

# CURRICULUM VITAE

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## EDUCATION

Ph.D. (1986), Analytical Chemistry, Purdue University, West Lafayette, IN  
B.S. (1982), Chemistry, South Dakota School of Mines and Technology, Rapid City, SD

## EXPERIENCE

### **Employment**

2000- Present          Adjunct faculty member, Genome Sciences and Technology Graduate School, University of Tennessee, Knoxville, TN. *Responsibilities include teaching graduate levels courses and advising graduate students.*

1986-Present          Chemical Sciences Division, Oak Ridge National Laboratory. *Responsibilities include research in development of mass spectrometry technologies, specifically trapped ion mass spectrometry (FTICR) for the structural characterization of a variety of important biomolecules.*

1980-1982          Experiment Station, South Dakota School of Mines and Technology, Rapid City, SD (Full time-summer, part time-school year). *Responsibilities included research in general analytical chemistry utilizing atomic absorption, atomic emission, x-ray fluorescence, and x-ray diffraction.*

### **Membership**

American Society for Mass Spectrometry  
East Tennessee Mass Spectrometry Discussion Group

**Awards and Honors** Martin Marietta Energy Systems Technical Achievement Award, 1994; W.R. Grace Fellowship, 1985-86; American Institute of Chemists Award, 1982; Academic All-American (track), 1982; ACS Undergraduate Award in Analytical Chemistry, 1981; CRC Freshman Chemistry Award, 1979.

## PROFESSIONAL ACTIVITIES

- 1986- Numerous technical presentations (>150), including invited lectures, have been given at national conferences and universities.
- 1986 - Member, American Society for Mass Spectrometry
- 1987 - Member, East Tennessee Mass Spectrometry Discussion Group
- 1990-1996 Lecturer, ORISE Traveling Lecture Program
- 1992-1993 Treasurer, East Tennessee Mass Spectrometry Discussion Group
- 1993 Thesis committee member for Mona Shahgholi, University of Tennessee, Chemistry Department
- 1993-1997 Executive board member, Southern Appalachian Science and Engineering Fair
- 1994 Advisory review member for Accelerator Mass Spec. program at LLNL
- 1994-1995 Member, ORNL-CASD strategic planning committee
- 1995-1998 Member, ACS Awards Canvassing Board
- 1996-1997 Chairman, East Tennessee Mass Spectrometry Discussion Group
- 2000- Review member for NIH-NCI Study Sections on Quantitative Proteomics
- 2001- Thesis advisor currently for Ph.D. graduate students (Chongle Pan, Heather Connelly, Melissa Thompson, and Carlee McClintock)
- 2002- Moderator, East Tenn. High School Science Bowl Annual Competition
- 2002 - Review member for NIH General Medicine Study Sections
- 2002 Review member for NIH Study Section of High-End Instrumentation Grants
- 2004- Review member for NIH Study Section on NCRR
- 2004 Chairman, NIH Study Section for New Technologies for Metabolomics

PUBLICATIONS (peer-reviewed)

1. "Heteronuclear Transition Metal Cluster Ions in the Gas Phase: Photodissociation and Reactivity of  $VFe^+$ ," R.L. Hettich and B.S. Freiser, J. Amer. Chem. Soc., (1985), 107, 6222.
2. "Photodissociation of  $FeCH_2^+$  and  $CoCH_2^+$ : Determination of the Carbene, Carbyne, and Carbide Bond Strengths," R.L. Hettich and B.S. Freiser, J. Amer. Chem. Soc., (1986) 108, 2537.
3. "Gas Phase Photodissociation of Organometallic Ions: Bond Energy and Structural Determinations," R.L. Hettich, T.C. Jackson, E.M. Stanko, and B.S. Freiser, J. Amer. Chem. Soc., (1986) 108, 5086.
4. "Determination of Carbide, Carbyne, and Carbene Bond Energies by Gas Phase Photodissociation of  $RhCH_2^+$ ,  $NbCH_2^+$ , and  $LaCH_2^+$ ," R.L. Hettich and B.S. Freiser, J. Amer. Chem. Soc., (1987) 109, 3543.
5. "Spectroscopic and Thermodynamic Investigations of Transition Metal Cluster Ions in the Gas Phase: Photodissociation of  $MFe^+$ ," R.L. Hettich and B.S. Freiser, J. Amer. Chem. Soc., (1987) 109, 3537.
6. "Gas Phase Photodissociation of Transition Metal Ion Complexes and Clusters," R.L. Hettich and B.S. Freiser, Fourier Transform Mass Spectrometry: Evolution, Innovation, and Applications, ACS Symposium Series 359, M.V. Buchanan, Editor, 1987.
7. "The Gas Phase Ion Chemistry of Methyl and Ethyl Borate," R.L. Hettich, T. Cole, and B.S. Freiser, Inter. J. Mass Spectrom. Ion Proc., (1987) 81, 203.
8. "Ligand Effects on Transition Metal Ion Reactivity: Primary and Secondary Reactions of  $Co^+$  and  $Ni^+$  with Alkenes," R.L. Hettich and B.S. Freiser, Organomet, (1989), 8, 2447.
9. "The Differentiation of Methyl Guanosine Isomers by Laser Ionization Fourier Transform Mass Spectrometry," R.L. Hettich, Biomed. Environ. Mass Spec., (1989) 18, 265.
10. "Characterization of Photo-induced Pyrimidine Cyclobutane Dimers by Laser Desorption Fourier Transform Mass Spectrometry" R. L. Hettich, M.V. Buchanan, and C.-h. Ho, Biomed. Environ. Mass Spec., (1990) 19, 55.
11. "Structural Investigations of Aluminum Cluster Ions,  $Al_n^-$  ( $n=3-50$ )," R. L. Hettich, J. Amer. Chem. Soc., (1989) 111, 8582.
12. "Investigation of UV Matrix-Assisted Laser Desorption Fourier Transform Mass Spectrometry for Peptides," R. L. Hettich and M. V. Buchanan, J. Amer. Soc. Mass Spec., (1991) 2, 22.
13. "Laser Ablation Studies of Palladium Electrolytically Loaded with Hydrogen and Deuterium," M. J. Shea, R. N. Compton, and R. L. Hettich, Phys. Rev. A, (1990) 42, 3579.
14. "Structural Characterization of Normal and Modified Oligonucleotides by Matrix-Assisted

Laser Desorption Fourier Transform Mass Spectrometry," R. L. Hettich and M. V. Buchanan, J. Amer. Soc Mass Spec. (1991), 2, 402.

15. "Matrix-Assisted Laser Desorption Fourier Transform Mass Spectrometry for Biological Compounds," Proceedings of the NATO Workshop on Methods and Mechanisms for Producing Ions from Large Molecules, edited by K. Standing and W. Ens, Plenum Press, New York, 1991, 247-255.

16. "Doubly-Charged Negative Ions of Carbon-60," R. L. Hettich, R. N. Compton, and R. H. Ritchie, Phys. Rev. Lett. (1991), 67, 1242.

17. "Matrix-Assisted Laser Desorption Fourier Transform Mass Spectrometry for the Structural Examination of Modified Nucleic Acid Constituents," R. L. Hettich and M. V. Buchanan, Int. J. Mass Spec. Ion Proc. (1991), 111, 365.

18. "Applications of Matrix-Assisted Laser Desorption FTMS for Biomolecules," R. L. Hettich and M. V. Buchanan, Lecture Notes in Physics, 389, Laser Ablation Mechanisms and Applications, J.C. Miller and R. F. Haglund, Jr., editors, Springer-Verlag Publishers, New York, NY 1991, p. 160.

19. "Ion-Molecule Reactions of Carbon Cluster Anions," R. L. Hettich, Lecture Notes in Physics, 389, Laser Ablation Mechanisms and Applications, J.C. Miller and R. F. Haglund, Jr., editors, Springer-Verlag Publishers, New York, NY 1991, p. 280.

20. "Doubly-Charged Negative Ions of Bucky Ball - C<sub>60</sub><sup>2-</sup>," R. L. Hettich, R. N. Compton, and R. H. Ritchie, Lecture Notes in Physics, 389, Laser Ablation Mechanisms and Applications, J.C. Miller and R. F. Haglund, Jr., editors, Springer-Verlag Publishers, New York, NY 1991, p. 285.

21. "Applications of Mass Spectrometry to DNA Sequencing," K. B. Jacobson, H. F. Arlinghaus, C. H. Chen, G. L. Glish, R. L. Hettich, M. V. Buchanan, and S. A. McLuckey, Genetic Analysis Tech. Appl., (1991), 8, 223.

22. "Contribution to the Isolation and Characterization of the Buckminsterfullerenes," M. Diack, R.L. Hettich, R.N. Compton, and G. Guiochon, Anal. Chem., (1992) 64, 2143.

23. "Characterization and Stability of Highly Fluorinated Fullerenes," A.A. Tuinman, P. Mukherjee, J.L. Adcock, R.L. Hettich, and R.N. Compton, J. Phys. Chem., (1992) 96, 7584.

24. "Fullerenes from the Geological Environment," P.R. Buseck, S. Tsipursky, and R.L. Hettich, Science, (1992) 257, 215.

25. "Methyl Guanine Isomer Distinction by Hydrogen/Deuterium Exchange using a Fourier Transform Mass Spectrometer," B.D. Nourse and R.L. Hettich, J. Amer. Soc. Mass Spec., (1993) 4, 296-305.

26. "Rapid Extraction and Structural Characterization of Biomolecules in Agarose Gels by Laser Desorption FTMS," J. C. Dunphy, K. L. Busch, R. L. Hettich, and M. V. Buchanan, Anal. Chem., (1993) 65, 1329-1335.

27. "Characterization of Large Biomolecules by FTMS", M.V. Buchanan and R.L. Hettich, Anal. Chem., (1993) 65, 245A-259A.
28. "Characterization of Underivatized Pterins by Laser Desorption Fourier Transform Mass Spectrometry", K. Bruce Jacobson and Robert L. Hettich, Pteridines, (1993) 4, 72-75.
29. "Laser Ablation and Laser Desorption Techniques with Fourier Transform Mass Spectrometry", Robert Hettich and Changming Jin, invited book chapter for Principles and Applications of Laser Ablation, J.C. Miller, editor, Springer Series in Materials Science 28, Springer-Verlag Publishers, Berlin, (1994), p. 135-154.
30. "Matrix-Assisted Laser Desorption/Ionization Fourier Transform Mass Spectrometry of Oligodeoxyribonucleotides," E.A. Stemmler, R.L. Hettich, G.B. Hurst, and M.V. Buchanan, Rapid Comm. Mass Spec., (1993) 7, 828-826.
31. "Characterization and Identification of Radiation-Induced Products of Thymidine-3'-Monophosphate and Thymidylyl (3'->5') Thymidine by Laser Desorption Fourier Transform Mass Spectrometry," H. Yoshida and R. Hettich, Radiation Research, (1994) 139, 271-279.
32. "Synthesis and Characterization of Molybdenum Carbide Clusters:  $\text{Mo}_n\text{C}_{4n}$  ( $n=1-4$ )", C. Jin, R.E. Haufler, R.L. Hettich, R.N. Compton, A.A. Puretzky, and A.V. Dem'yanenko, Science, (1994) 263, 68-71.
33. "Characterization of Naturally-Occurring and Modified Fullerenes by Fourier Transform Mass Spectrometry," R. Hettich, C. Jin, R. Compton (Oak Ridge National Laboratory) and P. Buseck and S. Tshipursky (Arizona State University), American Institute of Physics Conference Proceedings (Laser Ablation: Mechanisms and Applications-II), Vol 288, J.C. Miller and D.B. Goehagan, Editors, AIP Press, New York, (1994), p. 94-99.
34. "Laser Desorption Fourier Transform Mass Spectrometry Studies of Modified Fullerenes," C. Jin, R. Hettich, and R. Compton, American Institute of Physics Conference Proceedings (Laser Ablation: Mechanisms and Applications-II), Vol 288, J.C. Miller and D.B. Goehagan, Editors, AIP Press, New York, (1994), p. 141-147.
35. "Matrix-Assisted Laser Desorption/Ionization Mass Spectrometry for the Structural Characterization of Modified Oligonucleotides," G. Hurst, R. Hettich, and M. Buchanan (Oak Ridge National Laboratory) and E. Stemmler (Bowdoin College, Brunswick, ME), American Institute of Physics Conference Proceedings (Laser Ablation: Mechanisms and Applications-II), Vol 288, J.C. Miller and D.B. Goehagan, Editors, AIP Press, New York, (1994), p. 519-525.
36. "Laser Ablation of Graphite in Different Buffer Gases," A.A. Puretzky, D.B. Goehagan, R.E. Haulfer, R.L. Hettich, X.-Y. Zheng, and R.N. Compton, American Institute of Physics Conference Proceedings (Laser Ablation: Mechanisms and Applications-II), Vol 288, J.C. Miller and D.B. Goehagan, Editors, AIP Press, New York, (1994), p. 365-374.

37. "Characterization of Modified Nucleic Acid Constituents by Matrix-Assisted Laser Desorption Mass Spectrometry," R. Hettich, G. Hurst, M. Buchanan, and E. Stemmler, Polycyclic Aromatic Compounds, M. Zander, editor, (1994) 6, 95-102.(peer-reviewed).
38. "The Structural Characterization of Polycyclic Aromatic Hydrocarbon Dihydrodiol Epoxide DNA Adducts Using Matrix-Assisted Laser Desorption/Ionization Fourier Transform Mass Spectrometry," E.A. Stemmler, M.V. Buchanan, G.B. Hurst, and R.L. Hettich, Anal. Chem., (1994), 66, 1274-1285.
39. "Determination of the Electron Affinities of Fluorinated Fullerenes ( $C_{60}F_{44,46}$ ,  $C_{70}F_{52,54}$ ) by Fourier Transform Mass Spectrometry," R. Hettich, C. Jin, and R. Compton, Int. J. Mass Spec. Ion Proc (Special Issue on Fullerenes), (1994) 138, 263-274.
40. "Direct Solid Phase Hydrogenation of Fullerenes," C. Jin, R. Hettich, R. Compton, D. Joyce, J. Blencoe, and T. Burch, J. Phys. Chem., (1994), 98, 4215-4217.
41. "Attachment of Two Electrons to  $C_{60}F_{46,48}$ : Shape Resonances in Multiply Charged Anions," C. Jin, R. Hettich, R. Compton, A. Tuinman, Phys. Rev. Lett., (1994) 73, 2821.
42. "Ionic Properties of Hydrogenated and Fluorinated Fullerenes," R.L. Hettich, C. Jin, P.F. Britt, A.A. Tuinman, and R.N. Compton, Mat. Res. Soc. Symp. Proc. (1994) 349, 133.
43. "Thermodynamic Characterization of the Plastic Crystal and Non-Plastic Crystal Phases of  $C_{70}$ ," Y. Jin, A. Xenopoulos, J. Cheng, W. Chen. B. Wunderlich, M. Diack, C. Jin, R.L. Hettich, R.N. Compton, and G. Guiochon, Mol. Cryst. Liq. Cryst., (1994) 257, 235-250.
44. "Production and Characterization of Metallofullerene Superatoms," Z.C. Ying, C. Jin, R.L. Hettich, A.A. Puretzky, R.E. Haufler, and R.N. Compton, in *Fullerenes: Recent Advances in the Chemistry and Physics of Fullerenes and Related Materials*, edited by K.M. Kadish and R.S. Ruoff, (The Electrochemical Society, Pennington), 1995, Volume 94-24, p. 1402. (invited paper).
45. "Low Level Detection of Chemical Agent Simulants in Meat and Milk by Ion Trap Mass Spectrometry," M.V. Buchanan, R.L. Hettich, J.H. Xu, L.C. Waters, and A. Watson, J. Hazard. Mat., (1995) 42, 49.
46. "Structural Characterization of Underivatized Pteridines by Laser Desorption Fourier Transform Mass Spectrometry," R. L. Hettich and K. B. Jacobson, J. Mass Spec., (1995) 30, 872.
47. "The Analysis of Modified Oligonucleotides by Matrix-Assisted Laser Desorption/ Ionization Fourier Transform Mass Spectrometry," E.A. Stemmler, M.V. Buchanan, G.B. Hurst, and R.L. Hettich, Anal. Chem., (1995) 67, 2924.
48. "A New Interface for Combining Electrospray with Fourier Transform Ion Cyclotron Resonance Mass Spectrometry," L. Tang, R.L. Hettich, and M.V. Buchanan, Rapid Comm. Mass Spec., (1995) 9, 731.

49. "Mass Spectrometry and Small-Angle X-Ray Scattering and Studies of Gamma-Irradiated C<sub>60</sub>," R.L. Hettich, S. Henderson, R.N. Compton, and G. Bakale, J. Phys. Chem., (1996) 100 5426.
50. "Structural Determination and Ionic Properties of Endohedral Lanthanum Fullerenes," R.L. Hettich, Z. C. Ying, and R.N. Compton, Recent Advances in the Chemistry and Physics of Fullerenes and Related Materials: Volume 3, K.M. Kadish and R.S. Ruoff, editors, The Electrochemical Society: Pennington, N.J. (1994), p. 1457.
51. "Instability of Fullerene Molecules at a High Temperature," Z.C. Ying, R.N. Compton, B.A. DiCamillo, R.L. Hettich, and G.A. Guiochon, J. Phys. Chem., in press.
52. "Enrichment and Characterization of a Noble-Gas Fullerene: Ar@C<sub>60</sub>," B.A. DiCamillo, R.N. Compton, R.L. Hettich, A.A. Tuinman, J. Cross, Jimenez-Vazquez, M. Saunders, J. Phys. Chem., (1996) 100, 9197-9201.
53. "Investigation of Oligonucleotide Fragmentation with MALDI-FTMS and Sustained Off-Resonance Irradiation (SORI)," Robert Hettich and Elizabeth Stemmler, Rapid Comm. Mass Spec. (Special ORNL issue), (1996) 10 321.
54. "Concerning Naturally-Occurring Fullerenes in Shungite," R.L. Hettich and P. R. Buseck, Carbon, (1996) 34, 685-687.
55. "Synthesis of Nitrogen-Doped Fullerenes by Laser Ablation," Z.C. Ying, R.L. Hettich, R.N. Compton, and R.E. Haufler, J. Phys. B, (1996) 29, 4935-4942.
56. "Sonochemical Synthesis of C<sub>60</sub>H<sub>2</sub>," D. Mandrus, M. Kele, R.L. Hettich, G. Guiochon, B.C. Sales, and L.A. Boatner, J. Phys. Chem., (1997) 101, 123-128.
57. "Synthesis of Doped Fullerene Clusters and Boron-Nitrogen Tubules Using Laser Ablation," Z.C. Ying, J.G. Zhu, R.N. Compton, L.F. Allard, Jr., R.L. Hettich, R.E. Haufler, invited book chapter for *Nanostructured Materials: Clusters, Composites, and Thin Films*, M. Moskovits and V.M. Shalaev, editors, (1998).
58. "Endohedral Metallofullerenes," A. Lahamer, Z.C. Ying, R.E. Haufler, R.L. Hettich, and, R.N. Compton, invited book chapter for *Advances in Metal and Semiconductor Clusters, Vol. IV*, M. Duncan, editor, JAI Press, (1998), pp. 179-203.
59. "Cadiolides A and B, New Metabolites from an Ascidian of the Genus *Botryllus*," C.J. Smith, R.L. Hettich, J. Jompa, A. Tahir, M.V. Buchanan, and C. M. Ireland, J. Org. Chem., (1998), 63, 4147-4150.
60. "Investigation of the Fragmentation and Oxygen Reactivity of Endohedral Metallofullerenes M@C<sub>60</sub>," R. Hettich, A. Lahamer, and R. Compton, Int. J. Mass Spec. Ion Proc., (Freiser focus issue), (1999) 182/183, 335-348.

61. "Formation and Characterization of Iron-Oligonucleotide Complexes with MALDI-FTICR," R. Hettich, J. Amer Soc. Mass Spec. (Freiser focus issue), (1999), 10, 941-949.
62. "Spacer Length Effect on the PET Fluorescent Probe for Alkali Metal Ions," H.-F. Ji, R. Dabestani, G. M. Brown, and R.L. Hettich, Photochem. Photobiol. J., (1999) 69, 513-516.
63. "Optical Sensing of Cesium Using 1,3-Alternate Calix[4]-mono- and di(anthrylmethyl)-aza-crown-6," Ji, H F, Dabestani R, Hettich R L, Brown G M, Photochemistry and Photobiology (1999) 70 882-886.
64. "Investigating the Effect of Transition Metal Ion Oxidation State on Oligodeoxyribonucleotide Binding by Matrix-Assisted Laser Desorption/Ionization Fourier Transform Ion Cyclotron Resonance Mass Spectrometry," R.L. Hettich, Int. J. Mass Spec., (2001) 204, 55-75.
65. "Characterization of Monomeric and Dimeric Forms of Recombinant *Sml1p-histag* Protein by Electrospray-MS," T. Uchiki, R. Hettich, V. Gupta, and C. Dealwis, Anal. Biochem., (2002) 301, 35-48.
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71. "Mass Spectrometry", Nathan VerBerkmoes, Joshua Sharp, and Robert Hettich, in *Microbial Functional Genomics*, edited by Jizhong Zhou, Dorothea Thompson, Ying Xu, and James Tiedje, John Wiley & Sons, New Jersey, 2004, pp. 241-282.
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