

Curriculum Vitae

LAWRENCE BARTON

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EDUCATION:

B.Sc. Chemistry and Physics - 1960 Liverpool University

B.Sc. (hons) Chemistry - 1961 Liverpool University

Ph.D. Inorganic Chemistry - 1964 Liverpool University (with Dr. D. Nicholls)

Postdoctoral Research Associate - 1964-1966 Cornell University (with Prof. Richard F. Porter)

PROFESSIONAL EXPERIENCE:

Professor of Chemistry Emeritus, University of Missouri-St. Louis, 2007 - present

Professor of Chemistry, University of Missouri-St. Louis, 1986-2007

Acting Director, Center for Molecular Electronics, Nov 1998 – 2006.

Chairman, Department of Chemistry, University of Missouri-St. Louis, 5/12/80 – 8/15/98

Visiting Associate Professor of Chemistry, The Ohio State University, 1977-78 and Summer, 1979

Visiting Professor, Washington University, Spring 1977

Associate Professor of Chemistry, University of Missouri-St. Louis, 1971-1986

Senior Research Fellow, Explosives Research and Development Establishment, Waltham Abbey, UK 1970-71

Assistant Professor of Chemistry, University of Missouri-St. Louis, 1966-71

HONORS AND AWARDS

Boron in the Americas Award for Distinguished Achievements in Boron Science, 2004

Distinguished Service Award, UM-St. Louis, 2002.

UM-St. Louis Chancellor's Award for Faculty Service, 2000.

Distinguished Service Award, St. Louis Section, American Chemical Society, 1999.

Special Recognition Award, UM-St. Louis Alumni Association, 1998.

Potts Medallist, Liverpool University Chemical Society, 1992

St. Louis Award, American Chemical Society, 1991

UM-St. Louis Alumni Association, Faculty Service Award, 1990

Cited by the American Chemical Society for Chairing the St. Louis Section during the year it won the Award for Outstanding Performance in 1981.

Awarded Senior Research Fellowship, Explosives Research and Development Establishment, Waltham Abbey, Essex, England 1970-71

Goodlass Wall Fellowship, 1961-64 Liverpool University

ORGANIZATIONS

The Royal Society of Chemistry
(Member of Dalton and Education sections)

American Chemical Society
(Member of Inorganic, History of Chemistry, and Education Divisions)

MAJOR PROFESSIONAL APPOINTMENTS, ETC

1979-80 Chairman-elect, St. Louis Section, American Chemical Society

1980-81 Chairman, St. Louis Section, American Chemical Society

1980-81 Vice-President, UMSL Chapter, American Association of University Professors

1983-85, 1994-95 President, St. Louis Research Council

2000-02 Chair, Faculty Senate and University Assembly, UMSL

1998-06 Member, Governing Board, UM-St. Louis Alumni Association

RESEARCH INTERESTS

Synthesis, structure, and chemistry of borane and metallaborane cage compounds, boron oxygen ring systems, organometallic chemistry.

RESEARCH SUPERVISION

Postdoctoral

Dileep K. Srivastava, Ph.D. Banaras Hindu University, India

Jonathon Bould, Ph.D. University of Leeds, England

Hong Fang, University of Missouri St. Louis

Rhodri Ll. Thomas, Ph.D. Heriot Watt University, Scotland

Ramón Macías as, Ph.D. University of Leeds, England

Mitsuhiro Hata, Ph.D. University of Tokyo, Japan
Oleg Volkov, Ph.D. Institute of Inorganic Chemistry, Novosibirsk, Russia

Graduate

Ph.D. F. L. Longcor, P. Rush, H. Fang, P. McQuade.

MS M. H. Owens, T. Zhu, S. Rahman, G. Biddlecombe.

Undergraduate

D. Nuelle	F. Longcor	D. Brinza	P. Nevels	K. Hupp
C. Heil	J. Crump	D. Davis	M. Sharma	A. Steeples
D. Wester	J. Wheatley	M. Williams	R. Brewer	B. Tekle
M. Young	M. Owens	D. Rush	E. Razavia	K. Aldermann
G. Bohn	T. Russell	D. Bergstrom	H. Grunkemeyer	M. Petetit
S. Stanfield	C. Rieser	T. Tolley	T. Schweitzer	
D. Henton	R. Frease	D. Boyer	M. Pasieka	

PH.D. THESIS COMMITTEES

Edward G. Vassian, University of Missouri-Columbia (1967)
David L. Beach, University of Missouri-St. Louis (1976)
Pauline L. Bellevance, University of Missouri-St. Louis (1977)
Ali A. Bazzi, University of Missouri-St. Louis (1981)
William A. VanArsdale, University of Missouri-St. Louis (1983)
Shankar Ranavare, University of Missouri-St. Louis (1983)
Rajiv Banavali, University of Missouri-St. Louis (1984)
Susan Jansen, University of Missouri-St. Louis (1985)
Greg Lumetta, University of Missouri-St. Louis (1986)
Christy S. John, University of Missouri-St. Louis (1987)
Ko-Chung Lin, University of Missouri-St. Louis (1987)
Dawn L. Shiang, University of Missouri-St. Louis (1988)
Ding Rong, University of Missouri-St. Louis (1991)
Kathleen Fallis, University of Missouri-St. Louis (1992)
Gang Bao, University of Missouri-St. Louis (1992)
Abdul R. Khan, University of Missouri-St. Louis (1994)
Chongfu Xu, University of Missouri-St. Louis (1994)
Sohrab Abdohalli, University of Missouri-St. Louis (1995)
Rafaat Shaltout, University of Missouri-St. Louis (1996)
Shengping Tian, University of Missouri-St. Louis (1996)
Anne M. Cafferty, University of Missouri-St. Louis (1997)
Ali A. Kasiri, University of Missouri-St. Louis (1997)
Robert A. Stockland, University of Missouri-St. Louis (1998)
Yahia Z. Hamada, University of Missouri-St. Louis (1999)
Ricardo Delgado, University of Missouri-St. Louis (1999)
Lin Yong Mao, University of Missouri-St. Louis (2001)
Mesfin Janka, University of Missouri-St. Louis (2002).
John Swearingen, University of Missouri-St. Louis (2004).
Bingly Yan, University of Missouri-St. Louis (2005).
Colin White, University of Missouri-St. Louis (2006).
Hui Zhao, University of Missouri-St. Louis (2006)
Mehda Kamat, University of Missouri-St. Louis (2006)
Patamaporn Umnahanant, University of Missouri-St. Louis (2008)
Ngamjit Praingam, University of Missouri-St. Louis (2009)

Dissertations Directed

Francine L. Longcor "Studies of Some Cyclic Boronic Esters," Ph.D. Jan. 1984.

Pamela K. Rush "The Chemistry of Some Borane and Carborane Anion Salts," Ph.D. Aug. 1984.

Hong Fang "The Selective Synthesis and Structure of some bis[pentaboranyl(9)] Metal Complexes." Ph.D. Aug. 1996.

Paul McQuade "Interaction of Bidentate Phosphines with Boranes and Metallaboranes" Ph.D. Jan. 2001.

MS THESIS COMMITTEES

Vincent Chang, University of Missouri-St. Louis (1979)

Dorothea Bean, University of Missouri-St. Louis (1987)

RESEARCH PUBLICATIONS (All are either refereed or invited articles. Books and book reviews are identified as such).

1. L. Barton and D. Nicholls, "High Temperature Routes to Boron Monoxide and Diborane," Proceedings of the Chemical Society, 242 (1964).
2. L. Barton, S.K. Wason and R.F. Porter, "Thermochemistry of Interconversion of $\text{H}_2\text{B}_2\text{O}_3(\text{g})$ and $\text{H}_3\text{B}_3\text{O}_3(\text{g})$," Journal of Physical Chemistry, **69**, 2160 (1965).
3. L. Barton and D. Nicholls, "The Hydrogenation of Boron Monoxide to Diborane and the Reactions of Boron and Boron Carbide with Titanium and Zirconium Dioxide," Journal of Inorganic and Nuclear Chemistry, **28**, 1367 (1966).
4. L. Barton, C. Perrin and R.F. Porter, "Mass Spectrometric Study of Intermediates in the Oxidation of B_5H_9 , B_4H_{10} and BH_3CO ," Inorganic Chemistry, **5**, 1466 (1966).
5. L. Barton, F.A. Grimm and R.F. Porter, "Boroxine, A Simplified Preparation," Inorganic Chemistry, **11**, 2076 (1966).
6. F.A. Grimm, L. Barton and R.F. Porter, "A Vibrational Analysis of Gaseous Boroxine," Inorganic Chemistry, **7**, 1309 (1968).
7. L. Barton, "Boroxine: A Novel Approach to the $\text{BH}_3\text{-PF}_3$ System," Journal of Inorganic and Nuclear Chemistry, **30**, 1683 (1968).
8. L. Barton and C.A. Heil, "Reaction of Germanium Dioxide with Graphite at High Temperatures," Journal of the Less Common Metals, **20**, 11 (1970).
9. L. Barton and G.T. Bohn, "Oxidation of Trimethylborane," Mass Spectral Evidence for the Intermediate $(\text{CH}_3)_2\text{B}_2\text{O}_3$," Journal of the Chemical Society, Chemical Communications, 77, (1971).
10. D.W. Wester and L. Barton, "Trimethylboroxine," Organic Preparations and Procedures-International, **3**, 191 (1971).

11. D.W. Wester, F. Longcor and L. Barton, "The Preparation and Characterization of 2-Methyl-1,3,2-dioxaborolane," Synthesis in Inorganic and Metal-Organic Chemistry, **3**, 115 (1973).
12. L. Barton and J.M. Crump, "Oxidation of 1,1-Dimethyldiborane: Isolation and Characterization of 2,5-Dimethyl-1,3,4-trioxadiborolane," Inorganic Chemistry, **12**, 2252 (1973).
13. L. Barton and J.M. Crump, "Oxidation of 1,1-Dimethyldiborane: Gas Phase Peroxide Intermediates," Inorganic Chemistry, **12**, 2506 (1973).
14. L. Barton, J.M. Crump and J.B. Wheatley, "Trioxadiborolanes from the Oxidation of Methyldiborane," Journal of Organometallic Chemistry, **72**, C1 (1974).
15. L. Barton, D. Brinza, R.A. Frease and F.L. Longcor, "Evidence for Aromaticity in Some Boron-Oxygen Heterocycles from NMR and Mass Spectral Measurements," J. Inorg. Nucl. Chem., **39**, 1945 (1977).
16. L. Barton, "(Oxy)hydroboranes and Related Species," Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 48, "Borverbindungen 16," 1 - 14 (1977)
17. L. Barton, "Tetrakis(organyloxy)diboranes (4) and Additional Diborane (4) Derivatives," Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 48, "Borverbindungen 16," 24 - 36 (1977).
18. L. Barton, "Oxygen-Boron-Nitrogen Heterocycles," Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 48, "Borverbindungen 16," 101 - 124 (1977).
19. L. Barton, T.P. Onak and S.G. Shore, "Species Containing Three Boron Atoms," in: Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 52, "Borverbindungen 18," 190-208 (1978).
20. L. Barton, T.P. Onak and S.G. Shore, "Hexaborane Species," in Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 54, "Borverbindungen 20," 52-79 (1979).
21. L. Barton and S.G. Shore, "Heptaborane and Octaborane Species," in Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 54, "Borverbindungen 20," 80-96 (1979).
22. L. Barton, T.P. Onak and S.G. Shore, "Nonaborane Species," in Gmelin Handbuch der Anorganischen Chemie, Erg-Wer, Vol 54, "Borverbindungen 20," 97-121 (1979).
23. L. Barton, T.P. Onak, R.J. Rimmel and S.G. Shore, "Decaborane Species," in Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 54, "Borverbindungen 20," 122-209 (1979).
24. L. Barton, T.P. Onak, R.J. Rimmel and S.G. Shore, "Species Containing 11 or 12 Boron Atoms," in Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 54, "Borverbindungen 20," 210-239 (1979).
25. L. Barton, T.P. Onak, "Species Containing More than 12 Boron Atoms," in Gmelin Handbuch der Anorganischen Chemie, Erg-Werk, Vol 54, "Borverbindungen 20," 240-304 (1979).

26. I. S. Jaworiskey, J.R. Long, L. Barton and S.G. Shore, "Directive Effects in Bridge Cleavage Reactions of Methyl-Substituted Boron Hydrides; Preparation and NMR Spectra of 3-CH₃B₆H₁₁, 3-CH₃B₅H₁₀ and 1-CH₃B₄H₉," Inorg. Chem., **18**, 56-61 (1979).
27. L. Barton, "Systematization and Structures of the Boron Hydrides," Topics in Current Chemistry, **100**, 169-206 (1982).
28. L. Barton, "The System Boron Hydrogen" Gmelin Handbuch der Anorganischen Chemie, 2nd Supplement, Vol 1, 3-204 (1983).
29. A.F. Berndt, L. Barton and F.L. Longcor, "2,3,5,6-Tetramethyl-1,4-Dioxane-2,5-diol, C₈H₁₆O₂," Acta Crystallographica, **C39**, 395-397 (1983).
30. L. Barton and P.K. Rush, "Phosphine-Ligated Copper(I) Derivatives of Dicarbahexaborane(8)," Inorganic Chemistry, **24**, 2413-20 (1985).
31. P.K. Rush and L. Barton, "Direct Synthesis and NMR Spectra of [(C₆H₅)₂PCH₂]₂CuB₅H₈: Comments on the Solution Structure of 2,3-μ-Metallopentaboranes," Polyhedron, **4**, 1741-3 (1985).
32. L. Barton and P.K. Rush, "Formation of {1,1-[bis(diphenyl-phosphino)ethane]-2,3-dicarbonyl-nickela-closo-heptaborane} via the Intermediacy of 4,5(μ-halogeno[bis(diphenylphosphino)ethane]nickel-2,3-dicarbonyl-nido-hexaborane(8))," Inorganic Chemistry, **25**, 91-93 (1986).
33. L. Barton, "The Boron-Hydrogen System," Gmelin Handbook of Inorganic Chemistry, Boron Compounds, 3rd Supplement, Vol. 1, 2-241 (1987). Springer-Verlag, Berlin.
34. L. Barton, "The Formation of Bonds between Hydrogen and Elements of Group IIIB (B, Al, Ga, In, Tl)," in Inorganic Reactions and Methods, J.J. Zuckerman, Ed.; VCH Publishers Inc.: West Germany (1987) Vol. 2, Sect 1.7, pp. 124-148.
35. L. Barton, Book Review: "Inorganic Mass Spectrometry," Edited by: F. Adams, R. Gibjels, and R. Van Grieken. Wiley Inter-science, New York 1988, Journal of the American Chemical Society, **110**, 7266 (1988).
36. L. Barton, P.K. Rush, T. Zhu, P. Nevels, and M.H. Owens, "Reaction of Intermediate Sized Boranes with Methylidene-triphenylphosphorane," Inorganic Chemistry, **26**, 381-382, (1989).
37. L. Barton, Book Review: "Non-Metal Rings, Cages and Clusters," by: J. D. Woolins, John Wiley, New York 1988, Journal of the American Chemical Society, **111**, 5891, (1989).
38. L. Barton and D. K. Srivastava, "[PPh₃]₂CuB₆H₉Fe(CO)₄: Rational Synthesis of a Heterobimetallaborane from Hexaborane(10)". Organometallics **10**, 2982-5, (1991).
39. L. Barton, "The Formation of Group VIB to Group IIIB Element Bonds from Group VIB-Hydrogen Bonds and Group IIIB - Sulfur and Selenium Bonds," in Inorganic Reactions and Methods, ed. J.J.Zuckerman, Verlag Chemie, West Germany. (1991) Vol. 5, Sect 3.5.3.4 - 3.5.4.3, pp. 270-278.

40. L. Barton and D. K. Srivastava, "1-Triphenylstannyl-*nido*-Pentaborane(9): An Example of ^{119}Sn - ^{11}B NMR Coupling in a Pyramidal Borane" Journal of the Chemical Society, Dalton Transactions. 1327-8, (1992).
41. D. K. Srivastava, N. P. Rath, and L. Barton, "Stoichiometric Removal of ligand from Copper(I) Reagents: A Novel Synthesis of Di- μ -bromo-tetrakis (methyldiphenylphosphine)-dicopper(I) and the Structures of $[\text{CH}_3(\text{C}_6\text{H}_5)_2\text{P}]_3\text{CuBr}$ and $\{[\text{CH}_3(\text{C}_6\text{H}_5)_2\text{P}]_2\text{CuBr}\}_2$ ". Polyhedron **11**, 1251- 59 (1992).
42. D. K. Srivastava, N. P. Rath and L. Barton, "The Three Isomers of Triphenylstannyl-*nido*-pentaborane(9): Isolation and Structural characterization of 2,3- μ -(SnPh_3) B_5H_8 , 1-(SnPh_3) B_5H_8 , 1-(SnClPh_2) B_5H_8 " Organometallics **11**, 2263-73 (1992).
43. A. R. Khan, L. Barton, and V. T. D'Souza, "Heptakis-2,3-epoxy- β -cyclodextrin, a Key Intermediate in the Synthesis of Custom-designed Cyclodextrins". Journal of the Chemical Society, Chemical Communications. 1112-1114 (1992).
44. D. K. Srivastava, N. P. Rath, L. Barton, J. D. Ragaini, O. Hollander, R. Godfroid and S. G. Shore "Structure and Spectra of 4,5- μ -(Tetracarbonyl)ironhexaborane(10), $\text{Fe}(\text{CO})_4\text{B}_6\text{H}_{10}$ and its conjugate base $[\text{Fe}(\text{CO})_4\text{B}_6\text{H}_9]^-$ " Organometallics **12**, 2017-24 (1993).
45. D. K. Srivastava, and L. Barton, "Organotin Derivatives of Hexaborane(10). Organometallics, **12**, 2864-68 (1993).
46. D. Srivastava, H. Fang, N. P. Rath and L. Barton, "Triphenylstannyl-derivatives of Pentaborane(9) and Hexaborane(10)," Current Topics in the Chemistry of Boron, G. W. Kabalka, Ed.; Special Publication. Royal Society of Chemistry, **143**, 310 - 313 (1994).
47. H. Fang, D. Zhao, L. Brammer and L. Barton, "Crystal and Molecular Structure of $\mu,2'$ - $\text{SnPh}_2(\text{B}_5\text{H}_8)_2$ and $\mu,1'$ - $\text{SnPh}_2(\text{B}_5\text{H}_8)_2$: The First Structurally Characterized Examples of Two Pentaborane Cages Linked by a Single Heteroatom". Journal of the Chemical Society, Chemical Communications. 1531-33 (1994).
48. L. Barton, "The Boron-Hydrogen System," Gmelin Handbook of Inorganic Chemistry, Boron Compounds, 4th Supplement, Vol. 1a, 9-155 (1994). Springer-Verlag, Berlin.
49. L. Barton and D. K. Srivastava, "Metallaboranes" in Comprehensive Organometallic Chemistry, II, Wilkinson, G.; Abel, E. W.; Stone, F. G. A., Eds., Pergamon, **1995** Vol. 1, Ch. 8, pp. 275-373.
50. H. Fang, D. Zhao, N. P. Rath, L. Brammer and L. Barton, "Isomers of $\text{SnPh}_2(\text{B}_5\text{H}_8)_2$: Synthesis and Characterization of μ,μ' - $\text{SnPh}_2(\text{B}_5\text{H}_8)_2$, $\mu,2'$ - $\text{SnPh}_2(\text{B}_5\text{H}_8)_2$ and $\mu,1'$ - $\text{SnPh}_2(\text{B}_5\text{H}_8)_2$, Organometallics **14**, 1700 - 1711 (1995).
51. J. Bould, N. P. Rath and L. Barton, " $\{1,2-[\eta^5-(\text{C}_5\text{Me}_5)\text{Ir}]_2\text{B}_5\text{H}_5\}$: Isolation and Structural Characterization of A *Closo*-polyhedral Metallaborane Cluster with a Capping BH Group". Organometallics **14**, 2119 - 2122 (1995).

52. J. Bould, N. P. Rath and L. Barton, "*Nido*-[(PPh₃)₂(CO)Os(μ-H)Cp*IrB₃H₆], *Closo*-[(PPh₃)₂(CO)OsB₄H₆IrCp*] and *Pileo*-[(PPh₃)(CO)HOsB₅H₅Ir(PPh₃)₂CO]: A Unique Homologous Series of Iridaosmaborane Cluster Types" Journal of the Chemical Society, Chemical Communications. 1285-86 (1995).
53. J. Bould, N. P. Rath and L. Barton, "1,1,1-(CO)₃-2,2,2-(CO)₂(PPh₃)-5-(PPh₃)-*closo*-1,2-FeIrB₅H₄: The First Structurally Characterized *Closo*-heterobimetalloheptaborane System". Angewandte Chemie. **34**, 1641-43 (1995).
54. J. Bould, M. Pasieka, J. Braddock-Wilking, N. P. Rath, L. Barton and C. Gloeckner, "Synthesis of Heterobimetalloboranes and Related Species from [(PPh₃)₂(CO)OsB₅H₉]: *Pileo*-[(PPh₃)₂(CO)OsB₅H₅IrH(PPh₃)(CO)], *Closo*-[(PPh₃)₂(CO)(μ-H)OsB₄H₅{η⁵-(C₅Me₅)M}] (M = Rh, Ir), *Nido*-[(PPh₃)₂(CO)Os(μ-H){η⁵-(C₅Me₅)Ir}B₃H₆], and *Nido*-[(PPh₃)₂(CO)OsB₄H₇(*n*-C₄H₉)]." Organometallics. **14**, 5138-49 (1995).
55. J. Bould, N. P. Rath and L. Barton, "Synthesis and Characterization of *Nido*-[1,1,2,2-(CO)₄-1,2-(PPh₃)₂-1,2-FeIrB₂H₅]: A Heterobimetalloborane Analogue of *Nido*-[B₄H₇⁻]", Inorganic Chemistry. **35**, 35-39 (1996).
56. D. L. Denton, R. A. Godfroid, L. Barton and S. G. Shore, "Preparation of an Edge-Bonded Metalladerivative of Hexaborane(10)" Inorganic Chemistry, **35**, 791-792 (1996).
57. P. Kaur, J. Holub, N. P. Rath, J. Bould, L. Barton, B. Štíbr and J. D. Kennedy, "Macropolyhedral boron containing cluster chemistry: Nineteen-vertex [S₂B₁₇H₁₇(SMe₂)₂]: An unusual apical boron atom of cluster connectivity six and a new polyhedral borane building block." Journal of the Chemical Society, Chemical Communications. 273 - 275 (1996).
58. Jonathan Bould, Nigam P. Rath, Hong Fang and Lawrence Barton. "Chemistry of the Hexaborane(10) Analogue (PPh₃)₂(CO)IrB₅H₈: Formation and Characterization of the Heterobimetalloheptaboranes 1,1,1-(CO)₃-2,2,2-(CO)₂(PPh₃)-4-(PPh₃)-*closo*-1,2-FeIrB₅H₄ and 2,2,2-(CO)(PPh₃)₂-7,7-Cl-(PMe₂Ph)-*nido*-2,7-IrPtB₅H₇". Inorganic Chemistry. **35**, 2062 - 2069 (1996).
59. J. Bould, N. P. Rath, and L. Barton, "[[(CO)H(PPh₃)₂-*arachno*-OsB₃H₈]," Acta Crystallographica. **C52**, 1388 - 1390 (1996).
60. L. Barton, J. Bould, J. D. Kennedy and N. P. Rath. "Macropolyhedral boron-containing cluster chemistry. The isolation and characterisation of the eighteen-vertex *nido*-5'-iridaoctaborano-(3',8':1,2')-*closo*-4-iridadecaborane, [(CO)(PMe₃)₂IrB₁₆H₁₄Ir(CO)(PMe₃)₂]" Journal of the Chemical Society, Dalton Transactions 3145 - 3149 (1996) .
61. R. Khan, L. Barton and V. T. D'Souza, "Epoxides of the Secondary Side of Cyclodextrins," Journal of Organic Chemistry, **61**, 8301 - 8305 (1996).
62. L. Barton, "The Boron-Hydrogen System," Gmelin Handbook of Inorganic Chemistry, Boron Compounds, 4th Supplement, Vol. 1b, 155pp (1996). Springer-Verlag, Berlin.

63. J. Bould, N. P. Rath and L. Barton, "Metallaborane Heteroatom Incorporation Reactions: Iridacarboranes, Iridathiaboranes and an Iridaazaborane from Iridanonaborane Precursors". Organometallics, **15**, 4915 - 4929 (1996).
64. Lawrence Barton, Jonathan Bould, Hong Fang and Nigam P. Rath, "Formation of Heterobimetallaheptaboranes from the *nido*-metallaheptaboranes $(PPh_3)_2(CO)OsB_5H_9$ and $(PPh_3)_2(CO)IrB_5H_8$ ". Main Group Metal Chemistry, **19**, 711 - 725 (1996).
65. L. Barton, H. Fang, D. K. Srivastava, T. A. Schweitzer and N. P. Rath, "Recent Studies of Group 14 Derivatives of Small *Nido*-boranes". Applied Organometallic Chemistry **10**, 183 - 198 (1996).
66. Lawrence Barton, Jonathan Bould, Hong Fang, Kevin Hupp, Nigam P Rath and Charles Gloeckner, "A Unique *Nido Exo-arachno* Equilibrium Involving $[(PPh_3)_2(CO)OsB_5H_9]$ and its Base Adducts: Crystal and Molecular Structure of $[(PPh_3)_2(CO)OsB_4H_7](BH_2 \cdot PPh_2Me)$ ". Journal of the American Chemical Society. **119**, 631 - 632 (1997).
67. U. Dörfler, J. D. Kennedy, L. Barton, C. M. Collins and N. P. Rath, "Polyhedral azadirhodaborane chemistry. The reaction of $[(\eta^5-C_5Me_5)RhCl_2]_2$ with $[EtH_2NB_8H_{11}NHEt]$ to give contiguous ten-vertex $[1-Et-6,7-(\eta^5-C_5Me_5)_2-closo-8,7,1-Rh_2NB_7H_7]$ ". J. Chem. Soc., Dalton Trans. 707-708 (1997).
68. J. Bould, N. P. Rath and L. Barton, "The Structure of $[1,1,1-H(PMe_3)_2-6-Cl-1,2,4-IrC_2B_8H_9]$ ". Acta Crystallographica **C53**, 416 - 419 (1997).
69. L. Barton, J. Bould, H. Fang, K. Hupp and N. P. Rath. " *Nido* \rightleftharpoons *exo-Arachno* Metallaheptaborane Equilibria: Formation of $[(PPh_3)_2(CO)OsB_5H_9](PR_3)$ providing possible insights into the mechanism of formation of the key compound $1-[Fe(CO)_3]B_4H_8$ ". Advances in Boron Chemistry. W. Siebert, Ed.; Special Publication. Royal Society of Chemistry, **201**, 476 - 479 (1997).
70. J. Bould, P. Brint, J. D. Kennedy, M. Thornton-Pett, L. Barton and N. P. Rath, Metallaborane Reaction Chemistry. Part 3. Reaction of Carbon Monoxide with $[6,6,6-(PPh_3)(Ph_2P-ortho-C_6H_4)H-nido-6-IrB_9H_{12}-5]$ and the isolation and characterization of an arachno-6-monoiridadecaborane, $\{6-(CO)-6,9-(PPh_3)_2(Ph_2P-ortho-C_6H_4)-6-H-arachno-6-IrB_9H_{11}-5\}$. Collection of Czechoslovakian Chemical Communications. **62**, 1239-1253 (1997).
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54. "Isomers of SnPh₂(B₅H₈)₂: Synthesis and Characterization of μ , μ' -SnPh₂(B₅H₈)₂, μ ,2'-SnPh₂(B₅H₈)₂ and μ ,1'-SnPh₂(B₅H₈)₂". H. Fang, D. Zhao, L. Brammer and L. Barton, Missouri Universities Inorganic Day, May 7, 1994.
55. "Bimetallaheptaboranes". J. Bould and L. Barton, Missouri Universities Inorganic Day, May 7, 1994.
56. "BimetallaHeptaboranes: Synthesis and characterization of 2-(CO)-2,2-(PPh₃)₂-7-Cl-7-(PMe₂Ph)-(2,7-H μ)-*nido*-2,7-Iridaplinaheptaborane, (PPh₃)₂COHr-(PMe₂Ph)ClPtB₅H₆." Jonathan Bould and Lawrence Barton, Fourth Boron-USA Workshop, Syracuse, NY, July, 1994.
57. "Crystal and Molecular Structure of μ , μ' -SnPh₂(B₅H₈)₂, μ ,2'-SnPh₂(B₅H₈)₂ and μ ,1'-SnPh₂(B₅H₈)₂: The First Structurally Characterized Examples of Two Pentaborane Cages Linked by a Single Heteroatom" Hong Fang, Dong Zhao, Lee Brammer, Nigam P. Rath and Lawrence Barton. Fourth Boron-USA Workshop, Syracuse, NY, July, 1994

58. "Crystal and Molecular Structure of $\mu,2'$ -SnPh₂(B₅H₈)₂ and $\mu,1'$ -SnPh₂(B₅H₈)₂: The First Structurally Characterized Examples of Two Pentaborane Cages Linked by a Single Heteroatom". H. Fang, D. Zhao, L. Brammer and L. Barton, Abstracts, 207th. National Meeting, American Chemical Society, Washington, DC August 1994, INOR #13.
59. "Synthesis and Characterization of μ,μ' -Cd(B₅H₈)₂: A Reassignment of the NMR spectra for 2,3- μ -metalladerivatives of B₅H₉". Hong Fang, Jonathan Bould and Lawrence Barton Abstracts, 29th Midwest Regional Meeting, American Chemical Society, Kansas City, MO., Nov. (1994).# 124.
60. "Metallahexaboranes: Studies of the Species, *Nido*-(PPh₃)₂(CO)OsB₅H₉ and *Nido*-(PPh₃)₂-(CO)IrB₅H₈, Air-stable analogues of Hexaborane(10). Jonathan Bould, Nigam P. Rath and Lawrence Barton, Abstracts, 29th Midwest Regional Meeting, American Chemical Society, Kansas City, MO., Nov. (1994).# 125.
61. "Formation of Novel Bimetallaheptaboranes: Crystal and Molecular Structure of (PPh₃)₂COHr-(PMe₂Ph)ClPtB₅H₆, 1,1-(CO)₃-2,2,2-(CO)₂(PPh₃)-5-(PPh₃)-closo-1,2-FeIrB₅H₄ and *Pileo*-[(PPh₃)₂(CO)HOsB₅H₅Ir(PPh₃)₂CO]," Jonathan Bould, Nigam P. Rath and Lawrence Barton, Abstracts, 208th. National Meeting, American Chemical Society, Anaheim, CA, April (1995), INOR #95.
62. Jonathan Bould and Lawrence Barton, "Synthesis of B-Frame Clusters," Inorganic Day, May 6, 1995, UM-St. Louis.
63. Lawrence Barton, Nigam P. Rath and Jonathan Bould, "Heterobimetallaboranes Based on *nido*-(PPh₃)₂(CO)IrB₅H₈" Inorganic Day, May 6, 1995, UM-St. Louis.
64. "Formation of HeteroBimetallaheptaboranes from the *nido*-metalla-hexaboranes (PPh₃)₂(CO)OsB₅H₉ and (PPh₃)₂(CO)IrB₅H₈," Jonathan Bould, Nigam P. Rath and Lawrence Barton, Abstracts, 209th. National Meeting, American Chemical Society, Chicago, IL, August (1995) INOR # 637.
65. "Formation of HeteroBimetallaheptaboranes from the *nido*-metalla-hexaboranes (PPh₃)₂(CO)OsB₅H₉ and (PPh₃)₂(CO)IrB₅H₈," Jonathan Bould, Nigam P. Rath and Lawrence Barton. Abstracts, INTRABORON, Leeds University, Sept. 11-13, 1995
66. "Some Iridanaborane Chemistry," Jonathan Bould, Nigam P. Rath and Lawrence Barton. Abstracts, INTRABORON, Leeds University, Sept. 11-13, 1995.
67. "Metallaborane Heteroatom Incorporation Reactions," L. Barton, J. Bould and N. P. Rath, Missouri Universities Inorganic Day, April 27, 1996, Rolla, MO.
68. "Mass Spectrometry of Metallaboranes and Related Species," Charles, Gloeckner, Lawrence Barton, Jonathan Bould and Nigam P. Rath, Abstracts, Annual Meeting, American Society for Mass Spectrometry, Portland, OR, May 11 - 16, 1996.
69. J. Bould, N. P. Rath, L. Barton and J. D. Kennedy, "Metalla-B-Frame Chemistry," Abstracts, Fifth Boron-USA Workshop, (BUSA-V-MEX), Mexico City, May, 1996. (paper No. 1).
70. H. Fang, J. Bould, J. Braddock-Wilking and L. Barton, "Synthesis and Characterization of μ,μ' -Cd(B₅H₈)₂: A Reassignment of the NMR spectra for 2,3- μ -metalladerivatives of B₅H₉". Abstracts Fifth Boron-USA Workshop, (BUSA-V-MEX), Mexico City, May, 1996.(paper No. 54)
71. Heterobimetallaboranes based on Small Borane Cages," Jonathan Bould, Nigam P. Rath and Lawrence Barton. Abstracts Fifth Boron-USA Workshop, (BUSA-V-MEX), Mexico City, May, 1996. (paper No. 19)

72. "A *NIDO EXO-ARACHNO* Metallahexaborane Equilibrium: Formation of $[(PPh_3)_2(CO)OsB_5H_9](PR_3)$ providing possible insights into the mechanism of formation of the key compound 1- $[Fe(CO)_3]B_4H_8$." Lawrence Barton, Jonathan Bould, Hong Fang, Kevin Hupp and Nigam P. Rath, Abstracts, Ninth International Meeting on Boron Chemistry, Heidelberg, July 14-18, 1996, paper No. CA7..
73. "Incorporation of Heteroatoms into Metallaboranes: Formation of Metallacarboranes, Metallathiaboranes and An Iridaazaborane from an Iridanonaborane," L. Barton, J. Bould, N. P. Rath, and J. D. Kennedy, Abstracts, Ninth International Meeting on Boron Chemistry, Heidelberg, July 14-18, 1996, paper No. P81.
74. "Metallaborane Heteroatom Incorporation Reactions: Metallacarboranes, Metallathiaboranes and An Iridaazaborane from Iridanonaborane Precursors." Jonathan Bould, Nigam P. Rath and Lawrence Barton. Abstracts, 211th. National Meeting, American Chemical Society, Orlando, FL, Aug 1996 (INOR 0098).
75. "Chemistry of the Hexaborane(10) Analogue $(PPh_3)_2(CO)OsB_5H_9$: Formation and Characterization of Lewis Base adducts and a New Degradation Reaction for Metallaborane Clusters." Lawrence Barton, Jonathan Bould, Hong Fang, Kevin Hupp and Nigam P. Rath. Abstracts, 212th. National Meeting, American Chemical Society, San Francisco, CA, Apr 1997 (INOR 147).
76. "Incorporation of Unsaturated Molecules into Polyhedral Borane Cages: Synthesis and Characterization of a New Dicage Orthocarborane." Ramón Macías, Nigam P. Rath and Lawrence Barton, Abstracts, 213th. National Meeting, American Chemical Society, Las Vegas, Sept. 1997. (INOR 228).
77. "Synthesis and Characterization of Early Transition Metallaboranes: Structure of a Novel Air-Stable Cationic Zirconaborane". Rhodri L.I. Thomas, Nigam P. Rath, and Lawrence Barton, Abstracts, 213th. National Meeting, American Chemical Society, Las Vegas, Sept. 1997. (INOR 319).
78. "Heterobimetallaboranes Based on the Species, *nido*- $(PPh_3)_2(CO)OsB_5H_9$: An Air-Stable Analogue of Hexaborane(10) ". L. Barton, P. McQuade, R. L.I. Thomas, R. Macias, H. Fang, N. P. Rath, Abstracts, 32nd. Midwest Regional Meeting, American Chemical Society, Tantara, Lake of the Ozarks, MO, Nov 1997 (Paper # 115).
79. "Synthesis and Characterization of Early Transition Metal Metallaboranes: Structure of $[(Cp)_2Zr_2B_5H_8]+[B_{11}H_{14}]$, A Novel Air-Stable Dizirconaborane". L. Barton, R. L.I. Thomas, N. P. Rath, Abstracts, 32nd. Midwest Regional Meeting, American Chemical Society, Tantara, Lake of the Ozarks, MO, Nov 1997 (Paper # 133).
80. "Characterization of a New Dicage Orthocarborane and the Observation of Supramolecular Assembly Involving Borane Cages". R. Macias, N. P. Rath, L. Barton, Abstracts, 32nd. Midwest Regional Meeting, American Chemical Society, Tantara, Lake of the Ozarks, MO, Nov 1997 (Paper # 144).
81. P. McQuade, R. L.I. Thomas, H. Fang, N. P. Rath and L. Barton. "Reactions of the Hexaborane(10) analogue *nido*- $(PPh_3)_2(CO)OsB_5H_9$ with phosphines.", Inorganic Day, Columbia, MO, May 2, 1998.
82. Ramón Macías, Nigam P. Rath and Lawrence Barton. "New Metallaborane Chemistry Arising from pentaborane(9): Synthesis and Characterization of the First Nine-vertex *n-arachno*-Biplatinaborane", Inorganic Day, Columbia, MO, May 2, 1998.
83. Rh.L.I. Thomas and L. Barton , "Bimetallaborane Analogues of *nido*-Hexaborane(10)", Inorganic Day, Columbia, MO, May 2, 1998.

84. Reactions of the Hexaborane(10) Analogue *nido*-(PPh₃)₂(CO)OsB₅H₉ with Phosphines." P. McQuade, R. L. Thomas, H. Fang, N. P. Rath and L. Barton. Abstracts, **BUSA-VI**, Athens GA, May 14 – 18 (1998).
85. "New metallaborane chemistry arising from pentaborane(9): synthesis and characterization of the first nine-vertex *n-arachno*-Biplatinaborane." Ramón Macías, Nigam P. Rath and Lawrence Barton. . Abstracts, **BUSA-VI**, Athens GA, May 14 – 18 (1998).
86. Bimettallaborane Analogues of *nido*-Hexaborane(10), Rh. L. Thomas and L. Barton. Abstracts, **BUSA-VI**, Athens GA, May 14 – 18 (1998).
87. "Construction of Metallaheteroboranes and Macropolyhedral Boranes From Iridanonaborane Precursors." J. Bould, N. P. Rath, J. D. Kennedy and L. Barton, Abstracts, **BUSA-VI**, Athens GA, May 14 – 18 (1998).
88. [8,8-η²-{η²-(BH₃)Ph₂PCH₂PPh₂}-8,7-RhSB₉H₁₀]: A *nido*-rhodathiaborane with a novel intramolecular phosphine-borane adduct coordinating to a metal center. Ramón Macías, Nigam P. Rath and Lawrence Barton. Abstracts, 215th. National Meeting, American Chemical Society, Boston, Aug. 1998.
89. "Novel Chemistry on a Rhodathiaborane Cluster: Formation of a Complex Containing a Unique Bidentate Phosphine-borane Ligand, [{η²-(BH₃)}Ph₂PCH₂PPh₂]", Ramón Macías, N. P. Rath and L. Barton. Abstracts, 33rd. Midwest Regional Meeting, American Chemical Society, Wichita, KS, Nov 1998.
90. P. McQuade, N. P. Rath and L. Barton. "Reactions of small metallaboranes with Lewis bases", Abstracts, 33rd. Midwest Regional Meeting, American Chemical Society, Wichita, KS, Nov 1998.
91. Ramón Macías, Nigam P. Rath and Lawrence Barton. "Reactions of bidentate phosphines with the unsaturated cluster [8,8-(PPh₃)₂-*nido*-7,8-RhSB₉H₁₀]: Formation of [8,8-η²-{η²-(BH₃)Ph₂PCH₂PPh₂}-8,7-RhSB₉H₁₀], a *nido*-rhodathiaborane with a novel intramolecular phosphine-borane adduct coordinating to a metal center". Abstracts, 16th Missouri Inorganic Day, May 8, 1999
92. Paul McQuade, Nigam P. Rath and Lawrence Barton. "Preparation of Bidentate Phosphine Derivatives and Their Reactions with *nido*-[(PPh₃)₂(CO)OsB₅H₉]: Crystal and molecular Structure of [(*p*-cym)RuCl₂PPh₂CH₂C₆H₄CH₂Ph₂P•BH₃]. " Abstracts, 16th Missouri Inorganic Day, May 8, 1999
93. Lawrence Barton "Reactions of bidentate phosphines with metallaboranes: Possible routes to linked cluster systems", Abstracts, Tenth International Meeting on Boron Chemistry, Durham, UK, 1999, paper No. IA-1.
94. Jonathan Bould, Daniel L Ormsby, Hai-Jun Yao, Chun-Hua Hu, Jie Sun, Ruo-Shui Jin, Suzanne L Shea, William Clegg, Nigam P Rath, Mark Thornton-Pett, Robert Greatrex, Pei-Ju Zheng, Lawrence Barton and John D Kennedy. "Macropolyhedral Boron-containing Cluster Chemistry. Characterization of Larger Metallaborane Assemblies with up to Thirty Metal and boron Atoms, and some Possible General Structural Implications". Abstracts, Tenth International Meeting on Boron Chemistry, Durham, UK, 1999, paper No. CA -8.
95. Lawrence Barton, Ramon Macias, Rhodri Ll. Thomas and Nigam P. Rath, "Preparation of novel Bimettallaboranes: Species with both conventional structures and unconventional structures". Abstracts, Tenth International Meeting on Boron Chemistry, Durham, UK, July 1999, paper No. PA-17.

96. Paul McQuade and Lawrence Barton, "Studies of the reactions of bidentate phosphines containing rigid backbones with metallahexaboranes". Abstracts, Tenth International Meeting on Boron Chemistry, Durham, UK, July 11-15, 1999, paper No. PA-18.
97. Rhodri Ll. Thomas, Nigam P. Rath and Lawrence Barton, "Studies of early transition metal metallaboranes." Abstracts, Tenth International Meeting on Boron Chemistry, Durham, UK, July 11-15, 1999, paper No. PB-38.
98. Lawrence Barton, "Reactions of metallaboranes: From cluster degradation to the formation of linked clusters". Abstracts, 217th. National Meeting, American Chemical Society, New Orleans, Aug. 1999, paper No. INOR-256.
99. P. McQuade, N. P. Rath and L. Barton, "Reactions of [(PPh₃)₂(CO)OsB₅H₉] with Bidentate Phosphines containing Rigid Backbones: Formation and Structure of [(p-cym)RuCl₂PPh₂CH₂C₆H₄-CH₂Ph₂P•BH₃]. Abstracts, 217th. National Meeting, American Chemical Society, New Orleans, Aug. 1999, paper No. INOR223.
100. P. McQuade, N. P. Rath and L. Barton, "Reaction of an osmahexaborane with rigid backbone bidentate phosphines: Possible route to linked clusters." Abstracts, 34th. Midwest Regional Meeting, American Chemical Society, Quincy, IL, Oct. 1999.
101. P. McQuade, N. P. Rath and L. Barton, "Preparation of bidentate phosphine derivatives and their reactions with *nido*-metallahexaboranes." Abstracts, 218th. National Meeting, American Chemical Society, San Francisco, CA, March, 2000.
102. "Rigid bidentate phosphines and their reactions with the hexaborane(10) analogue (PPh₃)₂(CO)OsB₅H₉", Paul McQuade and Lawrence Barton, Abstracts, BUSA-VII, Pittsburgh, PA. June 7-11 (2000).
103. "Synthesis and characterization of [(PPh₃)₂(CO)OsB₅H₉·PPh₂LPPh₂·Ru(*p*-cym)X₂] and a comparison with the species PPh₂LPPh₂·Ru(*p*-cym)X₂ and BH₃·PPh₂L·PPh₂·Ru(*p*-cym)X₂. (L= C₂H₄, C₃H₆, C₆H₁₂ and CH₂C₆H₄CH₂, X= Cl, I.)", Paul McQuade, Nigam P. Rath and Lawrence Barton, Abstracts, BUSA-VII, Pittsburgh, PA. June 7-11 (2000).
104. "Reactions of the Unsaturated Cluster [8,8-(PPh₃)₂-*nido*-8,7- RhSB₉H₁₀] with Bidentate Phosphine Ligands." Ramón Macías, Nigam P. Rath and Lawrence Barton, Abstracts, BUSA-VII, Pittsburgh, PA. June 7-11 (2000).
105. "Reactions of the hexaborane(10) analogue [2,2,2-(PPh₃)₂(CO)-*nido*-2-OsB₅H₉] with phosphine bases, Part IV." Paul McQuade and Lawrence Barton. Abstracts, 35th Midwest Regional Meeting, American Chemical Society, St. Louis, MO, Oct. 2000.
106. "Synthesis of monofunctionalized bidentate phosphines and their reactions with [2,2,2-(PPh₃)₂(CO)-*nido*-2-OsB₅H₉]. A detailed description of some interesting spectroscopic observations." Paul McQuade, Nigam P. Rath and Lawrence Barton. Abstracts, 35th Midwest Regional Meeting, American Chemical Society, St. Louis, MO, Oct. 2000.
107. "Formation and characterization of Group IV transition metal derivatives of pentaborane(9)" Rhodri Ll. Thomas, Mitsuhiro Hata, Nigam P. Rath, and Lawrence Barton, Abstracts, 222nd National Meeting, American Chemical Society, Chicago, IL, August, 2001.
108. Formation and characterization of a series of bifunctional bidentate phosphines," Mitsuhiro Hata, Paul McQuade, Nigam P. Rath and Lawrence Barton, Abstracts, 222nd National Meeting, American Chemical Society, Chicago, IL, August, 2001

109. " Reactions of 11-vertex rhodathiaboranes and rhodadicarbaboranes with bidentate phosphines and their subsequent rearrangements," Oleg Volkov, Ramon Macias, Nigam P. Rath and Lawrence Barton. Abstracts, 222nd National Meeting, American Chemical Society, Chicago, IL, August, 2001.
110. "The Saint Louis Section: Approaching 100 years", Lawrence Barton, and Jane A. Miller, Abstracts, 222nd National Meeting, American Chemical Society, Chicago, IL, August, 2001.
111. Reactions of 11-vertex rhodathiaboranes and rhodadicarbaboranes with bidentate phosphines and their subsequent rearrangements", Lawrence Barton, Oleg Volkov, Ramon Macias, and Nigam P. Rath, Abstracts, Euroboron2, Dinard, France, Sept 2 – 6, 2001.
112. "Metallaboranes in St. Louis: New Wrinkles on Phosphine Borane Chemistry", Lawrence Barton, Mitsuhiro Hata, Paul McQuade Nigam P. Rath and Oleg Volkov. Abstracts, INTRABORON20, Killin, Scotland, Sept. 10 – 12, 2001.
113. "The Structural Chemistry of the *Arachno*-Nonaboranes." L. Barton, J. Bould, R. Greatrex, J. D. Kennedy, D. L. Ormsby, M. G. S. Londesborough, K. L. F. Callaghan, M. Thornton-Pett, S. J. Teat, W. Clegg, H. Fang, N. P. Rath, and T. R. Spalding. Abstracts, *Boron Americas-VIII*, Death Valley, CA. Jan, 2002.
114. "Reactions of 11-vertex rhodathiaboranes and rhodadicarbaboranes with bidentate phosphines and their subsequent rearrangements." O. Volkov, R. Macias, N. P. Rath and L. Barton. Abstracts, *Boron Americas-VIII*, Death Valley, CA. Jan, 2002.
115. "Formation of Group IV transition metal derivatives of pentaborane(9) and a novel oxidative coupling reaction to form the new structural motif B₉H₁₁(PPh₃)₂." M. Hata, R. LI. Thomas, N. P. Rath, L. Barton. Abstracts, *Boron Americas-VIII*, Death Valley, CA. Jan, 2002.
116. "A Novel Application of the Polyhedral Skeletal Electron Pair Theory to Borane Clusters." R. LI. Thomas, N. P. Rath, W. Porterfield and L. Barton, Missouri Inorganic Day, UM-St. Louis, May 4, 2002.
117. "Reactions of boranes and metallaboranes with phosphines." Lawrence Barton, Oleg Volkov, Mitsuhiro Hata, Paul McQuade and Nigam P. Rath. Abstracts, *Eleventh International Meeting on Boron Chemistry*, Moscow, Russia, July 28-August 2, 2002.
118. "Formation of Bimetallaboranes using Rhodathiaborane and Rhodadicarbaborane templates." Oleg Volkov, Nigam P. Rath and Lawrence Barton, Abstracts, *Eleventh International Meeting on Boron Chemistry*, Moscow, Russia, July 28-August 2, 2002.
119. " Organometallic Chemistry on a Rhodathiaborane Cluster: Reactions with bidentate phosphines and organotransition metal reagents." Oleg Volkov, Ramon Macias, Nigam P. Rath and Lawrence Barton, Abstracts, 224th National Meeting, American Chemical Society, Boston, August, 2002.
120. "Formation of bimettallaboranes using rhodathiaborane or rhodadicarbaborane templates." Lawrence Barton, Oleg Volkov and Nigam P. Rath, Abstracts, 37^h Midwest Regional Meeting, American Chemical Society, Lawrence, KS, Oct. 23 – 25, 2002.
121. "Reactions of boranes and metallaboranes with phosphines." Lawrence Barton, Oleg Volkov, Mitsuhiro Hata, Paul McQuade and Nigam P. Rath, Abstracts, 38th Midwest Regional Meeting, American Chemical Society, Columbia, MO, Nov. 5 – 7, 2003.
122. "Symmetrical versus non-symmetrical cleavage of diborane when reacted with a base. Kristina Alderman, Grainne Biddlecombe and Lawrence Barton, Undergraduate Research Symposium, UM-St. Louis, April, 23, 2004.

123. "Formation of group 4 transition metal derivatives of small boranes and novel borane coupling reactions. Rhodri Ll. Thomas, Mitsuhiro Hata, Nigam P. Rath, Grainne Biddlecombe and Lawrence Barton, . Abstracts, *Boron Americas-IX*, San Marcos, TX. May, 2004.
124. "Another look at the *nido*-undecaborane system. O. Volkov, K. Radacki, R. Ll. Thomas, N. P. Rath and L. Barton. Abstracts, *Euroboron-3*, Prague, Czech Republic, Sept 12 – 16, 2004.
125. "X-ray Crystallography: An Essential Tool for the Study of Complex Derivatives of Boranes" X-ray Crystallography Open House, UM-St. Louis Chemistry Department, August 17, 2005
126. "The structure of the *nido*-undecaborate anion" L. Barton, O. Volkov, R. Ll. Thomas , K. Radacki and N. P. Rath, Abstracts, 230th National Meeting, American Chemical Society, Washington, DC, August, 2005.
127. "Formation and chemistry of hybrid metallaboranes and phosphines. Lawrence Barton, Mitsuhiro Hata, Paul McQuade, Rudolph E. K. Winter and Nigam P. Rath. Abstracts, *Twelfth International Meeting on Boron Chemistry*, Sendai, Japan, Sept. 2005.
128. "Boron Hydride and Related Chemistry and the Influence of Sheldon Shore", *The Shore Diamond Jubilee Symposium*, Ohio State University, Columbus Ohio, Oct. 8-9 (2005).
129. "Bidentate phosphine-borane complexes as chelating or bridging ligands" Lawrence Barton, Nigam P. Rath, Paul McQuade, Oleg Volkov and Mitsuhiro Hata, Abstracts, 40th Midwest Regional Meeting, American Chemical Society, Joplin, MO, Oct, 26 – 28, 2005.
130. "Hybrid metallaboranes and phosphines." Lawrence Barton*, Mitsuhiro Hata, Paul McQuade, Rudolph E. K. Winter and Nigam P. Rath. Abstracts, BORAMX, San Juan, Puerto Rico, Aug. 2006.
131. "Small cage metallaborane chemistry and the influence of Sheldon Shore", Lawrence Barton. Abstracts, 233rd National Meeting, American Chemical Society, Chicago, March 2007.

INVITED SEMINARS AND LECTURES

The University of Missouri-St. Louis, April, 1966
 St. Louis University, November 1966
 The University of Missouri-St. Louis, December, 1966
 The University of Missouri-St. Louis, February 1969
 The University of Missouri-Rolla, April 1970
 The University of Missouri-St. Louis, August 1970
 The University of Missouri-St. Louis, July 1973
 Education Topics Group, ACS, St. Louis Section, February 1976.
 Southern Illinois University-Edwardsville, February 1977.
 Ohio State University, October, 1977.
 The University of Kentucky, Lexington, November, 1977
 The University of Missouri-St. Louis, November, 1978
 Eastern Illinois University, December, 1979.
 St. Louis University, November 1981.
 Illinois State University, Bloomington-Normal, November, 1984.
 Southern Illinois University, Commencement Discussion Panel, June 1985.
 The University of Missouri-St. Louis, November, 1985.
 Northeast Missouri State University, Kirksville, MO January, 1986.
 Southern Illinois University-Edwardsville, April 1986.

History of Chemistry Club, SIU-Edwardsville, April, 1986.
Engleman Institute II, Commencement Address, June, 1991.
St. Louis Award Address, St. Louis Section, April 1991.
The University of Missouri-St. Louis, January, 1992
The University of Leeds, UK, February, 1992
Strathclyde University, Glasgow, UK., March 1992
The University of Liverpool, UK., March 1992.
The Ohio State University, May 1992.
Battelle, Pacific Northwest Laboratory, Richland, WA., July 1992.
Purdue University, February, 1993
University of Missouri-Kansas City, March, 1993
Southeast Missouri State University, April 1993
University of Texas-El Paso, April 1994
Southern Methodist University, April 1994
Michigan Technological University, April 1994.
The University of Missouri-St. Louis, August, 1995.
Eastern Illinois University, October, 1995.
The University of Missouri-Columbia, February, 1996.
Rock River Section, American Chemical Society, Northern Illinois University, March, 1996.
St. Louis University, October 17, 1997.
St. Louis Section, American Society of Brewing Chemists. February, 1998
The University of Missouri-St. Louis, April 1998.
Heriot-Watt University, Edinburgh, Scotland, April, 1998.
Leeds University, Leeds, UK., April, 1998.
The University of Loughborough, Loughborough, UK, April, 1998.
The Ohio State University, February, 1999.
Southeast Missouri State University, April 1999
Invited Session Lecture, *Xth International Conference on Boron Chemistry*, Durham, July 1999.
Invited lecture in the Symposium, *Organic and Inorganic Synthesis via Boranes*, at the 217th National Meeting, American Chemical Society, New Orleans, Aug. 1999
Northern Illinois University, March 6, 2000
UM-St. Louis, March 20, 2000
Invitation to present a Plenary Lecture, *XIth International Conference on Boron Chemistry*, Moscow, Russia, July. 2002.
Invitation to present a lecture in the Symposium *Recent Developments in Inorganometallic Chemistry* at the 224th National Meeting, American Chemical Society, Boston, Aug. 2002.
Invitation to present a Keynote Lecture at the *XIIth International Conference on Boron Chemistry*, Sendai, Japan, Sept. 2005.
Invitation to speak at the The Shore Diamond Jubilee Symposium, Ohio State University, Oct 8/9, 2005
The University of Minnesota-Duluth, December 2005.
The University of Missouri-St. Louis, 2006.
ACS Inorganic Chemistry Award Symposium, Chicago, March 2007

RESEARCH GRANTS FUNDED

External

1. "High Temperature Transpiration Studies," Submitted to the Petroleum Research Fund of the American Chemical Society, May 1967, Type G grant, awarded September 1, 1967. \$5,000 funded for 2 years.

2. "Oxidation of Some Group IIIA and IVA Alkyls and Hydrides," \$37,000 for 27 months. Submitted to the NSF, ONR and the Army Research Office (Durham). September 1968. 28,100 awarded by the NSF for two years, June 1, 1969. (NSF GP 11211).
3. NSF grant G.P. 11211 extended to August 31, 1973 with redistribution of funds.
4. Travel award to attend IMEBORON IV, Salt Lake City Utah, July 1979. ACS-P.R.F. \$200.00 awarded.
5. "Studies of Transition-metal Complexes containing Main Group Element Ligands" NSF. Instrumentation Proposal for an Infrared Spectrometer (Co-investigator with inorganic chemistry colleagues) \$22,090.00 funded. 1983.
6. "Purchase of an NMR Spectrometer," NSF Chemical Instrumentation Program, December 1984 \$140,000 funded, Aug. 15, 1985. Departmental Proposal, PI.
7. NSF - Research Experiences for Undergraduates, \$60,000 February 1987, L. Barton contributor. Funded 5/7/87, \$31,000.
8. NSF - Purchase of a Mass Spectrometer, February 1988, \$153,366 (Funded 5/19/88). Departmental Proposal, PI.
9. NSF - Purchase of a CD/ORD Spectropolarimeter, July 1988, \$83,333 (Funded 11/88). Departmental Proposal, PI.
10. Missouri Research Assistance Act - "Borane and Metallaborane Chemistry of Some B₆ and B₇ Systems". Funded Nov 1989, \$9,711. These funds matched a \$19,422 grant from the Monsanto Co.
10. Missouri Research Assistance Act - "Borane and Metallaborane Chemistry of Some B₆ and B₇ Systems". Funded Nov 1990, \$5,289. These funds matched a \$10,578 grant from the Monsanto Co.
11. NSF - Research Experiences for Undergraduates, \$100,000, 4/1/92 - 3/31/95. L. Barton contributor.
12. "Novel Metallaborane Chemistry," National Science Foundation, \$105,000, funded for three years, July 1993 July 1996.
13. "Purchase of an X-ray Diffractometer," NSF Chemical Instrumentation Program, Submitted, Jan. 1993, \$150,000 funded, Jan 1994. Departmental Proposal, PI.
14. Purchase of an NMR Spectrometer," NSF Chemical Instrumentation Program, Submitted, July. 1993, \$160,000 funded, Jan 1994. Departmental Proposal, PI.
15. NSF - Research Experiences for Undergraduates, Special Creativity Award Renewal, \$114,000, 4/1/95 - 9/30/97, L. Barton contributor.
16. "New Directions in Metallaborane Chemistry," ACS-PRF, \$50,000 funded. June 1996 - May 1998.
17. "Purchase of a High Resolution Mass Spectrometer," NSF Chemical Instrumentation Program, Submitted, Jan 1997, \$250,000 funded, July 1997. Departmental Proposal, PI.
18. "Metallaborane Chemistry, From Small Heterobimetallaboranes to Large Metallaheteroboranes", NSF, \$223,000 funded, March 1998; extended through Nov 2002.

19. Upgrade of a 300MHz NMR Spectrometer, National Science Foundation (CHE-9974801, \$150,694, 1999) (LB Co-investigator, Spilling PI).
20. "The Chemistry of Larger Polyhedral Borane Clusters" NSF International Collaboration award. Submitted, Oct. 1999, \$12,000 funded for three years, March 2000; extended through April 2004.
21. Upgrade of a CCD-based X-ray Diffraction Laboratory, National Science Foundation, \$126,619.00, November 2004 - October 2007, \$126,619.00, \$126,619.00, Active, Co-I.

Internal

1. "Reactions of $\text{PF}_3(\text{g})$ and $\text{NH}_3(\text{g})$ with Boroxine," Summer 1967. \$1,500 awarded.
2. "High Temperature Chemistry," Summer 1968. \$1,600 awarded (includes Fellowship \$900 and \$700 research grant).
3. "Oxidation of Some Group IIIA and IVA Alkyls and Hydrides," Summer Fellowship and Grant awarded 1969. Subsequently withdrawn on the award of the NSF grant.
4. "Transient Intermediates in the Oxidation of the Lower Boranes and Organo-derivatives of the Lower Boranes," Summer Fellowship funded 1973.
5. "Oxidation of Boranes: A Novel Approach to the Classification of Boranes," Summer Fellowship, funded 1975
6. "Synthesis and Reactions of Some Novel Boron-Oxygen Ring Systems," Dec. 1979. Summer Fellowship, funded, 1980
7. "Novel Metallaborane Chemistry," April 1980, UM-St. Louis Weldon Spring Award, \$13,200 - funded.
8. Multinuclear NMR Spectra, \$750.00 obtained from the Intercampus Doctoral Activities Fund awarded May 1983. Proposal for an additional \$642 submitted Sept. 1983; Awarded Sept. 15, 1983.
9. UM-St. Louis, Grant Incentive Proposal, "Synthesis of Some New Metallaborane Clusters," March 1986, \$5,750 funded.
10. UM-St. Louis, Improved Research Quality Proposal, "Boronation of β -Cyclodextrin". Fall 1989, \$1,836.00 funded.
11. UM-St. Louis, Improved Research Quality Proposal, "Tin-substituted Pentaboranes(9)". Fall 1991, \$5,380.00 funded.
12. UM-St. Louis, Research Incentive Award, "Metallaboranes based on Hexaborane(10)," \$7,188, funded, Winter 1993.
13. Missouri Research Board, "Heterobimetallaboranes based on Hexaborane(10)," \$18,300, funded Sept. 1993.
14. UM-St. Louis, Research Incentive Award, "Metallaboranes based on Pentaborane(9) and Hexaborane(10)," \$2,500, funded, Winter 1994.
15. UM-St. Louis, Research Incentive Award, "New Directions in Metallaborane Chemistry," \$3,000, funded, Fall 1995.

16. UM-St. Louis, Small Grants Award, "Travel to International Boron Chemistry Conferences," \$750, funded, Fall 1995.
17. Missouri Research Board, "New Directions in Metallaborane Chemistry," \$32,600, funded June. 1996.
18. UM-St. Louis, Small Grants Award, "Purchase of Hardware for the XRD Facility" \$1,350, funded, Winter 1997 (with N. P. Rath).
19. UM-St. Louis, Research Leave, funded March 1998, for Winter 1999.
20. UMSL Small Grants Program. Travel to International Boron Conference, \$600, **funded** Dec. 1998.
21. UMSL Research Award Application, "Metallaborane Chemistry", \$5,200, Feb. 1999, **funded** Feb. 1999.
22. Missouri Research Board, " Degradation Mechanisms in Metallaborane Clusters," \$34,500, **funded** April. 2000.
23. "Formation of Novel Complexes of Phosphine Boranes with Transition Metal Organometallic Reagents". UMSL Research Award, Feb. 2001. \$12,500, **funded**.
24. UMSL Small Grants Program. Travel to *Boron Americas VIII*, \$807, **funded** Nov. 2001.
25. UM-St. Louis Research Award, Metallaheteroborane Cluster Chemistry, \$10,450, March 2003.
26. UMSL Small Grants Program. Travel to *IME Boron, XII*, \$1,000, Sendai, Japan. **funded** April. 2005.

Industrial Grants

Several industrial grants and contracts were awarded to the department at my instigation when I was chair between 1980 and 1988 - ca. \$750,000.

TEACHING EXPERIENCE

1. Prior to joining UM-St. Louis
 - (1) Demonstratorship, Inorganic Chemistry, University of Liverpool, (1961-1964)
 - (2) Part-time Instructor, Introductory Physics, University of Central Lancashire, Preston, UK (1962-63)
 - (3) Occasional lectures, Cornell University, as replacement in 1965-66.
2. At the University of Missouri-St. Louis
 - General Chemistry (non-majors)
 - General Chemistry Laboratory (non-majors)
 - Introductory Chemistry I and II (majors)
 - Quantitative Analysis
 - Introduction to the Chemical Literature
 - Basic Inorganic Chemistry

Senior Undergraduate Seminar
Inorganic Chemistry I (required of BS majors)
Inorganic Chemistry II (senior undergraduate and beginning graduate students)
Inorganic Reactions (senior level lab course)
Instrumental Analysis (mass spec portion)
Typical Element Chemistry (graduate students)
Coordination Chemistry (graduate students)
Special Topics in Inorganic Chemistry (graduate course on cluster chemistry)
Problem Seminar in Inorganic Chemistry (graduate course)
External Speaker Seminar

3. At Washington University

Inorganic Chemistry I

SERVICE

A. University Committees (Asterisk* indicates I served as chair)

Department

Executive Committee* (current)
Curriculum Committee*
Catalog and Publicity Committee*
Group Proposals Committee*
Graduate Policy Committee*
Graduate Admissions Committee*
Library Committee
Search Committees
High School Liaison
Public Relations Coordinator*)
Advising Coordinator
ACS Students Affiliates Advisor.
Ad Personam Committees*
External Affairs Committee* (current)
Alumni Relations Coordinator* (current)
Editor, UMSL CHEMIST, 1984- 09 (current)
Chair, Murray Lecture Committee (current)

College of Arts and Sciences.

Ad Hoc Curriculum Committee
Planning Committee*
Nominating Committee
Advising Committee*
Honors Committee
Policy Committee
Associate Dean Search Committee
Development Officer Search Committee
Scholarship and Awards Committee*

Graduate School

Graduate Council (Secretary and Vice-chairman)
Graduate Council Executive Committee
Graduate Faculty Secretary

Graduate School Nominating Committee*
Graduate School Curriculum Committee*

University Senate

Member of Senate.
Curriculum and Instruction Committee.*
Executive Committee.
Invited member of the Faculty Council Steering Committee which met regularly with the Chancellor in the 1970s.
Nominating Committee.
Research and Publications Committee.
Elections Committee.
University Relations Committee.*
Physical Facilities and General Services Committee.*
Committee on Appointments, Promotion and Tenure.

Faculty Senate and University Assembly

Chair, Faculty Senate and University Assembly
Chair, Steering Committee, Faculty Senate and University Assembly.
Steering Committee
Budget and Planning Committee
Committee on Committees
Committee to consider issues of tenure removal
University Relations Committee
Academic Advisory Committee

Campus

University Student Affairs Committee.
Science Complex Planning Committee.
Research Leave Committee.
Advisory Committee-Health Related Studies Center.
Miscellaneous Ad Hoc committees.
Media Relations Committee.
Engineering Study Committee.
Faculty Advisory Board-Center for Science and Technology.
Search Committee-Associate Vice Chancellor for Research and Graduate Studies.
Search Committee-Vice Chancellor for Administrative Services.
Campus review Committee-System-wide University Planning Council.
Engineering-Program Implementation Committee.
Campus Committee on University Relations.
Center for Molecular Electronics Building Committee.
Center for Molecular Electronics Steering Committee.
Fiscal Oversight Committee.
Search Committee-Safety and Risk Management Assistant.
Search Committee-Director of Facilities Management.
Benton/Stadler Halls Remodeling Committee.
2000 Committee.
Chancellor's Committee on Academic Review, Facilitator, Physics Department Review Team.
Chancellor's Committee on Academic Review, Facilitator, Center for Neurodynamics Review Team.
Search Committee, Vice Chancellor for University Relations.
Search Committee, Vice Chancellor for Student Affairs
Space Committee

Chancellor's Cabinet
Search Committee, Director of Alumni Relations
Strategic Planning Committee
Chancellor's Award for Staff Excellence 2001, 2002
Faculty Grievance Panel member 2002 – 2006
40th Anniversary Celebration Planning Committee.
Chancellor Search Committee 2003
Campus Review Committee – University relations
Campus review Committee – Faculty Senate and University Assembly

Other Campus

Member Alumni Association Governing Board (current)
Distinguished Alumni Award Selection Committee

UM-System Wide

Committee on Access to Engineering in Urban Areas
Inter-campus Weldon Spring Review Committee.
Missouri Research Assistance Act Review Committee.
Presidential Award for Research, Review Committee, 1999.
Inter-campus Faculty Council 2000 - 2002

B. Service to Chemistry and Professional Organizations

American Chemical Society

National Level

Councilor, 1990-06
Membership Affairs Committee, Associate - 1991, Member - 1992-1997, Secretary, 1992-93.
Session chairman, ACS National Meeting, Denver, 1993, Washington 1994, New Orleans, 1999
Local Section Activities Committee, Member – 1998 – 2004.
Senior Chemists Taskforce. 1999 – 2001
Membership Affairs Committee - liaison to the Budget and Finance Committee
Local Section Activities Committee – Liaison to the Divisional Activities Committee
Committee on Committees, 2005 – present.
Committee on Committees, Liaison to the Committee on Chemical Safety and to the Committee on PROJECT SEED, 2005 - present

Midwest Region

Session Chairman, Midwest Regional Meeting 1967, 1992, 1994, 1997.
Symposium Chairman, *Rings, Cages and Clusters of the Main Group Elements*, Midwest Regional Meeting 1979
Program Chairman, Inorganic Chemistry Division, ACS Midwest Regional Meeting, 1974, 1997.
Exposition Chair, Midwest Regional Meeting, 2000.

St. Louis Section

Subcommittee Chairman, Continuing Education 1972-74
Education Committee Chair and Voting Member of the Board of Directors 1973-75
St. Louis Award Jury 1975, 1977, 1978
Conant Award Jury 1976
High School Chemistry Contest Organizer 1976, 1977
Member, Board of Directors, 1977-79; 1981-89, 1993 - present.

Steering Committee Chairman -1979
Steering Committee member, 1980, 1981, 1996, 1997, 1998.
Alternate Councilor, 1979-81
Nominations Committee Chairman (1979)
Chairman - elect 1979
Chairman - 1980
Midwest Award Jury, 1983-89, 1992-98
Member Special Committee to Review the Midwest Award 1987
St. Louis Award Symposium Chairman 1980, 1983, 2000, 2005, 2006, 2007.
National Society Councilor - 1990 - present.
High School Career Day Organizer, 1993 - 1998, 2000.
Section Historian, 2000 – present

Professional Refereeing.

Referee for various periodicals including *Journal of the American Chemical Society*, *Organometallics*, *Inorganic Chemistry*, *Inorganica Chimica Acta*, *Czechoslovakian Chemical Communications*, *Main Group Metal Chemistry*, *Synthesis and Reactivity in Inorganic and Organometallic Chemistry*, and *Applied Organometallic Chemistry*. Evaluation of grant applications for the National Science Foundation, Petroleum Research Fund and Research Corporation.

Other

Session Chairman, Fourth Boron USA Workshop, Syracuse, N.Y. July (1994), BUSA-V-MEX, Guanajuato, Mexico, May, (1996), Boron in the Americas IX, San Marcos, TX, May (2004).
Member, National Organizing Committee, Boron-USA (BUSA) Workshops.
Co-chair, Boron in the Americas XI, St. Louis, MO, 2008.
President - St. Louis Research Council (1983-85, 1994-95)
Secretary - St. Louis Research Council (1993-94)
Member - Chemical industrial laboratory technician, advisory committee - St. Louis School District, 1980s.
Member site organizing committee, 1988 Annual Meeting, Council for Chemical Research;
Chairman, MASUA, Chemistry Department Chairs Conference, 1986
Co-Chair, ACS, Cooperative Education Conference, UM-St. Louis, 1983
Member site organizing committee, 1997 Annual meeting, Council for Chemical Research
Member Awards Committee, Council for Chemical Research, 1996-97.

Review Panels

Member of a three-person review panel for the 5-year evaluation of the department of chemistry and biochemistry at Southern Illinois University-Carbondale, 1982.

Member of a three-person review panel for the 5-year evaluation of the department of chemistry at the University of Missouri-Kansas City, 1993

Member of NSF-SBIR Research Panel on Nanotechnology, Sept 2002.

Consultant for NREL-DOE Hydrogen Storage Program, 2007.

C. Community Service and Other Service

Member, Board of Trustees - Glen Echo Park, Missouri 1981-present. Served as Chair for three years and am in 24th year as Clerk
Chairman - Normandy High School - Viking Parents Organization, 1981-1988.
Normandy School District, Special Task Force Member, 1984,1987.

Normandy Municipal Council, Member, Board of Directors 1987-90, Vice-President, 1988-1990.

Member Political Advisory Committee, Metropolitan Transit Authority, Bi-state Development Agency, 1989-92.

Delegate to Normandy Communities Forum, Partnership 2000.

Member, St. Louis Regional Commerce and Growth Focus Group on Science and Technology 1997.

Awards for Community Service

Normandy Municipal Council, President's Award for Outstanding Community Service 1985

Normandy Area Historical Association, Certificate of Appreciation, February 1986.