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Research Interests

Mechanistic evaluation of G protein signaling pathways as targets for therapeutics

Education

- 1979-1981 University of Connecticut, Storrs, CT
B.S. Biology, 1981
- 1982-1984 Arizona State University, Tempe, AZ
M.S. Botany, 1984
- 1984-1990 University of Arizona, Tucson, AZ
Ph.D. Biochemistry, 1990
Doctoral dissertation research, laboratory of Dr. Richard G. Jensen.
- 1990-1994 Postdoctoral Fellow, Pharmacology Department, University of Texas
Southwestern Medical Center at Dallas, Dallas, TX, laboratory of Dr. Paul C.
Sternweis

Academic Appointments

- 1994-1996 Assistant Professor of Pharmacology,
University of Rochester School of Medicine and Dentistry
- 1996-2000 Assistant Professor of Pharmacology and Physiology and of Oncology,
University of Rochester School of Medicine and Dentistry.
- 2000-2007 Associate Professor of Pharmacology and Physiology and of Oncology,
University of Rochester School of Medicine and Dentistry.
- 2004-2007 Associate Professor (with tenure) of Pharmacology and Physiology,
Biochemistry and Biophysics and of Oncology, University of Rochester
School of Medicine and Dentistry.
- 2007-present Professor of Pharmacology and Physiology, Biochemistry and Biophysics,
University of Rochester School of Medicine and Dentistry.
- 2008-2009 Visiting Professor, Institute for Research in Biomedicine, Barcelona, Spain.
- 2010-present Professor in the Aab Cardiovascular Research Institute
- 2011-present Louis C. Lasagna Professor of Experimental Therapeutics.

Funding

Current:

- 4/08-3/16 National Institutes of Health R01-GM081772 (Smrcka, PI)
Selective targeting of G protein $\beta\gamma$ subunits with small molecules”
- 9/96-12/15 National Institutes of Health R01 GM53536 (Smrcka, PI) “Mechanisms for
Regulation of Phospholipase C by G Proteins”
- 8/14-7/18 National Institutes of Health R01GM111735-01 (Smrcka, PI)
Phosphatidylinositol 4-phosphate Hydrolysis in Spatiotemporal Cell
Signaling.
- 4/12 – 3/17 National Institutes of Health R01 GM101023-01 (Kammermeier, PI)
Functional and Pharmacological Implications of mGluR Heteromerization
- 7/13 – 6/18 National Institutes of Health R01 (Rahman, A., PI)
Regulation of Lung Autophagy and Inflammation
- 9/14-12/15 Novartis Pharmaceuticals (Smrcka, A., PI)
Cellular Mechanisms for Serelaxin-Dependent Regulation of Cardiac
Myocyte Hypertrophy.

Pending:

- 7/15-6/20 National Institutes of Health T32GM113880-01 (Smrcka, PI)
Rochester Pharmacological Sciences Training Program
- 1/16-12/21 National Institutes of Health R01 GM53536 (Smrcka, PI) “Mechanisms for
Regulation of Phospholipase C by G Proteins (6th percentile)

Past:

- 11/14-3/15 National Institutes of Health R13DA038929-01 (Smrcka, PI)
2015 Molecular Pharmacology Gordon Research Conference/Gordon
Research Seminar
- 7/13 – 6/14 URMC Clinical and Translational Science Institute CTSI Pilot Project
(Smrcka and Anolik, MPI) Investigation of inhibition of G Protein $\beta\gamma$
signaling as a therapeutic approach to treatment of lupus
- 10/11-9/12 National Institutes of Health (SBIR) R43-HL110555-01 (Goodfellow-PI,
Smrcka Co-PI) Califia Bio/University of Rochester subcontract
“Therapeutic Small Molecule Modulators of $G\beta\gamma$ Signaling”
- 7/11-6/12 National Institutes of Health R21NS075611 (Martinez-Sobrido, PI;
Smrcka, Co-PI) “Identification of compounds that activate interferon to treat
viral infections”
- 4/10-6/12 National Institutes of Health R01-HL091475 (Blaxall, PI; Smrcka,
Co-PI) “Targeting Of β -Ar/ $G\beta\gamma$ Signaling In The Heart With Small
Molecules”
- 9/08-8/09 University of Rochester Provost Award (Smrcka, Co-PI) “Mechanistic
Studies of G-Protein Rearrangements Using Single Molecule Fluorescence
Resonance Energy Transfer”
- 2/06-6/07 Johnson and Johnson Discovery Fund (Smrcka, PI) Small Molecule
Targeting of G Protein Beta Gamma Subunits

Funding, Past (contd.):

- 4/05–04/06 National Institutes of Health Grant S10 RR20876 (Smrcka, PI)
Instrumentation Grant Nano-HPLC-ESI Quadrupole Ion Trap Mass Spectrometer
- 7/00-6/03 American Heart Association Northeast Affiliate Grant-in-Aid (Smrcka, PI)
“Development of Selective Cell Permeable Inhibitors of G Protein $\beta\gamma$ Subunit Signaling”
- 6/00-5/08 National Institutes of Health R01-GM060286 (Smrcka, PI) Structural Basis for binding to G Protein $\beta\gamma$ subunits.
- 7/97- 6/99 American Heart Association Grant-in-aid 96012990 (Smrcka, PI)
“Determination of the Mechanism for Regulation of Phospholipase C $\beta 2$ by G-protein $\beta\gamma$ subunits”
- 7/95- 6/96 A.C.S. Institutional Research Grant (Smrcka, PI) “Identification of Phospholipase C-G Protein Interactions”
- 1/96- 12/96 Pharmaceutical Manufacturers of America Research Starter Grant (Smrcka, PI) “Regulation of Phospholipase C by G-proteins and Lipids”

Patents

U.S. Patent Number 8,748,480

Title “Methods for Treating Opioid Tolerance”

Inventors: Smrcka, Font, Bonacci

U.S. Patent Number 20100130505

Title: “Compositions And Methods For Inhibiting G Protein Signaling”

Inventor(s): Smrcka, Bidlack and Blaxall

National Service/Awards/Honors

1991-1993	National Institutes of Health Postdoctoral Research Fellowship "Regulation of Phospholipase C by G Proteins"
1998-2001	Member of the Molecular Scientific Review Group at the American Heart Association
2002-2003	Professor of the Year Award in the Natural Sciences from the Undergraduate Student Association Senate.
2002-03	Standing Member of the "Pharmacology" study section at NIH.
2003-06	Standing Member of the "Hypertension Microcirculation" study section at NIH.
2007	URMC Cancer Center "Davey Award" for basic research excellence.
2008-09	Chair-Elect, Molecular Pharmacology Division, American Society of Pharmacology and Experimental Therapeutics.
2009-10	Chair, Molecular Pharmacology Division, American Society of Pharmacology and Experimental Therapeutics.
2011-present	Lewis C. Lasagna Endowed Professorship in Experimental Therapeutics
2014-	Standing Member of the "Molecular and Integrative Signal Transduction (MIST)" study section at NIH
2016	Chair, MIST study section at NIH

Publications (original research)

- Smrcka A.V.**, and Szarek S.R. Phenotypical Temperature Adaptation of Protein Turnover in Desert Annuals. *Plant Physiol* **80**:206-210, 1986.
- Smrcka A.V.**, and Jensen R.G. HPLC Separation and Indirect Ultraviolet Detection of Phosphorylated Sugars. *Plant Physiol* **86**:615-618, 1988.
- Smrcka A.V.**, Ramage R.T., Bohnert H.J., and Jensen R.G. Purification and Characterization of the Large and Small Subunits of Ribulose 1,5-Bisphosphate Carboxylase Expressed Separately in *Escherichia Coli*. *Arch Biochem Biophys* **285**:6-13, 1991.
- Smrcka A.V.**, Bohnert H.J., and Jensen R.G. Modulation of the Tight Binding of 2-Carboxy-D-Arabinitol 1,5-Bisphosphate to the Large Subunit of Ribulose 1,5-Bisphosphate Carboxylase/Oxygenase. *Arch Biochem Biophys* **286**:14-19, 1991.
- Smrcka A.V.**, Hepler J.R., Brown K.O., and Sternweis P.C. Regulation of Polyphosphoinositide-Specific Phospholipase C Activity by Purified G_q. *Science* **251**:804-807, 1991.
- Gutowski S., **Smrcka A.**, Nowak L. Wu D., Simon M., and Sternweis P.C. Antibodies to the α_q Subfamily Of G-Protein α Subunits Attenuate Activation of Polyphosphoinositide Hydrolysis by Hormones. *J Biol Chem* **266**:20519-20524, 1991.
- Wang R.L., **Smrcka A.V.**, Sternweis P.C., and Exton J.H. Photoaffinity Labeling of Two Rat Liver Plasma Membrane Proteins With [³²P]Gamma-Azidoanilido GTP in Response to Vasopressin. *J Biol Chem* **266**:11409-11412, 1991.
- Berstein G., Blank J.L., **Smrcka A.V.**, Higashijima T., Sternweis P.C., Exton J.H., and Ross E.M. Reconstitution of Agonist-Stimulated Phosphatidylinositol 4,5-Bisphosphate Hydrolysis Using Purified M1 Muscarinic Receptor, G_{q/11} and Phospholipase C β 1. *J Biol Chem* **267**:8081-8088, 1992.
- Smrcka A.V.**, and Sternweis P.C. Regulation of Purified Subtypes of Phosphatidylinositol Specific Phospholipase C β by G Protein α and $\beta\gamma$ Subunits. *J Biol Chem*. **283**:9667-9674, 1993.
- Hepler J.R., Kozasa T., **Smrcka A.V.**, Simon M.I., Rhee S.G., Sternweis P.C., and Gilman A.G. Purification From Sf9 Cells and Characterization Of Recombinant G_{q α} and G_{11 α} : Activation of Purified Phospholipase C Isozymes by G α Subunits. *J Biol Chem*. **268**:14367-14375, 1993.
- Ueda N., Iniguez-Lluhi J.A., Lee E., **Smrcka A.V.**, Robishaw J.D., and Gilman A.G. G Protein $\beta\gamma$ Subunits: Simplified Purification and Properties of Novel Isoforms. *J Biol Chem* **269**:4388-4395, 1993.
- Kozasa T., Hepler J.R., **Smrcka A.V.**, Simon M.I., Rhee S.G., Sternweis P.C., and Gilman A.G. Purification From Sf9 Cells and Characterization of Recombinant G_{16 α} : Activation of Purified Phospholipase C Isozymes by G α Subunits. *Proc Natl Acad Sci USA* **90**:9176-9180, 1993.
- Stephens L., **Smrcka A.**, Cooke F.T., Jackson T.R., Sternweis, P.C., and Hawkins P.T. A Novel Phosphoinositide 3-Kinase Activity in Myeloid Derived Cells is Activated by G-Protein $\beta\gamma$ -Subunits. *Cell* **77**:83-93, 1994.
- Parish, C.A., **Smrcka, A.V.**, and Rando, R.R. Functional Significance of $\beta\gamma$ -Subunit Carboxymethylation for the Activation of Phospholipase C and Phosphoinositide 3kinase. *Biochemistry* **34**:7722-7727, 1995.

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- Kuang Y., Wu Y., **Smrcka A.**, Jiang H., and Wu D. Identification of a Phospholipase C $\beta 2$ Region that Interacts with G $\beta\gamma$. *Proc Natl Acad Sci USA* **93**:2964-2968, 1996.
- Jiang H., Kuang Y., Wu Y., **Smrcka A.**, Simon M.I., and Wu D. Pertussis Toxin-Sensitive Activation of Phospholipase C by the C5a and f-Met-Leu-Phe Receptors. *J Biol Chem* **271**:13430-13434, 1996.
- Parish C.A., **Smrcka A.V.**, and Rando R.R. The Role of G Protein Methylation in the Function of a Geranylgeranylated $\beta\gamma$ Isoform. *Biochemistry* **35**:7499-7505, 1996.
- Ptasznik A., Prossnitz E.R., Yoshikawa D., **Smrcka A.**, Traynor-Kaplan A.E., and Bokoch G.M. PIP₃ Formation in Chemo Attractant-Stimulated Human Neutrophils Requires a Tyrosine Kinase Signaling Pathway. *J Biol Chem*, **271**: 25204-25207, 1996.
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- Stephens L.R., Eguinoa A., Erdjument-Bromage H., Liu M., Cooke F., Coadwell J., **Smrcka A.V.**, Thelen M, Cadwallader K, Tempst P, and Hawkins PT. The G $\beta\gamma$ -Sensitivity of a PI3K is Dependent Upon a Tightly-Associated Adapter, P101. *Cell*, **89**:105-114, 1997.
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- Xie, W., Samoriski, G.M., McLaughlin, J.P., Romoser, V.A., **Smrcka, A.V.**, Hinkle, P.M., Bidlack, J.M., Gross, R.A., Jiang, H. and Wu, D. Genetic Alteration of Phospholipase C $\beta 3$ Expression Modulates Behavioral and Cellular Responses To μ Opioids. *Proc Natl Acad Sci USA* **96**:10385-10390, 1999.
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- Barr, A.J., Ali, H., Haribabu, B., Snyderman, R., and **Smrcka, A.V.** Identification of a Region at the N-Terminus of Phospholipase C- $\beta 3$ that Interacts with G Protein $\beta\gamma$ Subunits. *Biochemistry* **39**:1800-1806, 2000.
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- Hou, Y., Azpiazu, I, **Smrcka, A.** and Gautam, N. Selective Role of G Protein γ Subunits in Receptor Interaction. *J Biol Chem* 275:38961-38964, 2000.
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- Fogg, V.C., Azpiazu, I., Linder, M.E., **Smrcka, A.**, Scarlata, S., and Gautam, N. Role Of The Gamma Subunit Prenyl Moiety In G Protein $\beta\gamma$ Complex Interaction With Phospholipase C β . *J Biol Chem* **276**:41797-41802, 2001.
- Goubaeva, F., Ghosh, M., Malik, S., Yang, J., Hinkle, P.M., Griendling, K.K., Neubig, R.R. and **Smrcka, A.V.** Stimulation Of Cellular Signaling And G Protein Subunit Dissociation By G Protein $\beta\gamma$ Subunit Binding Peptides. *J Biol Chem* **278**:19634-19641, 2003.
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- Ghosh, M., Peterson, Y.K., Lanier, S.M. and **Smrcka, A.V.** Receptor And Nucleotide Exchange Independent Mechanisms For Promoting G Protein Subunit Dissociation. **Accelerated Publication** *J Biol Chem*. **278**: 34747-34750, 2003.
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- Kelley, G.G., Kaproth-Joslin, K.A., Reks, S.E., **Smrcka, A.V.** and Wojcikiewicz, R.J. G-protein coupled receptor agonists activate endogenous phospholipase C ϵ and phospholipase C β 3 in a temporally distinct manner. *J Biol Chem*. **281**:2639-48. 2006.
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- Bonacci, T.M., Mathews, J.L., Yuan, C., Lehmann, D., Malik S., Wu, D., Font, J.L., Bidlack, J.M. and **Smrcka, A.V.** Differential Targeting of G $\beta\gamma$ -Subunit Signaling with Small Molecules. *Science* **312**: 443-446, 2006.

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- Hinkes, B., Wiggins, R.C., Gbadegesin, R., Vlangos, C.N., Seelow, D., Nurnberg, G., Garg, P., Verma, R., Chaib, H., Hoskins, B.E., Ashraf, S., Becker, C., Hennies, H.C., Goyal, M., Wharram, B.L., Schachter, A.D., Mudumana, S., Drummond, I., Kerjaschki, D., Waldherr, R., Dietrich, A., Ozaltin, F., Bakkaloglu, A., Cleper, R., Basel-Vanagaite, L., Pohl, M., Griebel, M., Tsygin, A.N., Soyulu, A., Muller, D., Sorli, C.S., Bunney, T.D., Katan, M., Liu, J., Attanasio, M., O'Toole, J.F., Hasselbacher, K., Mucha, B., Otto, E.A., Airik, R., Kispert, A., Kelley, G.G., **Smrcka, A.V.**, Gudermann, T., Holzman, L.B., Nurnberg, P. and Hildebrandt, F. Positional Cloning of *PLCE1* Mutations as the First Cause of a Nephrotic Syndrome Variant Which May be Reversible. *Nature Genetics* **38**:1397-40, 2006.
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- Citro, S., Malik, S., Oestreich, E., Radeff-Huang, J., Kelley, G.G., **Smrcka***, **A.V.**, Heller-Brown*, J. Phospholipase C ϵ is a Nexus for Rho and Rap-Mediated G Protein-Coupled Receptor-Induced Astrocyte Proliferation. *Proc Natl Acad Sci* **104**:15543-15548, 2007.
- *These authors contributed equally to this work.
- Lehmann, D.M. and **Smrcka A.V.** Small Molecule Inhibition of G Protein $\beta\gamma$ Subunit Signaling Suppresses Neutrophil Chemotaxis and Inflammation. *Mol Pharm* **73**:410-418, 2008.
- Mathews, J.L., **Smrcka, A.V.** and Bidlack, J.M. A novel G $\beta\gamma$ -subunit inhibitor selectively modulates mu-opioid-dependent antinociception and attenuates acute morphine-induced antinociceptive tolerance and dependence. *J Neurosci* **28**:12183-12189, 2008.
- Oestreich, E.A., Malik S., Goonasekera, S.A., Blaxall, B.C., Kelley, G.G., Dirksen, R.T. and **Smrcka A.V.** EPAC and phospholipase C ϵ regulate Ca²⁺ release in the heart by activation of protein kinase C ϵ and calcium-calmodulin-kinaseII. *J Biol Chem* **284**:1514-1522, 2009.
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- Wang, Z., Kumamoto, Y., Wang, P., Gan, X., Lehmann, D., **Smrcka, A.V.**, Cohn, L., Iwasaki A., Li L. and Wu, D. Regulation of immature dendritic cell migration by RhoA guanine nucleotide exchange factor Arhgef5. *J Biol Chem.* **284**:28599-28606, 2009.
- Serasinghe, M.N., Seneviratne, A.M., **Smrcka, A.V.** and Yoon, Y. Identification and characterization of unique proline-rich peptides binding to the mitochondrial fission protein hFis1. *J Biol Chem* **285**:620-630, 2010.

Publications (original research) (contd.)

- Smrcka, A.V.**, Kichik, N., Tarrago, T., Burroughs, M., Park, M-S, Igota, N.K., Stern, H.A., Willardson, B.M., and Giralt, E. NMR analysis of G-protein $\beta\gamma$ subunit complexes reveals a dynamic $G\alpha$ - $G\beta\gamma$ subunit interface and multiple protein recognition modes. *Proc Natl Acad Sci* **107**:239-644, 2010.
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- Gaudy, A.M., Clementi, A.H., Campbell, J.S., **Smrcka, A.V.** and Mooney, R.A. Suppressor of cytokine signaling-3 is a glucagon-inducible inhibitor of PKA activity and gluconeogenic gene expression in hepatocytes. *J Biol Chem* **285**:41356-41365, 2010.
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- Park, M.S., **Smrcka, A.V.** and Stern, H.A. Conformational flexibility and binding interactions of the G protein $\beta\gamma$ heterodimer. *Proteins* **79**:518-527, 2011.
- Seneviratne, A.M.P.B., Burroughs, M., Giralt, E., and **Smrcka, A.V.** Direct-reversible binding of small molecules to G protein $\beta\gamma$ subunits. *Biochim Biophys Acta: Proteins and Proteomics*, **1814**:1210-1218, 2011.
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- Zhang, L., Malik, S., Kelley, G.G., Kapiloff, M.S., and **Smrcka, A.V.** Phospholipase C ϵ scaffolded to mAKAP β integrates multiple hormonal stimuli to stimulate hypertrophy of cardiac myocytes. *J. Biol. Chem.* **286**:23012-23021, 2011.
- McCoy, K.L., Gyoneva, S., Vellano, C.P., **Smrcka, A.V.**, Traynelis, S.F., Hepler, J.R. Protease activated receptor 1 (PAR1) coupling to G(q/11) but not to G(i/o) or G(12/13) is mediated by discrete amino acids within the receptor second intracellular loop. *Cell Signal.* **24**:1351-1360, 2012.
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Publications (original research) (contd.)

- Dusaban, S.S., Purcell, N.H., Rockenstein, E., Masliah, E., Cho, M.K., **Smrcka, A.V.**, Brown, J.H. Phospholipase C ϵ links G protein-coupled receptor activation to inflammatory astrocytic responses *Proc Natl Acad Sci U S A*. **110**:3609-14, 2013.
- Zhang, L., Malik, S., Pang, J., Wang, H., Park, K.M., Yule, D.I., Blaxall, B.C. and **Smrcka, A.V.** Phospholipase C ϵ Hydrolyzes Perinuclear Phosphatidylinositol 4-Phosphate to Regulate Cardiac Hypertrophy. *Cell* 153:216-27, 2013
- Sun, Z., **Smrcka, A.V.**, Chen, S. WDR26 functions as a scaffolding protein to promote G $\beta\gamma$ -mediated phospholipase C β 2 (PLC β 2) activation in leukocytes. *J. Biol. Chem.* **288**:16715-25, 2013.
- Easterhoff, D., Dimaio, J.T., Liyanage, W., Lo, C.W., Bae, W., Doran, T.M., **Smrcka, A.**, Nilsson, B.L., Dewhurst, S. Fluorescence detection of cationic amyloid fibrils in human semen. *Bioorg. Med. Chem. Lett.* **23**:5199-202, 2013.
- Ruisanchez E., Dancs P., Kerék M., Németh T., Faragó B., Balogh A., Patil R., Jennings B.L., Liliom K., Malik K.U., **Smrcka A.V.**, Tigyi G., Benyó Z. Lysophosphatidic acid induces vasodilation mediated by LPA1 receptors, phospholipase C, and endothelial nitric oxide synthase. *FASEB J* **28**:880-890, 2014.
- Xiang S.Y., Ouyang K., Yung B.S., Miyamoto S., **Smrcka A.V.**, Chen J., Brown J.H. PLC ϵ , PKD1, and SSH1L Transduce RhoA Signaling to Protect Mitochondria from Oxidative Stress in the Heart. *Sci Signal* **6**(306):ra108, 2013.
- Kan W., Adjobo-Hermans M., Burroughs M., Faibis G., Malik S., Tall G.G., **Smrcka A.V.**. M3 Muscarinic Receptor Interaction with Phospholipase C β 3 Determines its Signaling Efficiency. *J. Biol Chem.* **289**:11206-18, 2014.
- Kamal, F.A., Mickelsen, D.M., Wegman, K.M., Travers, J.G., Moalem, J., Hammes, S.R., **Smrcka, A.V.**, and Blaxall, B.C. Simultaneous adrenal and cardiac GPCR-G $\beta\gamma$ inhibition halts heart failure progression. *J Amer Coll of Cardiol.* **63**:2549-2557, 2014.
- Surve, C., Lehmann, D., and **Smrcka, A.V.** A Chemical Biology Approach Demonstrates GTP-binding Protein G $\beta\gamma$ Subunits are Sufficient to Mediate Directional Neutrophil Chemotaxis. *J Biol Chem.* **289**: 17791-17801, 2014.
- Oldenburger A., Timens W., Bos S., Smit M., **Smrcka A.V.**, Laurent A.C., Cao J., Hylkema M., Meurs H., Maarsingh H., Lezoualc'h F., Schmidt M. Epac1 and Epac2 are differentially involved in inflammatory and remodeling processes induced by cigarette smoke. *Faseb J.* **11**: 4617-28, 2014.
- Le N.T., Takei Y., Izawa-Ishizawa Y., Heo K.S., Lee H., **Smrcka A.V.**, Miller B.L., Ko K.A., Ture S., Morrell C., Fujiwara K., Akaike M., Abe J. Identification of Activators of ERK5 Transcriptional Activity by High-Throughput Screening and the Role of Endothelial ERK5 in Vasoprotective Effects Induced by Statins and Antimalarial Agents. *J. Immunol.* **193**: 3803-3815, 2014.
- Kalwa H., Storch U., Demleitner J., Fiedler S., Mayer T., Kannler M., Fahlbusch M., Barth H., **Smrcka A.**, Hildebrandt F., Gudermann T., Dietrich A. Phospholipase C Epsilon (PLC ϵ) Induced TRPC6 Activation: A Common but Redundant Mechanism in Primary Podocytes. *J Cell Physiol.* **230**:1389-99, 2015.

Malik S., deRubio R.G., Trembley M., Irannejad R., Wedegaertner P.B., **Smrcka A.V.** G Protein $\beta\gamma$ Subunits Regulate Cardiomyocyte Hypertrophy Through A Perinuclear Golgi Phosphatidylinositol 4-Phosphate Hydrolysis Pathway. *Mol. Biol. Cell* **26**:1188-1198, 2015.

Publications (original research) (contd.)

Brand, C.S., Sadana, R., Malik, S., **Smrcka, A.V.** and Dessauer, C.W. Adenylyl Cyclase 5 Regulation by G $\beta\gamma$ Involves Isoform Specific Use of Multiple Interaction Sites. *Mol. Pharm.* **88**:758-767, 2015.

Dusaban SS, Kunkel MT, **Smrcka AV**, Brown JH. Thrombin Promotes Sustained Signaling and Inflammatory Gene Expression through the CDC25 and Ras Associating Domains of Phospholipase C- ϵ . *J. Biol. Chem.* (Pub online Sept 8).

Invited Reviews and Book Chapters

Smrcka A.V., and Jensen R.G. High performance liquid chromatography of key sugar phosphates involved in photosynthetic carbon reduction. *Prog Photosynthesis Res* **Vol III**:281-284, 1987.

Sternweis P.C., and **Smrcka A.V.** G proteins in signal transduction: Regulation of phospholipase C. *Ciba Found Symp* **176**:96-111, 1992.

Sternweis P.C., **Smrcka A.V.**, and Gutowski S. Hormone Signalling via G-proteins: Regulation of Phosphatidylinositol 4,5-bisphosphate Hydrolysis by G $_q$. *Phil Trans R Soc Lond B* **336**:35-42, 1992.

Sternweis P.C., and **Smrcka A.V.** Regulation of Phospholipase C by G Proteins. *Trends Biochem. Sci.* **17**:502-506, 1992.

Smrcka AV, and Sternweis PC. Purification of $\alpha_{q/11}$ from Brain. *Met Neurosci* **18**:72-82, 1993.

Pang I.H., **Smrcka A.V.**, and Sternweis, P.C. Synthesis and Applications of Affinity Matrix Containing Immobilized $\beta\gamma$ Subunits of G Proteins. *Meth Enzymol* **237**:164-175, 1994.

Smrcka, A.V. and Scott, J.K. Discovery of Ligands for $\beta\gamma$ Subunits from Phage-Displayed Peptide Libraries. *Met Enzymol* **344**:557-576, 2002.

Methods in G Protein Signaling, Methods in Molecular Biology Series. Humana Press, **Alan Smrcka**, editor, *volume 237*, 2003.

Ghosh, M. and **Smrcka, A.V.** Assay for G Protein Dependent Activation of Phospholipase C β Using Purified Protein Components. *Methods in Molecular Biology*, **237**, 67-75, 2004.

Ghosh, M., Wang, H., Kelley, G.G. and **Smrcka, A.V.** Purification of Phospholipase C β and Phospholipase C ϵ from SF9 Sells. *Methods in Molecular Biology*, **237**, 55-64, 2004.

Blumer, J.B., **Smrcka A.V.** and Lanier S.M. Mechanistic Pathways and Biological Roles for Receptor-Independent Activators of G-protein Signaling. *Pharmacology and Therapeutics*, **113**:488-506, 2007.

Lehmann, D.M., Yuan, C., and **Smrcka, A.V.** Analysis and Pharmacological Targeting of Phospholipase C β Interactions with G Proteins *Met Enzymol* **434**:29-48, 2007.

Smrcka, A.V., Lehmann, D.M. and Dessal, A. G Protein $\beta\gamma$ Subunits as a Target for Small Molecule Therapeutic Development. *Comb Chem High Throughput Screen* **11**:382-95, 2008.

Smrcka, A.V., Oestreich, E.A., Blaxall, B.C., Dirksen, R.A. EPAC Regulation of Cardiac EC Coupling. *J Physiol (letter)* **584**:1029-31, 2007.

Smrcka, A.V. G protein $\beta\gamma$ subunits: central mediators of G protein-coupled receptor signaling. *Cell Mol Life Sci.* **65**:2191-214, 2008.

Invited Reviews and Book Chapters (contd)

Kamal. F.A., **Smrcka, A.V.** and Blaxall, B.C. Taking the heart failure battle inside the cell: small molecule targeting of G $\beta\gamma$ subunits *J Mol Cell Cardiol* **51**:462-467, 2011.

Lin, Y., **Smrcka, A.V.**. Understanding Molecular Recognition by G protein $\beta\gamma$ Subunits on the Path to Pharmacological Targeting. *Mol Pharmacol.* **80**:551-557, 2011.

Invited Reviews and Book Chapters (contd.):

Smrcka, A.V., Brown J.H., Holz G.G. Role of phospholipase C ϵ in physiological phosphoinositide signaling networks. *Cell Signal.* **24**:1333-43, 2012.

Smrcka, A.V., Molecular targeting of G α and G $\beta\gamma$ subunits: a potential approach for cancer therapeutics. *Trends Pharmacol. Sci.* **34**: 290-298, 2013.

Smrcka A.V. Regulation of Phosphatidylinositol-specific Phospholipase C at the Nuclear Envelope in Cardiac Myocytes. *J. Cardiovasc. Pharmacol.* **65**:203-10, 2015.

Journal Reviews

Journal of Biological Chemistry, Editorial Board
Molecular Pharmacology, Editorial Board
Cellular Signaling, Editorial Board

Invited reviewer for Biochemistry, Molecular Pharmacology, Journal of Biological Chemistry, Science, American Journal of Physiology, Molecular Endocrinology, Journal of Neurochemistry, Biochimica et Biophysica Acta, Nature Structural Biology, Protein Science, EMBO J., Journal of Molecular Biology, Journal of Cell Biology, Journal of Clinical Investigation, PNAS, Current Biology, Journal of Physiology, Science Signaling

Professional Society Memberships

American Association for the Advancement of Science
American Society of Biochemistry and Molecular Biology
American Society of Pharmacology and Experimental Therapeutics
American Heart Association

Teaching Activities

1982-1984	Lab courses in Botany and Plant Physiology, Arizona State University
1984-1990	Teaching assistant in a two semester Biochemistry course for undergraduates and graduates for four years. University of Arizona
1994-1996	“Principles of Pharmacology”, URM (2 lecture hours.)
1996-2000	“Medical Pharmacology”, URM (2 lecture hours)
1995-1997	“Neuropharmacology”, URM (2 lecture hours)
1995-present	“Signal Transduction”, URM (8-12 lecture hours)
1997-present	Course Director for “Signal Transduction”, URM
1997-present	“Advanced Topics in Biological Macromolecules” URM (3 lecture hours)
1999-2003	“Molecular Pharmacology” URM (2 lecture hours)
2001-2003	“Integrated Systems A” URM (1 lecture hour)
2002-2004	“Mind Brain Behavior” URM (5 lecture hours)
2005-2007	“Medical Pharmacology” URM (5 lecture hours)
2002-2008	“Medical Pharmacology Human Simulator Exercise” URM (8 hours)
2007-present	“Principles of Pharmacology” URM (10 lecture hours)
2012-present	“Molecular Biology and Genetics” URM (1 lecture hour)

Graduate Students, thesis advisor for

Jerry Madukwe (2015-present) (Biochemistry and Biophysics)
Isaac Fisher (2014-present) (Pharmacology and Physiology)
Jesi Lee Anne To (2013-present) Pharmacology and Physiology
Rafael Gil de Rubio (2013-present) (Pharmacology and Physiology)
Chinmay Surve (2011-2015) (Biochemistry and Biophysics) Currently a Postdoctoral Fellow at Albert Einstein College of Medicine

Graduate Students, thesis advisor for (contd.)

Lianghui Zhang (2008-2012) (Pharmacology and Physiology) Currently a Postdoctoral Fellow at University of Illinois at Chicago

Wei Kan (2008-Present) (Pharmacology and Physiology) (AHA predoctoral award) Currently a Postdoctoral Fellow at Stanford University

Axel Dessal, (2005-2010) Ph.D. May 2010 (Pharmacology and Physiology)

Pramodh Seneviratne, (2005-2010) Ph.D. May 2011 (Pathology) Currently a Postdoctoral fellow at Cornell Weill Medical College with Geri Kreitzer

Emily Oestreich, (2003-2007) Ph.D. May 2008, (Pharmacology and Physiology)

Supported by an NIH training Grant in Oral Biology. Currently Assistant Professor of Physiology at Pacific Northwest University of Health Sciences

Chujun Yuan, (2002 – 2007) Ph.D. May 2008, (Biochemistry and Biophysics) Project: Was supported by and American Heart Association Predoctoral Fellowship from 2004-2006

Tabetha Bonacci, (2000-2005) Ph.D. May 2006 Pharmacology and Physiology
Tabetha's thesis won the Fenn Award for Outstanding Thesis at the URM in 2005.

She was supported by an NIH training grant in Cardiovascular Science. Currently Dr. Bonacci is a Scientist at the Amgen.

Huan Wang, (2000-2006) Ph.D. May 2006 Biochemistry and Biophysics

Dr. Wang is currently a postdoctoral Fellow at the Wistar Institute in Philadelphia working on Mass Spectrometry and Proteomics.

Daniel Yoshikawa, (1995-2001) Ph.D. May 2001 Pharmacology

Dr. Yoshikawa is currently a marketing executive at Bio-Rad Corporation in charge of the chromatography division.

Post-Doctoral Trainees and Fellows

Craig Nash, Ph.D. University of Birmingham (2012), Postdoctoral Fellow, 2015-present.

Yuan Lin, Ph.D. Johns Hopkins University (2008), Postdoctoral Fellow, 2009-2011.

Rachel Niemer, Ph.D. California Institute of Technology (2007)

Postdoctoral Fellow (2007-2008)

Zulfiqar Ahmad, Ph.D. Postdoctoral Fellow (2006). Currently on the Faculty at East Tennessee State University

David Lehmann, Ph.D. University of Rochester (2005) Postdoctoral

Fellow (2005-2007).

Supported 2005-2006 on a NCI Cancer Center Training Grant.

Supported 2006-2007 postdoctoral fellowship from the Arthritis Foundation.

Jose Font, Ph.D. Washington University. Postdoctoral research volunteer (2005-2007)

Mousumi Ghosh, Ph.D. University of Calcutta, India (1997) Postdoctoral

Fellow (2001-2004). Currently a Postdoctoral Fellow at the University of Miami

Farida Goubaeva, Ph.D. M.D. Russian State Medical University, Moscow

(1997) Postdoctoral Fellow (2001-2002). Currently a postdoctoral Fellow at Columbia University

Banumathi Sankaran, Ph.D. University of Kentucky (1997) Postdoctoral

Fellow (1998-1999). Currently a scientist at Wyeth-Lederle.

Research Assistant Professor

Sundeep Malik, Research Assistant Professor (2002 – Present)

Student Thesis Advisory Committees

Anshika Bajaj, Biochemistry and Biophysics, Thesis Adviser: Mark Dumont
Corey Hoffman, Pharmacology and Physiology, Thesis Adviser: Laura Calvi
Kelly McGlynn, Pharmacology and Physiology, Thesis Adviser: Archie Perkins
Rachel Walker, Pharmacology and Physiology, Thesis Adviser: Keith Nehrke
Liwei Wang, Pharmacology and Physiology, Thesis Adviser: David Yule
Hanna Stoveken, Pharmacology and Physiology, Thesis Adviser: Gregory Tall
Bharti Patel, Pharmacology and Physiology, Thesis Adviser: Gregory Tall
Makaia Papasergi, Pharmacology and Physiology, Thesis Adviser: Gregory Tall
Alina Monteagudo, Pharmacology and Physiology, Thesis Adviser: Gail Johnson
Walter Knight, Pharmacology and Physiology, Thesis Adviser: Chen Yan
Peter DiStefano, Pharmacology and Physiology, Thesis Adviser: Angela Glading
Alex Fricke, Pharmacology and Physiology, Thesis Adviser: David Yule
Rahul Chandrasekhar, Pharmacology and Physiology, Thesis Adviser: David Yule
Hen Prizant, Pharmacology and Physiology, Thesis Adviser: Steve Hammes
Jennifer Newell, Biochemistry and Biophysics, Thesis Adviser: Philip J. Fay
Madhavika Serasinghe, Biochemistry and Biophysics, Thesis Adviser: Yisang Yoon
Rachel Mroczek, Pathology and Laboratory Medicine, Thesis Adviser: J. Edward Puzas
David Nagel, Pharmacology and Physiology, Thesis Adviser: Chen Yan
Lea Gunnell, Pathology and Laboratory Medicine, Advisor: Regis O'Keefe
Li Wang, Pharmacology and Physiology, Thesis Adviser: Mark B. Taubman
Christopher A. Ingraham, Biomedical Genetics, Advisor: Carl Pinkert
Erik Allman, Pharmacology and Physiology, Thesis Adviser: Keith Nehrke
Meital Gabay, Pharmacology and Physiology, Thesis Adviser: Gregory Tall
Rajashri Sridharan, Biochemistry and Biophysics, Thesis Adviser: Mark Dumont
Elena Chan, Pharmacology and Physiology, Thesis Adviser: Gregory Tall
George Compitello, Biomedical Genetics, Advisor: Hucky Land
Nir Maymon, Pharmacology and Physiology, Thesis Adviser: Ingrid Sarelius
Wenhua Wang, Biochemistry and Biophysics, Thesis Adviser: Clara Kielkopf
Amir Taslimi, Biochemistry and Biophysics, Thesis Adviser: Mark Dumont
Jeffrey Zuber, Biochemistry and Biophysics, Thesis Adviser: Mark Dumont
Allison Gaudy, Pharmacology and Physiology, Thesis Adviser: Robert Mooney
Conan Kinsey, Biomedical Genetics, Thesis Adviser: Harmut Land,
Rachel Mroczek, Pathology and Laboratory Medicine Thesis Adviser: J. Edward Puzas
Madhavika Serasinghe, Biochemistry and Biophysics, Thesis Adviser: Yisang Yoon
David Nagel, Pharmacology and Physiology, Thesis Adviser: Chen Yan
Lea Gunnell, Pathology, Advisor: Regis O'Keefe,
Li Wang, Pharmacology and Physiology, Thesis Adviser: Mark B. Taubman
Jennifer Newell, Biochemistry and Biophysics, Thesis Adviser: Philip J. Fay
Brian Jones, Pharmacology and Physiology, Thesis Adviser: Patricia M. Hinkle
Christopher A. Ingraham, Department of Biomedical Genetics, Advisor: Carl Pinkert
David Lomb, Pharmacology and Physiology, Thesis Adviser: Robert Freeman

Fatbardha Varfaj, Biochemistry and Biophysics, Thesis Adviser: Philip J. Fay,
Student Thesis Advisory Committees (contd.):

Jennifer Mathews, Pharmacology and Physiology, Thesis Adviser: Jean Bidlack,
Julien Sebag, Pharmacology and Physiology, Thesis Adviser: Patricia M. Hinkle
Aditya Sethi, Biomedical Genetics, Thesis Adviser: Robert Angerer
Lu Xu, Pharmacology and Physiology, Thesis Adviser: A. William Tank
Ningzhe Zhang, Pharmacology and Physiology, Thesis Adviser: Mark Noble
Anshika Bajaj, Biochemistry and Biophysics, Thesis Adviser: Mark Dumont
Austin Gehret, Biochemistry and Biophysics, Advisor: Mark Dumont
Craig Menges, Biochemistry and Biophysics, Thesis Adviser: Dennis McCance,
Huan (Kathy) Wang, Biochemistry and Biophysics, Advisor: Fred Hagen
Ruolan Han, Pharmacology and Physiology, Advisor: Mark Noble
Matt Schoell, Pharmacology and Physiology, Thesis Adviser: Robert Freeman
Erik Sampson, Biomedical Genetics, Thesis Adviser: Harmut Land,
Andjelka Celic, Biochemistry and Biophysics, Thesis Adviser: Mark Dumont
Qinlei Zheng, Pharmacology and Physiology, Thesis Adviser: Bradford C. Berk
Ryan Hoefen, Pharmacology and Physiology, Thesis Adviser: Bradford C. Berk
Jennifer Straub, Pharmacology and Physiology, Thesis Adviser: Robert Freeman
Liang Xie, Pharmacology and Physiology, Thesis Adviser: Robert Freeman
Amy Wagner, Pathology and Laboratory Medicine, Thesis Adviser: Janet Sparks
Jason Homsy, Biomedical Genetics, Thesis Adviser: Dirk Bohmann
Patrick Sarmiere, Pharmacology and Physiology, Thesis Adviser: Robert Freeman
Wayne Anderson, Pharmacology and Physiology, Thesis Adviser: M.W. Anders
Larry Jolivette, Pharmacology and Physiology, Thesis Adviser: M.W. Anders,
Bo Liu, Pharmacology and Physiology, Thesis Adviser: Dianqing Wu
Elizabeth Lipscomb, Environmental Medicine, Advisor: Robert Freeman
Junhao Mao, Pharmacology and Physiology, Thesis Adviser: Dianqing Wu
Robert Crowder, Pharmacology and Physiology, Thesis Adviser: Robert Freeman
Valerie Romoser, Pharmacology and Physiology, Thesis Adviser: Patricia Hinkle
Vinita Uttamsingh, Pharmacology and Physiology, Thesis Adviser: M.W. Anders
LeeAnn Higgins, Pharmacology and Physiology, Thesis Adviser: Jeffrey Jones

University and Departmental Service

- 1995-1996 Organized the Department of Pharmacology and Physiology Seminar Series
- 1997-present Organize a weekly Cell Signaling Journal Club
- 1998-2001 Member of the Medical Faculty Council
- 1997-1998 Member of the graduate admissions committee for the Program in Biology and Medicine
- 1997-1998 Member of the Department of Pharmacology and Physiology Faculty Search Committee
- 1998-2001 Member of the Cell Regulation and Molecular Pharmacology Cluster Steering committee
- 1998-2000 Member of the GEBS curriculum committee
- 1998-2000 Member of the Biochemistry, Molecular Biology, and Genetics Cluster curriculum committee
- 1999-2000 Member of the graduate admissions committee for the Department of Pharmacology and Physiology.
- 2001-2006 Member of the Cellular and Molecular Medicine cluster steering committee.
- 2000-present Member of the Graduate Study Committee for the Department of Pharmacology and Physiology.
- 2005-2006 Director of “Mass Spectrometry Users Group” and helped to establish the proteomics/Mass Spectrometry core at the University of Rochester
- 2005-2008 Member of the “Intellectual Property Advisory Committee (IPAC)”
- 2006-2007 Member of the X-ray crystallography Faculty Search Committee (Biochemistry and Biophysics)
- 2006-2007 Member of the Pharmacology and Physiology Faculty Search Committee.
- 2006-2008 Director of the Cellular and Molecular Medicine Cluster for graduate student recruitment
- 2007-2008 Member of the “Computational Biology” Faculty Search Committee (Biochemistry and Biophysics)
- 2008-2015 Established and Directed the “High Throughput Screening” Core Facility (now transitioned to the Pathways Discovery Resource)
- 2013-present Member of the University of Rochester Conflict of Interest Advisory Group.
- 2015-present Member of the School of Medicine Scientific Advisory Committee
- 2015-present Director of the URM C Drug Targets and Mechanisms Program of Excellence
- 2015-present Member of the URM C Curriculum Reform Committee
- 2015-present Executive advisory committee for to the “Pathways Discovery Resource” Screening Facility

Invited Presentations

Invited Speaker, American Society of Biochemistry and Molecular Biology Keystone Symposium: "Molecular Recognition in G Protein Signaling", Oct. 1996

Seminar, State University of New York at Stony Brook, Department of Physiology and Biophysics, April 31, 1997

Seminar, University of New Mexico School of Medicine, Department of Pathology October 1, 1997

Seminar, University of Rochester School of Medicine, Department of Dermatology, March 6, 1998

Seminar, Cornell University, Department of Biochemistry, Ithaca, NY, April 3, 1998

Seminar, Geisinger Institute, Pennsylvania State University, Danville, PA, April 17, 1998

Invited Speaker, FASEB Summer Research Conference, "Phospholipases" Saxton River, VT July 25, 1998

Seminar, Simon Fraser University, Institute of Molecular Biology and Biochemistry, Burnaby, B.C., Canada, March 1999

Seminar, University of Rochester, Department of Biochemistry and Biophysics, Rochester, NY. March 2001

Seminar, University of Missouri, Department of Biochemistry, Kansas City, MO, March 2001

Seminar, Boston Biomedical Research Institute, Boston MA, February 2002

Seminar, University of Minnesota, Department of Biochemistry, Minneapolis, MN, April 3, 2002

Invited Speaker, Great Lakes G Protein Coupled Receptor conference at University of Michigan, Ann Arbor, MI, October 2002

Invited Speaker, Gordon Research Conferences "Second Messengers and Protein Phosphorylation" Kimball Union Academy, Lebanon, NH, June 2003

Seminar, University of Illinois at Chicago, Department of Pharmacology, Chicago, IL, September, 2003

Co-session Chair on Phospholipase C ϵ , Experimental biology Annual Meeting, Washington DC. April 2004

Invited Presentations (contd.):

Session Chair, FASEB summer conferences “Phospholipases”, Pine MT, Ga, July 2004

Seminar, UNDMJ School of Medicine, Department of Pharmacology and Physiology, Newark, NJ, February 2005

Invited Speaker, Gordon Research Conferences “Molecular Pharmacology”, IL Ciocco, Italy, May 2005

Seminar, Washington University, Department of Cell Biology, St. Louis, MO, May 2005

Invited Speaker, FASEB summer conferences “Phospholipases”, Saxton River, VT July 2006.

Invited Speaker, Great Lakes G Protein Coupled Receptor Conference, Detroit, MI October 2006

Invited Speaker, Louisiana State University Health Science Center, Department of Pharmacology and Experimental Therapeutics, New Orleans, LA. November 2006

Invited Speaker, Cancer Center Symposium, University of Rochester School of Medicine. November 2006

Invited Speaker, Univ. of Pittsburgh, Dept. of Pharmacology, Pittsburgh PA Nov. 2006

Invited Speaker, Univ. of Michigan, Dept. of Pharmacology, Ann Arbor MI, Dec. 2006

Invited Speaker, University of Rochester School of Medicine, CVRI seminar, January 2007

Invited Speaker, Robarts Research Institute, Department of Cell Biology, London, Ontario, CA, February 2007.

Invited Speaker, Mt. Sinai School of Medicine, Department of Pharmacology, New York, NY, March 2007.

Plenary Lecture, Society for Biomolecular Sciences 13th Annual Meeting, Montreal, Quebec, CA, April 2007.

Invited Speaker, University of Texas at Houston, Department of Integrative Biology and Pharmacology, May 2007.

Invited Speaker, Gordon Conference “Protein Phosphorylation and G Protein Mediated Signaling Networks”, June 2007.

Invited Presentations (contd.):

Invited Speaker, Gordon Conference “Calcium Signaling”, July 2007.

Invited Speaker, Symposium "G Protein Coupled Receptor Signaling and Disease", Geisinger Clinic, September 2007.

Invited Speaker, Department of Pharmacology, University of Chicago, Chicago, Illinois, March 2008.

Invited Speaker, Department of Pharmacology, McGill University, Montreal Canada, May 2008.

Invited Speaker, FASEB Workshop “Lipids as regulators of cell function”, Spetses, Greece, June 2008.

Invited Speaker, Gordon Conference “Cardiac Regulatory Mechanisms”, July 2008.

Plenary Speaker, Institute for Research In Biomedicine, Parc Cientifique, Barcelona, Spain, October 2008.

Invited Speaker, Department of Physiological Chemistry, University Medical Center, Utrecht, The Netherlands, January 2009.

Organizer and Speaker, G protein targets, ASPET Molecular Pharmacology Colloquium, Experimental Biology, New Orleans, April 2009.

Invited Speaker, “International Congress of Physiological Science”, Kyoto, Japan, July 2009.

Organizer, Great Lakes G Protein Coupled Receptor Retreat, University of Rochester, Rochester, NY, October 2009.

Invited Speaker, Department of Pharmacology, University of California at San Diego, January 2010

Invited Speaker, Leslie Dan School of Pharmacy, University of Toronto, Toronto, Ontario, Canada, February 2010

Invited Speaker, Department of Pharmacology, Cornell University, Ithaca, New York, October 2010

Invited Speaker, Molecular Pharmacology Gordon Research Conference, Ventura, CA, January 2011

Invited Presentations (contd.):

Symposium Organizer: Experimental Biology 2012, San Diego, CA. “Novel Roles for G protein Regulated Phospholipase C signaling” April 2012

Speaker Experimental Biology 2012 “PLC ϵ as a localized signal integrator downstream of GPCRs and RTKs”. April 2012

Invited Speaker, Phosphorylation and G protein-mediated Signaling Networks Gordon Research Conference, Biddeford, ME, June 2012

Invited Speaker, Yale University, Department of Pharmacology, New Haven, CT, November 2012

Invited Speaker, University of North Carolina, Department of Pharmacology, Chapel Hill, NC, April 2013

Symposium Organizer: Experimental Biology 2013, Boston, MA “New roles for signaling by G protein $\beta\gamma$ subunits” April 2013

Speaker Experimental Biology 2013 “Pharmacological targeting of G $\beta\gamma$ subunits: Mechanisms and outcomes” April 2013

Vice Chair, Molecular Pharmacology Gordon Research Conference, Il Ciocco, Italy, April 2013.

Invited Speaker, Department of Integrative Biology & Physiology, University of Minnesota, November, 2013.

Invited Speaker, Department of Pharmacology, Vanderbilt University, Nashville, TN, March, 2014

Invited Speaker, Department of Medicinal Chemistry and Molecular Pharmacology, Purdue University, West Lafayette, IN, May 2014.

Invited Speaker, Calcium Signaling: From Bench to Bedside, Stockholm, Sweden, July 2014

Invited Speaker, Joint International Symposium on Mechanisms of Cellular Compartmentalization, Philipps-Universitat Marburg, Germany, September 2014

Invited Speaker, National Academy of Sciences of the Czech Republic/Charles University, Prague, Czech Republic, October 2014.

Conference Organizer, Molecular Pharmacology Gordon Research Conference, Ventura, CA, February 2015.

Invited Presentations (contd.):

Invited Speaker, Montreal Heart Institute, Montreal, Quebec, Canada, April 2015.

Invited Speaker, Queens University, Kingston, Ontario, Canada, May 2015

Invited Speaker, 16th annual Great Lakes GPCR Retreat, Toronto, Canada, October 2015