Peter W. Carr
2013
Curriculum Vitae

Professor • Department of Chemistry
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Education

1965	B.S. in Chemistry - Polytechnic Institute of Brooklyn
1969	Ph.D. in Chemistry - Pennsylvania State University
1968-69	Postdoctoral Studies - Stanford University Medical School

Professional Background

1961-1963	Lab Technician, American Molasses Company, Brooklyn, NY, summers
1965	Research Assistant, Brookhaven National Laboratory, Upton, NY, summer
1966	Research Associate, Brookhaven National Laboratory, Upton, NY, winter, summer
1968-1969	Postdoctoral Associate, Stanford University Medical School
1969-1975	Assistant Professor, Department of Chemistry, University of Georgia
1975-1977	Associate Professor, Department of Chemistry, University of Georgia
1977-1981	Associate Professor, Department of Chemistry, University of Minnesota
1981-present	Professor, Department of Chemistry, University of Minnesota
1987-1990	Associate Director, Cooperative Research Center for Bioanalytical Processing, University of Minnesota
1990-present	Associate Member, Graduate Faculty, Microbial Engineering, University of Minnesota

Honors and Awards

1984	R. S. Palmer Award, Minnesota Chromatography Forum
1987	Merit Award, Chicago Chromatography Discussion Group,
1990	Benedetti-Pichler Award, American Microchemical Society
1993	Fields Award in Analytical Chemistry, Eastern Analytical Symposium, Inc.
1996	S. Dal Nogare Award of the Delaware Valley Chromatography Forum, The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy
1997	Award in Chromatography, American Chemical Society, sponsored by SUPELCO, Inc.
1997	ISCO Award, Department of Chemistry, University of Nebraska
2000	Award for Outstanding Achievements in Separation Science, Eastern Analytical Symposium, Incorporated, sponsored by Waters Corporation
2002	Award for Outstanding Contributions to Postbaccalaureate, Graduate, and Professional Education, University of Minnesota Alumni Association
2002	Academy of Distinguished Teachers, University of Minnesota
2003	Iddles Lectureship, Department of Chemistry, University of New Hampshire, Durham, NH
2004	Pittsburgh Analytical Chemistry Award, Society for Analytical Chemists of Pittsburgh

2009	McElvain Lectureship, Department of Chemistry, University of Wisconsin, Madison
2009	ACS Award in Analytical Chemistry
2010	A. J. P. Martin Gold Medal of the Chromatography Society (Great Britain)
2010	Csaba Hovath Award of the Connecticut Separation Science Council and the Hungarian Chromatography Society
2013	LCGC Lifetime Achievement Award
2013	American Chemical Society, Division of Analytical Chemistry, J. Calvin Giddings Award for Outstanding Teaching in Analytical Chemistry.

Appointments

1965-1968	NDEA Fellow, Pennsylvania State University
1967	Fellow, Analytical Division of the American Chemical Society
1964	Member, Phi Lambda Upsilon, Chemistry Honorary Fraternity
	President, Symposium on the Recent Advances in the Analytical Chemistry of Pollutants, Inc.
1978-1981	Editorial Advisory Board, *Analytical Chemistry*
1978-1979	First President, Minnesota Chromatography Forum
1981-1984	Editorial Advisory Board, *Talanta*
1983-present	Editorial Advisory Board, *LC-GC*
1986-1997	Editorial Board, *Microchemical Journal*
1987-1988	Chairman-Elect, Chromatography and Separations Chemistry Sub-Division of the Analytical Division of the American Chemical Society
1988	Metallobiochemistry Study Section, National Institutes of Health
1989	Chairman, Chromatography and Separations Chemistry, Sub-Division of the Analytical Division of the American Chemical Society
1990-2000	Editoral Board, *Journal of Chromatography*
1989-2006	Editorial Advisory Board, *Chromatographia*
1992-1995	Editorial Board, *Comprehensive Analytical Chemistry* Series, Elsevier Science Publishers
1993	Guest Editor, with D.E. Martire and L.R. Snyder, Special Volume of the *Journal of Chromatography A,* "The Retention Process in Reversed-Phase Liquid Chromatography," Vol. 656, Nos. 1+2
1994	Program Chair, HPLC '94, Eighteenth International Symposium on Column Liquid Chromatography, Minneapolis, MN
1996	Chairman, Symposium: "Optimization in HPLC," Eastern Analytical Symposium and Exposition, Somerset, NJ
1997	American Men and Women of Science
1997-present	Editorial Board, *Separation Science and Technology*
1998	Session Presider, "Bioanalytical Separations," Pittsburgh Conference & Exposition
2000	Session Presider, "Reversed Phases–Silica Based," Pittsburgh Conference & Exposition
2003	Session Presider and Organizer, Symposium: "High Stability/Novel Phases for HPLC," Pittsburgh Conference& Exposition, Orlando, FL
2004	Session Presider and Organizer, "High Speed HPLC: Increasing Speed in HPLC," Pittsburgh Conference & Exposition, Chicago, IL

2004 Organizer, Symposium: "Advances in Fast LC," HPLC 2004–28th International Symposium and Exhibit on High Performance Liquid Phase Separations and Related Techniques, Philadelphia, PA

2004 Organizer, Symposium: "High Throughput/Parallel Separations," HPLC 2004–28th International Symposium and Exhibit on High Performance Liquid Phase Separations and Related Techniques, Philadelphia, PA

2004 Research Career Profiled, "60th Birthday of Professor Peter W. Carr," Editorial in *Chromatographia* 60, 143-144, August, No. 3/4, 2004

2005 Research Profiled, "Heat Speeds Up 2-D-LC for Proteomics Use," Science and Technology Concentrates Section of *Chemical & Engineering News*, p. 30, March 28, 2005

2005 Research Profiled, "Guidelines Help High-Speed Gradient-Elution RPLC," In the News section of *Trends in Analytical Chemistry* 24, iv, 2005

2005 Research Profiled, "High-Temperature 2-D LC," Currents section of *Journal of Proteome Research*, 4, 661, 2005

2006 Organizer and Presider, Symposium: "Modern Liquid Chromatography," Pittsburgh Conference& Exposition, Chicago, IL

2007 Organizer and Presider, Symposium: "Modern Liquid Chromatography," Pittsburgh Conference& Exposition, Chicago, IL

2008 Chair, Discussion Session 1: "The Future of 2D Liquid Chromatography," HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

2008 Chair, Lecture Session: "2D HPLC," HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

2009 Co-organizer and Co-presider, Symposium: "High Speed Liquid Chromatography," Pittsburgh Conference& Exposition, Chicago, IL, March 11, 2009.

Professional Societies

American Chemical Society
Phi Lambda Upsilon
American Association of Clinical Chemists
Sigma Xi
Minnesota Chromatography Forum
New York Academy of Science, 1986 to present
The Chromatographic Society

Research Interests

Theory of Analysis and Thermoanalytical Chemistry, Including Thermometric Titrimetry, Enthalpimetric Analysis, Scanning Calorimetry and Thermogravimetry
Electron Transfer Processes in Homogeneous Solution
Clinical Chemistry and Analytical Biochemistry
Liquid Chromatographic Investigation of Biochemicals and Affinity Chromatography
Analytical Applications of Immobilized Enzymes in Clinical Chemistry and Environmental Analysis
Study of Solute-Solvent Interaction by Chromatography
Study of Porous Ceramics, Especially Zirconia
Theory of Retention in Chromatography
Linear Solvation Energy Relationships

Development of Novel Stationary Phases for Liquid Chromatography
Ultra Fast Liquid Chromatography
Development of Fast Comprehensive, In-line Two Dimensional Liquid Chromatography
Metabolomics

Academic Grants Awarded

"New Methodologies in Bio-Analytical Chemistry," National Institute of General Medical Science (GM-17913, 01-03), $120,000–3 years

"Calorimetric Investigation and Correlations with the Marcus Theory," Petroleum Research Foundation, Level G–rescinded due to receipt of the above grant, $7,500

"New Methodologies in Bio-Analytical Chemistry," National Institute of General Medical Sciences (GM-1793, 04-06), $180,000–3 years

"New Developments in Thermochemical Analysis," $90,000–3 years, NSF, $28,000 for 1978/79

"Novel LC Multi-element Methods for Occupational Health," NIH, $154,379–3 years; Larry D. Bowers, co-principal investigator, 1979-1982

"New Developments in Thermochemical Analysis," Budget Supplement, $24,365 for one year

"Development of High Performance Affinity Chromatography," NIH, $35,000 per year, 1979-1981

"Solvatochromism and Chromatography," NSF, $50,000/year 1982-1985

"Development of Analytical High Performance Liquid Affinity Chromatography," NSF, $40,000/year 1983-1986

"Trace Anion Analysis," Dow Chemical Company, $6,000/year, 1983-1984

"Solvatochromic Studies of Fluorochemical Liquids," 3M Company, $10,500/year, 1982-83

"High Performance Liquid Chromatography of Proteins," Bioprocess Technology Center, University of Minnesota, $7,500, 1986

"Construction of an Automated Gas Chromatographic Head Space Analyzer," DOD, $40,000, 1985-1986

"Study of the Binding of Nonelectrolytes to Proteins and Cell Wall Membranes by Automated Head Space Gas Chromatography," Graduate School Grant-in-aid Program, University of Minnesota, $11,500, 7/1/86-6/30/87.

"Application of the Solvatochromic Comparison Method to Chromatographic Retention and Selectivity," NSF, $340,500, 1987-90

"Development of Ceramic Supports for HPLC," 3M Company, $30,000, 1987

"Application of Solvatochromism and Linear Solvation Energy Relationships to the Study of Fluid Phase Equilibria," Petroleum Research Fund, $35,000, 1987-89

"Development of Ceramic Supports in Liquid Chromatography," 3M Company, $42,021, 1989

• *Academic Grants Awarded, continued* •

"Regeneratable Supports for Affinity Chromatography," University of Minnesota Bioprocess Technology Center, $14,000, 9/1/89-8/31/90

"Development of Ceramic Supports in Liquid Chromatography," 3M Company, $29,577, 1/1/90-12/31/90

"Lowering Feedstock Costs for PHBV Production," Upper Minnesota Valley Regional Development Commission, Principal Investigators: Peter W. Carr, Rex Lovrien, Chang Ho Park, $227,000, 5/1/90-6/30/92.

"Training for Future Biotechnology Development," NIH Training Grant, $79,344, 9/25/90-6/30/91

"Application of the Solvatochromic Comparison Method to Chromatographic Retention and

Selectivity," NSF, CHE-9002446, $404,900, 12/1/90-6/30/93.

"Adsorptive Separation of Lactic Acid," Research Consortium on Agricultural Utilization Technology Development Program, Principal Investigators: Peter W. Carr and Jeffrey Tate, $9,500, 2/1/91-10/31/91.

"Base Stable and Composite Ceramic Supports for HPLC," NIH, 5R01-GM45988-02, Principal Investigators: Peter Carr, Michael C. Flickinger, and Alon McCormick, $589,591, 8/1/91-7/31/94.

"Base Stable and Composite Ceramic Supports for HPLC," NIH, 5R01-GM45988-04, Principal Investigators: Peter Carr, Michael C. Flickinger, and Alon McCormick, $765,195, 8/1/94-7/31/98. (Direct Costs for year 5, 8/1/95-7/31/96, $216,686)

"Base Stable and Composite ZrO_2 Ceramic Supports for HPLC," NSF, CHE-9107029, Principal Investigators: Alon McCormick, Peter W. Carr, and Michael C. Flickinger, ~$392,000, 7/1/91-1/31/96.

"Zirconia Based Anion-Exchange HPLC Packing; Separation of Carbohydrates," Sartec Corporation, $140,000, 9/15/92-2/14/96.

"Academic Career Planning in a Chemistry Program," Camille and Henry Dreyfus Special Grant Program in Chemical Sciences for 1993, $7,000, 1/1/93-12/31/93.

"DuPont 1994-95 Educational Aid Program," award in support of research, $5,000.

"Linear Solvation Energy Relationships and Phase Equilibria," University of Minnesota Graduate School Grant-in-aid of Research, Artistry and Scholarship, $14,600, 7/1/95-12/15/96.

"Application of the Solvatochromic Comparison Method to Chromatographic Retention and Selectivity," NSF, CHE-9521003, $250,000, 12/15/95-5/31/97.

"Surface Modified Zirconia in Analytical Chromatography," NIH, R01 GM54585-01, $480,742, 8/1/96-7/31/99.

"Thermospray Mass Spectrometry Ionization Processes Fundamental Mechanisms for Speciation, Separation and Characterization of Organic Complexants in DOE Waste," DOE subcontract for collaborative research, Principal Investigator: Dr. John E. Caton, $180,000, 1998-2001.

"Academic Careers in Chemistry: A Short Course by Teachers for Prospective Chemistry Teachers," The Camille and Henry Dreyfus Foundation, Inc., Principal Investigators: Peter W. Carr and Neil D. Jespersen, ~$15,900, 1998.

"Advantages of HPLC with Ultra Stable ZrO_2 Based Phases," NIH, R01 GM54585-04, $956,609, 8/1/99-7/31/03.

"Advantages of HPLC with Ultra Stable ZrO_2 Based Phases," NIH, R01 GM54585-04, Interim Funding: $83,010 Costs, 8/1/02-7/31/04.

"Advantages of HPLC with Ultra Stable Phases," NIH, 2 R01-GM054585-08 A1, $1,055,462, 04/01/04-03/31/08.

"Ultra-Fast Gradient Elution HPLC as a High Throughput, High Information Content Screening Tool for Drugs of Abuse," Midwest Forensics Research Center, $55,000, 10/1/04-9/5/05.

Academic Grants Awarded, continued •

"Development of a Rapid, HPLC-Based Intoxicant Screening Approach," Midwest Forensics Research Center, $55,000, 1/1/06-12/31/06.

"Fast, Comprehensive, Two-Dimensional HPLC through the Use of High-Temperature Ultra-Fast Gradient Elution Reversed-Phase LC," Agilent Technologies Foundation Gift # 06Q4-065FD, Awarded August 16, 2006, $47,081.20.

"Ultrafast Gradient Elution as a High Throughput, High Information Content Screening Tool for

• Drugs of Abuse," Midwest Forensics Research Center, $55,000, 2/1/07-9/30/07.

"Fast, Comprehensive, Two-Dimensional HPLC through the Use of High-Temperature Ultra-Fast Gradient Elution Reversed-Phase LC," Agilent Technologies Foundation Gift, Awarded May 31, 2007, $49,500.

"Testing the Snyder Scheme to Predict Similarity and Differences in Phase Behavior for Pharmaceutically Interesting Compounds," Abbott Laboratories, $50,000, 10/16/07-7/15/08.

"Development of 2DLC," Agilent Technologies Foundation Gift, $47,000, 9/1/07-6/1/08."Fast, Comprehensive, Two-Dimensional HPLC through the Use of High-Temperature Ultra-Fast Gradient Elution Reversed-Phase LC," Agilent Technologies Foundation Gift, Awarded May 19, 2008, $47,800, 6/1/08 – 5/31/09.

"Advantages of HPLC with Ultra Stable Phases," NIH, 2 R01-GM054585-12, $1,244,777, 09/22/08-08/31/12.

"Ultrafast Gradient Elution as a High Throughput, High Information Content Screening Tool for
• Drugs of Abuse," Midwest Forensics Research Center, $65,000, 3/1/09 – xx/xx/09.

Instructional Grants Awarded

NSF, "Undergraduate Student Instruction Program," $19,700 (and University of Minnesota match) 1978-1980

University of Minnesota Educational Development Program, "To Renovate and Revitalize Chemistry 5127," $l,700

Industrial Consulting

1970-1979	Consultant to Leeds & Northrup Company in Analytical and Clinical Chemistry, September 1970 to 1979
1979-1990	Consultant to 3M Company in Analytical Chemistry, December 1979 to 1990
1984-present	Consultant to Hewlett Packard Co., 1984-to date

Industrial Grants Awarded

"Monodisperse, Nonporous Zirconia Microspheres for Ultrafast Liquid Chromatography," NSF SBIR Phase I, Grant #DMI-9761543, Grantee Organization: ZirChrom Separations, Inc., Principal Investigator: Peter Carr, Total Direct Costs: $78,833, 1/1/98-6/30/98. Subcontract to Alon McCormick's Laboratory: $33,333.

"Reproducibility in Zirconia Colloid Production," Minnesota Technology Partnership Fund, Grantee Organization: ZirChrom Separations, Inc., Principal Investigators: Peter Carr and Alon McCormick, $100,000, 4/1/98-3/31/99.

"Zirconia Colloid Synthesis," Minnesota Technology Partnership Fund, Grantee Organization: ZirChrom Separations, Inc., Total Interest Free Loan: $70,000, 3/98-2/99. Subcontract to Alon McCormick's Laboratory: $56,025.

"Production of Preparative Zirconia by Spray Drying," NIH SBIR Phase I, Grant #1 R43 GM58354-01, Grantee Organization: ZirChrom Separations, Inc., Principal Investigators: Peter Carr and Anu Subramanian, Total Direct Costs: $81,714, 9/30/98-3/31/99. Subcontract to Anu Subramanian's Laboratory: $30,000.

"Zirconia for Ultrafast Liquid Chromatography," NSF Phase II, Grant #DMI-9901750, Grantee Organization: ZirChrom Separations, Inc, Total Direct Costs: $317,788, 8/1//99-

7/31/01. Subcontract to Alon McCormick's Laboratory: $143,038.

Industrial Grants Awarded, continued •

"Production of Preparative Zirconia by Spray Drying," NIH SBIR Phase II, Grant #1 R43 GM58354-02, Grantee Organization: ZirChrom Separations, Inc.; Total Costs: $748,938, 3/1/00-2/28/02. Subcontract to Anu Subramanian's Laboratory: $230,592.

"Surface Carbon Clad Zirconia as Chiral Stationary Phases," NIH SBIR Grant #1 R3HL 70334A, Grantee Organization: ZirChrom Separations, Inc., Direct Costs: $100,000, 10/1/01-3/31/02, Subcontract to Dr. Angelos Kyrlidis of Cabot Corporation: $30,000.

"Nonporous Zirconia Microspheres for Ultrafast Liquid Chromatography," Agency: NSF Phase IIB (extension), Grant #DMI-9901750, Grantee Organization: ZirChrom Separations, Inc, Total Direct Costs: $350,000, 8/01/01-7/31/02.

"Synthesis of Preparative-Scale Porous Zirconia for Bioseparations," Agency: NSF Phase I Grantee Organization: ZirChrom Separations, Inc, Total Direct Costs: $100,000, 2/01/03-7/31/03.

Patents

1. W.D. Bostick and P.W. Carr, U.S. Patent No. 3,821,643 - "A Novel Coagulation Detector." Rights owned by University of Georgia and Research Corporation, June 28, 1974.

2. D.F. Hagen, S.J. St. Mary, L.A. Errede, and P.W. Carr, U.S. Patent No. 4,810,381 - "Composite Chromatographic Article." Rights owned by Minnesota Mining and Manufacturing Company, St. Paul, MN. March 7, 1989.

3. P.W. Carr, Eric F. Funkenbusch, M.P. Rigney, P.L. Coleman, D.A. Hanggi, and W.A. Schafer, U.S. Patent No. 5,015,373 - "High Stability Porous Zirconium Oxide Spherules." Rights owned by the Regents of the University of Minnesota, May 14, 1991.

4. E.F. Funkenbusch, P.W. Carr, D.A. Hanggi, and T.P. Weber, U.S. Patent No. 5,108,597 - "Carbon-Clad Zirconium Oxide Particles." Rights Owned by the University of Minnesota, April 28, 1992.

5. P.W. Carr, Eric F. Funkenbusch, M.P. Rigney, P.L. Coleman, D.A. Hanggi, and W.A. Schafer, U.S. Patent No. 5,141,634 - "High Stability Porous Zirconium Oxide Spherules." Rights owned by the Regents of the University of Minnesota, August 25, 1992.

6. E.F. Funkenbusch, P.W. Carr, D.A. Hanggi, and T.P. Weber, U.S. Patent No. 5,182,016 - "Polymer-Coated Carbon-Clad Inorganic Oxide Particles." Rights owned by the Regents of the University of Minnesota, January 26, 1993.

7. P.W. Carr, Eric F. Funkenbusch, M.P. Rigney, P.L. Coleman, D.A. Hanggi, and W.A. Schafer, U.S. Patent No. 5,205,929 - "High Stability Porous Zirconium Oxide Spherules." Rights owned by the Regents of the University of Minnesota, April 27, 1993.

8. E.F. Funkenbusch, P.W. Carr, T.P. Weber and D.A. Hanggi, U.S. Patent No. 5,254,262,

issued – "Carbon-Clad Zirconium Oxide Particles." Rights owned by the Regents of the University of Minnesota, October 19, 1993.

10. E.F. Funkenbusch, P.W. Carr, D.A. Hanggi, and T.P. Weber, U.S. Patent No. 5,271,833 - "Polymer-Coated Carbon-Clad Inorganic Oxide Particle." Rights owned by the Regents of the University of Minnesota, December 21, 1993.

11. E.F. Funkenbusch, P.W. Carr, D.A. Hanggi, and T.P. Weber, U.S. Patent No. 5,346,619 – "Carbon-Clad Zirconium Oxide Particles." Rights owned by the Regents of the University of Minnesota, September 13, 1994.

\•*Patents, continued*•

12. P.W. Carr, M.P. Rigney, Eric F. Funkenbusch, P.L. Coleman, and D.A. Hanggi, European Patent Specification EP 0 331 283 B1- "High Stability Porous Zirconium Oxide Spherules." Rights owned by the Regents of the University of Minnesota, April 28, 1993.

13. E.F. Funkenbusch, P.W. Carr, D.A. Hanggi, and T.P. Weber, U.S. Patent No. Re.34,910 - "Carbon-Clad Zirconium Oxide Particle." Rights owned by Regents of the University of Minnesota, April 18, 1995.

14. E.F. Funkenbusch, P.W. Carr, D.A. Hanggi, and T.P. Weber, European Patent Specification EP 0 448 302 B1 - "Carbon-Clad Inorganic Oxide Particles and the Same with a Polymer Coating Thereon." Rights owned by the Regents of the University of Minnesota, August 30, 1995.

15. P.W. Carr, A.V. McCormick, M.J. Annen, L. Sun, and J.R. Brown, U.S. Patent No. 5,540,834 – "Synthesis of Porous Inorganic Particles by Polymerization-Induced Colloid Aggregation (PICA)." Rights owned by the Regents of the University of Minnesota, July 30, 1996.

16. M.C. Flickinger, M.J. Robichaud, J.E. Morris, C.M. Griffith, M.J. Annen, P.W. Carr, and C. Dunlap, U.S. Patent No. 5,837,826– "Protein Adsorption by Very Dense Porous Zirconium Oxide Particles in Expanded Beds." Rights owned by the Regents of the University of Minnesota, November 17, 1998.

17. M.C. Flickinger, M.J. Robichaud, J.E. Morris, C.M. Griffith, M.J. Annen, P.W. Carr, and C. Dunlap, U.S. Patent No. 6,036,861 – "Protein Adsorption by Very Dense Porous Zirconium Oxide Particles in Expanded Beds." Rights owned by the Regents of the University of Minnesota, March 14, 2000.

20. C.V. McNeff, P.W. Carr, S.J. Rupp, D.R. Stoll, D.R. Hawker, L.D. Zigan, and K.G. Johnson, U.S. Patent No. 6,846,410 – "High Stability Porous Metal Oxide Spherules Used for One-Step Antibody Purifications." Rights owned by ZirChrom Separations, January 25,2005.

20. P.W. Carr, M.A. Hillmyer, H. Liu, H. Luo, L. Ma and B.C. Trammell, U.S. Patent No. 6,991,852 – Silica-Based Materials and Methods." Rights owned by the Regents of the University of Minnesota, January 31, 2006.

Students: University of Georgia, Ph.D. and Masters Recipients

1972 *Earl B. Smith*, Ph.D., "The Thermometric Titration of Proteins," — Greenville General Hospital

1974 *William D. Bostick*, Ph.D., "The Thermometric Determination of Blood Coagulation" — ORNL

1973 *Joseph H. Kennedy*, M.S., "A Survey of Purity Assay by Differential Scanning Calorimetry" — Eli Lilly

1973 *William B. Speg*, M.S., "The Saponification and Analysis of Serum Triglycerides in MSO" —

1975 *Larry D. Bowers*, Ph.D., "Biochemical and Clinical Applications of Thermoanalytical Chemistry" — U.S. Anti-Doping Agency, Colorado Springs, CO

1975 *Robert H. Callicott*, Ph.D., "Selected Applications of Thermoanalytical Chemistry" — Procter & Gamble

1975 *Leslie M. Canning*, M.S., "The Thermochemical Analysis of Serum Urea Using an Immobilized Urease Packed Column" —

•Students: University of Georgia – Ph.D. Recipients, continued•

1978 *Larry F. Whiting*, Ph.D., "Theoretical and Experimental Investigations of Enzyme-Substrate Reactions by Differential Scanning Calorimetry" — Dow

1978 *S. Richard Schifreen*, Ph.D., "Theoretical and Practical Aspects of Flow Enthalpimetry in Clinical Analysis" — Promega Corporation, Madison, WI

1980 *R. Cameron Dorey*, Ph.D., "A Liquid Chromatography Detector for Transition and Rare-Earth Metal Ions Based on a Cupric Ion-Selective Electrode" — University of Central Arkansas, Conway, AR

1977 *Robert E. Adams*, Ph.D., "Development and Application of a Totally Electrochemical pH-Stat and Controlled Current Acid-Base Analyzer for Biological Studies" — Southern Research Institute

Students: University of Minnesota – Ph.D. Recipients

1981 *Mark W. Watson,* "Simplex Optimization in Gradient Elution High Performance Liquid Chromatography: The Preparation and Characterization of Bio-compatible High Performance Liquid Chromatography Packing Materials — Du Pont

1983 *Young T. Shih,* "Trace Metal Analysis by High Performance Liquid Chromatography with n-Butyl-2-Naphthylmethyldithiocarbamate Complexes" — 3M Company

1983 *William E. Barber*, "Peak Shape Analysis in HPLC UV Visualization of Inorganic Anions by Reverse Phase Ion Interaction Chromatography" — Agilent Technologies

1984 *James E. Brady*, "Theoretical and Experimental Investigations of Solvatochromism" — Hercules, Inc.

1984 *Amy J. Muller*, "The Preparation and Characterization of a High Performance Liquid Affinity Chromatography System" — Lucent Technologies

1984 *Paul Sadek*, "Elucidation of the Factors Responsible for Small Solute Retention and Irreversible Protein Binding in Reversed-Phase High Performance Liquid

Chromatography" — Analytical Consulting Laboratories

1987 *Douglas Hanggi*, "High Performance Dye-Ligand Affinity Chromatography Using Immobilized Triazine Dyes" — 3M Company

1988 *Jung-Hag Park*, "Headspace Gas Chromatographic Measurement and Applications of Limiting Activity Coefficients" — Yeung Nam University, Korea

1988 *James Wade*, "The Theory of Nonlinear Chromatography and Its Application to Affinity Chromatography" — CPKelco, San Diego, CA

1988 *Martin P. Rigney*, "The Development of Porous Zirconia as a Support for Reversed-Phase High-Performance Liquid Chromatography" — Echo Labs.

1988 *Won-Jo Cheong*, "Measurements of Limiting Activity Coefficients of Homologous Series of Solutes and Their Application to the Study of Retention Mechanism in Reversed Phase Liquid Chromatography" — Inha University, Korea

1990 *David Schisla*, "Hollow-Fiber Liquid Chromatography" –Shell Development Company

1991 *John A. Blackwell,* "Metal-Ion Modified Zirconium Oxide Based Chromatographic Supports" — Rhodia, Inc., PA

1991 *Thomas P. Weber*, "The Development and Characterization of High Performance Liquid Chromatographic Supports Based on High Temperature Modified Porous Zirconia Micro-particles" — INEX Pharmaceuticals Corp., Burnaby, BC, Canada

1992 *Alan J. Bergold*, "High Performance Lectin Affinity Chromatography: An Examination of the Thermodynamic and Kinetic Limitations of the Technique and the Development of an Alternative Elution Method" — Sigma–Genosys, The Woodlands, TX

•Students: University of Minnesota – Ph.D. Recipients, continued•

1992 *Jianjun Li*, "Solvatochromic and Thermodynamic Studies of Retention in Gas Chromatography and Gas-Liquid Equilibria —Procter & Gamble, Cincinnati, OH

1993 *David Eikens*, "Applicability of Theoretical and Semi-Empirical Models for Predicting Infinite Dilution Activity Coefficients" —

1993 *Randall A. Wanke*, "Investigations into the Hydrogen Bonding and Hydrogen-Bond Aggregation Leading to Hydrogen-Bonded Crystal Formation" — Augustana College, Rock Island, IL

1994 *Lifang Sun*, "Polybutadiene-Coated Zirconia as a Biocompatible Reversed-Phase High Performance Liquid Chromatography Support" – San Diego State University, San Diego, CA

1994 *Lay Choo Tan*, "Study of Retention Mechanism in Reversed Phase Liquid Chromatography" — Novartis, New Jersey

1995 *Andrew J. Dallas*, "Fundamental Solvatochromic and Thermodynamic Studies of Complex Chromatographic Media" — Donaldson Company, Inc., Bloomington, MN

1996 *Clayton V. McNeff*, "Synthesis and Use of Polyanine Coated Porous Zirconia for High Performance Anion-Exchange Chromatography") — ZirChrom Separations, Inc., Anoka, MN

1996 *Jeffery D. Weckwerth*, "Solvatochromic Studies of Retention in Supercritical Fluid Chromatography" — Hutchinson Technology Inc.

1997 *Christopher J. Dunlap*, "The Synthesis and Characterization of Dextran-Coated Zirconia as a Stationary Phase Material for High Performance Liquid Chromatography" — St. Mary's College, Notre Dame, IN

1997 *Mark Vitha*, "Thermodynamic and Solvatochromic Studies of the Fundamental Chemical Forces Governing Solute Interactions with Surfactant Micelles" — Drake University, Des Moines, IA

1997 *Paul Jackson*, "Chemically Modified Zirconia: Synthesis and Evaluation of Novel High Performance Liquid Chromatographic Materials" — St. Olaf College, Northfield, MN

1998 *Andrew M. Clausen*, "Synthesis and Characterization of a Chelator Modified Zirconia Support for BioChromatographic Applications" — Merck and Company, Inc.

1998 *Yue Hu*, "Synthesis and Evaluation of Novel Polymer-Coated Zirconia as Reversed and Ion-Exchange Stationary Phases" — BMS, New Brunswick, NJ

1999 *Jianhong Zhao*, "Synthesis, Evaluation, Application and Modification of a Novel Aromatic Polymer Coated Zirconia HPLC Support" — Pfizer, CT

2001 *Aosheng Wang*, "Multivariate Calibration of Retention in Reversed-Phase Liquid Chromatography" — Beckman-Coulter, St. Paul, MN

2001 *Yun Mao*, "Selectivity Optimization in Liquid Chromatography Using the Thermally Tuned Tandem Concept (T^3C)" — Merck and Company, Inc., West Point, PA

2002 *Brian Trammell*, Ph.D., "Novel Stationary Phases on Silica and Zirconia for the Reversed-Phase High Performance Liquid Chromatographic Separation of Acidic and Basic Analytes" — Patheon, Cincinnati, OH

2003 *Jon Thompson*, "High Temperature Ultrafast Liquid Chromatography" — Systec, Inc., New Brighton, MN

2004 *Xiqin Yang*, "Mixed-Mode Separations of Cationic Analytes on Polybutadiene Coated Zirconia and Octadecyl Silane Bonded Silica Phases" – GlaxoSmithKline, King of Prussia, PA

2005 *Jun Dai*, "Understanding Retention Mechanisms and Adjusting Selectivity of Basic Pharmaceutical Separations by Reversed Phase Liquid Chromatography" – Bristol-Myers Squibb, Lawrenceville, NJ

2005 *Lianjia (Leo) Ma*, "Acid Stable Hyper Crosslinked Stationary Phases for the Reversed Phase High Performance Liquid Chromatographic Separation of Basic and Biological Analytes" - Schering-Plough, Union, NJ

2006 *Adam Schellinger*, "Improving the Speed, Transferability and Optimization in Gradient Elution Reversed-Phase Liquid Chromatography" - Abbott Laboratories, North Chicago, IL

2006 *Hao Luo*, "A Silicon-Based Hydrophase Cation Exchange Phase for Water Soluble Pharmaceutical and Bioactive Anhydrous" - Schering-Plough, Union, New Jersey

2006 *Xiaoli Wang*, "Part I: Fundamental and Applied Studies of Chromatographic Resolving Power for One in Proteamic Analysis. Part II: Transition Metal Based Chiral Station and Phases for Enantiomeric Separation" - Astrazeneca, Wilmington, DE

2007 *Dwight R. Stoll II*, "Fast, Comprehensive Two-Dimensional High Performance Liquid Chromatography" – Dept of Chemistry, Gustavus Adolphus College, St. Peter, MN

2010 Yu Zhang, "Hyper-crosslinked Stationary Phases for Reversed Phase Liquid Chromatography", Millenium Inc., Boston, MA

2011 Chang yub Paek, "Carbon Clad Silica Phases for Repersed Phase liquid Chromatography", Conoco, Ponca City, OK

2012 Marcelo Filgueira,"Developments in Two Dimensional Liquid Chromatography", Dow Chemical Co. Spring House, PA

Students: University of Minnesota – Masters Recipients

1980 *James E. Elvecrog*, "A Thermochemical Unsegmented Flow System Bases on the Iodide Catalyzed Cerium-Arsenic Reaction" — 3M Company

1987 *Peter R. Johnson*, "Analysis of Serum Bile Acids with an Immobilized Enzyme Reactor by Flow Injection Analysis and Reverse Phase High Performance Liquid Chromatography" — 3M company

1988 *Martha Crowell-Gill*, "The High Performance Liquid Chromatography of Metal Butylnaphthylmethyldithiocarbamates"
1988 *Tina Wade*, "The Study of Small Molecule-Ligand Interactions in High Performance Affinity Chromatography Using Immobilized Triazine Dyes" — North Hennepin Community College, Minneapolis, MN
1990 *Wes Schafer*, "The Use of Zirconium Oxide Sorbents in the Separation of Biological Compounds" — Merck, Sharp & Dohme Research Laboratories
1996 *Li Li*, "Studies of Retention Mechanisms and Stability of Horizontally Polymerized Bonded Phase for RPLC") — Bristol-Myers Squibb, NJ
1999 *James Paulson* — Bristol-Myers Squibb, NJ
1999 *Glenn Langenburg* — Bureau of Criminal Apprehension, State of Minnesota
2003 *Matthew Bigert*, "Selectivity Optimization Flexibility in Liquid Chromatography Using the Eluent Variable (X) Tuned Tandem Column Concept (XTTC): Solvent Tuned Tandem Column (STTC) and Ionic Strength Tuned Tandem Column (ITTC) Concepts" — Merck and Company, Inc., West Point, PA
2003 *Ilya Tsukerman*, "The Effect of Phosphate on Retention of Anti-Depressant Drugs on Polybutadiene-Coated Zirconia (PBD-ZrO_2)" —
2008 *Ke Huang* — Pharmacy Program, University of Illinois, Chicago

Postdoctoral Research Associates

03/71-09/71 *Christine Bowman*, Ph.D., University of Wisconsin
10/71-04/73 *Stephen R. Betso*, Ph.D., Ohio State University
09/76-09/77 *Richard G. Leffler*, Ph.D., Michigan State University
09/79-09/80 *Rogers Gurira*, Ph.D. Pennsylvania State University
06/82-05/83 *Xindu Geng*, Ph.D., People's Republic of China
01/83-08/85 *Abul Hussam*, Ph.D., University of Pittsburgh
01/88-07/88 *Sarah C. Rutan*, Ph.D., Washington State University
07/88-06/89 *Chuck Lucy*, Ph.D., University of Alberta, Edmonton
04/89-11/90 *Yunke Zhang*, Ph.D., University of New Hampshire
06/91-06/93 *Hsui Ouyang*, Ph.D., University of Pittsburgh
04/92-06/92 *Hong-Bing Ding*, Ph.D., University of Minnesota
09/92-09/93 *Jacek Nawrocki*, Ph.D., Adam Mickiewicz University, Poznan, Poland
09/92-03/94 *Michael Annen*, Ph.D., Virginia Polytechnic Institute and State University
09/93-08/94 *Jung-Hag Park*, Ph.D., University of Minnesota
11/94-09/95 *Asadollah Nasehzadeh*, Ph.D., University of Surrey, United Kingdom
11/94-12/96 *Jianwei Li*, Ph.D., Purdue University
01/95-12/96 *Arun Sathyagal*, Ph.D., Purdue University
08/96-07/98 *Ravi Ranatunga*, Ph.D., University of Houston
01/97-02/98 *Sabir Majumder*, Ph.D., University of New Mexico
07/97-03/99 *Mario Reta*, Ph.D., Universidad Nacional de Rio Cuarto, Argentin)
05/98-09/99 *Gary Mabbott*
10/97-12/99 *Cecilia Castells*, Ph.D., National University of La Plata, Argentina
09/97-05/01 *Bing-Wen Yan*, Ph.D., Nankai University, People's Republic of China
05/00-05/02 *Dihua Jin*, Ph.D., Purdue University
09/01-07/02 *Bin Chen*, Ph.D., University of Minnesota
01/02-05/03 *Huqun Liu*, Ph.D., University of New Hampshire
6/06-12/06 *Yuming Huang*, Ph.D., Nanjing University, People's Republic of China

9/06-10/08 *Xiaoping Li*, Ph.D., Michigan State University, East Lansing
7/07-2/2009 *Wenzhe Fan,* Ph.D., University of New Hampshire, Durham
8/07-3/2009 *Ayse Beyaz,* Ph.D., University of Missouri, Rolla
9/08 – 6/09 *Lawrence W. Potts,* Ph.D., University of Minnesota–Twin Cities
12/08-3/11 *Yuan Huang,* Ph.D., University of Arizona, Tucson
3/09-8/09 *Drew Dunwoody,* Ph.D., University of Iowa, Iowa City
5/09-2/11 *Haiwei Gu*, Ph.D., Ph.D., Purdue University, West Lafayette
3/11-8/12 *Arianne Soliven*, Ph.D., University of West Sidney, Sidney
5/11-present *Imad Haldar*, Ph.D., Florida State University, Tallahassee
6/11-present Brian Barnes, Ph.D., Seton Hall University, Newark
8/11-present Robert Allen, Ph.D., Virginia Commonwealth University, Richmond

Courses Taught: University of Georgia

Advanced Analytical Chemistry - electroanalytical kinetic and radio chemical analysis (senior division–undergraduate and graduate course) CHM 580

Separation Methods in Analytical Chemistry - Theory and Practice of gas and liquid chromatography (graduate) CHM 881C

Analytical Biochemistry (special topics graduate course) CHM 884

Electrochemistry and Ionic Equilibrium - advanced treatment of general concepts in analytical chemistry, CHM 881A

Quantitative Analysis - introductory course (undergraduate) CHM 280

Chemical Instrumentation - modern electronics applied to instrumentation for chemical measurement (graduate) CHM 581/781

Courses Taught: University of Minnesota

1977

Fall 5127 (4/1)	Analog/Digital Instrumentation (with Professor John F. Evans)
Winter 5139 (3)	Introduction to Separations Science

1978

Fall 5127 (4/1)	Analog/Digital Instrumentation (with Professor John F. Evans)
Winter 5139 (3)	Introduction to Separations Science
Spring 5133 (3/2)	Instrumental Analysis for Majors

1979

Fall 5127 (4/1)	Analog/Digital Instrumentation (with Professor John F. Evans)
Winter 5139 (3/1)	Introduction to Separations Science
Spring 5133 (3/2)	Instrumental Analysis for Majors (with Professor John F. Evans)
Spring 5126 (2/2)	Instrumental Analysis for Non-Majors (with Professor John F. Evans)

•Courses Taught: University of Minnesota, continued•

1980

Fall 5127 (4/2)	Analog/Digital Instrumentation
Winter 5139 (3/1)	Introduction to Separations Science
Spring 5126 (2/2)	Instrumental Analysis for Non-Majors
Spring 8129 (4/4)	Survey of Modern Instrumental Analysis

1981

Fall 5127 (4/2)	Analog/Digital Instrumentation
Winter 5139 (3/1)	Introduction to Separations Science
Spring 5126 (2/2)	Instrumental Analysis for Non-Majors
Spring 5133 (3/2)	Instrumental Analysis for Majors

1982

Fall 5127 (4/2)	Analog/Digital Instrumentation
Winter 5139 (3/2)	Introduction to Separations Science
Winter 5134 (2/2)	Chemical Instrumentation and Analysis Laboratory

1983

Fall 5139 (3/2) Introduction to Separations Science
Winter 5127 (4/2) Analog/Digital Instrumentation

•Courses Taught: University of Minnesota, continued•

1984
Winter 5139 (3) Introduction to Separations Science
Spring 1133 (3/1) Quantitative Analysis

1985
Fall 5127 (4/2) Analog/Digital Instrumentation
Winter 5139 (3) Introduction to Separations Science
Spring 1133 (3/1) Quantitative Analysis

1986
Winter 5139 Introduction to Separations Science
Spring 1133 Quantitative Analysis

1987
Fall 5139 (3) Introduction to Separations Science

1988
Fall 5139 (3) Introduction to Separations Science
Spring 1133 Quantitative Analysis

1989
Spring 1133 Quantitative Analysis
Fall 5139 Introduction to Separations Science

1990
Spring 1133 Quantitative Analysis
Fall 5139 Introduction to Separations Science

1991
Winter 1004 (5) General Principles of Chemistry
Spring 1133 Quantitative Analysis
Fall 3101 (2) Quantitative Analysis Laboratory

1992
Winter 5127 (5) Analog Instrumentation
Spring 5139 Introduction to Separations Science

1993
Winter 5127 (5) Analog Instrumentation
Spring 5139 Introduction to Separations Science
Fall 3101 (2) Quantitative Analysis Laboratory

1994

Spring 5139	Introduction to Separations Science

1995

Winter 5127 (5)	Analog Instrumentation
Spring 5139	Introduction to Separations Science
Fall 8001 (4)	Applied Chemical Thermodynamics

1996

Winter 5127 (5)	Analog Instrumentation
Spring 5139	Introduction to Separations Science
Fall 5127 (5)	Analog Instrumentation
Fall 8001 (4)	Applied Chemical Thermodynamics

1997

Spring 5139 (4)	Introduction to Separations Science
Fall 8001 (4)	Applied Chemical Thermodynamics

1998

Winter 5127 (5)	Analog Instrumentation
Spring 5139	Chromatography and Separation Science
Fall 5127 (5)	Analog Instrumentation

1999

Winter	*Single Quarter Leave*
Spring 5139	Chromatography and Separation Science
Fall 8151 (4)	Advanced Analytical Chemistry I

2000

Spring 4111 (2)	Intermediate Analytical Chemistry Lab
Fall 8151 (4)	Advanced Analytical Chemistry I

2001

Spring	*Sabbatical*
Fall	*Sabbatical*

2002

Spring	*Sabbatical*
Fall 4101 (3)	Intermediate Analytical Chemistry Lecture

2003

Fall 8151 (4)	Analytical Separations and Chemical Equilibria
Fall 4101 (3)	Intermediate Analytical Chemistry Lecture

2004

Spring 8151 (4)	Analytical Separations and Chemical Equilibria

Fall 4101 (3)	Intermediate Analytical Chemistry Lecture

2005

Spring 8151 (4)	Analytical Separations and Chemical Equilibria
Fall 4101 (3)	Intermediate Analytical Chemistry Lecture

2006

Spring 8151 (4)	Analytical Separations and Chemical Equilibria
Fall 4101 (3)	Intermediate Analytical Chemistry Lecture

2007

Spring 8151 (4)	Analytical Separations and Chemical Equilibria
Fall 8151 (4)	Analytical Separations and Chemical Equilibria

2008

Spring	*Single Quarter Leave*
Fall 8151 (4)	Analytical Separations and Chemical Equilibria

2009

Spring 4111 (2)	Intermediate Analytical Chemistry Lab

2010

Departmental Committee Assignments

1977-1978	Smith Hall Renovation	Member
	Awards Committee	Member
	Special Equipment Request Committee (ad hoc)	Member
	Evans Tenure Committee	Chair
1978-1979	Smith Hall Renovation	Member
	Analytical Seminar	Chair
	Analytical Faculty Search Committee	Chair
	Awards Committee	Member
	Evans Tenure Committee	Chair
	Dean's Committee on Distribution of Special	Member
	Legislative Request Funds (Summer 1979, ad hoc)	Member
1979-1980	Smith Hall Renovation	Member
	Analytical Seminar	Chair
	Analytical Faculty Search Committee	Member
	Evans Tenure Committee	Member
1980-198l	Smith Hall Renovation	Member
	Analytical Seminar	Chair
	Evans Tenure Committee	Member
	Library Committee (ad hoc)	Member
1981-1982	Smith Hall Renovation	Member

	Analytical Seminar	Chair
	Stankovich Tenure Committee	Member
1982-1983	Smith Hall Renovation	Member
	Analytical Seminar	Chair
	Lodge Tenure Committee	Member
	Minisymposium Committee	Chair
1984-1985	Stankovich Tenure Committee	Member
	Lodge Tenure Committee	Member
1985-1986	Small Computer Committee	Member
	Liu Tenure Committee	Member
	Lodge Tenure Committee	Member
	Stankovich Tenure Committee	Member
	Bioprocess Technology Institute Facilities Committee	Member
	Search Committee for New Departmental Chairman	Chair
	Instrumental Microcomputer Committee	Chair
1986-1987	Liu Tenure Committee	Member
	Search Committee for New Departmental Chairman	Member
	Stankovich Tenure Committee	Member
	Kariv-Miller Promotion Committee	Member
	Undergraduate Microcomputer Committee	Member

•Departmental Committee Assignments, continued•

1987-1988	Liu Tenure Committee	Member
1988-1989	Instructional Computer Committee	Member
	Safety Committee	Chair
	Liu Tenure Committee	Member
	IT Search Committee for New Departmental Chairman	Member
1989-1990	Instructional Computer Committee	Member
	Evans Promotion Committee	Member
	Safety Committee	Member
	Liu Tenure Committee	Member
	Analytical Seminar	Chair
1990-1991	Instructional Computer Committee	Member
	Safety Committee, Chairman	Member
	Analytical Seminar	Chair
1991-1992	Instructional Computer Committee	Member
	Safety Committee	Chair
	Analytical Seminar	Chair
	Graduate Curriculum Committee	Chair
1992-1993	Instructional Computer Committee	Chair

	Safety Committee	Chair
	Analytical Seminar	Chair
	Graduate Curriculum Committee	Chair
	Analytical Specialty Area Coordinator, beginning W93	Member
1993-1994	Instructional Computer Committee	Member
	Analytical Specialty Area	Coordinator
	Analytical Seminar	Chair
	Graduate Curriculum Committee	Member
1994-1995	Instructional Computer Committee	Member
	Analytical Specialty Area	Coordinator
	Faculty Search Committee	Member
	Minisymposium Committee	Chair
	Stankovich Promotional Documentation Committee	Member
	Munson Tenure Committee	Member
1995-1996	Instructional Computer Committee	Member
	Analytical Specialty Area	Coordinator
	Munson Tenure Committee	Member
	Sun Tenure Committee	Member
	Damme/Carr Academic Careers Committee	Member
1996-1997	Analytical Specialty Area	Coordinator
	Munson Tenure Committee	Member
	Sun Tenure Committee	Member
1997-1998	Analytical Specialty Area	Coordinator
	Analytical Chemistry Faculty Search	Member
	Munson Tenure Committee	Member

•Departmental Committee Assignments, continued•

1998-1999	Analytical Specialty Area	Coordinator
	Munson Tenure Committee	Member
	Arriaga Tenure Committee	Member
1999-2000	Analytical Specialty Area	Coordinator
	Munson Tenure Committee	Member
	Arriaga Tenure Committee	Member
2000-2001	Analytical Specialty Area	Coordinator
	Munson Tenure Committee	Member
	Arriaga Tenure Committee	Member
	Buhlmann Tenure Committee	Member
2001-2002	Arriaga Tenure Committee	Member
	Buhlmann Tenure Committee	Member

2002-2003	Arriaga Tenure Committee	Member
	Buhlmann Tenure Committee	Member
2003-2004	Arriaga Tenure Committee	Member
	Buhlmann Tenure Committee	Member
2004-2005	Buhlmann Tenure Committee	Member
2005-2006	Buhlmann Tenure Committee	Member
	Faculty Search Committee	Member
	Undergraduate Curriculum Committee	Member
	Undergraduate Program Committee	Member
2006-2007	Undergraduate Curriculum Committee	Member
	Undergraduate Program Committee	Member
	Undergraduate Chemistry Major Advisory Committee	Member
	Undergraduate Research Opportunities Program (UROP) Award Committee	Member
2010-present	Department Tenure Committee	Member

National Science Foundation

SBIR Review Panel, 1984-85
SBIR Review Panel, 1985-86

American Chemical Society Committees

1980-1983	Chromatography Award Committee	Member
1982-present	Teaching Excellence Committee	Member
1983	Instrumentation Award Committee, Chairman,	
1983-1984	Committee to Review Analytical Chemistry Books and Journals, Analytical Division	Member
1983-1984	Committee on Graduate Proficiency Exam Analytical Division	Member
1988	Division of Analytical Chemistry Committee on Education, American Chemical Society	Member
1989-1992	Canvassing Committee - ACS Award in Chromatography	Member
1991	Undergraduate Education Subcommittee, Analytical Division	Chair
2004	Committee for the ACS 2005 Award for Young Investigators in Separation Science	Member
2006 – present		Selection Committee,
ACS 2007 Award in Chromatography		Member
2006-2007	Division of Analytical Chemistry Young Separation Scientist Award Committee	Member

Papers Presented at Scientific Meetings

1. E.B. Smith and P.W. Carr, "High Sensitivity Thermochemical Analysis," Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, March 1972.

2. E.B. Smith and P.W. Carr, "Thermochemical Analysis of Proteins," National A.C.S. Meeting, Boston, MA, April 1972.

3. W.D. Bostick and P.W. Carr, "Measurement of Prothrombin Time by Thermoanalytical Probes," Southeast Regional A.C.S. Meeting, Birmingham, AL, November 1972.

4. P.W. Carr and W.B. Speg, "Saponification of Triglycerides in Dimethylsulfoxide," Southeast Regional A.C.S. Meeting, Birmingham, AL, November 1972.

5. S.R. Betso and P.W. Carr, "Amperometric Titration of Proteins with 12-Phosphotungstic Acid at Rotating Gold Electrodes," Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy, March 1973.

6. W.D. Bostick and P.W. Carr, "A Novel Coagulation Time Detector Based on the Flow Sensitivity of Self-Heated Thermistors," National Meeting A.C.S., Dallas, TX, Spring 1973.

7. E.B. Smith and P.W. Carr, "A High Precision Reference Method for Total Protein," American Association of Clinical Chemists, National Meeting, New York, NY, August 1973.

8. W.D. Bostick and P.W. Carr, "A Continuous Recording Coagulation Time Detector," American Association of Clinical Chemists, Southeast Regional Meeting, Augusta, GA, October 1973.

9. W.K. Nonidez, P.W. Carr, and D.E. Leyden, "X-ray Fluorescence Analysis of Total Serum Phospholipid," Southeast Regional Meeting, ACS, Charleston, NC, November 1973.

10. J.H. Kennedy and P.W. Carr, "Effect of Inert Solids on the Measurement of Purity by Differential Scanning Calorimetry," Southeast Regional Meeting, ACS, Charleston, NC, November 1973.

11. E.B. Smith, S.R. Betso and P.W. Carr, "The Interaction of Proteins with 12-Phosphotungstic Acid," Southeast Regional Meeting, ACS, Charleston, NC, November 1973.

12. J.J. Alberts, J.S. Schindler, R.E. Miller and P.W. Carr, "Analysis of Mercury in Natural Waters by Persulfate Oxidation and Cold Atomic Absorption," Southeast Regional Meeting, ACS, Charleston, NC, November 1973.

13. R.H. Callicott and P.W. Carr, "Active Filters as Differentiators, Rate Meters and Endpoint Locators," First Federation of Analytical Chemistry and Spectroscopy Societies Meeting, Atlantic City, NJ, November 1974.

14. P.W. Carr and L.M. Canning, "Determination of Urea Using Immobilized Urease Columns," 3rd Annual SEAAC Conference, Atlanta, GA, April 1975.

15. L.N. Klatt, D.R. Senn and P.W. Carr, "Trace Determination of Nitrate Using an Immobilized Enzyme," 2nd Annual FACSS Conference, Indianapolis, IN, October 1975.

•Papers Presented at Scientific Meetings, continued•

16. R.E. Adams and P.W. Carr, "Development of a Totally Electrochemical pH Stat for Automated Acid-Base Determinations and Reaction Rate Measurements," Pittsburgh Conference on Analytical Chemistry, Cleveland, OH, March 1976.

17. L.D. Bowers, R.S. Schifreen and P.W. Carr, "Thermochemical Analysis of Serum Constituents Using Immobilized Enzymes," Symposium on Advanced Concepts in Clinical Chemistry, Oak Ridge, TN, March 1976.

18. P.W. Carr and R.E. Adams, "A Totally Electrochemical pH Stat for Automated Measurement of Enzymic Activity," Southeast Analytical Chemistry Conference, Winthrop College, April 1976.

19. P.W. Carr and L.F. Whiting, "Theoretical Studies of Heat and Mass Transfer in Enzyme Reactions Studied by Differential Scanning Calorimetry," North American Thermal Analysis Symposium (NATAS), Princeton University, June 1976.

20. L.F. Whiting and P.W. Carr, "Study of Enzyme Catalyzed Reactions by Differential Scanning Calorimetry," National ACS Meeting, San Francisco, CA, September 1976.

21. L.F. Whiting and P.W. Carr, "Simple, Fast, Numerical Method for the Solution of a Wide Variety of Electrochemical Diffusion Problems," Southeast Regional Meeting, ACS, Gatlinburg, TN, October 1976.

22. R.E. Adams and P.W. Carr, "Precise Determination of Enzyme Substrates Using a Coulometric pH-Stat," Southeast Regional Meeting, ACS, Gatlinburg, TN, October 1976.

23. R.C. Dorey and P.W. Carr, "General Metal Ion Detector Using a Cupric Ion Selective Electrode," Southeast Regional Meeting, ACS, Gatlinburg, TN, October 1976.

24. S.N. Lowery, W.R. Seitz and P.W. Carr, "Enzyme Induced Chemiluminescence-Determinations of L-Amino Acids and L-Amino Acid Oxidase Using Luminol," Southeast Regional Meeting, ACS, Gatlinburg, TN, October 1976.

25. R.S. Schifreen, D.A. Hanna and P.W. Carr, "Practical and Theoretical Aspects of Flow Enthalpimetry Using Immobilized Enzyme Column Reactors," Southeast Regional Meeting, ACS, Gatlinburg, TN, October 1976.

26. R.S. Schifreen and P.W. Carr, "Theoretical Model of a Flow Enthalpimetric Analyzer That Uses Immobilized Enzyme Columns," National ACS Meeting, New Orleans, LA, March 1977.

27. P.W. Carr, "Theoretical Evaluation of the Transient Response of Potentiometric Enzyme Electrodes by the Method of Fourier," National ACS Meeting, New Orleans, LA, March 1977.

28. R.C. Dorey and P.W. Carr, "General Metal Ion Detector for Liquid Chromatography," National ACS Meeting, Chicago, IL, August 1977.

29. R.S. Schifreen and P.W. Carr, "Determination of Triglycerides by Flow Enthalpimetry with Immobilized Lipase," Pittsburgh Conference on Analytical Chemistry, Cleveland, OH, March 1978.

30. P.W. Carr, "Fundamental Analytical Characteristics of Immobilized Enzyme Reactors," Midland Macromolecular Institute, Symposium on Silylated Surfaces, Midland, MI, May 1978.

•Papers Presented at Scientific Meetings, continued•

31. R.S. Schifreen and P.W. Carr, "Immobilized Enzyme Reactors in Body Fluid Analysis," National ACS Meeting, Miami, FL, September 1978.

32. P.W. Carr,"Flow Enthalpimetric Analysis" and "Fundamental Limitations of Kinetic Methods of Analysis," FACSS Meeting, Boston, MA, November 1978.

33. P.W. Carr, "High Performance Lectin Affinity Chromatography," 2nd International Conference on HPLC of Peptides and Proteins, Baltimore, MD, December 1982.

34. P.W. Carr and W.E. Barber, "Determination of Anions by Ion Interaction Chromatography with UV Active Quaternary Amines," Eastern Analytical Symposium, New York, NY, November 1983.

35. P.W. Carr and Amy J. Muller, "High Performance Affinity Chromatography," Pittsburgh Conference on Analytical Chemistry, Pittsburgh, PA, March 1984.

36. P.W. Carr and P.C. Sadek, "Thermodynamic Properties of Fluorinated Bonded Phases in HPLC," International HPLC Conference, New York, NY, May 1984.

37. P.W. Carr and W.E. Barber, "Sensitivity Effects in UV Visualization Ion Interaction HPLC," International HPLC Conference, New York, NY, May 1984.

38. A. Hussam and P.W. Carr, "Rapid Measurement of Vapor/Liquid Equilibria by Headspace Gas Chromatography," Paper No. 5, Minnesota Chromatography Forum, May 19-21, 1985.

39. D.W. Fritz and P.W. Carr, "A Priori Estimation of Gas-Liquid Partition Coefficients by Application of the UNIFAC Solution Groups Method," Paper No. 8, Minnesota Chromatography Forum, May 19-21, 1985.

40. P.C. Sadek and P.W. Carr, "Chromatographic Comparison of Solute Retention, Functional Group Selectivity and Packing Material Stability of Fluorinated Bonded Phases," Paper No. 36, Minnesota Chromatography Forum, May 19-21, 1985.

41. P.C. Sadek and P.W. Carr, "Solvatochromic Studies of Retention Processes in Reversed-Phase High Performance Liquid Chromatography," Paper No. 37, Minnesota Chromatography Forum, May 19-21, 1985.

42. A.F. Bergold and P.W. Carr, "Kinetic Contributions to Total Plate Height under Linear Isotherm Conditions in Con A Affinity Chromatography," Paper No. 38, Minnesota Chromatography Forum, May 19-21, 1985.

43. J. Wade, A. Bergold, and P.W. Carr, "Nonlinear Chromatographic Theory and Its Applications," Minnesota Chromatography Forum, Minneapolis, MN, May 18-20, 1987.

44. Tina Wade and P.W. Carr, "The Study of Small Molecule-Ligand Interactions in HPAC Using Immobilized Triazine Dyes," Minnesota Chromatography Forum, Minneapolis, MN, May 18-20, 1987.

45. Jung-Hag Park and P.W. Carr, "Experimental Test of the MOSCED and UNIFAC Methods for Estimating χ^{∞}," Minnesota Chromatography Forum, Minneapolis, MN, May 18-20, 1987.

•Papers Presented at Scientific Meetings, continued•

46. P.W. Carr, A.F. Bergold, and J. Wade, "Theory of Nonlinear Chromatography," ASTM--Twenty-Sixth Annual Conference on the Practice of Chromatography, Minneapolis, MN, October 7, 1987.

47. P.W. Carr and J. Wade, "Nonlinear Effects in Chromatography," American Society of Testing Materials, E19 Committee Meeting, Minneapolis, MN, October 7, 1987.

48. P.W. Carr, J.H. Park, and W.J. Cheong, "An Automated Head Space Chromatographic System for Measurement of Infinite Dilution Activity Coefficients," Midwest Thermodynamics Symposium, Lake Geneva, WI, May 15-17, 1988.

49. M.P. Rigney, P.W. Carr, and E.F. Funkenbusch, "Development of a Stable, ZrO_2-Based Reversed Phase Chromatographic Support," Paper No. 3, Minnesota Chromatography Forum, May 16-18, 1988

50. W.J. Cheong and P.W. Carr, "The Kamlet-Taft Polarity/Polarization Parameter of Reversed-Phase HPLC Solvents," Paper No. 4, Minnesota Chromatography Forum, May 16-18, 1988.

51. D.I. Eikens and P.W. Carr, "Calculation of Precision in Chromatographic Peak Moments," Paper No. 6, Minnesota Chromatography Forum, May 16-18, 1988.

52. Chemistry," Paper No. 7, Minnesota Chromatography Forum, May 16-18, 1988.

53. W.J. Cheong and P.W. Carr, "Head Space Chromatographic Measurements of Limiting Activity Coefficients of a Homologous Series of Normal Alkanes, and Some Branched and Cyclic Alkanes in a Wide Variety of Organic Solvents," Paper No. 8, Minnesota Chromatography Forum, May 16-18, 1988.

54. M. Gill, Y.T. Shih, and P.W. Carr, "Trace Metal Analysis by Reversed-Phase Liquid Chromatography Based on the Use of Naphthyl Dithiocarbamates," 195th American Chemical Society National Meeting, Toronto, Canada, June 5-10, 1988.

55. P.W. Carr and A. Bergold, "The Effect of Ligand Density on the Recovery of Multivalent Proteins from Affinity Supports," 195th American Chemical Society National Meeting, Toronto, Canada, June 5-10, 1988.

56. P.W. Carr, J.L. Wade, and A.F. Bergold, "Chemical and Physical Properties of Ideal Chromatographic Supports for High Performance Chromatography of Proteins," 195th American Chemical Society National Meeting, Toronto, Canada, June 5-10, 1988.

57. S.C. Rutan and P.W. Carr, "Application of the Kalman Filter to the Prediction of Reversed-Phase Liquid Chromatographic Retention Using Linear Free Energy Relationships," 27th Annual Eastern Analytical Symposium, New York City, NY, October 2-7, 1988.

58. T.P. Weber and P.W. Carr, "The Preparation, Characterization, and Use of Zirconium Dioxide as a Normal Phase Adsorption Chromatographic Support," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Atlanta, GA, March 6-10, 1989.

•Papers Presented at Scientific Meetings, continued•

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62. P.W. Carr, "Use of Recent Advances in Linear Solvation Energy Relationships for Rationalizing and Predicting Phase Transfer Equilibria," 5th International Conference on Fluid Properties and Phase Equilibria for Chemical Process Design," Banff, Alberta, Canada, April 30-May 5, 1989.

63. J.E. Wade, C. Lucy, and P.W. Carr, "Experimental and Theoretical Investigation of Overload Phenomena in Reversed Phase High Performance Liquid Chromatography," PREP-89, 6th International Symposium on Preparative Chromatography, Washington, DC, May 8-10, 1989.

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84. T.A. Weber and P.W. Carr, "The Chromatographic Evaluation of Porous Carbon-Clad Zirconia Micro-Particles," Minnesota Chromatography Forum 1991 Spring Symposium, Bloomington, MN, May 7-8, 1991.

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99. J. Morris, C. Dunlap, P.W. Carr, and M.F. Flickinger, "Preliminary Development of a Thiophilic Zirconia-Based Support for Antibody Purification," 1993 Spring American Chemical Society National Meeting, Division of Biochemical Technology, Denver, CO, March 28-April 2, 1993.

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101. L.C. Tan, P.W. Carr, J.M.J. Fréchet, and V. Smigdol, "The Use of a Phenolic Liquid Chromatography Stationary Phase for the Study of Solute Hydrogen Bonding Basicity by Linear Solvation Energy Relationships," 206th American Chemical Society National Meeting, Chicago, IL, August 22-27, 1993.

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112. J.D. Weckwerth and P.W. Carr, "Solvatochromic Studies of Retention in Supercritical Fluid Chromatography," 18th International Symposium on Column Liquid Chromatography, Minneapolis, MN, May 10, 1994.

113. L. Sun and P.W. Carr, "Separation of Proteins and Peptides on Phosphoric Acid-Adsorbed Polybutadiene-Coated Zirconia," 18th International Symposium on Column Liquid Chromatography, Minneapolis, MN, May 11, 1994.

114. Q. Zhao and P.W. Carr, "Anion-Exchange and Hydrophobic Interaction Multimodal Polyethyleneimine-Coated Zirconia Packings for Protein Separations," 18th International Symposium on Column Liquid Chromatography, Minneapolis, MN, May 12, 1994.

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125. P.W. Carr, J.F. Evans, and L. Li, "Chromatographic Evaluation of a New Alkyl-Bonded Phase Prepared through Horizontal Polymerization," Minnesota Chromatography Forum Spring Symposium, Minneapolis, MN, May 3, 1995.

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128. P.W. Carr and J.D. Weckwerth, "Solvatochromic Studies of Retention in Supercritical Fluid Chromatography," Eastern Analytical Symposium, Somerset, NJ, November 12-18, 1995.

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141. A. M. Clausen, A. Subramanian and P.W. Carr, "Chromatographic Stationary Phase and Its Application to the Removal of Endotoxins from Insulin," 17th International

Symposium & Exhibit on the Separation of Proteins, Peptides, and Polynucleotides, Rockville, MD, October 26-29, 1997.

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151. A. McCormick, K-T. Lee, A. Sathyagal, D. Reeder, S. Majumder, and P. Carr, "Roles of Polymerization, Precipitation, and Aggregation in the Synthesis of Monodisperse Nonporous or Controlled Pore Ceramic Microspheres," Materials Research Society 1998 Spring Meeting, San Francisco, CA, April 13-17, 1998.

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160. C. McNeff and P.W. Carr, "Comparison of Stable Reversed-Phase HPLC Column Packings Including Zirconia, Silica, Alumina, and Polymer-Based Columns," Eastern Analytical Symposium, HPLC Selectivity and Mechanisms, Somerset, NJ, November 19, 1998.

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162. J.H. Park, J.W. Ryu, J.K. Park, P.W. Carr, and C.V. McNeff, "Separation of Racemic DNP-Amino Acids on Heptakis(3-O-methyl)-b-Cyclodextrin Coated Zirconia in RPLC," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: Gas Chromatography: Applications, Orlando, FL, March 7-12, 1999.

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C18 Nonporous Silica Using Linear Solvation Energy Relationships," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: LC: Others, Orlando, FL, March 13, 2003.

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260. C.V. McNeff, D.R. Stoll, D.R. Hawker, and P.W. Carr, "The Synthesis of Thermally Stable HPLC Phases Based on Zirconia for Fast High Temperature Separations," Minnesota Chromatography Forum 24th Annual Spring Symposium, St. Paul, MN, May 15, 2003.

•Papers Presented at Scientific Meetings, continued•

261. D. Stoll and P.W. Carr, "High-Speed Two-Dimensional Liquid Chromatography through the Use of Ultra-Fast High Temperature Liquid Chromatography as the Second Separation Dimension," Minnesota Chromatography Forum 24th Annual Spring Symposium, St. Paul, MN, May 15, 2003.

262. H. Luo, H. Liu, L. Ma, B. Trammell, and P.W. Carr, "Synthesis and Use of Ultra-Stable Poly(ethyleneimine)-Bonded Silica for High-Performance Liquid Chromatography," Minnesota Chromatography Forum 24th Annual Spring Symposium, St. Paul, MN, May 15, 2003.

263. P.W. Carr, "Synthesis and Characterization of Acid Stable Alkyl Bonded Phases for Reversed Phase Liquid Chromatography," HPLC 2003, 27th International Symposium on

High Performance Liquid Phase Separations and Related Techniques, Nice, June 15-19, 2003.

264. D. Stoll and P.W. Carr, "High-Speed Two-Dimensional Liquid Chromatography through the Use of Ultra-Fast High Temperature Liquid Chromatography as the Second Separation Dimension," Eastern Analytical Symposium, HPLC Poster Session, Somerset, NJ, November 17-20, 2003.

265. C.V. McNeff, P.W. Carr, T.W. Hoye, G. Gaudet, and A. Kyrlidis, "A New Method for the Generation of Chiral Stationary Phases on Nonporous Zirconia for Fast Chiral Separations," Eastern Analytical Symposium, LC Columns Poster Session, Somerset, NJ, November 17-20, 2003.

266. C.V. McNeff, B. Yan, P.W. Carr, and T.R. Hoye, "Synthesis of a New Class of Pirkle-Type Chiral Stationary Phases on Porous Zirconia," Eastern Analytical Symposium, Oral Session: HPLC Column Technology and Applications, Somerset, NJ, November 17-20, 2003.

267. J. Dai, L. Ma, B.C. Trammell, M.A. Hillmyer, and P.W. Carr, "Chromatographic Characterizations of the Highly Crosslinked Reversed Phase," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Column Technology, Chicago, IL, March 9, 2004.

268. H. Luo, B. Trammell, L. Ma, H. Liu, and P.W. Carr, "Synthesis and Use of Ultrastable Poly(ethyleneimine)-Bonded Silica for High-Performance Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Column Technology, Chicago, IL, March 9, 2004.

269. B. Yan, C.V. McNeff, P.W. Carr and T.R. Hoye, "Design and Testing of a Novel Set of Brush-Type Chiral Stationary Phases on Zirconia," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Separations: New Methods and Applications, Chicago, IL, March 10, 2004.

270. X. Yang, J. Dai, and P.W. Carr, "Comparison of the Retention and Efficiency of Polybutadiene Coated Zirconia and Various Octadecyl Bonded Silica Based Columns Using Cationic Drugs," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: LC: Methods and High Throughput, Chicago, IL, March 12, 2004.

271. A. Wruck, P. W. Carr, and D. Stoll, "Thermo-Mechanical Stability of HPLC Columns," 227th ACS National Meeting, Poster Session, Anaheim, CA, March 28-April 1, 2004.

•Papers Presented at Scientific Meetings, continued•

272. A. Schellinger and P.W. Carr, "A Practical Approach to Transferring Gradient HPLC Separations between Instruments," Minnesota Chromatography Forum 25th Annual Spring Symposium, Eden Prairie, MN, May 13, 2004.

273. A. Schellinger, D. Stoll and P.W. Carr, "Accelerating Gradient Elution RPLC," HPLC 2004–28th International Symposium and Exhibit on High Performance Liquid Phase Separations and Related Techniques, Poster, Philadelphia, PA, June 12-18, 2004.

274. X. Yong and P.W. Carr, "High Temperature Ultra-Fast Chromatography of Proteins Using Silica-Based Station Phase with Greatly Enhanced Low pH Stability," HPLC 2004–28th International Symposium and Exhibit on High Performance Liquid Phase Separations and Related Techniques, Poster, Philadelphia, PA, June 12-18, 2004.

275. A. Schellinger and P.W. Carr, "A Practical Approach to Transferring Gradient HPLC Separations between Instruments," HPLC 2004–28th International Symposium and Exhibit on High Performance Liquid Phase Separations and Related Techniques, Poster, Philadelphia, PA, June 12-18, 2004.

276. M.A. Schultze, D.R. Stoll, and P.W. Carr, "Performance of Cation-Exchange Columns Used in Proteomics," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Proteomics and Genomics, Orlando, FL, February 28, 2005.

277. B. Yan, C.V. McNeff, and P.W. Carr, "Fast Screening of Zirconia Based Chiral Stationary Phases for Chiral Separations," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Drug Discovery, Orlando, FL, February 28, 2005.

278. L. Ma, and P.W. Carr, "New Generation of Acid Stable Hyper-Crosslinked Stationary Phases–Ultimate Acid Stability and High Efficiency for Basic Compounds," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Proteomics and Genomics, Orlando, FL, February 28, 2005.

279. X. Wang, D.R. Stoll, and P.W. Carr, "Optimum Gradient Steepness for Maximizing Peak Capacity in Reversed-Phase Gradient Elution Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Liquid Chromatography: New Developments and Applications, Orlando, FL, March 1, 2005.

280. A.P. Schellinger, and P.W. Carr, "Isocratic vs. Fast Gradient HPLC: Is There a Reason to Do Isocratic HPLC?," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Liquid Chromatography: General Applications, Orlando, FL, March 1, 2005.

281. H. Luo, L. Ma, and P.W. Carr, "Hyper-Crosslinked Phases–A Novel Silica-Based Platform for a Family of Reversed and Ion Exchange Phases," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: LC-MS Analysis of Glycoproteins and Modified Peptides, Orlando, FL, March 2, 2005.

282. X. Wang, K.R. Mann, and P.W. Carr, "The 'Double-Reciprocal' Hypothesis: A New Concept for Designing Universal Chiral Stationary Phases," The Pittsburgh Conference on

Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Liquid Chromatography: Bioanalytical Applications, Chiral Separations and Data Base Management, Orlando, FL, March 3, 2005.

•Papers Presented at Scientific Meetings, continued•

283. A.P. Schellinger, and P.W. Carr, "How to Do Sub-Minute Gradient Elution HPLC Using Small Particles and Short Columns," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: High- Throughput Chemical Analysis, Orlando, FL, March 3, 2005.

284. J. Dai, and P.W. Carr, "Understanding Anionic Additive Effects in the Reversed-Phase Separation of Basic Pharmaceuticals," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Liquid Chromatography: LC/MS et al, Orlando, FL, March 4, 2005.

285. A. Schellinger and P.W. Carr, "High Speed Gradient Elution RPLC of Basic Drugs," Minnesota Chromatography Forum 26th Annual Spring Symposium, Minneapolis, MN, May 19, 2005.

286. D. Stoll and P.W. Carr, "Fast Two-Dimensional HPLC for the Analysis of Complex Samples," Minnesota Chromatography Forum 26th Annual Spring Symposium, Minneapolis, MN, May 19, 2005.

287. X. Wang and P.W. Carr, "Optimizing Peak Capacity of Peptides in Reversed-Phase Gradient Elution Chromatography," Minnesota Chromatography Forum 26th Annual Spring Symposium, Minneapolis, MN, May 19, 2005.

288. H. Luo and P.W. Carr, "Synthesis and use of Silica-Based Hyper-Crosslinked Strong Cation Exchanger SO_3-HC," Minnesota Chromatography Forum 26th Annual Spring Symposium, Minneapolis, MN, May 19, 2005.

289. A. Schellinger and P.W. Carr, "High Speed Gradient Elution RPLC of Basic Drugs," Minnesota Chromatography Forum 26th Annual Spring Symposium, Minneapolis, MN, May 19, 2005.

290. S.G. Porter, D.R. Stoll, S.C. Rutan, P.W. Carr, and J.D. Cohen, "Data Handling in 2-D LC Separations: Applications to Maize Metabolomics," 230th ACS National Meeting, Washington, DC, August 28-September 1, 2005.

291. X. Wang, D.R. Stoll, and P.W. Carr, "Optimizing Peak Capacity of Peptides in Reversed-Phase Gradient Elution Chromatography," 230th ACS National Meeting, Washington, DC, August 28-September 1, 2005.

292. H. Luo, L. Ma, and P.W. Carr, "Synthesis and Use of Silica-Based Hyper-Crosslinked Strong Cation Exchanger SO_3-HC-C_8: Separation of Catecholamines," Eastern Analytical Symposium, Oral Session: Column Technology, Part II, Somerset, NJ, November 14, 2005.

293. P.W. Carr, "Practical Aspects of Fast, Two-Dimensional High Performance Liquid Chromatography," Eastern Analytical Symposium, Oral Session: Fast Efficient HPLC, Somerset, NJ, November 14, 2005.

294. X. Wang and P.W. Carr, "Optimizing Peak Capacity of Peptides in Reversed-Phase Gradient Elution Chromatography," Eastern Analytical Symposium, Oral Session: HPLC Applications for Biological Samples, Part I, Somerset, NJ, November 15, 2005.

295. A. Schellinger and P.W. Carr, "High Speed Gradient Elution RPLC of Basic Drugs," Eastern Analytical Symposium, Oral Session: High Throughput, High Speed HPLC, Somerset, NJ, November 16, 2005.

•Papers Presented at Scientific Meetings, continued•

296. A. P. Schellinger and P.W. Carr, "High Speed Gradient Elution RPLC of Non-Ionizable Solutes," Eastern Analytical Symposium, HPLC Poster Session, Part II, Somerset, NJ, November 16, 2005.

297. P.W. Carr and D. Stoll, "Fast, Two-Dimensional Gradient Elution High Performance Liquid Chromatography of Peptides," ISPPP 2005 (25th International Symposium & Exhibit on the Separation of Proteins, Peptides ^ Polynucleotides, St. Pete Beach, FL, November 6-9, 2005.

298. X. Wang, W.E. Barber, and P.W. Carr, "A Practical Approach to Maximizing Peak Capacity by Using Long Columns Packed with Pellicular Stationary Phases for Proteomic Research," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Proteomics and Genomics, Orlando, FL, March 12, 2006.

299. S.G. Porter, D.R. Stoll, S.C. Rutan, P.W. Carr, and J.D. Cohen, "Data Handling in Two-Dimensional LC Separations: Applications to Maize Metabolomics," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Chemometric Applications, Orlando, FL, March 14, 2006.

300. A.P. Schellinger, D.R. Stoll, and P.W. Carr, "High Speed Gradient Elution RPLC of Basic Drugs," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: HPLC: Pharmaceutical and Agricultural Applications, Orlando, FL, March 15, 2006.

301. P.W. Carr, "A Critical Look at Peak Capacity Production in Two-Dimensional High Performance Liquid Chromatography," 232nd ACS National Meeting, San Francisco, CA, September 10-14, 2006.

302. Y. Zhang, and P.W. Carr, "Study of a Highly Hydrophilic Acid-Stable HPLC Stationary Phase," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Novel Stationary Phases, Chicago, IL, February 27, 2007.

303. P.W. Carr, "Role of Electronic Instrumentation in Instrumental Analysis," Minnesota Analytical Professors (MAP) Meeting, Gustavus Adolphus College, St. Peter, MN, May 2007.

304. Y. Zhang and P.W. Carr, "The Role of Selectivity in Chromatography," Minnesota Chromatography Forum 28th Annual Spring Symposium, Minneapolis, MN, May 17, 2007.

305. X. Li, D. Stoll, and P.W. Carr, "Maximizing the "Real" Peak Capacity in Two-Dimensional Liquid Chromatography," Eastern Analytical Symposium, Session: HPLC–Theory and Columns, Somerset, NJ, November 12, 2007.

306. Y. Zhang, and P.W. Carr, "The Role of Chemical Selectivity in Chromatography," Eastern Analytical Symposium, Session: HPLC–Theory and Columns, Somerset, NJ, November 12, 2007.

307. X. Wang, D. Stoll, P.W. Carr, and P. Schoenmakers, "A Graphical Method for Understanding Separation Speed and Peak Capacity in Gradient Elution LC," Eastern Analytical Symposium, Session: Current Strategies of HPLC Method Development, Somerset, NJ, November 15, 2007.

308. H. Luo, L. Ma, Y. Zhang, and P.W. Carr, "Synthesis and Characterization of Silica-Based Hyper-Crosslinked Hydrophobic Strong Cation-Exchange Phases," Eastern Analytical Symposium, Session: HPLC–Theory and Columns, Somerset, NJ, November 15, 2007.

309. X. Li and P.W. Carr "Application of Unusual Solvents in Two-Dimensional Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Liquid Chromatography: Specialized Applications I, New Orleans, LA, March 3, 2008.

310. Y. Zhang and P.W. Carr "A Reversed-Phase Column Selectivity Triangle Based on the Snyder Hydrophobic Subtraction Model," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Liquid Chromatography: Specialized Applications I, New Orleans, LA, March 3, 2008.

311. A.P. Schellinger and P.W. Carr, "Factors Affecting Retention Time Reproducibility in Gradient Elution Reversed-Phase Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Advances in Liquid Chromatography, New Orleans, LA, March 3, 2008.

312. R. Sa, Y. Zhang, P.W. Carr, and E.A. Arriaga, "Increasing Sequence Coverage of Integral Membrane Proteins through Transmembrane Peptide Detection," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Liquid Chromatography/Mass Spectroscopy: Biological Applications I, New Orleans, LA, March 5, 2008.

313. W. Fan, P.W. Carr, A.P. Schellinger, and W. Pritts, "Application of Hydrophobic-Subtraction Phase Classification Scheme to Analytes of Pharmaceutical Interest," Poster Session: Pharmaceutical Analysis, HPLC 2008 – 32nd International Symposium on

High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

314. Y. Zhang and P.W. Carr, "Reversed-Phase Column 'Selectivity Triangles' Based on the Snyder Hydrophobic Subtraction Model," Poster Session: Column Methodologies, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

315. X. Wang, and P.W. Carr, "Achieving High Speed in HPLC: The Relationship between Particle Size, Pressure, Temperature and Column Format," Poster Session: High-Speed and High-Throughput, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

316. X. Li, D.R. Stoll, and P.W. Carr, "Maximizing the 'Real" Peak Capacity in Two-Dimensional Liquid Chromatography with Superficially Porous Materials," Poster Session: Multidimensional Comprehensive, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

317. X. Li and P.W. Carr, "Application of Unusual Solvents in Two-Dimensional Liquid Chromatography of Plant Metabolomic Samples," Poster Session: Multidimensional Comprehensive, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

318. H.P. Bailey, S.C. Rutan, D.R. Stoll, and P.W. Carr, "Analysis of Comprehensive 2D Liquid Chromatographic (2DLC) Data Using Multivariate Techniques," Poster Session: Multidimensional Comprehensive, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

319. C. Paek, P.W. Carr, and A. McCormick, "Preparation of Carbon Coated Alumina as a High Surface Area Packing Material for Liquid Chromatography," Poster Session: New Packing Materials, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

320. Y. Zhang, and P.W. Carr, "A Reversed-Phase Column 'Selectivity Triangle' Based on Snyder-Dolan Hydrophobic Subtraction Model," Eastern Analytical Symposium, Poster Session: Pharmaceutical Analysis, Somerset, NJ, November 17, 2008.

321. Y. Zhang, and P.W. Carr, "Study of a Highly Hydrophilic Acid-Stable HPLC Stationary Phase," Eastern Analytical Symposium, Oral Session: New Learnings in LC Stationary Phases, Somerset, NJ, November 18, 2008.

322. C. Paek, A.V. McCormick, and P.W. Carr, "Robust Carbon Coated Substrates as High Surface Area Packing Materials for Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: High Throughput Columns for Liquid Chromatography, Chicago, IL, March 8, 2009.

323. W. Fan, P.W. Carr, S.C. Rutan, A.P. Schellinger, and W.A. Pritts, "Application of Snyder-Dolan Reversed Phase Classification Scheme to the Selection of Orthogonal Columns for Pharmaceutical Applications," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Pharmaceutical Applications of Liquid Chromatography, Chicago, IL, March 9, 2009.

325. A. Beyaz, W. Fan, and P.W. Carr, "A Study of Gradient Parameters Which Affect Stationary Phase Selectivity in the Separation of Pharmaceutical Compounds," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Poster Session: Pharmacology/Drug/Applications for Liquid Chromatography, Chicago, IL, March 12, 2009.

Invited Lectures and Seminars

1. P.W. Carr, E.B. Smith and W.D. Bostick, "Biomedical Applications of Thermometric Titrimetry," Middle Atlantic Regional Meeting of ACS, Washington, DC, January 1973.

2. P.W. Carr, "Determination of Total Serum Protein by Thermometric Enthalpy Titration," Chemistry Department Seminar, Pennsylvania State University, January 1973.

3. E.B. Smith, S.R. Betso, R.H. Callicott and P.W. Carr, "Thermochemical Investigation of the Binding of l2-Phosphotungstic Acid to Proteins," Symposium on Analytical Calorimetry, National ACS Meeting, Los Angeles, CA, April 1974.

4. L.D. Bowers and P.W. Carr, "On the Temperature Resolution of Thermistors," Symposium on Analytical Calorimetry, National ACS Meeting, Los Angeles, CA, April 1974.

5. P.W. Carr, W.D. Bostick, E.B. Smith and S.R. Betso, "Clinical Applications of Thermochemical Analysis," Oak Ridge Conference on Analytical Chemistry, Gatlinburg, TN, October 1973.

6. P.W. Carr, R.H. Callicott, L.D. Bowers and W.D. Bostick, "Biochemical Enthalpimetric Analysis," Symposium on Enthalpimetric Analysis at First Annual Meeting of the Federation of Analytical Chemistry and Applied Spectroscopy Societies (FACCS), Atlantic City, NJ, November 1974.

7. P.W. Carr,"Assorted Biochemical Applications of Thermochemical Analysis," Lehigh University, Bethlehem, PA, November 1974.

8. P.W. Carr, "Assorted Biochemical Applications of Thermochemical Analysis," Villanova University, Villanova, PA, November 1974.

9. P.W. Carr, "Biochemical and Clinical Applications of Thermochemical Analysis," University of North Carolina, Greensboro, NC, April 1975.

10. L.N. Klatt, D.R. Senn and P.W. Carr, "Determination of Trace Nitrate by Use of Immobilized Nitrate Reductase," Annual Conference on the Determination and Characterization of Water Contaminants and Pollutants, Jekyll Island, GA, May 1975.

11. P.W. Carr, L.D. Bowers and L.M. Canning, "Analytical Applications of Immobilized Enzymes," Benedetti Pichler Award Symposium, Second Annual Symposium, Indianapolis, October 1975.

12. P.W. Carr, "Analytical Applications of Immobilized Enzymes," University of South Carolina, Columbia, SC, September 1976.

13. P.W. Carr, "Analytical Applications of Immobilized Enzyme Technology," Oak Ridge National Laboratory, Analytical Division, Oak Ridge, TN, October 1976.

14. P.W. Carr, “Analytical Applications of Immobilized Enzymes,” Department of Chemistry, University of Pittsburgh, Pittsburgh, PA, December 1976.

15. P.W. Carr, “Microcalorimetry in Biochemical Analysis and Enzymology,” Summer Symposium of Analytical Chemistry, University of Massachusetts, Amherst, MA, June 1977.

•Invited Lectures and Seminars, continued•

16. P.W. Carr, “Immobilized Enzymes in Analytical Chemistry, Department of Chemistry, University of Michigan, Ann Arbor, MI, January 1978.

17. P.W. Carr, “Applications of Immobilized Enzyme Reactors and Electrodes: A Review,” Analytical Chapter of the 3M Technical Forum, St. Paul, MN, May 1978.

18. P.W. Carr, “Fundamental Aspects of Immobilized Enzyme Reactors for Chemical Analysis,” Georgia Institute of Technology, Atlanta, GA, May 1978.

19. P.W. Carr, “Fundamental Aspects of Immobilized Enzymes in Analytical Chemistry,” Department of Chemistry, North Dakota State University, Fargo, ND, October 1978.

20. P.W. Carr, “Immobilized Enzymes in Analytical Chemistry,” Department of Chemistry, Concordia College, Moorhead, MN, October 1978.

21. P.W. Carr, “Fundamental Aspects of Immobilized Enzyme Reactors for Chemical Analysis,” Department of Chemistry, University of Iowa, Iowa City, IA, October 1978.

22. P.W. Carr, “Immobilized Enzymes in Analytical Chemistry,” Department of Chemistry, Grinnell College, Grinnell, IA, October 1978.

23. P.W. Carr, “Analytical Fundamentals of Immobilized Enzyme Reactors,” University of Arizona, Tucson, AZ, February 1979.

24. P.W. Carr, “Fundamental Aspects of Immobilized Enzymes in Analytical Chemistry,” University of Denver, Distinguished Series Lecturer in Analytical Chemistry, Denver, CO, March 1980.

25. P.W. Carr, “Fundamental Aspects of Immobilized Enzymes in Analytical Chemistry,” Colorado State University, Fort Collins, CO, March 1980.

26. P.W. Carr, “A New Approach to Chromatographic Solvent Theory,” Purdue University, West Lafayette, IN, April 1980.

27. P.W. Carr, “Immobilized Enzyme Systems,” 3M Company, St. Paul, MN, August 1980.

28. P.W. Carr, “Nonlinear Kinetic Effects in Flow Analysis,” FACSS Meeting, Philadelphia, PA, September 1980.

29. P.W. Carr, “Flow Injection Analysis,” DuPont Company, Wilmington, DE, September 1980.

30. P.W. Carr, “New Approach to Solvent Effects in Chromatography,” University of Illinois, Urbana, IL, October 1980.

31. P.W. Carr, “A New Approach to Chromatographic Solvent Theory,” St. Catherine College, St. Paul, MN, October 1980.

32. P.W. Carr, “Fundamental Aspects of Immobilized Enzymes in Analytical Chemistry, University of California, Riverside, CA, November 1980.

33. P.W. Carr, “Fundamental Aspects of Immobilized Enzymes in Analytical Chemistry,” University of California, Riverside, CA, January 1981.

•Invited Lectures and Seminars, continued•

34. P.W. Carr, “A New Approach to Solvent Theory in Chromatography,” Marquette University, Milwaukee, WI, February 1981.

35. P.W. Carr, “A New Approach to Solvent-Solute Interaction in Chromatography,” ACS National Meeting, Atlanta, GA, April 1981.

36. P.W. Carr, “A New Approach to Chromatographic Solvent Theory,” State University of New York, Buffalo, NY, April 1981.

37. P.W. Carr,”A New Approach to Chromatographic Solvent Theory,” University of Tennessee, Knoxville, TN, May 1981.

38. P.W. Carr, “Investigation of Fluorocarbon Solvents by Solvatochromism,” 3M Company, St. Paul, MN, October 1981.

39. P.W. Carr, “Solvatochromism and Chromatography,” Chemistry Colloquium, Pennsylvania State University, University Park, PA, November 1981.

40. P.W. Carr, “Solvatochromic Investigation of GLC Stationary Phases,” Eastern Analytical Symposium, November 1981.

41. P.W. Carr, “Solvatochromism and Chromatography,” St. John's University, Queens, NY, 1981.

42. P.W. Carr, “An Overview of Methods Development in HPLC,” Henkel Corporation, Minneapolis, MN, January 1982.

43. P.W. Carr, “Adventures in Inorganic Chromatography,” Grinnell College, Grinnell, IA, December 1982.

44. P.W. Carr, “Study of Solvent Effects in Chromatography via Solvatochromism,” Iowa State University, Ames, IA, December 1982.

45. P.W. Carr, “Multicomponent Trace Metal Analysis by HPLC,” Iowa State University, Ames, IA, December 1982.

46. W.E. Barber and P.W. Carr, “UV Visualization Reverse Phase Chromatography of Anions,” Eastern Analytical Symposium, New York City, NY, October 1983.

47. P.W. Carr, “Fundamental Studies in High Performance Affinity Chromatography, Hope College, Holland, MI, November 1983.

48. P.W. Carr, “Application of Reverse Phase HPLC to the Determination of Cations and Anions,” Gustavus Adolphus, St. Peter, MN, November 1983.

49. A.J. Muller and P.W. Carr, “Fundamental Aspects of Affinity Chromatography,” Dal Nogae Award Symposium, Pittsburgh Conference on Analytical Chemistry and Applied Spectrometry, March 1984.

50. P.W. Carr, “Fundamentals of Affinity Chromatography,” Hormel Institute, April 1984.

51. W.E. Barber and P.W. Carr, “Sensitivity Effects in UV Visualization HPLC,” 8th International Symposium on Column Liquid Chromatography, New York City, NY, May 1984.

•Invited Lectures and Seminars, continued•

52. P.C. Sadek and P.W. Carr, “Thermodynamic Aspects of Reversed Phase Chromatography on Bonded Fluorinated Phases,” 8th International Symposium on Column Liquid Chromatography, New York City, NY, May 1984.

53. P.W. Carr, “What is Analytical Chemistry,” St. John's University, Collegeville, MN, October 16, 1984.

54. P.W. Carr, “High Performance Liquid Chromatography of Protein,” St. John's University, Collegeville, MN, October 16, 1984.

55. P.W. Carr, “High Performance Liquid Affinity Chromatography,” University of Florida, Gainesville, FL, November 9, 1984.

56. P.W. Carr, “Linear Solvation Energy Relationships and Chromatography,” University of Florida, Gainesville, FL, November 8,9,10, 1984.

57. P.W. Carr, “Solvatochromism in Chromatography,” workshop on Linear Solvation Free Energy Relationships sponsored by Department of Defense, University of California-Irvine, December 15-17, 1984.

58. P.W. Carr, “Development of HPLC as a Method for Trace Analysis of Inorganic Materials,” Analytical Topical Group Speaker, Cincinnati, OH ACS Meeting, January 23, 1985.

59. P.W. Carr, “High Performance Affinity Chromatography with Immobilized Lectins,” Department of Chemistry, Miami University, Oxford, OH, January 24, 1985.

60. P.W. Carr, “Solvatochromism in Chromatography,” Department of Chemistry, University of Alberta, April 1985.

61. P.W. Carr, “Inert Solvents Aren't Inert,” Department of Chemistry, Carleton College, November 8, 1985.

62. P.W. Carr, “Interactions of Sugars with Silica Bound Concanavalin A,” Eastern Analytical Symposium, New York City, November 1985.

63. P.W. Carr, “Solvatochromism in Chromatography,” National Science Foundation, Washington, D.C., November 1985.

64. P.W. Carr, “What I Did on My Summer Vacation,” 3M Technical Forum, Analytical Chapter, February 1986.

65. P.W. Carr, “Studies in High Performance Liquid Chromatography of Biological Macromolecules,” Department of Chemistry and Ames Laboratory, Iowa State University, Ames, IA, March 1986.

66. P.W. Carr, seminar presented in the “Antibiotic Development Seminar Series,” Eli Lilly Company, Indianapolis, IN, April 1986.

67. P.W. Carr, “Microchemical Analysis in the Study of the Thermodynamics of Vapor-Liquid Equilibria by Capillary Gas Chromatography,” Benedetti-Pichler Symposium, Eastern Analytical Symposium, October 24, 1986.

•Invited Lectures and Seminars, continued•

68. P.W. Carr, “High Performance Affinity Chromatography,” Department of Chemistry, Rutgers University, New Brunswick, N.J., October 28, 1986.

69. P.W. Carr, “High Performance Affinity Chromatography,” Dow Lecturer, Bucknell University, Lewistown, PA, October 29, 1986.

70. P.W. Carr, “Linear Solvation Energy Relationships and Quantitative Structure Activity Relationships,” Department of Medicinal Chemistry, University of Minnesota, January 6, 1987.

71. P.W. Carr, “High Performance Affinity Chromatography in Biotechnology,” Symposium on Biotechnology, University of California, Los Angeles, Breckenridge, CO, March 1987.

72. P.W. Carr, “Linear Solvation Energy Relationships in Methods for Estimating Infinite Dilution Activity Coefficients,” Department of Chemical Engineering, University of Illinois, Champaign-Urbana, IL, July 1987.

73. P.W. Carr, “Solvatochromism in Chromatography,” Chicago Area Chromatography

Discussion Group, Chicago, IL, October, 1987.

74. P.W. Carr, "Recent Developments in Applications of Linear Solvation Energy Relationships to Chromatography," University of California, Irvine, December, 1987.

75. P.W. Carr, "Solvatochromic Linear Solvation Energy Relationships and Chromatography," Department of Chemistry, University of Washington, Seattle, WA, April 11, 1988.

76. P.W. Carr, "Solvatochromism in Chromatography and Quantitative Structure Activity (Retention) Relationships," Sterling Research Group, Malvern, PA, September 30, 1988.

77. P.W. Carr, "Recent Developments in the Theory and Practice of High Performance Liquid Chromatography in Bioprocess Technology," Department of Chemistry, Indiana University--Purdue University at Indianapolis, January 18, 1989.

78. P.W. Carr, "Recent Developments in the Theory and Practice of High Performance Liquid Chromatography in Bioprocess Technology," Eli Lilly Company, Indianapolis, IN, January 19, 1989.

79. P.W. Carr, "Application of Solvatochromism to the Study of Retention in Chromatography," Exploring HPLC Technologies IV: Theory and Practice of Method Development, Burdick & Jackson Div., Baxter Health Care Corporation, Muskegan, MI, July 31-August 2, 1989.

80. P.W. Carr, "Chromatography and Solvatochromism," Washington Chromatography Discussion Group, Washington, D.C., February 16, 1990.

81. P.W. Carr, "Development of Ultra Stable Supports for HPLC," Department of Chemistry, The Ohio State University, Columbus, OH, February 20, 1990.

82. P.W. Carr, "Development of Ultra Stable Supports for HPLC," Department of Chemistry, The Pennsylvania State University, University Park, PA, February 21, 1990.

•Invited Lectures and Seminars, continued•

83. C.A. Lucy, J.L. Wade, and P.W. Carr, "Study of Preparative Reversed-Phase Chromatography by Application of Kinetic and Equilibrium Models of Column Overload," 199th National ACS Meeting, Symposium on Chromatography and Separation Science Emphasizing Biological Separations--I. Dynamics of Chromatography Symposium, Boston, MA, April 23-27, 1990.

84. A.J. Dallas, W.J. Cheong, and P.W. Carr, "Solvatochromic Studies of Retention Processes in Reversed-Phase Liquid Chromatography," Symposium on Colloid Science and Solution Chemistry in Separation Science--I," 199th National ACS Meeting, Symposium, Boston, MA, April 22-27, 1990.

85. P.W. Carr, "Solvatochromism and Chromatography," Symposium, Department of Chemistry, The Pennsylvania State University, University Park, PA, August 11, 1990.

86. P.W. Carr, "Linear Solvation Energy Relationships: Solvatochromism and Chromatography," Gordon Research Conference on Separation and Purification, Colby-Sawyer College, New London, NH, August 16, 1990.

87. J. Li, Y. Zhang, A.J. Dallas, and P.W. Carr, "A Gas Chromatographic Approach to the Measurement of Linear Solvation Energy Parameters," Eastern Analytical Symposium: Theoretical Aspects of Chromatographic Separations, Somerset, NJ, November 14, 1990.

88. E.T. Ulrich and P.W. Carr, "A Solvatochromic Study of the Effect of Chain Length, Chain Branching and Polymethylation of Alkylbenzenes on Solvent Polarizability," Eastern Analytical Symposium: American Microchemical Society Benedetti-Pichler Award Symposium Honoring Peter W. Carr, Somerset, NJ, November 15, 1990.

89. J. Brady, J.H. Park, S. Rutan, W.J. Cheong, A. Dallas, D. Eikens, and P.W. Carr, "What I Learned in Lab Today: What in the World Is Solvatochromism and What Does It Have to Do with Chromatography?" Eastern Analytical Symposium: American Microchemical Society Benedetti-Pichler Award Symposium Honoring Peter W. Carr, Somerset, NJ, November 15, 1990.

90. P.W. Carr, "Almost Indestructible Columns for Reversed Phase HPLC," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Chemistry in Chromatography U.S.-Japan Joint Symposium, Chicago, IL, March 4, 1991.

91. P.W. Carr and J. Li, "Classification Method for Gas Chromatographic Phases Based on Solvatochromic Linear Solvation Energy Relationships," 201st National ACS Meeting, Atlanta, GA April 14-19, 1991.

92. P.W. Carr, "Digital Simulations of Nonlinear Chromatography, and Their Relation to Closed-Form Solutions," 201st National ACS Meetings, ACS Award Symposium Honoring Georges Guiochon, Session II, Atlanta, GA, April 17, 1991.

93. P.W. Carr, "Development of Alkaline Stable HPLC Supports for Bioprocess Technology," Department of Chemistry, Ripon College, Ripon, WI, April 29, 1991.

94. P.W. Carr, "Flow Dispersion in Chromatographic Media," Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN, August 12, 1991.

•Invited Lectures and Seminars, continued•

95. J. Blackwell and P.W. Carr, "Analogies between Calcium Hydroxyapatite and Zirconium Oxide for the Separation of Proteins," 202nd ACS National Meeting, Symposium on Preparative/Process Chromatography of Biopolymers, New York City, NY, August 25-30, 1991.

96. S. Damme, L. Pignolet, S. Miller and P.W. Carr, "Outreach and Community Building Experiences in Chemistry," 43rd Annual Southeastern Regional Meeting, American Chemical Society, Symposium on Educational Issues in Chemistry from Middle School to Retirement, Richmond, VA, November 13-15, 1991.

97. P.W. Carr, "The Physico-Chemical Origin of Solvatochromism and Its Use in Rationalizing and Correlating Fluid Phase Equilibria," Department of Chemistry, Emory University, Atlanta, GA, February 17, 1992.

98. P.W. Carr, "The Physico-Chemical Origin of Solvatochromism and Its Use in Rationalizing and Correlating Fluid Phase Equilibria," School of Chemical Engineering and School of Chemistry, Georgia Institute of Technology, Atlanta, GA, February 18, 1992.

99. P.W. Carr, "The Origins of Retention in Chromatography," Department of Chemistry, The University of Kansas, Lawrence, KS, February 24, 1992.

100. P.W. Carr, "Gas Chromatographic Studies of Solute Hydrogen Bond Basicity," U.S. Army Chemical Research, Development and Engineering Center, Department of the Army, Aberdeen Proving Ground, MD, May 27, 1992.

101. A.J. Dallas, J. Li, and P.W. Carr, "Use of Gas-Liquid Partition Coefficients to Study the Mechanism of Reversed-Phase Liquid Chromatography," Symposium: Fundamental Advances in Liquid Chromatography, Fall 1992 American Chemical Society Meeting, Washington, DC, August 23-28, 1992.

102. P.W. Carr, "The Origins of Retention in Chromatography," Department of Chemistry, Virginia Commonwealth University, Richmond, VA, August 28, 1992.

103. P.W. Carr, "Ultra Stable Supports for Biochromatography," Department of Biomedical Engineering, University of Minnesota, Minneapolis, MN, October 27, 1992.

104. P.W. Carr, "Zirconia: A Nearly Indestructible Support for Analytical and Preparative High Performance Liquid Chromatography," Oak Ridge National Laboratories, Oak Ridge, TN, November 4, 1992.

105. P.W. Carr, "Zirconia: A Nearly Indestructible Support for Analytical and Preparative High Performance Liquid Chromatography," Department of Chemistry, University of Tennessee, Knoxville, TN, November 5, 1992.

106. P.W. Carr, "Development of an Ultrastable Support for Bioprocess Chromatography: An Interdisciplinary Project," Minisymposium in Chemistry, Department of Chemistry, University of Minnesota, Minneapolis, MN, November 7, 1992.

107. P.W. Carr, J. Li, and A.J. Dallas, "Is the Martin Equation Valid? Studies of the Martin Equation in Hexadecane, Water and Reversed Phase Partition Equilibria," Eastern Analytical Symposium Award in Chromatography to Dr. D. Martire, Somerset, NJ, November 17, 1992.

108. P.W. Carr, "Scales and Factors Affecting Solute-Solvent Interaction Energies," Adhesion, Wetting and Adsorption Focus Workshop, Surface Energetics, Center for Interfacial Engineering, University of Minnesota, Minneapolis, MN, May 13, 1993.

109. L.F. Sun, M. Annen, A. McCormick, and P.W. Carr, "Development of Monodisperse Porous Zirconia as a Support for Biochromatography," PREP-93, 10th International Symposium on Preparative Chromatography, Arlington, VA, June 14-16, 1993.

110. P.W. Carr, L.C. Tan, J.J. Li and A. Dallas, "Studies of the Retention Mechanism in Reversed-Phase Liquid Chromatography by Head Space Gas Chromatography: Are Solutes Embedded in the Bonded Phase?" Symposium: The Molecular Basis of Liquid Chromatography, 206th American Chemical Society National Meeting, Chicago, IL, August 22-27, 1993.

111. P.W. Carr, L.C. Tan, and M.H. Abraham, "Study of Linear Solvation Energy Relationships in Reversed Phase Chromatography," 206th American Chemical Society National Meeting, Chicago, IL, August 22-27, 1993.

112. P.W. Carr, A. Dallas, J.J. Li, L.C. Tan, and D.I. Eikens, "The Mechanism of Retention in Reversed-Phase Liquid Chromatography," Session: Eastern Analytical Symposium Award for Achievements in the Fields of Analytical Chemistry, II: Honoring Peter Carr, The Thirty-Second Eastern Analytical Symposium and Exposition, Somerset, NJ, November 17, 1993.

113. P.W. Carr, A. Dallas, D.I. Eikens, J.J. Li, and L.C. Tan, "Studies of the Hydrophobic Effect and Its Implications for the Retention Mechanism in Reversed-Phase Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Kolthoff Memorial Symposium, Chicago, IL, February 27 - March 4, 1994.

114. L. Sun, M.J. Annen, F. Lorenzano, A.V. McCormick, and P.W. Carr, "Development of Monodisperse, Porous Zirconia as Supports for Conventional and Perfusion Chromatography of Biomolecules," 18th International Symposium on Column Liquid Chromatography, Minneapolis, MN, May 12, 1994.

115. C. Francisco Lorenzano-P., M.J. Annen, P.W. Carr, A.V. McCormick and M.F. Flickinger, "Pore Structure and Diffusion Tortuosity of Controlled-Pore ZrO_2 Aggregates for HPLC," PREP-94, 11th International Symposium on Preparative Chromatography, Washington, DC, June 12-15, 1994.

116. P.W. Carr, J.H. Park, and L.C. Tan, "A Comparison of the Behavior of Polar and Nonpolar Solutes in Reversed-Phase Liquid Chromatography and Partitioning between Hexadecane and Hydro-organic Mixtures," Session: Eastern Analytical Symposium Award for Achievements in Separation Science: Honoring Lloyd Snyder, The Thirty-Third Eastern Analytical Symposium and Exposition, Somerset, NJ, November 15, 1994.

117. P.W. Carr, "Solvation in Chemistry and Chromatography," Department of Chemistry and Biochemistry, Southern Illinois University at Carbondale, Carbondale, IL, April 28, 1995.

118. P.W. Carr, "The Origin of Retention in Chromatography: Why the Stuff Comes Off When it Does," Focus Speaker, Minnesota Chromatography Forum Spring Symposium, Minneapolis, MN, May 3, 1995.

119. P.W. Carr, "A Revisionist View of the Hydrophobic Interpretation of Reversed Phase Liquid Chromatography," Principal Lecturer, Annual Analytical Symposium, Hercules, Inc., Wilmington, DE, May 17, 1995.

•Invited Lectures and Seminars, continued•

120. C.J. Dunlap, C. McNeff, Q. Zhao, P.W. Carr, A.V. McCormick and M.F. Flickinger, "Polymer Coated Zirconia Stationary Phases for Use in High Performance Liquid Chromatographic Separations of Bio-Molecules," 1995 International Symposium on Preparative Chromatography, Washington, DC, June 11-14, 1995.

121. P.W. Carr, "The Hydrophobic Effect and the Solvophobic Model of Reversed-Phase Liquid Chromatography: Is Conventional Wisdom Correct?" Department of Chemistry, University of Pittsburgh, Pittsburgh, PA, November 17, 1995.

122. P.W. Carr, "The Academic Careers in Chemistry Seminar at Minnesota," University of Pittsburgh, Pittsburgh, PA, November 17, 1995.

123. P.W. Carr, "The Role of Theory in Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Dal Nogare Award Address, Chicago, IL, March 3- 8, 1996.

124. M.H. Glavanovich, P.T. Jackson and P.W. Carr, "The Pursuit of Monomeric Reversed-Phase Supports on Microporous Zirconia," 20th International Symposium on High Performance Liquid Phase Separations and Related Techniques, San Francisco, CA, June 16-21, 1996.

125. P.W. Carr, "Why the Stuff Comes Off the Column When It Does or the Origin of the Chromatographic Species," Department of Chemistry, Seton Hall University, South Orange, NJ, November 19, 1996.

126. P.W. Carr, "Why the Stuff Comes Off the Column When It Does or the Origin of the Chromatographic Species," Department of Chemistry, University of Michigan, Ann Arbor, MI, January 22, 1997.

127. P.W. Carr and P.T. Jackson, "Carbon Coated Zirconia: A Highly Selective Reverse Phase Support for Separation of Stereo Isomers," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Chromatography Forum of Delaware Valley Dal Nogare Award, Pittsburgh, PA, March 17, 1997.

128. P.W. Carr, "Chemistry and Chromatography: The Origin of the (Chromatographic) Species or Why the Stuff Comes Off the Column When It Does," 213th American Chemical Society National Meeting, San Francisco, CA, April 13-17, 1997.

129. P.W. Carr and L. Sun, "A Simple Approximate Equation for the Minimum Plate Height and Optimum Velocity in HPLC," Symposium in Honor of J. Calvin Giddings, 214th American Chemical Society National Meeting, Las Vegas, NV, September 7-12, 1997.

130. P.W. Carr, "Chemistry and Chromatography or Why the Stuff Comes Off the Column When It Does," Department of Chemistry, Vanderbilt University, Nashville, TN, September 22, 1997.

131. P.W. Carr and P.T. Jackson, "The Remarkable Chromatographic Selectivity of Carbon Based Reversed Phase Adsorbents and Their Application to Separation of Diastereomers Based on Mosher's Reagent for the Analysis of Chiral Drugs," Eastern Analytical Symposium, Benedetti-Pichler Symposium Honoring John G. Dorsey, Somerset, NJ, November 20, 1997.

132. P.W. Carr, "Chemistry and Chromatography or Why the Stuff Comes Off the Column When It Does," Department of Chemistry, Purdue University, West Lafayette, IN, March 26, 1998.

•Invited Lectures and Seminars, continued•

133. P.W. Carr, A.W. Clausen, and A. Subramanian, "Development of a Novel Stationary Phase for Purification of IgGs," HPLC'98–22nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, St. Louis, MO, May 2-8, 1998.

134. P.W. Carr, J. Zhao, M. Reta, and A. Wang, "Use of Linear Solvation Energy Relationships in Reversed-Phase Liquid Chromatography to Elucidate the General Issue of 'Operational' Selectivity," 1998 Anachem Award Symposium in Honor of Dr. Lloyd R. Snyder, Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) National Meeting, Austin, TX, October 11-15, 1998.

135. P.W. Carr, Y. Mao, C.V. McNeff, and J.W. Li, "Advantages of Ultra Stable Stationary Phases for RPLC at Temperatures Approaching 200C," Eastern Analytical Symposium, Recent Advances in HPLC, Part I, Somerset, NJ, November 17, 1998.

136. P.W. Carr, "The Experimental Study of Intermolecular Interactions in Phase Transfer Processes: A Comparison and Applications of Thermodynamic and Solvatochromic Approaches," Department of Chemical Engineering, Georgia Institute of Technology, Atlanta, GA, January 12, 1999.

137. P.W. Carr, "Linear Solvation Energy Relationships: A Unifying Approach to the Study of Retention Mechanisms and Processes in Chromatography and Phase Equilibria," Department of Chemical Engineering, Georgia Institute of Technology, Atlanta, GA, January 20, 1999.

138. P.W. Carr, "A Unified Approach to the Theory of Retention Chromatography," Department of Chemistry, University of Georgia, Athens, GA, January 25, 1999.

139. P.W. Carr, "Why Oil and Water Don't Mix: The View of a Radical-Conservative," Department of Chemical Engineering, Georgia Institute of Technology, Atlanta, GA, January 28, 1999.

140. P.W. Carr, "Linear Solvation Energy Relationships: A Unifying Approach to Retention in Chromatography," Department of Chemistry, Indiana University–Purdue University Indianapolis, Indianapolis, IN, March 24, 1999.

141. P.W. Carr, "From Colloids to Columns: The Development and Application of Ultra-Stable Zirconia-Based Phases for HPLC," Department of Chemistry, University of Alberta, Edmonton, Alberta, Canada, May 25, 2000.

142. B. Yan, J. Brown, Y. Mao, J. Thompson, and P.W. Carr, "High Temperature Ultra Fast Liquid Chromatography and Thermally Tuned Two Column Liquid Chromatography," Invited Keynote Lecture, Canadian Society of Chemistry, Calgary, Alberta, Canada, May 28, 2000.

143. P.W. Carr, "A Unified Approach to Retention in GC, SFC, RPLC, and HPLC Based on Linear Solvation Energy Relationships," Eastern Analytical Symposium Award for Achievements in Separation Science, Sponsored by Waters Corporation, Honoring Peter W. Carr: LSERs and Solvatochromism in Chromatography, Somerset, NJ, October 31, 2000.

144. C.B. Castells and P.W. Carr, "Sixty-Second Chiral Separations Using Derivatized Cellulose Coated on Porous Microspheres of Zirconia," Eastern Analytical Symposium, Chiral Separations, Somerset, NJ, November 1, 2000.

145. P.W. Carr, "Recent Developments in Zirconia-Based Ultra Stable Stationary Phases for HPLC," Procter & Gamble, Cincinnati, OH, March 21-22, 2001.

•Invited Lectures and Seminars, continued•

146. P.W. Carr, "Temperature–the Third Dimension in HPLC: Use of Temperature to Make LC Faster and Improve Selectivity," Minnesota Chromatography Forum 22nd Annual Spring Symposium, Brooklyn Park, MN, May 17, 2001.

147. P.W. Carr, "Global Linear Solvation Energy Relationships," Application of Theory to the Understanding and Practice of Chromatography: A Symposium in Honour of Lloyd Snyder, Ellecom, The Netherlands, June 14, 2001.

148. P.W. Carr, "Zirconia Based Phases for Biological Separations," Lilly Pharmaceuticals, Indianapolis, IN, May 8, 2001.

149. P.W. Carr, "Recent Developments in Zirconia-Based Ultra Stable Stationary Phases for HPLC," PPD Inc., Madison, WI, August 15, 2001.

150. P.W. Carr, "Recent Developments in Zirconia-Based Ultra Stable Stationary Phases for HPLC," Novartis Institute for Biomedical Research, Hanover, NJ, August 27, 2001.

151. P.W. Carr and R. Ranatunga, "The Origins of the Enthalpy and Entropy of Retention in

RPLC: Further Thoughts on the Solvophobic Mechanism of Retention," Eastern Analytical Symposium, Theory of HPLC Retention, Atlantic City, NJ, October 2, 2001.

152. P.W. Carr, "Zirconia-Based HPLC: The Next Generation of Stationary Phases," Eli Lilly, West Lafayette, IN, October 11, 2001.

153. P.W. Carr, "Zirconia-Based HPLC: The Next Generation of Stationary Phases," Merck & Co., Inc., Rahway, NJ, November 15, 2001.

154. P.W. Carr, "Zirconia-Based HPLC: The Next Generation of Stationary Phases," Schering-Plough, Kenwilworth, NJ, November 19, 2001.

155. P.W. Carr, "Temperature, the Third Dimension in HPLC," Schering-Plough, Kenilworth, NJ, November 19, 2001.

156. P.W. Carr, "Zirconia-Based HPLC: The Next Generation of Stationary Phases," Johnson & Johnson Research Institute, Princeton, NJ, November 20, 2001.

157. P.W. Carr, "Zirconia-Based HPLC: The Next Generation of Stationary Phases," Glaxo, Smith, Kline, Inc., Piscataway, NJ, November 20, 2001.

158. P.W. Carr, "Zirconia-Based HPLC: The Next Generation of Stationary Phases," Bristol Meyers Squibb, New Brunswick, NJ, November 26, 2001.

159. P.W. Carr, "Chromatography with Ultra-stable Zirconia-Based Supports for HPLC," Schering-Plough, Piscataway, NJ, February 12, 2002.

160. P.W. Carr, "Chromatography with Ultra-stable Zirconia-Based Supports for HPLC," Pfizer, Groton, CT, February 13, 2002.

161. P.W. Carr, "Temperature, the Third Dimension in HPLC," Pfizer, Groton, CT, February 13, 2002.

•Invited Lectures and Seminars, continued•

162. P.W. Carr, "Chromatography with Ultra-stable Zirconia-Based Supports for HPLC," A. H. Robins, Richmond, VA, February 14, 2002.

163. P.W. Carr, "Chromatography with Ultra-stable Zirconia-Based Supports for HPLC," Glaxo, Smith, Kline, Durham, NC, February 15, 2002.

164. P.W. Carr, "Zirconia-Based Supports: The Next Generation of HPLC Phases," EPA Laboratories, Cincinnati, OH, April 17, 2002.

165. P.W. Carr, "Zirconia-Based Supports: The Next Generation of HPLC Phases," Eli Lilly Research Center, Indianapolis, IN, April 18, 2002.

166. P.W. Carr, "Zirconia-Based Supports: The Next Generation of HPLC Phases," Procter &

Gamble, Analytical Laboratories, Cincinnati, OH, April 19, 2002.

167. P.W. Carr, "Zirconia –Based Supports for HPLC," Abbott Laboratories, Skokie, IL, May 1, 2002.

168. P.W. Carr, "Zirconia –Based Supports for HPLC," Pharmacia, Chicago, IL, May 2, 2002.

169. P.W. Carr, "Zirconia –Based Supports for HPLC," Pfizer, Holland, MI, May 3, 2002.

170. P.W. Carr, "Zirconia –Based Supports for HPLC," Pfizer, Ann Arbor, MI, May 4, 2002.

171. P.W. Carr, "Temperature, the Third Dimension in HPLC," Pfizer, Ann Arbor, MI, May 4, 2002.

172. P.W. Carr, "The Next Generation of Stationary Phases for HPLC," Glaxo, Smith, Kline, Jersey City, NJ, May 9, 2002.

173. P.W. Carr, "The Next Generation of Stationary Phases for HPLC," Merck & Co., Inc., West Point, PA, May 10, 2002.

174. P.W. Carr, "Temperature, the Third Dimension in HPLC," Merck & Co., Inc., West Point, PA, May 10, 2002.

175. P.W. Carr, "The Next Generation of Stationary Phases for HPLC," La Roche, Piscataway, NJ, May 13, 2002.

176. P.W. Carr, "The Next Generation of Stationary Phases for HPLC," Connecticut Separations Science Council, Milford, CT, May 13, 2002.

177. P.W. Carr, C.V. McNeff, D. Stoll, and A. Kyrlides, "The Development of Polymer-Coated and Carbon-Clad Metal Oxide–the Ultimate Platforms for Ultra-Stable Reversed Phase Liquid Chromatography," Eastern Analytical Symposium, Stationary Phases for Reversed-Phase HPLC. Geometry, Chemistry, HPLC Behavior, Somerset, NJ, November, 2002.

178. P.W. Carr, "From Colloids to Columns: The Development of Ultra-Stable Zirconia-Based Stationary Phases," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: New Generation of Chromatographic Media for Separation Science, Orlando, FL, March 14, 2003.

•Invited Lectures and Seminars, continued•

179. P.W. Carr, "Use of Higher Temperatures in HPLC to Achieve Selectivity and to Accelerate Analysis," Waters Corporation, Milford, MA, April 29, 2003.

180. P.W. Carr, "A Comparison of Silica and Zirconia Based Phases for the Separation of Organic Bases," Waters Corporation, Milford, MA, April 29, 2003.

181. P.W. Carr, "Solvation in Chemistry and Chromatography," Iddles Lectureship, Department of Chemistry, University of New Hampshire, Durham, NH, April 30, 2003.

182. P.W. Carr, "Development of Zirconia Based HPLC Phases: From Colloid to Column," Iddles Lectureship, Department of Chemistry, University of New Hampshire, Durham, NH, May 1, 2003.

183. P.W. Carr and J. Thompson, "The Theory of High Temperature Ultra Fast Liquid Chromatography: Novel Applications for Stable Stationary Phases," Minnesota Chromatography Forum 24th Annual Spring Symposium, St. Paul, MN, May 15, 2003.

184. P.W. Carr, "Lessons Learned–Insights from Entrepreneurs," Carlson School of Management, University of Minnesota, Minneapolis, MN, January 2004.

185. P.W. Carr, "Chemistry and Chromatography," Department of Chemistry, Macalester College, St. Paul, MN, February 10, 2004.

186. P.W. Carr, J.D. Thompson and D. Stoll, "Use of High Temperature to Speed Up HPLC," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: High Speed HPLC: Increasing Speed in HPLC, Award Address, Chicago, IL, March 10, 2004.

187. P.W. Carr, B.C. Trammell, L. Ma, H. Luo, J. Dai, X. Yang, and M.A. Hillmyer, "Surface Confined Polymer Networks Based on Orthogonal Reaction Chemistry: A Novel Approach to High Efficiency Stable Silica-Based Reversed Phase Media," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: Pittsburgh Analytical Chemistry Award, Chicago, IL, March 9, 2004.

188. L. Ma, J. Dai, H. Luo, X. Yang, B. Trammell, and P.W. Carr, "Development of Hyper-Crosslinked Acid Stable Silica Based Phases for Protein and Peptide Separations," HPLC 2004–28th International Symposium and Exhibit on High Performance Liquid Phase Separations and Related Techniques, Symposium: Column Technology I and II, Philadelphia, PA, June 12-18, 2004.

189. P.W. Carr, D. Stoll, A. Schellinger, L. Ma, X. Yang, and J. Thompson, "High Temperature Ultra Fast Liquid Chromatography," HPLC 2004–28th International Symposium and Exhibit on High Performance Liquid Phase Separations and Related Techniques, Symposium: Advances in Fast LC, Philadelphia, PA, June 12-18, 2004.

190. L. Ma and P.W. Carr, "A Study of the Silanophilicity of Acid Stable Hyper-Crosslinked Stationary Phases," Eastern Analytical Symposium, Invited Session: HPLC Method Development, Somerset, NJ, November 15-18, 2004.

191. J. Dai and P.W. Carr, "A Study of Ion-Pair Agent Effect for the Separation of Basic Compounds on Silica-Based Stationary Phase," Eastern Analytical Symposium, Invited Session: HPLC Method Development, Somerset, NJ, November 15-18, 2004.

•Invited Lectures and Seminars, continued•

192. P.W. Carr, "Development of High Speed and Comprehensive Two-Dimensional HPLC," Society of Analytical Chemists of Pittsburgh, Fall Quarterly Meeting, Pittsburgh, PA,

November 2004.

193. P.W. Carr, "A Study of the Ion Pair Effect on Retention of Pharmaceutically Active Bases in Reversed-Phase Liquid Chromatography," Department of Chemistry, University of Pittsburgh, Pittsburgh, PA, November 2004.

194. P.W.Carr, and D.R. Stoll, "Fast, Two-Dimensional High Performance Liquid Chromatography of Peptides," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: Getting Serious about Separations: Two-Dimensional Separations–Power for Complex Analyses, Orlando, FL, February 28, 2005.

195. X. Wang, D.R. Stoll, and P.W. Carr, "Optimizing Peak Capacity of Peptides in Reversed-Phase Gradient Elution Chromatography," The 230th ACS National Meeting, Washington, DC, August 28, 2005.

196. D. Stoll, X. Wang, A. Schellinger, and P.W.Carr, and, "Fast, Two-Dimensional Gradient Elution High Performance Liquid Chromatography of Peptides," 25th International Symposium & Exhibit on the Separation of Proteins, Peptides & Polynucleotides (ISPPP 2005), Session 1: Peptides, St. Pete Beach, FL, November 6-9, 2005.

197. P.W. Carr, L. Ma, H. Luo, and J. Dai, "A Novel Stationary Phase Platform for the Development of High Efficiency Acid Stable Silica Based Phases by Orthogonal Polymerization," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Chromatography Forum of Delaware Valley Dal Nogare Award Session, Orlando, FL, March 13, 2006.

198. P.W. Carr, D. Stoll, A.P. Schellinger, and X. Wang, "Optimization of Peak Capacity Productivity in LC-GC through Design of High Speed Gradient Elution Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: The Limits of Chromatographic Efficiency, Orlando, FL, March 14, 2006.

199. P.W. Carr, D.R. Stoll, and A.P. Schellinger, "Peak Capacity Optimization in 1-D and 2-D Liquid Chromatography of Peptides," The 231th ACS National Meeting, Special Session Honoring John Dorsey, Chromatography Awardee, Atlanta, GA, March 28, 2006.

200. P.W. Carr, A.P. Schellinger, X. Wang, D.R. Stoll, and J. Thompson, "High Tempterature Fast Liquid Chromatography," Workshop on Chemical Weapons Detection, Infectious Disease Epidemiology, Prevention and Control, Minnsota Department of Health, St. Paul, MN, September 27, 2006.

201. D.R. Stoll, A.P. Schellinger, X. Wang, and P.W. Carr, "Revisiting Gradient Elution HPLC as a Tool for Ultra-Fast Liquid Chromatography Analysis," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Liquid Chromatography at the Extreme: Ultra-Pressure, High Temperature, and Ultra-Fast, Chicago, IL, February 25, 2007.

202. P.W. Carr, Y. Zhang, H. Luo, and L. Ma, "Synthesis and Characterization of Hyper-Crosslinked RPLC Stationary Phases," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Chromatography Forum of Delaware Valley Dal Nogare Award Session, Chicago, IL, February 26, 2007.

203. S.C. Rutan, S.E. Porter, M.T. Cantwell, D.R. Stoll, and P.W. Carr, "Data Analysis Approaches for Two-Dimensional LC Separations," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Modern Liquid Chromatography, Chicago, IL, February 27, 2007.

204. P.W. Carr, D.R. Stoll, A.P. Schellinger, and X. Wang, "Fast, Two-Dimensional High Performance Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Modern Liquid Chromatography, Chicago, IL, February 27, 2007.

205. P.W. Carr, "Adventures in 2DLC," Department of Chemistry, University of Minnesota, Faculty Luncheon Seminar Series, March 2007.

206. P.W. Carr, "Ultrafast Two-Dimensional Liquid Chromatography," Annual Graduate Student Selected Speaker, Department of Chemistry, Florida State University, Tallahassee, FL, April 13, 2007.

207. P.W. Carr, "Development of Fast 2DLC Using High Temperature Chromatography," Keynote Address, Chromatography Forum of the Delaware Valley, Fort Washington, PA, April 26, 2007.

208. P.W. Carr, "Metabolomic Applications of 2DLC," Merck, Inc., West Point, PA, April 26, 2007.

209. P.W. Carr, "Instrumental Aspects and Limitations of 2DLC," Agilent Technologies, Inc., Little Falls, PA, April 27, 2007.

210. P.W. Carr, "Metabolomic Applications of 2DLC," AstraZeneca Pharmaceuticals LP, Wilmington, DE, May 21, 2007.

211. "Principles of Fast Liquid Chromatography and Comprehensive Two-Dimensional Liquid Chromatography," Abbott Laboratories, Waukegan, IL, July 26, 2007.

212. P.W. Carr, D.R. Stoll, A.P. Schellinger, and X. Wang, "Adventures in Fast, Two-Dimensional Liquid Chromatography," Eastern Analytical Symposium, Invited Session: EAS Award for Outstanding Achievements in Separation Science Honoring Professor Peter C. Uden, Somerset, NJ, November 13, 2007.

213. P.W. Carr, "Fast, Comprehensive Two-Dimensional HPLC Through the Use of High-Temperature Ultra-Fast Dual Gradient Elution Reversed-Phase LC," North Jersey Chromatography Discussion Group, Somerset, NJ, November 14, 2007.

214. P.W. Carr, Y. Zhang, B. Trammell, L. Ma, J. Dai, and H. Luo, "Novel Ultrastable Silica-Based Stationary Phases for Reversed-Phase Liquid Chromatography," Eastern Analytical Symposium, Invited Session: Chromatographic Solutions to Difficult Analytical Problems: A Memorial Honoring Robert L. Grob, Part I, Somerset, NJ, November 15, 2007.

215. P.W. Carr, D.R. Stoll, X. Li, and X. Wang, "Optimization of Peak Capacity Productivity in LC-LC through Design of High Speed Gradient Elution Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: HPLC on the Edge, New Orleans, LA, March 2008.

216. P.W. Carr, J. Thompson, X. Wang, and D.R. Stoll, "High Speed HPLC: Increasing Speed in HPLC," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: Chromatography Forum of Delaware Valley Dal Nogare Award, New Orleans, LA, March 2008.

217. P.W. Carr, "Fast 2DLC for Chemical Analysis: the Promises and the Challenges," Colloquium Speaker, Department of Chemistry, Michigan State University, East Lansing, MI, April 2008.

218. J. Dai, Y. Zhang, D. Wang-Iverson, A. Tymiak, and P.W. Carr, "Critical Evaluation for Selecting Reversed-Phase Stationary Phases Based on Column Selectivity, Silanophilicity, and Sample Loadability," Lectures: Applications of Retention Mechanisms, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

219. P.W. Carr, D.R. Stoll, X. Li, and X. Wang, "Fast 2D-LC for Chemical Analysis: The Promises and the Challenges," Lectures: 2D HPLC (Plenary Speaker), HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

220. L. Ma, and P.W. Carr, "The Loss of Bonded Phase in Reversed-Phase Liquid Chromatography in Acidic Eluents and Practical Ways to Improve Column Stability," Lectures: Use of Fine Particles I, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

221. P.W. Carr, "Comprehensive Two-Dimensional Liquid Chromatography: The Good, the Bad and the Ugly," Tutorial 4 (one hour talk), HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

222. J.M. Davis, D.R. Stoll, and P.W. Carr, "Dependence of Observed Peak Number in Comprehensive Two-Dimensional Separations on Total Peak Capacity Distribution between the Two Dimensions of Separation," Lectures: 2D HPLC, HPLC 2008 – 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques, Baltimore, MD, May 10-16, 2008.

223. L. Ma, J. Dai, H. Luo, Y. Zhang, W. Fan, and P.W. Carr, "Study of the Preparation and Use of Acid Stable Hyper-Crosslinked Stationary Phases for Reversed Phase Chromatography," 236th American Chemical Society National Meeting, Invited Session: ACS Award in Chromatography: Symposium in Honor of Frantisek Svec, Philadelphia, PA, August 17-21, 2008.

224. P.W. Carr, "Izaak Maurits Kolthoff: His Contributions to the Development of Analytical Chemistry and Some Personal Remembrances," 236th American Chemical Society

National Meeting, Invited Session: The Evolution of Analytical Sciences in the U.S., Philadelphia, PA, August 17-21, 2008.

225, P.W. Carr, "Fast 2DLC for Chemical Analysis: the Promises and the Challenges, W.R. Grace, Columbia, MD, August 19, 2008.

226. P.W. Carr, "High Speed Liquid Chromatography 101–Separating the Hype from the Reality," Eastern Analytical Symposium, Invited Session: Very High Pressure/Very High Temperature Liquid Chromatography, Somerset, NJ, November 18, 2008.

227, P.W. Carr, "Fast 2DLC for Chemical Analysis: the Promises and the Challenges, Merck & Co., Inc., Rahway, NJ, November 20, 2008.

228, P.W. Carr, "Fast 2DLC for Chemical Analysis: the Promises and the Challenges, Agilent Technologies Wilmington, DE, November 21, 2008.

229. P.W. Carr, "Fast 2DLC for Chemical Analysis: the Promises and the Challenges," McElvain Lectureship, Department of Chemistry, University of Wisconsin, Madison, March 5, 2009.

230. P.W. Carr, "The Evolution of Speed and Resolving Power in 1D and 2D Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: Evolution of Modern Chromatography: Celebration of 25 Years of the Subdivision of Chromatography and Separation Chemistry, Chicago, IL, March 8, 2009.

231. P.W. Carr, "High Speed Two-Dimensional Liquid Chromatography: The Promise and the Challenge," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: New Dimensions in Multidimensional Separations, Chicago, IL, March 10, 2009.

232. P.W. Carr, D.R. Stoll, X. Wang, and J.M. Davis, "The Evolution of Speed and Resolving Power in 1D and 2D Liquid Chromatography," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: ACS Division of Analytical Chemistry, Evolution of Modern Chromatography: Celebration of 25 Years of the Subdivision of Chromatography and Separation Chemistry, Chicago, IL, March 8, 2009.

233. P.W. Carr, D.R. Stoll, X. Li, and L.W. Potts, "High Speed Two-Dimensional Liquid Chromatography: The Promise and the Challenge," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: ACS Division of Analytical Chemistry, New Dimensions in Multidimensional Separations, Chicago, IL, March 10, 2009.

234. D. Stoll and P.W. Carr, "A Simple Yet Accurate Approach to Optimization in Isocratic HPLC with a Focus on Performance and Insights into the Roles of Temperature and Pressure in Fast Separations," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., Symposium: High Speed Liquid Chromatography, Chicago, IL, March 11, 2009.

235. X. Li, D.R. Stoll, and P.W. Carr, "A Simple and Accurate Equation for Peak Capacity Estimation in Two Dimensional Liquid Chromatography," The Pittsburgh Conference on

Analytical Chemistry and Applied Spectroscopy, Inc., Oral Session: Fundamentals of LC and GC I, Chicago, IL, March 12, 2009.

236. Carr, P.W., "Fast Two Dimensional Liquid Chromatography," Tenth Annual Land O' Lakes Bioanalytical Conference, Merrimac, WI, July 14, 2009.