

Dr. Richard W. Fitch

Associate Professor of Chemistry
Department of Chemistry
Indiana State University
Terre Haute, IN 47809

Phone (812) 299-4979 (home)
(812) 237-2244 (work)
Fax (812) 237-2232
E-mail rfitch@indstate.edu
Web <http://indstate.edu/chemistry/fitch.html>

Education

05/92	B.S. Chemistry (ACS accredited)	Western Kentucky University
09/98	Ph.D. Synthetic Organic Chemistry	University of Louisville

Doctoral Dissertation (Frederick A. Luzzio, Advisor)

Ultrasound In Natural Products Synthesis.

I. Ultrasound Promoted Organic Transformations.

II. Tandem Nitroaldol ("Double Henry ") Routes to Histrionicotoxin

Postdoctoral Experience (John W. Daly, Advisor)

1999-2003 IRTA Fellow -Section on Pharmacodynamics, Laboratory of Bioorganic Chemistry National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health. Research: Discovery and Development of Novel and Selective Cholinergic Ligands. Bioanalysis of cholinergic binding and function. Nonradioactive assay techniques. Measurement and correlation of binding and function. Structure-activity relationships for potency and efficacy. Isolation, structure, and pharmacology of amphibian alkaloids.

Fields of Interest

Natural product isolation and pharmacology. Synthesis and synthetic methodology. Structural biology of membrane proteins. Nicotinic receptor neurochemistry and receptor pharmacology.

Appointments, Awards and Honors

Fellows Award for Research Excellence	National Institutes of Health	2004
Arthur E. Schwarting Award	American Society of Pharmacognosy	2004
Assistant Professor of Chemistry	Indiana State University	2003
Associate Professor of Chemistry	Indiana State University	2009
Promising Scholar Award	Indiana State University	2006
Faculty Fellow Award	Indiana State University	2006,2008
Jack L. Beal Award	American Society of Pharmacognosy	2010

Professional Organizations

American Chemical Society (Division of Organic Chemistry, Division of Medicinal Chemistry, Wabash Valley Local Section Chair), American Society of Pharmacognosy, American Society for Pharmacology and Experimental Therapeutics (Molecular Pharmacology Division, Neuropharmacology Division), Sigma Xi, Indiana Academy of Science (Chemistry Chair), Central States Universities Incorporated (ISU Representative)

Peer Reviewer

Journal of Organic Chemistry, Organic Letters, Journal of Medicinal Chemistry, Journal of Natural Products, Chemical Reviews, Bioorganic and Medicinal Chemistry, Analytical Biochemistry, Journal of Pharmacy and Pharmacology, Expert Opinion in Drug Discovery
Guest editor, Journal of Natural Products.

Grant Reviewer

National Science Foundation, American Chemical Society Petroleum Research Fund, Research Corporation, Indiana Academy of Science

Publications

Fitch, R. W.; Luzzio, F. A. The Aluminum Amalgam Reduction of 2-Nitroalkanols Promoted by Ultrasound *Tetrahedron Lett.* **1994**, 35, 6013-6016.

Fitch, R. W.; Luzzio, F. A. Ultrasound in Natural Products Synthesis: Applications to the Synthesis of Histrionicotoxin via Nitroalkanal Acetals *Ultrasonics: Sonochemistry* **1997**, 4, 99-107.

Fitch, R. W.; Luzzio, F. A. Preparation of *dl*-Camphor from *dl-endo*-Borneol, in *Synthetic Organic Sonochemistry*, Ch. 9 Selected Experiments, J.L. Luche (Ed.), Plenum Press, **1998**, 160, 360-361.

Luzzio, F. A.; Fitch, R. W. 4-Nitrobenzaldehyde from 4-Nitrobenzyl Alcohol, in *Synthetic Organic Sonochemistry*, Ch. 9 Selected Experiments, J.L. Luche (Ed.), Plenum Press, **1998**, 157, 334-336.

Luzzio, F. A.; Fitch, R. W.; Moore, W. J.; Mudd, K. J. A Facile Oxidation of Alcohols Using Pyridinium Chlorochromate/Silica Gel *J. Chem. Ed.*, **1999**, 76, 974-975.

Luzzio, F. A.; Fitch, R. W. A Formal Synthesis of (+)- and (-)-Perhydrohistrionicotoxin: A "Double Henry"/Enzymatic Desymmetrization Route to the Kishi Lactam *J. Org. Chem.*, **1999**, 64, 5485-5493.

Luzzio, F. A.; Fitch, R. W. A Rearrangement Route to Fenvaleric Acid *J. Prakt. Chem.*, **2000**, 342, 498-501.

Fitch, R. W.; Xiao, Y.; Kellar, K. J.; Daly, J. W. Membrane Potential Fluorescence: A Sensitive Assay for Nicotinic Receptor Function *Proc. Nat. Acad. Sci.* **2003**, 100, 4909-4914.

Fitch, R. W.; Garraffo, H. H.; Spande, T. F.; Yeh, H. J. C.; Daly, J. W. Bioassay-Guided Isolation of Epiquinamide a Novel Quinolizidine Alkaloid and Nicotinic Agonist from an Ecuadoran frog, *Epipedobates tricolor* *J. Nat. Prod.* **2003** 66, 1345-1350. Winner of the 2003 Arthur E. Schwarting Award from the American Society of Pharmacognosy.

Fitch, R. W.; Pei, X. F.; Kaneko, Y.; Gupta, T.; Shi, D.; Federova, I.; Daly, J. W. Homoepiboxidines: Further Potent Agonists for Nicotinic Receptors *Bioorg. Med. Chem.* **2004**, 12, 179-190.

Fitch, R. W.; Kaneko, Y.; Klaperski, P.; Daly, J. W.; Seitz, G.; Gündisch, D. Halogenated and Isosteric Cytisine Derivatives with Increased Affinity and Functional Activity at Nicotinic Acetylcholine Receptors *Bioorg. Med. Chem. Lett.* **2005**, 15, 1221-1224.

Crosland, R. D.; Fitch, R. W.; Hines, H. B. Characterization of β -Leptinotarsin-h and the Effects of Calcium Flux Antagonists on its Activity *Toxicon*, **2005**, 45, 829-841.

Fitch, R. W.; Daly, J. W. A Phosphorescence Imaging Method for Isotopic Ion Flux Assays *Anal. Biochem.* **2005**, 342, 260-270.

Freyer, A. J.; Huffman, J.; Menachery, M. D.; Huey, K.; Leavens, W. J.; Fitch, R. W. Isolation, Structure Elucidation, and Biological Evaluation of 15-Amido-3-demethoxy-2 α ,3 α -methylenedioxyerythroculine, a New Alkaloid from *Hyperbaena valida* *J. Nat. Prod.* **2006**, *69*, 1514 – 1516.

Wijdeven, M. A.; Wijtmans, R.; van den Berg, R. J. F.; Noorduyn, W.; Schoemaker, H. E.; Sonke, T.; van Delft, F. L.; Blaauw, R. H.; Fitch, R. W.; Spande, T. F.; Daly J. W.; Rutjes, F. P. J. T. *N,N*-Acetals as *N*-Acyliminium Ion Precursors: Synthesis and Absolute Stereochemistry of Epiquinamide *Org. Lett.* **2008**, *10*, 4001-4003.

Scates, B. A.; Lashbrook, B. L.; Chastain, B. C.; Tominaga, K.; Elliott, B. T.; Theising, N. J.; Baker, T. A.; Fitch, R. W. Polyethylene Glycol-Based Homologated Ligands for Nicotinic Acetylcholine Receptors *Bioorg. Med. Chem.* **2008**, *16*, 10295-10300.

Fitch, R. W.; Sturgeon, G. D.; Patel, S. R.; Spande, T. F.; Garraffo, H. M.; Daly J. W.; Blaauw, R. H. Epiquinamide: A Poison That Wasn't from a Frog That Was *J. Nat. Prod.*, **2009**, *72*, 243-247.

Fitch, R. W.; Spande, T. F.; Garraffo, H. M.; Chase, R. R.; Clinedinst, M. A.; Parkes, D. A.; Reed, R.; Whittaker, N. F.; Daly J. W. Dioicine, a Novel Prenylated Purine Alkaloid from *Gymnocladus dioicus* *Heterocycles*, **2009**, *79*, 583-598.

Fitch, R. W.; Spande, T. F.; Garraffo, H. H.; Yeh, H. J. C.; Daly, J. W. Phantasmidine: An Epibatidine Congener from the Ecuadorian frog, *Epipedobates anthonyi* *J. Nat. Prod.* **2010** *73*, 331-337. Winner of the 2010 Jack L Beal Award from the American Society of Pharmacognosy.

Fitch, R. W.; Bewley, C. A.. John W. Daly (1933-2008) *J. Nat. Prod.* **2010** *73*, 299-300 (Editorial).

Anciano-Grenadillo, V. J.; Earley, J. N.; Shuck, S. C.; Geogiadis, M. M.; Fitch, R. W.; Turchi, J. Targeting the OB-folds of Replication Protein A with Small Molecules. *J. Nucleic Acids* **2010** doi:10.4061/2010/304035.

Neher, T. M.; Jalal, S. I.; Fitch, R. W.; Turchi, J. J. Novel Irreversible Small Molecule Inhibitors of Replication Protein A Display Single Agent Activity and Synergize with Cisplatin. *Mol. Cancer. Therap.* **2011**, doi: 10.1158/1535-7163.MCT-11-0303.

Aachoui, Y.; Chowdhury, R. T.; R.; Fitch, R. W.; Ghosh, S. K. Molecular Signatures of Phytol-Derived Immunostimulants in the Context of Chemokine-Cytokine Microenvironment and Enhanced Immune Response *Cell. Immunol.* **2011**, **2011**, *271*, 227-238.

Aachoui, Y.; Schulte, M. L.; R.; Fitch, R. W.; Ghosh, S. K. Synthetic adjuvants for vaccine formulations: Evaluation of new phytol derivatives in induction and persistence of specific immune response. *Cell. Immunol.* **2011**, *271*, 308-318.

Swaffar, D. S.; Holley, C. J.; Fitch, R. W.; Elkin, K. R.; Zhang, C.; Sturgill, J. P.; Menachery, M. D. Phytochemical Investigation and *in vitro* Cytotoxic Evaluation of Alkaloids from *Abuta rufescens* *Planta Med.* **2012**, *78*, 230-232.

Patents

Fitch, R. W.; Spande, T. F.; Garraffo, H. M.; Yeh, H. J. C.; Daly, J. W. Phantasmidine, a Nicotinic Receptor Agonist for the Treatment of Addiction and Neurological Disorders HHS, Reference No. E-125-2010/0, US, Application No. 61/315,674 filed 19 Mar 2010; International Application PCT/US/28989, filed March 18, 2011.

Conference Presentations

Fitch, R. W.; Luzzio, F. A. Ultrasound-Mediated Aluminum Amalgam Reductions. Rate Acceleration and Alteration of Product Distribution in Reductions of 2-Nitroalkanols. Presented at the 207th National Meeting of the American Chemical Society, San Diego CA, March 13-17, **1994** (Poster ORGN 273).

Fitch, R. W.; Luzzio, F. A. Histrionicotoxins: A "Double Henry" Route to the Azaspiro[5,5]undecane System via Nitro-Functionalized Acetals. Presented at the 209th National Meeting of the American Chemical Society, Anaheim, CA, April 2-6, **1995** (Oral ORGN 377).

Luzzio, F. A.; Fitch, R. W. "Facile Reduction of Cinnamyl Compounds by Aluminum Amalgam Under Stirred and Sonolytic Conditions." Presented at the 35th National Organic Chemistry Symposium, San Antonio, TX, June 22-29, **1997** (Poster M96).

Fitch, R. W.; Luzzio, F. A. A "Double-Henry"/Nitroacetal Route to the Azaspiro[5,5]undecane Ring System Presented at the 214th National Meeting of the American Chemical Society, Las Vegas, NV, September 7-11, **1997** (Oral ORGN 380).

Luzzio, F. A.; Menes, M. E.; Fitch, R. W. Preparation and Evaluation of an Asymmetric Ligand for the Addition of Organometallic Reagents. Presented at the 49th Southeast Regional Meeting of the American Chemical Society, Roanoke, VA, October 19-22, **1997** (Poster ORGN 337).

Fitch, R. W.; Luzzio, F. A. Enzymatic Desymmetrization of *meso*-Azaspirocyclic Systems: A Formal Route to (+)- and (-)-Perhydrohistrionicotoxin. Presented at the 216th National Meeting of the American Chemical Society, Boston, MA, August 23-27, **1998** (Poster ORGN 143, SciMix).

Fan, H.; Scheffel, U.; Finley, P. A.; Dannals, R. F.; Wong, D. F.; Fitch, R.; Xiao, Y.; Kellar, K. J.; Musachio, J. L. C-11 Labeled 5-Propargyl-*O*-Methyl and 5-Propyl-*O*-Methyl Analogs of A-85380 as *in vivo* Markers of Central Nicotinic Acetylcholine Receptors. Presented at the 221st National Meeting of the American Chemical Society, San Diego CA, April 1-5, **2001** (Poster MEDI 81).

Fitch, R. W.; Garraffo, H. H.; Spande, T. F.; Yeh, H. J. C.; Daly, J. W. Epiquinamide: a Novel Nicotinic Agonist from an Ecuadoran Frog, *Epipebobates tricolor*. Presented at the 38th National Organic Symposium, Bloomington, IN, June 8-12, **2003** (Poster D46).

Fitch, R. W.; Garraffo, H. H.; Spande, T. F.; Yeh, H. J. C.; Daly, J.W. Fluorescent calcium and membrane potential sensitive assays for identification and isolation of bioactive natural products: isolation and characterization of novel nicotinic agonists from an Ecuadoran frog, *Epipedobates Tricolor*. Presented at the 44th meeting of the American Society of Pharmacognosy, Chapel Hill, NC, July 12-16, **2003** (Poster).

Fitch, R. W.; Garraffo, H. H.; Spande, T. F.; Yeh, H. J. C.; Daly, J. W. Bioassay-Guided Isolation of New Nicotinic Agonists from an Ecuadoran Frog, *Epipedobates tricolor*. Presented at the 52nd Gordon Research Conference on Natural Products, Tilton, NH, July 27-August 1, **2003** (Poster).

Fitch, R. W.; Chastain, B. C.; Clay, A. M.; Bedi, F. M.; Elliott, B. T. Homologated monovalent ligands for nicotinic receptors based on polyethylene glycol tethers. Presented at the 229th National Meeting of the American Chemical Society, San Diego CA, March 13-17, **2005** (Poster MEDI 0094).

Fitch, R. W.; Patel, S. R.; Lipscomb, K. J. Synthetic studies toward epiquinamide and analogs. Presented at the 229th National Meeting of the American Chemical Society, San Diego, CA, March 13-17, **2005** (Poster MEDI 0099).

Fitch, R. W.; Chastain, B. C.; Clay, A. M.; Bedi, F. M.; Elliott, B. T., Tominaga, K. Homologated ligands for nicotinic receptors. Presented at the 5th Kentuckiana Undergraduate Research Symposium, Louisville, KY, April 2, **2005** (Oral).

Fitch, R. W.; Sturgeon, G. D. Synthesis and Stereochemistry of Epiquinamide. Presented at the 230th National Meeting of the American Chemical Society, Washington, DC, August 28-September 1, **2005** (Poster MEDI 0150).

Lipscomb, K. J.; Patel, S.R.; Sturgeon, G.D.; Fitch, R.W. Synthesis and Biological Activity of Epiquinamide and Analogs. Presented at the 2nd Yamada Symposium (on Key Natural Organic Molecules in Biological Systems, Osaka, Japan, September 10-14, **2005** (Poster P-38).

Fitch, R.W.; Tominaga, K.; Hughes, J.M.; Elliott, B.T.; Clay, A.M.; Bedi, F.M. Homologated ligands for nicotinic receptors. Presented at the fall meeting of the Indiana Academy of Science, St. Mary-of-the-Woods College, St. Mary-of-the-Woods, IN, October 7, **2005** (Oral Presentation).

Lipscomb, K.J.; Patel, S.R.; Sturgeon, G.D.; Fitch, R.W. Synthesis and Stereochemistry of Epiquinamide. Presented at the 6th Kentuckiana Undergraduate Research Symposium, Louisville, KY, April 8, **2006** (Oral).

Fitch, R.W.; Sturgeon, G.D.; Patel, S.R.; Lipscomb, K.J.; Tucker, R.F. Synthesis and Biological Activity of Epiquinamide Stereoisomers. Presented at the 55th Gordon Research Conference on Natural Products, Tilton, NH, July 23-28, **2006** (Poster).

Chase, R.R.; Wright, J.; Fitch, R.W. Alkaloids of the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 47th meeting of the American Society of Pharmacognosy, Arlington, VA, August 5-9, **2006** (Poster P115).

Scates, B.A.; Theising, N.J.; Baker, T.G.; Chastain, B.C.; Tominaga, K.; Elliott, B.T.; Fitch, R.W. PEG-Ligand Analogs for Nicotinic Acetylcholine Receptors. Presented at the 233rd National Meeting of the American Chemical Society, Chicago, IL, March 24-29, **2007** (Poster MEDI 0291).

Fitch, R.W. Polyethylene Glycol-Modified Ligands for Nicotinic Acetylcholine Receptors. Presented at the 7th Kentuckiana Undergraduate Research Symposium, Louisville, KY, March 31, **2007** (Oral).

Fitch, R.W. Epiquinamide: A Poison That Wasn't From a Frog That Was. Presented at the 48th annual meeting of the American Society of Pharmacognosy, Portland, ME, July 14-18, **2007** (Oral O4).

Chase, R.R.; Fitch, R.W. Dioicine, a Novel Alkaloid from the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 48th annual meeting of the American Society of Pharmacognosy, Portland, ME, July 14-18, **2007** (Poster P117S).

Fitch, R. W.; Menachery, M. D.; Sikora, A. K.; Sharif, A. I.; Freyer, A. J. Isolation and Characterization of Erythramide from *Hyperbaena prioriana*: Nicotinic Receptor Pharmacology of Erythramide and Erythroculines. Presented at the 49th annual meeting of the American Society of Pharmacognosy, Athens Greece, August 3-8, **2008** (Poster P117S).

Fitch, R. W.; Chase, R. R. Acylcholine derivatives based on enantioenriched aminocyclanols. Presented at the 237th National Meeting of the American Chemical Society, Salt Lake City, UT, March 22-26, **2009** (Poster MEDI 249).

Fitch, R. W.; Hubbs, J.; Spande, T.F.; Garraffo, H. M.; Green, B. T.; Panter, K. E. Coffee Anyone: The Chemistry and Initial Pharmacology of Dioicine. Presented at the 50th annual meeting of the American Society of Pharmacognosy, Honolulu, HI, June 27-July 1, **2009** (Oral O-057).

Menachery, M. D.; Elkin, K. R.; Zhang, C.; Sturgill, J. P.; Fitch, R. W.; Further Alkaloids of *Abuta splendida/Abuta rufescens*. Presented at the 50th annual meeting of the American Society of Pharmacognosy, Honolulu, HI, June 27-July 1, **2009** (Poster P-348).

Fitch, R.W.; Spande, T. F.; Garraffo, H.M.; Yeh, H.J.C.; Whittaker, N.F.; Daly, J.W. Phantasmidine: A Novel Nicotinic Agonist from *Epipedobates anthonyi*. Presented at the 239th National Meeting of the American Chemical Society, San Francisco, CA, March 21-25, **2010** (Poster ORGN 338).

Fitch, R. W. Synthetic Studies Toward Phantasmidine. Presented at the 241st National Meeting of the American Chemical Society, Anaheim, CA, March 27-31, **2011** (Poster ORGN 122, SciMix).

Fitch, R. W. Phantasmidine: Structure, Activity and Synthetic Efforts. Presented at the 52nd Annual Meeting of the American Society of Pharmacognosy, San Diego, CA, July 30-August 3, **2011** (Oral O-091).

Swaffar, D. S.; Holley, C.; Fitch, R. W.; Menachery, M. D.; Cytotoxicity of Phenolic Alkaloids and Non-Phenolic Tropoloisoquinoline Alkaloids from *Abuta* Species Presented at the 52nd Annual Meeting of the American Society of Pharmacognosy, San Diego, CA, July 30-August 3, **2011** (Poster P-070).

Undergraduate Student Presentations

Chastain, B.C.; Fitch, R.W. Monovalent ligands for nicotinic receptors: A-84543 homologs. Presented at the 8th Indiana State University Research Showcase, April 24, **2004** (Poster).

Ganatra, S.; Fitch, R.W. Tobacco alkaloids: chemical and biological characterization. Presented at the 8th Indiana State University Research Showcase, April 24, **2004** (Poster).

Bedi, M.; Clay, A.M.; Fitch, R.W. Acetylcholine analogs and homologs for nicotinic receptors. Presented at the 8th Indiana State University Research Showcase, April 23, **2004** (Poster).

Lipscomb, K.J.; Fitch, R.W. Synthetic studies toward epiquinamide. Presented at the 8th Indiana State University Research Showcase, April 24, **2004** (Poster – **Award Winner**).

Chastain, B.C.; Fitch, R.W. PEG-conjugated ligands for nicotinic receptors: A-84543 homologs. Presented at the 229th National Meeting of the American Chemical Society, San Diego CA, March 13-17, **2005** (Poster CHED 1144).

Fitch, R.W.; Chastain, B.C.; Clay, A.M.; Bedi, F.M.; Elliott, B.T., Tominaga, K. Homologated monovalent ligands for nicotinic receptors based on polyethylene glycol tethers. Presented at the 5th Kentuckiana Undergraduate Research Symposium, Louisville, KY, April 2, **2005** (Poster).

Chase, R.R.; Fitch, R.W. Investigation of the alkaloid content of the Kentucky Coffeetree, *Gymnocladus dioica*. Presented at the 5th Kentuckiana Undergraduate Research Symposium, Louisville, KY, April 2, **2005** (Poster).

Chastain, B.C.; Fitch, R.W. PEG-conjugated ligands for nicotinic receptors: A-84543 homologs. Presented at the 9th Indiana State University Research Showcase, April 23, **2005** (Poster).

Tominaga, K.; Fitch, R.W. Synthesis of Monovalent polyethylene glycol-tethered acetylcholine analogs for nicotinic receptors. Presented at the 9th Indiana State University Research Showcase, April 23, **2005** (Poster).

Elliott, B.T.; Fitch, R.W. Synthesis of tethered ligands for nicotinic acetylcholine receptors based on quaternary ammonium salts: Piperazine derivatives. Presented at the 9th Indiana State University Research Showcase, April 23, **2005** (Poster).

Chase, R.R.; Fitch, R.W. Investigation of the alkaloid content of the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 9th Indiana State University Research Showcase, April 23, **2005** (Poster).

Gleckler, C.J.; Fitch, R.W. Enantiopure synthesis of cyclic serine/threonine derivatives. Presented at the 9th Indiana State University Research Showcase, April 23, **2005** (Poster– **Award winner**).

Sturgeon, G.D.; Fitch, R.W. Synthesis of Epiquinamide Isomers. Presented at the fall meeting of the Indiana Academy of Science, St. Mary-of-the-Woods College, St. Mary-of-the-Woods, IN, October 7, **2005** (Poster).

Hughes, J.M.; Elliott, B.T.; Tominaga, K.; Fitch, R.W. Synthetic Studies Toward Adamantane-Based Multivalent Dendrimers. Presented at the fall meeting of the Indiana Academy of Science, St. Mary-of-the-Woods College, St. Mary-of-the-Woods, IN, October 7, **2005** (Poster).

Chase, R.R.; Fitch, R.W. Investigation of the alkaloid content of the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 231st National Meeting of the American Chemical Society, Atlanta GA, March 26-30, **2006** (Poster CHED 1004).

Sturgeon, G.D.; Fitch, R.W. Resolution of Quinolizidine Enantiomers. Presented at the 231st National Meeting of the American Chemical Society, Atlanta GA, March 26-30, **2006** (Poster CHED 1018).

Chase, R.R.; Fitch, R.W. Investigation of the alkaloid content of the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 6th Kentuckiana Undergraduate Research Symposium, Louisville, KY, April 8, **2006** (Poster, *updated*).

Kuckewich, L.; Ellis, C.; Fitch, R.W. Synthetic Studies Toward Phantasmidine. Presented at the 10th Indiana State University Research Showcase, April 27, **2006** (Poster).

Sturgeon, G.D.; Fitch, R.W. Resolution of Quinolizidine Enantiomers. Presented at the 10th Indiana State University Research Showcase, April 27, **2006** (Poster).

Chase, R.R.; Wright, J. Fitch, R.W. Alkaloids of the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 10th Indiana State University Research Showcase, April 27, **2006** (Poster– **Award winner**).

Chase, R.R.; Wright, J. Fitch, R.W. Alkaloids of the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 122nd meeting of the Indiana Academy of Science, Muncie, IN, November 3, **2006** (Oral).

Miller, M.A.; Fitch, R.W. Alkaloids of *Packera glabella*. Presented at the 122nd meeting of the Indiana Academy of Science, Muncie, IN, November 3, **2006** (Oral).

Sturgeon, G.D.; Patel, S.R.; Lipscomb, K.J.; Tucker, R.J.F.; Fitch, R.W. Synthesis and Biological Activity of Epiquinamide Stereoisomers. Presented at the 122nd meeting of the Indiana Academy of Science, Muncie, IN, November 3, **2006** (Oral).

Baker, T.G.; Theising, N.J.; Tominaga, K.; Elliott, B.T.; Fitch, R.W. Synthesis and Biological Activity of Tethered Choline Analogs as Ligands for Nicotinic Receptors. Presented at the 122nd meeting of the Indiana Academy of Science, Muncie, IN, November 3, **2006** (Poster).

White, B.D.; Fitch, R.W. Studies Toward Enantioselective Swern Oxidation of Alcohols Presented at the 122nd meeting of the Indiana Academy of Science, Muncie, IN, November 3, **2006** (Poster).

Chase, R.R.; Wright, J. Fitch, R.W. Dioicine, a Novel Alkaloid from the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 233rd National Meeting of the American Chemical Society, Chicago, IL, March 24-29, **2007** (Poster CHED 1300).

Miller, M.A.; Fitch, R.W. Alkaloids of *Packera glabella*. Presented at the 233rd National Meeting of the American Chemical Society, Chicago, IL, March 24-29, **2007** (Poster CHED 1348).

White, B.D.; Fitch, R.W. Studies Toward Enantioselective Sulfur-Mediated Oxidation of Alcohols Presented at the 233rd National Meeting of the American Chemical Society, Chicago, IL, March 24-29, **2007** (Poster CHED 0677).

Chase, R.R.; Wright, J. Fitch, R.W. Dioicine, a Novel Alkaloid from the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 7th Kentuckiana Undergraduate Research Symposium, Louisville, KY, March 31, **2007** (Poster).

Miller, M.A.; Fitch, R.W. Alkaloids of *Packera glabella*. Presented at the 7th Kentuckiana Undergraduate Research Symposium, Louisville, KY, March 31, **2007** (Poster).

White, B.D.; Fitch, R.W. Studies Toward Enantioselective Sulfur-Mediated Oxidation of Alcohols Presented at the 7th Kentuckiana Undergraduate Research Symposium, Louisville, KY, March 31, **2007** (Poster).

Chase, R.R.; Fitch, R.W. Dioicine, a Novel Alkaloid from the Kentucky Coffeetree, *Gymnocladus dioicus*. Presented at the 11th Indiana State University Research Showcase, April 11, **2007** (Oral– **Award winner**).

Baker, T.G.; Theising, N.J.; Tominaga, K.; Elliott, B.T.; Fitch, R.W. Synthesis and Biological Activity of Tethered Choline Analogs as Ligands for Nicotinic Receptors. Presented at the 11th Indiana State University Research Showcase, April 11, **2007** (Poster).

Miller, M.A.; Fitch, R.W. Alkaloids of *Packera glabella*. Presented at the 11th Indiana State University Research Showcase, April 11, **2007** (Poster).

White, B.D.; Fitch, R.W. Studies Toward Enantioselective Sulfur-Mediated Oxidation of Alcohols Presented at the 11th Indiana State University Research Showcase, April 11, **2007** (Poster).

Chase, R.R.; Fitch, R.W. Enantioselective Synthesis of Aminocyclobutanol. Presented at the 2007 Eli Lilly Undergraduate Research Fellows Symposium, Indianapolis, IN, August 7, **2007** (Poster).

Liu, Y.C.; Yake, K.; Fitch, R.W. Selective Monoalkylation of Tetraethylene Glycol. Presented at the 123rd meeting of the Indiana Academy of Science, Indianapolis, IN, October 26, **2007** (Oral)

Miller, M.A.; Cox, M.E.; Fitch, R.W. Synthesis and Characterization of S,S'-di-tert-Butylcyclocysteine and the Corresponding Sulfoxide. Presented at the 123rd meeting of the Indiana Academy of Science, Indianapolis, IN, October 26, **2007** (Oral)

Chase, R.R.; Fitch, R.W. Enantioselective Synthesis of Aminocyclobutanol. Presented at the 4th Annual IRCBC Undergraduate Research Symposium, Terre Haute, IN, November 2, **2007** (Poster).

Liu, Y.C.; Yake, K.; Fitch, R.W. Selective Monoalkylation of Tetraethylene Glycol. Presented at the 4th Annual IRCBC Undergraduate Research Symposium, Terre Haute, IN, November 2, **2007** (Poster).

Liu, Y.C.; Yake, K.; Fitch, R.W. Selective Monoalkylation of Tetraethylene Glycol. Presented at the 235th National Meeting of the American Chemical Society, New Orleans, LA, April 5-10, **2008** (Poster CHED 0440).

Chase, R.R.; Fitch, R.W. Enantioselective Synthesis of Aminocyclobutanol. Presented at the 235th National Meeting of the American Chemical Society, New Orleans, LA, April 5-10, **2008** (Poster CHED 0595).

Miller, M.A.; Cox, M.E.; Fitch, R.W. Synthesis and Characterization of S,S'-di-tert-Butylcyclocysteine and the Corresponding Sulfoxide. Presented at the 235th National Meeting of the American Chemical Society, New Orleans, LA, April 5-10, **2008** (Poster CHED 0580).

Liu, Y.C.; Yake, K.; Fitch, R.W. Selective Monoalkylation of Tetraethylene Glycol. Presented at the 12th Indiana State University Research Showcase, April 2, **2008** (Oral).

Reed, R.; Fitch, R.W. Investigation of Alkaloid Content of Local Leguminous Trees Presented at the 12th Indiana State University Research Showcase, April 2, **2008** (Poster).

Chase, R.R.; Fitch, R.W. Enantioselective Synthesis of Aminocyclobutanol. Presented at the 12th Indiana State University Research Showcase, April 2, **2008** (Oral).

Miller, M.A.; Cox, M.E.; Fitch, R.W. Synthesis and Characterization of S,S'-di-tert-Butylcyclocysteine and the Corresponding Sulfoxide. Presented at the 12th Indiana State University Research Showcase, April 2, **2008** (Poster).

Chase, R.R.; Fitch, R.W. Enantioselective Synthesis of Aminocyclobutanol. Presented at the University of Kentucky Research Poster Session, April 18, **2008** (Poster – **Award - 1st place**).

Schulte, M. L.; Fitch, R.W. Synthetic Studies on 2,5-Dichlorohomonicotinic acid . Presented at the 2007 Eli Lilly Undergraduate Research Fellows Symposium, Indianapolis, IN, July 22, **2008** (Poster).

Coffey, A. C. J.; Fitch, R.W. Synthesis of Sulfenamides and Evaluation in Halogen-Based Oxidation of Alcohols . Presented at the 124th meeting of the Indiana Academy of Science, Evansville, IN, October 24, **2008** (Oral)

Seward K. B.; Clinedinst, M. A.; Cox, M. E.; Fitch, R.W. *S-tert*-butylation of Aminothiols. Presented at the 124th meeting of the Indiana Academy of Science, Evansville, IN, October 24, **2008** (Oral)

Schulte, M. L.; Fitch, R.W. Synthetic Studies on 2,5-Dichlorohomonicotinic acid . Presented at the 124th meeting of the Indiana Academy of Science, Evansville, IN, October 24, **2008** (Oral)

Clinedinst, M. A.; Coffey, A. C. J.; Fitch, R. W. Studies on Sulfur-Mediated Oxidation of Alcohols with Chiral Sulfides. Presented at the 237th National Meeting of the American Chemical Society, Salt Lake City, UT, March 22-26, **2009** (Poster CHED 859).

Seward K. B.; Coffey, A. C. J.; Clinedinst, M. A.; Cox, M. E.; Fitch, R. W. Acid-Promoted *tert*-Butylation of Thiols Under Pressure. Presented at the 237th National Meeting of the American Chemical Society, Salt Lake City, UT, March 22-26, **2009** (Poster CHED 719).

Titzer, P.; Chase, R.R.; Fitch, R.W. Optimization of Cyclobutene Synthesis by Photochemical Ring Closure. Presented at the 2009 Eli Lilly Undergraduate Research Fellows Symposium, Indianapolis, IN, August 4, **2009** (Poster).

Clinedinst, M. A.; Coffey, A. C. J.; Fitch, R. W. Studies on Sulfur-Mediated Oxidation of Alcohols with Chiral Sulfides. Presented at the 2009 Meeting of the Lewis Stokes Alliance for Minority Participation, Indiana, West Lafayette, IN, November 7, **2009** (Poster).

Seward K. B.; Coffey, A. C. J.; Clinedinst, M. A.; Cox, M. E.; Fitch, R. W. Acid-Promoted *tert*-Butylation of Thiols Under Pressure. Presented at the 2009 Meeting of the Lewis Stokes Alliance for Minority Participation, Indiana, West Lafayette, IN, November 7, **2009** (Poster).

Paden, A. B.; Fitch, R. W. Synthesis of a Bifunctional Linker Based on a PEG-Diamine Presented at the 2009 Meeting of the Lewis Stokes Alliance for Minority Participation, Indiana, West Lafayette, IN, November 7, **2009** (Poster).

Tingley, J.; Paden, A. B.; Fitch, R. W.; Synthetic Studies Toward Adamantane-Based Dendrimers for Biological Applications. Presented at the 239th National Meeting of the American Chemical Society, San Francisco, CA, March 21-25, **2010** (Poster CHED 1158).

Wyman, B.; Hubbs, J.; Torma.; Fitch, R.W. Dioicine: Chemical Ecology, Synthetic and Biological Studies. Presented at the 239th National Meeting of the American Chemical Society, San Francisco, CA, March 21-25, **2010** (Poster CHED 1170).

Titzer, P.; Chase, R.R.; Fitch, R.W. Synthetic Studies on the Photochemical Electrocyclic Ring Closure of 1,3-Butadiene. Presented at the University of Kentucky Research Poster Session, April 16, **2010** .

Tingley, J.; Paden, A. B.; Fitch, R. W.; Synthetic Studies Toward Adamantane-Based Dendrimers for Biological Applications. Presented at the Indiana State University Celebration of Student Scholarship, April 21, **2010** (Poster).

Wyman, B.; Hubbs, J.; Torma.; Fitch, R.W. Dioicine: Chemical Ecology, Synthetic and Biological Studies. Presented at the Indiana State University Celebration of Student Scholarship, April 21, **2010** (Poster).

Titzer, P.; Chase, R.R.; Fitch, R.W. Synthetic Studies on the Photochemical Electrocyclic Ring Closure of 1,3-Butadiene. Presented at the Indiana State University Celebration of Student Scholarship, April 21, **2010** (Poster).

Buchanan, C. B.; Kast, J. A.; Fitch, R. W. Selective Lithiation of 2,6-Dichloropyridine. Presented at the annual meeting of Central States Universities Inc., Argonne, IL, October 15, **2010** (Oral)

Wyman, B.; Fitch, R. W. Synthetic Studies Toward Dioicine. Presented at the 126th meeting of the Indiana Academy of Science, Indianapolis, IN, March 5, **2011** (Poster)

Buchanan, C. B.; Kast, J. A.; Fitch, R. W. Selective Lithiation of 2,6-Dichloropyridine. Presented at the 126th meeting of the Indiana Academy of Science, Indianapolis, IN, March 5, **2011** (Poster)

Wyman, B.; Fitch, R. W. Synthetic Studies Toward Dioicine. Presented at the 241st National Meeting of the American Chemical Society, Anaheim, CA, March 27-31, **2011** (Poster CHED 468).

Buchanan, C. B.; Kast, J. A.; Fitch, R. W. Selective Lithiation of 2,6-Dichloropyridine. Presented at the 241st National Meeting of the American Chemical Society, Anaheim, CA, March 27-31, **2011** (Poster CHED 1066).

Norcross, R.; Stanfield, J. Fitch, R.W. Acid-Catalyzed tert-Butylation of Thiols. Presented at the 2011 Eli Lilly Undergraduate Research Fellows Symposium, Indianapolis, IN, August 16, **2011** (Poster).

Norcross, R.; Stanfield, J. Fitch, R.W. Acid-Catalyzed tert-Butylation of Thiols. Presented at the 46th Midwest/39th Great Lakes Joint Regional ACS Meeting St. Lous, MO, October 19-22, **2011** (Poster).

Buchanan, C. B.; Fitch, R. W. Synthesis of 2,6-dichlorohomonicotinic Acid. Presented at the 127th meeting of the Indiana Academy of Science, West Lafayette, IN, March 10, **2012** (Oral).

Buchanan, C. B.; Fitch, R. W. A Convenient Synthesis of 2,6-dichlorohomonicotinic Acid. Presented at the 243rd National Meeting of the American Chemical Society, San Diego, CA, March 25-29, **2012** (Poster CHED 1165).

Norcross, R.; Stanfield, J. Fitch, R.W. Convenient Synthesis of alkyl- and aryl-*S-tert*-butylthioethers. Presented at the 243rd National Meeting of the American Chemical Society, San Diego, CA, March 25-29, **2012** (Poster CHED 1165).

Buchanan, C. B.; Fitch, R. W. A Convenient Synthesis of 2,6-dichlorohomonicotinic Acid. Presented at the University of Kentucky Research Poster Session, April 13, **2012** .(**Honorable Mention Award**).

Major L.; Prickett, C.; Dalton, D.; Moser, L.; Fitch, R.W. Halopyridine Bicycles as Intermediates for Alkaloid Synthesis. Presented at the 9th Annual IRC Undergraduate Research Symposium, Terre Haute, IN, October 22, **2012** (Poster).

Steele E.; McDonald, C.; Weng, A.; Saporito, R. A.; Fitch, R.W. Alkaloid Constituents of *Dendrobates auratus* from Oahu, Hawaii. Presented at the 9th Annual IRC Undergraduate Research Symposium, Terre Haute, IN, October 22, **2012** (Oral).

Funding

Current

(R.A. Kjoanaas, L. Rosenhein, A. Halpern, coPIs) 8/15/2010 – 10/30/2013
NSF CCLI Program (DUE 0942345) \$116,389
CCLI: Cross-Course Collaboration in the Undergraduate Chemistry Curriculum.

NSF- CHE- RUI (CHE 1012629) 7/1/2010 – 6/60/2012
Investigator initiated grant (PI) \$169,122 direct
Stereocontrolled Synthesis of Phantasmidine and Analogs

Pending

(A. Albig, D. K. Hews, S. F Wolf, coPIs) 9/1/2012 – 8/31/2015
NSF MRI Program \$385,003
MRI: Acquisition of a Liquid Chromatograph Mass Spectrometer.

Completed

University Research Committee (UNR 301) 2/22/2010 – 12/31/2011
Indiana State University \$5,267.75
Synthetic and Semisynthetic Derivatives of Dioicine.

R21GM072780 01A1 5/1/2006-4/30/2009
NIH/NIGMS R21 \$175,000 Direct
Multivalent ligands for nicotinic receptors.

Enantioselective Sulfur-Mediated Oxidation of Alcohols 5/1/2006-6/1/2009
Research Corporation (Cottrell College Science Award) \$38,218 Direct

Center for Public Service and Community Engagement 9/1/08 – 4/30/09

Indiana State University	\$4,000
Experiential Learning and Community Engagement - Synthetic Studies Toward Phantasmidine	
Center for Public Service and Community Engagement	9/1/08 – 4/30/09
Indiana State University	\$5,000
Undergraduate Fellow: Synthetic Studies Toward Phantasmidine (Michael Schulte – Student)	
Center. for Public Service and Community Engagement	5/1/08 – 6/30/09
Indiana State University	\$5,000 Fellow/\$5,000 Department
Faculty Fellow: Synthesis of Dioicine.	
Center for Information and Research Technology	Spring 2007
Indiana State University	\$4,000
IT-Minigrant “Incorporation of Electronic Resources into the Advanced Organic Chemistry Laboratory”	
Promising Scholars (Office of the Provost/Lilly Foundation)	1/1/2006-5/1/2008
Indiana State University	\$15,000
Bioactive compounds from Indiana Plants.	
CHE-0521075 (R.A. Kjonaas, L. Rosenhein, coPIs)	7/1/2005 – 6/30/2008
NSF MRI Program	\$284,000
MRI: Acquisition of a 400 MHz Nuclear Magnetic Resonance Spectrometer.	
Center for Public Service and Community Engagement	9/1/06 – 4/30/07
Indiana State University	\$5,000
Undergraduate Fellow: Bioactive Compounds from Natural Sources (Rachael Chase – Student)	
Center for Public Service and Community Engagement	5/1/06 – 4/30/07
Indiana State University	\$5,000 Fellow/\$5,000 Department
Faculty Fellow: Isolation of Natural Products from Native Indiana Plants.	
University Research Committee Grant UNR-246	6/1/2005 – 12/31/2006
Indiana State University	\$6,285
Chemistry and Pharmacology of Plant Alkaloids	
Sigma Xi Grant-in-aid	1/4/2004 – 5/4/2004
Synthesis of Epiquinamide (Karen Lipscomb – Student)	\$750
Startup Funds	9/1/2003 – 8/30/2006
Indiana State University	\$75,000.

References

Dr. Thomas F. Spande

Laboratory of Bioorganic Chemistry
National Institute of Diabetes and Digestive and Kidney Diseases
National Institutes of Health
9000 Rockville Pike, Bldg. 8, Rm. 1A24
Bethesda, MD 20892
(301) 496-2686
Email THOMASSP@bdg8.niddk.nih.gov

Dr. Kenneth J. Kellar, Professor

Department of Pharmacology
Georgetown University School of Medicine
3900 Reservoir Road, NW
Washington, DC 20057
(202) 687-1032

Dr. Eric D. Glendening, Professor and Chair

Department of Chemistry and Physics
Indiana State University
600 Chestnut Street, Science S35
Terre Haute, IN 47809