CURRICULUM VITAE

Professor H. M. 'Skip' Kingston
600 Forbes Avenue
Department of Chemistry and Biochemistry
Mellon Hall of Science, 308
Pittsburgh, PA 15229

Phone: (412) 396-5564 (Office)
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kingston@duq.edu (email)

Center for Environmental Research and Education (CERE)
Director – Center for Microwave and Analytical Chemistry

ACADEMIC TRAINING

Ph.D., Analytical Chemistry & Environmental Management
The American University, 1978

M.S., Analytical Chemistry
Indiana University of Pennsylvania, 1975

B.S., Chemistry Education
Indiana University of Pennsylvania, 1973

A.S., Chemistry Education
Harrisburg Area Community College, 1971

BACKGROUND SUMMARY

Academic training in analytical, environmental, biochemistry, chemical education and laboratory automation.

Experience includes fundamental research development in isotope dilution mass spectrometry (IDMS), invention of speciated isotope dilution mass spectrometry (SIDMS, Patented), microwave-enhanced chemistry (patents), speciation analysis, separation science (invention of Chelation Ion Chromatography, (patented), ICP-MS, nuclear and environmental waste testing, conceptual developments in automation including expert systems and robotics, instrument design, development and analysis, environmental research, Standard Reference Materials development and certification of standard methods (over 10 national standard methods). Founded industry and government consortium on laboratory automation (CAALS). Developed fundamental new technology for Metara Inc., a Silicon Valley metrology company as Chief Technical Officer (CTO).

PROFESSIONALEXPERIENCE

1991 - Present	Professor, Department of Chemistry and Biochemistry and Environmental Science and Management Program, Duquesne University, Pittsburgh, PA
2001 - 2002	Sabbatical from Duquesne University Chief Technical Officer, CTO, Metara Inc. Sunnyvale, California Consultant June 2000 to May 2001, and Sept. 2002 to May 2003
1989 - 1991	Project Manager, (Founder) Consortium on Automated Analytical Laboratory Systems (CAALS), National Institute of Standards and Technology (NIST), Gaithersburg, MD
1988 - 1991	Supervisory Research Chemist, Group Leader, National Institute of Standards and Technology, Gaithersburg, MD

1985 - 1988 Research Professor, Chemistry Department, The American University, Washington, DC

1984 - 1985 Congressional Science Fellow, U.S. Congress, House of Representatives, Rayburn House Office Building, Washington, DC

1976 - 1991 Research Chemist, National Institute of Standards and Technology (formerly the National Bureau of Standards, NBS), Gaithersburg, MD

1975 - 1976 Instructor, The American University, Chemistry Department, Washington, DC

1972 - 1975 Teaching Assistant, Indiana University of Pennsylvania, Indiana, PA

HONORS & AWARDS

2001 Duquesne University School of Natural Science Faculty Award for Excellence “In Scholarship”.

98 - 2001 Elected to the National Academy of Science’s Committee on Nuclear Waste Isolation

1998 EPA, Florence M. Richardson Service and Others Awards, “in recognition of continuing efforts to improve the quality of hazardous waste characterization methodology and to reduce monitoring costs through the development of new methodologies and improvements in our knowledge of microwave digestion technology”, US EPA Office of Solid Waste, July 13, 1998.

1998 Elected to the National Academy of Science’s study panel on Nuclear Waste.

1996 R&D-100 Award
"... for development of speciated isotope dilution mass spectrometry... selected by Research and Development Magazine as one of the 100 most significant new technical products of the year."

1996 Environmental Lab, Ten Leading Method Developers, July 1996

1996 PACS Hall of Fame Award “Recognize and Honor Contributions of Merit”, Symposium

1995 Environmental Lab, Ten Leading Method Developers, July 1995

1995 MAC Hall of Fame 1995, Excellence in the Field of Microwave Assisted Chemistry, CEM Corp.

1995 Duquesne University, 1995 Presidential Award for Faculty Excellence “In Scholarship”

1995 Duquesne University School of Natural and Environmental Sciences Faculty Award for Excellence “In Scholarship”

1991 Award of Merit from the Federal Laboratory Consortium for Technology Transfer
"...for outstanding work in the field of technology transfer."

1990 Applied Research Award from the National Institute of Standards and Technology
"...for your pioneering contributions in trace chemical analysis through improvements in sample preparation."

1990 Bronze Medal from the Department of Commerce

"...for your pioneering contributions on the application of microwaves to chemical analysis methodology."

1990, 1988 and 1989 Certificates of Recognition
"Outstanding Performance", Director, NIST.

1989 R&D-100 Award
"... for development of the chelation ion chromatography system ... selected by Research and Development Magazine as one of the 100 most significant new technical products of the year."

1988 Pioneer in Laboratory Robotics Award
Presented by the International Symposium on Laboratory Automation and Robotics "...in recognition of your scientific and technological contributions.

1987 IR-100 Award
"for development of the microwave dissolution system ".. selected by Research and Development Magazine as one of the 100 most significant new technical products of the year.

1984 - 1985 Congressional Science Fellowship
Sponsored by the National Society of Professional Engineers (NSPE).

1983 Certificate of Recognition
"... for excellence in ultra-trace element analysis and the development of an interactive model for evaluating anthropogenic inputs into the Chesapeake Bay ...", Director, NBS.

1983 Approved Postdoctoral Advisor by the National Research Council.

1981 Certificate of Recognition
"... for his outstanding efforts in providing critical review and guidance of program tasks as a member of the Nuclear Waste Management team and for his enthusiastic and professional direction to scientific activities as a project leader for nuclear waste work in the Inorganic Analytical Research Division ...", Director, NBS.

1980 Certificate of Recognition
"...in acknowledgment of the team effort utilizing sophisticated chemical methodology and high accuracy mass spectrometry to produce two new NBS SRM's, U-233 and Pu-244, for nuclear safeguards measurement ...", Director, NBS.

PROFESSIONAL PARTICIPATION

Advisory Board Memberships and Professional Committees

1998 - 2001	National Academy of Science's Committee on Nuclear Waste
1999 - Present	NCCLS Subcommittee on Microwave Instruments Standard
1999	Strategic Planning Implementation Committee, Bayer School of Natural and Environmental Sciences, Duquesne University
1999	Promotion and Tenure Committee, Bayer School of Natural and Environmental Sciences, Duquesne University
1999 - Present	University Research Advisory Committee, Duquesne University
1998 - Present	National Research Council (NRC), National Academy of Sciences, Committee on the Waste Isolation Pilot Plant (WIPP), Nuclear Waste Study Committee
1990 - Present	American Chemical Society's, Analytical Chemistry Journal's Lab Guide
1994 - Present	Global Registrars., Registrar Division ISO 9000, 14000, Governing Board

1995 - Present	Laboratory Automation Standards Foundation
1994 - Present	Duquesne Chemistry Department - Personnel Committee
1996 - Present	Duquesne ESM Program Advisory Board
1992 - Present	Duquesne ESM Program Application Review Committee
1995 - Present	Duquesne Freshman Technology Committee
1996 - Present	Vice-President Phi Kappa Phi - Duquesne University
1996 - Present	Microwave Chemistry Analysis, Standard Methods
1997 - 1999	Chair, Chemistry Dept. Space Committee
1997 - 1998	Chair, Implementation Committee, New Chemistry Ph.D. Program
Nominated -1997	EPA Science Advisory Board
1996 - 1997	Chairman, Personnel Committee, Duquesne Chemistry Dept.
1995 - 1997	Duquesne Chairman - Faculty Senate Computer Committee
1994 - 1996	Chairman, Graduate Studies Committee, Duquesne Chemistry Dept.
1994	NSF, Reviewed STTR Phase I Proposals
1990 -1991	Lab Tech '91 - Industrial and Environmental Laboratory Technology Conference
1989 -1990	Scientific Computing and Automation Conference and Exposition Program Committee

Editorial Board Memberships

1989 - Present	Journal of Chemical Automation
1990 - 1992	Encyclopedia of Scientific Instruments
1991 - 1997	Fresenius' Journal of Analytical Chemistry / Advisory Board

Phi Kappa Phi (Honorary Society, elected 1978), 1995 to Present Vice-President Duquesne U.
Chi Beta Phi (Honorary Society, elected 1973)
Ph.D. Summa Cum Laude, M.S. Magna Cum Laude, B.S. Cum Laude, A.S. Cum Laude

Standards Organizations Memberships and Committees

1999 - Present	NCCLS Subcommittee on Microwave Instruments Standard
1999 - 2000	SEMI, Standard Analysis Methods Development Committee
1989 - Present	ASTM E-31.40 LIMS, D-19 Water
1989 - Present	EPA, Inorganic Working Group SW-846/ RCRA Methods Development Group
1987 - 1995	IUPAC, Analytical Chemistry Division (1989: elected titular member)
1981 - 1989	ASTM C-26.05, Test Methods; C-26.07, Waste Materials

Society Memberships

1994 - Present	Int'l Microwave Power Institute (IMPI)
1991 - Present	Society for Analytical Chemists of Pittsburgh (SACP)
1991 - Present	Spectroscopy Society of Pittsburgh (SSP)
1990 - 1995	Sigma Xi
1989 - Present	ASTM
1983 - Present	Society for Applied Spectroscopy
1976 - Present	Phi, Kappa, Phi, (1996 – present, vice president of chapter)
1972 - Present	American Chemical Society

Security Clearances

1982 - 1991	"Q" and "Secret" NIST, suspended upon leaving government service.

PATENTS

U. S. Patent Number 5,883,349 “Method and Apparatus for Microwave Assisted Chemical Reactions”, Granted May 16, 1999.

U. S. Patent Number 5,830,417 “Method and Apparatus for Microwave Assisted Chemical Reactions”, Granted Nov. 3, 1998.

U. S. Patent Number 5,414,259, “Method of Speciated Isotope Dilution Mass Spectrometry”, Granted May 9, 1995.

U. S. Patent Number 5,244,634 Fundamental Patent for Commercial Instrument "Chelation Ion Chromatograph", Dionex Corporation, Granted Sept. 14,1993.

U. S. Patent Number 5,126,272, "A Method and Apparatus for Detecting Transition and Rare Earth Elements in a Matrix”, Granted June 30, 1992, filed March 1989; (foreign patents filed March 1990 in USA, United Kingdom, Japan, Canada, Germany).

Pending Patents:

International Patent “Speciated Isotope Dilution Mass Spectrometry of Reactive Species and Related Methods,” International Patent Number WO 99/39198A1 (1999).

U. S. Patent “Method and Apparatus for Automated In-Process, Isotope Dilution Threshold and Quantitation Measurement Mass Spectrometry”.

U. S. Patent application: Method and Instrument for Automated Analysis of Fluid-Based Processing Systems, PCT

U. S. Patent application: A Method and Apparatus for In-Process, Automated Analysis and Characterization of Chemical Constituents of Process Solutions,

U.S. Patent Pending, “Method and Apparatus for Microwave Assisted Reactions” Continuation-in-part

International PCT Patent Pending, “Speciated Isotope Dilution Mass Spectrometry of Reactive Species and Related Methods”

US Patent Pending, “Process for Recycling Oil using Microwave and Supercritical Fluids, (placed in public domain: 2001, due to University and Private Industry Negotiations)

Other Disclosures in Process

TEACHING EXPERIENCE

1991 - Present	Duquesne University
1989 - Present	American Chemical Society, Short Course Invited Lecturer
1983 - Present	Society of Applied Spectroscopy, Short Course Lecturer
1985 -1988	The American University, Research Professor
1988, 1993 -1995	Pittsburgh Conference Program, Short Course Lecturer
1975 -1976	The American University, Instructor
1972 -1975	Indiana University of Pennsylvania, Teaching Assistant

Present - Graduate Level Courses in Analytical Chemistry, Duquesne University
Graduate Environmental Chemistry, Duquesne Univeristy
Graduate Special Topics in Mass Spectrometry
“Special Topics in Analytical Chemistry , Duquesne University
“Microwave Enhanced Chemistry” , Duquesne University
"Special Topics - Analytical Chemistry" , Duquesne University
"Advanced Instrumental Methods of Chemical Analysis", Duquesne University
"Introduction to Environmental Science", Duquesne University
"Environmental Chemistry", Duquesne University
“Analytical Chemistry”, (undergraduate) Duquesne University
"Clean Room Chemistry", The American University
"Inorganic Isotope Dilution Mass Spectroscopy", The American University
"Doctoral Dissertation Research", Duquesne University, The American University and University of Maryland.

Postdoctoral Studies sponsored by - National Research Council, CEM Corp., Dionex Corp., E. I. DuPont, NIST and Duquesne University

Undergraduate Level Courses at Duquesne University
General Chemistry Recitations
Analytical Chemistry
Environmental Chemistry
Integrated Laboratory

Teaching for Professional Societies, invited courses:

“Microwave Enhanced Chemistry”, for the American Chemical Society, 5 Day Lecture-Laboratory Course, Duquesne University, Pittsburgh, PA July 28-Aug. 1, 2003.

Inductively Coupled Plasma Mass Spectrometry and Sample Preparation, May 15, 2003, with Professor Ramond Barns, Emeritus professor University of Massachusetts, for the Spectroscopy Society of Pittsburgh

Winter Plasma Conference January 8, 2001, Clean Chemistry; Sample Preparation for ICP-MS

“Microwave Enhanced Sample Preparation”, for the American Chemical Society, 5 Day Lecture-Laboratory Course, Duquesne University, Pittsburgh, PA July 30-Aug. 3, 2001.

“A Novel Approach in Speciation: Speciated Isotope Dilution Mass Spectrometry (SIDMS)” Eighth International Symposium on Biological and Environmental Reference Materials (BERM-8), Bethesda, Maryland, September 17-22, 2000.

“Dissolution by Wet Ashing”, Practical Methods of Microwave digestion for Trace Analysis IX, University of Massachusetts, Amherst, MA, August 14-18, 2000.

“Standard Methods: EPA”, Practical Methods of Microwave digestion for Trace Analysis IX, University of Massachusetts, Amherst, MA, August 14-18, 2000.

"Advanced Microwave Sample Preparation for ICP-MS, Providing Unique Mechanistic Solutions to Elemental and Species Analysis", 2000 Winter Conference on Plasma Spectrochemistry, Fort Lauderdale, FL, January 13, 2000.

"Clean Microwave Digestion for Trace Element Analysis", 2000 Winter Conference on Plasma Spectrochemistry, Fort Lauderdale, FL, January 9, 2000.

"Standard Methods: EPA, AOHL, ASTM, SEMI and international", University of Massachusetts, Amherst, MA, August 4, 1999.

"Microwave Dissolution by Wet Ashing – the state of the art", University of Massachusetts, Amherst, MA, August 4, 1999.

"Standard Methods: EPA, and Total Decompositions", University of Massachusetts, Amherst, MA, August 5, 1998.

"Dissolution by Wet Ashing-the Chemistry", University of Massachusetts, Amherst, MA, August 5, 1998.

"Microwave Enhanced Sample Preparation: General and Environmental Applications", for the American Chemical Society, 5 Day Lecture-Laboratory course, Duquesne University, Pittsburgh, PA, May 12-16, 1997.

"Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of Cr(VI)", for the U.S. Department of Energy, Environmental Measurements Laboratory, 201 Varick Street, 5th Floor, New York, NY 10014-4811, March 29, 1997.

"Microwave Enhanced Sample Preparation for Environmental and Analytical Analysis Application", for the U. S. Department of Energy, Environmental Measurements Laboratory, 201 Varick Street, 5th Floor, New York, NY 10014-4811, (March 29, 1997).

"Microwave Sample Preparation: Theory and Methods", for the American Chemical Society, 1 or 2 day course, Pittsburgh Conference, New York, NY (Mar 1990); EPA Region 3 & RCRA Headquarters staff, NIST, MD; FACSS, Cleveland, OH (Oct. 1990); EPA ,Baltimore, MD (Dec. 1990); Pittsburgh Conference, Chicago, IL (Mar 1991), Pittsburgh Conference, New Orleans, LA (Mar 1992), Kodak, Rochester, NY (Aug. 1992), EPA, Pittsburgh Conference, Atlanta, GA (Mar 1993) , Annapolis, MD (July 1993), Pittsburgh Conference, Chicago, IL (Feb. 1994), Pittsburgh Conference, New Orleans, LA (Mar 1995); EAS,(Nov. 29, 1996); PittCon 97, Atlanta GA,(March 21,1997).

"Microwave Sample Preparation", FACSS St. Louis MO., (Oct. 1994), FACSS Detroit MI. (Oct. 1993), PittCon New Orleans LA, (March 1992).

"Successful Atomic Spectrometric Determinations", for the Society of Applied Spectroscopy, 2 days (with R. L. Walters, M. Epstein, and N. M. Miller-Ihli, Atlantic City, NJ (Mar 1987), Baltimore, MD (May 1987), Detroit, MI (Oct. 1987), New Orleans, LA (Feb. 1988), Los Alamos, N.M., (May 1989), FACSS Conf., Philadelphia, PA (Sept. 1992).

"Introduction to Microwave Sample Preparation" 1994 Winter Conference on Plasma Spectrochemistry, San Diego, CA , (Jan. 8, 1994)(with L. Jassie), Winter Conference on Plasma Spectrochemistry , Ft. Lauderdale, FL, (Jan. 6, 1996).

"Applications of Microwave Sample Preparation Control and Matching Instrument Needs" 1994 Winter Conference on Plasma Spectrochemistry, San Diego, CA , (Jan. 9, 1994) (with Peter J. Walter].

"Microwave Enhanced Sample Preparation: General and Environmental Applications", for the American Chemical Society, 4 Day Lecture-Laboratory course, Duquesne University, Pittsburgh, PA, (August 23-26, 1994).

"Sample Prep for ICP-MS" 1995 Winter Conference on Plasma Spectrochemistry, Cambridge, England, UK, (Jan. 8, 1995) (with S. Haswell).

“Environmental Applications of Microwave Enhanced Chemistry, “Pittsburgh Conference, New Orleans, LA, Mar. 7, 1995 (With P. Walter), FACSS, Cincinnati, OH, Oct. 1995, Pittsburgh Conference, Chicago, IL, (Mar. 6, 1996).

"Microwave Enhanced Sample Preparation: General and Environmental Applications", for the American Chemical Society, 5 Day Lecture-Laboratory course, Duquesne University, Pittsburgh, PA, (May 15-19, 1995), (May 13-17, 1996).

“Applications of Various Microwave Sample Preparation Methods for ICP Trace Elemental Analysis”, Winter Conference on Plasma Spectrochemistry, Ft. Lauderdale, FL, (Jan. 7, 1996).

BOOKS

Developed two professional reference texts for the American Chemical Society on the subject of microwave sample preparation and microwave analytical chemistry.

Kingston, H. M. Skip and Haswell, Steve, Eds., Microwave Enhanced Chemistry: Fundamentals, Sample Preparation, and Applications, ACS Professional Reference Book Series, American Chemical Society, Washington, DC, 1997.

Kingston, H. M. and Jassie, L. B., Eds., Introduction to Microwave Sample Preparation: Theory and Practice, ACS Professional Reference Book, American Chemical Society, Washington, DC, 1988. ISBN 0-8412-1450-6.

Translated into Russian by the Russian Academy of Sciences, ISBN 7-5029-0830-7.
Translated into Chinese by the Chinese Science Society, ISBN 5-03-002108-6.

EXPERIENCE AND PROFESSIONAL CONSULTATION

2000 - Present	Metara, Inc.
1996 - Present	Milestone Inc., USA
1994 - Present	Milestone s.l.r. Italy
1998 - 1999	Sony Chemicals Corporation of America
1998 - 1999	Los Alamos National Laboratory
1998 - 1999	MEMC Pasadena, Semiconductor Analysis
1980 - 1982	DOE, Evaluation of Nuclear Waste, Analytical Methods, and Method Development of Simulated Nuclear Waste Protocol
1979 - 1981	EPA, Quality Assurance Study of the Chesapeake Bay
1994	Kodak
1994 - 1995	R. J. Reynolds Tobacco Company, Laboratory Automation Consultant
1992	NIST

CHAIRED DOCTORAL DISSERTATION RESEARCH COMMITTES

Ye Han
Dissertation Title: “Method and Instrumental Development for Ultra-Trace Elemental and Speciation Analysis”, Duquesne University, Pittsburgh, PA, 1996 – 2001.

Helen Boylan
Dissertation Title: “The Analysis of Mercury and Its Species for Environmental Applications”, Duquesne University, Pittsburgh, PA, 1996 – 2001.

Dirk D. Link
Dissertation Title: “Microwave-Enhanced Analytical Chemistry for Leaching, Total Processing, and Clean Chemistry in Inorganic Analysis.” Duquesne University, Pittsburgh, PA, 2000.

Dengwei Huo
Dissertation Title: “The Development of Methods in Speciated Isotope Dilution Mass Spectrometry (SIDMS) for Elemental Speciation of Chromium in Environmental Samples Using LC-ICP-MS” Duquesne University, Pittsburgh, PA , 1999.

Lois B. Jassie
Dissertation Title: "Microwave Dissolution Development and Application of a New Sample Preparation Technique”,The American University, Washington, DC, 1989.

Peter J. Walter
Dissertation Title: "The Development and Validation of Advanced Reaction Control Techniques for Microwave Sample Preparation”, Duquesne University, Pittsburgh PA, 1996.

Sejal Iyer, in progress, Duquesne University, Pittsburgh, PA, 1997-Present

Mizanur Rahman, in progress, Duquesne University, Pittsburgh, PA, 1999-Present

David Lineman, In Progress, Duquesne University, Pittsburgh, PA, 2001-Present

David Ionadi, In Progress, Duquesne University, Pittsburgh, PA, 2002-Present

Pallavi Despada, In Progress, Duquesne University, Pittsburgh, PA 2002-Present

Carolyn Curtin, In Progress, Duquesne University, Pittsburgh, PA, 2002-on medical leave

Doctoral Advisory Committee

Sherif Farag Badawy
Dissertation Title: “Characterization and bioavailability of hydrophilie danazolcyclodextrin complexes" Duquesne University, Department of Pharmacy, Pittsburgh, PA, 1995.

CMU with …

DOCTORAL ROTATION STUDENTS

Sandeep Bhandari, 1999 –2000
Tara Carpenter, 1999- 2000
Irena Karpov, 2001-2002
David Lineman, 2001
David Ionadi, In 2002
Pallavi Despada, 2002
Carolyn Curtin, 2002
Hua Ye, 2003

POSTDOCTORAL STUDENTS AND PROFESSIONALS

Dr. Theo Towns, supported by Metara Inc. 2002
Development of methods and instrumentation for semiconductor QA using ES-LC-MS

Dr. Amit Chatterjee, supported by Metara Inc. 2001
Development of methods and instrumentation for semiconductor QA using ES-LC-MS

Dr. Robert C. Richter, supported by Milestone, Inc. 1997-2000
Continuation of the development of microwave methods

Dr. Stuart Chalk, supported by Prolabo Instruments, France, 1994 -1996
Development of Open Vessel Microwave Chemistry

Dr. Peter Walter, supported by Milestone srl, Italy, 1996 - 1997
Development of Standard Methods and Acid Chemistry Database and Web Site

Dr. Daniel Taylor, supported by Fisons Instruments, UK, 1993 - 1995
Development of ICP-MS Speciation Techniques

Dr. Leo Collins, supported by Prolabo Instruments, France, 1993 -1994
Development of Open Vessel Microwave Chemistry

Dr. Archava Siriraks, supported by Dionex Corporation, 1987 - 1990
Transition Element Chromatography Using Ion Chromatography

Dr. Lois B. Jassie, supported by CEM Corporation, 1989 - 1992
Microwave Sample Preparation

Dr. Barry J. Wyttoff, supported by National Research Council, 1990 - 1992
Investigation of Neural Networks and a Logical Conflict Resolution Scheme for Interpretation of Complex Spectral Data

Dr. Jim Petersen, supported by E. I. DuPont Corporation, 1990 - 1992
Developing robot Automated Microwave Decomposition Module

Dr. Anna P. Emery, supported by NIST, 1989 - 1992
Ion Chromatography Methods, and Supercritical Fluid Extraction

INTERNATIONAL SCIENCE FELLOWS

Dr. A. Al-Khalidi, President, Supraceutics Corporation, 1997 -2000

Dr. Marlene Franke, Duquesne University, 1993 - 2000
Dr. Elke Lorentzen, Duquesne University, 1993 – 1999

INTERNATIONAL and GUEST SCIENTISTS

Dr. Karin Rosen; MD/Ph.D., Validation & evaluation study of patented SIDMS methods

Mr. Matt Pamuku, Life Science validation & evaluation study of patented SIDMS method

Mr. Katsuyoshi Kubo, Daikin Industries Ltd., Supported by Daikin Industries Ltd. Osaka, Japan, 1988-1990. Studying aspects of Chelation Chromatography

Mr. Weiren Yuan, Chief of Department, China Center of Testing Technology, supported by China Center of Testing Technology, Shanghai, People's Republic of China, 1985-1986. Studying Automation and Laboratory Robotics

Dr. Joost Woittiez, Netherlands Energy Research Foundation (ECN), Petten, The Netherlands. Supported by Netherlands Energy Research Foundation, 1983-1984. Studying Ultra-Trace Analysis and Clean Chemistry

MASTER STUDENTS (* denotes chair of masters thesis committee)

* Jason Brown, Thesis, Modeling of Complex Aqueous Equilibrium, 2003
* George Lusnak, Non-Thesis, Duquesne University, 2000
* David Camillo, Non Thesis, Duquesne University, 1999-Present
* Shawn Moore, Non Thesis, Duquesne University, 1997-1999
* Randy Cain, Thesis Title: "Characterization of Chromium Species Leaching from a Coal Combustion Fly Ash Landfill and Potential Remediation with Acid Mine Drainage", Duquesne University, 1998
* Yusheng Lu, Thesis Title: "Identification of Standard Method Biases in Chromium(VI) Species Analysis and Microwave Improvements in Extraction
* Elke Lorentzen, Thesis Title: A Comparison of Microwave Assisted and Conventional Leaching Using EPA Method 3050B" , 1996.
* Jason Brown, in progress, Duquesne University, 1993 - Present
* Haujan Guan, Non-Thesis, Duquesne University, 1996.
* Wenchen Jiang, Thesis Title: "Ozone Degradation of Residual Carbon from Microwave Digestion of Biological Samples", Duquesne University, 1996
* Jamie Natalie, Duquesne University, 1994 - Present
* John Sebroski, Thesis Title: "Cyanide Method Research Study", Duquesne University, 1995
* Mike Wade, Thesis Title: "A Study of the Biodegradability of Cyclohexylamine and Dicyclohexylamine by Aerobic Biological Treatment", Duquesne University, 1995
* James Ferguson, Thesis Title: "Educational Opportunities and Applications of Computer Based Environmental Modeling", Duquesne University, 1995

RESEARCH INTERESTS

- Development of speciated isotope dilution mass spectrometry (SIDMS) methods for legally defensible and accurate species measurements in environmental, clinical, nutritional and industrial samples. Implementation of this procedure to solve speciation measurement problems in the aforementioned areas. Produced and hold the fundamental enabling patents in this area of research.

- Investigate closed vessel microwave sample preparation and decomposition. Seek fundamental mathematical relationships to allow theoretical prediction of power absorption and molecular

interaction in the microwave environment. Develop unique applications for this technique. Develop predictive models. Develop expert systems to provide methods development and control systems. Develop fundamental reference tools including a leading web site on research and reference material in this field of research. Produced enabling patents in this area of research.

- Develop standard measurement methods and evaluation procedures for international standards organizations. Focus is on environmental measurements and evaluation of inorganic trace and ultra-trace constituents.

- Develop fundamental methods in laboratory automation, robotics and expert systems for use in instrumental analysis. Develop fundamental theories for extending automated methods to research, environmental, clinical and industrial laboratory, addressing data quality, intelligent instrument control, instrument modularity, and quality assurance.

- Investigate novel approaches to achieve ultra-trace element separations using chelation chromatography, IC, and HPLC elemental separations to enhance analytical instrumental measurement analysis. Develop novel hyphenated analysis techniques based on matrix modification and separation. Produced fundamental enabling patents in this area of research that are held by the federal government.

- Develop new, highly selective fixed-phase chelators for the matrix modification of analytical samples. Investigate the theory and mechanism of these reactions. Investigate the application of chelating resins for IC and HPLC elemental separations.

- Develop advanced laboratory automation methods and apply these concepts to advanced prototype systems that address broad segments of analytical analysis. Investigate fundamental methods to modularize instrumentation for the analytical laboratory.

- Combine automated analytical sample separation instrumentation and microwave sample decomposition for instrumental analysis.

- Increase the accuracy and precision in elemental analysis of biological and botanical materials by developing new methods of sample preparation and combining them with traditional instrumental quantification methods.

- Develop new methods in ultra-trace element analysis using a variety of novel approaches. Use in situ reagent generation to reduce the analytical blank. Combine several portions of the electromagnetic spectrum to promote more efficient sample preparation.

- Investigate the use of expert systems for intelligent control of automated instrumentation and systems. Develop quality assurance benefits of expert systems through instructional capability as off line advisor and interactive controller.

PUBLICATIONS:

127. Mizanur Rahman and H. M. 'Skip' Kingston*, Mercury Species Analysis Method Optimized Using Microwave Enhancements for Soil and Sediments, Analytical Chemistry, Submitted

126. Helen Boylan*, Randy Cain, H. M. Skip Kingston, A New Method to Assess Mercury Emissions: A Study of Three Coal-Fired Electric-Generating Power Stations Configurations, Journal of the Air & Waste Management Association, Volume 53, November 2003.

125. Mizanur Rahman, H. M. Skip Kingston*, Sandeep Bendari, Synthesis and Characterization of Isotope Enriched Methylmercury ($CH_3^{201}Hg$), Inorganic Chemistry, Journal of Applied Organometalic Chemistry, 17, pg 913-920, 2003.

124. EPA Draft Method 3200 Mercury Species by Selective Solvent Extraction and Acid Digestion," Ye Han, Mizanur Rahman, H. M. Skip Kingston, Submitted for Adoption in EPA RCRA SW-846 September 2003, pending committee approval and SW-846 update in the Federal Register.

123. Automated, On-Line, Trace Contamination and Chemical Species Analysis For the Semiconductor Industry, Skip Kingston, Robert McDonald, Ye Han, Jason Wang, June Wang, Michael West, Larry Stewart, Bob Ormond, and Rudy Mui, API Conference Proceedings Bolume 683, Melville, NY, 2003

122. Controlling Copper Electrochemical Deposition (ECD), Michael West, Robert McDonald, Marc Anderson, Skip Kingston, and Rudy Mui, API Conference Proceedings Bolume 683, Melville, NY, 2003

121. Controlling Wafer Contamination Using Automated On-Line Metrology during Wet Chemical Cleaning, Jason Wang, Skip Kingsotn, Ye Han, Harmesh Saini, Robert McDonald, and Rudy Mui, API Conference Proceedings Bolume 683, Melville, NY, 2003

120. H. M. Kingston, Rudy Mui, Ye Han, "Real-Time, Unattended Trace Contamination and Chemical Species Analysis of Semiconductor Cleaning Solutions" in the Preceding of Semi Con Singapore 2002.

119. Ye Han, H. M. Kingston*, H Boylan, G. M. M. Rahaman, S. Shah, R. C. Richter, D. D. Link, S. Bhandari, Sepciation of Mercury in Soil and Sediment by Selective Solvent and Acid Extraction, Journal of Analytical and Bioanalytical Chemistry, 375, 428-436, 2003.

118. D. Link, H.M. "Skip" Kingston*, G. Havrilla, L. Colletti, "***Development of Microwave-, Assisted Drying Methods for Sample Preparation for Dried Spot Micro-x-ray Fluorescence Analysis", Analytical Chemistry***, 74, 1165-1170, 2002.

117. S. Shah, R.C. Richter, H. M. Kingston*, ***"Microwave Assisted Organic Extraction: An Integrated Approach"***. LCGC, Vol. 20, 2002

116. D. Link, H.M. Kingston*, G. Havrilla, L. Colletti, "***Development of Microwave-, Assisted Drying Methods for Sample Preparation for Dried Spot Micro-x-ray Fluorescence Analysis".***

115. Yee Han, H.M. Kingston, Dirk Link*, George Havrilla, ***"Handbook of Semiconductor Wafer Cleaning Technology"***.

114. Ye Han*, H.M. Kingston, Robert C. Richter, Camillo Pirola, ***"Dual-vessel Integrated Microwave Sample Decomposition and Digest Evaporation for Trace Element Analysis***

of Silicon Material by ICP-MS: Design and Application", Analytical Chemistry***,*** vol. 73, no. 6, 1106-1111, March 15, **2001**.115.

113. Robert C Richter, Dirk Link, H.M. Kingston*, ***"Microwave Enhanced Chemistry: Standardizing Sample Preparation",*** Analytical Chemistry, A-pages, January 1, **2001**.

112. John Garrick*, Mark D. Abkowitz, Alfred W. Grella, Mike P. Hardy, Stanley Kaplan, H. M. Kingston, W. John Lee, Milton Levenson, Werner F. Lutze, Kimberly Ogden, Martha R. Scott, John M. Sharp, Jr., Paul G. Shewmon, James Watson, Jr., Ching H. Yew.
"Improving Operations and Long-Term Safety of The Waste Isolation Pilot Plant: Final Report", Committee Final Report, Committee on the Waste Isolation Pilot Plant, National Research Council, National Academy Press, **2001.**

111. Raul J., Gazmuri*, Elizabeth Hoffner, Jordan Kalcheim, Helen Ho, Mukti Patel, Iyad Ayoub, Mike Epstein, H.M. Kingston, Ye Han. ***"Myocardial Protection During Ventricular Fibrillation by Interventions that Limit Proton-Driven Sarcolemmal Sodium Influx",*** American Heart Association, Journal of Laboratory and Clinical Medicine, vol. 137, No. 1, **2001**.

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n. US-EPA Method 3052 - Microwave assisted acid digestion of siliceous and organically based matrices

o. US-EPA Method 3015 - Microwave assisted acid digestion of aqueous samples and extracts

p. US-EPA Method 3031 - Acid digestion of oils for metals analysis by FAA or ICP spectroscopy

q. US-EPA Method 3050B - Acid digestion of sediments, sludges, and soils

r. US-EPA Method 3051 - Microwave assisted acid digestion of sediments, sludges, soils, and oils

s. US-EPA Method EMMC - Microwave assisted acid extraction and dissolution of soils, sediments, sludges and oils

t. US-EPA Method NPDES - Closed vessel microwave digestion of wastewater samples for metals determination

u. US-EPA Method 3015A - Acid leach of water & wastewater

v. US-EPA Method 3031 - Acid digestion of oils

w. US-EPA Method 3050B - Acid leach of soil, sediment, sludge

x. US-EPA Method 3051A - Acid leach of soil, sediment, sludge, and oil

y. Standard Methods 3030K (modified US-EPA 3015) - Acid leach of water

z. ASTM Method D5258-92 (modified US-EPA 3015) - Acid leach of sediment and soil

aa. ASTM Method D4309-91 (modified US-EPA 3051) - Acid leach of water

bb. ISO/TC 147/SC 2/WG40, Draft N18 and N19, "Decomposition of Water Samples with Aqua Regia and Nitric Acid" Contributed fundamental method parameters to committee members

cc. NCCLS Microwave Equipment Standard for Clinical Laboratories
Clinical Microwave Standard, 2003

dd. SEMI F48-0200 "Method for Determining Trace Metals in Polymer Materials"
(US and International, Approved 2000, good for 5 years then reapproval)

Others Standards Modified and Edited as part of method committee duties

PRESENTATIONS (* Invited Lectures)

*191. Invited Plenary Lecture: Automated, On-Line, Trace Contamination and Chemical Species Analysis for the Semiconductor Industry, ***Skip Kingston, ULSI meeting, sponsored by NSF, NIST, SEMI, MRS and others, Austin TX March 27, 2003***

*190. Invited Key Note Address: The Impact of Metrology in Future Chip Manufacturing Metrology, Skip Kingston, February 19, 2003.

*189. Prepared and Chaired - Corporate Seminar, State-of-the-art and Developed Automated Metrology in Semiconductor fab and future developments, December 2002. H. M. Skip Kingston, CTO; Technical Advisory Board of Metara Inc. December 15, 2002

*188. Invited Lecture "Real-Time, Unattended Trace Contamination and Chemical Species Analysis of Semiconductor Cleaning Solutions" H. M. Kingston, Semi Con Singapore, 5/8/02

*187. Invited Key Note Address: The Impact of Metrology in Future Chip Manufacturing Metrology, Skip Kingston, February 19, 2003.

*186. Keynote Speaker, "Speciated Isotope Dilution Mass Spectrometry", Trends in Sample Preparation, 2002, Leoben University, August 1, **2002**, Professor Wolfhard Wegshider Host.

*185. Keynote Speaker, "Trends and Applications of Integrated Automated Ultra-Trace Sample Handling and Analysis", Trends in Sample Preparation, 2002, Graz University of Technology, Graz, Austria, June 30, **2002,** Professor Gunter Knapp Host.

*184. Invited Lecture, "Real-Time, Unattended Trace Contamination and Chemical Species Analysis of Semiconductor Cleaning Solutions", Semi Con, Singapore, May 8, **2002**

*183. Invited Lecture, "Clean Microwave Digestions for Ultra-trace Analysis", Winter Conference on Plasma, Scottsdale Arizona, January 6, **2002**

*182. Invited Lecture, "Microwave Sample Preparation for Inorganic Analysis", Winter Conference on Plasma, Scottsdale Arizona, January 5, **2002**

*181. Invited Lecture, "Microwave Sample Preparation", ICAS Post Conference, Waseda University, Tokyo Japan, August 10, **2001**

*180. Invited Lecture, "Difficult Species Preparation and Analysis using Speciated Isotope Dilution Mass Spectrometry", ICAS (IUPAC) Conference, Tokyo Japan, August 8**, 2001**

*179. Invited lecture, "Sample Preparation of Difficult Species", USDA, Beltsville MD. February 15, **2001**

*178. Invited lecture, "Difficult Chemical Species Evaluations in the Environment by Speciated Isotope Dilution Mass Spectrometry (SIDMS)", Westminster College February 13, **2001.**

*177. Invited lecture, "Mercury Species by Selective Solvent Extraction and Acid Digestion, EPA Draft Method 3200", Inorganic Working Group, EPA WTQA meeting, Washington DC, August 7. **2000.**

*176. Invited lecture, "A Novel Approach in Speciation: Speciated Isotope Dilution Mass Spectrometry (SIDMS)" Eighth International Symposium on Biological and Environmental Reference Materials - BERM-8, NIH Campus, NIST Department of Commerce, September, 18, **2000.**

*175. Invited lectures "Dissolution by Wet Ashing" and "Standard Methods, EPA etc.", University of Massachusetts, August 15, **2000.**

*174. "Dissolution by Wet Ashing", Practical Methods of Microwave digestion for Trace Analysis IX, University of Massachusetts, Amherst, MA, August 14-18, **2000.**

*173. "Standard Methods: EPA ", Practical Methods of Microwave digestion for Trace Analysis IX, University of Massachusetts, Amherst, MA, August 14-18, **2000.**

*172. "Taking Mercury Analysis into the 21st Century with Speciation", Helen M. Boylan, H.M.Kingston, 16th Annual Waste Testing and Quality Assurance Symposium, Arlington, VA, August 5-10, **2000**.

*171. Session Chairman, "Sample Preparation and Treatment for Plasma Spectroscopy, Analysis of High Purity Materials", 2000 Winter Conference on Plasma Spectrochemistry, Fort Lauderdale, FL, January 13, **2000.**

*170. "Standard Methods: EPA, AOHL, ASTM, SEMI and international", University of Massachusetts, Amherst, MA, August 4, **1999.**

*169. "Microwave Dissolution by Wet Ashing – the state of the art", University of Massachusetts, Amherst, MA, August 4, **1999.**

*168. "WWW.Sample Prep", Laboratory demonstration, University of Massachusetts, Amherst, MA, August 3, **1999.**

*167. "State of the art and new advances in microwave inorganic sample preparation", Los Alamos National Laboratory, Albuquerque, NM, July 28, **1999.**

*166. "Using Acid Mine Drainage to Detoxify Hexavalent Chromium Leachate Feasibility for Coal Generated Electric Power", Poster presentation, H.M.Kingston, Randy Cain, Waste Testing & Quality Assurance Symposium (WTQA), Arlington, VA, July 21, **1999.**

*165. "New Development of Method 7473", Helen M. Boylan, H.M. Kingston, Terri Serapiglia, Waste Testing & Quality Assurance Symposium (WTQA), Arlington, VA, July 20, **1999.**

*164. "ICP-MS Sample Preparation: Making the Sample Fit the Analysis Needs", University of Pittsburgh, Presented to Mass Spectrometry Discussion Group of Pittsburgh and the Spectroscopy Society of Pittsburgh, July 15, **1999.**

*163. "State of the Art and Fundamental of Microwave Chemistry", Cambridge, England, March 24, **1999.**

*162. "State of the Art and Fundamental of Microwave Chemistry", Reading, England, March 22, **1999.**

*161. "Microwave Enhanced Chemistry: What makes it special? Where is the field now? Where it is going?", Milestone, Inc., Monterrey, Mexico, October 21, **1998.**

*160. "Microwave Enhanced Chemistry: What makes it special? Where is the field now? Where it is going?", Milestone, Inc., Mexico City, Mexico, October 19, **1998.**

*159. "Analytical Microwave Sciences Enhanced Chemistry in Inorganic Analytical Analysis", DOW, Presented to multi national audience via conference calling, August 18, **1998.**

*158. "Standard Methods: EPA, and Total Decompositions", CEM, University of Massachusetts, Amherst, MA, August 5, **1998.**

*157. "Dissolution by Wet Ashing – the Chemistry", CEM, University of Massachusetts, Amherst, MA, August 3, **1998.**

*156. "Diagnosing Errors in Species Analysis Using SIDMS Method 6800", WTQA, July 14, **1998.**

*155. "Microwave Enhanced Chemistry: What Makes It Special?, Where is the Field Now?, Where Is It Going?", Milestone, s.r.l., Bergamo, Italy, Presented to representatives of 41 countries, April 27, **1998.**

*154. "The New Standard Method for Sample Preparation", Munich, Germany, April 21, **1998**.

153. "New EPA RCRA Method 6800, Elemental and Speciated Isotope Dilution Mass Spectrometry", New Orleans, LA, March 5, **1998.**

*152. "Microwave Enhanced Sample preparation for Analytical Analysis Applications", SAS, Chicago, IL, February 10, **1998.**

*151. "Clean Microwave Digestion for Trace Element Analysis", 1998 Winter Conference on Plasma Spectrochemistry, Scottsdale, AZ, January 4, **1998.**

*150. "Microwave Sample Preparation", 1998 Winter Conference on Plasma Spectrochemistry, Scottsdale, AZ, January 3, **1998.**

*149. "The Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of CR(VI) in Soil", Eastern Analytical Symposium & Exposition, Somerset, N. J., November 21, **1997.**

*148. "Microwave Sample Preparation: Theory and Practice", Eastern Analytical Symposium & Exposition, Somerset, N. J., November 20, **1997.**

*147. Plenary Lecture "Microwave Enhanced Sample Preparation for Analytical Analysis Applications", Society for Analytical Chemists of Pittsburgh, Pittsburgh, PA, October 6, **1997.**

*146. "Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of Chromium (VI) in Soil", 9th Annual Symposium on Emerging Technologies in Hazardous Waste Management, Pittsburgh, PA, September 15, **1997.**

*145. "Speciated Isotope Dilution Mass Spectrometry and Accurate Speciation Analysis Method: Exemplified Using CR (VI) in Soil and Water", 43rd International Conference on Analytical Sciences and Spectroscopy, McGill University, Montreal, Quebec, Canada, August 12, **1997.**

*144. "Practical Clean Chemistry Techniques for Trace and Ultra-Trace Elemental Analysis", 43rd International Conference on Analytical Sciences and Spectroscopy, McGill University, Montreal, Quebec, Canada, August 11, **1997.**

*143. "Standard methods: EPA and Total Decompositions", Practical Methods of Digestion for Trace Analysis VI Conference University of Massachusetts, Amherst, MA, August 7, **1997.**

*142. "Dissolution by Wet Ashing-the Chemistry", Practical Methods of Digestion for Trace Analysis VI Conference University of Massachusetts, Amherst, MA, August 6, **1997.**

*141. "The Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of CR (VI) in Soil", Environmental Chemistry Symposium of the 1997 Rocky Mountain Conference, Denver, CO, August 4, **1997.**

*140. "Legally Defensible Speciated Measurements Using SIDMS Analysis", 13th Annual Waste Testing & Quality Assurance Symposium (WTQA), Washington, D.C., July 8, **1997.**

*139. "Practical Clean Chemistry Techniques for Trace & Ultra Trace Elemental Analysis", 13th Annual Waste Testing & Quality Assurance Symposium (WTQA), Washington, D.C., July 8, **1997.**

*138. "Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of Cr (VI)", U.S. Department of Energy - Environmental Measurements Laboratory, New York, N.Y., May 29, **1997.**

*137. "Microwave Enhanced Sample Preparation for Environmental and Analytical Analysis Application", U.S. Department of Energy - Environmental Measurements Laboratory, New York, New York, May 29, **1997.**

*136. "The Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of Chromium(VI) in Soil." PittCon97, Atlanta GA, May19, **1997.**

*135. "The Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of Chromium(VI) in Soil", 35th Annual Eastern Analytical Symposium and Exposition, Somerset NJ, Nov. 21, **1996.**

*134. "The Accurate Determination of Species by Speciated Isotope Dilution Mass Spectrometry: Exemplified by the Evaluation of Cr(VI) in Soil", The 12th Annual Waste Testing and Quality Assurance Symposium, Washington DC, July 25, **1996.**

*133. Plenary Lecture "Sample Preparation Using Microwaves", PACS Environmental Sampling, On-Site Analysis and Sample Preparation Conference, Pittsburgh, PA, June 27, **1996.**

*132. "Lecture 303: Closed Vessel Microwave Digestion", University of Massachusetts, Microwave Short Course, June 4, **1996.**

*131. "Lecture 306: EPA Protocol for Microwave Digestion", University of Massachusetts, Microwave Short Course, June 5, **1996.**

*130. "Environmental Sample Preparation Using Microwave Technology", Villanova University, April 30, **1996.**

*129. Plenary Lecture "Closed Vessel Microwave Digestion. Theory Part 2 (Inorganic Samples)" Workshop on Sample Decomposition Methods, University of Sao Paulo, Center for Agriculture Nuclear Energy, Piracicaba, Brazil April 1, **1996.**

*128. Plenary Lecture "Closed Vessel Microwave Digestion. Theory Part 1 (Inorganic Samples)", Workshop on Sample Decomposition Methods, University of Sao Paulo, Center for Agriculture Nuclear Energy, Piracicaba, Brazil, April 1, **1996.**

*127. Plenary Lecture "Closed Vessel Microwave Digestion. Theory Part 2 (Organic Samples)" Workshop on Sample Decomposition Methods, University of Sao Paulo, Center for Agriculture Nuclear Energy, Piracicaba, Brazil, March 29, **1996.**

*126. Plenary Lecture "Closed Vessel Microwave Digestion. Theory Part 1 (Organic Samples)" Workshop on Sample Decomposition Methods, University of Sao Paulo, Center for Agriculture Nuclear Energy, Piracicaba, Brazil, March 27, **1996.**

*125. Chairman of Session: Microwave Enhanced Environmental Analysis Symposium, "Research and Future Directions in Microwave Enhanced Sample Preparation for Environmental Applications" Pittsburgh Conference, Chicago, IL March 7, **1996.**

*124. Chairman of Session: Sample Preparation and Treatment for Plasma Spectroscopy, "Robust Environmental Sample Preparation for ICP-MS Including Total and Speciated Elemental Analysis", Winter Conference on Plasma Spectrochemistry, Ft. Lauderdale, FL, January 11, **1996.**

*123. Keynote Address "Microwave Sample Preparation for General and Environmental Elemental Analysis", Twenty-Second Annual Meeting of The Iron and Steel Chemists' Association, Pittsburgh, PA, October 30, **1995.**

*122. "Environmental Analysis: New Generations and Innovations" Indiana University of Pennsylvania, September 29, **1995**

*121. "Microwave Applications to Environmental Analysis Including New Draft Method 3052", PACS Environmental Sampling, On-site Analysis and Sample Preparation Conference, Pittsburgh, PA, June 28, **1995**

*120. "Lecture 304: EPA Protocol for Microwave Digestion", University of Massachusetts, Microwave Short Course, June 6, **1995.**

*119. "Lecture 303: Closed Vessel Microwave Digestion", University of Massachusetts, Microwave Short Course, June 6, **1995.**

*118. "The Structure Required to Achieve Integrated Automated Analysis", ACS National Meeting, Division of Industrial and Engineering Chemistry, Symposium on Automation: Key to Productivity in the 90's, Anaheim, CA, April 4, **1995.**

*117. "Microwave Digestion for Preparation of Environmental Samples", Argonne National Laboratory, Argonne, IL, March 24, **1995.**

*116. "Integrating Automated Analysis", 1995 Pittsburgh Conference, New Orleans, LA, March 8, **1995**.

*115. Plenary lecturer "Sample Preparation for ICP-MS and ICP-OES", 1995 Winter Conference on Plasma Spectrochemistry, Cambridge, England, UK, Jan. 10, **1995.**

*114. "Automation, Transfer, and Encapsulation of Standard Environmental Methods, " Emerging Technologies in Hazardous Waste Management VI, Atlanta, GA, Sept. 19, **1994.**

*113. Invited Symposium "Microwave Sample Preparation Control and Matching Instrument Needs", 1994 Winter Conference on Plasma Spectrochemistry, San Diego, CA, Jan. 12, **1994.**

*112. "Microwave Digestion Environmental and Analysis Applications", University of Pittsburgh, Pittsburgh, PA, Oct. 28, **1993.**

*111. "Matrix Alteration for On-Line Analysis using Chelation Chromatography for Trace Elemental Analysis in Complex and Environmental Samples", FACSS XX, Society of Applied Spectroscopy, Cobo Hall, Detroit Michigan, Oct. 18, **1993.**

*110. "Matrix Alteration for On-Line Analysis using Chelation Chromatography for Trace Elemental Analysis in Complex and Environmental Samples", ACS 25th Central Regional Meeting, Pittsburgh, PA, Oct. 4,**1993.**

*109. "Introduction to Microwaves and Instrumental Requirements" Plenary Lecture, International Conference on Microwave Enhanced Chemistry, Birmingham, U.K., Sept. 29, **1993.**

*108. "Microwave Chemistry Development and Future Directions", Hewlett Packard Corporation, Little Falls, DE, June 28**,1993.**

*107. Invited Symposium "Microwave Sample Preparation: the state-of-the-art, " PittCon 93, Atlanta, GA, March. 8, **1993.**

*106. Invited Symposium Presentation "Microwave Sample Preparation Control, Today and Tomorrow " PittCon 93, Atlanta, GA, March. 8, **1993.**

*105. "Microwave Applications in Analytical Chemistry", First World Congress on Microwave Chemistry, Plenary Lecture, Breukelen, The Netherlands, Sept. 6, **1992.**

*104. "Microwave Sample Preparation for Environmental and Chemical Analysis", Indiana University of Pennsylvania, Indiana, PA, April 17, **1992.**

*103. "Challenges Facing the Chemist in the 21st Century: Microwave Sample Preparation for Environmental and Chemical Analysis", Spectroscopy Society of Pittsburgh, Pittsburgh, PA, February 22, **1992.**

*102. "Sample Processing for Trace Element Determinations With Special Reference to Microwave Dissolution Procedures", Human Tissue Banking Workshop, Great Lakes Health Effects Program, Tunney's Pasture Research Center, Health and Welfare, Ottawa, Canada, November 4, **1991**.

*101. "Encapsulation of Methods for Intelligent Automated Analysis", International Symposium on Laboratory Automation and Robotics, Boston, MA, October 20, **1991.**

*100. "New Sample Preparation Methods for Environmental Analysis" , Lab Tech '91, Industrial and Environmental Laboratory Technology Conference and Exhibition, Atlantic City Convention Center, Atlantic City , NJ, June 12, **1991.**

*99. "Trace Analysis: Trends in the 90's", (Session Chairman, Trace Element Analysis), LabTech '91, Industrial and Environmental Laboratory Technology Conference and Exhibition, Atlantic City Convention Center, Atlantic City , NJ, June 12, **1991**.

*98. "Laboratory Strategies for the 1990's: Laboratory Automation", (Plenary Lecture), LabTech '91, Industrial and Environmental Laboratory Technology Conference and Exhibition, Atlantic City Convention Center, Atlantic City , NJ, June 12, **1991.**

*97. "Directions of Analytical Chemistry in the 90's: Laboratory Automation", Department of Chemistry, Mellon Hall, Duquesne University, Pittsburgh, PA, February 18, **1991.**

*96. "Intelligent Laboratory Automation", Symposium on Expert Systems in Analytical Chemistry, The 1991 Pittsburgh Conference, Chicago IL, March 7, **1991.**

*95. "State of the art in Microwave Sample Preparation", Argon National Laboratory, Chicago IL, March 1, **1991.**

*94. "New Methods and Future Directions in Sample Preparation and Elemental Analysis", Mellon Hall, Chemistry, Mellon Hall, Duquesne University, Pittsburgh, PA, February 18, **1991.**

*93. "New Methods and Future Directions in Sample Preparation and Elemental Analysis", Science Complex, University of Montana, Missoula, MT, February 7, **1991.**

*92. "The Future of Analytical Chemistry", Department of Chemistry, Washington and Lee University, Lexington, VA, November 9, **1990.**

*91. "Analytical Instrumental Methods", Department of Chemistry, Virginia Military Institute, Lexington, VA, November 8, **1990.**

*90. "Analytical Chemistry, Trends, Present and Future", Department of Chemistry, George Washington University, Washington, D C, November 7, **1990.**

*89. "Critical Issues, Trends and Methods in Automated Analysis", Plenary Lecture, Federation of Analytical Chemistry and Spectroscopy Societies, Cleveland Convention Center, Cleveland, OH, October 10, **1990.**

*88. "Automated Sample Pretreatment Using Ion Exchange and ICP-AES Detection of the Noble and Transition Elements", Federation of Analytical Chemistry and Spectroscopy Societies, Cleveland Convention Center, Cleveland, OH, October 10, **1990.**

*87. "Automated Sample Preparation for Environmental Analysis", Chemistry Department, University of Maryland, College Park, MD, September 28, **1990.**

*86. "Consortium on Automated Analytical Laboratory Systems", (Session Chairman), Scientific Computing and Automation Conference, Philadelphia, PA, September 20, **1990.**

*85. "Automated Microwave Sample Preparation", Euro-Analysis, Vienna, Austria, August 31**, 1990** .

*84. "Consortium on Automated Analytical Laboratory Systems", Euro-Analysis, Vienna, Austria, August 31, **1990**.

*83. "New Sample Preparation Methods for Environmental Analysis", Rocky Mountain Conference, Rocky Mountain Section, Society for Applied Spectrography, Denver, CO, August 1, **1990.**

*82. "Sample Preparation for Atomic Spectrometric Analysis", Plenary Lecture, 5th Biennial National Atomic Spectroscopy Symposium (BNASS), Royal Society of Chemistry, Analytical Division, Loughborough University of Technology, Loughborough, England, July 20, **1990**.

*81. "Consortium on Automated Analytical Laboratory Systems", NIST Visiting Committee, June 25, **1990.**

*80. "Chemical Application of Microwave Energy", Eastman Kodak Co., Rochester, NY, March 23, **1990.**

*79. "Sample Preparation: Decomposition, Separation and Preservation", Plenary Lecture, 2nd International Conference on Environmental Analytical Chemistry, Honolulu, HI, January 18, **1990.**

*78. "Microwave Sample Preparation Short Course", 1990 Winter Conference on Plasma Spectrochemistry, St. Petersburg, FL, January 6, **1990.**

*77. "Automated Microwave Sample Preparation", 1990 Winter Conference on Plasma Spectrochemistry, St. Petersburg, FL, January 9, **1990.**

*76. "Automated Analytical Chemistry; Applications to EPA Methods", EPA Headquarters, Washington Information Center, Washington, D. C., December 8, **1990**.

*75. "Future Directions in Laboratory Automation", Digital Equipment Co., Boston, MA, December 21, **1989.**

*74. "Chelation Ion Chromatography for Analysis of Trace Transition Elements as an Independent Method and as a Hyphenated Method", Advances in Ion Exchange Separation and Electrochemical Detection Symposium, Baltimore, MD, September 22, **1989.**

*73. "Microwave Interactions with Acid Solutions", 24th Microwave Power Symposium and Short Course, Stamford, CT, August 22, **1989.**

*72. Seminar (Four Subjects) "Successful Atomic Spectrometric Determinations: Clean Chemistry, Microwave Sample Preparation, Laboratory Robotics, and Separations for Analytical Determinations of Trace Elements", Course for Society of Spectroscopy, Los Alamos National Laboratory, NM, May 18, **1989.**

*71. "Automated Chelation Ion Chromatography for Preconcentration and Determination of Trace Transition Elements in Sea Water and Biological Tissue", Pittsburgh Conference, Atlanta, GA, March 9, **1989.**

*70. "Computer-Assisted Laboratory Procedures for Microwave Sample Dissolution", Pittsburgh Conference, Atlanta, GA, March 9, **1989.**

*69. "Microwave Sample Preparation", Short Course sponsored by the Pittsburgh Conference, Pittsburgh Conference, Atlanta, GA, March 9, **1989.**

*68. "Microwave Digestion Procedures for Soils, Sediments and Oils", U.S. EPA OSW Inorganic Caucus, San Francisco, CA, April 25, **1989.**

*67. "Advanced Field Methods: Chelation Ion Chromatography", U.S. EPA OSW Inorganic Caucus, San Francisco, CA, April 25, **1989.**

*66. "Fundamental Relationships in Acid Decomposition of Environmental Samples for Elemental Analysis Using Microwave Energy", U.S. EPA OSW Symposium on Waste Testing and Quality Assurance, Washington, DC, July 13, **1988.**

*65. "Microwave Sample Preparation for Environmental Testing", Meeting of EPA Regional Laboratory Directors and Branch Chiefs, Seattle, WA, June 14, **1988.**

*64. "Laboratory Robotics", Meeting of EPA Regional Laboratory Directors and Branch Chiefs, Seattle, WA, June 14, **1988.**

*63. "An Expert System for Sample Preparation", 3rd Chemical Congress of North America, Toronto, Canada, June 9, **1988.**

*62. "Fundamentals of Microwave Sample Preparation: With Practicum", Training Course of the Society for German Chemists, No. 349/88, Sample Preparation for Trace Analysis for Trace Elements and Radionuclides, Kernforschungsanlage, Central Department for Chemical Analysis, Julich GmbH, West Germany, May 19, **1988.**

*61. "High Temperature and Pressure Acid Decomposition of Materials in Microwave System", Joint ASTM D-34 and D-19 Committee Meeting, Toronto, Ontario, May 17, **1988.**

*60. "Neutron Activation Analysis of the NBS Bovine Serum Standard Reference Material Using Chemical Separations", Third International Symposium on Biological Reference Materials, Bayreuth, FRG, May 6, **1988.**

*59. "High Temperature Microwave Sample Decomposition for Elemental Analysis", Materials Research Society, Reno, NV, April 7, **1988.**

*58. "Fundamental Relationships in Acid Decomposition of Environmental Samples for Elemental Analysis Using Microwave Energy", Symposium on Microwave Processing of Materials, paper #fM5.1, Reno, NV, April 5-8, **1988.**

*57. "Computer Controlled Laboratory Robotics and Microwave Sample Preparation", EPA Seminar - EPA/EMSL, Las Vegas, NV, April 4, **1988.**

*56. "Microwave Acid Sample Decomposition for Elemental Analysis", Pittsburgh Conference, New Orleans, LA, February 26, **1988.**

*55. "Microwave Energy for Sample Preparation and Robotics for Analytical Analysis", Arco Oil and Gas Company, Plano, TX, February 24, **1988.**

*54. Seminar (Four Subjects) "Clean Chemistry, Microwave Sample Preparation, Laboratory Robotics, and Separations for Analytical Determinations of Trace Elements", Course for Society of Spectroscopy, Pittsburgh Conference, New Orleans, LA, February 20-21, **1988.**

*53. "Successful atomic Spectrometric Determinations", SAS Short Course, New Orleans, LA, February 20-21, **1988.**

*52. "The Use of Microwave Technology for Sample Digestion and Preparation", Phillips Petroleum Company, Bartlesville, OK, February 19, **1988.**

*51. "Solving Difficult Problems with Microwave Assisted Sample Decomposition", Panel Discussion: 1988 Winter Conference on Plasma Spectrochemistry, San Diego, CA, January 6, **1988.**

*50. "Microwave Assisted Sample Decomposition for Trace Analysis", Short Course, 1988 Winter Conference on Plasma Spectrochemistry, San Diego, CA, January 2, **1988.**

*49. "Microwave Assisted Decomposition of Soils", part of a short course on Sample Preparation at the 1988 Winter Conference on Plasma Spectrochemistry, San Diego, CA, January 2, **1988.**

*48. "Chemical Robotics and Microwave Assisted Digestive Techniques", EPA EMSL - Cincinnati, Cincinnati, OH, December 2, **1987**.

*47. "Microwave Energy for Sample Preparation", Shanghai Institute of Testing Technology, Shanghai, People's Republic of China, November 2, **1987**.

*46. "Laboratory Robotics", Shanghai Institute of Testing Technology, Shanghai, People's Republic of China, November 2, **1987.**

*45. "Isotopic Mass Spectrometry", Co-chair of Symposium, Beijing Conference and Exhibition on Instrumental Analysis, Beijing, People's Republic of China, October 22, **1987.**

*44. "Development of a Computer-Controlled Robot System for Analytical Separations by Column Chromatography", Beijing Conference and Exhibition on Instrumental Analysis, Beijing, People's Republic of China, October 21, **1987.**

*43. "The Development and Use of Fast Microwave Acid Sample Decomposition for Elemental Analysis", Beijing Conference and Exhibition on Instrumental Analysis, Beijing, People's Republic of China, October 20, 1987.

*42. "New Techniques in Analytical Spectroscopy", Co-chair of Symposium, Beijing Conference and Exhibition on Instrumental Analysis, Beijing, People's Republic of China, October 20, **1987.**

*41. "Applications of Laser-Enhanced Ionization Spectroscopy", Federation of Analytical Chemistry and Spectroscopy Societies XIV, Detroit, MI, October 6, **1987.**

*40. "Successful Atomic Spectrometric Determinations", SAS Short Course, Detroit, MI, October 3-4, **1987.**

*39. Seminar: (Four Subjects) "Clean Chemistry, Microwave Sample Preparation, Laboratory Robotics, Separations For Analytical Determinations of Trace Elements", Seminar for Society of Applied Spectroscopy, FACSS Meeting, Detroit, MI, October 3, **1987.**

*38. "Microwave Acid Sample Decomposition for Elemental Analysis", Accuracy in Trace Analysis: Accomplishments, Goals, Challenges, NBS, Gaithersburg, MD, September 29, **1987.**

*37. "Microwave Acid Dissolutions at High Temperatures and High Pressures", Eastern Analytical Symposium, New York, NY, September 14, **1987.**

*36. " Microwave Techniques", Co-chaired Symposium: Eastern Analytical Symposium, New York, NY, September 14, **1987.**

*35. "Closed Vessel Microwave Sample Preparation: Theory and Practice", EPA Solid Waste Testing and Quality Assurance Symposium, Washington, DC, July 15, **1987**.

*34. Seminar: (Four Subjects) "Clean Chemistry, Microwave Sample Preparation, Separations for Analytical Determinations of Trace Elements", Seminar for Society of Applied Spectroscopy, Pittsburgh Conference, Atlantic City, NJ, March 7-8, **1987.**

*33. Seminar: (Four Subjects) "Clean Chemistry, Microwave Sample Preparation, Laboratory Robotics, and Separations for Analytical Determinations of Trace Elements", Seminar for Society of Applied Spectroscopy, Baltimore, MD, May 12, **1987.**

*32. "Automated Column Chromatography for Elemental Separation", AOAC 1987 Spring Training Workshop, Ottawa, Canada, April 30, **1987.**

*31. "Preparative Chemistry for Inorganic Mass Spectrometry", Modern Methods of Inorganic Mass Spectrometry, one of 4 talks presented for the Society for Applied Spectroscopy, NBS, November 7, **1986.**

*30. "Closed Vessel Microwave Acid Decomposition: Monitoring and Predicting Conditions", Co-chaired Symposium: Recent Advances in Sample Preparation Using Microwave Technology, Eastern Analytical Symposium, New York, NY, October 20, **1986.**

*29. "Laboratory Robotics", Department of Chemistry, University of Maryland, College Park, MD, September 5, **1986.**

*28. "The Use of Microwave Energy in Acid Decomposition of Samples for Trace Elemental Analysis", SOHIO, Cleveland, OH, March 26, **1986.**

*27. "The Certification of Vanadium in Human Serum at the ppb Level Using IDMS", Indiana University of Pennsylvania, Indiana, PA, February 21, **1986.**

*26. "Laboratory Robotics", Society for Applied Spectroscopy, Gaithersburg, MD, January 28, **1986**.

*25. "Understanding the Acid Coupling in Microwave Dissolution Technology", CEM Corporation, Charlotte, NC, December 14, **1985.**

*24. "Acid Decomposition of Biological Tissue Using Microwave Dissolution Technology", ACS National Meeting, Chicago, IL, September 9, **1985.**

*23. "Closed Vessel Acid Dissolution Using Microwave Energy", Chemical Society of Washington, George Washington University, Washington, DC, May 9, **1985.**

*22. "Microwave Dissolution in Closed Vessels Under Elevated Temperature and Pressure", Pittsburgh Conference, New Orleans, LA, February 27, **1985.**

*21. "Risk Assessment: Legislative Alternatives in the 99th Congress", Society for Risk Analysis, McLean, VA, February 8, **1985.**

*20. "The Use of Microwave Energy for Closed Vessel Acid Decomposition", CEM Corporation, Charlotte, NC, December 13, **1984.**

*19. "Robots in the Analytical Chemistry Laboratory: A Useful Tool, Or All Thumbs?", National Bureau of Standards, Gaithersburg, MD, November 27, **1984.**

*18. "Some Aspects of the Chemistry of Acid Dissolution in a Microwave System", 30th ORNL-DOE Energy Technology Conference, Knoxville, TN, October 20-22, **1984.**

*17. "Standardizing the Plasma Determination of Elemental Components of Leachate Materials Derived from Simulated Nuclear Waste", ASTM C-26 Subcommittee on Plasma Standards, Quebec, Canada, July 14, **1983.**

*16. "The Leach Testing Evaluation of Simulated Nuclear Waste Glasses: Can It Be Done Precisely?", National Bureau of Standards, Gaithersburg, MD, July 8, **1982.**

*15. "An Examination of the MCC-1 Leach Test Method: Experimental Technique", Second Semiannual Workshop on the Leaching Mechanisms of Nuclear Waste Forms, Gaithersburg, MD, May 19, **1982.**

*14. "An Examination of the MCC-1 Leach Test Method: Comparison of Glass Compositions", Second Semiannual Workshop on the Leaching Mechanisms of Nuclear Waste Forms, Gaithersburg, MD, May 19, **1982.**

*13. "Workshop on Spiking Procedures for Isotope Dilution Mass Spectrometry", Mass Spectrometry Conference, Minneapolis, MN, May **1981.**

*12. "Preparation and Leachability Test Procedures for Nuclear Waste Forms", FACSS Meeting, Philadelphia, PA ,September 25-28, 1981. (Co-Chairperson for Topical Forum on Standards in the Nuclear Waste Industry, FACSS, September **1981).**

*11. "State-of-the-art Analytical Measurements of Trace Elements in Aqueous and Other Matrices With an Emphasis on Chemical Manipulation", Rockwell International Labs, Richland, WA, January 27, **1981**.

*10. "Trace Metal Analysis: The Effect of Chemical Manipulation on the Results", Battelle Pacific Northwest Labs, Richland, WA, January 28, **1981**.

*9. "Analytical Chemistry Techniques as Applied to Analysis of Water in the Chesapeake Bay", Thiel College, Greenville, PA, March 27, **1980.**

*8. "Prospective of Ultra-Trace Elemental Analysis in Chesapeake Bay Water With a Discussion of Clean Laboratory and Field Sampling Technology", NOAA, Ocean Dumping and Marine Pollution Division, Rockville, MD, January 31, **1980.**

*7. "Chesapeake Bay Trace and Toxic Elemental Measurement: What Do We Have and Where is the Value?", NBS Colloquium on Mathematical Modeling in Science and Engineering, National Bureau of Standards, Gaithersburg, MD, June 11, **1980.**

*6. "Annual Report to EPA on the Progress of the Trace Elemental Analysis of the Chesapeake Bay Program", Ocean City, MD, October 15, **1980.**

*5. "Characterization of the Chesapeake Bay: A Systematic Analysis of Toxic Trace Elements", EPA Chesapeake Bay Program, 1979 Annual Meeting, Hampton, VA, November 28, **1979.**

*4. "Clean Chemistry and Clean Room Procedures for the Reduction of the Analytical Blank", Los Alamos Scientific Laboratory CNC-1, Chemistry/Nuclear Chemistry Section, Los Alamos, NM, November 20, **1978.**

*3. "Techniques for Spiking Isotopic Solutions by Weight Using Specially Modified Apparatus", Los Alamos Scientific Laboratory CMB-1, Analytical Chemistry, Los Alamos, NM, November 29, **1978**.

*2. "Cation Exchange Filters for Sample Preconcentration in X-Ray Spectrometric Analysis", X-Ray Analysis Conference, Denver, CO, August 3, **1978**.

*1. "Water Pollution and the Environment", 30 minute radio program, WASH-FM, Washington, DC, **1976.**

NIST CERTIFICATION OF STANDARD REFERENCE MATERIALS (SRM's): 1979-1990

SRM No.	Title	Elements Certified
897	High Temperature Alloy	Se,Te
898	High Temperature Alloy	Se,Te
899	High Temperature Alloy	Se,Te
909	Human Serum	V
996	Plutonium-244 Isotopic Spike	Pu
1145	White Cast Iron	Se, Te
1146	White Cast Iron	Se, Te
1150	White Cast Iron	Se, Te
1151	Stainless Steel	Se, Te
1152	Stainless Steel	Se, Te
1153	Stainless Steel	Se, Te
1154	Stainless Steel	Se, Te
1515	Apple Leaves	Mn, Ni
1547	Peach Leaves	Mn, Ni
1548	Total Diet	Cu, Mn, Ni, Pb
1566	Oyster Tissue	V
1566a	Oyster Tissue	V
1567a	Wheat Flour	P
1572	Citrus Leaves	Cu, Zn, Mo, Cd, V
1577a	Bovine Liver	Cu, Zn, Mo, Cd, Se, V
1577b	Bovine Liver	Cu, Zn, Mo, Cd, Se,
1598*	Bovine Serum	Al, Cu, Mn, V, Mn, Ni
1618	Residual Oil	V, Ni
1632a	Trace Elements in Coal	Na, Mg, Ca, Cu, Fe, Mn, Sr, V, Zr
1633a	Coal Fly Ash	Th, Ca, Mg, Rb, K, Th, U, Zn, Fe, Ni, Cu, Ga, Pb, V, Cd
1634a	Trace Elements in Fuel Oil	V, Ni
1634b	Trace Elements in Fuel Oil	V
1643a	Trace Elements in Water	Cd

1643b	Trace Elements in Water	Mn, Ni, Pb, V, Cd, Co, Cu
1646	Estuarine Sediment	V
2704	Buffalo River Sediment	Cd, Mn, Ni, Pb
		As, Cd, Hg, P, Se, S, Th, U
RM8505	Crude Oil Research Material	V
U-233	Safeguards Program DoD/DoE/DoC	U-233
Pu-244	Safeguards Program DoD/DoE/DoC	Pu-244

- *Technical champion responsible for planning, preparation and the certification program for SRM 1598 Bovine Serum.
- Over 100 certifications of elements in Standard Reference Materials.
- Certifications involving all major instrumental methods within the Inorganic Analytical Research Division at NIST.

PROFESSIONAL ACCOMPLISHMENTS

Invented and developed intellectual property enabling automated inorganic and species mass spectrometry. Created enabling methods on which Metara Inc. is based. Developed instrumental application in-process mass spectrometry and subsequent technologies for application in the semiconductor industry.

Invented and developed intellectual property and scholarly publications enabling Microwave-Enhanced Chemistry currently a $120,000,000.00 business growing at 15% yearly with >10 contributed national and international standard methods in the field.

Developed US EPA to approve the first reference speciated method (RECRA # 6800) based on Specated Isotope Dilution Mass Spectrometry (SIDMS)

Established the Center for Environmental Research and Education at Duquesne University and teach 2/3 of required science courses at the graduate level 1993 to present, Member of the Advisory Board.

Conceived, implemented and Chaired a Consortium at the National Institute of Standards and Technology (NIST) dedicated to the acceleration and advancement of automated analytical systems, to improve efficiency and data quality, and promote transferability of analytical methods. The Consortium on Automated Analytical Laboratory Systems (CAALS) was formed nine months after its conception in 1989 and currently has 14 members from U. S. industry and other government agencies. It has an annual operating budget approaching $1 million derived from both private sector and government funds. The Consortium coordinates the efforts of industrial producers and users of analytical instrument technology. It is also developing key concepts necessary to develop integrated, automated analytical chemical laboratories. Several of the demonstration projects are based on fundamental concepts that I developed.

Developed standard methods and evaluation procedures accepted by U.S. and international standards organizations for environmental measurement of inorganic constituents. Methods include EPA methods 3051 and 3015 and the CLP analogs, IUPAC Nomenclature for Laboratory Robotics and Automation, ASTM Procedures for High Accuracy Leaching of Nuclear Waste Materials, Over 100 Standard Reference Material Certifications and several pending standard methods in environmental chromatography.

Developed a Chelation Ion Chromatography technique for the determination of trace transition elements from biological, botanical, environmental, and geological samples. The technique uses a unique design combining chelation chromatography with traditional ion chromatography to provide for both total analysis and sample preparation capability. A multi-year research program has been established with an industrial research organization to investigate this new technique. This technique is being established as a new, independent method for analysis of Standard Reference Materials at NIST. The patent is pending and a company is negotiating for a license to produce the equipment and use the method.

Designed robotic systems for use in element analysis. The first system is based on chelation and ion exchange separations for isolation of inorganic trace elements from a variety of sample matrices. The system uses computer control integrated with a laboratory robot. The system is designed to expand to accommodate increasingly complex separations, and is currently being used in the SRM program as an automated sample preparation method for certification of NIST SRMs. The second system is a robot microwave sample preparation system that is being tested by the U.S. EPA for use as an automated system in standard method preparations.

Developed fundamental relationships and methods permitting the use of microwave energy in closed vessel chemical reactions. Developed microwave sample preparation techniques that are being used as a standard method by NIST analysts for certification of SRMs. These techniques are also currently used in thousands of analytical laboratories in the United States and internationally. Developed microwave methods that provide results equivalent to standard procedures for the U.S. EPA which are being adopted as standard methods. These methods provide 90-98% improvement in efficiency over traditional methods. Established a research program between industry and NIST to investigate the fundamental parameters of microwave use in the analytical laboratory (1984 - 1993).

Congressional Science Fellow: Handled scientific legislation with the U.S. Congress, House of Representatives, Science & Technology and Energy & Commerce Committees. Worked with Congressman Dr. Don Ritter to write, introduce, amend, and evaluate legislation concerned with energy, environment, human health, high technology and American industrial competitiveness. Responsible for recruitment of expert witnesses for Congressional hearings regarding risk assessment from national leaders in industry, academia, government and the environmental community. Responsibilities included House, Senate and Administration coordination of scientific legislation.

Designed and conducted research in the separation and analysis of trace and ultra-trace elements from a variety of biological, botanical, environmental, mineral and alloy matrices. These research activities demand expertise and innovation in clean laboratory chemistry, chelation and ion exchange chromatography, high purity reagent production, sample manipulation, and a broad analytical instrumental familiarity. This research lead to the development of a series of separation matrix modification techniques used to make samples instrument-compatible for high precision analysis. The analytical instruments used have included high precision and experimental instrumental techniques. These separations have been specifically used with thermal and spark source ionization isotope dilution mass spectrometry, X-ray fluorescence, thermal and flame spectroscopy, inductively coupled and direct current plasma spectrometry, neutron activation analysis, and laser enhanced ionization spectrometry.

Participated as a Research Chemist in the Standard Reference Materials (SRM) Program at the National Bureau of Standards, which has resulted in over 100 certifications of trace and ultra-trace elemental compositions of a variety of biological, botanical, environmental, mineral and alloy SRM's. Many of these certified numbers were sole certifications through the use of definitive techniques such as isotope dilution mass spectrometry. Participation in this program has been extremely challenging and rewarding as it supports analytical chemistry worldwide and demands state-of-the-art methodology. Technical champion of Bovine Serum SRM 1598 development, testing, statistical evaluation and certification has provided experience in all aspects of standards development and certification. This SRM was particularly challenging, having certified concentrations for trace elements below any other biological materials.

Principal organizer and investigator with responsibility for quality assurance in the research of ultra-trace elements in a study of the water column of the Chesapeake Bay. This was a large program encompassing all phases of environmental study, including sample collection, clean laboratory facilities, separation development and instrumental analysis by neutron activation analysis, graphite furnace atomic absorption and mass spectrometry, followed by data analysis. The study yielded a new analytical procedure and a database in excess of five thousand determinations at the 95% confidence limit. Additionally, studies into blank distribution and data reduction produced a unique interpretative model, which is capable of discriminating between naturally occurring element concentrations and anthropogenic sources.

Appointed to the NBS Evaluation Panel on Scientific Advisement for the Nuclear Waste Industry. Participated as one of a four-member management team directing a multi-million dollar program in nuclear waste research. Principal investigator of leachability testing and research material preparation for NBS. Co-chairman of a task group for ASTM Committee C-26.05 (Nuclear Fuel Cycle - Analytical Methods). Responsible for portions of two documents originating from the leachability testing of simulated nuclear waste materials. This research also led to co-chairing a forum on "Analytical Chemistry in Nuclear Waste" at the 8th Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies.

As a Research Chemist, supervised the preparation and participated in the certification of NBS SRM 996 Plutonium-244 Spike, Assay and Isotopic Standard. This standard made possible worldwide inter-comparison for the safeguard program. This represented a combined effort of several national laboratories, including Oak Ridge, Los Alamos, and NBS.

Developed and presented courses for the American Chemical Society and the Society for Applied Spectroscopy. These courses have provided an opportunity to teach microwave theory and sample preparation, ultra-trace analysis and clean chemistry, laboratory automation and robotics, and separations for analytical determination of trace elements and other interesting aspects of analytical chemistry.

PROFESSIONAL DEVELOPMENT COURSES: 1979-2002

2002 - The 14th Samibel Conference on Mass Spectrometry, “Front End Sample Handling Techniques for Analysis by Mass Spectrometry”, Sanibel CA
2002 - Time of Flight Mass Spectrometry for Elemental Analysis, Gary M. Hieftje, Winter Plasma Conference
2000 - Elemental Speciation for Biological Samples, Joseph A. Caruso
1996 - ICP-Mass Spectrometry I: Advanced Topics, R. Sam Houk
ICP-Mass Spectrometry II: Advanced Topics, R. Sam Houk
Element Pre-concentration in Trace Analysis, Gunter Knap
1994 - Sample Introduction for ICP-AES and ICP/MS
Flow Injection Analysis Techniques and Applications
ICP-Mass Spectrometry I: Introduction
Trace Element Speciation
Calibration and Data Evaluation
Element Preconcentration in Trace Analysis
1994 Winter Conference on Plasma Spectrochemistry, San Diego, CA
1993 - Introduction to Thermal Ionization Mass Spectrometry, New Brunswick Laboratory, DoE Argonne, Illinois.
1992 - Atomic Spectroscopy - New Techniques and Applications, Technology Forum of the Spectroscopy Society of Pittsburgh
1991 - HPLC Practical Theory and Instrumentation, Hewlett Packard
HPLC Columns and Detectors
HPLC Methods Development and Troubleshooting
1991 - Quality Assurance of Chemical Measurements, ACS Short Course, Dr. Taylor
1990 - The Computer-Integrated Laboratory: A Hands-On Experience in Lab Automation, American Chemical Society Short Course
1990 - Plasma Spectroscopic Detection in Chromatography, 1990 Winter Conference on Plasma Spectrochemistry
1990 - Element Preconcentration in Trace Analysis, 1990 Winter Conference on Plasma Spectrochemistry
1989 - The Computer-Integrated Laboratory, Scientific Computing and Automation Conference
1989 - Electromagnetic Heating, International Microwave Power Institute
1989 - Current Ion Chromatography, Dionex Corp.
1988 - Introduction to dBase III Plus, NBS
1987 - Artificial Intelligence, University of Maryland
1986 - Effective Writing for Professionals, NBS
1985 - Risk Analysis in Occupational Health, Harvard School of Public Health

1984 - SCORPIO, Congressional Computer System Searching, Library of Congress
1984 - Microprocessors and Personal Computing, Montgomery College
1983 - Computer BASIC, Montgomery College
1983 - Data Acquisition & Process Control, Hewlett-Packard
1982 - Speed Reading, NBS
1981 - Statistics in Measurement Sciences, NBS Statistical Division
1981 - Management Seminar, U.S. Dept. of Commerce
1979 - Toxicology (graduate level), The American University

RESEARCH GRANTS & CONTRACTS

	Total Research Awards Received 1979-Present $5,632,326
2004	$148,000, EPA, Method Development, Pending
2004	$120,000, NETL-DOE, Sequestration Research Project Collaboration
2003	$7,200 Data Correlation and Validation of Draft EPA Method 3200 Mercury Speciation of Mercury, Developed in the Kingston Research Group, New EPA method validated, RCRA 3200.
2003	$8,000 Development of Analysis of Ophthalmic Stabilizers in eye solutions. Harvard Medical School.
2001-2003	$126,550 yearly for 3 years, plus one time $250,000 Prototype ES-MS-IDMS-TOF (Instrument Not Sent as agreed by Metara), Metara Inc. CRDA, Research and Development of On-Line Real – Time ES-MS-TOF, for Semiconductor Trace Element Analysis. Instrument not shipped or provided as contractually agreed.
2001	Patent License Agreement for Specific Fields of Use (Instrumental Mass Spectrometry Instruments and Semiconductor Applications), (5,414,259, Title "Method of Speciated Isotope Dilution Mass Spectrometry"), Metara Corporation. Stock in Corporation, Original Stock 100,000 (originally $200,000); currently essentially worthless.
2001	$40,000, SAIC/EPA, Validation Study of Draft EPA SW-846 Method 3200.
2000-2001	$257,550 Metara, Inc., "Ultra-trace element analysis in aqueous and cleaning reagents associated with silicon wafer manufacturing."
2000	$10,600 Environmental Standards, Inc., "Analysis of Samples based on Patented EPA Method 6800".
2000	$61,143 from Milestone, Inc. for the continuation of the development of microwave methods, product support and Research and Development.
2000	$40,000 from Science Applications International Corporation (SAIC), "Enforcement Support Services of Mercury Speciation Method".
2002	Patent License Royalty Fees paid to the University (#5,883,349, 1999; #5,830,417,1998), $25,000 (first year).
1999-2000	$100,000 from Allegheny Energy, "Mercury and Speciated Mercury Analysis Methods Development and Application".
1999-2000	$23,900 from American Chemical Society, "Determination of Organic and Inorganic Compounds in Soil".
1999-2000	$9,600 from QIT, "Evaluating Microwave Controlled Acid Leach of Specific Samples".
1999	$13,755 from STS Consultants, Inc., "Hg Remediation Project".
1999	$28,000 from Los Alamos National Laboratory, Extension of 15K, "Microwave Ultra-Trace Elemental Analysis in Semiconductor Research".

1999 $35,000, Allegheny Power, “Environmental Cr(VI) research related to coal Fired Electric Power Waste.”

1999 $146,119, Milestone, Inc. Calendar Year 1999, “Microwave Sample Preparation research and Hg instrument validation and research and Standards Research Associate Support.”

1998 $102,900, Milestone Laboratories, Cooperative Research and Development Grant, “For Establishing and Maintaining the Microwave Sample Preparation World Wide Web Site.”

1998 $10,000, Alcoa, Standard Method Development for “Development of a Speciated Cyanide Environment Standard Method.”

1998 $15,000, Los Alamos National Laboratory, “for evaluation of microwave decomposition and drying of semi-conductor materials”.

1998 $10,000 from Milestone, Inc. for the development of a Web site.

1998 $38,000 from SE Technologies, Inc. “for the development of mercury species analysis method development and extension of EPA method 7473”.

1998 $30,000 from Allegheny Power “for the evaluation of Cr(VI) speciation and development of remediation methods specially designed for the Harrison WV Power Plant”.

$10,000, Milestone Laboratories, Cooperative Research and Development Grant, “For Establishing and Maintaining the Microwave Sample Preparation World Wide Web Site.”

1996 $165,000, University Grants Program, Hewlett Packard, HP 4500 ICP-MS System (Inductively Coupled Plasma Mass Spectrometer) including a Vectra Computer Controller and Laser Jet 4 Printer, Equipment Grant.

1995-1996 $21,000, CEM, Cooperative Research and Development Grant, For Research on the Application and Testing of the New Prototype Microwave System for Environmental Analysis, Including a Postdoctoral Student Stipend.

1994-1997 $272,000, Milestone Laboratories, Cooperative Research and Development Grant, For Development of Element and Ultra-Trace Element Analysis Utilizing Sample Preparation Methods Using Closed Vessel Microwave Technology, Including a Postdoctoral Student Stipend and Ph.D. Student Stipend.

1993-1996 $259,000, Prolabo Instruments, Cooperative Research and Development Grant, For Development of Open vessel Microwave Methods for Elemental Analysis using Focused Microwave Instrumentation, Including a Postdoctoral Student Stipend and a partial Ph.D. Student Stipend.

1993 $97,000, University Grants Program, Hewlett Packard, ORCA Robot System, Equipment Grant.

1992-1993 $1,500 Duquesne University, Hunkele Instructional Innovation Grant, "Interactive Simulation Software for Training in Analytical and Instrumental Chemistry".

1992-1993 $30,000, Research Contract, for Development of Environmental Soil Leachate Standards and Microwave Test Methods, Office of Standard Reference Materials, National Institute of Standards and Technology, including support of Ph.D. students.

1992-1995 $500,000, Fisons Instruments, Cooperative Research and Development Grant, for Development of Trace and Ultra-trace Elemental Analysis Methods Using Inductively

Coupled Plasma Mass Spectrometry (ICP-MS), Including a Postdoctoral Student Stipend and Ph.D. Student Stipend.

1992 Second $20,000 from CEM Corporation, Equipment Grant for Microwave Environmental and Analytical Chemistry Research, Specially Built Computer Interfaced Laboratory Microwave System.

1992 Laboratory Robot Equipment, Los Alamos National Laboratory, value of equipment $77,040. (Long Term Loan - Became Permanent 2/96)

1992 Long Term Loan of Government Laboratory Robot Equipment, National Institute of Standards and Technology, value of equipment $47,300.

1992 $50,000, Texaco Corporation, Grant of Laboratory Robotic and Automation Equipment.

1992 Long Term Loan of Government Laboratory Robot Equipment, National Institute of Standards and Technology, value of equipment $65,000.

1991-1992 $4,069 Duquesne University, Noble Dick Faculty Development Grant, "Development of a Computer-Interfaced Feedback Control System for Microwave Induced Chemical Reactions".

1991 $19,000 from CEM Corporation, Equipment Grant for Microwave Environmental and Analytical Chemistry Research, State-of-the-art Laboratory Microwave System.

1990-1993 $ 180,000 from Department of Energy for support of the Consortium on Automated Analytical Laboratory Systems.

CAALS

Consortium on Automated Analytical Laboratory Systems: Membership fees from March 1990

Corporation	Fee	Equipment	Personnel
Analytical Biochemical Labs.	$15,000	$15,000	
CEM Corporation	$15,000	$15,000	Analytical Chemist, Postdoc.
Digital Equipment Corporation	$30,000	$100,000	
Dionex Corporation	$15,000	$15,000	Chromatographer, Postdoc.
E. I. DuPont Company	$30,000		Analytical Chemist, Postdoc.
Kodak Corporation	$30,000		
Occidental Chemical	$30,000		
Perkin-Elmer Corporation	$30,000		
Union Carbide Corporation	$30,000		
Zymark Corporation	$15,000	$15,000	
2- National Laboratories / DoE	$60,000		

Consortium on Automated Analytical Laboratory Systems: Membership fees from March 1991

Corporation	Fee	Equipment	Personnel
Analytical Biochemical Labs.	$15,000	$15,000	
Analytical Laboratories Inc.	$15,000	$15,000	
CEM Corporation	$15,000	$15,000	Analytical Chemist, Postdoc.
BP America	$30,000		
Digital Equipment Corporation	$30,000	$100,000	
E. I. DuPont Company	$30,000		Analytical Chemist, Postdoc.
Kodak Corporation	$30,000		
Occidental Chemical	$30,000		
Perkin-Elmer Corporation	$30,000		
Union Carbide Corporation	$30,000		
National Laboratories / DoE	$30,000		

1989-1991	$100,000 from EPA Region 3, RCRA, and CERCLA Program Offices for Development and Testing of Microwave Sample Preparation Methods, Validation, and Technical Consulting.
1988-1991	$110,000 from U. S. EPA EMSL-LV for Robot Design and Development for EPA Procedures.
1988-1989	NSF Joint Grant with VMI and Washington and Lee Universities for Expert Systems Development in Analytical Chemistry (NIST policy prevents NIST personnel from receiving funds) (ref. publication no. 55).
1988	$10,000 from Zymark Corporation, Service in the Design of Automation Quality Control Software for Data Entry.
1987-88	$80,000 from EPA RCRA & CERCLA Programs, for Microwave Sample Preparation Methods Development and Validation.
1987- 90	$130,000 from Dionex Corporation, One Full Time Researcher + $10,000/year for expendables in the Development of Chelation Ion Chromatography.
1987	$100,000 from NBS Competence, Grant for Expert Systems in Analytical Chemistry.
1987	$25,000 from Zymark Corp., Grant of Robot Equipment for Research into Intelligent Control of Laboratory Robotics.
1986	$35,000 from Savannah River Laboratory for the Development of Microwave Decomposition Methods.
1986	$25,000 from Union Carbide Corporation for the Development of Microwave Decomposition of Alpha-Alumina Based Catalysts, Research Contract.
1984- 1991	$230,000, from CEM Corporation, One Full Time Researcher + $10,000/year for Microwave Decomposition Research.
1984-1985	$100,000 from NBS Competence Grant for Laboratory Robot Development.
1981-1982	$150,000 from Department of Energy, Nuclear Waste Program for the Development of High Accuracy Leach Test Methods.
1979-1980	$150,000 from Environmental Protection Agency (EPA) Chesapeake Bay Program for Trace Element Analysis and Quality Assurance Methods.

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