Wade D. Van Horn Curriculum Vitae

Arizona State University
School of Molecular Sciences
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Current Position and Affiliations

Assistant Professor of Chemistry and Biochemistry at Arizona State University
Investigator, The Biodesign Institute
Investigator, The Virginia G. Piper Center for Personalized Diagnostics
Investigator, The Magnetic Resonance Research Center

Postdoctoral Training

Vanderbilt University School of Medicine – Nashville, TN — Sept ′07 – Aug ′12
Department of Biochemistry and Center for Structural Biology

Education

University of Utah – Salt Lake City, UT — Aug ′02 – Aug ′07
Ph.D. – Department of Chemistry
Dissertation Title: “Methodological Development of Reverse Micelle Applications in Biophysics and Structural Biology”

Brigham Young University – Provo, UT — Jul ′95 – April ′02
B.S. – Major in Chemistry with minor in Philosophy

Memberships in Professional Societies

American Association for the Advancement of Science (AAAS)	2008 – current
American Chemical Society	2007 – current
Biophysical Society	2007 – current
American Society for Biochemistry and Molecular Biology (ASBMB)	2015 – current

Honors and Awards

Zebulon Pearce Distinguished Teaching Award Nominee (ASU)	2016
Biomolecular Structure, Dynamics, and Function of Membrane Proteins Conference Travel Award (ASU)	2014
Distinction of Merit and Scholastic Occupation (DMSO) Chemistry Department Teaching Award Recipient (ASU)	2014
Global Institute of Sustainability Leadership Academy (ASU)	2013-2014
Early Career Bisgrove Scholar (ASU)	2012-2014
American Heart Association Postdoctoral Fellow (VU)	2010-2012
FASEB Ion Channel Regulation Conference Travel Award Recipient (VU)	2011
NIH Earl Stadtman Symposium Participant: Frontiers in Biochemistry (VU)	2011
NIH Roadmap Membrane Protein Technologies Conference Travel Award Recipient (VU)	2010
Cold Spring Harbor-Asia Membrane Proteins Conference Travel Award Recipient (VU)	2010
NIH Training Grant Fellow in Ion Channel and Transporter Biology (VU)	2007 & 2009
University of Utah Graduate School Travel Award Recipient (UU)	2006
Associated Students of the University of Utah Travel Award Recipient (UU)	2006
NIH Predoctoral Training Grant Fellow in Biological Chemistry (UU)	2003 – 2004
Student Representative to the Advisory Council in the Biological Chemistry Program (UU)	2003
Garth L. Lee Undergraduate Teaching Award Recipient (BYU)	2000

Professional Development

2013-Promotion and Tenure Workshop (Provost's Office, Arizona State University)

2013-OKED ASU National Science Foundation Day (Arizona State University)

Research Experience

Postdoctoral Fellow – Department of Biochemistry and Center for Structural Biology, Vanderbilt University
Dr. Charles R. Sanders Sept ′07 – Aug ′12
Investigation of membrane protein biophysics. Skills include membrane protein structural determination by solution NMR, membrane protein overexpression, purification, folding and enzymology, computational structure prediction, as well as cell culture and whole cell patch clamp electrophysiology of ion channels.

Ph.D. Studies – Department of Chemistry, University of Utah
Dr. Peter F. Flynn Aug ′02 – Aug ′07
Studies included investigation of proteins placed within reverse micelles using NMR techniques. Skills include multidimensional heteronuclear solution NMR spectroscopy, reverse micelle technology and encapsulation techniques, and protein overexpression and purification.

Undergraduate Research Assistant – Department of Physiology and Developmental Biology, Brigham Young University
Dr. David D. Busath Apr ′00 – Jul ′02
Developed a model of a rarified membrane bilayer for use in biophysical investigations of membrane bound channel proteins that was investigated with molecular mechanics and dynamics simulations.

Publications

h-index (Web of Science, January 2017): 13

Average citations per item (Web of Science, January 2017): 23.1

Publications after ASU affiliation:

(*Corresponding or co-corresponding author, **BOLD** indicates member of the Van Horn lab)

Hilton JK, **Van Horn WD***. New Pieces to an Old Puzzle: Identifying the Warfarin-binding Site that Prevents Clotting. *Nature Structure Molecular Biology.* **2017,** 24, 5-6. (**DOI:** 10.1038/nsmb.3356) Impact Factor: 13.338

Liao JY, **Anosova I**, Bala S, **Van Horn WD**, Chaput JC. A Parallel Stranded G-quadruplex Composed of Threose Nucleic Acid (TNA). *Biopolymers.* **2017,** 107(3). (**DOI:** 10.1002/bip.22999) Impact Factor: 2.248

Kronce BM, **Van Horn WD***, Smith J, Kang C, Welch RC, Song Y, Nannemann DP, **Sisco NJ**, George AL, Meiler J, Vanoye CG, Sanders CR. Structural Basis for KCNE3 Modulation of Potassium Recycling in Epithelia. *Science Advances.* **2016,** *2,* e1501228. (**DOI:** 10.1126/sciadv.1501228) (*Co-corresponding author)

Anosova I, Kowal EA, **Sisco NJ**, Sau S, Liao J, Bala S, Rozners E, Egli M, Chaput JC, **Van Horn WD***. Structural Insights into Conformational Differences between DNA/TNA and RNA/TNA Chimeric Duplexes. *ChemBioChem.* **2016,** *17,* 1705-1708 (**DOI:** 10.1002/cbic.201600349) Impact Factor: 3.088 *(Featured on back cover)*

Rath P, **Hilton JK**, **Sisco NH**, **Van Horn WD***. Implications of Human Transient Receptor Potential Melastatin 8 (TRPM8) Channel Gating from Menthol Binding Studies of the Sensing Domain. *Biochemistry.* **2016,** *55,* 114-124. (**DOI:** 10.1021/acs.biochem.5b00931)

Impact Factor: 3.015

Anosova I, Kowal, EA, Dunn MR, Chaput JC, **Van Horn WD***, Egli M. The structural diversity of artificial genetic polymers. *Nucleic Acids Res.* **2016,** *44,* 1007-1021. (**DOI:** 10.1093/nar/gkv1472 PMID: 26673703
Impact Factor: 9.112 (*Co-corresponding author)

Hilton JK, **Rath P**, **Helsell CV**, Beckstein O, **Van Horn WD.*** Understanding Thermosensitive Transient Receptor Potential Channels as Versatile Polymodal Cellular Sensors. *Biochemistry.* **2015,** *54,* 2401-2413. (**DOI:** 10.1021/acs.biochem.5b00071)
Impact Factor: 3.194 *(Featured on cover)*

Zook, J., Mo, G, **Sisco, NJ**, Craciunescu, FM, Hansen, DT, Baravati, B, Cherry, B, Sykes, K, Wachter, R, **Van Horn, WD*,** Fromme, P. NMR Structure of *Francisella tularensis* Virulence Determinant Reveals Structural Homology to Bet v1 Allergen Proteins. *Structure.* **2015,** *23,* 1116-1122. (**DOI:** 10.1016/j.str.2015.03.025)
Impact factor: 6.337 (*Co-corresponding author)

Van Horn WD*. VKORC1 ER mislocalization causes rare disease. *Blood.* **2014,** *124,* 1215-1216. (**DOI:** 10.1182/blood-2014-07-586032)
Impact Factor: 9.775

Peng D, Kim JH, Kroncke BM, Law CL, Xia Y, Droege KD, **Van Horn WD**, Vanoye CG, Sanders CR. Purification and Structural Study of the Voltage-Sensor Domain of the Human KCNQ1 Potassium Ion Channel. *Biochemistry.* **2014,** *53*, 2032-42. (**DOI:**10.1021/bi500102w)
Impact Factor: 3.194

Van Horn WD*. Structural and functional insights into human vitamin K epoxide reductase and vitamin K epoxide reductase-like 1. Crit. Rev. Biochem. Mol. Biol. **2013,** 48, 357-372. (**DOI**:10.3109/10409238.2013.791659)
Impact factor: 5.810

Barrett PJ, Chen J, Cho MK, Kim JH, Lu Z, Mathew S, Peng D, Song Y, **Van Horn WD**, Zhuang T, Sönnichsen FD, Sanders CR. The quiet renaissance of protein nuclear magnetic resonance. *Biochemistry.* **2013,** *52*, 1303-20. (**DOI**: 10.1021/bi4000436)
Impact factor: 3.194

Current publications under revision

Hilton JK, **Salepour T**, **Sisco NJ**, **Rath P**, **Van Horn WD***. Characterization of Human Transient Receptor Potential Melastatin 8(TRPM8) Ion Channel Modulation by Phosphoinositide Regulator of TRP (PIRT). *Submitted to The Journal of Biological Chemistry*

Publications prior to ASU affiliation:

Shi, M., Pedchenko, V., Greer, B.H., **Van Horn, W.D.**, Santoro, S.A., Sanders, C.R., Hudson, B.G., Eichman, B.F., Zent, R., Pozzi, A., Increasing integrin α1 i domain affinity to ligand potentiates integrin α1β1-mediated downregulation of collagen synthesis., *J. Biol. Chem.* **2012,** *287,* 35139-35152. (**DOI:** 10.1074/jbc.M112.358648)

Barrett P.J., Song Y., **Van Horn W.D.**, Hustedt E.J., Schafer J.M., Hadziselimovic A., Beel A.J., Sanders C.R., The amyloid precursor protein has a flexible transmembrane domain and binds cholesterol, *Science* **2012,** *336,* 1168-1171. (**DOI:** 10.1126/science.1219988)

Lu, Z., **Van Horn, W.D.**, Chen, J., Mathew, S., Zent, R., Sanders, C.R., Bicelles at low concentrations, *Mol. Pharm.* **2012,** *9,* 752-761. (**DOI:** 10.1021/mp2004687)

Van Horn, W.D., Sanders, C.R., Prokaryotic Diacylglycerol Kinase and Undecaprenol Kinase, *Annu. Rev. Biophys.* **2012,** *41,* 61-81. (**DOI**: 10.1146/annurev-biophys-050511-102330)

Van Horn, W.D., Vanoye C.G., Sanders, C.R., Working model for the structural basis for KCNE1 modulation of the KCNQ1 potassium channel, *Curr. Opin. Struct. Biol.* **2011,** *21,* 283-291. (**DOI:** 10.1016/j.sbi.2011.01.001)

Kang, C., Vanoye C.G., Welch, R.C., **Van Horn, W.D.**, Sanders, C.R., Functional Delivery of a Membrane Protein into Oocyte Membranes Using Bicelles, *Biochemistry* **2010,** *49,* 653-655.

Van Horn, W.D., Beel, A.J., Kang, C., Sanders, C.R., The Impact of Window Functions on NMR-Based Paramagnetic Relaxation Enhancement Measurements in Membrane Proteins, *Biochim. Biophys. Acta* **2010,** *1798,* 140-149.

Kim, H., Howell, S.C., **Van Horn, W.D.**, Jeon, Y.H., Sanders, C.R., Recent Advances in the Application of Solution NMR Spectroscopy to Multi-Span Integral Membrane Proteins, *Prog. Nucl. Magn. Reson. Spectrosc.* **2009,** *55,* 335-360.

Van Horn, W.D., Kim, H., Ellis, C.D., Hadziselimovic, A., Sulistijo, E.S., Karra, M.D., Tian, C., Sönnichsen, F.D., Sanders, C.R., NMR Solution Structure of the Membrane-Integral Diacylglycerol Kinase, *Science* **2009,** *324,* 1726-1729.

Van Horn, W.D., Ogilvie, M.E., Flynn, P.F. Reverse Micelle Encapsulation as a Model for Intracellular Crowding, *J. Am. Chem. Soc.* **2009,** *131,* 8030–8039.

Van Horn, W.D., Ogilvie, M.E., Flynn, P.F. Use of reverse micelles in membrane protein structural biology, *J. Biomol. NMR* **2008,** *40,* 203-211.

Flynn, P.F., Simorellis, A.K, **Van Horn, W.D.**, NMR Studies of Encapsulated Macromolecules, *Annual Reports in NMR Spectroscopy* **2007,** *62,* 179-219.

Simorellis, A.K., **Van Horn, W.D.**, Flynn, P.F., Dynamics of Low Temperature Induced Water Shedding from AOT Reverse Micelles, *J. Am. Chem. Soc.,* **2006,** *128,* 5080-5090.

Van Horn, W.D., Simorellis, A.K., Flynn, P.F., Low Temperature Studies of Encapsulated Proteins, *J. Am. Chem*. *Soc*., **2005,** *127,* 13553-13560.

Invited Seminars after ASU affiliation

Agonist Regulation of TRP Channels for Therapeutic Intervention. University of California, Irvine Department of Pharmaceutical Sciences, 11/8/2016

Dissecting Polymodal TRP Channel Modulation: Identifying the Mechanism of TRPV1 Thermosensing. University of Utah, Department of Chemistry, 10/6/2016

Dissecting Polymodal TRP Channel Modulation: Identifying the Mechanism of TRPV1 Thermosensing. Miami University of Ohio, Department of Chemistry, 9/15/2016

Identifying the Molecular Mechanism of Thermosensing in the TRPV1 Ion Channel. Fusion 2016 Biodesign Scientific Retreat. Carefree AZ, 4/1/2016

Dissecting Polymodal TRP Channel Modulation: Identifying the Mechanism of TRPV1 Thermosensing. Ohio State University, Department of Chemistry, 11/2/15

Dissecting the Polymodal Gating and Modulation of TRP Channels. Arizona State University, Department of Physics, Center for Biological Physics, 11/19/14

Presentations at Meetings and Symposia after ASU affiliation

Regulation of TRP Channels with Potential Therapeutic Intervention. *Invited Oral Presentation,* 254th American Chemical Society National Meeting, Symposium on "Membrane Proteins: Structure, Function and Drug Development" August 20-24, 2017 Washington, DC

Sisco, N.J., Helsell, C.V.M., Rath, P., **Van Horn, W.D. 2017.** Competitive Interactions of PIRT and PI(4,5)P2 Modulate TRPM8. *Poster Presentation*, Biophysical Society Annual Meeting. New Orleans, LA.

Rath, P., Luu, D., Hilton, J.K., Sisco, N.J., Benkaim, M., Chiu, P. **Van Horn, W.D. 2017.** The Role of the Transmembrane Domain (S1-S6) in TRPM8 Temperature and Menthol Dependent Gating. *Poster Presentation*, Biophysical Society Annual Meeting. New Orleans, LA.

Kim, M, Sisco, N.J., Hilton, J.K., **Van Horn, W.D. 2017.** The Emerging Role of human TRPV1 Sensing Domain in Channel Gating via Thermosensing. *Poster Presentation*, Biophysical Society Annual Meeting. New Orleans, LA.

Nguyen, H. Luu, D., Hilton, J.K., Rath, P., **Van Horn, W.D. 2017.** Optimization of Expression and Purification of the Human TRPM8 Ion Channel and Implicaitons of Post-translational Modification on Function. *Poster Presentation.* AAAS Annual Meeting. Boston, MA.

Sisco, N.J., Hilton, J.K., Rath, P., **Van Horn, W.D. 2016.** TRPM8 Modulation by Competitive PIRT and PI(4,5)P_2 Interactions. *Poster Presentation*, Ion Channels Gordon Research Conference. South Hadley, MA.

Sisco, N.J., Rath, P., **Van Horn, W.D. 2016.** Competitive PIRT and PI(4,5)P_2 Interactions Modulate TRPM8. *Poster Presentation*, Biophysical Society Annual Meeting. Los Angeles, CA.

Hilton, J.K., Sisco, N.J., Rath, P., **Van Horn, W.D. 2016.** Biophysical Characterization of Human Transient Receptor Potential Melastatin 8 (TRPM8) Ion Channel Modulation by Phosphoinositide Regulator of TRP (PIRT). *Poster Presentation*, Biophysical Society Annual Meeting. Los Angeles, CA.

Kim, M., Hilton, J.K., Sisco, N.J., Rath, P., **Van Horn, W.D. 2015.** Studies of the TRPV1 thermosensing mechanism. *Poster Presentation.* FASEB Ion Channel Regulation Conference. Big Sky, MT.

Helsell, C.V.M., **Van Horn, W.D. 2015.** TRPM8 Comparative Models Provide Predictions of Modular Binding Protein Structures. *Poster Presentation.* AAAS Annual Meeting. San Jose, CA.

Waris, M.S., Cervantes, B.A., **Van Horn, W.D. 2015.** Optimizing Megaprimer PCR of Whole Plasmids (MEGAWHOP) via the Construction of Chimeric Membrane Proteins. *Poster Presentation.* AAAS Annual Meeting. San Jose, CA.

Rath, P., Sisco, N.J., **Van Horn, W.D. 2014.** The Role of the TRPM8 Voltage-Sensing Domain in Channel Modulation. *Oral and Poster Presentation*, Biomolecular Structure, Dynamics, and Function of Membrane Proteins. Nashville, TN.

Van Horn, W.D. Rath, P., Sisco, N.J. **2014.** Biophysical Characterization of the TRPM8 Voltage-Sensing Domain. *Poster Presentation*, Biophysical Society Annual Meeting. San Francisco, CA.

Participant at DARPA Fold F(x) Meetings. 2014 Teluride, CO. 2014 Arlington, VA. 2015 Park City, UT.

Presentations at Meetings and Symposia Prior to ASU affiliation

Van Horn, W.D., Kang, C., Welch, R. C., Meiler, J., George, A.L., Vanoye, C.G. Sanders, C.R. **2012**. Integrative structural biological of the KCNE3-KCNQ1 complex: How channel modulation works. *Poster Presentation*, FASEB Summer Conference on Membrane Biophysics. Snowmass, CO

Van Horn, W.D., Kang, C., Welch, R. C., Meiler, J., George, A.L., Vanoye, C.G. Sanders, C.R. **2012**. Integrative structural biological of the KCNE3-KCNQ1 complex. *Oral Presentation*, Arizona State University Membrane Protein Workshop. Tempe, AZ

Van Horn, W.D., Kang, C., Vanoye, C.G., Welch, R. C., George, A L., Sanders, C.R. **2012**. Integrated Structural Biology of the KCNQ1-KCNE3 Complex. *Poster Presentation*, Biophysical Society Annual Meeting. San Diego, CA

Van Horn, W.D., Kang, C., Vanoye, C.G., Welch, R. C., George, A.L., Sanders, C.R. **2011**. Integrative structural biological basis of KCNE3 modulation of the KCNQ1 potassium channel. *Oral and Poster Presentation*, FASEB Summer Conference on Ion Channel Regulation. Steamboat Springs, CO

Van Horn, W.D., Kang, C., Vanoye, C.G., Welch, R. C., Sanders, C.R. **2010**. KCNE Family Modulation of the Voltage-Gated Potassium Channel KCNQ1. *Poster Presentation*, 3rd Annual NIH Roadmap Meeting on Membrane Protein Technologies. La Jolla, CA

Van Horn, W.D., Kim, H., Ellis, C.D., Hadziselimovic, A., Sulistijo, E. S., Karra, M., Tian, C., Sönnichsen, F.D., Sanders, C.R. **2010**. Membrane Integral Diacylglycerol Kinase Structure, Function, and Misfolding. *Oral Presentation*, Cold Spring Harbor-Asia Conference on Membrane Proteins: Structure and Function. Suzhou, China

Van Horn, W.D., Kang, C., Vanoye, C.G., Welch, R. C., George, A. L., Sanders, C.R. **2010**. Structural Underpinnings for modulation of the voltage-gated potassium channel KCNQ1 by the KCNE family of Proteins. *Poster Presentation*, Biophysical Society Annual Meeting. San Francisco, CA

Van Horn, W.D., Kim, H., Ellis, C.D., Karra, M., Power, P.J., Sönnichsen, F.D., Sanders, C.R. **2009**. Solution NMR Structure of the α-helical Membrane Protein Diacylglycerol Kinase. *Oral Presentation*, Experimental Biology/American Society for Biochemistry and Molecular Biology (ASBMB) Annual Meeting. New Orleans, LA

Van Horn, W.D., Kim, H., Ellis, C.D., Karra, M., Power, P.J., Sönnichsen, F.D., Sanders, C.R. **2009**. Solution NMR Structure of the α-helical Membrane Protein Diacylglycerol Kinase. *Oral Presentation*, 50th Experimental Nuclear Magnetic Resonance Conference (ENC). Pacific Grove, CA

Van Horn, W.D., Kim, H., Ellis, C.D., Karra, M., Power, P.J., Sönnichsen, F.D., Sanders, C.R. **2008**. Solution NMR Structure of Diacylglycerol Kinase: A Polytopic Membrane Protein. *Poster Presentation*, 23rd International Conference on Magnetic Resonance in Biological Systems (ICMRBS). San Diego, CA

Van Horn, W.D., Kim, H., Ellis, C.D., Karra, M., Power, P.J., Sönnichsen, F.D., Sanders, C.R. **2008**. Solution NMR Structure of Diacylglycerol Kinase: A Polytopic Membrane Protein. *Oral Presentation*, Vanderbilt Institute of Chemical Biology Retreat. Nashville, TN

Spencer, C.A., Simorellis, A.K., **Van Horn, W.D.**, Flynn, P.F. **2007**. Applications of Encapsulation in Studies of Confinement. *Poster Presentation*, Keystone Symposia on Frontiers of NMR in Molecular Biology, Snowbird, UT

Van Horn, W.D. and Flynn, P.F. **2006**. On the Way to Membrane Protein Structural Biology in Reverse Micelles. *Poster presentation*, Nuclear Magnetic Resonance Conference, Pacific Grove, CA

Simorellis, A.K., **Van Horn, W.D.**, and Flynn, P.F. **2006**. Solution NMR Characterization of the Structure and Dynamics of Confined Water. *Poster presentation*, Nuclear Magnetic Resonance Conference, Pacific Grove, CA

Van Horn, W.D., Simorellis, A.K., and Flynn, P.F. **2006**. Investigations of Encapsulated Proteins at Low Temperature by NMR. *Poster presentation*, Biophysical Society Annual Meeting, Salt Lake City, UT

Simorellis, A.K., **Van Horn, W.D.**, Carr, A., and Flynn, P.F. **2006**. Reverse Micelles as a Vehicle for Studying the Structure and Dynamics of Confined Water. *Poster presentation*, Biophysical Society Annual Meeting, Salt Lake City, UT

Van Horn, W.D., Simorellis, A.K., and Flynn, P.F. **2005**. Low Temperature NMR Studies of Encapsulated Proteins. *Oral presentation*, University of Utah Biological Chemistry Program Retreat, Snowbird, UT

Van Horn, W.D. and Flynn, P.F. **2004**. Structural Studies of Reverse Micelle Solubilized Membrane Proteins by NMR. *Poster presentation*, Keystone Symposia on Structural Genomics and Frontiers in Structural Biology, Snowbird, UT

Van Horn, W.D., Simorellis, A.K., and Flynn, P.F. **2004**. Low Temperature NMR Studies of Encapsulated Proteins. *Poster presentation*, University of Utah Bioscience Symposium, Salt Lake City, UT

Van Horn, W.D. and Flynn, P.F. **2003**. Encapsulated Glucagon: A Prototypical Structural Study of Membrane Proteins. *Poster presentation*, University of Utah Bioscience Symposium, Salt Lake City, UT

Active Research Support

R01 GM112077 Van Horn (PI) 07/1/2015-06/30/2020

NIH NIGMS R01

PIRT Family Modulation of TRPM8. Phosphoinositide interacting regulator or TRP (PIRT), is a protein that modulates TRPM8 function. In this proposal we seek to generate tie together the first structural insights with functional data to understand the modulation of the membrane protein complex using nuclear magnetic resonance, computational structural biology, and electrophysiology methods.

Role: PI Total Funds: $1,455,335

100% REC and RID to the Van Horn Lab

13-EXO13-0051 Chaput (PI), **Van Horn**, Allen (Co-PIs) 07/1/2014-06/30/2017

NASA/Exobiology & Evolutionary Biology

The Emergence of Protein Folds. In collaboration with Professors Chaput and Allen we seek to understand the molecular origins and evolution of protein structural folds. My lab will contribute by characterizing the structure and dynamic properties of de novo evolved proteins by solution nuclear magnetic resonance (NMR).

Role: Co-PI Total Funds: $575,066

20% REC and RID to the Van Horn Lab

NOTE: This grant was transferred to UCI when the PI left ASU.

NSF-BIO-DBI Spence (PI) 9/1/2015-8/31/2018

Carpenter, Frasch, Fromme, Halden, Hogue, Labaer, Leket-Mor, Liu, Liu, Mason, Muthuswamy, Olive, Rege, Rez, Rittmann, Roberson, Ros, Ros, Stabenfeldt, Torres, **Van Horn**, Vermaas, Wachter, Weierstall, Westerhoff, Wiktor, Yan (Co-PIs)

NSF Major Research Instrumentation Proposal Total Awarded Funds: $2,825,509

MRI: Acquisition of Cryo-EM for Southwest Regional Center The purpose of this proposal is to bring a cryo-transmission electron microscope (TEM) to Arizona State University for use in structural biology utilizing single particle reconstruction techniques. The microscope will be state-of-the-art and include a direct electron detector which will allow for high resolution structure determination (sub 3 Å resolution)

3% REC to the Van Horn Lab

2015 National Cancer Institute, NCI Experimental Therapeutics (NExT) Fromme, P. (PI)
Fromme, Anderson, DuBois, Fromme, Fromme, Graves, Hansen, Kirian, LaBaer, Liu, Nannenga, Qiu, Ros, Sayres, Spence, Tao, **Van Horn**, Want, Weierstall, Wiktor.

Center for Membrane Protein Drug Design (MEDD) Total Requested Funds: $26,685,114

The purpose of the proposal is to set up a new National Cancer Institute center at ASU that focuses on development of therapeutic targets with structural biology techniques. The Van Horn lab will utilize its focus in membrane protein handling and NMR-based structural studies as its contribution.

3% REC and RID to the Van Horn Lab

Completed Research Support

DARPA-14-13-FOLD-PA-004 Chaput (PI) 10/01/2014-08/31/2016

Van Horn, Egli, Heemstra (Co-PIs)

DOD-DARPA

Rapid Synthesis and Evolution of Artificial TNA Polymers having Affinity and Catalytic Acitivity. Our team is developing methods to produce the artificial genetic polymer, threose nucleic acid (TNA) such that TNAs can be used as bioaffinity reagents and catalysts. The Van Horn lab contribution is characterizing TNA with solution NMR techniques.

Role: Co-PI Total Funds: $5,994,793

20% REC and RID to the Van Horn Lab

TRIF:BDI Van Horn (PI) 07/01/2015-06/30/2016
Wei Liu (Co-PI)

Structure and function of the mammalian TRPM8—μ-opioid receptor membrane protein complex. Our team is generating the infrastructure to determine the structures of human membrane protein complexes. The initial target focuses on an ion channel–GPCR complex important in health and disease. This is a seed grant to initiate collaboratory research that will be leveraged in future federal and private funding applications.

Role: PI Total Funds: $95,000

50% REC to the Van Horn Lab

TRIF:BDI Mor (PI) 07/01/2015-06/30/2016
Van Horn (Co-PI), Fromme (Co-investigator)

Structural dynamics of the HIV-1viroporin Vpu in solution. Our team is on utilizing solution NMR techniques to determine the structure of the HIV-1 VpU protein. This is a seed grant to initiate collaboratory research that will be leveraged in future federal and private funding applications.

Role: co-PI Total Funds: $83,142

33% REC to the Van Horn Lab

2012 Science Foundation Arizona Early Career Bisgrove Scholar (12081999): Van Horn (PI)
08/16/12-08/15/14

On the Path to Unlocking the Therapeutic Potential of TRPM8. Structural and functional investigations of TRPM8, an ion channel involved in cold sensation and recently implicated in numerous human diseases such as cancer and obesity. Two early career Bisgrove awards were made in the state of Arizona. This is the first awarded to ASU.

Role: PI Total Awarded Funds: $200,000

Pending Support

2016 NIH R01: Lindert, S. (PI-Ohio State University) Submitted 10/5/2016

NIH NIGMS R01

Cryo-EM-Guided Membrane Protein Structure Refinement Protocol. The Van Horn lab role is to help characterize the mechanism of gold nanoparticle formation used in the dosimeters with solution NMR techniques.

Role: Co-Investigator Total Requested Funds for the Van Horn Lab: $324,446

100% REC and RID to the Van Horn Lab Subcontract

Declined Support

2016 NIH R01: Rege, K. (PI) Submitted 2/5/2016

NIH NIGMS R01

Nanoscale Radiation Dosimeters. The Van Horn lab role is to help characterize the mechanism of gold nanoparticle formation used in the dosimeters with solution NMR techniques.

Role: Co-Investigator Total Requested Funds: $2,560,154

5% REC and RID to the Van Horn Lab

2015 NIH R01: Fromme, R. (PI) Submitted 6/5/2015

NIH NIGMS R01

Development of Robust Low-toxicity Synthetic Hemoglobin. The Van Horn lab role is to help characterize synthetic hemoglobin molecules with nuclear magnetic resonance spectroscopy.

Role: Investigator Total Funds: $2,216,300

5% REC and RID to the Van Horn Lab

2014 Mallinckrodt Foundation Scholar Van Horn (PI) Reviewed Sept. 2014

Structural and Functional Characterization of PIRT2 a New TRP channel Modulatory Protein. This proposal focuses on the initial characterization for a novel and newly identified protein in the Van Horn lab called PIRT2.

Role: PI Total Funds Requested: $180,000

2014 Pew Scholarship Van Horn (PI) Internal ASU reviewed Aug. 2014

Pew Scholars Program in Biomedical Sciences.

Characterization of the Temperature-dependent Gating Mechanism of TRPM8. The goal of this proposal was to utilize a variety of computational and experimental techniques to understand and characterize the mechanism of thermosensing in TRPM8.

Role: PI Total Funds Requested: $240,000

2013 NIH R01: Holland (PI) Reviewed Feb. 2014

NMR Investigation of spider venom neurotoxins. In collaboration with Dr. Greg Holland and his investigations of spider venom neurotoxins; my lab will evaluate neurotoxins for functional effects on human ion channels in human cell lines using electrophysiology experiments.

Role: Other Significant Contributor (10% effort) Total Funds Requested: $898,931

Teaching and Related Experience

Arizona State University Spring, Fall ′14, Fall ′15, Spring ′17
Biophysical Chemistry (BCH 463)
This is an undergraduate course on biophysical chemistry. The course covers an introduction to and application of quantum mechanics ending with examples and insight in to the common spectroscopies of nuclear magnetic resonance and electron paramagnetic resonance. This course is team taught with another professor (Moore, Wachter) who covers further examples of spectroscopy and other related topics.

Arizona State University Spring ′14, ′15, ′16
Structure discovery in Biophysical Chemistry (BCH/CHM598)
This is a newly developed graduate level course structural biology techniques, focusing primarily on nuclear magnetic resonance and x-ray crystallography. The course was co-developed and is team taught with Professor Petra Fromme who focuses on the x-ray crystallography. During my half of the class, the graduate students are introduced to modern theory and examples of NMR in understanding biomolecular structure. The course also has a breakout session where the students learn how to setup, process, and analyze data with the end goal of them determining a structure. Importantly, students gain the experience to apply these techniques to their own research.

Arizona State University Fall ′12, ′13, ′14, ′15, ′17
Membrane Protein Biophysics (BCH 598)
This was a newly developed graduate level course on membrane protein biophysics. The course covers instrumental approaches to the most salient current topics in membrane protein biophysics. This course was co-developed with and team taught by Professor Thomas Moore who focuses on advances in the biophysics of bioenergy.

Arizona State University Fall ′12, ′13, Spring ′14, ′15, ′16
Current Topics in Biochemistry (BCH 501)
This course focused on current topics in membrane protein biochemistry and gave the students the chance to discuss and critique current literature while gaining experience and confidence presenting scientific information in a group setting.

Lecturer: Vanderbilt University Fall ′10
Biomolecular NMR Spectroscopy
The graduate level NMR course is team taught by Walter Chazin, Chuck Sanders, Steve Fesik, Mike Stone, and Markus Voehler. I gave a lectures on scalar couplings, NOEs, and chemical shifts.

Teaching Assistant: University of Utah Jan ′06 –Aug ′07
Biological Chemistry I & II
Led student discussions to reinforce key concepts central to understanding principles of biochemistry.

Teaching Assistant: University of Utah Oct ′06 – Dec ‘06
Advanced Inorganic Chemistry Laboratory
Guided students in synthesis and characterization of inorganic compounds.

Teaching Assistant: University of Utah Aug ′06 – Oct ′06
Advanced Organic Chemistry Laboratory
Introduced students to instrumental methods and data interpretation that are commonly available to organic chemists.

Teaching Assistant: University of Utah May ′06 – Aug ′06
Biological Chemistry I

Online based course; met with students individually and by email and phone correspondence to encourage comprehension of course material. Also lead the technical administration of class homework assignments.

Teaching Assistant: University of Utah Jan ′06 – May ′06
Preparation for General Chemistry
Led discussions of class sections that reinforced important principles needed for classroom success.

Teaching Assistant: University of Utah Aug ′05 – Dec ′05
Elementary Chemistry Laboratory
Helped students complete laboratory explorations which reinforced principles discussed in the classroom.

Lecture Demonstration Laboratory Manager: Brigham Young University Apr ′00 – Jul ′02
Executed, developed, and prepared lecture demonstrations for BYU faculty. The demonstrations were a crucial connection between lecture and practical experience. Hired and managed a small group (~6) of undergraduate students.

Part-time Active Instructor: Brigham Young University Jan ′99 – Apr ′00
General College Chemistry Laboratory
Responsible for laboratory safety and instruction of proper lab techniques as well as teaching students teamwork and motivating important principles of chemistry.

Chemistry Departmental Tutor: Brigham Young University Jan ′99 – Apr ′00
Helped students individually and in small groups to understand and gain confidence dealing with chemical principles especially through working related problems. Served as part of a team that staffed the department of chemistry tutorial laboratory.

Workshop Attendence

ROSETTA Workshop, **2011,** An Introductory Workshop to the Rosetta Protein Modeling Suite. Hosted by Jens Meiler at Vanderbilt University, Nashville, TN.

NAMD Workshop, **2011,** Hand-On Workshop on Computational Biophysics. Hosted by Klaus Schulten at Georgia Institute of Technology, Atlanta, GA.

Current Collaborations

John Chaput, UCI, Irvine CA.
Martin Egli, Vanderbilt University, Nashville TN.
Jennifer Heemstra, University of Utah, Salt Lake City, UT.
James Harper, University of Central Florida, Orlando FL.
Steffen Lindert, Ohio State University, Columbus, OH.
Wei Liu, ASU, Tempe AZ.
Tsafrir Mor, ASU, Tempe AZ.
Petra Fromme, ASU, Tempe AZ.
Po-Lin Chiu, ASU, Tempe AZ.
Marcia Levitus, ASU, Tempe AZ.
Oliver Beckstein, ASU, Tempe AZ.

Service

University Service

ASU University-level Reviewer for Science Foundation Arizona Bisgrove Scholar Applications (2015–present)

Postdoc best practices Advisory Board (2015–present)

School/Department/Institute Service

ASU Student Affiliates of the American Chemical Society (SAACS) Faculty Advisor (2016–present)

Fusion 2016 Biodesign Institute Scientific Retreat Abstract and Poster Judging Committee Member (2016)

School of Molecular Sciences Faculty Representative for the Senior Scholar Recruiting Dinner (2016)

Biodesign Institute Faculty Chalk Talk Seminar Series Committee, member (2016–present)

Search Committee for Director of the School of Molecular Sciences (2015)

Barrett Honors College Faculty Honors Advisor and Liaison (2014–present)

Ad Hoc Committee on Physical and Biophysical Chemistry Offerings in the Biochemistry track, member (2014)

Magnetic Resonance Research Center advisory council, member (2014–present)

Committee on Graduate Recruitment, member (2012–present)

Professional reviewer activities

Grant reviewer for:

A*STAR, (Agency for Science, Technology and Research), Singapore

ETH Zurich, Switzerland

SLAC National Accelerator Laboratory, Department of Energy, Menlo Park, CA, USA

Ad–Hoc Manuscript Reviewer:

Accounts of Chemical Research, ACS Nano, Biophysics Journal, Blood, Biochemistry, Molecules, Nature, Nature Molecular Structural Biology, Nutrients, Structure

Postdoctoral Fellow Research Advisor

Parthasarathi Rath, Ph.D. (2013–present)
Irina Anosova, Ph.D. (2014–2016)

Ph.D. Graduate Student Research Advisor

Nicholas Sisco
Jacob Hilton
Minjoo Kim
Dustin Luu

Masters Graduate Student Research Advisor

Molly Benkaim

Masters Graduate Student Committee member

Joshua Pittman (Prof. Xu Wang)

Undergraduate Student Research Advisor

Dorothy Machorro (2012–2013) Technical Marketing Specialist at Abbie Gregg Inc.
Beatriz Cervantes (2012–2013) Postbach at the University of Pennsylvania
Jeremy McCarver (2012–2013) Student at the Midwestern University Arizona College of Osteopathic Medicine
Cole Helsell (2012–2015) Graduate student UCSF Biophysics

Patrick Kelly (2014–2015) Graduate student ASU School of Molecular Sciences
Mac Castro (2013–2016) Graduate student Vanderbilt University Interdisciplinary Graduate Program (IGP) for in 2016
Maryam Waris (2013–2016) NIH Postbach Scholar
Hoang Nguyern (2016–present)
Samuel Gowland (2016–present)
Derek Lee (2016–present)
Julia Torline (2017–present)
Phuong Nguyen (2017–present)
Robert Walls (2017–present)

Ph.D. Thesis Committee members

Anirban Purohit (Prof. Marcia Levitus)
Patrick Kelly (Prof. Jeremy Mills)
William Johnson (Prof. Keven Redding)
Alex Buchberger (Prof. Nicholas Stephanopoulos)
Bobby Baravati (Profs. Petra Fromme & Debra Hansen)
Brian Dohaphon (Prof. Marcia Levitus)
Joshua Jeffs (Prof. Chad Borges)
Andrew Serban (Prof. Rebekka Wachter)
Di Shen (Prof. Xu Wang)
Erandi Kapuruge (Prof. Chad Borges)
Nirupa Nagaratnam (Prof. Petra Fromme & Stephen Johnston)
David Dotson (Prof. Oliver Beckstein, Physics)

Ph.D. Oral Committee member

Raghu Pradeep (Profs. Hao Yan & Nicholas Stephanopoulos)
Shannon Huey (Prof. Mark Hayes)
Shatabdi Roy-Chowdhury (Prof. Petra Fromme)
Zahra Bahrami Dizcheh (Prof. Giovanna Ghirlanda)
Christopher Gisriel (Prof. Kevin Redding)
Renjie Liao (Prof. Jia Guo)
Jason Maxwell (Prof. Giovanna Ghirlanda)
Christopher Nazaroff (Prof. James Lee & Jia Guo)
Anirban Purohit (Prof. Levitus)

Ph.D. Oral Committee Chair

Jesse Coe (Prof. Petra Fromme)

Barret Honors Student Thesis Advisor

Cole Helsell (2015)
Maryam Waris (2016)
Shelby Hoebee (2016)
Molly Benkaim (2016)
Hoang Nguyern (2017)
Derek Lee (anticipated 2018)
Julia Torline (anticipated 2019)

Barret Honors Student Committee member

Tsuiying “Connie” Lan (Xu Wang) 2014
Phong Nguyen (Kevin Redding) 2015
Tyler Miyasaki (Chad Borges) 2015
Gina Mo (Petra Fromme) 2016

Graduate Student Achievements

Nicholas Sisco, 2016, ASU College of Liberal Arts and Sciences Excellence Fellowship for First Generation Students.

Nicholas Sisco, 2017, ASU Graduate College Travel Award

Undergraduate Student Achievements

Cole Helsell, currently graduate student at UCSF, Honorable mention in the Cellular and Molecular Biology Poster Presentation at the 2015 AAAS National Meeting. Noted in the Apr. 3, 2015 issue of Science (pg. 140)

Maryam Waris, graduated Barrett Honors Student in the Van Horn Lab, 2015 participant in the Albert Einstein College of Medicine Clinical Research Training Program.

Manuel Castro, currently undergraduate student in the Van Horn Lab, 2015 participant in the Biophysical Society Summer Research Program in Biophysics, hosted at UNC Chapel Hill. Olivia Brunacini, 2015 ASU College of Liberal Arts and Sciences Undergraduate Summer Enrichment Award.

Manuel Castro, 2016 recipient of a National Science Foundation Graduate Research Fellowship Program (NSF GFRP), Manuel will attend Vanderbilt University for graduate school in Fall 2016.

Maryam Waris, graduated Barrett Honors Student in the Van Horn Lab, 2016 Fulbright Scholar.

Hoang Nguyen, 2016 ASU College of Liberal Arts and Sciences Undergraduate Summer Enrichment Award.

Molly Benkaim, 2016 Moeur Award from ASU

Hoang Ngugen, 2016 ASU College of Liberal Arts and Sciences Student Leader

Intellectual Property

2015

Title: *A Protein-based Molecular Temperature Switch* AzTE invention ID M14-155L
PCT (Patent Cooperation Treaty) PCT/US15/15464
Nationalized PCT 15/118,358

2016

Title: *A heat-sensing protein switch and uses thereof* AzTE invention ID M15-269L
US Patent Number 20160376338
Application Number 15/191902