Bruce H. Weber
Professor
Biochemistry
California State University, Fullerton
and
Robert H. Woodworth Professor of Science and Natural Philosophy
Bennington College

Education

San Diego State University, San Diego	B.S., Chemistry	1963
University of California, San Diego	Ph.D., Chemistry	1968

Honors

Woodrow Wilson Predoctoral Fellowship, 1963-1964
NIH Predoctoral Fellowship, UCSD, 1964-1968
American Cancer Society Postdoctoral Fellowship, UCLA, 1968-1970
Outstanding Professor, School of Mathematics, Science, and Engineering, CSUF, 1977
Outstanding Professor, CSUF, 1979
Exceptionally Meritorious Service Award, CSUF, 1984
Meritorious Performance Award, CSUF, 1985, 1987, 1990
Elected Fellow of the Linnean Society (London) 1995
CSUF PSSI Award 1996, 1998
CSUF FMI Award 1999, 2000, 2001
NSM Dean's Award for Contributions to Student Success 1996
California State University Program for Education and Research in Biotechnology Andreoli Biotechnology Service Award 2001
Distinguished Faculty Award for College of Natural Science and Mathematics CSUF 2001

Research and Professional Experience

Graduate Student, Department of Chemistry, University of California, San Diego; Laboratory of Joseph Kraut, 7/64 - 8/68, applications of chemical modification in protein crystallography, physical biochemistry.
Postdoctoral Scholar, Molecular Biology Institute, University of California, Los Angeles; Laboratory of Paul Boyer, 9/68 - 8/70, protein crystallization, protein purificaiton and characterization, enzymology.
Visiting Scientist, Department of Neuroscience, City of Hope National Medical Center, Duarte, California, 9/75 - 8/76, purificaiton and characterization of choline acetyltransferase.
Assistant and Associate Professor and Professor of Biochemistry, Department of Chemistry and Biochemistry, California State University, Fullerton, California, 1970 - present. Structure, function, and evolution of phosphoglycerate kinase, choline acetyltransferase, aldolase, and glycyl tRNA synthetase. Application of nonequilibrium thermodynamics and information theory to developing and evolving complex systems. Conceptual analysis of evolutionary theories. History of biochemistry, especially of bioenergetics and chemiosmotic theories. Theoretical models of the origin of life. Conceptual issues in the evolution-creation controversy. Robert Woodworth Professor of Science and Natural Philosophy at Bennington College (2001-present).

Memberships

American Association for the Advancement of Science
American Chemical Society
American Society for Biochemistry and Molecular Biology
Association for the Foundation of Science, Language, and Cognition
The Biochemical Society
History of Science Society
International Society for the History Philosophy, and Social Science of Biology
Linnean Society (London)
Philosophy of Science Association

Washington Evolutionary Systems Society

Publications (* indicates work done at CSUF)

1. E.J. Grubbs, J.D. McCullough, B.H. Weber and J.R. Maley, "The Synthesis and Thermal Rearrangement of Substituted α, α - Diphenyl-N-Benzyhydrylnitrones," *J. Org. Chem.*, 31, 1098 (1966).
2. B.H. Weber and J. Kraut, "Isolation and Partial Characterization of Iodinated Chymotrypsinogens," *Biochem. Biophys. Res. Comm., 33*, 262 (1968).
3. B.H. Weber and J. Kraut, "Identification of the Most Rapidly Iodinating Tyrosine Subtilisin BPN' " *Biochem. Biophys. Res. Comm., 33*, 280 (1968).
4. B. H. Weber and P.E. Goodkin, "A Modified Microdiffusion Procedure for the Growth of Single Protein Crystals by Concentration-Gradient Equilibrium Dialysis," *Arch. Biochem. Biophys.*, 141 (1970).
5. B.H. Weber and F.S. Markland, "Characterization of Phosphoglycerate Kinase," *Fed. Proc.*, 30, 1104 (1971).*
6. E.G. Heidner, B.H. Weber and D. Eisenberg,"Subunit Structure of Aldolase," *Science*, 171, 677 (1971).
7. "Molecular Symmetry and Crystal Packing of Glutamine Synthetase," D. Eisenberg, E.G. Heidner, P. Goodkin, M. Dastoor, F. Wedler and B.H. Weber, *Cold Spring Harbor Symposium in Quantitative Biology*, 37, 583 (1971).
8. H.T. Wright and B.H. Weber, "The Iodination of Chymotrypsinogen and Chymotrypsin in Crystal and Solution," *Eur. J. Biochem.*, 24, 583 (1972).*
9. B.H. Weber, M.C. Storm and P.D. Boyer, "An Assessment of the Exchangeability of Water Molecules in the Interior of Chymotrypsinogen," *Arch. Biochem. Biophys.*, 163, 1 (1974).
10 A.T. Brake‡ and B.H. Weber, "Evidence for an Essential Carboxyl Group for Yeast Phosphoglycerate Kinase: Reaction with Woodwards Reagent K," *J. Biol. Chem., 249*, 5452 (1974).*
11. F.S. Markland, A. Bacharach, B.H. Weber, T. O'Grady‡ , G. Saunders† and N. Umemura‡ , "Chemical Modification of Yeast Phosphoglycerate Kinase," *J. Biol. Chem., 250*, 1301 (1975).*
12. G. Saunders‡ and B.H. Weber, "Evidence for Participation of Lysine in the Subunit Contact Regions of Rabbit Muscle Aldolase," *Arch. Biochem. Biophys., 168*, 525 (1975).*
13. B.H. Weber, "Peptide and Amino Acid Analysis," *Beckman New Directions,* (1975).*
14. B.H. Weber and K. Rogers‡ , "Evidence for an Essential Role for Arginyl Residues for Yeast Phosphoglycerate Kinase," *Fed. Proc., 35*, 1434 (1976).*
15. "Enzyme Properties of Choline Acetyltransferase of Drosophila Melanogaster," J. Driskell, B.H. Weber, O. Chude, J.-Y. Wu, and E. Roberts, *Trans. Amer. Soc. Neurochem.*, 7, 137 (1976).
16. J.-Y. Wu, O. Chude, B.H. Weber, J. Driskell and E. Roberts, "Properties of L-Glutamate Decarboxylase from Crayfish," *Trans. Amer. Soc. Neurochem., 8,* 168 (1977).
17. J. Driskell, B.H. Weber and E. Roberts"Purification of Choline Acetyltransferase of *Drosophila Melanogaster*," , *Trans. Amer. Soc. Neurochem., 8*, 1698 (1977).
18. A. Bacharach, F.S. Markland, A. Pellino and B.H. Weber, "Modification of Yeast 3-Phosphoglycerate Kinase: Isolation and Sequence Determination of a Nitrated Active-Site Peptide and Isolation of a Carboxyl Modified Active-Site Peptide," *Biochem. Biophys. Res. Comm., 74*, 165 (1977).*
19. K. Rogers and B.H. Weber, "Evidence for an Essential Role for Arginyl Residues for Yeast phosphoglycerate Kinase," *Arch. Biochem. Biophys., 180, 19 (1977).*
20. W.J. Driskell, B.H. Weber and E. Roberts, "Purification of Choline Acetyltransferase from *Drosophila Melanogaster*," *J. of Neurochemistry, 30*, 1135 (1978).*
21. B.H. Weber and J. Richman‡ , "Hemoglobins of the Western Toad," *Fed. Proc., 37,* 1517 (1978).*
22. B.H. Weber, K. Willeford†, J.G. Moe and D. Piszkiewicz, "Hazards in the Use of Cibacron Blue F3GA in Studies of Proteins," *Biochem. Biophys. Res. Comm., 86*, 252 (1979).*
23. B.H. Weber, M. Hariri, D. Martin and W.J. Driskell, "Enzymatic Properties of Choline Acetyltransference for Heads of *Drosophila Melanogaster*," *J. Neurochem., 32,* 1597 (1979).*
24. B.H. Weber, "The Historical Physiological Roots of the Chemiosmotic Hypothesis," *Fed. Proc., 39*, 740 (1980).*
25. B.H. Weber and E. Olson, "Chemical Modification of Yeast Phosphoglycerate Kinase by the Dialdehyde Derivative of ATP," *Fed. Proc., 42*, 2226 (1983).*

26. "Paul Boyer" B.H. Weber in *Current Topics in Cellular Regulation Vol.,* xxi, (eds. H. Lardy, M. DeLuca and R. Cross). Academic Press (1984).*
27. G. Nagel, S. Cumberledge‡ , M. Johnson‡ , E. Petrella‡ and B.H. Weber, "The b Subunit of *E. coli* Glycyl-t RNA Synthetase Plays a Major Role in tRNA Recognition," *Nucleic Acids Research, 12*, 4377 (1984).*
28. D. Depew and B.H. Weber (eds.), *Evolution at a Crossroads: The New Biology and The New Philosophy of Science*, MIT Press, (1985).*
29. D. Depew and B.H. Weber (eds.), "Innovation and Tradition in Evolutionary Theory" D. Depew and B.H. Weber in *Evolution at a Crossroads*, MIT Press, pp. 227-260, (1985).*
30. "How Does Biochemistry Mean," B.H. Weber in *Science and Society II: The Languages of Creativity - Models, Problem-Solving, Discourse* (ed. Mark Amsler) University of Delaware Press, pp.47-67 (1986).*
31. B.H. Weber in F. Alvarado and Van Os (eds), "The Impact of the Prague Symposium on the Conceptual Development of Bioenergetics: A Retrospective and Prospective View," *Ion Gradient-Coupled Transport*, Elsevier, pp. 1-9, (1986).*
32. "Biochemistry," B.H. Weber, in *Flex Review*, Third edition, pp 23-32, 84-92 (1987).*
33. *Entropy, Information, and Evolution: New Perspectives on Physical and Biological Evolution*, B.H. Weber, D.J. Depew and J.D. Smith (eds.), MIT Press, (1988).*
34. B.H. Weber, D.J. Depew and J.D. Smith (eds.), "Consequences of Nonequilibrium Thermodynamics for the Darwinian radition," D.J. Depew and B.H. Weber in *Entropy, Information, and Evolution*, MIT Press, pp 317-354 (1988).*
35. G.M. Nagel, M.S. Johnson‡ , J. Rynd, E. Petrella‡ and B.H. Weber, "Glycl-tRNA Synthetase of *E. coli*: Immunological Homology with Phenylalanyl-tRNA Synthetase," *Archives of Biochemistry and Biophysics, 262,* 409-415 (1988).*
36. B.H. Weber *et. al.* "Evolution in a Thermodynamic Perspective: An Ecological Approach," *Biology and Philosophy 4*, 373-405 (1989).*
37. D.J. Depew and B.H. Weber, "The Evolution of the Darwinian Research Tradition," *Systems Research , 6,* 255-263 (1989).*
38. B.H. Weber and D.J. Depew, "Evolution and General Systems Theory: Towards a Robust Synthesis," *Proceedings of the International Society for the Systems Sciences 33 Number 3*, pp 38-45, (1989).*
39. A. Hariri†, B. Weber, and J. Olmsted III, "On the Validity of Shannon-Information Calculations for Molecular Biological Sequences," *Journal of Theoretical Biology, 147*, 235-254, (1990).*
40. "Ethical Implications of the Interface of Natural and Artificial Systems," B.H. Weber, in "*A Delicate Balance: Technics, Culture, and Consequences*, M. Rogers and N. Warren (Eds.), IEEE Press, pp 62-67 (1990) *
41. "Complex Systems Dynamics and the Evolution of Biological Hierarchies," B.H. Weber, in *The Cybernetics of Complex Systems: Self-Organization, Evolution and Social Change*, (F. Geyer, ed.), Intersystems Publications, pp. 31-40 (1991).*
42. "Implications of the Application of Complex Systems Theory to Ecosystems," B.H. Weber, in *The Cybernetics of Complex Systems: Self Organization, Evolution, and Social Change*, (F. Geyer, ed.), Intersystems Publications, pp. 21-30 (1991).*
43. B. H. Weber, "Glynn and the Conceptual Development of the Chemiosmotic Theory: A Retrospective and Prospective View," *Bioscience Reports 11*, 577-617. Also reprinted in book form in *Perspectives in Vectorial Metabolism and Osmochemistry* (P. Mitchell and C.A. Pasternak, eds.) Plenum/Glynn Research Foundation, (1991).*
44. B.H. Weber, "Book Review: *Water* by P. Caro, " *The Quarterly Review of Biology 69*, 516, (1994).*
45. D.J. Depew and B.H. Weber, *Darwinism Evolving: Systems Dynamics and the Genealogy of Natural Selection*, MIT, (1995).*
46. D.J. Depew and B.H. Weber, "Evolution, Ethics, and the Complexity Revolution," in *Evolutionary Journeys*, R. Wesson and P. Williams (eds.), Rodopi, pp. 49-77 [1995].*
47. B.H. Weber and D.J. Depew, "Natural Selection and Self-Organization: Dynamical Models as Clues to Possible New Evolutionary Synthesis," *Biology and Philosophy 11,* 33-65 (1996).*
48. B.H. Weber, "Origins of Order in Dynamical Models," *Biology and Philosophy 13*, 133-144 (1998).*
49. B.H. Weber, "Early Adventures in Biochemistry," *The Biochemist 18 (2)*, 15 [1996].*
50. B.H. Weber and D.J. Depew, "Does the Second Law of Thermodynamics Refute the Neo-Darwinian Synthesis?" in *Sociobiology and Bioeconomics: The Theory of Evolution in Biological and Economic Theory,* P. Koslowski (ed.), Springer-Verlag, pp. 50-75 (1999).*

51. B.H. Weber, “Emergence of Life and Biological Selection from the Perspective of Complex Systems Dynamics,” *in Evolutionary Systems*, G. van de Vijver, S.S. Salthe and M Delpos (eds), Kluwerpp. 59-66 (1998).*
52. S.A. Hewitt, B.H.Weber, J. Olmsted III, and A. Flores, “Ethics in Undergraduate Research: Getting Students Involved,” *Council on Undergraduate Research Quarterly 18*, 117-119 (1998).*
53. D.J. Depew and B.H. Weber, “Self-Organization,” *MIT Encyclopedia of Cognative Science*, MIT Press, pp. 737-739 (1998).*
54. D.J. Depew and B.H. Weber, “What Does Natural Selection Have to Be Like In Order to Work with Self-Organization?” *Cybernetics and Human Knowing 5*, 18-31 (1998).*
55. B.H. Weber, “Irreducible Complexity and the Problem of Biochemical Emergence,” *Biology and Philosophy 14*, 593-605 (1999).*
56. B.H. Weber, “Biochemical Complexity: Emergence or Design?” *Rhetoric and Public Affairs 1*, 611-616 (1999).*
57. B.H. Weber and D.J. Depew, “Developmental Systems, Darwinian Evolution, and the Unity of Science” in *Cycles of Contingency*, S. Oyama, R. Gray and P. Griffiths (eds), MIT Press pp. 239-253 (2001).*
58. B.H. Weber and D.J. Depew, “The Modern Evolutionary Synthesis and Complex Systems Dynamics: Prospects for a New Synthesis,” in *Semiosis.Energy.Evolution*, E. Taborsky (ed), Shaker Verlag, pp. 263-281 (2000).*
59. B.H. Weber, “Closure in the Emergence and Evolution of Life*” New York Academy of Science 901*, 132-138 (2000).*
60. B.H. Weber and T.C. Deacon, “Thermodynamic Cycles, Developmental Systems, and Emergence,” *Cybernetics and Human Knowing 7*, 21-43 (2000).*
61. B.H. Weber and S. Brier, “Forward,” *Cybernetics and Human Knowing 7*, 3-5 (2000).
62. B.H. Weber, “Welcome to the Land of Opportunity.” *Hispanic Outlook in Higher Education11(5)*, 13-15 (2000).
63. B.H. Weber, “Bringing Chemistry to Life: From Matter to Man,’ *The Biochemist* 22(5): 56-58 (2000).
64. Hofmann, J.R. and B.H. Weber (2003), “The Fact of Evolution: Implications for Science Education,” *Science and Education* 12” 729-760.
64. Prebble, J. and B.H. Weber (2003), *Wandering in the Gardens of the Mind: Peter Mitchell and the Making of Glynn*, New York: Oxford University Press.
65. Weber, B.H. (2003), “ Emergence of Mind and the Baldwin Effect,” in *Evolution and Learning: The Baldwin Effect Reconsidered* (B.H. Weber and D.J. Depew, eds), Cambridge MA: MIT Press , pp. 309-326.
66. Weber, B.H. and D.J. Depew (2003), *Evolution and Learning: The Baldwin Effect Reconsidered*, Cambridge MA: MIT Press.
67. Weber, B.H. and D.J. Depew (2004), “Darwinism, Design, and Complex Systems Dynamics,” in The Appearance of Design in Nature (W. Dembski, and M. Ruse eds), Cambridge: Cambridge University Press, pp. 173-190.
68. Weber, B.H. and J. Prebble (2005), “An Issue of Originality and Priority: The Correspondence and Theories of Oxidative Phosphorylation of Peter Mitchell and Robert J.P. Williams, 1961-1980.” *Journal of the History of Biology* (accepted, in press).
69. Weber, B.H., “Life”, *Stanford Encyclopedia of Philosophy* (Fall 2003 edition), Edward N. Zalta(ed.), URP=http://plato.stoanford.edu/archives/fall2003/entries/life/
70. Weber, B.H. (2005), “The Past Illuminates the Present.” *Biology and Philosophy* (in press).
71. Weber, B.H. (2005), “Re-visioning Evolutionary Psychology.” *American Journal of Psychology* (in press).

Funded Grants

Burroughs-Wellcome, 2000-2001, “A Biography of Dr. Peter Dennis Mitchell” $1,300.
National Institutes of Health, 1999-2005, LA Basin Minority International Research Training $1,167,792
National Institutes of Health, 1998-2002, “Minority Student Development at CSU Fullerton” $2,120,351
National Institutes of Health, 1994-1999 "LA Basin Minority International Research Training" $562,506
National Institutes of Health, 1996-97, “MBRS Supplement” $247,236
National Institutes of Health, 1995-96, “MBRS Equipment Supplement” $76,340
National Institutes of Health, 1993-98, "MBRS Program at California State University, Fullerton" $1,485,341

National Science Foundation, 1992-94, "Science, Ethics and the Environment" (as CoPI) ($24,980)
Burroughs-Wellcome Fund, 1992-93, "Criticism and the Growth of Chemiosmotic Concepts" $2,000
Hughes Faculty Research Grant, 1992, "A Scientific Biography of Peter Mitchell" $900
National Institutes of Health, 1990-93, "MBRS Program at California State University, Fullerton" $420,000
Burroughs-Wellcome Fund, 1991, "Criticism and the Growth of Chemiosmotic Concepts"$2,500
Hughes Faculty Research Grant, 1991, "Conceptual Foundations of Vectorial Chemistry and the Chemiosmotic Theory" $600
Hughes Faculty Research Grant, 1990, "The Centrality of Chemistry in Historical and Philosophical Perspective: A Case Study of the Conceptual Development of Bioenergetics" $752
Hughes Faculty Research Grant, 1989, "Applicaiton of Nonequilibrium Thermodynamics to the Origin of Life" $1,200
Hughes Faculty Research Grant, 1988-89, "Application of Nonequilibrium Thermodynamics to Self-Organizing systems" $1,200
Hughes Faculty Research Grant, 1987-88, "Transport, Metabolism and Bioenergetics" $1,200
Full Professor Summer Research Grant, 1986, "The Conceptual Development of Bioenergetics" $3,000
Hughes Faculty Research Grant, 1985. “Application of Nonequilibrium Thermodynamics to Evolution” $1,200
Burroughs-Wellcome Fund, 1982-3. “Mechanisms of ATP Synthesis and Posphoryl Transfer” $2,500
National Science Foundation 1982-3, “Historical Analysis of the Development and Evaluation of Chemiosmotic Concepts” $25,000.
National Science Foundation, 1981, “The Development of Chemiosmotic Concepts” $5,000
American Philosophical Society, 1980, “Historical Development of the Chemiosmotic Concept” $1,000
National Science Foundation 1978-81, Co-PI with G. Nagel, PI, “Glycyl tRNA Synthetase”
National Institutes of Health, 1975-6, “Isolation of Neurotransmitter Synthesizing Enzymes” $15,000
Natioinal Science Foundation, 1973-75, “Structure, Mechanism and Evolution of Phosphoglycerate Kinase” $30,000
National Institutes of Health, 1971-74, “Selected Probes of Protein Structure-Function” $80,000
Research Corporation, 1970-71, “Crystallization of Proteins” $4,000

Presentation at Meetings (selected, last several years)

"Developing a New Field of Inquiry: The Chemiosmotic Revolution--The Role of Institutions," International Society for the History, Philosophy and Social Science of Biology Meeting, Northwestern University, July 11, 1991.

"Natural Selection and Self-Organizaiton," International Society for the History, Philosopy, and Social Science of Biology Meeting, Northwestern Univeristy, July 12, 1992.

"An Evolving Philosophy of Biology Course: Adventures in Team Teaching," International Society for the History, Philosophy and Social Science of Biology, Northwestern University, July 13, 1991.

"On the Relationship of Natural Section and Self Organization", at the meeting of the WashingtonEvolutionary Systems Society, Arlington, Virginia, November 6, 1991.

"Darwinism Evolving," Smithsonian Institution, March 2, 1992, Washington D.C.

"The Thermodynamics of Nonequilibrium Systems: Conceptual Considerations," keynote address at the Meeting of the Canadian Society for Theoretical Biology at Victoria, Canada, June 16, 1992.

"Vectorial Metabolism and Osmochemistry," Department of Chemistry and Biochemistry, California State University, Fullerton, November 19, 1992.

"Conceptual Change and Integration in Science," Fourteenth Annual Conference of the Association for Integrative Studies, Pomona, California, November 20, 1992.

“Chemiosmotic Theory: A Biochemical Advance of Philosophical Interest,” Unit for History of Philosophy of Science, Department of Philosophy, King’s College of the University of London, 14 January 1993.

"Critical Evaluation of Osmochemistry and Vectorial Metabolism," Department of Chemistry and Biochemistry, California State University, Long Beach, February 17, 1993.

"Peter Mitchell and Vectoral Chemistry," Department of Chemistry, Cal Poly University, San Luis Obispo, March 4, 1993.

"At the Interface of the Physical and Biological Levels: Chemiosmotics and the Origin of Life," International Society for the History, Philosophy and Social Science of Biology, Brandeis University, July 15, 1993.

"A Critical Evaluation of the Gaia Hypothesis," International Society for the History, Philosophy and Social Science of Biology, Brandeis University, July 17, 1993.

"Problems in Scientific Biography: A case Study of the Mitchell-Williams Controversy," International Society for the History, Philosophy and Social Science of Biology, Brandeis University, July 18, 1993.

"Systems Dynamics and the Geneology of Natural Selection," Centre for Philosophical Studies, Kings' College London, October 19, 1994.

"Darwinism Evolving: Systems Dynamics at the Interface of the Physical and Biological Sciences," Center for the Study of the Evolution and Origin of Life, UCLA, February 15, 1995.

"Emergence of Life and Biological Selection from the Perspective of Complex Systems Dynamics," International Workshop on Evolving Ssytems, Vienna, March 8, 1995.

"Does the Second Law of Thermodynamics Refute the Neo-Darwinian Synthesis?" Forshungs Institut für Philosophie Hannover, Hildesheim, April 26, 1996.

“Devices, Desires, and Dangers of the Biographical Turn in the History of Contemporary Science,” Third British-North American History of Science Meeting, July 23, 1996.

“The Mars Rock and the Origin of Life.” Biology Department, California State University, Dominguez Hills, October 22, 1996.

“”ALH84001: Evidence for Life on Mars or Hints about the Origin of Life?” Center for the Study of the Evolution and Origin of Life, UCLA, December 5, 1996.

“Developmental Systems, Thermodynamic Imperatives, Autocatalytic Cycles, and Natural Selection,” International Society for the History, Philosophy, and Social Science of Biology, Seattle, July 18, 1997.

“The Second Law of Thermodynamics and Natural Selection,” International Symposium on Time, Heat and Order, Institute for Philosophy, University of Aarhus, Denmark 10 September 1997

“The Modern Evolutionary Synthesis and Complex Systems Dynamics,” International Symposium on Semiosis.Evolution.Energy, University of Toronto, 17 October 1997.

“Wandering in the Gardens of the Mind: Peter Mitchell and the ‘Ox-Phos Wars,’” Project on the Rhetoric of Inquiry, University of Iowa, 30 October 1997.

“Emergence of Biological Order through the Interaction of Selection and Self-Organization,” Division of Science, Bennington College, 4 May, 1998.

“”Tracking Minority Student Progress,” Evaluation Exploration Workshop, NIH, Warrenton VA, 26 September 1998.

"Thermodynamics and Information in Development and Evolution," Symposium on Modeling Evolution at the American Association for the Advancement of Science meeting, Anaheim, 22 January 1999.

"Assessing the Minority Scientist Development Program: Measures and Methods," with Leslie Grier and Tom Mayes, Third Annual Assessment Conference, CSUF, 5 March 1999.

"Emergence and Evolution of Life: Multiple Discourses or One?" international conference on Closure: Emergent Organizations and their Dynamics, University of Gent, Belgium, 3 May 1999.

"Developing Program Assessment Tools for MSD/MARC", with Robert A. Koch, Leslie Grier, Thomas Mays and Julia Wan, NIH-MORE Program Directors' Meeting, Chantilly, Virginia, 21 June 1999.

"Thermodynamics, Catalytic Cycles and Emergence" at the Bennington Conference on the Evolutionary Emergence of the Embodied Mind, 9 November 1999, Bennington College, VT.

"Assessing the Minority Scientist Development Program: Measures and Methods II", with Leslie Grier and Tom Mayes, Fourth Annual Assessment Conference, CSUF, 3 March 2000.

"Qualitative Assessment Methods",NIH- IMSD Program Directors Meeting, Asilomar, 20 March 2000.

"Religion in an Age of Science" Workshop presented for the Episcopal Diocese of Los Angeles, 10 March 2001; at St. Peter's Episcopal Church, Bennington VT, 6 December 2001.

"In Defense of Common Descent," presented at the 6th International History, Philosophy and Science Teaching Conference, Denver Co, 7-11 November, 2001.

"How Intelligent is Intelligent Design?" 27 September 2002, Bennington College, VT.

"Nobel Prize Fights: Discovery and Controversy in the Development of Chemiosmotic Concepts" 25 October 2002, Department of Biochemistry, University of Vermont; 12 November 2002, Division of Science, Bennington College.

"The Cambrian Explosion" 14 October 2003, Division of Science, Bennington College.

"The Biochemistry Department at Cambridge (1939-1955) Viewed Through the Experience of Peter Mitchell" 13 January 2004, Department of Biochemistry Symposium, Cambridge University.

"Science, Religion and Eugenics in the Thought of Ronald Fisher: An Incoherent Mix?" 19 October 2004, Division of Science, Bennington College.

Recent University and Community Service

Chair, Chemistry and Biochemistry Department, 1995-1998
Acting Chair, Chemistry and Biochemistry Department, 1989-90
Vice Chair, Chemistry and Biochemistry Department, 1983-87, 1990-1995
Director CSUF MBRS Program 1990-1998
Director CSUF MSD Program 1998-2001
Director LA Basin Minority International Research Training 1995-2004
Member, Institute for Molecular Biology and Nutrition, 1970-present
Director, Institute for Molecular Biology and Nutrition, 1977-79
Member, Health Professions Committee, 1970-1999
Acting Health Professions Coordinator, 1980-81, 1994
Member, University Personnel Committee, 1977-79
Member, General Education Committee, 1983-87
Chair, General Education Committee, 1985-87
At-Large Member of Academic Senate, 1986-87

Member, Liberal Studies Advisory Board, 1977-present
Chair, Biology Performance Review Committee, 1993
Member, President's Scholars Selection Committee, 1979-80, 1994-present
Member, Hispanic Scholars Selection Committee, 1994-present
Member, Chemistry Department Personnel Committee, 1974-75, 1976-79, 1980-83, 1985-87, 1988-1995
Chair, Chemistry Department Personnel Committee, 1976-77, 1992-93
Chair, Chemistry Department Committee on B.A. and B.S. Degrees in Biochemistry, 1986-89
Member, Medieval Colloquium, 1980-present
Board of Directors, Pacific Interfaith Peace Prize Foundation
Board of Directors, International Society for System Sciences, 1989-1991
Reviewer for MIT Press, Harvard University Press, Oxford University Press, *Journal of Theoretical Biology, Biology and Philosophy, Bioscience Reports, Systems Research, Journal of Biological Systems, BioSystems*
Program Performance Review Committee for Department of Chemistry, CSUN, 1997.
Program Performance Review Committee for Department of Chemistry, CPSUSLO, 1998.
Chair, Resource and Planning Committee 1997-98.
Program Performance Review Committee for Biological Sciences, CSUF, 2000.
Panel Member NIH Review of Proposals for MIRT Programs 2000.
Member of the Board of Governors of Semiosis.Evolution.Energy Institute.
Member of the Board of Editors for journal *Semiotics, Evolution, Energy, Development*.
Member of the Editorial Board for the journal *Cybernetics and Human Knowing.*

Courses Taught (last ten years)

Chem 421A,B	Biological Chemistry
Chem 423A,B	General Biochemistry
Chem 543	Physical Chemistry of Macromolecules
Chem 580	Seminar (Bioenergetics)
LibST 307	Liberal Studies in the Sciences
Phil 386	Philosophy of Biology
Phil 333	Evolution and Creation
LibSt 487	Senior Seminar in Evolution and Creation
Hon 305	Honors Seminar on Evolution and Creation

At Bennington College Philosophy of Biology, The Meanings of Evolution, Molecular Evolution, Emergence of Embodied Mind, Emergent Complexity

†Undergraduate student co-author

‡Graduate student co-author

*Work completed at CSUF