynote speaker**, “The Flotation Chemistry of Soluble Salt Minerals,” J. D. Miller, Mineral Processing Symposium, 49th Canadian Chemical Engineering Conference, Saskatoon, Saskatchewan, Canada, 3–6 October 1999.

“Interaction Forces between Silica Surfaces in Water as Influenced by the Presence of Poly(Ethylene Oxide),” V. Paruchuri, J. Nalaskowski, A. Datta, and J. D. Miller (Poster Presentation), ERC Meeting (Science Advisory Board), Gainesville, Florida, 13–14 October 1999.

**Plenary Lecture**, “Hydrophobic Surface Forces,” J. D. Miller, 1999 International Workshop on the Electrochemistry of Sulfide Mineral Flotation Honoring Professor Wang Dianzuo for his 50th Anniversary Working in Mineral Processing, Changsha, Hunan, China, 5–7 November 1999.

“The Action of High Fields in Nonchemical Water Treatment Technologies,” J. D. Miller and M. Colic (presenter), International Workshop on Chemical, Physical and Biological Processes under High Magnetic Fields (IWCPB–HMF '99), Omiya, Saitama, Japan, 24–26 November 1999.

“The Hydrophobic Surface State,” J. D. Miller, Seminar, University of California, Berkeley, Berkeley, California, 10 February 2000.

Nine presentations by J. D. Miller and Research Group at the 2000 SME Annual Meeting, Salt Lake City, Utah, 28 February–1 March 2000. (1) “Design of a Bubble–Separation Tank for Water Treatment Using Computational Fluid Dynamics,” P. R. Desam (presenter), A. Datta, and J. D. Miller. (2) “Interaction of Amine with Borate Species in Flotation Pulps,” Y. Akin, M. Hancer (presenter), M. S. Celik, and J. D. Miller. (3) “The Low–Potential Hydrophobic State of Pyrite in Amyl Xanthate Flotation with Nitrogen,” J. D. Miller, R. Du Plessis (presenter), D. Kotlyar, X. Zhu, and G. Simmons. (4) “Development of an On–Line Coal Washability Analysis System Using X–Ray Computed Tomography,” C. L. Lin (presenter), J. D. Miller, G. H. Luttrell, and G. T. Adel. (5) “An Evaluation of Plantwide Control Strategies for Coal Preparation Plants,” G. H. Luttrell, D. M. Catarious (presenter), J. D. Miller, and F. L. Stanley. (6) “Recent Development of Advanced Flotation Strategies for Florida Phosphate Resources,” J. D. Miller (presenter), X. Wang, and M. Li. (7) “Modified Activated Carbon for Gold Recovery from Cyanide Leaching Solutions,” G. A. Munoz (presenter), S. Duyvesteyn, and J. D. Miller. (8) “Influence of Phosphates on Gypsum Crystallization: A Fundamental Study,” M. Niewiadomski (presenter), A. Datta, J. D. Miller, S. Veeramasesaneni, Q. Yu, and S. Sucech. (9) “Interaction Forces between Coal and Polystyrene Surfaces in the Presence of Surfactants,” J. Nalaskowski, A. Datta (presenter), and J. D. Miller.

“Interaction Forces between Toner Surfaces,” M. A. D. Azevedo (presenter) and J. D. Miller, 2000 TAPPI Recycling Symposium, Washington, DC, 6–8 March 2000.

“Projection Theorem and the Reconstruction Algorithm in Fan Beam Computed Tomography,” A. Khan (presenter), C. L. Lin, E. Cherkaev, and J. D. Miller, Conference on the Tenth Inverse Problems in Engineering Seminars, Arlington, Texas, 5–6 June 2000.

“Separation of Nylon 66 (PA 66) from Automotive Shredder Residue (ASR) Plastics by Flotation,” E. Mutkowska (presenter), M. A. D. Azevedo, J. D. Miller, and R. Kobler, 5th World Congress and Envirotech Trade Show, Recovery, Recycling, Re-integration, Toronto, Ontario, Canada, 5–9 June 2000.

“Flotation of Automotive Shredder Residue Plastics,” E. Mutkowska and M. A. D. Azevedo (poster session), 93rd Annual Conference & Exhibition of the Air & Waste Management Association (A & WMA), Salt Lake City, Utah, 18–20 June 2000.



SEMINARS & PRESENTATIONS, cont.

**Invited Speaker**, two presentations by J. D. Miller at the 13th International Symposium on Surfactants in Solution (SIS-2000) and Surfactants and Polymers at Interfaces, A Special Symposium in Honor of Professor P. Somasundaran, Gainesville, Florida, 11–16 June 2000. (1) “Carboxyl Stretching Vibrations of Spontaneously Adsorbed and LB Transferred Calcium Carboxylates as Determined by FTIR Internal Reflection Spectroscopy,” Y. Lu and J. D. Miller. (2) “Adsorbed Surfactant Structures and Their Effect on Surface Hydrophobicity — Soft-Contact Atomic Force Microscopy Study,” V. Paruchuri (presenter), J. Nalaskowski, and J. D. Miller.

Two presentations by J. D. Miller Research Group at the 2nd International Symposium on Contact Angle, Wettability and Adhesion, Newark, New Jersey, 21–23 June 2000. (1) “Contact Angle Relaxation for Ethoxylated Alcohol Solutions on Hydrophobic Surfaces,” J. Drelich (presenter), R. Zahn, J. D. Miller, and J. K. Borchardt. (2) “Surface Properties of Fatty Amines as Revealed by Contact Angle, FTIR, and AFM Measurements,” S. Wisniewska (presenter), J. Nalaskowski, and J. D. Miller.

“Simulation and Pore Structure Analysis of Cast Gypsum,” C. L. Lin (presenter) and J. D. Miller, 7th Annual International Conference on Composites Engineering (ICCE/7), Denver, Colorado, 2–8 July, 2000.

Two presentations by J. D. Miller, **Session Chair**, and associates at the XXI International Mineral Processing Congress, Rome, Italy, 23–28 July 2000. (1) “A Computational Fluid Dynamics (CFD) Model for a Bubble Separation Tank,” P. R. Desam, A. Datta, and J. D. Miller (poster session). (2) “Removal of Oil Contaminants from Soil by Flotation,” M. Niewiadomski, J. Nalaskowski, J. Hupka, and J. D. Miller (presenter).

“On-Line CT-Based Coal Washability Measurement: Simulated Field Testing,” C. L. Lin (presenter) and J. D. Miller, 17th Annual International Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, 11–14 September 2000.

“Electrokinetic Behavior of Borax in Saturated Solutions and its Role in Flotation,” M. Muduroglu, M. Hancer, M. S. Celik, and J. D. Miller, VIII International Mineral Processing Symposium, Antalya, Turkey, 16–18 October 2000.

**Invited Speaker**, “A New Collector Chemistry for Phosphate Flotation, J. D. Miller, X. Wang, and M. Li, 15<sup>th</sup> Annual Regional Phosphate Conference, Lakeland, Florida, 19–20 October 2000.

“Interaction Forces Involved in Deinking Processes with Fatty Alcohol Ethoxylates – Fundamental Considerations,” M. A. D. Azevedo, J. Nalaskowski, J. Drelich, J. K. Borchardt, and J. D. Miller, 2000 TAPPI Pulping Conference, Boston, Massachusetts, 5–9 November 2000.

J. D. Miller, Eight **Invited Lectures** at CETEM (Centro de Tecnologia Mineral), Rio de Janeiro, Brazil, 11–18 November 2000. (1) “Advances in Flotation Fundamentals: The Hydrophobic Surface State.” (2) “Advances in Flotation Fundamentals: In-Situ FTIR/IRS Analysis of Collector Adsorption.” (3) “Flotation Technology for Mineral Fertilizers–Potash and Phosphate: Flotation of Potash and Other Soluble Salt Minerals.” (4) Flotation Technology for Mineral Fertilizers–Potash and Phosphate: New Collector Chemistry for Phosphate Flotation.” (5) “New Developments in the Electrochemistry of Pyrite Flotation: The Low Potential Hydrophobic State of Pyrite in Amyl Xanthate Flotation with Nitrogen.” (6) “New Developments in the Electrochemistry of Pyrite Flotation: Trithiocarbonate Collectors for Pyrite Flotation.” (7) “Gypsum Characterization in the Production of Wall Board: Simulation and Pore Structure Analysis of Cast Gypsum.” (8) “Gypsum Characterization in the Production of Wall Board: Fundamental Studies of Condensed Phosphate Modifiers in Gypsum Crystallization.”

“The Catalysis of Gold Leaching in Cyanide by Lead,” R. F. Sandenbergh (presenter) and J. D. Miller, Minerals Engineering 2000, Cape Town, South Africa, 13–15 November 2000.

“Cyanide Recovery/Destruction Using Air Sparged Hydrocyclone Technology,” J. R. Parga (presenter), and J. D. Miller, TMS Cyanide Symposium, New Orleans, Louisiana, 11–15 February 2001.

Nine presentations by J. D. Miller and Research Group at the 2001 SME Annual Meeting, Denver, Colorado, 26–28 February 2001. (1) “A New Collector Chemistry for Phosphate Flotation,” X. Wang,

## SEMINARS & PRESENTATIONS, cont.

M. Li, and J. D. Miller (presenter). (2) “Advances in Magnetic Activated Carbon for Gold Recovery—Physical and Chemical Characteristics,” G. A. Munoz (presenter), S. Duyvesteyn, and J. D. Miller. (3) “Cone Beam X-ray Microtomography – A New Facility for 3D Analysis of Multiphase Materials,” C. L. Lin (presenter) and J. D. Miller. (4) “Engineering Analysis of Magnetic Activated Carbon for Gold Recovery in CIP and CIL Circuits,” G. A. Munoz (presenter), S. Duyvesteyn, and J. D. Miller. (5) “Evaluation of CT-Based Coal Washability Analysis System under Simulated On-Line Conditions,” C. L. Lin (presenter), J. D. Miller, and G. H. Luttrell. (6) The Flotation Chemistry of Potassium Double Salts: Schoenite, Kainite, and Carnallite,” M. Hancer (presenter), and J. D. Miller. (7) “Deformation and Adhesion of Fine Particles at Contact – Atomic Force Microscopy Study,” R. Aranowski, J. Nalaskowski (presenter), A. Datta, J. Hupka, and J. D. Miller. (8) “Selective Flotation of Plastics from Automotive Shredder Residue,” E. Mutkowska (presenter), M. A. D. Azevedo, J. D. Miller, and R. Kobler. (9) “The Structure and Characteristics of Adsorbed Surfactants as Revealed by AFM Imagery,” V. K. Paruchuri (presenter), J. Nalaskowski, and J. D. Miller.

**Invited Speaker**, “Some Fundamental Issues in the Ferric Sulfate Leaching of Chalcopyrite,” J. D. Miller, International Technical Meeting on the Development of Copper Bioleaching Technology, Antofagasta, Region II, Chile, 12–14 March 2001.

“Analysis of Surface Surfactant Structures by Soft Contact Atomic Force Microscopy,” J. D. Miller, First Ever Separations and Analysis Contractors’ Meeting, San Diego, California, 4–7 April 2001.

“Development of an On-Line Washability Analyzer,” C. L. Lin, G. Luttrell (presenter), and J. D. Miller, 18<sup>th</sup> International Coal Preparation Exhibition and Conference, Lexington, Kentucky, 1–3 May 2001.

“Tratamiento Avanzado de Agua Residual de la Industria Pesquera de Ensenada, B.C.,” B. P. Flores Baez (presenter) and J. D. Miller, VI Congreso Nacional de Ciencias Ambientales, Pachuca de Soto, Hidalgo, 16–18 May 2001.

Five presentations by J. D. Miller, **Session Chair**, and Research Group at the Engineering Foundation Conference, “Froth Flotation/Dissolved Air Flotation: Bridging the Gap,” Tahoe City, California, 20–25 May 2001. (1) “Froth Modification for Reduced Fuel Oil Consumption in Phosphate Flotation,” R. Snow, P. Zhang (presenter), and J. D. Miller. (2) “From Air Sparged Hydrocyclone to Bubble Accelerated Flotation: Mineral Industry Technology Sets Stage for Development of New Wastewater Treatment Flotation,” M. Colic (presenter), D. Morse, W. Morse, T. Matherly, S. Carty, and J. D. Miller. (3) “A Bubble Accelerated Flotation System for Wastewater Treatment in the Fish Industries,” M. M. Niewiadomski, A. Datta, J. Hupka (presenter), D. Morse, and J. D. Miller. (4) “A Computational Fluid Dynamics (CFD) Model for a Bubble Separation Tank Used in Waste Water Treatment,” P. R. Desam, A. Datta, W. Morse, and J. D. Miller (presenter). (5) “Recent Progress in the Analysis of Soluble Salt Flotation Systems,” J. D. Miller (presenter).

“Surfactant Surface Structures and Interaction Forces in Chemical Mechanical Polishing Processes,” V. K. Paruchuri, J. Nalaskowski, and J. D. Miller, poster presentation, SCP Global Technologies 8<sup>th</sup> International Symposium and Technical Exhibition, Boise, Idaho, 21–23 May 2001.

**Invited Speaker**, “Design and Synthesis of Magnetic Activated Carbons for Adsorption of Gold from Alkaline Cyanide Leaching Solutions,” J. D. Miller, S. Duyvesteyn, and G. A. Munoz (presenter), Fundamentals and Applications of Anion Separations Symposium, 222<sup>nd</sup> American Chemical Society National Meeting, Chicago, Illinois, 26–30 August 2001.

Eight presentations by J. D. Miller and Research Group at the Utah 2001 Industry Showcase, Salt Lake City, Utah, 27–29 August 2001. (1) “Treatment of Cyanide Solutions Using Air-Sparged Hydrocyclone Technology,” J. D. Miller (presenter) and T. Chatwin, **Invited lecture**. (2) “Cyanide Recovery Using Air-Sparged Hydrocyclone Technology,” J. D. Miller (poster). (3) “X-ray Micro-Tomography,” J. D. Miller (poster). (4) “Magnetic Activated Carbon Technology,” S. Duyvesteyn and J. D. Miller (poster). (5) “Treatment of Cyanide Solutions Using Air-Sparged Hydrocyclone Technology,” J. D. Miller and T. Chatwin (slide show). (6) “Magnetic Activated Carbon (MAC) Technology,” G. A. Munoz, S.

## SEMINARS & PRESENTATIONS, cont.

- Duyvesteyn, and J. D. Miller (slide show). (7) “New Collector Chemistry for Sedimentary Phosphate Rock,” J. D. Miller, X. Wang and M. Li (slide show). (8) “Flotation Chemistry for the Trona Industry,” J. D. Miller, X. Wang and M. Li (slide show).
- “Surface Heterogeneity of Barley Straw,” S. Wisniewska, J. Nalaskowski, E. Witka-Jezewska, J. Hupka, and J. D. Miller, Fourth International Symposium, Effects of Surface Heterogeneity in Adsorption and Catalysis on Solids, Cracow, Poland, 27–31 August 2001.
- “A New Cone Beam X-ray Microtomography Facility for 3D Analysis of Multiphase Materials,” C. L. Lin (presenter) and J. D. Miller, 2<sup>nd</sup> World Congress on Industrial Process Tomography, Hannover, Germany, 29 August–1 September 2001. **Member of Technical Advisory Board.**
- Invited Speaker, and Session Chair**, Two presentations by J. D. Miller and Research Group at the IX Balkan Mineral Processing Congress, Istanbul, Turkey, 11–13 September 2001. (1) “The Status of Mineral Processing Technology – a Panoramic View, J. D. Miller (**Plenary Lecture**). (2) “Flotation Fundamentals of Soluble Salts,” M. Hancer, J. D. Miller, and M. S. Celik.
- “Dispersed Oil Impact on Froth Stability in Flotation,” M. Niewiadomski (presenter), J. Hupka, J. Nalaskowski, and J. D. Miller, Physicochemical Problems of Mineral Processing, 38<sup>th</sup> Symposium, Szczyrk, Poland, 17–19 September 2001.
- 2001 SCERP Technical and Policy Exchange Conference, Universidad Autonoma de Baja California, Mexicali, BC, 17–19 October 2001.
- Three presentations by J. D. Miller and Research Group at the Engineering Foundation Conference, Beneficiation of Phosphate III, St. Pete Beach, Florida, 2–7 December 2001. (1) “Bench Scale Flotation of Sedimentary Phosphate Rock with Hydroxamic Acid Collectors,” J. D. Miller (presenter), X. Wang, and M. Li. (2) “Selective Flotation of Phosphate Minerals with Alcoholic Solutions of Alkyl Hydroxamic Acids,” J. D. Miller (presenter), X. Wang, and M. Li. (3) “Fatty Acid Flotation of Calcareous Phosphate Rock Using Enzymes for a Selective Separation,” A. Yehia, (presenter), J. D. Miller, M. A. Abdel-Khalek, and M. Fadel. **Member of Organizing Committee.**
- Eight presentations by J. D. Miller and Research Group at the 2002 SME Annual Meeting, Phoenix, Arizona, 25–27 February 2002. (1) “The Effect of Activation on the Low Potential Hydrophobic State of Pyrite in Amyl Xanthate Flotation with Nitrogen,” R. Du Plessis (presenter), D. G. Kotlyar, G. L. Simmons, and J. D. Miller. (2) The Significance of Filter Cake Pore Structure as Determined by Micro CT in the Analysis of Filtration Phenomena,” C. L. Lin (presenter) and J. D. Miller. (3) Flotation as a Process Alternative for the Treatment of Trona Resources,” X. Wang, M. Li, and J. D. Miller (presenter). (4) Flu Gas Treatment for SO<sub>2</sub> Removal with Gas–Sparged Hydrocyclone Technology,” R. Bokotko, J. Hupka (presenter), and J. D. Miller. (5) “Ultimate Recovery in Heap Leaching Operations as Established from Mineral Exposure Analysis by X–ray Microtomography,” J. D. Miller (presenter), C. L. Lin, C. Garcia, and H. Arias. (6) “Cyanide Recovery and Reuse by Air Stripping with ASH Technology,” J. Hupka (presenter), B. Dabrowski, J. D. Miller, T. Jiang, and D. Halbe. (7) “Fundamental Aspects of Gold Adsorption by Magnetic Activated Carbon,” G. A. Munoz (presenter), S. Duyvesteyn, and J. D. Miller. (8) “Conformation of Chemisorbed Oleate at a Calcite Surface,” C. A. Young (presenter) and J. D. Miller.
- “Ultimate Recovery in Heap Leaching Operations as Established from Mineral Exposure Analysis by X–ray Microtomography,” J. D. Miller (presenter), C. L. Lin, C. Garcia, and H. Arias, Utah Section of the Society of Mining Engineers, Salt Lake City, Utah, 18 April 2002.
- “The Effect of Relaxation Times on the Surfactant Surface Structures,” V. K. Paruchuri, D. Shah (presenter), and J. D. Miller, Surfactants in Solution Symposium (SIS–2002), Barcelona, Spain, 9–14 June 2002.
- Two presentations by J. D. Miller Research Group at the 26<sup>th</sup> IPMI International Precious Metals Conference, Miami, Florida, 15–18 June 2002. (1) “Gold Recovery from Cyanide Leaching Solutions by Powdered Magnetic Activated Carbons,” G. Munoz (presenter), S. Duyvesteyn, and J. D. Miller. (2)

## SEMINARS & PRESENTATIONS, cont.

“The Development of Trithiocarbonate Collectors for Precious Metals Recovery by Sulfide Mineral Flotation,” R. du Plessis (presenter), J. C. Davidtz, and J. D. Miller.

Two presentations by J. D. Miller Research Group at the 76<sup>th</sup> Colloid and Surface Science Symposium, Ann Arbor, Michigan, 23-26 June 2002. (1) “Interaction Forces between a Calcium Dioleate Sphere and Calcium/Fluorite Surfaces,” K. Fa (presenter) and J. D. Miller. (2) “FTIR Studies of Water Structure in Soluble Salt Flotation Systems,” Z. S. Nickolov (presenter) and J. D. Miller.

**Invited Keynote Speaker**, “The Flotation Chemistry of Nonsulfide Minerals,” J. D. Miller, Flotation and Flocculation: from Fundamentals to Applications, Kona, Hawaii, 28 July–2 August 2002.

Advanced Separations Roadmap Workshop, Center for Advanced Separations Technologies (CAST), Charleston, West Virginia, 14–15 August 2002.

NSF Site Visit Review/IAB Meeting, ERC, University of Florida, Gainesville, Florida, 4–5 September 2002.

Four presentations by J. D. Miller Research Associates at the 3<sup>rd</sup> International Conference – Oil Pollution, Prevention, Characterization, Clean Technology, Gdansk, Poland, 8–11 September 2002.

“Study of Particle – Bubble Interaction Using Atomic Force Microscopy—Current Possibilities and Challenges,” J. Nalaskowski, A. V. Nguyen, J. Hupka (presenter), and J. D. Miller, 39<sup>th</sup> Symposium on Physicochemical Problems of Mineral Processing, Polanica Zdroj, 16–18 September 2002.

“Measurement of Bubble–Particle Interaction Forces by Atomic Force Microscopy,” A. V. Nguyen (presenter), J. Nalaskowski and J. D. Miller, 9<sup>th</sup> APCChE (Asian Pacific Confederation of Chemical Engineering) Congress and Chemeca (30<sup>th</sup> Annual Australasian Chemical Engineering Conference) 2002, Christchurch, New Zealand, 29 September–3 October 2002.

“The Effect of Thermal Stability on the Flotation Response of Sodium Carbonate Salts,” O. Ozcan (presenter), M. Celik and J. D. Miller, IX International Mineral Processing Symposium, Cappadocia, Turkey, 18–20 September 2002.

“3D Fine Coal Characterization and Washability Analysis by X-ray Microtomography,” C. L. Lin and J. D. Miller, 19<sup>th</sup> Annual International Pittsburgh Coal Conference, Pittsburgh, Pennsylvania, 23–27 September 2002.

“Nonsulfide Flotation Technology and Plant Practice,” J. D. Miller, B. Tippin (presenter) and R. Pruett, Symposium on Mineral Processing Plant Design, Control and Practice, Vancouver, B.C., Canada, 20–24 October 2002.

**Invited Lecturer**, Particle Processing: Liquid Phase, Summer School in Winter, PERC (Particle Engineering Research Center), University of Florida, Gainesville, Florida, 10–17 January 2003.

TVA Flocculation Technology Seminar, Memphis, Tennessee, 14 February 2003.

IAB Meeting, ERC, University of Florida, Gainesville, Florida, 18–19 February 2003.

Six presentations by J. D. Miller and Research Group at the 2003 SME Annual Meeting, Cincinnati, Ohio, 24–26 February 2003. (1) “FTIR Analysis of Water Structure and Its Significance in the Flotation of Sodium Carbonate and Sodium Bicarbonate Salts,” Z. S. Nickolov (presenter), O. Ozcan and J. D. Miller. (2) “Interaction Forces between Silica Surfaces in the Presence of Poly (Ethylene Oxide),” V. K. Paruchuri, J. Nalaskowski and J. D. Miller (presenter). (3) “Influence of Surfactants on Interaction Forces between Polyethylene Surfaces in Hydrocarbon Solvent,” R. Aranowski, J. Nalaskowski, J. Hupka (presenter) and J. D. Miller. (4) “Plant Experiences in the Recovery of Cyanide from Gold Leach Solution Using ASH Technology,” J. Hupka (presenter), B. Dabrowski, J. D. Miller, T. Jiang and D. Halbe. (5) “Estimation of Ultimate Recovery in Heap Leaching Operations using High Resolution Cone Beam X-ray Microtomography (XMT),” J. D. Miller, C. L. Lin, C. Roldan (presenter) and C. Garcia. (6) “Characterization of Spherical Alumina Particles Obtained by Melting in a Hydrogen–oxygen Flame,” J. Nalaskowski, M. Niewiadomski, V. K. Paruchuri and J. D. Miller (presenter).

Two presentations by J. D. Miller Research Group at the 225<sup>th</sup> ACS National Meeting, Surface Chemistry of Carbonaceous Materials, New Orleans, Louisiana, 23–27 March 2003. (1) “Structural Features of

## SEMINARS & PRESENTATIONS, cont.

- Magnetic Activated Carbons and their Significance in Adsorption Processes,” G. A. Munoz (presenter), S. Duyvesteyn and J. D. Miller. (2) “Organization of Surface Micelles Confined in Molecular Corrals at a Graphite Surface: Direct Evidence for the Surface Templating Effect,” V. Paruchuri, J. Nalaskowski, T. P. Beebe, Jr. (presenter) and J. D. Miller.
- “3D Analysis of Particulate Systems by Cone Beam X-ray Micro CT,” J. D. Miller, **Invited Seminar**, Sigel Lecture Series, Chemical Engineering Department, Michigan Technical University, Houghton, Michigan, 24–25 April 2003.
- “Micellar Surface Structures,” J. D. Miller, J. Nalaskowski, Z. Nickolov, V. K. Paruchuri, and K. Fa, DOE/BES Contractors Meeting, Santa Fe, New Mexico, 28–30 April 2003.
- “Structural Considerations in the Surface Charge of Kaolinite as Determined by AFM Force Measurements,” J. Nalaskowski and J. D. Miller, Classic Clays and Minerals, Joint CMS/MSA Meeting, Athens, Georgia, 7–12 June 2003.
- Three Seminars by J. D. Miller presented at University of Pretoria, Pretoria, South Africa, 14–26 June 2003. (1) “3D Analysis of Particulate Systems by Cone Beam X-ray MicroCT.” (2) “Surface Chemistry Considerations in Particle Separations by Flotation.” (3) “Thiocarbonate Collectors for Pyrite Flotation.”
- “The Effect of Pore Size Distribution on Gold Adsorption by Magnetic Activated Carbons,” G. A. Munoz, S. Duyvesteyn (presenter), and J. D. Miller, Hydro 2003, 2003 International Symposium on Hydrometallurgy in Honor of Professor Ian Ritchie, Vancouver, B.C., Canada, 24–27 August 2003.
- “Cyanide Recovery from Process Streams using Air–Sparged Hydrocyclone Technology,” J. D. Miller (presenter), and B. Dabrowski, Mining Energy Solutions Conference, Elko, Nevada, 26–28 August 2003.
- NSF Site Visit Review/IAB Meeting, ERC, University of Florida, Gainesville, Florida, 2–4 September 2003.
- “Characterization and Analysis of Copper Heap Leaching by X-ray Computed Tomographic Techniques,” J. D. Miller, C. L. Lin (presenter), C. Roldan, and C. Garcia, 3<sup>rd</sup> World Congress on Industrial Process Tomography, Banff, Canada, 2–5 September 2003. **Member of Technical Advisory Group.**
- Three presentations by J. D. Miller research associate at Colloquium Spectroscopicum Internationale (CSI XXXIII), Granada, Spain, 7–12 September 2003. (1) “Surfactant Adsorption at the Surface of Microparticles Studied by Second Harmonic Generation,” poster by Z. S. Nickolov (presenter) and J. D. Miller. (2) “Liquid/Air Interfacial Structure of Alcohol–Octyl Hydroxamic Acid Mixtures: A Study by Sum–Frequency Spectroscopy,” poster by Z. S. Nickolov (presenter), X. Wang, and J. D. Miller. (3) “Studies of Mixed Surfactant Monolayers at Interfaces by Sum–Frequency Spectroscopy,” Z. S. Nickolov (presenter), J. D. Miller, and D. W. Britt.
- “3D Analysis of Particulates in Mineral Processing Systems by Cone Beam X-ray Microtomography,” J. D. Miller and C. L. Lin, XXII International Mineral Processing Congress, Cape Town, South Africa, 28 September–3 October 2003. **Plenary Session Chairman.**
- “Flotation Technology for the Trona Industry,” J. D. Miller, CAST 2003 Technology Conference, Charleston, West Virginia, 19–21 November 2003.
- “Particle Size Distribution for Copper Heap Leaching Operations as Established from 3D Mineral Exposure Analysis by X-ray MicroCT,” J. D. Miller, C. L. Lin, and C. Garcia, Copper 2003–Cobre 2003, Santiago, Chile, 30 November–3 December 2003. **Session Co–Chair.**
- “Removal of Dissolved and Colloidal Contaminants from Fish Processing Wastewater,” J. D. Miller, J. Hupka (presenter), B. Flores, and M. Niewiadomski, Annual SCERP Conference, Laredo, Texas, 11–13 February 2004.
- Seven presentations by J. D. Miller and Research Group at the 2004 SME Annual Meeting, Denver, Colorado, 23–25 February 2004. (1) “Improving Phosphate Flotation with New Chemistry, Smart Flowsheet and Novel Equipment,” P. Zhang (presenter), R. Snow, J. D. Miller and M. Mankosa. (2)

## SEMINARS & PRESENTATIONS, cont.

“Sum Frequency Spectroscopy Reveals New Possibilities to Study Interfaces,” Z. S. Nickolov (presenter) and J. D. Miller. (3) “Fluid Flow Characteristics in Column Leaching as Described by LB Simulation,” C. L. Lin (presenter) and J. D. Miller. (4) “The Effect of Amine Surfactant Headgroup on Micelle Structures Developed at Selected Surfaces,” V. K. Paruchuri and J. D. Miller (presenter). (5) Hydrodynamic Interaction between a Gas-Liquid Interface and an AFM Solid Particle Probe,” J. Nalaskowski (presenter), A. V. Nguyen and J. D. Miller. (6) “Hydrogen Bonding and Hydrophobic Interactions in Dextrin Adsorption Phenomena,” M. Niewiadomski (presenter), J. Nalaskowski and J. D. Miller. (7) “The Influence of Pyrite Pre-oxidation on Gold Recovery by Cyanidation,” J. Li, B. Dabrowski, J. D. Miller (presenter), S. Acar, M. Dietrich, K. M. LeVier and R. Y. Wan. (8) “Air Sparged Hydrocyclone (ASH) Technology for Cyanide Recovery,” J. Hupka, B. Dabrowski (presenter), J. D. Miller and D. Halbe.

NSF Site Visit Review/IAB Meeting, PERC, University of Florida, Gainesville, Florida, 23-24 March 2004. “Separation Technology for Plastics Recycle,” J. D. Miller and R. Kobler, U.S.-Egypt Workshop: Advances in Science and Technology of Treatment and Utilization of Industrial Wastes, Cairo, Egypt, 5-11 June 2004.

Two presentations by J. D. Miller and Research Group at the Western Phosphate Mining and Processing Conference, Pocatello, Idaho, 18 June 2004. (1) “ASH Flotation Technology for Phosphate Flotation,” J. D. Miller and X. Wang. (2) “Flotation Phosphate Mineral with Hydroxamic Acid Collector,” J. D. Miller and X. Wang.

“Sum-Frequency Spectroscopic Study of the Stearic Acid Monolayer – Water Interface,” Z. S. Nickolov (presenter), D. W. Britt, and J. D. Miller, 78<sup>th</sup> ACS Colloid and Surface Science Symposium, Yale University, New Haven, Connecticut, 20–23 June 2004.

“Some Thoughts on Sulfide Flotation Chemistry,” J. D. Miller, Seminar, University of Pretoria, Pretoria, South Africa, 6 August 2004.

“Phosphate Flotation Technology and Possibility for Future Research,” J. D. Miller, FIPR Flotation Workshop, Bartow, Florida, 18 August 2004.

**Plenary Lecture**, “Recent Developments in the Analysis of Multiphase Materials and their Surfaces,” South Dakota NSF EPSCoR Annual Conference, Rapid City, South Dakota, 17 September 2004.

“3D Characterization and Quantitative Analysis of Mineral Phases Using Dual-Energy X-Ray Micro Computed Tomography Techniques,” C. L. Lin, J. D. Miller, and C. Garcia, presented by C. Schneider, ICAM Brazil 2004, 8<sup>th</sup> International Congress on Applied Mineralogy, Aguas de Lindoia, Brazil, 19–22 September 2004. **Member Scientific Committee.**

“Characterization and Analysis of Surfactant Structures,” J. D. Miller and J. Nalaskowski (presenter), IAB Meeting, PERC, University of Florida, Gainesville, Florida, 21–23 September 2004.

“Progress in Separation Technology for the Mineral Industry,” J. D. Miller, Separations Technology IV: New Perspectives on Very Large–Scale Operations, Engineering Conferences International/United Engineering Foundation, Fraser Island, Australia, 3–8 October 2004.

“Three Dimensional Particle Characterization for Improved Mineral Processing Technology,” J. D. Miller and C. L. Lin (presenter), Xth International Mineral Processing Symposium, Cesme-Izmir, Turkey, 5–7 October 2004.

“Flotation Chemistry of Pyrrhotite in the Processing of PGM Ores,” J. D. Miller and J. C. Davidtz, Precious Metals ‘04, Cape Town, South Africa, 10–12 November 2004.

“Pilot-Plant Evaluation of a Water Insoluble Hydroxamic Acid,” X. Wang and J. D. Miller, 4<sup>th</sup> International Conference, Beneficiation of Phosphates IV, Engineering Conferences International, Miami, Florida, 5–10 December 2004. **Conference Co-Chair and Session Co-Chair.**

NSF Site Visit Review/IAB Meeting, PERC Semi-Annual Meeting, University of Florida, Gainesville, Florida, 1-2 February 2005.

## SEMINARS & PRESENTATIONS, cont.

- “Arsenic Removal from Contaminated Waters,” J. Adams (presenter), X. Diaz, J. D. Miller, T. R. Mankhand, and T. Chatwin, Symposium on Arsenic Metallurgy: Fundamentals and Applications, 134<sup>th</sup> TMS Annual Meeting, San Francisco, California, 13–17 February 2005.
- Six presentations by J. D. Miller and Research Group at the 2005 SME Annual Meeting, Salt Lake City, Utah, 28 February–2 March 2005. (1) “Air Sparged Hydrocyclone (ASH) Technology for Separation and Environmental Clean-up,” J. Hupka and J. D. Miller. (2) “Attachment and Spreading of Insoluble Hydroxamic Acid/Alcohol Collectors at Quartz and Apatite Surfaces,” X. Wang (presenter), A. Nguyen, and J. D. Miller. (3) “Interaction Forces of Calcium Dioleate Collector Colloids with Calcite and Fluorite Surfaces,” K. Fa, A. Nguyen, and J. D. Miller; J. Nalaskowski (presenter). (4) “Thiohydrometallurgical Processes for Gold Recovery—Fundamentals and Applications,” R. Y. Wan (presenter), J. Li, and J. D. Miller. (5) 3D Characterization and Analysis of Particle Shape Using X-ray Microtomography (XMT),” C. L. Lin (presenter) and J. D. Miller. (6) “Vibrational Spectroscopic Studies of Water Structure and its Significance in the Flotation of Carbonate Salts,” Z. S. Nickolov, O. Ozdemir (presenter), and J. D. Miller.
- “Flotation Chemistry of Soluble Salt Minerals,” DOE BES Separations and Analysis Program Contractor’s Meeting, Rockville, Maryland, 27–30 April 2005. (Double Tree Hotel).
- Three presentations by J. D. Miller at the Centenary of Flotation Symposium, Brisbane, Australia, 6–9 June 2005. (1) **Keynote Address**, “Flotation Chemistry of Soluble Salt Minerals,” J. D. Miller. (2) Interaction of Calcium Dioleate Collector Colloids with Calcite and Fluorite Surfaces as Revealed by AFM Force Measurements and Molecular Dynamics Simulation,” K. Fa, A. V. Nguyen, and J. D. Miller. (3) “Pyrite Activation in Amyl Xanthate Flotation with Nitrogen,” J. D. Miller, R. Kappes, G. L. Simmons, and K. M. LeVier.
- “3D Analysis of Particulate Systems by Cone Beam X-Ray Micro CT – What XMT Measures/What This Means to an Operation,” J. D. Miller, 2005 Newmont Metallurgy Conference, “Measurement, Management and Control,” Brisbane, QL, Australia, 10–11 June 2005.
- “Micelles at Surfaces,” J. D. Miller, SURUZ Scientific Network Workshop on “Emulsions for Food, Cosmetics, Pharmaceutical and Household Use,” Gdansk, Poland, 19–20 June 2005.
- Two presentations by J. D. Miller and Research Group at AUZO 2005, 4<sup>th</sup> International Conference on Oils & Environment, Gdansk, Poland, 20–23 June 2005. (1) “Dimethyl Ether – A New Synthetic Fuel Commodity and Chemical Building Block,” J. D. Miller and W. W. Zmierzak (presenter). (2) **Invited Lecture**: “The Hydrophobic Surface State,” J. D. Miller.
- Invited Lecture**: “X-ray CT for LB Simulation of Flow through Packed Particle Beds,” J. D. Miller, Advanced Research Workshop, NATO: Viable Methods of Soil and Water Pollution Monitoring, Protection and Remediation, Development and Use, Krakow, Poland, 26 June–1 July 2005.
- Three presentations by J. D. Miller and Research Group, CAST 2005 Annual Workshop, Blacksburg, Virginia, 26–28 July 2005. (1) “Development of a Flotation Technology for the Trona Industry,” J. D. Miller and O. Ozdemir. (2) “Computed Tomography for the Analysis of Heap Leaching Systems,” J. D. Miller, C. L. Lin, A. R. Videla, and D. Garcia. (3) “Characterization and Washability Analysis of Coal by X-ray Microtomography (XMT),” C. L. Lin, A. R. Videla, and J. D. Miller, poster presentation.
- Invited Lecture**: “3D Particulate Structures of Complex Geometry from Microtomography to Nanotomography,” J. D. Miller, International Symposium on the Role of Adsorbed Films and Particulate Systems in Nano and Biotechnologies, Gainesville, Florida, 24–26 August 2005.
- Two presentations by J. D. Miller and Research Group, XLII Annual Symposium Physicochemical Problems of Mineral Processing and X International Mineral Processing Meeting, Wisla, Poland, 5–7 September 2005. (1) “Application of Atomic Force Microscopy in Fundamental Studies of Flotation Separation Systems,” J. Nalaskowski (presenter) and J. D. Miller. (2) “Laboratory and Pilot Scale Photodegradation of Cyanide-containing Waste Waters,” B. Dabrowski (presenter), J. Hupka, M. Zurawska, and J. D. Miller.

## SEMINARS & PRESENTATIONS, cont.

- “Reconstruction and Watershed Functions Applied to a 3D Image Analysis Segmentation Problem for a Packed Bed of Multiphase Particles,” A. R. Videla, C. L. Lin (presenter), and J. D. Miller, 4<sup>th</sup> World Congress on Industrial Process Tomography, Aizu, Japan, 5–8 September 2005.
- “Atomic Force Microscopy Characterization of Molecular Self-Assemblies at Solid-Liquid Interfaces,” J. Nalaskowski (presenter), V. K. Paruchuri, and J. D. Miller, 8<sup>th</sup> International Conference on Intermolecular and Magnetic Interactions in Matter, Naleczow, Poland, 8–10 September 2005.
- “New Developments in Mixing, Coagulation, Flocculation and Flotation for Industrial Wastewater Pretreatment,” M. Colic (presenter), W. Morse, D. Morse, and J. D. Miller, Intertech’s Coagulants and Flocculants 2005, Chicago, Illinois, 19–21 September 2005.
- “Nanoparticles Analysis and Characterization Using Atomic Force Microscopy,” L. Hupka (presenter), J. Nalaskowski, and J. D. Miller, 22<sup>nd</sup> Annual Utah Safety & Industrial Hygiene Conference, Salt Lake City, Utah, 7 October 2005.
- “Determination of Colloid Deposition at Grain-Grain Contacts Using X-ray Microtomography,” X. Li (presenter), C. L. Lin, J. D. Miller, and W. P. Johnson, 2005 Salt Lake Annual Meeting, Geological Society of America, Salt Lake City, Utah, 16-19 October 2005.
- “New Developments in Mixing, Flocculation and Flotation for Industrial Wastewater Pretreatment and Municipal Wastewater Treatment,” M. Colic (presenter), D. Morse, W. Morse, and J. D. Miller, Water Environmental Federation Conference (WEFTEC 2005), Washington, DC, 29 October–2 November 2005.
- “3D Characterization and Analysis of Heap Leaching Systems using X-ray Microtomography (XMT),” A. R. Videla (presenter), C. L. Lin, and J. D. Miller, HydroCopper 2005 – International Copper Hydrometallurgy Workshop, Santiago, Chile, 24–25 November 2005.
- “Research Activities in Mineral Processing at the University of Utah,” J. D. Miller, AMIRA International Council Visit: Meet the Researchers, Toronto, Ontario, Canada, 21–23 March 2006
- “Research Activities in Mineral Processing at the University of Utah,” J. D. Miller, Seminar, Virginia Tech, Blacksburg, Virginia, 23–27 March 2006.
- “Experimental Evaluation of a Mineral Exposure Model for Crushed Copper Ores,” D. Garcia (presenter), C. L. Lin, and J. D. Miller, 2006 SME Annual Meeting, Comminution Symposium, St. Louis, Missouri, 27–29 March 2006.
- “Atomic Force Microscopy Investigation of Interaction Forces between Polyethylene and Asphaltene Surfaces in Nonaqueous Surfaces,” R. Aranowski, J. Nalaskowski (presenter), J. Hupka, and J. D. Miller, 2006 SME Annual Meeting, Symposium on Functional Fillers and Nanoscale Minerals II, St. Louis, Missouri, 27–29 March 2006.
- Three presentations by J. D. Miller Research Group, World Congress on Particle Technology Student Conference, Cocoa Beach, Florida, 21–23 April 2006. (1) “Direct Observation of Microsphere Deposition in Porous Media Using X-ray Microtomography (XMT),” X. Li, C. L. Lin, J. D. Miller, and W. P. Johnson (presented by V. Gupta). (2) “Bio-Treatment of Cyanide and Arsenic in Drinking Water and Mine Waste Streams,” N. N. Newton (presenter), J. Adams, and J. D. Miller. (3) “Study of Poly (Ethylene Oxide) Adsorption on Silica Surface by Interaction Force Measurements,” W. Huang (presenter), V. K. Paruchuri, J. Nalaskowski, and J. D. Miller.
- Two presentations by J. D. Miller Research Group, 5<sup>th</sup> World Congress on Particle Technology (WCPT5), Orlando, Florida, 23–27 April 2006. (1) “Determination of Colloid Deposition at Grain-Grain Contacts Using X-ray Microtomography (XMT),” X. Li, C. L. Lin, J. D. Miller, and W. P. Johnson (presented by V. Gupta). (2) “The Effect of Hydrophobic Surface Modification on Bulk Cohesive Strength,” K. Johanson (presenter), J. D. Miller, and C. L. Lin.
- Invited Lecture:** “Research Progress for the Processing of Gold Ores, From Particle Characterization to Recovery,” J. D. Miller, 7<sup>th</sup> International Gold Symposium, Lima, Peru, 2–5 May 2006.



## SEMINARS & PRESENTATIONS, cont.

**Invited Seminar:** “Research Progress for the Processing of Gold Ores, From Particle Characterization to Recovery,” J. D. Miller, National University of Engineering, Lima, Peru, 2 May 2006.

“Single Particle Microelectrodes for Electrochemical Analysis of Sulphide Flotation Processes,” T. Vermaak, J. D. Miller, and M. Moats (presenter), 7<sup>th</sup> International Symposium on Electrochemistry in Mineral and Metal Processing (EMMP7), Denver, Colorado, 7–12 May 2006.

“Structural and Dynamic Properties of Concentrated Alkali Halide Solutions: A Molecular Dynamics Simulation Study,” H. Du (presenter), J. C. Rasaiah, and J. D. Miller, Gordon Conference: Water & Aqueous Solutions, Plymouth, New Hampshire, 30 July–4 August 2006.

“Catalytic Conversion of Lignin to Liquid Fuels,” W. W. Zmierczak (presenter) and J. D. Miller, CHISA 2006 (17<sup>th</sup> International Congress of Chemical and Process Engineering), Prague, Czech Republic, 27–31 August 2006.

Two presentations by J. D. Miller Research Group at the XXIII International Mineral Processing Congress, Istanbul, Turkey, 3–8 September 2006. (1) “Evaluation of Reverse Flotation for the Trona Industry,” A. Jain, O. Ozdemir (presenter), X. Wang, and J. D. Miller, poster presentation. (2) “Flotation Chemistry Considerations in the Development of Flotation Technology for the Trona Industry,” O. Ozdemir, A. V. Nguyen, Z. S. Nickolov, M. S. Celik, and J. D. Miller.

“The Significance of Oil Sands Characteristics on Bitumen Recovery by Water Processing Techniques,” J. D. Miller, Western U.S. Oil Sands Conference, University of Utah, Salt Lake City, Utah, 21 September 2006.

“The Anisotropic Character of Talc Surfaces as Revealed by Streaming Potential Measurements, Atomic Force Microscopy, and Molecular Dynamics Simulations,” J. Nalaskowski, B. Abdul, H. Du, and J. D. Miller, 6<sup>th</sup> UBC-McGill-UA International Symposium on Fundamentals of Mineral Processing in Honor of Professor Janusz S. Laskowski, Montreal, Quebec, Canada, 1–4 October 2006.

“Atomic Force Microscopy Study of Contaminant-Wafer Interactions,” L. Hupka (presenter), J. Nalaskowski, J. D. Miller, M. Hancer, N. Sinha, N. Greeley, poster presentation, nanoUtah 2006 Conference, University of Utah, Salt Lake City, Utah, 5 October 2006.

“Trithiocarbonates for the Flotation of PGM Sulphides,” C. F. Vos (presenter), J. C. Davidtz, and J. D. Miller, 2<sup>nd</sup> International Platinum Conference, “Platinum Adding Value,” Sun City, South Africa, 8–12 October 2006.

“The Hydrophobic Surface State: Water Structure, Surface Forces, and Adsorption Reactions,” J. D. Miller, Seminar, Virginia Tech/CAST Meeting, 7 December 2006.

“Activated Carbon Research for Gold Recovery at the University of Utah,” J. D. Miller, Calgon Carbon Corporation/Univar Activated Carbon Seminar, Elko, Nevada, 25 January 2007.

Three presentations by J. D. Miller Research Group at the 2007 SME Annual Meeting, Denver, Colorado, 25–28 February 2007. (1) “Particle Interaction Forces in Selected Phyllosilicate Mineral Systems,” B. Abdul (presenter), J. Nalaskowski, H. Du, and J. D. Miller. (2) “Nanoparticle Technology in Water Treatment for Removal of Heavy Metal Contaminants,” J. D. Miller, J. Adams, X. Diaz, and N. Newton (presenter). (3) “Particle Interaction Forces in Industrial Minerals Systems,” J. Nalaskowski (presenter), B. Abdul, and J. D. Miller.

“An Examination of Ferric Ion Reduction in Sulfate Based Copper Electrowinning Electrolyte,” R. Bhide, J. Li, M. Free (presenter), J. D. Miller, and J. B. Hiskey, TMS 2007 Annual Meeting & Exhibition, Orlando, Florida, 25 February– 1 March 2007.

**Invited Seminars:** University of Pretoria, Pretoria, South Africa, 24 April 2007. (1) “The 3D Analysis of Multiphase Particles and Packed Particle Beds by Cone Beam X-ray Micro CT for Improved Understanding of Mineral Processing Systems,” J. D. Miller. (2) “Molecular Dynamic Simulations for the Analysis of Interfacial Chemistry in Selected Flotation Systems,” J. D. Miller.

“Molecular Dynamics Simulation for the Analysis of Interfacial Chemistry in Selected Flotation Systems,” J. D. Miller and H. Du, Seminar, Gdansk University of Technology, Gdansk, Poland, 17 May 2007.

## SEMINARS & PRESENTATIONS, cont.

- “Molecular Dynamics Simulation for the Analysis of Interfacial Chemistry in Selected Flotation Systems,” J. D. Miller and H. Du, Surfactants and Dispersed Systems in Theory and Practice (SURUZ 2007), Institute of Organic Technology, Wroclaw University of Technology, Ksiaz Castle, Poland, 22-24 May 2007.
- “Comparison of Transport Behavior of Two Adhesion-Deficient Bacteria Strains within Water-Reactive Porous Media,” V. Gupta (presenter), W. P. Johnson, J. D. Miller, and S. Hubbs, 81<sup>st</sup> ACS Colloid & Surface Science Symposium, Newark, Delaware, 24–27 June 2007.
- “Membrane Filtration Pretreatment: Advances in Primary Treatment,” M. Colic (presenter), W. Morse, A. Lechter, J. D. Miller, AWWA Conference, Toronto, Canada, 24–28 June 2007.
- “Characterization of Water-soluble Fullerene C<sub>60</sub> Nanoparticles Using Asymmetrical Flow Field-Flow Fractionation and Atomic Force Microscopy,” S. Tadjiki, S. Assemi (presenter), B. C. Donose, A. Nguyen, and J. D. Miller, International FFF Symposium, Salt Lake City, Utah, 27–30 June 2007.
- “Molecular Dynamics Simulation for the Analysis of Interfacial Chemistry in Selected Hydrophobic Mineral Systems,” J. D. Miller and H. Du, Remote Seminar for South Dakota School of Mines and Technology, Materials and Metallurgical Engineering Students, Rapid City, South Dakota, 16 July 2007.
- Two presentations/posters by J. D. Miller and Research Group at the CAST 2007 Workshop, Blacksburg, Virginia, 24–26 July 2007. (1) “Mineral Liberation by X-ray Microtomography,” C. L. Lin (presenter), A. Videla, and J. D. Miller. (2) “LB Methods for Fluid Flow Simulation in Packed Particle Beds,” A. R. Videla (presenter), C. L. Lin, D. Thorn, M. Sukop, and J. D. Miller. Posters: (1) “Mineral Liberation Analysis in 3D by X-ray MicroCT for the Evaluation of Particle Separation Efficiency,” A. R. Videla, C. L. Lin, and J. D. Miller. (2) “Lattice Boltzmann Methods for Fluid Flow Simulation in Packed Particle Beds,” A. R. Videla, C. L. Lin, J. D. Miller, M. Sukop, and D. Thorne.
- “Case Study: Fish Processing Plant Wastewater Treatment,” M. Colic (presenter), W. Morse, J. Hicks, A. Lechter, J. D. Miller, Water Environment Federation, Industrial Water Quality, Providence, Rhode Island, 29 July–1 August 2007.
- “Characterization and Analysis of Porous, Brittle Solid Structures by Micro CT,” C. L. Lin (presenter), A. R. Videla, Q. Yu, and J. D. Miller, 5<sup>th</sup> World Congress on Industrial Process Tomography, Bergen, Norway, 3–6 September 2007.
- “Advanced Flotation Technology for Removal of Suspended Particles in Wastewater Treatment Plants,” J. D. Miller, Seminar, Donghua University, Shanghai, P.R. China, 17 September 2007.
- Two Seminars by J. D. Miller at Central South University, Changsha, P.R. China, 20 September 2007. (1) “Molecular Dynamics Simulation for the Analysis of Interfacial Chemistry in Naturally Hydrophobic Mineral Systems,” J. D. Miller. (2) “The 3D Analysis of Multiphase Particles and Particle Beds by Cone Beam X-ray Microtomography for Improved Understanding of Mineral Processing Systems,” J. D. Miller.
- Three presentations by J. D. Miller at the 2007 Precious Metals Meeting, Tucson, Arizona, 3–6 October 2007. (1) “Thiocyanate Chemistry and Process Strategies for Gold Recovery,” J. Li and J. D. Miller. (2) The 3-D Analysis of Activated Carbon by X-ray Micro-CT,” C. L. Lin and J. D. Miller. (3) “Application of Membrane Technology in the Separation of Cyanide Complexes from Process Solution,” R. Raitani, and J. D. Miller.
- “The Hydrophobic Surface State: Water Structure, Surface Forces, and Adsorption Phenomena,” J. D. Miller, Lindsay Lecture, Dept. of Chemical Engineering, Texas A & M University, College Station, TX, 12 October 2007.
- “Innovation, Design, Implementation - Transforming Mineral Resources and Metals into Useful Products That Improve the Quality of Our Lives,” J. D. Miller, Back to Earth, Mines and Earth Science, University of Utah, Salt Lake City, Utah, 25 October 2007.
- Two presentations by J. D. Miller Research Group, nanoUtah 2007, University of Utah, Salt Lake City, Utah, 26 October 2007. (1) “Evaluation of Novel Post-CMP Cleaning Solutions,” L. Hupka (presenter),

## SEMINARS & PRESENTATIONS, cont.

J. Nalaskowski, and J. D. Miller. (2) “Characterization of Water-soluble Fullerol Nanoparticles Using Asymmetrical Flow Field-flow Fractionation, and Atomic Force Microscopy,” S. Tadjiki (presenter), S. Assemi, B. C. Donose, A. Nguyen, and J. D. Miller.

**Invited Presentation:** “Surface Characteristics of Selected Two Layer Silicate Minerals,” J. D. Miller, J. Nalaskowski, B. Abdul, and H. Du (presented by Zhenghe Xu), 57<sup>th</sup> Canadian Chemical Engineering Conference (CSCHE 2007), the Oil Sands Symposium, and Special Symposium Honoring Professor Jacob Masliyah, Edmonton, Alberta, Canada, 28–31 October 2007.

Two presentations by J. D. Miller Research Group, AIChE Annual Meeting, Salt Lake City, Utah, 4–9 November 2007. (1) “Adsorption States of Amphipatic Solutes at the Surface of Naturally Hydrophobic Minerals: A Molecular Dynamics Simulation Study,” H. Du (presenter) and J. D. Miller. (2) “Transport Behavior and Interaction Forces of Adhesion-Deficient Bacterial Strain in a Radial Stagnation-Point Flow System,” V. Gupta (presenter), W. Johnson, and J. D. Miller.

“Investigation of Interaction Forces between Contaminant Particle and the Wafer Surface in Post-CMP Cleaning,” L. Hupka, J. Nalaskowski (presenter), and J. D. Miller, 5<sup>th</sup> International Surface Cleaning Workshop: Future and Current Challenges in Surface Cleaning, Boston, Massachusetts, 12–14 November 2007.

**Plenary Lecture:** “3D Analysis of Multiphase Particles and Particle Beds by Cone Beam X-ray Microtomography for Improved Understanding of Mineral Processing Systems,” J. D. Miller and C. L. Lin, National Meeting on Mineral Processing and Extractive Metallurgy (Encontro Nacional de Tratamento de Minerios e Metalurgia Extrativa – ENTMMME), VII Southern Hemisphere Meeting on Mineral Technology, Ouro Preto, Brazil, 20–24 November 2007.

“Validation of Lattice Boltzmann Modeling of Multiphase Fluids in Porous Media with Micro X-ray Tomography Data,” M. Sukop (presenter), M. Deo, J. D. Miller, H. Huang, and C. L. Lin, 2007 AGU Fall Meeting, San Francisco, California, 10–14 December 2007.

“Gold Adsorption by Activated Carbon: Fundamental Aspects, 3D Micro CT Analysis,” J. D. Miller and Xinkai Jiang (Eriez Mfg.), Barrick Tech Center Meeting, Vancouver, B.C., Canada, 12–13 December 2007.

Three presentations by J. D. Miller, Beneficiation of Phosphates V, ECI Conference, Rio de Janeiro, Brazil, 17–22 February 2008. (1) “Effect of Feed Characteristics on Flotation Performance of Phosphate Ores,” H. El-Shall, R. Stana, G. Wang, M. Raslan, and J. D. Miller. (2) “Liberation Limitations to Phosphate Flotation Recovery and Concentrate Grade as Revealed by 3D X-ray Micro CT Analysis,” J. D. Miller, C. L. Lin, and A. R. Videla. (3) “Structures of Adsorbed Amine at the Quartz Surface,” J. Liu, H. Du, and J. D. Miller.

Nine presentations by J. D. Miller and Research Group, 2008 SME Annual Meeting, Salt Lake City, Utah, 24–27 February 2008. (1) “Magnetic Separation for the Production of High Quality Trona Concentrate,” O. Ozdemir, V. Gupta (presenter), M. Cinar, M. Celik, and J. D. Miller. (2) “Particle Characterization of Phosphate Flotation Feed and Products,” L. Hupka (presenter), C. L. Lin, M. Al-Wakeel, J. Nalaskowski, and J. D. Miller. (3) “The Effect of Particle Size and Other Process Variables in the Stripping of Gold Cyanide from Activated Carbons,” F. Elnathan (presenter), S. Zheng, C. L. Lin, and J. D. Miller. (4) “A Molecular Dynamics Simulation Study of Water Structure and Adsorption States at Talc Surfaces,” H. Du (presenter) and J. D. Miller. (5) “Evaluation of Sulfide Flotation Efficiency by Analysis of Misplaced Particles,” E. Blanco, J. F. Medina (presenter), J. Nalaskowski, and J. D. Miller. (6) “3D Interfacial Area Analysis of Multiphase Particle Breakage,” D. Garcia, C. L. Lin, and J. D. Miller (presenter). (7) “Multiphase Fluid Flow in Porous Media Based on X-ray Computed Tomography Analysis Coupled with the Lattice-Boltzmann Simulation Method,” A. R. Videla (presenter), C. L. Lin, and J. D. Miller. (8) “Advances in 3D Image Analysis of X-ray Micro CT Data for the Characterization of Multiphase Particles and Particles in Mineral Processing,” A. R. Videla, C. L.

## SEMINARS & PRESENTATIONS, cont.

- Lin (presenter), and J. D. Miller. (9) “Direct Measurement of Particle-bubble Interaction Forces Using Atomic Force Microscopy,” S. Assemi (presenter), A. Nguyen, and J. D. Miller.
- “The Development and Application of the Hybrid Centrifugal – Dissolved Air Flotation System for Wastewater Treatment,” M. Colic, A. Lechter, W. Morse, and J. D. Miller, American Filtration and Separation Society Meeting, Valley Forge, Pennsylvania, May 2008.
- “Chemical Utilization of Sequestered Carbon Dioxide as a Booster of Hydrogen Economy,” M. M. Moats (presenter), J. D. Miller, and W. W. Zmierzak, 137<sup>th</sup> Annual TMS Meeting & Exhibition, New Orleans, Louisiana, 9–13 March 2008.
- “Adsorption States of Amphipatic Solutes at the Surfaces of Naturally Hydrophobic Minerals,” J. D. Miller, H. Du, J. Liu, and J. Nalaskowski, 2008 Analysis, Imaging, and Separations (Contractors’) Research Meeting, DOE BES Chemical Science, Geosciences, and Biosciences Division, Annapolis, Maryland, 4–7 May 2008.
- “High-Performance Liquid Hydrocarbon Fuels from Lignin,” W. W. Zmierzak (presenter) and J. D. Miller, International Workshop on Defining Issues in Biofuels R & D, Cetraro (Calabria), Italy, 3–7 August 2008.
- Two presentations by J. D. Miller and Research Group, Sixth International Symposium on Hydrometallurgy (Hydrometallurgy 2008), Phoenix, Arizona, 17–20 August 2008. (1) “Thiocyanate Process Chemistry for Gold Recovery,” J. Li, R. Y. Wan, K. M. LeVier, and J. D. Miller. (2) “Evaluation of Ferric Ion Reductants in Sulfate Based Copper Electrowinning Electrolyte,” R. Bhide, J. Li, M. L. Free (presenter), J. D. Miller, and B. J. Hiskey.
- Two presentations by J. D. Miller Research Group, AUZO 2008 (5<sup>th</sup> International Conference on Oils & Fuels for Sustainable Development), Gdansk, Poland, 8–11 September 2008. (1) “Symmetric Interaction Forces for Hydrophilic & Hydrophobic Surfaces and Nanobubble Phenomenon,” L. Hupka (presenter), H. Du, J. Nalaskowski, and J. D. Miller. (2) “Symmetric Interaction Forces for Hydrophilic & Hydrophobic Surfaces and Characterization of Nanobubble Formation,”(poster), L. Hupka, H. Du, J. Nalaskowski, and J. D. Miller.
- “Particle-Wafer Interactions in Semiaqueous Silicon Cleaning Systems,” L. Hupka, J. Nalaskowski (presenter), W. P. Johnson, and J. D. Miller, Ultra Clean Processing of Semiconductor Surfaces (UCPSS 2008 Conference), Brugge, Belgium, 21–24 September 2008.
- Old Timers Club/National Mining Association Coal Show, Las Vegas, Nevada, 22–24 September 2008. Presentation on the status of mining-related engineering education, programs, and enrollment at the University of Utah, J. D. Miller.
- Two presentations by J. D. Miller Research Group, XXIV International Mineral Processing Congress (24<sup>th</sup> IMPC), Beijing, China, 24–28 September 2008. (1) “Surface States of Flotation Systems as Revealed by SFVS and MDS,” J. D. Miller, H. Du (presenter), and J. Liu. (2) “Surface Chemistry Features in the Flotation of KCl,” F. Cheng (presenter), H. Du, Y. Zhang, J. Liu, J. Nalaskowski, and J. D. Miller.
- “Gas and Sulfide Generation from Groundwater Interaction with an Iron PRB, Fry Canyon, Utah, USA,” D. Naftz (presenter), C. Fuller, B. Stolp, T. Snyder, C. L. Lin, and J. D. Miller, 2008 USEPA/NGWA Remediation of Abandoned Mine Lands Conference, Denver, Colorado, 2–3 October 2008.
- “Fundamental Aspects of Carbonate and Bicarbonate Salt Flotation,” O. Ozdemir (presenter), C. Karaguzel, A. V. Nguyen, M. S. Celik, and J. D. Miller, Chemeca (Towards a Sustainable Australasia), Newcastle, Australia, 28 September–1 October 2008.
- “Interaction Forces for Hydrophilic & Hydrophobic Surfaces and Nanobubbles as Studied by Atomic Force Microscopy and Molecular Dynamics Simulations,” L. Hupka (presenter), H. Du, J. Nalaskowski, and J. D. Miller, NanoUtah ‘08 Conference, University of Utah, Salt Lake City, Utah, 16–17 October 2008.
- Invited Presentation:** “Interfacial Surfactant Structures and their Significance in Particle Separation by Froth Flotation,” J. D. Miller, 2008 Contractors’ Meeting on Condensed Phase and Interfacial Molecular Science (CPIMS 2008), Warrenton, Virginia, 19–22 October 2008.

SEMINARS & PRESENTATIONS, cont.

- “Surface Characterization of Selected Mineral Fillers Using Atomic Force Microscopy,” B. Benli (presenter), J. Nalaskowski, M. S. Celik, and J. D. Miller, 11<sup>th</sup> International Mineral Processing Symposium, Belek, Antalya, Turkey, 21–23 October 2008.
- Congratulatory remarks, J. D. Miller, D. W. Fuerstenau Birthday Celebration, Emeryville, California, 11–12 December 2008.
- “Interfacial Chemistry in Nonsulfide Mineral Flotation Systems,” J. D. Miller, PNNL Seminar, Richmond, Washington, 22-23 January 2009.
- “Ideal Grade/Recovery Curves from X-ray Micro CT Analysis of Feed Material for the Evaluation of Separation Efficiency,” J. D. Miller, C. L. Lin, M. I. Al-Wakeel, and L. Hupka, 2009 Somasundaran Symposium, Innovations in Minerals Research, Operations and Education for Sustainable Development, 2009 SME Annual Meeting, Denver, Colorado, 22–25 February 2009.
- Four presentations by J. D. Miller Research Group, 237<sup>th</sup> ACS National Meeting, Salt Lake City, Utah, 22–26 March 2009. (1) “Detection, Separation, and Quantification of Unlabeled Silica Nanoparticles in Biological Media Using Sedimentation Field-flow Fractionation,” S. Tadjiki (presenter), S. Assemi, C. E. Deering, J. M. Veranth, and J. D. Miller. (2) “Investigation of Stability of Nanoparticles Using Asymmetrical Flow Field-flow Fractionation and Atomic Force Microscopy,” S. Tadjiki, S. Assemi (presenter), B. C. Donose, A. Nguyen, and J. D. Miller. (3) “A Comparative Study of ZnO-CuO-Al<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> Composite and Hybrid Catalysts for Direct Synthesis of Dimethyl Ether from Syngas,” S. P. Naik, H. Wan, S. Bali, J. D. Miller, and W. W. Zmierczak. (4) “Improvement in Catalytic Activity of Al-MCM-41 Mesoporous Molecular Sieve,” S. P. Naik, S. Bali, H. Du, E. M. Eyring, J. D. Miller, and W. W. Zmierczak.
- “Minerals, Materials, and Energy, the Sustainable Utilization of Our Earth Resources,” J. D. Miller, Potomac Advocates, University of Utah, Salt Lake City, Utah, 23 March 2009.
- “X-ray Micro CT for 3D Characterization, Analysis, and Simulation of Multiphase Systems,” J. D. Miller, John & Virginia Towers Distinguished Lecture, Materials Science and Engineering Department, Michigan Technological University, Houghton, Michigan, 10 April 2009.
- “Advanced 3D Multiphase Flow Simulation in Porous Media Reconstructed from X-ray Micro Tomography Data Using the He-Chen-Zhang Lattice Boltzmann Model,” C. L. Lin (presenter), A. R. Videla, and J. D. Miller, 3<sup>rd</sup> International Workshop on Process Tomography (IWPT-3), Tokyo, Japan, 17–19 April 2009.
- Member of Advisory Committee**, HydroCopper 2009, V International Copper Hydrometallurgy Workshop, Antofagasta, Chile, 13–15 May 2009.
- “Mineral Processing and Hydrometallurgy Research,” J. D. Miller, Lecture, Kunming University of Science and Technology (KUST), Kunming, China, 18 May 2009.
- “Developments in Copper Ore Processing,” J. D. Miller, Lecture, China Yunnan Metallurgy Company (CYMCO), Research Institute, Kunming, China, 19 May 2009.
- “Interaction Forces between Hydrophilic and Hydrophobic Surfaces in Semiaqueous Systems,” L. Hupka (presenter), J. Nalaskowski, and J. D. Miller, 13<sup>th</sup> IACIS International Conference on Surface and Colloid Science/83<sup>rd</sup> ACS Colloid & Surface Science Symposium, Columbia University, New York, 14–19 June 2009.
- “Characterization of Water-soluble C<sub>60</sub>(OH)<sub>24</sub> Fullerol Nanoparticles Using Asymmetrical Flow Field-flow Fractionation and Atomic Force Microscopy,” S. Assemi, S. Tadjiki (presenter), B. Donose, A. V. Nguyen, and J. D. Miller, 14<sup>th</sup> International Symposium on Field- and Flow-based Separations (FFF-2009 Symposium), Patras, Greece, 5–8 July 2009.
- “Study of Aggregation of Hydrophilic and Hydrophobic Nanoparticles Using Flow and Sedimentation Field-Flow Fractionation,” S. Assemi (presenter), S. Tadjiki, A. V. Nguyen, and J. D. Miller, Application of Field-Flow Fractionation in Characterization of Macromolecules and Nanoparticles Symposium, 238<sup>th</sup> National Meeting & Exposition, Washington DC, 16–19 August 2009.

## SEMINARS & PRESENTATIONS, cont.

- “High Resolution X-ray Micro CT (HRXMT) – Advances in 3D Particle Characterization for Mineral Processing Operations,” J. D. Miller and C. L. Lin, Mineral Processing Plant Design – An Update, Tucson, Arizona, 30 September –3 October 2009.
- “Anisotropic Surface Chemistry Features of Kaolinite Particles as Revealed by AFM Surface Force Measurements,” V. Gupta (presenter) and J. D. Miller, nanoUtah 2009, Salt Lake City, Utah, 15–16 October 2009.
- “Pore-scale Analysis of Pyrolyzed Oil Shale Cores,” C. L. Lin, J. D. Miller, C. H. Hsieh, P. Tiwari, and M. D. Deo (presenter), 29<sup>th</sup> Oil Shale Symposium, CSM, Boulder, Colorado, 19–23 October 2009.
- Inaugural Lecture:** “High Resolution X-ray Micro CT (HRXMT) – Advances in 3D Particle Characterization for Mineral Processing Operations,” J. D. Miller, International Seminar on Mineral Processing Technology (MPT–2009). Bhubaneswar, India, 28–30 October 2009. **Member of Advisory Committee**
- “3D Liberation Analysis of Feed and Products from Copper Flotation Circuits Using High Resolution X-ray Micro CT (HRXMCT),” J. D. Miller, C. L. Lin, A. Videla (presenter), and J. F. Medina, VI International Mineral Processing Seminar (PROCEMIN 2009), Santiago, Chile, 2–4 December 2009.
- Seven Presentations by J. D. Miller Research Group, 2010 SME Annual Meeting, Phoenix, Arizona, 28 February– 3 March 2010. (1) “Particle Damage during Breakage Using High Resolution X-ray Micro CT,” C. L. Lin (presenter) and J. D. Miller. (2) “Surface Chemistry Features of Kaolinite as Revealed by Advanced Analytical Techniques,” V. Gupta (presenter), X. Wang, and J. D. Miller. (3) “Effect of Water Chemistry on Copper Sulfide Flotation,” J. F. Medina (presenter), R. Kappes, J. C. Gathje, and J. D. Miller. (4) “Reverse Flotation to Concentrate Low Grade Chinese Bauxite Ores,” X. Wang (presenter), Q. Zhao, J. Sheng, H. Zhang, Xiaoli Wang, and J. D. Miller. (5) “States of Adsorbed Amine and Interfacial Water at a Silica Surface as Revealed by MDS and Vibrational Spectroscopy,” X. Wang (presenter), J. Liu, H. Du, and J. D. Miller. (6) “Fundamental Analysis and Simulation of Fine Coal Filtration,” C. L. Lin (presenter), A. Mejia, A. R. Videla, and J. D. Miller. (7) “Stucco Binder for Agglomeration in Copper Heap Leaching,” P. Kodali (presenter), X. Wang, C. L. Lin, and J. D. Miller.
- “3D Characterization of Porosity and Multiphase Particle Properties in Geomaterials with a Novel Lab Based Multiscale CT at a Voxel Resolution below 50 nm,” Poster Presentation, S. H. Lau (presenter), J. D. Miller, C. L. Lin, T. Fong, L. Hunter, and J. Gelb, GeoX 2010 (3<sup>rd</sup> Intl Workshop on X-ray CT for Geomaterials), New Orleans, Louisiana, 28 February–3 March 2010.
- “Using Electrochemical Impedance Spectroscopy to Investigate Gold Dissolution in Thiourea and Thiocyanate Acid Solutions,” X. Yang, M. S. Moats (presenter), and J. D. Miller, 8<sup>th</sup> International Symposium on Electrochemistry in Mineral and Metal Processing (EMMP8), in conjunction with 217<sup>th</sup> Electrochemical Society Meeting, Vancouver, Canada, 25–30 April 2010.
- “Surface Chemistry Issues in the Development of Flotation Technology for the Processing of Low Grade Bauxite Resources,” Poster Presentation, J. D. Miller, Office of Basic Energy Sciences Separations and Analysis Contractors’ Meeting, Baltimore, Maryland, 25–28 April 2010.
- Two presentations by J. D. Miller Research Group, International Coal Preparation Congress, Lexington, Kentucky, 26–29 April 2010. (1) “Fine Coal Filtration as Revealed by 3D Lattice-Boltzmann Simulations,” C. L. Lin (presenter) and J. D. Miller. (2) “Advances in X-ray Computed Tomography for Improved Coal Washability Analysis,” C. L. Lin (presenter) and J. D. Miller.
- “Pore Scale Analysis of Oil Sand/Oil Shale Pyrolysis by X-ray Micro CT and LB Simulation,” C. L. Lin, J. D. Miller, C. H. Hsieh (presenter), Poster Presentation, U of U Unconventional Fuels Conference, ICSE Meeting, Salt Lake City, Utah, 28 April 2010.
- “The Many Dimensions of Particulate Systems,” J. D. Miller, Gdansk University of Technology, Awarding of Doctor Honoris Causa, Gdansk, Poland, 24 May 2010.

## SEMINARS & PRESENTATIONS, cont.

- “Utah Science Technology & Research (USTAR) Update,” J. D. Miller, Gdansk University of Technology – The Entrepreneurial University of XXI Century Conference, and 65<sup>th</sup> Anniversary of GUT, Gdansk, Poland, 25 May 2010.
- “Case for Non Invasive 3D Imaging of Materials at Multiscale Resolution with Lab Based X-ray Tomography,” S. H. Lau (presenter), J. D. Miller, and C. L. Lin, 2<sup>nd</sup> Conference on 3D-Imaging of Materials and Systems 2010, Hourtin, France, 6–10 September 2010.
- Two presentations by J. D. Miller Research Group, XXV International Mineral Processing Congress (IMPC 2010), Brisbane, Australia, 6-10 September 2010. (1) **Keynote Address:** “Characterization, Analysis, and Simulation of Multiphase Particulate Systems Using High Resolution X-ray Micro Tomography (HRMXT),” J. D. Miller. (2) “Significance of Ion Interactions in Flotation in Saline and Brine Solutions,” O. Ozdemir, A. V. Nguyen (presenter), J. D. Miller, and M. S. Celik.
- “Further Analysis of the Rheological Behavior of Kaolinite,” V. Gupta (presenter), J. D. Miller, and A. V. Nguyen, 49<sup>th</sup> Conference of Metallurgists (COM 2010), Vancouver, BC, Canada, 3–6 October 2010.
- “Effect of Comminution Method on Internal Particle Crack Density,” M. S. Moats (presenter), J. D. Miller, C. L. Lin, and R. Rajamani, Workshop on the Lunar Applications of Mining and Mineral Beneficiation, Butte, Montana, 5–7 October 2010.
- “Surface and Colloidal Chemistry of Kaolinite,” J. D. Miller, 3<sup>rd</sup> Dreyer Conference on Specialty Clays – Geology, Production & Markets, Chicago, Illinois, 10–17 October 2010.
- “Flow Simulation with the Lattice Boltzmann Method in 3D Porous Structures of Pyrolyzed Oil Shale Cores Using Multiscale X-Ray CT Imaging,” C. L. Lin (presenter), J. D. Miller, and Ching Hao Hsieh, AIChE Annual Meeting, Salt Lake City, UT, 7–12 November 2010.
- Two presentations by J. D. Miller Research Associates, Mineral Processing Technology Conference (MPT-2010), Jamshedpur, India, 15–17 December 2010. (1) “The Settling Rate of Kaolinite Particles,” A. Bajaj, V. Gupta (presenter), J. D. Miller, and V. K. Gupta. (2) “Effect of Stucco, as a Binder for Agglomeration, on Copper Recovery from Column Leaching Experiments,” J. P. Patel (presenter), P. Kodali, T. Depci, X. Wang, C. L. Lin, and J. D. Miller.
- “States of Water and Adsorbed Dodecyl Amine (DDA) at Silica Surfaces Based on MD Simulations,” X. Yin, H. Du, X. Wang, and J. D. Miller (presenter), Symposium: Recent Advances in Studies of Molecular Processes at Liquid Interfaces, 2010 International Chemical Congress of Pacific Basin Societies (Pacifichem 2010), Honolulu, Hawaii, 15–20 December 2010.
- Four presentations by J. D. Miller and Research Associates, Roe-Hoan Yoon International Symposium on Advanced Separation Processes and Resource Engineering, 2011 SME Annual Meeting, Denver, Colorado, 27 February–2 March 2011. (1) **Keynote Address:** “The Surface Chemistry of Layered Silicate Minerals,” J. D. Miller (presenter), V. Gupta, H. Du, X. Wang, X. Yin, and J. Wang. (2) “Evaluation of Pyrite Flotation Efficiency Using Liberation-Limited Grade/Recovery Curves,” J. F. Medina (presenter), C. L. Lin, and J. D. Miller. (3) “The Flotation of a Brazilian Bauxite Ore,” S. L. Marino (presenter), X. Wang, C. L. Lin, and J. D. Miller. (4) “Interfacial Chemistry Features of Selected Fluorite Surfaces,” X. Zhang (presenter), X. Wang, X. Yin, H. Du, and J. D. Miller.
- Three presentations by J. D. Miller Research Associates, 2011 SME Annual Meeting, Denver, Colorado, 27 February–2 March 2011. (1) “Waste Materials for the Treatment of Contaminated Water,” X. Wang (presenter), F. Cheng, L. Cui, and J. D. Miller. (2) “Potential Photocatalysts for Oil Spill Mitigation,” A. Zaleska, A. Zielinski-Jurek, E. Grabowska, J. Hupka (presenter), and J. D. Miller. (3) “Oil-Water Separation in the Spinning Fluids Reactor,” R. Aranowski, M. Niewiadomski, J. Hupka (presenter), and J. D. Miller.
- “The Leaching of Gold in Acid Thiourea-thiocyanate Solutions Using Ferric Sulfate as Oxidant,” X. Yang, X. Shi (presenter), H. Xu, M. S. Moats, J. D. Miller, X. Xiao, and L. Ma, 2011 TMS Annual Meeting & Exhibition, San Diego, California, 27 February–3 March 2011.

## SEMINARS & PRESENTATIONS, cont.

“Characterization, Analysis, and Simulation of Multiphase Particulate Systems,” J. D. Miller, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, China, 6 March 2011.

Two presentations by J. D. Miller and Research Group, International Conference, Beneficiation of Phosphates VI, Kunming, Yunnan, China, 6–11 March 2011. (1) **Plenary Lecture:** “Advanced Instrumentation for Mineral Liberation Analysis and Use in the Phosphate Industry,” J. D. Miller (presenter), C. L. Lin, I. S. Ismael, X. Wang, and P. Zhang. (2) “Magnetic Column Flotation for Magnetite Removal from a Brazilian Phosphate Ore,” S. Marino (presenter), M. Birinci, M. Sarikaya, X. Wang, C. L. Lin, and J. D. Miller.

“The Surface Chemistry of Layered Silicate Minerals,” J. D. Miller (presenter), V. Gupta, X. Yin, X. Wang, H. Du, and J. Wang, lecture presented at awarding of Honorary Professorship, Kunming University of Science and Technology, Kunming, Yunnan, China, 18 March 2011.

Seminar, J. D. Miller, University of Shanxi, Taiyuan, Shanxi Province, China, 19 March 2011.

“3D Characterization, Analysis, and Simulation of Multiphase Particulate Systems in Mineral Processing Using X-ray Computed Tomography,” J. D. Miller, Seminar, Virginia Tech, Blacksburg, Virginia, 27 April 2011.

“Advanced Water Treatment Improves Swimming Pool Safety,” A. Korkosz (presenter), S. Assemi, J. Hupka, and J. D. Miller, 5<sup>th</sup> Annual Salt Lake Countywide Watershed Symposium, West Valley City, Utah, 10–12 August 2011.

“3D Characterization of Porous and Multiphase Materials with High Contrast and Multiscale Resolutions,” S. H. Lau (presenter), J. D. Miller, and C. L. Lin, 4<sup>th</sup> International Workshop on Process Tomography (IWPT4), Chengdu, China, 21–23 September 2011.

“Study of the Stability of Silver Nanoparticles Using Sedimentation Field-flow Fractionation,” S. Assemi (presenter), V. Boss, P. Hooker, and J. D. Miller, nanoUtah, Salt Lake City, Utah, 13–14 October 2011.

“Bridging the 3D Sample Size, Sample Preparation and Contrast Gaps in Electron Microscopy – for Hard to Soft Materials,” S. H. Lau (presenter), J. D. Miller and C. L. Lin, XXIII Congress of the Brazilian Society for Microscopy & Microanalysis, Rio de Janeiro, Brazil, 15–18 October 2011.

**Keynote Address:** “Sustainability through Resource Consideration and Recycling in the Mineral Industry,” J. D. Miller and X. Wang, 2011 IEEE International Conference on Waste Recycling, Ecology and Environment (2011 ICWREE), Mianyang, Sichuan, China, 15-22 October 2011.

**Keynote Address:** “3D Characterization, Analysis, and Simulation of Multiphase Particulate Systems in Mineral Processing Using X-ray Computed Tomography,” J. D. Miller, 33<sup>rd</sup> International Congress in Metallurgy and Materials, Saltillo, Mexico, 9–11 November 2011.

Short Course, “Technological Innovations for the Recovery of Gold and Silver,” J. D. Miller, Saltillo Institute of Technology, Saltillo, Mexico, 9–11 November 2011.

Seven presentations by J. D. Miller and Research Associates, 2012 SME Annual Meeting, Seattle, Washington, 19–22 February 2012. (1) “Particle Aggregation and Sedimentation Characteristics of Kaolinite Suspensions as Explained by Surface Charge Considerations,” J. D. Miller (presenter) and V. Gupta. (2) “Induction Time Measurements for Air Bubbles on Chalcopyrite, Bornite and Gold in Seawater,” J. Drelich (presenter) and J. D. Miller. (3) “Acid Bake-leach Process for the Treatment of Enargite Concentrates,” M. S. Safarzadeh (presenter), M. S. Moats, and J. D. Miller. (4) “Water Structure at Hydrophobic Surfaces,” J. D. Miller. (5) “Collector/Frother Distribution during Bubble Attachment and Detachment,” X. Wang (presenter) and J. D. Miller. (6) “Influence of Textural Features on the Flotation of Locked Pyrite Particles,” J. F. Medina, C. L. Lin (presenter), and J. D. Miller. (7) “Water Structure Influence on the Flotation of Arcanite (K<sub>2</sub>SO<sub>4</sub>) and Epsomite (MgSO<sub>4</sub>·7H<sub>2</sub>O),” F. Cheng, Q. Cao, Y. Guan, X. Wang (presenter), and J. D. Miller.

“The Flotation of a Brazilian Bauxite Ore,” S. Marino (presenter), X. Wang, C. L. Lin, and J. D. Miller, International Alumina Quality Workshop, Perth, Australia, 18–22 March 2012.



## SEMINARS & PRESENTATIONS, cont.

- “Polarization and High-Resolution Vibrational Spectroscopy on Liquid and Liquid/Solid Interfaces: Atmospheric and Geochemical Perspective,” Z. Lu, X. Zhang, L. Velarde, X. Wang, J. D. Miller and H. Wang (presenter), Atmospheric and Geochemical Interfaces Symposium, 2012 Spring Meeting, ACS, San Diego, California, 25–29 March 2012.
- “High Resolution X-ray Microtomography for Particle Texture Analysis in the Flotation of Locked Pyrite Particles,” J. F. Medina, C. L. Lin (presenter), J. D. Miller, S. H. Lau, and M. Feser, 6<sup>th</sup> International Symposium on Process Tomography, Cape Town, South Africa, 26–28 March 2012.
- Invited Guest Speaker, Department of Chemical and Materials Engineering, University of Alberta, Edmonton, Alberta, Canada, 16–19 April 2012. Two presentations by J. D. Miller: (1) “3D Characterization, Analysis, and Simulation of Multiphase Particulate Systems in Mineral Processing Using X-ray Computed Tomography.” (2) “Water Structure at Hydrophobic Surfaces.”
- “Surface Chemistry Issues in the Development of Nonsulfide Flotation Technology,” J. D. Miller and X. Wang, DOE Office of Basic Energy Sciences, 2012 Separations and Analysis Meeting, Annapolis, Maryland, 22–25 April 2012.
- Four seminars by J. D. Miller, KIGAM, Daejeon, Korea, 2–3 July 2012. (1) “Activated Carbon for Gold Recovery from Alkaline Cyanide Solutions.” (2) “3D Characterization, Analysis, and Simulation of Multiphase Particulate Systems in Mineral Processing using X-ray Computed Tomography.” (3) “Surface Chemistry Advances in Mineral Flotation Systems.” (4) “Developments in the Processing of Copper Ores.”
- “Surface Chemistry Advances in Mineral Flotation Systems,” J. D. Miller, Conference on Efficient Utilization of Low Grade Potassium Ore, Qinghai University, Xining, China, 24–27 July 2012.
- Two presentations by J. D. Miller, ECI Conference, Rare Earth Minerals/Metals – Sustainable Technologies for the Future, San Diego, California, 12–17 August 2012. (1) “Rapid Scan Radiography and High Resolution X-ray Micro Tomography for the Analysis of Rare Earth Resources,” J. D. Miller, C. L. Lin, and K. Hsieh. (2) “Surface Chemistry Features Associated with Bastnaesite Flotation,” J. D. Miller, X. Zhang, X. Wang, and H. Du.
- “Molecular Features of Water in the Wetting of Mineral Surfaces,” J. D. Miller, ACS National Meeting, Philadelphia, Pennsylvania, 19–23 August 2012.
- Three presentations by J. D. Miller and Research Associates, XXVI International Mineral Processing Congress (IMPC 2012), New Delhi, India, 24–28 September 2012. (1) “Particle Damage during HPGR Breakage as Described by Specific Surface Area Distribution of Cracks in the Crushed Products,” C. L. Lin, J. D. Miller and C. H. Hsieh. (2) Molecular Features of Water Films Created with Bubbles at Hydrophilic and Hydrophobic Surfaces,” X. Wang (presenter), X. Yin, J. Nalaskowski, H. Du, and J. D. Miller. (3) “3D Mineralogy, Texture and Damage Analysis of Multiphase Mineral Particles with a High Contrast, Submicron Resolution X-ray Tomography System,” S. H. Lau (presenter), J. D. Miller, and C. L. Lin.
- Plenary Lecture:** “Advances in X-ray Tomography in the Processing of Mineral Resources,” J. D. Miller, XXVI International Mineral Processing Congress (IMPC 2012), New Delhi, India, 24–28 September 2012.
- “Study of the Interaction of Silver Nanoparticles with Bovine Serum Albumin (BSA) Using Sedimentation Field-flow Fractionation,” S. Assemi (presenter), T. Depci, S. Tadjiki, K. Prsbrey, P. Hooker, and J. D. Miller, nanoUtah 2012, Salt Lake City, Utah, 10–12 October 2012.
- Invited Speaker:** Two presentations by J. D. Miller, First International Meeting, Metallurgy Peru 2012, Lima, Peru, 23–30 October 2012. (1) “3D Characterization, Analysis, and Simulation of Multiphase Particulate Systems in Mineral Processing Using X-ray Computed Tomography.” (2) “Fundamental Features of Gold Adsorption from Alkaline Cyanide Solution by Activated Carbon.”
- Invited Short Courses:** Two short courses by J. D. Miller, Ministry of Mines, Lima, Peru, 25 October 2012. (1) “Advances in Liberation Analysis.” (2) “Fundamental Aspects of Flotation Chemistry.”

## SEMINARS & PRESENTATIONS, cont.

“Characterization of the Oil Shale Core Pore Structure before and after Pyrolysis,” P. Tiwari, M. D. Deo, J. D. Miller, and C. L. Lin, AIChE 2012 Annual Meeting, Pittsburgh, Pennsylvania, 28 October–2 November 2012.

**Keynote Lecture:** “The Continued Development of X-ray CT as an Effective Tool in Process Mineralogy,” J. D. Miller, Process Mineralogy 12, 2<sup>nd</sup> International Symposium on Process Mineralogy, Cape Town, South Africa, 7–9 November 2012.

“Characterization of Elastin-Like Polypeptides and Peptide-Fullerol Conjugates using Flow Field-Flow Fractionation,” S. Tadjiki (presenter), S. Assemi, T. Havard, J. D. Miller, Y. Chen, and D. Furgesen, 17<sup>th</sup> Symposium on the Interface of Regulatory and Analytical Sciences for Biotechnology Health Products (WCBP 2013), Washington, DC, 29–31 January 2013.

Five presentations by J. D. Miller and Research Associates, 2013 SME Annual Meeting, Denver, Colorado, 24–27 February 2013. (1) “Correction for 3D Segmentation of X-ray Tomographic Data,” Y. Wang (presenter), C. L. Lin, and J. D. Miller. (2) “Dual Energy Rapid Scan Radiography for Geometallurgy Evaluation and Isolation of Trace Mineral Particles,” Tsend-Ayush Tserendagva (presenter), K. Hsieh, C. L. Lin, and J. D. Miller. (3) “Flotation of Halite/Sylvite from Carnallite ( $\text{KMgCl}_3 \cdot 6\text{H}_2\text{O}$ ) with Dodecyl Morpholine,” X. Wang (presenter), B. Pan, H. Cheng, and J. D. Miller. (4) “Interfacial Chemistry Features of Selected Fluorite Surfaces,” X. Zhang (presenter), X. Wang, X. Yin, H. Du, and J. D. Miller. (5) “Surface Chemistry Analysis of Collector Adsorption in Kaolinite Flotation Systems,” J. Liu (presenter), X. Wang, and J. D. Miller.

**Wadsworth Award Lecture,** “X-ray Tomography for the 3D Analysis of Hydrometallurgical Systems,” J. D. Miller, 2013 SME Annual Meeting, Denver, Colorado, 24–27 February 2013.

“The Application of Machine Learning to the Problem of Classifying Voxels in X-ray Microtomographic Scans of Mineralogical Samples,” W. J. Shipman, A. L. Nel, D. Chetty (presenter), J. D. Miller and C. L. Lin, IEEE ICIT 2013 International Conference on Industrial Technology, Cape Town, South Africa, 25–27 February 2013.

“Application of X-ray Computed Tomography (CT) for Coal Washability Analysis,” A. V. Nguyen, T. Nguyen, J. D. Miller and C. L. Lin, ACARP Workshop, Brisbane, Australia, 23–29 March 2013.

**Invited Short Course:** “Fundamental Aspects of Flotation Chemistry,” J. D. Miller, Gdansk University of Technology, Gdansk, Poland, 9–20 May 2013.

**Invited Discussion Leader:** Student’s Licentiate Thesis Defense, Luleå, Sweden, 1–5 June 2013.

**Invited Seminar:** “The Continued Development of X-ray Computed Tomography as an Effective Tool in Process Mineralogy,” J. D. Miller, Luleå University of Technology, Luleå, Sweden, 3 June 2013.

**Invited Lecture:** “Selected Topics in Coal Preparation,” J. D. Miller, China University of Mining and Technology (CUMT), Xuzhou, China, 24 June 2013.

**Invited Lecture:** “Recent Trends in the Processing of Enargite,” J. D. Miller, College of Metallurgical Science and Engineering, Central South University, Changsha, China, 28 June 2013.

“High Resolution X-ray Microtomography for Micro Finite Element Analysis of the Mechanical Properties of Cellular Material,” C. L. Lin (presenter), N. Kumar, and J. D. Miller, 7<sup>th</sup> World Congress on Industrial Process Tomography (WCIPT 7), Krakow, Poland, 2–5 September 2013.

“Experimental and Theoretical Study on Styrax Officinalis Activated Carbon Adsorption of Lead and Zinc from Aqueous Solution,” T. Depci (presenter), A. R. Kul, K. A. Prsbrey, Y. Onal, and J. D. Miller, Porous and Powder Materials Symposium and Exhibition (PPM 2013), Izmir, Turkey, 3–6 September 2013.

“The Flotation of a Gibbsite Bauxite Ore from Paragominas,” S. Marino (presenter), X. Wang, C. L. Lin, and J. D. Miller, VIII Meeting of the Southern Hemisphere on Mineral Technology (MSHMT) XXV Encontro Nacional de Tratamento de Minerios e Metalurgia Extrativa (ENTMME), Goiania, Brazil, 20–24 October 2013.

## SEMINARS & PRESENTATIONS, cont.

- “Potash Flotation Practice for Carnallite Resources in the Qinghai Province, PRC,” X. Wang (presenter), J. D. Miller, F. Cheng, and H. Cheng, Flotation '13, Cape Town, South Africa, 18–21 November 2013.
- “Understanding the Effect of CO<sub>2</sub> on the Apatite Flotation from Catalao’s Siliceous Carbonate Phosphate Ore,” X. Wang, J. D. Miller, E. Matiolo, E. Ferreira, A. Avelar, K. Goncalves, and L. A. F. Barros (presenter), Flotation '13, Cape Town, South Africa, 18–21 November 2013.
- “Evaluation of Crushed Ore Agglomeration for Copper Ores,” N. Dhawan, M. S. Moats, M. L. Free (presenter), R. K. Rajamani, J. D. Miller, and C. L. Lin, Copper 2013, Santiago, Chile, 1–4 December 2013.
- Ten presentations by J. D. Miller and Research Associates, 2014 SME Annual Meeting, Salt Lake City, Utah, 23–26 February. (1) “Improved Calibration Procedure for Coal Washability by X-ray Micro Tomography,” Y. Wang (presenter), C. L. Lin, J. D. Miller, T. D. Nguyen, and A. V. Nguyen. (2) “Effect of Activated Carbon Particle Size on the Adsorption/Desorption of Gold from Alkaline Cyanide Solution,” D. Bhattacharyya (presenter), T. Depci, F. Elnathan, and J. D. Miller. (3) “The Edge Surface of Kaolinite and Its Surface Chemistry,” J. Liu (presenter), X. Wang, T. Depci, and J. D. Miller. (4) “Fundamental Aspects of Fine Coal Filtration,” J. A. Mejia (presenter), C. L. Lin, and J. D. Miller. (5) “Octyl Hydroxamate Adsorption by Bastnaesite – the Hydrophobic Surface State,” X. Zhang (presenter), H. Du, X. Wang, and J. D. Miller. (6) “The Significance of Acid Bake-leach Reactions and Process Design for Enargite Concentrates,” S. Safarzadeh (presenter) and J. D. Miller. (7) “Effect of Size on the Surface Properties of Nano Kaolinite Particles,” S. Assemi (presenter), S. Sharma, D. Allen, S. Tadjiki, J. Ranville, and J. D. Miller. (8) “Selective Flotation of Phosphate from Calcite/Dolomite with CO<sub>2</sub> Gas,” X. Wang (presenter), J. D. Miller, E. Ferreira, and E. Matiolo. (9) “Investigation of Clay Swelling Using Sedimentation Field-flow Fractionation,” S. Assemi (presenter), S. Sharma, S. Tadjiki, K. Prisbrey, J. Ranville, and J. D. Miller. (10) “Improved Image Fidelity in the 3D Tomographic Analysis of Packed Particle Beds,” J. D. Miller and C. L. Lin (presenter). (11) “Reducing MgO Content in Florida Phosphate Concentrate,” P. Zhang (presenter), S. Zheng, W. Song, X. Ma, and J. D. Miller.
- “Surface Chemistry Aspects of Bastnaesite (Ce, LaFCO<sub>3</sub>) Flotation with Octyl Hydroxamate,” J. D. Miller, X. Zhang, and X. Wang (Poster), DOE 2014 Separation and Analysis PI Meeting, Gaithersburg, Maryland, 27–29 April 2014.
- “Reactive Transport Models with Geomechanics to Mitigate Risks of Carbon Dioxide Utilization and Storage,” M. Deo, C.L. Lin (presenter), J.D. Miller, H. Huang, and T.L. McLing, DOE Contractors Review Meeting, Carbon Storage R & D Project, Pittsburgh, Pennsylvania, 12–14 August 2014.
- “Surface Chemistry Aspects of Polysaccharide Depressants in Mineral Flotation Systems,” K. Shrimali (presenter) and J.D. Miller, ASISC Annual Meeting, Houghton, Michigan, 14–15 August 2014.
- Plenary Lecture:** “Progress in X-ray Tomography for the 3D Characterization, Analysis, and Simulation of Particles in Mineral Processing Systems,” J.D. Miller, Minerals Engineering Conference, Beskidy Mountains, Poland, 15–18 September 2014.
- Invited Seminar:** “Progress in X-ray Tomography for the 3D Characterization, Analysis, and Simulation of Multiphase Particulate Systems in the Processing of Mineral Resources,” J.D. Miller, Carnegie Mellon University, Dept. of Materials Science and Engineering, Pittsburgh, Pennsylvania, 3 October 2014.
- “Size-Dependent Swelling of Montmorillonite Clay Particles,” S. Assemi (presenter), S. Sharma, S. Tadjiki, J. Ranville, and J.D. Miller, 17<sup>th</sup> International Symposium on Field and Flow-based Separations (FFF 2014), Salt Lake city, Utah, 12–16 October 2014.
- “Feature Based Classification to Improve Image Segmentation in the 3D Analysis of Packed Particle Beds,” C.L. Lin (presenter), Y. Wang, and J.D. Miller, Process Mineralogy '14, Cape Town, South Africa, 17–19 November 2014.

## SEMINARS & PRESENTATIONS, cont.

Five presentations by J. D. Miller and Research Associates, SME Annual Meeting, Denver, Colorado, 15–18 February 2015. (1) “Cluster Formation in Kaolinite Suspensions,” J. Liu (presenter), C.L. Lin, and J.D. Miller. (2) “Flow Simulation in Porous Structures by Lattice-Boltzmann Methods,” A. Videla, C.L. Lin (presenter), and J.D. Miller. (3) “Surface Exposure of Mineral Grains in Multiphase Particles.” Y. Wang (presenter), C.L. Lin, and J.D. Miller. (4) “Surface Chemistry of Bastnaesite Flotation with Lauryl Phosphate Collector,” W. Liu (presenter), X. Wang, and J.D. Miller. (5) “Reaction of Enargite in Hot Concentrated Sulfuric Acid,” S. Safarzadeh (presenter) and J.D. Miller.

**Two Keynote Presentations**, 7<sup>th</sup> International Conference on Phosphate Beneficiation, Beneficiation of Phosphates VII, Melbourne, Australia, 29 March–3 April 2015. (1) Advances in Particle Characterization for Improved Mineral Processing Technology,” J.D. Miller and C.L. Lin. (2) “The Surface and Colloid Chemistry of Layered Silicate Minerals,” J.D. Miller and J. Liu.

“Now X-ray Tomographic Washability Analysis is Possible for On-line Control in Coal Preparation Plants,” J.D. Miller, C.L. Lin, S. Saurabh (presenter), and H. Gurnani, Coal Beneficiation (Coal Prep Society of India, CPSI), New Delhi, India, 16–17 April 2015.

**Invited Presentation**, “The Complexities of Clay Cluster Formation, Flocculation, and Consolidation,” J.D. Miller and J. Liu, SME MPD 65<sup>th</sup> Annual Meeting, “Complexity in Mining,” Colorado Springs, Colorado, 23–25 April, 2015.

“The Nature of Graphene Surfaces as Determined from the Wettability Studies of Basal and Edge Planes,” D. Bhattacharyya (presenter), T. Depci, S. Assemi, and J.D. Miller, 227<sup>th</sup> ECS Meeting (Electrochemical Society 2015 – Carbon Nanostructures and Devices), 24–28 May 2015.

**Invited Seminar**, “Features of the Hydrophobic Surface State for Mineral Flotation Systems,” J.D. Miller, Oak Ridge National Laboratories (ORNL), Oak Ridge, Tennessee, 23–25 June 2015.

**Invited Seminar**, “Sample Characterization with High Speed X-ray Tomography, A Geometallurgy Tool for Mine-to-Mill Optimization,” J.D. Miller, Virginia Tech, Blacksburg, Virginia, 25–27 June 2015.

“Effect of Polymer Flocculants on Kaolinite Structures,” S. Sharma (presenter), C.L. Lin, and J.D. Miller, MPT 2016, Pune, India, 5–7 January 2016. Member of International Advisory Committee.

Seven presentations by J. D. Miller and Research Associates, SME Annual Meeting, Phoenix, Arizona, 21–24 February 2016. (1) “Alkyl Phosphates for the Flotation of Nonsulfide Minerals,” W. Liu, Z. Wang, V. Truong, X. Wang, and J.D. Miller (presented by B. Vaziri Hassas). (2) “Features of Kaolinite Flocculation with Selected Polymers,” S. Sharma (presenter), C.L. Lin, and J.D. Miller. (3) “Physical Chemistry Features of Bubble Attachment at a Talc Surface,” V. Atluri (presenter), X. Wang, and J.D. Miller. (4) “Opportunities for Plant-Site 3D Coarse Particle Characterization with Automated High Speed X-ray Tomography,” J.D. Miller (presenter), C.L. Lin, and Y. Wang. (5) “Permeability of Flocculated Kaolinite Sediments Using X-ray Micro-CT,” J. Dong (presenter), S. Sharma, Y. Wang, C.L. Lin, and J.D. Miller. (6) “Wetting Characteristics of Mineral Surfaces as Revealed by MD Simulations,” J. Jin (presenter), X. Wang, and J.D. Miller. (7) “Evaluation of the Selective Crushing and Size Separation of Coal Using X-ray CT Technology,” K. Zheng, Y. Wang (presenter), J. Dong, C.L. Lin, and J.D. Miller.

“Surface/Colloid Chemistry Considerations in Wallboard Production,” J.D. Miller (presenter) and X. Wang, USG/NIST Meeting, Libertyville, Illinois, 25–26 April 2016.

“Study of Room Temperature Solid Polymer Electrolyte for Lithium Sulfur Battery,” K. Liu (presenter), Y. Lin, J.D. Miller, J. Liu, and X. Wang, ECS Conference, San Diego, California, 29 May – 2 June 2016.

**Invited Seminars**, Central South University, Changsha, China, 25 June–2 July 2016. (1) “The Surface and Colloid Chemistry of Layered Silicate Minerals,” J.D. Miller. (2) “Characterization of Polymer-induced Kaolinite Flocculation, Sedimentation, and Consolidation,” J.D. Miller.

**Keynote Presentation**, “MDS for the Analysis of Flotation Chemistry Phenomena,” J.D. Miller, XXVIII International Mineral Processing Congress, Quebec City, Canada, 11–15 September 2016.

## SEMINARS & PRESENTATIONS, cont.

Two presentations by J.D. Miller and Research Associates, XXVIII International Mineral Processing Congress, Quebec City, Canada, 11–15 September 2016. (1) “Significance of Exposed Grain Surface Area in Coarse Flotation of Low-Grade Gold Ore with the HydroFloat™ Technology,” J.D. Miller (presenter), C.L. Lin, Y. Wang, M.J. Mankosa, J.N. Kohmuench, and G.H. Luttrell. (2) “Flotation of Zinc Oxide Minerals with Potassium Lauryl Phosphate,” X. Wang (presenter), J.D. Miller, Z. Wang, S. Jian, T. Song, and Y. Liang.

**Invited Plenary Presentation**, “The Wonderful World of Material Science in 3D with Advanced X-ray Tomography,” J.D. Miller, International Seminar on Advanced Material Research (2016 ISAMR), Kunming, China, 14–16 October 2016.

**Invited Seminar**, “Characterization of Clay Minerals (Phyllosilicates) – Primary Particles, Clusters, and Floccs,” J.D. Miller, Virginia Tech, Blacksburg, Virginia, 7 November 2016.

Six presentations by J. D. Miller and Research Associates, SME Annual Meeting, Denver, Colorado, 19 – 22 February 2017. (1) “Characterization of Breakage and Washability of ROM Coal Using X-ray Computed Tomography,” C.L. Lin (presenter), J.D. Miller, T. Nguyen, and A. Nguyen. (2) “Microstructural Characteristics of Polymer-Induced Kaolinite Flocculation,” J.D. Miller (presenter), S. Sharma, and C.L. Lin. (3) “Phyllosilicate Nanoparticles for Next Generation Lithium Batteries,” X. Wang and J.D. Miller (presenter). (4) “Quantitative Analysis of Exposed Grain Surface Area for Multiphase Particles Using X-ray Microtomography,” Y. Wang (presenter), C.L. Lin and J.D. Miller. (5) “Surface Chemistry Features in the Selective Flotation of Bastnaesite with Lauryl Phosphate,” W. Liu (presenter), X. Wang, and J.D. Miller. (6) “Surface Chemistry Issues in the Reverse Flotation of Iron Ore,” K. Shrimali (presenter) and J.D. Miller.

**Invited Presentation**, “High Throughput Applications of X-ray CT in the Mining Industry,” J.D. Miller (presenter) and C.L. Lin, Zeiss Workshop, Inside Out: X-ray Microscopy, Cape Town, South Africa, 19 March 2017.

**Invited Keynote Presentation**, “X-ray Tomography for Mineral Processing Technology – 3D Particle Characterization from Mine to Mill, J.D. Miller (presenter) and C.L. Lin, Process Mineralogy 17, Cape Town, South Africa, 20–22 March 2017.

“Nanoparticles in Utah Air,” S. Assemi (presenter), J.D. Miller, and S. Tadjiki, Air Quality: Science for Solutions, Salt Lake City, Utah, 30 March 2017.

“Laboratory and Plant-site Particle Characterization for the Phosphate Industry Using X-ray Tomography,” J.D. Miller, C.L. Lin, and X. Wang (presenter), First International Conference on Sustainable Development of Phosphate Resources, Yichang, China, 16–19 June 2017.

**Invited Seminar**, “Halloysite Nano Tubes a Unique Phyllosilicate Resource,” J.D. Miller, Virginia Tech, Blacksburg, Virginia, 5 October 2017.

**Plenary Presentation**, “Developments of Advanced Processing Technology for Copper Production – Acid-Bake Process for Copper Recovery from Enargite Concentrates,” J.D. Miller, 4<sup>th</sup> China Nonferrous Metallurgy Symposium 2017, Kunming, Yunnan, China, 17–20 November 2017.

Two presentations by J.D. Miller and Research Associates, SME Annual Meeting, Minneapolis, Minnesota, 25–28 February 2018. (1) “MDS Analysis of Bubble and Drop Attachment at the Molybdenite Face Surface,” J. Jin (presenter), L.X. Dang, and J.D. Miller. (2) “High Speed X-ray Tomography for Coarse Particle Characterization at Plant Sites,” J.D. Miller, C.L. Lin (presenter), Y. Wang, S. Puvvada, and S. Bacchuwar.

“Properties of Clay Minerals at Nanoscale,” S. Assemi (presenter), P. Sidhu, S. Sharma, V. Gupta, J. Liu, and J.D. Miller, Clay Minerals Society, University of Illinois, Urbana-Champaign, Illinois, 11–14 June 2018.

“Predominance and Roaster Diagrams for the Cu-As-S-O System,” S. Howard, S. Safarzadeh (presenter), and J.D. Miller, Extraction 2018, 7<sup>th</sup> International Symposium on Advances in Sulfide Smelting, Ottawa, Ontario, Canada, 26–29 August 2018.

## SEMINARS & PRESENTATIONS, cont.

“Application of X-ray Computed Tomography for Coal Washability Analysis,” T.D. Nguyen, A.V. Nguyen (presenter), C.L. Lin, and J.D. Miller, 17<sup>th</sup> Australian Coal Preparation Society (ACPS) Conference, Brisbane, Australia, 11–14 September 2018.

Three presentations by J.D. Miller and Research Associates, SME Annual Meeting, Denver, Colorado, 24–27 February 2019. (1) “High Speed X-ray Computed Tomography (HSXCT) for Plant-Site Analysis of Pebble Phosphate,” S. Puvvada (presenter), C.L. Lin, and J.D. Miller. (2) “Hydrophobic Surface State of Talc as Influenced by Aluminum Substitution in the Tetrahedral Layer,” J. Jin (presenter), V. Atluri, L.X. Dang, and J.D. Miller. (3) “The Significance of CO<sub>2</sub> Nanobubbles in the Collectorless Flotation of Pyrite,” J.D. Miller (presenter), B. Vaziri Hassas, J. Jin, and L.X. Dang.

**Invited Keynote Presentation**, “Recent Advances in the Surface and Colloid Chemistry of Layered Silicate Minerals,” J.D. Miller, Chinese Association for Science and Technology in Utah (CAST-UT) Annual Conference, University of Utah, Salt Lake City, UT, 14 December 2019.

Presentation (poster) by J.D. Miller Research Associate, “Multiscale Wetting Characteristics of Silica Surfaces and their Significance in Confined Flow,” J. Jin (presenter), C.L. Lin, X. Wang, J.D. Miller, H. Asgar, G. Gadikota, M. Deo, A. Jacobson, and J. Kaszuba, EFRC (Energy Frontier Research Center) Mid-Term Review of MUSE Research, Washington D.C., 11-13 February 2020.

Five presentations by J.D. Miller and Research Associates, SME Annual Meeting, Phoenix, Arizona, 23–26 February 2020. (1) “Analysis of Mono- and Bis- Carboxymethyl Trithiocarbonate Depressants in the Flotation of Molybdenite from Chalcopyrite,” W. Liu (presenter), D. Kashuba, and J.D. Miller. (2) “Dolomite Rejection from Crushed Florida Pebble Phosphate by Attrition Scrubbing and Reverse Flotation,” S. Puvvada, P. Thompson, X. Wang, and J.D. Miller (presenter). (3) “Dispersion Behavior and Attachment of High Internal Phase Water-in-Oil Emulsion Droplets during Fine Coal Flotation,” Y. Lu, X. Wang (presenter), and J.D. Miller. (4) “Gangue Rejection Analysis for Gravity, Preconcentration of Low Grade Sulfide Ores by X-ray Computed Tomography,” S. Bacchuwar (presenter), N. Mkandawire, T. McGrath, C.L. Lin, and J.D. Miller. (5) “Silica Surface States and their Wetting Characteristics,” J. Jin (presenter), X. Wang, C.D. Wick, L.X. Dang, and J.D. Miller.

## **PROGRAM AND PROPOSAL REVIEW ASSIGNMENTS**

Invited Reviewer, Review for Chemical Technology Program at the Oak Ridge National Laboratory by Office of Basic Energy Sciences, Division of Chemical Sciences, Oak Ridge, Tennessee, 20–22 April 1998.  
Panelist to evaluate NSF Major Research Instrumentation (FY 98) Proposals, Arlington, Virginia, 12 May 1998.

Invited Reviewer, MRI proposals, Chemical and Transport Systems Division, NSF/DOE, Washington D.C., 24 March–2 April 1999.

Invited Reviewer, NSF Review Panel, Technology for a Sustainable Environment (TSE), Arlington, Virginia, 18 October 1999.

Member, Committee on Microgravity Research (CMGR), Space Studies Board, NRC, 2001–02.

Member, Visiting Committee, Colorado School of Mines Metallurgical and Materials Engineering Department, Golden, Colorado, 2003–05.

Invited Reviewer, National Research Council, National Academies Panel on Chemical Science & Technology for the review of the Chemical Science and Technology Laboratory at NIST, March/April 2007.

Member, Visiting Committee, Colorado School of Mines Metallurgical and Materials Engineering Department, Golden, Colorado, 26–27 March 2009.

Invited Reviewer, Natural Sciences and Engineering Research Council (NSERC) Site Evaluation for an Industrial Research Chair in Water Quality Management for Oil Sands Extraction and Energy Production, Edmonton, Alberta, Canada, 5–6 April 2009.

Invited Member, International Assessment Review Committee, Institute of Process Engineering (IPE), Chinese Academy of Sciences, Beijing, PR China, 27–29 October 2014.

## LIST OF PUBLICATIONS

1. “Crysocolla Flotation by the Formation of Insoluble Surface Chelates,” H. D. Peterson, M. C. Fuerstenau, R. S. Rickard, and J. D. Miller, *Trans. SME/AIME*, 223, p. 388–392 (1965).
2. “Metal Ion Activation in Xanthate Flotation of Quartz,” M. C. Fuerstenau, J. D. Miller and R. E. Pray, *Trans. SME/AIME*, 232, p. 359–364 (1965).
3. “Chelating Agents — A Key to Chrysocolla Flotation,” H. D. Peterson, M. C. Fuerstenau, R. S. Rickard, and J. D. Miller, *Mining Engineering*, p. 81–84, April (1966).
4. “The Role of the Hydrocarbon Chain in Anionic Flotation of Calcite,” M. C. Fuerstenau and J. D. Miller, *Trans. SME/AIME*, 238, p. 153–160 (1967).
5. “Selective Flotation of Iron Oxide,” M. C. Fuerstenau, G. Gutierrez, and J. D. Miller, *Trans. SME/AIME*, 238, p. 200–203 (1967).
6. “Concentration Review,” J. D. Miller, *Mining Engineering*, p. 94–96, February (1969).
7. “Adsorption Mechanisms in Nonmetallic Activation Systems,” M. C. Fuerstenau, D. A. Elgillani, and J. D. Miller, *Trans. SME/AIME*, 247, p. 11–14, March (1970).
8. “Hydration Effects in Quaternary Amine Extraction Systems,” J. D. Miller and M. C. Fuerstenau, *Metall. Trans. TMS/AIME*, 1, p. 2531, September (1970).
9. “Hydroxamate vs. Fatty Acid Flotation of Iron Oxide,” M. C. Fuerstenau, R. W. Harper, and J. D. Miller, *Trans. SME/AIME*, 247, p. 69–73, March (1970).
10. “Pyrite Depression by Reduction of Solution Oxidation Potential,” J. D. Miller and W. G. Peterson, *Water Pollution Control Research Series 12010 DIM*, August (1970).
11. “Size Analysis and Flotation Chemistry Highlighted by Basic Science Researchers,” J. D. Miller, *Mining Engineering*, p. 92–95, February (1970).
12. “Mineral Processing Fundamentals,” J. D. Miller, *Mining Engineering*, p. 150–156, February (1971).
13. “Electrokinetic Behavior of Fluorite as Influenced by Surface Carbonation,” J. D. Miller and J. B. Hiskey, *Journal of Colloid and Interface Science*, 11 (3), pp. 567–573 (1972).
14. “Flotation of Molybdenum and Copper Minerals with Chromatographic Fractions of Petroleum Distillate Products,” J. L. Huiatt and J. D. Miller, 1972 Annual AIME Meeting, San Francisco, California, 21-24 February, US Department of Interior, Bureau of Mines, pp. 1-15 (1972).
15. “Hydrometallurgy — Chemical Processing Review 1971,” J. D. Miller, *Mining Engineering*, p. 96–97, February (1972).
16. “Removal of Dissolved Contaminants from Mine Drainage,” J. D. Miller, *Environmental Protection Technology Series, EPA-R2-72-130*, p. 1–53, December (1972).
17. “An Analysis of Concentration and Temperature Effects in Cementation Reactions,” J. D. Miller, *Mineral Science and Engineering*, 5 (3), p. 242 (1973).
18. “Processing of Leach Liquor Produced by Nuclear Solution Mining,” J. D. Miller, UCRL 50350 Lawrence Livermore Laboratory, Livermore, California, February 15 (1973).
19. “Screening and Classification,” M. C. Fuerstenau and J. D. Miller, *Mining Engineers Handbook, AIME*, 2, pp. 27-47–27-69 (1973).



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20. "Structure and Composition of Commercial Copper Chelate Extractants," R. L. Atwood and J. D. Miller, *Trans. SME/AIME*, 245, p. 319–323 (1973).
21. "Surface Deposit Effects in the Kinetics of Copper Cementation by Iron," J. D. Miller and L. W. Beckstead, *Metall. Trans. TMS/AIME*, 4, p. 1967–1973 (1973).
22. "Characterization of Sulfide Mineral Surfaces in Froth Flotation Systems Using Electron Spectroscopy for Chemical Analysis," R. K. Clifford, K. L. Purdy and J. D. Miller, in *Advances in Interfacial Phenomena*, AIChE Symposium Series 71 (150), p. 138–157 (1975).
23. "Discussion of the Kinetics of Copper Solvent Extraction with Hydroxy Oximes," J. D. Miller and R. L. Atwood, *Journal Inorganic and Nuclear Chemistry*, 37 (2), p. 2539 (1975).
24. "Kinetics of Copper Extraction from Acid Nitrate Solutions by LIX 64N," R. L. Atwood and J. D. Miller, *Metall. Trans. B*, 6B (3), TMS/AIME, p. 465 (1975).
25. "Acid Ferric Sulfate Leaching of Attritor–Ground Chalcopyrite Concentrate," L. W. Beckstead, P. B. Munoz, J. L. Sepulveda, J. D. Miller, J. A. Herbst, M. E. Wadsworth, and F. A. Olson, in *Extractive Metallurgy of Copper, Vol. II. Hydrometallurgy and Electrowinning*, TMS/AIME, p. 611 (1976).
26. "Analysis of the Surface Potential Developed by Non–Reactive Ionic Solids," J. D. Miller and J. V. Calara, in *Gaudin Memorial Symposium on Froth Flotation*, SME/AIME, 1, p. 66–86 (1976).
27. "Bismuth Dissolution from Smelter Flue Dust Residues," J. D. Miller, J. A. Herbst, and J. L. Sepulveda, *Trans. SME/AIME*, 260, p. 166 (1976).
28. "Determination of Madelung Constants for Infinite and Semi–Infinite Ionic Lattices by Direct Summation," J. V. Calara and J. D. Miller, in *Proceedings International Conference on Colloids and Surfaces*, Academic Press, III, p. 157, July (1976).
29. "Determination of Madelung Constants for Infinite and Semi–Infinite Lattices by Direct Summation," J. V. Calara and J. D. Miller, *Journal of Chemical Physics*, 65 (2), p. 843–844 (1976).
30. "Hot Water Extraction of Bitumen from Utah Tar Sands," J. E. Sepulveda, J. D. Miller, and A. G. Oblad, Fuels Division, ACS (1977). Symposium on Oil Shales, Tar Sands and Related Materials — Production and Utilization of Synfuels, Division of Fuel Chemistry, ACS, 21 (6), p. 110–122 (1976).
31. "Recovery of Bitumen from Oil–Impregnated Sandstone Deposits of Utah," A. G. Oblad, J. D. Seader, J. D. Miller, and J. W. Bunger, *Oil Shale and Tar Sands*, AIChE Symposium Series, 72 (155), p. 69–78 (1976).
32. "Ammonia Oxidation Leaching of Chalcopyrite — Surface Deposit Effects," L. W. Beckstead and J. D. Miller, *Metall. Trans. B*, 8B, TMS/AIME, p. 31–38 (1977).
33. "Ammonia Oxidation Leaching of Chalcopyrite — Reaction Kinetics," L. W. Beckstead and J. D. Miller, *Metall. Trans. B*, 8B, p. 19–29 (1977).
34. "Reaction Kinetics of Cupric Chloride Dissolution of Metallic Copper Spheres in a Stirred Reactor," W. K. Tolley, H. H. Haung, and J. D. Miller, in *Proceedings of International Chloride Hydrometallurgy Symposium*, Benelux Metallurgy, Brussels, Belgium (1977).
35. "Adsorption Reactions in the Depression of Coal by Organic Colloids," H. H. Haung, J. V. Calara, D. Bauer and J. D. Miller, ACS Separation Symposium San Francisco (1976), in *Recent Developments in Separation Science*, CRC Press, Vol. IV, pp. 115–133 (1978).
36. "Ammonia Oxidation Leaching of Chalcopyrite," L. W. Beckstead and J. D. Miller, in *Fundamental Aspects of Hydrometallurgy Processes*, AIChE Symposium Series 173, 73, pp. 28–40 (1978).

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37. "Kinetics and Thermochemistry of Amyl Xanthate Adsorption by Pyrite and Marcasite," H. H. Huang and J. D. Miller, *International Journal of Mineral Processing*, 5, pp. 241–266 (1978).
38. "Reaction Kinetics of Bismuth Dissolution from Lead Cake by Sulfuric Acid Leaching," J. D. Miller, J. A. Herbst, and J. L. Sepulveda, *Trans. SME/AIME, Mining Engineering*, p. 388–395, April (1978).
39. "Separation of Bitumen from Utah Tar Sands by a Hot Water Digestion–Flotation Technique," J. E. Sepulveda and J. D. Miller, *Technical Papers, Mining Engineering*, p. 1311–1320, September (1978).
40. "Hydrometallurgical Processes," M. E. Wadsworth and J. D. Miller, Chapter 3, in *Rate Processes of Extractive Metallurgy*, Plenum Press, pp. 33–244 (1979).
41. "Reaction Mechanism for the Acid Ferric Sulfate Leaching of Chalcopyrite," P. B. Munoz, J. D. Miller, and M. E. Wadsworth, *Metall. Trans. B*, 10B, p. 149, June (1979).
42. "Silver Catalysis in Ferric Sulfate Leaching of Chalcopyrite," J. D. Miller and H. Q. Portillo, XIII International Mineral Processing Congress, 1, pp. 851–901, Warsaw, June (1979).
43. "Surface Chemistry in Fluorite Flotation," J. D. Miller and J. V. Calara, in *Proceedings First Latin American Congress on Flotation*, Santiago, Chile, October (1979).
44. "Bench Scale Flotation of Alunite Ore with Oleic Acid," J. D. Miller and J. B. Ackerman, in *Fine Particle Symposium*, vol. 1, AIME, p. 832–852 (1980).
45. "The Effect of Feed Source in the Hot Water Processing of Utah Tar Sand," M. Misra and J. D. Miller, *SME/AIME Trans., Mining Engineering*, p. 302–311, March (1980).
46. "A Fundamental Approach to the Design and Optimization of Industrial Solvent Extraction Plants," J. E. Sepulveda and J. D. Miller, in *Proceedings International Solvent Extraction Conference (ISEC'80)*, Liege, Belgium, 6–12 September 1980, 1, No. 80-233, p. 1–10 (1980).
47. "Electrochemistry in Silver Catalyzed Ferric Sulfate Leaching of Chalcopyrite," J. D. Miller, P. J. McDonough, and H. Q. Portillo, in *Process and Fundamental Considerations of Selected Hydrometallurgical Systems*, SME/AIME, p. 327–338 (1981).
48. "Equilibrium and Kinetics of Copper Extraction from Ammonical Solutions by Hydroxyoximes with Particular Emphasis on Transport Phenomenon," J. D. Miller, H. H. Haung, and E. F. Pereira, in *Process and Fundamental Considerations of Selected Hydrometallurgical Systems*, SME/AIME, p. 221–241 (1981).
49. "Extraco de Cobre de Solucoes Amoniacais con Hidroxioximes," E. F. S. Pereira and J. D. Miller, *Metalurgia—ABM*, 37 (279), February (1981).
50. "Factors Affecting Droplet Size Distributions Produced in Dispersed Phase Mixers," R. Mackelprang, J. A. Herbst, and J. D. Miller, in *Process and Fundamental Considerations of Selected Hydrometallurgical Systems*, SME/AIME, p. 269 (1981).
51. "The Flotation Behavior of Digested Asphalt Ridge Tar Sand," R. J. Smith, M. Misra and J. D. Miller, *Mining Engineering, SME/AIME Trans.*, p. 1719–1724, December (1981).
52. "Flotation of Oil Droplets from Water," B. Gutkowski, J. Hupka, and J. D. Miller, in *Interfacial Phenomena in Mineral Processing, Proceedings of Engineering Foundation Conference*, Rindge, New Hampshire, February, 1981, pp. 287–301 (1981).
53. "Silver Catalysis in Ferric Sulphate Leaching of Chalcopyrite," J. D. Miller and H. Q. Portillo, *Dev. Miner. Process.*, 2 (Miner. Process., Part A), pp. 851–901 (1981).

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54. "Solution Concentration and Purification," J. D. Miller, First Bilateral China–USA Metallurgical Conference, November (1981); in *Metallurgical Treatises*, J. K. Tien and J. F. Elliott, eds., TMS/AIME, p. 95 (1981).
55. "Surface Chemistry Features in the Hot Water Processing of Utah Tar Sand," M. Misra, R. Aguilar and J. D. Miller, *Separation Science and Technology*, 16 (10), pp. 1523–1544 (1981).
56. "Concentration of Utah Tar Sands by an Ambient Temperature Flotation Process," J. D. Miller and M. Misra, *Int. J. Min. Processing*, 9 (3), pp. 269–287 (1982).
57. "Development of an Air–Sparged Hydrocyclone for Fine Particle Flotation in a Centrifugal Field," J. D. Miller, M. C. Van Camp, and S. Gopalakrishnan, in *Proceedings of the Second International Conference on Technology for Development*, Cairo, Egypt, May (1982).
58. "Fine Coal Flotation in a Centrifugal Field with an Air Sparged Hydrocyclone," J. D. Miller and M. C. Van Camp, *Technical Papers, Mining Engineering, SME/AIME*, p. 1575–1580, November (1982).
59. "Hot–Water Process Development for Utah Tar Sand," J. D. Miller and M. Misra, *Fuels Processing Technology*, 6 (1), pp. 27–59 (1982).
60. "Pilot–Plant Recovery of Bitumen from Oil Wet Tar Sands," K. E. Hatfield, A. G. Oblad and J. D. Miller, in *Proceedings of the Second International Conference on Heavy Crude and Tar Sand*, Caracas, Venezuela, February (1982).
61. "Concentration of Eastern Oil Shale by Froth Flotation," M. Misra, C. L. Lin, and J. D. Miller, in *Proceedings of 1983 Eastern Oil Shale Symposium*, Lexington, Kentucky, November, p. 377 – 387 (1983).
62. "Dextrin Adsorption by Oxidized Coal," J. D. Miller, J. S. Laskowski, and S. S. Chang, 56th Colloid and Surface Science Symposium, June (1982); *Colloids and Surfaces*, 8, pp. 137–151 (1983).
63. "Importance of Bitumen Viscosity in the Hot–Water Processing of Domestic Tar Sands," J. Hupka, J. D. Miller, and A. Cortes, *Technical Papers, Mining Engineering*, 35 (12), p. 1635–1641, December (1983).
64. "A Kinetic Model for the Simulation of Industrial Copper Solvent Extraction Plants," C. M. Meier and J. D. Miller, in *Proceedings of International Solvent Extraction Conference, ISEC '83*, Denver, Colorado, AIChE, p. 126–127 (1983).
65. "MIBC Adsorption at the Coal/Water Interface," J. D. Miller, C. L. Lin, and S. S. Chang, *Colloids and Surfaces I*, 7, pp. 351–355 (1983).
66. "New Developments in Amine Solvent Extraction Systems," J. D. Miller and M. B. Mooiman, in *Proceedings of the 10th Interamerican Chemical Engineers Conference*, Santiago, Chile, November (1983).
67. "Reaction Kinetics for the Leaching of MnO<sub>2</sub> by Sulfur Dioxide," J. D. Miller and R. Y. Wan, *Hydrometallurgy*, 10, p. 219–242 (1983).
68. "Solvent Extraction as a Rate Process in Hydrometallurgical Systems," J. D. Miller and M. B. Mooiman, 3rd Separation Science Symposium, Gatlinburg, Tennessee, June (1983).
69. "The Solvent Extraction of Gold from Aurocyanide Solutions," M. B. Mooiman, J. D. Miller, and M. M. Mena, in *Proceedings of the International Solvent Extraction Conference ISEC '83*, Denver, Colorado, AIChE, pp. 530–531 (1983).
70. "Water Deoiling in an Air–Sparged Hydrocyclone," J. D. Miller and J. Hupka, World Filtration Congress III, September (1982); *Filtration and Separation*, p.279–280, 282, July/August (1983).

PUBLICATIONS, cont.

71. "Coadsorption Phenomena in the Flotation of Pyrite from Coal by Reverse Flotation," J. D. Miller, C. L. Lin, and S. S. Chang, *Coal Preparation: An International Journal*, 1, p. 21–38 (1984).
72. "Comparison of Process Alternatives for Gold Recovery from Cyanide Heap Leach Solutions," M. B. Mooiman, J. D. Miller, J. B. Hiskey, and A. R. Hendriksz, in *Heap and Dump Leaching Practice*, SME/AIME, pp. 93–107 (1984).
73. "Electrochemical Features of the Ferric Sulfate Leaching of  $\text{CuFeS}_2/\text{C}$  Aggregates," R. Y. Wan, J. D. Miller, J. Foley, and S. Pons, in *Proceedings of the International Symposium on Electrochemistry in Mineral and Metal Processing*, Electrochemical Society, 84–10, p. 391 (1984).
74. "Enhanced Ferric Sulfate Leaching of Copper from  $\text{CuFeS}_2/\text{C}$  Aggregates," R. Y. Wan, J. D. Miller, and G. Simkovich, in *Proceedings of MINTEK 50: An International Conference on Recent Advances in Mineral Science and Technology*, Johannesburg, South Africa, vol. 2, p. 575–588, March (1984).
75. "Fast Flotation with an Air–Sparged Hydrocyclone," J. D. Miller and D. J. Kinneberg, in *Proceedings of MINTEK 50: International Conference on Recent Advances in Mineral Science and Technology*, Johannesburg, South Africa, vol. 1, p. 373–383, March (1984).
76. "Flotation Chemistry of the Fluorite/Oleate System," J. D. Miller, M. E. Wadsworth, M. Misra, and J. S. Hu, in *Proceedings of the Wark Symposium*, Adelaide, Australia, July (1983); in *Principles of Mineral Flotation*, Australasian Inst. Min. and Met., pp. 31–42 (1984).
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55. "Cone Beam X-ray Microtomography – A New Facility for 3D Analysis of Multiphase Materials," C. L. Lin and J. D. Miller, presented at the 130<sup>th</sup> SME Annual Meeting, Denver, Colorado, 26–28 February 2001, Preprint No. 01–44 (2001).
56. "Evaluation of CT-Based Coal Washability Analysis System under Simulated On-Line Conditions," C. L. Lin, J. D. Miller, and G. H. Luttrell, presented at the 130<sup>th</sup> SME Annual Meeting, Denver, Colorado, 26–28 February 2001, Preprint No. 01–45 (2001).
57. "The Flotation Chemistry of Potassium Double Salts: Schoenite, Kainite, and Carnallite," M. Hancer and J. D. Miller, presented at the 130<sup>th</sup> SME Annual Meeting, Denver, Colorado, 26–28 February 2001, Preprint No. 01–47 (2001).
58. "A New Collector Chemistry for Phosphate Flotation," X. Wang, M. Li, and J. D. Miller, presented at the 130<sup>th</sup> SME Annual Meeting, Denver, Colorado, 26–28 February 2001, Preprint No. 01–46 (2001).
59. "Selective Flotation of Plastics from Automotive Shredder Residue," E. Mutkowska, M. A. D. Azevedo, J. D. Miller, and R. Kobler, presented at the 130<sup>th</sup> SME Annual Meeting, Denver, Colorado, 26–28 February 2001, Preprint No. 01–123 (2001).
60. "The Structure and Characteristics of Adsorbed Surfactants as Revealed by AFM Imagery," V. K. Paruchuri, J. Nalaskowski, and J. D. Miller, presented at the 130<sup>th</sup> SME Annual Meeting, Denver, Colorado, 26–28 February 2001, Preprint No. 01–48 (2001).
61. "Conformation of Chemisorbed Oleate at a Calcite Surface," C. A. Young and J. D. Miller, presented at the 131<sup>st</sup> SME Annual Meeting, Phoenix, Arizona, 25–27 February 2002, Preprint No. 02–028 (2002).
62. "The Effect of Activation on the Low Potential Hydrophobic State of Pyrite in Amyl Xanthate Flotation with Nitrogen," R. du Plessis, D. G. Kotlyar, G. L. Simmons and J. D. Miller, presented at the 131<sup>st</sup> SME Annual Meeting, Phoenix, Arizona, 25–27 February, 2002, Preprint No. 02–155 (2002).
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65. "The Significance of Filter Cake Pore Structure as Determined by Micro CT in the Analysis of Filtration Phenomena," C. L. Lin and J. D. Miller, presented at the 131<sup>st</sup> SME Annual Meeting, Phoenix, Arizona, 25–27 February 2002, Preprint No. 02–112 (2002).
66. "Thermodynamic Evaluation of Oleate Chemisorption at Calcium Semi-Soluble Salt Surfaces," C. A. Young and J. D. Miller, presented at the 131<sup>st</sup> SME Annual Meeting, Phoenix, Arizona, 25–27 February 2002, Preprint No. 02–029.
67. "Ultimate Recovery in Heap Leaching Operations as Established from Mineral Exposure Analysis by X-ray Microtomography," J. D. Miller, C. L. Lin, C. Garcia, and H. Arias, presented at the 131<sup>st</sup> SME Annual Meeting, Phoenix, Arizona, 25–27 February, 2002, Preprint No. 02–170 (2002).
68. "Estimation of Ultimate Recovery in Heap Leaching Operations Using High Resolution Cone Beam X-ray Microtomography (XMT)," J. D. Miller, C. L. Lin, C. Roldan, and C. Garcia, 132<sup>nd</sup> SME Annual Meeting, Cincinnati, Ohio, 24–26 February 2003, Preprint No. 03–066 (2003).

PREPRINTS, cont.

69. "FTIR Analysis of Water Structure and Its Significance in the Flotation of Sodium Carbonate and Sodium Bicarbonate Salts," Z. S. Nickolov, O. Ozcan, and J. D. Miller, 132<sup>nd</sup> SME Annual Meeting, Cincinnati, Ohio, 24–26 February 2003, Preprint No. 03–005 (2003).
70. "Sum Frequency Spectroscopy Reveals New Possibilities to Study Interfaces," Z. S. Nickolov and J. D. Miller, 133<sup>rd</sup> SME Annual Meeting, Denver, Colorado, 23–25 February 2004, Preprint No. 04–106 (2004).
71. "Air Sparged Hydrocyclone (ASH) Technology for Cyanide Recovery," J. Hupka, B. Dabrowski, J. D. Miller and D. Halbe, 133<sup>rd</sup> SME Annual Meeting, Denver, Colorado, 23–25 February 2004, Preprint No. 04–143 (2004).
72. "3D Characterization and Analysis of Particle Shape Using X-ray Microtomography (XMT)," C. L. Lin and J. D. Miller, 134<sup>th</sup> SME Annual Meeting, Salt Lake City, Utah, 28 February–2 March 2005, Preprint No. 05–012 (2005).
73. "Direct Measurement of Particle-Bubble Interaction Forces Using Atomic Force Microscopy," S. Assemi, A. V. Nguyen, and J. D. Miller, 137<sup>th</sup> SME Annual Meeting, Salt Lake City, Utah, 24 –27 February 2008, Preprint No. 08–032 (2008).
74. "A Comparative Study of ZnO-CuO-Al<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> Composite and Hybrid Catalysts for Direct Synthesis of Dimethyl Ether from Syngas," S. P. Naik, H. Wan, S. Bali, J. D. Miller, and W. W. Zmierzak, 237<sup>th</sup> ACS National Meeting, Division of Fuel Chemistry, Salt Lake City, Utah, 22–26 March 2009, Preprint, 54 (1), pp. 200–201 (2009).
75. "Liberation-Limited Grade/Recovery Curves from X-ray Micro CT Analysis of Feed Material for the Evaluation of Separation Efficiency," J. D. Miller, C. L. Lin, M. I. Al-Wakeel, and L. Hupka, 138<sup>th</sup> SME Annual Meeting, Denver, Colorado, 22–25 February 2009, Preprint No. 09–025 (2009).
76. "Evaluation of Sulfuric Acid Baking and Leaching of Enargite Concentrates," M. S. Safarzadeh, M. S. Moats, and J. D. Miller, 141<sup>st</sup> SME Annual Meeting, Seattle, Washington, 19–22 February 2012, Preprint No. 12–068 (2012).
77. "Study on Preparation Techniques of Carnallite with Waste Brine," D. Li, X. M. Wang, F. Cheng, and J. D. Miller, 141<sup>st</sup> SME Annual Meeting, Seattle, Washington, 19–22 February 2012, Preprint No. 12–073 (2012).
78. "Insights into Heap Leach Technology," N. Dhawan, M. S. Safarzadeh, J. D. Miller, R. K. Rajamani, and M. S. Moats, 141<sup>st</sup> SME Annual Meeting, Seattle, Washington, 19–22 February 2012, Preprint No. 12–119 (2012).
79. "The Edge Surface of Kaolinite and Its Surface Chemistry," J. Liu, X. Wang, T. Depci, and J. D. Miller, 143<sup>rd</sup> SME Annual Meeting, Salt Lake City, Utah, 23–26 February 2014, Preprint No. 14-113 (2014).
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81. "Fundamental Aspects of Fine Coal Filtration," J. A. Mejia, C. L. Lin, and J. D. Miller, 143<sup>rd</sup> SME Annual Meeting, Salt Lake City, Utah, 23–26 February 2014, Preprint No. 14-112 (2014).
82. "Phase Transformations during Sulfuric Acid Baking of an Enargite Concentrate," M. S. Safarzadeh and J. D. Miller, 143<sup>rd</sup> SME Annual Meeting, Salt Lake City, Utah, 23–26 February 2014, Preprint No. 14-111 (2014).
83. "Opportunities for Plant-site Coarse Particle Characterization with Automated High Speed X-ray Tomography," J.D. Miller and C.L. Lin, 145<sup>th</sup> SME Annual Meeting, Phoenix, Arizona, 21–24 February 2016, Preprint No. 16-166 (2016).

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2. *Proceedings of the Third International Symposium on Hydrometallurgy, Hydrometallurgy, Research, Development, and Plant Practice*, K. Osseo Asare and J. D. Miller, eds., TMS/AIME, 1020 pp. (1983).
3. *Chemistry of Flotation*, M. C. Fuerstenau, J. D. Miller and M. C. Kuhn, SME/AIME, 177 pp. (1985).
4. *Proceedings of the Engineering Foundation Conference, Surface Characterization of Adsorption and Interfacial Reactions I*, Kona, Hawaii, 9–14 January 1994, Special Issue of Colloids and Surfaces, J. D. Miller and J. J. Kellar, eds., (1994).
5. *Advances in Flotation Technology — A Symposium in Honor of M. C. Fuerstenau*, B. K. Parekh, and J. D. Miller, eds., SME, Littleton, Colorado, 463 pp. (1999).
6. *Environmental Technology for Oil Pollution: Proceedings of U.S. United Engineering Foundation Conference and 2<sup>nd</sup> International Conference, 'Analysis and Utilization of Oily Wastes, AUZO 99,'* Vol. I and II, Jurata, Poland, 29 August – 3 September, 1999, J. Hupka and J.D. Miller, eds., Chemical Faculty, Technical University of Gdansk, 200 pp. and 80 pp. (1999).
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9. *Beneficiation of Phosphates, Technology and Sustainability, Proceedings of the 4<sup>th</sup> International Conference, Beneficiation of Phosphates IV*, Miami, Florida, 5–10 December 2004, P. Zhang, J. D. Miller, H. El-Shall, and R. Stana, eds., SME, Littleton, Colorado, 306 pp. (2006).
10. *International Journal of Mineral Processing*, Special Issue to Honor the Late Professor R. Peter King, J. D. Miller, co-ed., 84 (1–4), 362 pp. (October 2007).
11. *Beneficiation of Phosphates, Comprehensive Extraction, Technology Innovations, Advanced Reagents, Proceedings of the 7<sup>th</sup> International Conference on Phosphate Beneficiation, Beneficiation of Phosphates VII*, Melbourne, Australia, 29 March–3 April 2015. P. Zhang, J. D. Miller, E. Wingate, and L.L. Filho, eds., SME, Englewood, Colorado, 276 pp (2016).

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3. "Separation of Bitumen from Dry Tar Sands," J. D. Miller and J. E. Sepulveda, U.S. Patent 4,120,776, October 17 (1978).
4. "Air-Sparged Hydrocyclone and Method," J. D. Miller, U.S. Patent 4,279,743, July 21 (1981). Also corresponding foreign patents in Australia, Canada, and South Africa.
5. "Process for Enhanced Leaching of Minerals," J. D. Miller and G. Simkovich, U.S. Patent 4,343,773, August 10 (1982).
6. "Process for Recovering Products from Tar Sand," F. V. Hanson, J. D. Miller and A. G. Oblad, U.S. Patent 4,337,143, June 29 (1982), and U.S. Patent 4,409,090, October 1 (1983).
7. "Flotation Apparatus & Method for Separating Particles from a Fluid Suspension," J. D. Miller, U.S. Patent 4,397,741, August 9 (1983). Also corresponding foreign patents in Australia and Canada.
8. "Flotation Apparatus & Method for Achieving Flotation in a Centrifugal Field," J. D. Miller, U.S. Patent 4,399,027, August 16 (1983). Also corresponding foreign patents in Australia, Brazil, Canada, Chile, Mexico, Peru, Philippines, and South Africa.
9. "Process for Separating High Viscosity Bitumen from Tar Sands," J. D. Miller and M. Misra, U.S. Patent 4,410,417, October 18 (1983).
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11. "Process of Separating High-Viscosity Bitumen from Tar Sands," J. D. Miller and Manoranjan Misra, U.S. Patent 4,486,294, December 4 (1984).
12. "Solvent Extraction of Gold and Silver Anions under Alkaline Conditions," J. D. Miller and M. B. Mooiman, U.S. Patent 4,540,435, September 10 (1985).
13. "Direct Gold Electrolysis from a Loaded Organic Phase," J. D. Miller and Rong-Yu Wan, U.S. Patent 4,657,642, April 14 (1987).
14. "Coal Cleaning by Gaseous Carbon Dioxide Conditioning and Flotation," J. D. Miller and Manoranjan Misra, U.S. Patent 4,676,804, June 30 (1987).
15. "Selective Resin Flotation from Coal by Controlled Oxidation," J. D. Miller and Ye Yi, U.S. Patent 4,724,071, February 9 (1988).
16. "Flotation Apparatus and Method," J. D. Miller and D. J. Kinneberg, U.S. Patent 4,744,890, May 17 (1988).
17. "Ion Exchange Extraction of Metallic and Non-Metallic Anions by the Control of the Basicity of Amine Extractants," J. D. Miller and M. B. Mooiman, U.S. Patent 4,774,003, September 27 (1988).
18. "Fine Coal Cleaning by Chemically Controlled Oxidation Conditioning and Froth Flotation," J. D. Miller and Y. Ye, U.S. Patent 4,828,686, May 9 (1989).
19. "Air-Sparged Hydrocyclone Flotation Apparatus and Methods for Separating Particles from a Particulate Suspension," J. D. Miller and Y. Ye, U.S. Patent 4,838,434, June 13 (1989).

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21. "Fossil Resin Flotation from Coal by Selective Coagulation and Depression of Coal," J. D. Miller, Ye Yi, and Q. Yu, U.S. Patent 4,904,373, February (1990).
22. "Chemical Conditioning of Fine Coal for Improved Flotation and Pyrite Rejection," Jan D. Miller, and Yi Ye, U.S. Patent 5,008,006, April 16 (1991).
23. "Molybdenite Flotation from Copper Sulfide/Molybdenite Containing Materials by Ozone Conditioning," J. D. Miller, Ye Yi, and W. H. Jang, U.S. Patent 5,068,028, November 26 (1991).
24. "Surface Chemistry Control for Selective Fossil Resin Flotation," J. D. Miller, Y. Ye, and Q. Yu, U.S. Patent 5,318,185, July 15 (1992).
25. "Selective Flotation of Phosphate Minerals with Hydroxamate Collectors," J. D. Miller, M. Li, and X. Wang, U.S. Patent 6,341,697, January 29 (2002).
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28. "Purification of Trona Ores by Conditioning with an Oil-in-Water Emulsion," J. D. Miller, X. Wang, and M. Li, U.S. Patent 7,517,509, April 14 (2009).
29. "Fluid-Sparged Helical Channel Reactor and Associated Methods," W. W. Zmierzak, J. D. Miller, R. Rajamani, S. Messiter, N. B. Drinnan and E. Choros, Intl. Patent WO2010/105266, September 16 (2010).
30. "Processes for Catalytic Conversion of Lignin to Liquid and Novel Bio-Fuels," W. W. Zmierzak and J. D. Miller, U.S. Patent 7,964,761, June 21 (2011).
31. "Magnetic Activated Carbon Particles for Adsorption of Solutes from Solution," J. D. Miller, G. A. Munoz, and S. Duyvesteyn, U.S. Patent 8,097,185, January 17 (2012).
32. "Materials for Removing Contaminants from Fluids Using Supports with Biologically-Derived Functionalized Groups and Methods of Forming and Using the Same," D. Jack Adams and J. D. Miller, Mexico Patent 299124, May 14 (2012).
33. "Spinning Fluids Reactor," J.D. Miller, J. Hupka, R. Aranowski, U.S. Patent 8,313,716, November 20 (2012).
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35. "Fluid-Sparged Helical Channel Reactor and Associated Methods," W.W. Zmierzak, J.D. Miller, R. Rajamani, S. Messiter, N. Drinnan and E. Choros, U.S. Patent 8,980,196, March 17 (2015).
36. "Composite Solid Electrolytes for Lithium Batteries," J.D. Miller, X. Wang, Y. Lin, J. Liu, Int. Patent WO2017/161160, September 21 (2017).
37. "Composite Solid Electrolytes for Lithium Batteries," J.D. Miller, X. Wang, Y. Lin, and J. Liu (U-6104), US Patent 10,873,106, Issued December 22 (2020).

**SUPERVISION OF GRADUATE STUDENTS:**

Year	Degree	
	M.S.	Ph.D.
1970	Walter Gerald Peterson	
1971	Michael Edward Kelahan J. Brent Hiskey	
1972	Randolph Edward Scheffel	
1973	Leo William Beckstead <sup>1</sup> — —	Ronald L. Atwood Roger K. Clifford Milind V. Chaubal
1975	William K. Tolley Juan L. Sepulveda J.	Leo William Beckstead
1976	Alfred H. Chen	
1977	Danny L. Bauer Rene Antezana G. Jaime E. Sepulveda J. <sup>2</sup>	Pedro C. Munoz
1978	Hilarion Q. Portillo John B. Ackerman	Elcio F. S. Pereira
1979	Ronald B. Mackelprang	
1980	Royce Jay Smith	
1981	David J. Bunte Christine M. Meire Maurits C. Van Camp	Manoranjan Misra <sup>3</sup>
1982	Rosme Aguilar H. Sam Shao-Sue Chang Chen-Luh Lin	
1984	— —	Michael B. Mooiman Rong-Yu Wan
1985	Arturo Cortes <sup>4</sup> Philip Sibrell	Maria Cristina Ruiz Jian Sheng Hu
1986	—	Chen-Luh Lin

<sup>1</sup>Marcus Grossman Award — TMS

<sup>2</sup>Garr Cutler Energy Award — University Competition.

<sup>3</sup>Garr Cutler Energy Award — University Competition.

<sup>4</sup>Taggart Award — SME

**SUPERVISION OF GRADUATE STUDENTS, cont.**

Year	Degree	
	M.S.	Ph.D.
<b>1987</b>	— — —	Mustafa Akser <sup>5</sup> Jose Parga T. Ahmed Abdel Rahman (Cairo)
<b>1988</b>	Jesus L. Valenzuela (M.E.)	
<b>1989</b>	Youmin Liu Luis Bittencourt	Ruiren Jin <sup>6</sup>
<b>1990</b>	Woo-Hyuk Jang Nathan Rich (Mining Eng.)	
<b>1991</b>	Jitesh Bole —	S. Gopalakrishnan <sup>7</sup> Jon J. Kellar
<b>1992</b>	Ximena Diaz (M.E.) — —	Philip L. Sibrell David J. Kinneberg Qiang Yu
<b>1993</b>	Dariusz Lelinski Yih-kuan Yen	Jaroslav Drelich Madhava Rao Yalamanchili
<b>1994</b>	— — — — —	Arturo B. Cortes <sup>8</sup> Avimanyu Das Michael L. Free <sup>9</sup> Carlos A. Garcia <sup>10</sup> Woo-Hyuk Jang <sup>11</sup>
<b>1995</b>	Edmundo Alfaro-Delgado	Courtney A. Young <sup>12</sup>
<b>1997</b>	Yue Ma — —	Xiansheng Nie <sup>13</sup> Srinivas Veeramasuneni <sup>14</sup> Yih-Kuan Yen

<sup>5</sup>Outstanding Student Award, IPMI, 1986

<sup>6</sup>Garr Cutler Energy Award – University Competition.

<sup>7</sup>Garr Cutler Energy Award – University Competition.

<sup>8</sup>Taggart Award – SME

<sup>9</sup>College Teaching Assistant Award 1993/94.

<sup>10</sup>Outstanding Student Award, IPMI, 1992, 1994

<sup>11</sup>Best Paper Competition, Graduate Student Division, First Place – SME.

<sup>12</sup>Garr Cutler Energy Award – University Competition. Best Paper Competition, Graduate Student Division, Second Place – TMS.

<sup>13</sup>Environmental Engineering.

<sup>14</sup>Best Paper Contest – Graduate Student Division, First Place – SME, 1997. Mineral Resources Student Prize Paper, second place, Mining & Metallurgical Society of America, 1997. AIME Rossiter W. Raymond Memorial Award 1999 – Best Paper.



## SUPERVISION OF GRADUATE STUDENTS, cont.

Year	Degree	
	M.S.	Ph.D.
<b>1998</b>	Gustavo Munoz–Rivadeneira <sup>15</sup> Laurie Lee LaPlante <sup>16</sup>	Yongqiang Lu
<b>1999</b>	Jinshan Li (M.E.) <sup>17</sup> Xuming Wang	William M. Cross Jakub Nalaskowski (TUG, Poland) <sup>18</sup>
<b>2000</b>	— —	Maria A. D. Azevedo <sup>19</sup> Mehmet Hancer <sup>20</sup>
<b>2001</b>	Padmabhushana Reddy Desam Ewelina Mutkowska <sup>21</sup> Marcin Michal Niewiadomski	
<b>2002</b>	Minhua Li	Dariusz Lelinski <sup>22</sup>
<b>2004</b>	Christian Roldan <sup>23</sup> Bartek Dabrowski — —	Ronel du Plessis <sup>24</sup> Keqing Fa Jinshan Li Xuming Wang
<b>2005</b>	—	Sylwia Wisniewska
<b>2006</b>	Juan Francisco Medina Alvaro Videla Lukasz Hupka Amit Jain	Marcin Michal Niewiadomski
<b>2007</b>	Francis Elnathan —	Hao Du Gustavo A. Munoz

<sup>15</sup>Departmental Teaching Assistant Award, 1997/98 and 1999/2000. College Teaching Assistant Award, 1997/98. Outstanding Student Award, IPMI, 2000. Utah Engineering Experiment Station Team of Excellence Award, 2001.

<sup>16</sup>Environmental Engineering. Graduate Seminar Award, Department of Metallurgical Engineering, 1997/98.

<sup>17</sup>Outstanding Student Award, IPMI, 1997.

<sup>18</sup>Graduated with Distinction – special recognition by the faculty at the Technical University of Gdansk.

<sup>19</sup>Departmental Teaching Assistant Award 1996/97. Best Paper Award, TAPPI Recycling Symposium, 2000.

<sup>20</sup>Graduate Seminar Award, Department of Metallurgical Engineering, 1998/99.

<sup>21</sup>Environmental Engineering, 3rd Place – Masters Category, 2000 Annual Conference Student Program, Air & Waste Management Association.

<sup>22</sup>Environmental Engineering. Garr Cutler Energy Award – University Competition. Best Poster Competition, Air and Waste Management Association – University Competition, 1994.

<sup>23</sup>Graduate Seminar Award, Department of Metallurgical Engineering, 2004.

<sup>24</sup>Graduate Seminar Award, Department of Metallurgical Engineering, 1999/2000. University of Utah Graduate Research Fellow, 2001/2002. Outstanding Student Award, IPMI, 2001. Utah Engineering Experiment Station Team of Excellence Award, 2003.

## SUPERVISION OF GRADUATE STUDENTS, cont.

Year	Degree	
	M.S.	Ph.D.
<b>2008</b>	Luis Roman Baseer Abdul Nicol Nuku Newton Daniel Garcia Rajesh Raitani	Orhan Ozdemir Lukasz Hupka
<b>2009</b>	Amrita Mahapatra —	Vamsi Paruchuri Alvaro Videla
<b>2010</b>	Wenjing Xu Phanindra Kodali Ola Opara	
<b>2011</b>	—	Vishal Gupta
<b>2012</b>	Ken Hsieh Sandro Marino <sup>26</sup> Bo Pan	Juan Francisco Medina <sup>25</sup> Xihui Yin
<b>2013</b>	Joel Alejandro Mejia Dhiman Bhattacharyya <sup>28</sup>	Sadegh Safarzadeh <sup>27</sup>
<b>2014</b>	Zuoxing Wang	Xia Zhang
<b>2015</b>	Raquel Crossman	Jing Liu <sup>29</sup> Tsend-Ayush Tserendagva
<b>2016</b>	Sugandha Sharma <sup>30</sup>	Yan Wang <sup>31</sup> Jiaqi Jin <sup>32</sup>
<b>2017</b>	Jiawei Dong	

<sup>25</sup>Outstanding Student Award, IPMI, 2008.

<sup>26</sup>Outstanding Student Award for Best Paper, Beneficiation of Phosphates VI Conference, 2011.

<sup>27</sup>Outstanding Student Award, IPMI, Metalor Technologies, 2012. Best Paper Contest - Student Paper Winner, Colorado SME Division, MPD, 2012. Rong Yu Wan Ph.D. Dissertation Award for outstanding dissertation research, SME, 2014.

<sup>28</sup>Outstanding Student Award, IPMI, 2012. Departmental Teaching Assistant Award, 2012/2013.

<sup>29</sup>Departmental Teaching Assistant Award, 2011/2012. Outstanding PhD Student Award, Department of Metallurgical Engineering, 2014. Rong Yu Wan Ph.D. Dissertation Award for outstanding dissertation research, SME, 2015.

<sup>30</sup>Outstanding MS Student Award, Dept. of Metallurgical Engineering, 2016.

<sup>31</sup>Outstanding Student Award, IPMI, 2013.

<sup>32</sup>Outstanding Student Award, IPMI, 2014. Student Presentation Award, SME, Colorado MPD, 65<sup>th</sup> Annual Conference, 2015.

## SUPERVISION OF GRADUATE STUDENTS, cont.

Year	Degree	
	M.S.	Ph.D.
<b>2018</b>	Behzad Vaziri Hassas <sup>33</sup> Sanket Bacchuwar <sup>35</sup> Qinyu Zhu	Kaustubh Shrimali <sup>34</sup> Vu Truong
<b>2019</b>		Venkata Veeren Babu Atluri <sup>36</sup> Weiping Liu <sup>37</sup>
<b>2020</b>		Sindhoora Lakshmi Puvvada
<u>Thesis in Progress</u>		Marc (Freddy) Sime

<sup>33</sup>Outstanding Student Award, IPMI, Republic Metals, 2017. First Place, SME MPD Graduate Student Poster Contest, SME Annual Meeting, 2018.

<sup>34</sup>First Place, SME MPD Graduate Student Poster Contest, SME Annual Meeting, 2017. First Place, SME Graduate Student Research Poster Contest, SME Annual Meeting, 2017. Outstanding PhD Student Award, Dept. of Metallurgical Engineering, 2017.

<sup>35</sup> Outstanding MS Student Award, Dept. of Metallurgical Engineering, 2018.

<sup>36</sup>Second Place, SME MPD Graduate Student Poster Contest, SME Annual Meeting, 2017. Outstanding Teaching Assistant Award, Dept. of Metallurgical Engineering, 2017. Honorable Mention, IPMI Student Award, 2017.

<sup>37</sup>Student Presentation Award, SME, Colorado MPD Annual Conference, 2017. Outstanding Student Award, IPMI, George Benvegnio Memorial, 2018.