

DAVID SCOTT LAWRENCE

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PROFESSIONAL EXPERIENCE

- 2011- Chair, Division of Chemical Biology & Medicinal Chemistry, UNC Eshelman School of Pharmacy, University of North Carolina at Chapel Hill
- 2007- Fred Eshelman Distinguished Professor, University of North Carolina; Department of Chemistry (College of Arts & Sciences), Division of Chemical Biology & Medicinal Chemistry (Eshelman School of Pharmacy), Department of Pharmacology (School of Medicine), and the Lineberger Comprehensive Cancer Center
- 1997-06 Member, Albert Einstein Comprehensive Cancer Center
- 1996-06 Professor of Biochemistry
Albert Einstein College of Medicine of Yeshiva University
- 1995-96 Professor of Chemistry
State University of New York at Buffalo
- 1992-95 Associate Professor of Chemistry and Medicinal Chemistry; Adjunct Professor of Biological Sciences; Member, Center for Advanced Molecular Biology and Immunology
- 1991-95 Associate Professor of Chemistry
State University of New York at Buffalo
- 1985-91 Assistant Professor of Chemistry
State University of New York at Buffalo
- 1982-85 Postdoctoral Fellow
Research Director: Professor E. Thomas Kaiser
The Rockefeller University and The University of Chicago

EDUCATION

- Ph.D. Organic Synthesis
Research Director: Professor Robert V. Stevens
University of California, Los Angeles June 1982
- B.S. Biological Sciences
University of California, Irvine June 1976

HONORS AND AWARDS

John Gabriel Award (1973), Bank of America Award in Science (1973), Alpha Gamma Sigma (1974), Faculty award (1974), Department of Mathematics Award (1974), Arthur J. Baum Award (1974), Summa cum laude (1976), Phi Beta Kappa (1976), Chancellor's Intern Fellowship (1976), DuPont Teaching Prize (1979), Chancellor's Dissertation Fellowship (1980), NIH Postdoctoral Fellow (1982-1984), Marion Merrell Dow Lecture/Colorado State University (1995), Merck/American Association for the Advancement of Science Lecture/Allegheny College (1996), Sam Rosen Award (2000); Leo M. Davidoff Society (2000); Olympia Dukakis/Richard Zorich Award Grant for A-T Research (2000); AAAS Fellow (2005).

PROFESSIONAL ACTIVITIES

2018	External Reviewer, College of Pharmacy, Virginia Commonwealth University
2016	External Reviewer, College of Pharmacy, University of Texas at Austin
2016	Austrian Science Fund, External Reviewer
2015-	Council, American Peptide Society
2015-2016	Member, The Protein Society
2015-2018	Scientific Founder, Iris BioMed, LLC
2013	Co-organizer, 23 rd American Peptide Symposium and the 6 th International Peptide Symposium
2012	Member, du Vigneaud award committee; American Peptide Society
2012	International Advisory Board, The 7th International Conference on Inhibitors of Protein Kinases, Warsaw, Poland
2012-2018	Member, NIH Macromolecular Structure and Function E Study Section, National Institutes of Health
2011	External Reviewer, Purdue University Cancer Center External Reviewer, Department of Medicinal Chemistry, University of Utah
2010	Macromolecular Structure and Function E Study Section, National Institutes of Health
2009	International Advisory Board, The 6th International Conference on Inhibitors of Protein Kinases, Warsaw, Poland
2008	Chemical and Analytical Sciences Study Section, National Institutes of Health
2007	International Advisory Board, The 5th International Conference on Inhibitors of Protein Kinases, Warsaw, Poland
2006-2008	Consultant, Sigma-Aldrich
2006-2008	Member, American Society for Cell Biology
2005-2007	Member, The Harvey Society
2005	International Advisory Board, The 4th International Conference on Inhibitors of Protein Kinases, Warsaw, Poland
2004-	The American Peptide Society
2004-2007	Member, New York Academy of Science
2004	Scientific Cofounder, OnsetThera, Inc.
2004-2016	Editorial Advisory Board, <i>Accounts of Chemical Research</i>
2003-2007	Editorial Advisory Board, <i>Current Organic Synthesis</i>
2003-2007	Scientific Advisory Board, Panomics, Inc.
2003	International Advisory Board, The 3rd International Conference on Inhibitors of Protein Kinases, Warsaw, Poland
2003	Guest Editor, <i>Accounts of Chemical Research</i> , Special Issue on Signal Transduction
2002-2006	Member, American Society for Biochemistry and Molecular Biology
2001	International Advisory Board, The 2nd International Conference on Inhibitors of Protein Kinases, Warsaw, Poland
2000-2002	Scientific Advisory Board, Keyrx Biopharmaceuticals
2000-2004	Bioorganic and Natural Products Chemistry Study Section, National Institutes of Health
1999	Biochemistry Study Section, National Institutes of Health.
1999	Organizer of Symposium on “Biosensors: Visualizing the Chemistry of Living Cells”, American Chemical Society Western Regional Meeting, Ontario, California.
1998	International Advisory Board, The International Conference on Inhibitors of Protein Kinases, Warsaw, Poland

1997	Chemical and Related Sciences Special Emphasis Study Section, National Institutes of Health
1997	Clinical and Experimental Therapeutics Study Section, The USAMRMC Breast Cancer Research Program
1996-1997	Scientific Advisory Committee on Cancer Drug Development, American Cancer Society
1991-1996	Scientific Advisory Committee on Biochemistry and Endocrinology, American Cancer Society
1994	Chemical and Related Sciences Special Emphasis Study Section, National Institutes of Health
1982-	Member, American Association for the Advancement of Science
1977-	Member, American Chemical Society

PUBLICATIONS

1. Kenneth N. Trueblood, Carolyn B. Knobler, David S. Lawrence, and Robert V. Stevens, "Structures of the 1:1 Complexes of 18-Crown-6 with Hydrazinium Perchlorate, Hydroxylammonium Perchlorate, and Methylammonium Perchlorate". *Journal of the American Chemical Society*, **1982**, *104*, 1355 - 1362.
2. Robert V. Stevens, Fred C. Gaeta, and David S. Lawrence, "Camphorae: Chiral Intermediates for the Enantiospecific Total Synthesis of Steroids. Part 1". *Journal of the American Chemical Society*, **1983**, *105*, 7713 - 7719.
3. Emil Thomas Kaiser and David Scott Lawrence, "Chemical Mutation of Enzyme Active Sites". *Science*, **1984**, *226*, 505 - 511.
4. Catherine A. O'Brian, David S. Lawrence, E. Thomas Kaiser, and I. Bernard Weinstein, "Protein Kinase C Phosphorylates the Synthetic Peptide Arg-Arg-Lys-Ala-Ser-Gly-Pro-Pro-Val in the Presence of Phospholipid Plus Either Ca²⁺ or a Phorbol Ester Tumor Promoter". *Biochemical and Biophysical Research Communications*, **1984**, *124*, 296 - 302.
5. Robert V. Stevens and David S. Lawrence, "Camphorae: Chiral Intermediates for the Total Synthesis of Steroids". Part 2. An Enantiospecific Approach Toward Vitamin D Metabolites". *Tetrahedron* **1985**, *41*, 93 - 100.
6. Michael B. Doughty and David S. Lawrence, "On the Intramolecular Cyclization of a Thiazolium Salt". *Journal of the Chemical Society, Chemical Communications*, **1985**, 454 - 455.
7. Emil Thomas Kaiser, David Scott Lawrence, and Steven Edward Rokita, "The Chemical Modification of Enzymatic Specificity". *Annual Reviews in Biochemistry*, **1985**, *54*, 565 - 595.
8. Emil Thomas Kaiser and David S. Lawrence in "Frontiers in the Chemical Sciences", W. Spindel and R. M. Simon, eds., Westview Press, Boulder, Colorado, **1986**, 425 - 439.
9. Mary Prorok and David S. Lawrence, "Intrasubstrate Steric Interactions in the Active Site Control the Substrate Specificity of the cAMP-Dependent Protein Kinase". *Biochemical and Biophysical Research Communications*, **1989**, *158*, 136 - 140.
10. Mary Prorok and David S. Lawrence, "Cryopreservation of the Cyclic 3'-5'-Adenosine Monophosphate-Dependent Protein Kinase from Bovine Cardiac Muscle". *Journal of Biochemical and Biophysical Methods*, **1989**, *18*, 167 - 176.
11. Mary Prorok, Dinesh Sukumaran, and David S. Lawrence, "The Cyclic AMP-Dependent Protein Kinase from Bovine Cardiac Muscle is a Homoserine Kinase". *Journal of Biological Chemistry*, **1989**, *264*, 17727 - 17733.

12. Mary Prorok and David S. Lawrence, "Multiple Arginine Residues Contribute to the Increased Efficacy of Peptide Substrates for the cAMP-Dependent Protein Kinase". *Biochemical and Biophysical Research Communications*, **1989**, *165*, 368 - 371.
13. John S. Manka and David S. Lawrence, "High Yield Synthesis of 5,15-Diarylporphyrins". *Tetrahedron Letters*, **1989**, *30*, 6989 - 6992.
14. John S. Manka and David S. Lawrence, "Self-Assembly of a Hydrophobic Groove". *Tetrahedron Letters*, **1989**, *30*, 7341-7344.
15. John S. Manka and David S. Lawrence, "The Template-Driven Self-Assembly of a Heme-Containing Supramolecular Complex". *Journal of the American Chemical Society*, **1990**, *112*, 2440-2442.
16. Tata Venkata S. Rao and David S. Lawrence, "The Template-Driven Self-Assembly of a Threaded-Molecular Loop". *Journal of the American Chemical Society*, **1990**, *112*, 3614-3615.
17. Allen Salerno, Marianne Mendelow, Mary Prorok, and David S. Lawrence, "Noncovalent Active Site Interactions Enhance the Affinity and Control the Binding Order of Reversible Inhibitors of the cAMP-Dependent Protein Kinase". *Journal of Biological Chemistry*, **1990**, *265*, 18079-18082.
18. John S. Manka, Dennis S. Chugh, and David S. Lawrence, "The Free Base of Tetraphenylporphine Serves as a Host for Alkali Metal Salts". *Tetrahedron Letters* **1990**, *31*, 5873-5876.
19. Mary Prorok and David S. Lawrence, "An Affinity Label of Absolute Peptidic Origin", *Journal of the American Chemical Society*, **1990**, *112*, 8626-8627.
20. Dinesh K. Sukumaran, Mary Prorok, and David S. Lawrence, "A Molecular Constraint that Generates a Cis Peptide Bond", *Journal of the American Chemical Society*, **1991**, *113*, 706-707.
21. Diane Dick, Tata Venkata S. Rao, Dinesh Sukumaran, and David S. Lawrence, "Molecular Encapsulation: Cyclodextrin-Based Analogs of Heme-Containing Proteins", *Journal of the American Chemical Society*, **1992**, *114*, 2664-2669.
22. Diane Dick, Scott Pluskey, Dinesh K. Sukumaran, and David S. Lawrence, "NMR Spectral Analysis of Cytotoxic Ether Lipids", *Journal of Lipid Research* **1992**, *33*, 605-609.
23. Diane L. Dick and David S. Lawrence, "The Physicochemical Behavior of Cytotoxic Ether Lipids". *Biochemistry* **1992**, *31*, 8252-8257.
24. Young-Guen Kwon, Jaya Srinivasan, Marianne Mendelow, Tae Ryong Lee, Scott Pluskey, Allen Salerno, and David S. Lawrence, "The Active Site Substrate Specificity of the cAMP-Dependent Protein Kinase". *Journal of Biological Chemistry*, **1993**, *268*, 10713-10716.
25. Marianne Mendelow, Mary Prorok, Allen Salerno, and David S. Lawrence, "ATPase Promoting Dead End Inhibitors of the cAMP-Dependent Protein Kinase". *Journal of Biological Chemistry*, **1993**, *268*, 12289-12296.

26. Allen Salerno and David S. Lawrence, "Covalent Modification and Concomitant Inactivation of the cAMP-Dependent Protein Kinase by Affinity Labels Containing only L-Amino Acids". *Journal of Biological Chemistry* **1993**, 268, 13043-13049.
27. Young-Guen Kwon, Jaya Srinivasan, Marianne Mendelow, Scott Pluskey, and David S. Lawrence, "Stereochemistry Specifies the Regiochemistry of Phosphorylation in Two cAMP-Dependent Protein Kinase Substrates". *Journal of Biological Chemistry*, **1993**, 268, 16725-16729.
28. Young-Guen Kwon, Jaya Srinivasan, Marianne Mendelow, Scott Pluskey, and David S. Lawrence, "The cAMP-Dependent Protein Kinase Discriminates Between Prochiral Hydroxyl Groups". *Journal of the American Chemical Society* **1993**, 115, 7527-7528.
29. Tae Ryong Lee, Marianne Mendelow, Jaya Srinivasan, Young-Guen Kwon, and David S. Lawrence, "The Molecular Basis for the Substrate Specificity of a Serine/Threonine-Specific Protein Kinase". *Journal of the American Chemical Society* **1993**, 115, 9888-9891.
30. Young-Guen Kwon, Marianne Mendelow, and David S. Lawrence, "The Active Site Substrate Specificity of Protein Kinase C". *Journal of Biological Chemistry* **1994**, 269, 4839-4844.
31. Tae Ryong Lee, Jinkui Niu, and David S. Lawrence, "The Phenol Kinase Activity of the cAMP-Dependent Protein Kinase: Steric and Electronic Effects". *Biochemistry* **1994**, 33, 4245-4250.
32. Jungsook Cho Lee, Young-Guen Kwon, David S. Lawrence, and Arthur M. Edelman, "Both Basic and Hydrophobic Residues are Important Substrate Recognition Determinants of Ca²⁺-Calmodulin-dependent Protein Kinase Ia". *Proc. Natl. Acad. Sci. USA* **1994**, 91, 6413-6417.
33. Tao Jiang, Dinesh K. Sukumaran, Sunil-Dutta Soni, and David S. Lawrence, "The Synthesis and Characterization of a Pyridine-Linked Cyclodextrin Dimer". *Journal of Organic Chemistry*, **1994**, 59, 5149-5155.
34. Tao Jiang and David S. Lawrence, "Sugar-Coated Metallated-Macrocycles". *Journal of the American Chemical Society*, **1995**, 117, 1857-1858.
35. Tae Ryong Lee, Jinqi Niu, and David S. Lawrence, "The Extraordinary Active Site Substrate Specificity of pp60^{src}: A Multiple Specificity Protein Kinase". *Journal of Biological Chemistry*, **1995**, 270, 5375-5380.
36. Jaya Srinivasan, Mary Koszelak, Young-Guen Kwon, and David S. Lawrence, "The Design of Peptide-Based Substrates for the CDC2 Protein Kinase". *Biochemistry Journal*, **1995**, 309, 927-931.
37. Tao Jiang, Michael Levett, and David S. Lawrence, "Self-Assembling Supramolecular Complexes". *Chemical Reviews*, **1995**, 95, 2229-2260.

38. Tae Ryong Lee, Jeffrey H. Till, David S. Lawrence, and W. Todd Miller "Precision Substrate Targeting of Protein Kinases: v-Abl and c-Src". *Journal of Biological Chemistry*, **1995**, 270, 27022-27026.
39. Tao Jiang and David S. Lawrence, "The Synthesis and Molecular Recognition Properties of a Cyclodextrin Tetramer". *Journal of Organic Chemistry*, **1995**, 60, 7293-7297.
40. Derek Dunn, Li Chen, David S. Lawrence, and Zhong-Yin Zhang, "The Active Site Specificity of the *Yersinia* Protein Tyrosine Phosphatase". *Journal of Biological Chemistry*, **1996**, 271, 168-173.
41. Douglas S. Werner, Tae Ryong Lee, and David S. Lawrence, "Is Protein Kinase Substrate Efficacy a Reliable Barometer for Successful Inhibitor Design?" *Journal of Biological Chemistry*, **1996**, 271, 180-185.
42. Jason S. Wood, Xiongwei Yan, Marianne Mendelow, Jackie D. Corbin, Sharron H. Francis, and David S. Lawrence, "Precision Substrate Targeting of Protein Kinases: The cGMP- and cAMP-dependent Protein Kinases". *Journal of Biological Chemistry*, **1996**, 271, 174-179.
43. Xiongwei Yan, Jackie D. Corbin, Sharron H. Francis, and David S. Lawrence "Precision Targeting of Protein Kinases: An Affinity Label that Inactivates the cGMP- but not the cAMP-dependent Protein Kinase". *Journal of Biological Chemistry*, **1996**, 271, 1845-1848.
44. Chengqian Wang, Tae Ryong Lee, David S. Lawrence, and Joseph A. Adams, "Rate-Determining Steps for Tyrosine Phosphorylation by the Kinase Domain of v-fps". *Biochemistry*, **1996**, 35, 1533-1539.
45. Javier Montserat, Li Chen, David S. Lawrence, and Zhong-Yin Zhang, "Potent Low Molecular Weight Protein Phosphatase Substrates". *Journal of Biological Chemistry*, **1996**, 271, 7868-7872.
46. Li Chen, Javier Montserrat, David S. Lawrence, and Zhong-Yin Zhang, "The PTP1 and VHR Protein Phosphatases Exhibit Different Preferences for Nonpeptidic Substrates". *Biochemistry*, **1996**, 35, 9349-9354.
47. Xiongwei Yan, David S. Lawrence, Jackie D. Corbin, and Sharron H. Francis, "Distinguishing Between Closely Related Protein Kinases: A Variation on the Bisubstrate Inhibitor Theme". *Journal of the American Chemical Society*, **1996**, 118, 6321-6322.
48. Xiongwei Yan, David S. Lawrence, Jackie D. Corbin, and Sharron H. Francis, "*Journal of the American Chemical Society*, **1996**, 118, 11684-11685.
49. Scott Pluskey, Mohammad Mahroof-Tahir, Debbie C. Crans, and David S. Lawrence, "Vanadium Oxoion-Induced Inhibition Of and Cofactor Substitution In the cAMP-Dependent Protein Kinase". *Biochemical Journal*, **1997**, 321, 333-339.
50. Jinkui Niu and David S. Lawrence "Nonphosphorylatable Tyrosine Surrogates: Implications for Protein Kinase Inhibitor Design" *Journal of Biological Chemistry*, **1997**, 272, 1493-1499.

51. Jinkui Niu and David S. Lawrence “L-Dopa: A Potent Nonphosphorylatable Tyrosine Mimetic for pp60^{c-src}”. *Journal of the American Chemical Society*, **1997**, *119*, 3844-3845.
52. Varda Lev-Ram, Tao Jiang, Jason Wood, David S. Lawrence, and Roger Y. Tsien, “Synergies and Coincidence Requirements Between NO, cGMP, and Ca²⁺ in the Induction of Cerebellar Long-Term Depression” *Neuron*, **1997**, *18*, 1025-1038.
53. Yoram A. Puius, Yu Zhao, Michael Sullivan, David S. Lawrence, Steven C. Almo, and Zhong-Yin Zhang “Identification of a Second Phosphotyrosine-Binding Site in PTP1B: A Paradigm for Inhibitor Design”. *Proc. Natl. Acad. Sci. USA*, **1997**, *94*: 13420-13425.
54. David S. Lawrence and Jinkui Niu “Protein Kinase Inhibitors: The Tyrosine-Specific Protein Kinases”. *Pharmacology & Therapeutics*, **1998**, *77*, 81-114.
55. Ronald R. White, Young-Guen Kwon, Meng Taing, David S. Lawrence, and Arthur M. Edelman “Definition of Optimal Substrate Recognition Motifs of Ca²⁺-Calmodulin-Dependent Protein Kinases IV and II Reveals Shared and Distinctive Features”. *Journal of Biological Chemistry*, **1998**, *273*, 3166-3172.
56. Jason S. Wood, Mary Koszelak, Judy Liu, and David S. Lawrence “A Caged Protein Kinase Inhibitor” *Journal of the American Chemical Society*, **1998**, *120*, 7145-7146.
57. Kieran Curley and David S. Lawrence “Photoactivation of a Signal Transduction Pathway in Living Cells”. *Journal of the American Chemical Society*, **1998**, *120*, 8573-8574.
58. Adam A. Profit, Tae Ryong Lee, and David S. Lawrence “Bivalent Inhibitors of Protein Tyrosine Kinases”. *Journal of the American Chemical Society*, **1999**, *121*, 280-283.
59. Kieran Curley and David S. Lawrence “Light-Activated Proteins” *Current Opinion Chemical Biology*, **1999**, *3*, 84-88.
60. Kieran Curley and David S. Lawrence “Caged Regulators of Signaling Pathways” *Pharmacology & Therapeutics*, **1999**, *82*, 347-354.
61. Meng Taing, Yen-Fang Keng, Kui Shen, David S. Lawrence, and Zhong-Yin Zhang “Potent and Highly Selective Inhibitors of the PTP1B Protein Tyrosine Phosphatase”. *Biochemistry*, **1999**, *38*, 3793-3803.
62. Tae Ryong Lee and David S. Lawrence “Acquisition of Selective High-Affinity, SH2-Targeted Ligands via a Spatially-Focused Library”. *Journal of Medicinal Chemistry*, **1999**, *42*, 784-787.
63. Stefan W. Vetter, Y.-F. Keng, David S. Lawrence, and Zhong-Yin Zhang “Substrate Specificity of Protein Tyrosine Phosphatase 1B Determined By A Novel Combinatorial Approach” *Journal of Biological Chemistry*, **2000**, *275*, 2265-2268.
64. Tae Ryong Lee, and David S. Lawrence “SH2-Directed Ligands of the Lck Tyrosine Kinase”, *Journal of Medicinal Chemistry*, **2000**, *43*, 1173-1179.

65. Mauro Sarmiento, Yuram A. Puius, Stefan W. Vetter, Yen-Fang Keng, Li Wu, Yu Zhao, David S. Lawrence, Steven C. Almo, and Zhong-Yin Zhang "Structural Basis of Plasticity in Substrate Recognition by Protein Tyrosine Phosphatase 1B", *Biochemistry*, **2000**, 39, 8171-8179.
66. Xiongwei Yan, Kieran Curley, and David S. Lawrence "The Specificity of the PKC α , β , and γ isoforms As Assessed By An Unnatural Alcohol-Appended Peptide Library", *Biochemical Journal*, **2000**, 349, 709-715.
67. Noureddine Zebda, Ora Bernard, Susan Welti, Maryse Bailly, David S. Lawrence, and John S. Condeelis "Phosphorylation of ADF/Cofilin Abolishes EGF-Induced Actin Nucleation at the Leading Edge and Subsequent Lamellipod Extension", *Journal of Cell Biology*, **2000**, 151, 1119-1127.
68. Ottavio Arancio, Irina Antonova, Stepan Gambaryan, Suzanne M. Lohmann, Jason S. Wood, David S. Lawrence, and R. D. Hawkins "Presynaptic Role of cGMP-Dependent Protein Kinase During Long-Lasting Potentiation", *Journal of Neuroscience*, **2001**, 21, 143-149.
69. Bo Zhou, Li Wu, Kui Shen, Jialin Zhang, David S. Lawrence, and Zhong-Yin Zhang "Recognition of and Activation by ERK2 Involves Multiple Regions of MKP3", *Journal of Biological Chemistry*, **2001**, 276, 6506-6515.
70. Adam A. Profit, Tae Ryong Lee, Jinkui Niu, and David S. Lawrence "Molecular Rulers: An Assessment of Distance and Spatial Relationships of Src Tyrosine Kinase SH2 and Active Site Regions", *Journal of Biological Chemistry*, **2001**, 276, 9446-9451.
71. Ren-Hwa Yeh, Tae Ryong Lee, and David S. Lawrence "From Consensus Sequence Peptide to High Affinity Ligand: A "Library-Scan" Strategy", *Journal of Biological Chemistry*, **2001**, 276, 12235-12240.
72. David S. Lawrence "Functional Proteomics: Large Scale Analysis of Protein Kinase Activity", *GenomeBiology*, **2001**, 2, 1007.1 - 1007.3.
73. John S. Condeelis, Jeffrey B. Wyckoff, Maryse Bailly, Richard Pestell, David Lawrence, Jonathan S. Backer, and Jeffrey E. Segall "Lamellipodia in Invasion", *Seminars Cancer Biology*, **2001**, 11, 119-128.
74. Kui Shen, Yen-Fang Keng, Li Wu, Xiao-Ling Guo, David S. Lawrence, and Zhong-Yin Zhang "Acquisition of A Specific and Potent PTP1B Inhibitor from a Novel Combinatorial Library and Screening Procedure" *Journal of Biological Chemistry*, **2001**, 276, 47311-47319.
75. Ren-Hwa Yeh, Tae Ryong Lee, and David S. Lawrence "From Consensus Sequence to High-Affinity Ligands: Acquisition of Signaling Protein Modulators" *Pharmacology & Therapeutics*, **2002**, 93, 179-191.

76. Ren-Hwa Yeh, Xionwei Yan, Michael Cammer, Anne R. Bresnick, and David S. Lawrence "Real Time Visualization of Protein Kinase Activity in Living Cells" *Journal of Biological Chemistry*, **2002**, 277, 11527-11532.
77. Mousumi Ghosh, Ilia Ichetovkin, Xiaoyan Song, John S. Condeelis, and David S. Lawrence "A New Strategy for Caging Proteins Regulated by Kinases" *Journal of the American Chemical Society*, **2002**, 124, 2440-2441.
78. Chien-An Chen, Ren-Hwa Yeh, and David S. Lawrence "Design and Synthesis of a Fluorescent Reporter of Protein Kinase Activity" *Journal of the American Chemical Society*, **2002**, 124, 3840-3841.
79. Weiyang Lin and David S. Lawrence "Photolabile Protecting Group" *Journal of Organic Chemistry*, **2002**, 67, 2723-2726.
80. Xiao-Ling Guo, Kui Shen, Fang Wang, David S. Lawrence, and Zhong-Yin Zhang "Probing the Molecular Basis for Potent and Selective PTP1B Inhibition" *Journal of Biological Chemistry*, **2002**, 277, 41014-41022.
81. Weiyang Lin, Chris Albanese, Richard G. Pestell, and David S. Lawrence "Spatially-Discrete Light-Driven Protein Expression", *Chemistry & Biology*, **2002**, 9, 1347-1353.
82. Limin Shang, Young-Guen Kwon, Sandip K. Nandy, David S. Lawrence, and Arthur M. Edelman, "Catalytic and Regulatory Domains of Doublecortin Kinase-1", *Biochemistry*, **2003**, 42, 2185-2194.
83. David S. Lawrence "Chemical Biology of Signal Transduction", *Accounts of Chemical Research*, **2003**, 39, 353-354.
84. David S. Lawrence "Chemical Probes of Signal Transducing Enzymes", *Accounts of Chemical Research*, **2003**, 36, 401-409.
85. Fabo Liang, Zhinghui Huang, Seung-Yub Lee, Jiao Liang, Maya I. Ivanov, Andres Alonso, James B. Bliska, David S. Lawrence, Tomas Mustelin, and Zhong-Yin Zhang "Aurintricarboxylic Acid Blocks *in vitro* and *in vivo* Activity of YopH, an Essential Virulent Factor of *Yersinia Pestis*, the Agent of Plague" *Journal of Biological Chemistry*, **2003**, 278, 41734-41741.
86. Jin-Peng Sun, Alexander A. Federov, Seung-Yub Lee, Xiao-Ling Guo, Kui Shen, David S. Lawrence, Steven C. Almo, and Zhong-Yin Zhang "Crystal Structure of PTP1B Complexed with a Potent and Selective Bidentate Inhibitor" *Journal of Biological Chemistry*, **2003**, 278, 41734-41741.
87. Laiping Xie, Seung-Yun Lee, Jannik N. Andersen, Steve Waters, Kui Shen, Xiao-Ling Guo, Niels Peter H. Moller, Jerrold M. Olefsky, David S. Lawrence, and Zhong-Yin Zhang "Cellular Effects of Small Molecule PTP1B Inhibitors on Insulin Signaling" *Biochemistry*, **2003**, 42, 12792-12804.

88. Willem F. Veldhuyzen, Quan Nguyen, Gary McMaster, and David S. Lawrence “A Light-Activated Probe of Intracellular Protein Kinase Activity” *Journal of the American Chemical Society*, **2003**, *125*, 13358-13359.
89. Jung Hwan Lee, Sandip K. Nandy, and David S. Lawrence “A Highly Potent and Selective PKC α Inhibitor Generated Via Combinatorial Modification of A Peptide Scaffold”, *Journal of the American Chemical Society*, **2004**, *126*, 3394-3395.
90. Biao Xi, Fangxia Guan, and David S. Lawrence “Enhanced Production of Functional Protein From Defective Genes”, *Journal of the American Chemical Society*, **2004**, *126*, 5660-5661.
91. Chien-An Chen, Ren-Hwa Yeh, and David S. Lawrence “Biosensors of Protein Kinase Action: From *In Vitro* Assays to Living Cells” *Biochimica Biophysica Acta*, **2004**, *1697*, 39-51.
92. Mousumi Ghosh, Xiaoyan Song, Ghassan Mouneimne, Mazen Sidani, David S. Lawrence, and John S Condeelis “Cofilin Promotes Actin Polymerization and Defines the Direction of Cell Motility”, *Science*, **2004**, *303*, 743-746.
93. David S. Lawrence “New Design Strategies for Ligands That Target Protein Kinase-Mediated Protein-Protein Interactions” in *Handbook of Experimental Pharmacology: Inhibitors of Protein Kinases and Protein Phosphatases*, editors: Lorenzo A. Pinna and Patricia W. Cohen, Springer-Verlag, **2005**, *167*, 11-44.
94. Sanjai Kumar, Fubo Liang, David S. Lawrence, and Zhong-Yin Zhang “Small Molecule Approach to Studying Protein Tyrosine Phosphatase” *Methods* **2005**, *35*, 9-21.
95. Seung-Yub Lee, Fubo Liang, Xiao-Ling Guo, Laiping Xie, David S. Lawrence, and Zhong-Yin Zhang “Cell Penetrating Peptides: An Assessment of Intracellular Release of Active Cargo”, *Angewandte Chemie International Edition*, **2005**, *44*, 2-4.
96. John S. Condeelis and David S. Lawrence “The Application of Caged Proteins to Cell-Based Systems” in *Dynamic Studies in Biology: Phototriggers, Photoswitches, and Caged Compounds*, editors: Maurice Goeldner and Richard Givens, **2005**, 325-340.
97. Robert H. Singer, David Lawrence, Ben Ovryn, and John Condeelis “Light-Activated Imaging of Gene Expression in Living Cells”, *Journal of Biomedical Optics*, **2005**, *10*, 051406-1 – 051406-9.
98. Haishan Li and David S. Lawrence “Acquisition of Fyn-Selective SH3 Domain Ligands via A Combinatorial Library Strategy”, *Chemistry & Biology*, **2005**, *12*, 905-12.
99. Qunzhao Wang and David S. Lawrence “Phosphorylation-Driven Protein-Protein Interactions: A New Protein Kinase Sensing System”, *Journal of the American Chemical Society*, **2005**, *127*, 7684-5.
100. Fubo Liang, Seung-Yub Lee, Jiao Liang, David S. Lawrence, and Zhong-Yin Zhang “The Role of Protein Tyrosine Phosphatase 1B in Integrin Signaling”, *Journal of Biological Chemistry*, **2005**, *280*, 24857-63.

101. David S. Lawrence “Signaling Protein Inhibitors via the Combinatorial Modification of Peptide Scaffolds”, *Biochimica Biophysica Acta*, **2005**, 1754, 50-57.
102. David S. Lawrence “*In vivo* Applications of Caged Proteins and Peptides”, *Current Opinion Chemical Biology*, **2005**, 9, 570-575.
103. Hyangkyu Lee, Laiping Xie, Yong Luo, Seung-Yub Lee, David S. Lawrence, Xiao Bo Wang, Federica Sotgia, Michael P. Lisanti, and Zhong-Yin Zhang “Identification of Phospho-Caveolin-1 as a Novel PTP1B Substrate” *Biochemistry*, **2006**, 45, 234-40.
104. Qunzhao Wang, Sean M. Cahill, Michael Blumenstein, and David S. Lawrence “Self-Reporting Fluorescent Substrates of Protein Tyrosine Kinase”, *Journal of the American Chemical Society*, **2006**, 128, 1808-9.
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CURRENT RESEARCH SUPPORT

Single Cell Sampling of Signaling Activity in Triple Negative Breast Cancer. NIH, 1R01CA203032, Period: December 1, 2015 – November 30, 2020. P.I.: David Lawrence, Co-Is: Nancy Allbritton, Lisa Carey, and Elizabeth Dees. The advent of effective pharmacologic kinase inhibitors for clinical applications has created a critical need for assessing kinase activity, and therefore inhibitor efficacy, in disease models and patient samples. Biochemical analyses of aberrant signaling pathways are informative in terms of identifying the best treatment option and assessing therapeutic effectiveness in individual patients. One of the most critical issues in preclinical and clinical drug discovery is the ability to accurately monitor drug action and patient responsiveness. Indeed, it has been noted in a recent review: “As the age of precision medicine evolves, the heterogeneity of breast cancers continues to challenge the research community, emphasizing the need for robust patient selection strategies to guide the future clinical development of RTK (receptor tyrosine kinase) inhibitors.” Others have pointed out that “understanding tumor heterogeneity - the differences between individual cells in the same tumor - is one of the biggest challenges in cancer research today. The ability to describe tumors at the resolution of single cells would enhance our ability to determine the best treatment options and to anticipate disease outcome.” The goal of this collaborative multidisciplinary research program is to create instrumentation and chemical tools that rapidly and directly assess the intracellular catalytic activity of protein kinases in individual single cells from disease models and malignant tissue from cancer patients. Current Direct: \$306,000.

Spatiotemporal Control of Migratory Cellular Behavior. NIH, 1R01NS103486. Period: June 15, 2018 – March 31, 2023. P.I.: D. S. Lawrence. There is keen interest in identifying the biochemical pathways that mediate cytoskeletal remodeling, motility, migration, and phenotype switching since members of these pathways serve as potential therapeutic targets. Unfortunately, the spatiotemporal nature of these pathways renders the application of conventional tools (over/under-expression of the proteins of interest, inhibitory compounds, etc.) inadequate for studying dynamic cell behavior. We seek to engineer and evaluate optogenetic analogs of cofilin, cofilin’s upstream activators (slingshot and chronophin), and cofilin’s upstream negative regulators (LIM protein kinase, the cAMP-dependent protein kinase, the p21 activated protein kinase, and rho-associated protein kinase). These species offer a means to correlate spatially-focused biochemical activity with dynamic cellular behavior including F-actin remodeling activity as well as migratory aptitude. Current Direct: \$218,750.

Profiling signaling activity and gene expression in single, pancreatic adenocarcinoma cells using CE-RNA-Seq. NIH, R01CA224763 Period: April 1, 2018 – March 31, 2023. Multi-PI grant with Nancy Allbritton and Jen Jen Yeh. Pancreatic ductal adenocarcinoma is a devastating disease in dire need of improved therapies targeted at specific signaling pathways. Strategies to molecularly profile aberrant pancreatic tissue and inform targeted therapeutic decisions would be of immense value in patient treatment. However, molecular profiling is extremely challenging since biopsied patient tissue is a complex mixture of normal and malignant pancreatic cells. Furthermore, there is a growing understanding that mutations and gene expression alone do not tightly correlate with clinical response. In the current application, a multidisciplinary research team proposes to develop a state-of-the-art, single-cell, platform technology to measure the catalytic activity of sentinel kinases within the KRAS pathway and gene expression through RNA sequencing. The investigators will optimize and validate microsampling and microelectrophoresis methods to assay single cells, simultaneously overcoming the challenges of cellular heterogeneity and sample-size limits. Novel reporters of kinase activity within KRAS-outflow signaling pathways will be designed and new

methods and instrumentation combining single-cell capillary electrophoresis with efficient RNA capture will be pioneered. Human tumor samples maintained in murine xenografts will be assayed to gain unique insights into tumor properties not currently addressable. The work will directly link mRNA production with the catalytic activity of kinases in individual tumor cells derived from patients. The technology will enable questions such as which kinase signaling patterns drive the classical vs the basal phenotypes of pancreatic adenocarcinoma and whether a single tumor possesses a mixture of classical and basal-type cells. The data and the insights gained from implementation of this technology will provide a new approach for clinical assays with the potential for a profound impact on therapeutic strategies in the emerging field of precision medicine. Current Direct: \$408,773.

Towards Glucose Transporter-Mediated Glucose-Responsive Insulin Delivery with Fast Response. NIH, 1R01DK112939-01A1 Period: June 15, 2018 – May 31, 2023. P.I.: Z. Gu. Consortium P.I.: J. Buse. Co-I: D. S. Lawrence. Glucose-responsive delivery of insulin mimicking the function of pancreatic β -cells to achieve meticulous control of blood glucose (BG) would revolutionize type 1 and advanced type 2 diabetes care. However, it is extremely challenging to demonstrate a system which would combine fast response, reversible activation, ease of administration and excellent biocompatibility. In this proposal, we aim to establish an innovative glucose-responsive insulin delivery system based on the interaction between the glucose derivative-modified insulin (Glu-insulin) and glucose transporters (GLUTs) on red blood cells (RBCs). This binding interaction is reversible in the setting of hyperglycemia, resulting in fast release of insulin and subsequent drop of blood glucose levels. We will exploit two conjugation formulations of Glu-insulin and glucose transporters (GIGTer): 1) polymeric nanoparticles (NPs; ~100 nm in diameter) coated with the RBC membrane (with GLUTs) and loaded with Glu-insulin; and 2) liposomal NPs integrated with exogenously expressed glucose transporters and Glu-insulin. We will further integrate these two glucose-responsive formulations into a painless microneedle (MN)-array based transcutaneous patch to obtain the “smart insulin patch” (SIP). Glu-insulin encapsulated NPs will also be incorporated inside SIP for serving as insulin reservoir to “recharge” GIGTers for up to 48 h regulation within a normoglycemic range. In vivo potency of smart insulin patch will be evaluated using the streptozotocin (STZ)-induced type 1 diabetic male C57B6 mice and Sprague Dawley rats. In Aim 1, we will validate and optimize the glucose-responsive capability of the GIGTers based on our preliminary study. In Aim 2, we will evaluate the effectiveness of SIPs integrated with GIGTers, determining the feasibility of utilizing the GIGTer as a new administration modality. In Aim 3, we will optimize the physicochemical properties of the GIGTer-integrated patches in type 1 diabetic mouse and rat (implanted with the Continuous Glucose Monitoring System, CGMS) models; we will substantiate the glucose-responsive capability as well as the biocompatibility of SIPs with GIGTers. The proposed goal, when successfully realized, will be a significant upgrade over the current insulin-dependent diabetes therapy options and have a profound impact to improve health and quality of life of diabetic patients. Current Direct: \$308,595.

Light-Triggered Launching of Anti-Glioblastoma Therapeutics from Cellular Silos. Eshelman Institute for Innovation. Period 10/01/2015 – 9/20/2019. PI: Lawrence; co-I: Hingtgen. This work seeks to develop therapeutic neural stem cells for the treatment of glioblastoma, identify optimized parameters for efficient drug delivery using a 3D cell culture system, and perform an *in vivo* assessment of efficacy. Current Direct: \$250,000.

Optogenetic Manipulation of Striatal Neurons. The Eshelman Institute for Innovation. Period: June 1, 2017 – May 31, 2019. P.I. D. S. Lawrence. Co-I: G. Stuber. Brain dopaminergic pathways are critical for reward-related behavior and motor control. Examples of dopamine (DA)

dysfunctional conditions include Parkinson's disease, autism spectrum disorders, attention deficit disorder, drug addiction, compulsive behavior, and schizophrenia. MSNs are the principal DA responsive neurons in the striatum and are generally divided into two classes based on the nature of their DA receptors (D1R or D2R). D1R-containing MSNs transmit the DA binding event via activation of adenylate cyclase, which catalyzes the conversion of ATP to cAMP. Subsequent downstream events result in biochemical, transcriptional, and morphological changes that are responsible for memory, learning, and behavior. The primary goal of the proposed research program is the design of optogenetic analogs of proteins implicated in D1R-triggered signaling and their use in correlating intracellular biochemical activity with neuronal and organismal behavior. Current Direct: \$250,000.

Assessing Laboratory Risks in an Augmented Environment. The Eshelman Institute for Innovation. Period: August 1, 2018 – July 31, 2019. P.I. D. S. Lawrence. Co-I: J. Heneghan. The P.I. (Lawrence) has developed a full semester safety course required of all first year graduate students in the Division of Chemical Biology and Medicinal Chemistry and the Department of Chemistry (CHEM 701). Although the students appreciate the case study-based nature of the course, evaluations at the semester's end commonly suggest that real world experience in dealing with emergencies be implemented into the curriculum. However, emergency training exercises, particularly those within an authentic setting would be unacceptably dangerous. We seek to create a first-of-its-kind mixed reality (MR) training module designed to provide an immersive lab safety environment. MR merges real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time. Current Direct Costs: \$50,000.

GRANT APPLICATIONS UNDER REVIEW

INVITED LECTURES

- 1986** Department of Medicinal Chemistry, SUNY Buffalo
Department of Chemistry, State University College at Buffalo
Department of Chemistry, Canisius College
Department of Chemistry, Niagara University
Department of Biochemistry, School of Medicine, SUNY Buffalo
- 1987** Department of Medicinal Chemistry, SUNY Buffalo
Department of Chemistry, Alfred University
- 1988** Department of Chemistry, St. Bonaventure University
Undergraduate Biochemistry Club, School of Medicine, SUNY Buffalo
- 1989** Department of Physiology, School of Medicine, SUNY Buffalo
Department of Chemistry, State University College at Buffalo
Department of Chemistry, Rensselaer Polytechnic Institute
- 1990** Department of Chemistry, State University of New York at Stony Brook
Department of Chemistry, University of California at Santa Barbara
Department of Chemistry, University of California at Irvine
Department of Chemistry, University of California at Riverside
Department of Biophysics, Roswell Park
Department of Biochemistry, McMaster University
Department of Chemistry, State University of New York at Buffalo
Department of Biophysics, School of Medicine, State University of New York at Buffalo
- 1991** Tanabe Research Laboratories, San Diego, Ca
Department of Chemistry, University of Delaware
Department of Chemistry, Rutgers University (Newark)
Department of Biological Sciences, State University of New York at Buffalo
Department of Biochemical Pharmacology, State University of New York at Buffalo
- 1992** Department of Biophysics, State University of New York at Buffalo
Department of Chemistry, Rensselaer Polytechnic Institute
- 1993** The Buffalo Medical Foundation, Buffalo, NY
Parke-Davis Pharmaceuticals, Ann Arbor, MI
The Grace Cancer Drug Center, Roswell Park Cancer Institute
Indiana University of Pennsylvania, Department of Chemistry
- 1994** Department of Chemistry and Biochemistry, Wayne State University
Department of Biochemistry, Albert Einstein School of Medicine, Yeshiva University
Department of Chemistry, City University of New York, Queens College
Abbott Labs, Abbott Park, Il.
Department of Biochemistry, Albert Einstein College of Medicine
Department of Chemistry, Canisius College

Department of Biochemistry, Iowa State University

1995 Department of Chemistry and Biochemistry, University of Maryland
Department of Chemistry, Johns Hopkins University
Department of Chemistry and Biochemistry, University of Colorado at Boulder
Department of Chemistry, University of Wyoming
Department of Chemistry, Colorado State University
Department of Chemistry, University of Utah
Department of Chemistry and Biochemistry, University of California at San Diego
Merck, Inc., West Point, Pa.

1996 Department of Medicinal Chemistry, University of Kansas
Department of Biochemistry, Iowa State University
Department of Biological Sciences, Allegheny College
Cellular and Molecular Biodynamics Program, Rutgers University

1997 The Department of Chemistry, Furman University
The Department of Chemistry, University of South Florida
The Department of Physiology and Biophysics, SUNY at Stony Brook
Wyeth Ayerst Research, Pearl River, New York
The Department of Biology, Canisius College
The Departments of Chemistry and Biology, Reed College

1998 Aurora Pharmaceuticals, San Diego, California
Student Affiliates of the ACS, University of South Florida
Department of Chemistry, Florida Southern College
Department of Chemistry, University of Central Florida
Department of Molecular Pharmacology, University of Vermont
Department of Chemistry, University of California at San Diego
Department of Chemistry, Harvey Mudd College

1999 Department of Chemistry, University of Wisconsin at Oshkosh
Department of Chemistry, Trinity College
Department of Chemistry, University of Wisconsin at La Crosse
Department of Chemistry, The University of Wisconsin at Stevens Point
Department of Chemistry, Wesleyan University
Department of Chemistry, University of California at Irvine
Department of Chemistry, University of California at Riverside
Department of Chemistry, University of California at Los Angeles
Department of Chemistry, Indiana University
Department of Medicinal Chemistry, Purdue University
Department of Chemistry, University of Notre Dame

2000 Department of Chemistry, Hampton University
Colby College, Maine
Tripos, Inc., St. Louis, Missouri
IGEN, Gaithersburg, Maryland

Department of Chemistry; College of Charleston
Department of Chemistry, Florida Atlantic University

- 2001** Department of Medicinal Chemistry and Molecular Pharmacology, Purdue University
Merck, Inc., Rahway, New Jersey
Department of Medicinal Chemistry, Purdue University
Department of Biochemistry, Wayne State University
ArQule
Department of Chemistry, University of Georgia
- 2002** New York Blood Center
Promega Corporation
Department of Chemistry, University of Wisconsin
- 2003** OSI Corporation
Department of Molecular Pharmacology, The Johns Hopkins University
GenoSpectra
Department of Chemistry, University of Michigan
Department of Chemistry, University of Delaware
- 2004** Department of Medicinal Chemistry, The University of Michigan
The Walther Cancer Center, University of Notre Dame
Department of Chemistry, The University of Illinois at Chicago
Department of Chemistry, Columbia University
Department of Chemistry, Emory University
Molecular and Cell Biology Seminar Series, Scripps Research Institute
New York Academy of Sciences
- 2005** Venetian Institute of Molecular Medicine, University of Padova
Department of Chemistry, Oakland University
Department of Medicinal and Biological Chemistry, University of Toledo
- 2006** Sigma-Aldrich
Department of Chemistry, University of Texas at Dallas
Biophysics Program, Cornell University
Department of Medicinal Chemistry, University of Texas at Austin
University of Texas, Southwestern
Departments of Biochemistry & Biology, Life Sciences Seminar Series, Brandeis
Department of Biochemistry, CUNY
Departments of Chemistry and Medicinal Chemistry & Natural Products, University of North Carolina
- 2007** Department of Biochemistry, Mt. Sinai School of Medicine
Department of Chemistry, Duke
Department of Chemistry and Biochemistry, University of Pennsylvania
Department of Chemistry and Biochemistry, UCLA
- 2008** Department of Chemistry, University of South Florida

Department of Medicinal Chemistry & Natural Products, University of North Carolina
Department of Biochemistry, University of North Carolina

- 2009** Department of Chemistry, North Carolina State University
School of Pharmacy, UC San Diego
- 2010** Department of Chemistry, University of Illinois at Urbana Champaign
- 2011** Department of Chemistry, Wake Forest University
Department of Biochemistry and Molecular Biology, Indiana University School of Medicine
Department of Chemistry, Scripps Florida
Department of Chemistry, Purdue University
Department of Chemistry, Rose-Hulman Institute of Technology
- 2012** Department of Pharmaceutical and Biomedical Sciences, University of Georgia
Drug Discovery Program, National Cancer Institute
- 2013** Department of Medicinal Chemistry, University of Connecticut
Department of Medicinal Chemistry, University of Minnesota
Division of Integrative Bioscience and Biotechnology, POSTECH, Pohang, Korea
AmorePacific Corp., Seoul, Korea
School of Pharmacy, Hanyang University, Ansan, Korea
Department of Biomedical Engineering, Duke University
Department of Chemistry, Wayne State University
- 2014** Department of Chemistry, University of Nebraska
Department of Chemistry, Appalachian State University
CNRS, Montpellier, France
Department of Cell Biology, University of Texas @ Dallas
- 2015** Department of Chemistry, Johns Hopkins University
School of Pharmacy, University of Houston
Department of Chemistry, Northeastern University
- 2016** Department of Chemistry, University of North Carolina, Asheville
Institute for Structural Biology, Drug Discovery and Development (ISB3D), Virginia
Commonwealth University
- 2017** Department of Medicinal Chemistry, Purdue University
Department of Chemistry, Lehigh University
Integrating New Technologies Into Entrepreneurial Projects: Gamification, AR, VR and AI,
University of North Carolina at Chapel Hill
- 2019**
Department of Pharmacological Sciences, Mt. Sinai School of Medicine

NATIONAL AND INTERNATIONAL MEETINGS - INVITED LECTURES

- 1990** Signal Transduction in Biological Membranes, SUNY Buffalo
National Science Foundation Workshop on Natural Products, Denver, Colorado
- 1991** American Chemical Society Joint Central - Great Lakes Regional Meeting, Division of Medicinal Chemistry, Indiana University - Purdue University at Indianapolis
Novel Chemical Probes of Biology Symposium

Federation of Analytical Chemistry and Spectroscopy Societies and Pacific Conference on Chemistry and Spectroscopy, Anaheim, California
- 1992** Gordon Research Conference; Bioorganic Chemistry
Signal Transduction, Keystone, Colorado
- 1994** American Chemical Society Great Lakes Regional Meeting
Gordon Research Conference; Enzymes, Coenzymes, and Metabolic Pathways.
- 1995** Vth International Symposium on Molecular Aspects of Chemotherapy; Gdansk, Poland
9th International Conference on Second Messengers and Phosphoproteins (Signal Transduction in Health & Disease); Nashville, Tennessee
- 1998** 1st International Conference on Protein Kinase Inhibitors; Warsaw, Poland
- 1999** Hoechst Marion Roussel Protein Kinase Workshop; Tucson, Arizona
American Chemical Society Western Regional Meeting and the Pacific Conference on Chemistry and Spectroscopy Symposium on Biosensors: Visualizing the Chemistry of Living Cells
The Molecular Neurobiology of ATM, Cold Spring Harbor, New York
- 2000** PacifiChem 2000; Photoprotecting Groups and Caged Compounds Symposium, Honolulu, Hawaii
- 2001** 2nd International Conference on Protein Kinase Inhibitors; Warsaw, Poland
- 2003** Annual Meeting of the American Society for Biochemistry and Molecular Biology
3rd International Conference on Protein Kinase Inhibitors; Warsaw, Poland
- 2004** Cellular Regulation in Health and Disease. The Weizmann Institute of Science
- 2005** American Peptide Society Symposium
4th International Conference on Protein Kinase Inhibitors; Warsaw, Poland
- 2006** American Society for Cell Biology National Meeting; San Diego, California
- 2007** 5th International Conference on Protein Kinase Inhibitors; Warsaw, Poland
Howard Hughes Medical Institute, Janelia Farm "Chemistry in Neuroscience"
Howard Hughes Medical Institute, Janelia Farm "Fluorescent Proteins and Biological Sensors"

American Society for Cell Biology, Washington DC

- 2008** Chinese Chemical Society, Tianjin, China
- 2009** 6th International Conference on Protein Kinase Inhibitors, Warsaw, Poland
Florida Center of Excellence for Biomolecular Identification & Targeted Therapeutics
Symposium on Drug Design, Discovery and Delivery, Tampa, FL
- 2010** Gordon Research Conference; Chemistry & Biology of Peptides, Ventura California
BIT's 8th Annual Congress of International Drug Discovery Science and Technology (IDDST),
Beijing, China
- 2011** Gordon Research Conference; Bioorganic Chemistry
Southeast Regional Meeting of the American Chemical Society; Chemical Biology Session
- 2012** Biophysics Symposium, Academia Sinica, Taiwan
Bioimaging Symposium, Academia Sinica, Taiwan
Institute of Chemical Biology & Drug Discovery Symposium, SUNY Stony Brook
- 2013** Korean Chemical Society National Meeting, Seoul Korea
- 2014** Research Triangle Park Chemical Biology Symposium
4th Biosensor Meeting, Bordeaux France
EMBO Conference Series: Chemical Biology, Heidelberg Germany
International Chemical Biology Society Symposium, San Francisco
- 2017** Conference on Chemistry & Metabolism, Cold Spring Harbor Laboratory Symposium
Conference on Chemical Tools for Complex Biological Systems, Janelia Farm Conference
Holy Grails in Chemistry Symposium, American Chemical Society National Meeting, San
Francisco
Symposium on Light-Responsive Organic Chemistry for Biological Applications, American
Chemical Society National Meeting
- 2018** Emil T. Kaiser Memorial Symposium, Boston
Complex Control with Light Symposium, Goethe University, Germany (Lake Konstanz,
Germany)
- 2019** Photochemistry Gordon Research Conference

NATIONAL MEETINGS

Mary Prorok* and David S. Lawrence; American Chemical Society National Meeting, Biological
Chemistry Division (1998)

John S. Manka and David S. Lawrence*; American Chemical Society National Meeting, Organic
Chemistry Division (1989)

John S. Manka and David S. Lawrence* ; Gordon Research Conference: "Metals in Biology" (1990)

John S. Manka* , Dennis Chugh, and David S. Lawrence; American Chemical Society National Meeting, Inorganic Chemistry Division (1990)

John S. Manka and David S. Lawrence* ; American Chemical Society National Meeting, Organic Chemistry Division (1990)

Mary Prorok, Marianne Mendelow, Allen Salerno, Deborah Hermance, and David S. Lawrence* ; American Chemical Society National Meeting, Biological Chemistry Division (1990)

Mary Prorok, Marianne Mendelow, Allen Salerno, Deborah Hermance, and David S. Lawrence* ; SUNYAB 31st Annual Medicinal Chemistry Symposium (1990)

Diane Dick* , Scott Pluskey, and David S. Lawrence; North East Regional Meeting of the American Chemical Society (1990)

Scott Pluskey* , Diane Dick, and David S. Lawrence; North East Regional Meeting of the American Chemical Society (1990)

Deborah Hermance* , Marianne Mendelow, and David S. Lawrence; North East Regional Meeting of the American Chemical Society (1990)

Mary Prorok* and David S. Lawrence; North East Regional Meeting of the American Chemical Society (1990)

Allen Salerno* , Marianne Mendelow, Mary Prorok, and David S. Lawrence; North East Regional Meeting of the American Chemical Society (1990)

Mary Prorok and David S. Lawrence* ; 12th Enzyme Mechanisms Conference (1991)

Allen Salerno* and David S. Lawrence; North East Regional Meeting of the American Chemical Society (1992)

Young-Guen Kwon, Marianne Mendelow, Jaya Srinivasan, Tae Ryong Lee, Scott Pluskey, and David S. Lawrence* ; "Enzymes, Coenzymes, and Metabolic Pathways" Gordon Research Conference (1993)

Scott Pluskey, Debbie Crans* , and David S. Lawrence; 45th Southwest Regional Meeting of the American Chemical Society (1993)

David S. Lawrence, Tae Ryong Lee, and Jinqi Niu; ASBMB National Meeting (1993)

A. M. Edelman* , J. C. Lee, Y.-G. Kwon, and D. S. Lawrence; ASBMB National Meeting (1994)

Michelle Sanders* and David S. Lawrence; American Chemical Society National Meeting (1996)

Mary Koszalek* and David S. Lawrence; American Chemical Society National Meeting (1996)

Kieran Curley, Jason Wood, and David S. Lawrence; Bioorganic Gordon Research Conference (1998)

Tae Ryong Lee* and David S. Lawrence; Miami Biotechnology Winter Symposia on Signal Transduction (1999)

Adam Profit and David S. Lawrence; Miami Biotechnology Winter Symposia on Signal Transduction (1999)

Kieran Curley, Jason Wood, and David S. Lawrence; Miami Biotechnology Winter Symposia on Signal Transduction (1999)

Zachary L. Rodgers, Robert M. Hughes, Laura M. Doherty, Jennifer R. Shell, Alexander M. Brugh, Thomas A. Shell, Malcolm D.E. Forbes, and David S. Lawrence, "Red Photo-activation of Hydrogel Initiators". *2nd Annual Triangle Student Research Competition*, Research Triangle Park, Durham, NC, September 3rd, 2014.

Zachary L. Rodgers, Alexander M. Brugh, Laura M. Doherty, Thomas A. Shell, Jennifer R. Shell, and David S. Lawrence, "Red and Near Infrared Photo-activation of Biomolecules and Hydrogel Initiators Using Alkyl Cob(III)alamin-fluorophore Conjugates". *The RTP Chemical Biology and Biotechnology Symposium*, GlaxoSmithKline, Research Triangle Park, NC, May 28, 2014.

Zachary L. Rodgers, Brian Molesky, Alexander, M. Brugh, Thomas A. Shell, Malcom D. Forbes, and David S. Lawrence, "Detection of Radicals from Photoactivation of Fluorophore Augmented Cob(III)alamins". *Inter-American Photochemical Society Meeting*, Sarasota, FL, January 2-5, 2014.

Marvin, C., Smith, W., Oien, N., Hughes, R., Rogers, Z., and Lawrence, D. "NIR Mediated Release of Therapeutic Agents from Erythrocyte Drug Carriers" Presented at the 2014 AAPS Annual Meeting and Exposition, San Diego CA, 2014 (November 6, 2014).

RESEARCH STUDENTS

Undergraduate Students

Joseph Accurso	1986
Carol Bezio	1988
Russell Bird	1988
Dennis Chugh	1989
Michael Cristofaro	1986
Laura Doherty	2014
Tim Hartman	2017 - 18
Tom Kuhlman	1987
Nathan Levy	2010
Meredith Mau	1986
Louise Mahoney	1988
Marianne Mendelow	1988
David Montesanti	1986
Jeffrey Nonemaker	1992-93
Tammy Russell	1990
Alexandra Whicker	2015 - 16
Mamadi Yilla	1986

Graduate Students

Masters (research) - completed

Derek Dunn	1994-1995
David Freeman	2015-2016
Marianne Mendelow	1989-1991
Michelle Sanders	1995-1996
Douglas Werner	1994-1996

Doctoral - completed

Marissa Caan	2012-2017
Diane Dick	1986-1992
Finith Jernigan	2008-2013
Tao Jiang	1991-1995
Mary Koszelak	1993-1998
Young-Guen Kwon	1991-1994
Tae Ryong Lee	1992-1996
John Manka	1986-1990
Christina Marvin	2014-2018
Luong Nguyen	2010-2014
Jinkui Niu	1993-1997
Colin O'Banion	2011-2016
Nathan Oien	2010-2014

Scott Pluskey	1988-1993
Mary Prorok	1986-1990
Zach Rodgers	2012-2015
Al Salerno	1989-1993
Kui Shen	1995-2001
Weston Smith	2009-2015
Tata Venkata	1986-1992
Jason Wood	1993-1998
Weichen Xu	2008-2012
Xiongwei Yan	1992-1996

Doctoral - current

Brianna Vickerman	2017 -
Joshua Welfare	2017-
Emilia Zywtot	2017-

Postdoctoral Fellows - completed

Richard Agnes	2003-2007
Angela Brown	1999-2001
Maria Cabal	1995-1996
Chien-an Chen	1998-2001
Kieran Curley	1996-1998
Zhaohua Dai	2004-2006
Mousumi Ghosh	2000-2005
Fangxia Guan	2001-2003
Jung-Mi Hah	2003-2005
Qing “Sunny” Huang	2007
Sanjai Kumar	2005-2007
Hsienming Lee	2004-2010
Jung-Hwan Lee	2001-2006
Seung-Yub Lee	2001-2004
Tae Ryong Lee	1996-1999
Liang Sun	2008-2011
Weiyong Lin	2000-2004
Haishan Li	2002-2008
Javier Montserat	1995-1996
Sandip Nandy	2002-2006
Jinkui Niu	1998-2001
Colin O’Banion	2017-2018
James Parise	2007-2008
Adam Profit	1997-2000
Huimin Shang	2004-2007
Vyas Sharma	2004-2011
Jaya Srinivasan	1994-1995
Meng Taing	1995-1998

Willem Veldhuyzen	2002-2004
Stefan Vetter	1997-1998
Xiaodong Wang	2008
Xiongwei Yan	1996-1999
Jiade Yang	2002-2004
Ren-Hwa Yeh	1996-2001
Biao Xi	1999-2006

Former Research Faculty

Robert Hughes	2015-2016
Melanie Priestman	2011-2017
Vyas Sharma	2008-2011
Jennifer Shell	2008-2014
Thomas Shell	2008-2014

Postdoctoral - current

Song Ding	2015-
Anwasha Goswami	2016-
Lauren Haar	2018-
Natalia Orlova	2018-

Research Faculty – current

Qunzhao Wang	2007-
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TEACHING DUTIES (SUNY @ Buffalo)

Fall 1985	Chemistry 301	(Intermediate Organic Chemistry)
	Chemistry 501	(Organic Chemistry, Graduate Level Core Course)
Spring 1986	Chemistry 514	Bioorganic Chemistry (new course)
Fall 1986	Chemistry 301	(Intermediate Organic Chemistry)
	Chemistry 501	(Organic Chemistry, Graduate Level Core Course)
Spring 1987	Chemistry 252	(Honors Organic Chemistry, 2nd Semester)
Fall 1987	Chemistry 301	(Intermediate Organic Chemistry)
	Chemistry 501	(Organic Chemistry, Graduate Level Core Course)
Spring 1988	Chemistry 252	(Honors Organic Chemistry, 2nd Semester)
Fall 1988	Chemistry 501	(Organic Chemistry, Graduate Level Core Course)
Spring 1989	Chemistry 514	(Bioorganic Chemistry, Special Topics Graduate Level)
Fall 1989	Chemistry 301	(Intermediate Organic Chemistry)
Fall 1990	Chemistry 301	(Intermediate Organic Chemistry)
Spring 1991	Chemistry 202	(Introductory Organic Chemistry, 2nd Semester)
Fall 1991	Chemistry 301	(Intermediate Organic Chemistry)
Spring 1992	Chemistry 202	(Introductory Organic Chemistry, 2nd Semester)
Fall 1992	Chemistry 501	(Organic Chemistry, Graduate Level Core Course)
Fall 1993	Chemistry 501	(Organic Chemistry, Graduate Level Core Course)

Spring 1994	Chemistry 202	(Introductory Organic Chemistry, 2nd Semester)
Fall 1994	Chemistry 501	(Organic Chemistry, Graduate Level Core Course)
Spring 1995	Chemistry 252	(Honors Organic Chemistry; 2nd Semester)
Fall 1995	Chemistry 301	(Intermediate Organic Chemistry)

DEPARTMENTAL ACTIVITIES (SUNY @ Buffalo)

Ad Hoc Faculty Advisement, Policies, and Procedures Committee (1990)
Admissions Committee (1991-1992)
Advisor to Student Affiliates of the American Chemical Society (1985-1986)
Central Construction Fund Planning Committee (1990-1995)
Chairman and Coordinator: Chemistry Department Open House (November 1985)
Chairman: 1986 Departmental September Welcome
Chairman: 1987 Departmental September Welcome
Chairman, Recruitment for Organic Faculty (1991 and 1992)
Coeditor, Departmental Brochure 1988
Convener, Graduate Recruitment Committee (1994-1995)
Convener, Organic Committee (1994-1995)
Curriculum, Advisement, and Petitions Committee (1991-1995)
Editor, Departmental Brochure 1990
Executive Committee (1993-1995)
Facilities Committee (1987-1989)
Graduate Recruitment Committee (1985-1995)
Library Liaison Committee (1985-1995)
Organic Committee (1985-1995)
Personnel Committee (1991 and 1992)
Tenure Committee (1991-1995)

UNIVERSITY ACTIVITIES (SUNY @ Buffalo)

Member, Biomembranes Group
Member, Faculty of Natural Sciences & Mathematics Graduate Divisional Panel
Member, Faculty of Natural Sciences & Mathematics Undergraduate Divisional Panel
Member, Faculty of Natural Sciences & Mathematics Advisory Committee to the Science and Engineering Library
Mentor, University Honors Program
Howard Hughes Biological Sciences Undergraduate Educational Initiative
Member, Structural Biology Committee

TEACHING DUTIES (AECOM)

Molecular and Cellular Foundations of Medicine (1997; 9 lectures)
Molecular and Cellular Foundations of Medicine (1998; 10 lectures)
Molecular and Cellular Foundations of Medicine (1999; 10 lectures)

Molecular and Cellular Foundations of Medicine (2000; 10 lectures + 4 summer introductory lectures)
Molecular and Cellular Foundations of Medicine (2001; 10 lectures + 4 summer introductory lectures)
Molecular and Cellular Foundations of Medicine (2002; 10 lectures + 4 summer introductory lectures)
Molecular and Cellular Foundations of Medicine (2003; 10 lectures + 4 summer introductory lectures)
Molecular and Cellular Foundations of Medicine (2004; 10 lectures + 4 summer introductory lectures)
Molecular and Cellular Foundations of Medicine (2005; 10 lectures + 4 summer introductory lectures)
Molecular and Cellular Foundations of Medicine (2006; 10 lectures + 4 summer introductory lectures)
Graduate Biochemistry (2006; 3 lectures)
Graduate Biophysics (2006; 1 lecture)

DEPARTMENTAL ACTIVITIES (AECOM)

Biochemistry Appointments and Promotion Committee (1996 - present)
Mass Spectrometry Staff Position Search Committee (Fall 1996)
Departmental Seminar Coordinator (1998 – present)
Departmental Faculty Search Committee (2001)

COLLEGE ACTIVITIES (AECOM)

Academic Affairs Committee (2005 – 2007)
Chemical Hazards Committee (1998 - 2007)
Co-Chair of Chemical Biology and Chemical Genomics Strategic Planning (2006)
Committee of Professors (1997- present)
Committee on Computer-Based Education (1999 - present)
Committee on Patents (2006 – 2006)
Division of Research (advisory committee to the Dean) (1998 - 2001)
Faculty Senate (1996 - 1998; 2000 – 2001; 2005-2006)
Graduate Recruitment Committee (2002 – 2004)
Head, Graduate Recruitment (1997 - 2000)
LCME General Facilities Subcommittee (2005 – 2006)
Promotions Committee (1997- 1998)
Preclerkship Committee (2001 – present)
Sue Golding Graduate Division Admissions Committee (1996 – 2000)

TEACHING DUTIES (UNC)

Chemistry 465. Organic and Inorganic Reaction Mechanisms.
Fall 2007 – 28 lectures
Fall 2008 – 28 lectures
Fall 2009 – 28 lectures
(note: 50% of full semester course 4 unit course team-taught with Professor Joe Templeton)

Medicinal Chemistry 807/Chemistry 733. Molecular Foundations of Chemical Biology. I. Organic and Medicinal Chemistry (New Course)

Fall 2010 – 40 lectures
Fall 2011 – 40 lectures
Fall 2012 - 40 lectures

Pharmaceutical Science First Year Group
Fall 2011
1 lecture

Chemistry 799. Introduction to Laboratory Safety (new course).

Fall 2013
Fall 2014
Fall 2015
Fall 2016
Fall 2017
Fall 2018

Computer Science 585. Serious Games.

Spring 2018
Role: Facilitator

DEPARTMENTAL/DIVISIONAL ACTIVITIES (UNC)

Department of Chemistry Faculty Search Committee (Fall 2007)
School of Pharmacy Faculty Development/Mentoring Committee (Fall 2007)
School of Pharmacy Full Professors Committee (2007 -)
Department of Chemistry Full Professors Committee (2007 -)
School of Pharmacy Campbell Faculty Mentoring Program (2008 - 2012)
Divisional Director of Graduate Studies, Division of Medicinal Chemistry & Natural Products, School of Pharmacy (Fall 2009 - 2011)
Department of Chemistry, Nanomedicine Faculty Search Committee (Fall 2010)
Division of Medicinal Chemistry & Natural Products Faculty Search (Fall 2010)
School of Pharmacy, Administrative Review of Leaf Huang (Summer 2010)
ACPE Self-Study Organizational and Administration Committee, School of Pharmacy (Spring 2010)
Tenure Committee, Chemistry (Mohammed Yousef; 2010)
School of Pharmacy Strategic Initiatives Working Group (Spring 2011)
Interim Chair – Division of Medicinal Chemistry & Natural Products (Spring 2011)
Executive Committee – School of Pharmacy (2011 -)
Chair – Division of Chemical Biology & Medicinal Chemistry (Summer 2011 -)
Co-Chair, Ad hoc Safety Committee, Department of Chemistry (Spring 2012)
Chair, Safety Committee, Department of Chemistry (Fall 2012 -)
Tenure Committee, Chemistry (Eric Alexanian; 2013)
Chair, Full Professor Promotion Committee (David Nicewicz; 2017)
Chair, Full Professor Promotion Committee (Eric Alexanian; 2017)
Morehead Building Committee (2017 - present)
School of Pharmacy Dean Search (2018 and 2019)

Chemical Biology & Medicinal Chemistry Student Advisory Committee

Jon Bogart
Laura Bonifacio
Courtney Jones
Wei Sun
Caleb Vogt
Jarod Waybright

Chemical Biology & Medicinal Chemistry MS Defense
Josh Brattlie

Chemical Biology & Medicinal Chemistry Student Advisory Committee (Prior to 2015)
Josh Brattlie
Joyce Chandarajoti
Luong Nguyen (Advisor)
Colin O'Banion (Advisor)
Nathan Oien (Advisor)
Mike Perfetti

Chemical Biology & Medicinal Chemistry Ph.D. Defense
Laura Bonifacio
Tanya Burch
Joyce Chandarajoti
Rima Hajjo

Chemical Biology & Medicinal Chemistry Ph.D. Defense 2015
Adam Friedman
Michael Perfetti

Chemical Biology & Medicinal Chemistry Advisory Committee 2017
Jon Bogart
Tory Haberman
Nick Klus

Chemical Biology & Medicinal Chemistry Ph.D. Defense 2017
Kim Barnash
Jarod Waybright

Chemistry Oral Defense (2007 – 2010)
Elizabeth O'Bryan
Anne Marie Dechert
Colin Hughes
Justin Malinowski
Leila Flagg
Ryan Felix

Chemistry Oral Defense 2011
Joshua Beaver

Michael Corbett
Michael Bertucci
Ben Giglio
Kalulani Houston
Abigail Turner
Tien Guyen

Chemistry Oral Defense 2012
Nick Pinkin
Chris Turlington
Brendan Peacor
Gregg Rice

Chemistry Oral Defense 2013
Kate Lavoie

Chemistry Oral Defense 2014
Isaiah Gober

Chemistry Student Advisory Committee 2013
Emilie Mainz
Kate Lavoie

Chemistry Student Advisory Committee 2015
Zach Dunn
Nick Jenkins

Chemistry Student Advisory Committee 2016
Hannah Nowotarski
Brae Peterson

Chemistry Student Advisory Committee 2017
Matt Anttila
Hannah Nowotarski
Brae Peterson

Chemistry Ph.D. Defense 2009
Amanda Stewart

Chemistry Ph.D. Defense 2010
Lindsey Ingerman

Chemistry Ph.D. Defense 2011
Anne Marie Dechert
Elizabeth O'Bryan
Abby Pulsipher

Chemistry Ph.D. Defense 2012
Angela Proctor

Chemistry Ph.D. Defense 2013
Ryan Felix

Chemistry Ph.D. Defense 2014
Mike Bertucci
Kaulani Houston
Tien Nguyen
Abby Turner

Chemistry Ph.D. Defense 2015
Brendon Peacor
Gregg Rice
Weston Smith
Chris Turlington

Chemistry Ph.D. Defense 2017
Isaiah Gober

Pharmacology Student Advisory Committee
Eric Zimmerman

Pharmacology Student Advisory Committee 2011
Ryan Phillips

Pharmacology Ph.D. Defense 2011
Eric Zimmerman

Undergraduate Honors Thesis Committee
Lauren Burianek (2010)
Robin Muller (2011)
Susie Choi (2012)

UNIVERSITY ACTIVITIES (UNC)

Scientific Advisory Board, Center for Integrative Chemical Biology and Drug Discovery (Fall 2007 -)
Advisory Group Member, Carolina Counts (Spring 2010)
College of Arts & Sciences Interdisciplinary Initiatives Proposals Committee (Spring 2011)
Eshelman Institute for Innovation Reviewer (student and postdoctoral proposals) (Fall 2016)
Lineberger Comprehensive Cancer Center, UCRF, Reviewer (Fall 2015, 2016)