

Joshua J. Ziarek, PhD

Assistant Professor of Molecular and Cellular Biochemistry Indiana University

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Citizenship

United States of America

Education

- 2017 **Postdoctoral Fellowship, Harvard Medical School**
Mentor: Prof. Gerhard Wagner
- 2012 **Postdoctoral Fellowship, Medical College of Wisconsin**
Mentors: Prof. Samuel T. Hwang and Prof. Brian F. Volkman
- 2011 **PhD, Medical College of Wisconsin**
Dissertation: Biophysical analysis of CXCL12/CXCR4 interactions and structure-guided inhibitor discovery
Mentor: Prof. Brian F. Volkman
- 2007 **BS, University of Wisconsin – Milwaukee**
Mentor: Dist. Prof. J. Rudi Strickler

Faculty Appointments

- 2017- Assistant Professor of Molecular and Cellular Biochemistry, Indiana University, USA

Professional Experience

- 2015-2016 Visiting Researcher with Prof. Masatsune Kainosho, Nagoya University, Japan
- 2012-2017 Postdoctoral Fellow with Prof. Gerhard Wagner, Harvard Medical School, USA
- 2011-2012 Postdoctoral Fellow with Prof. Sam T. Hwang and Prof. Brian F. Volkman, Medical College of Wisconsin, USA
- 2007-2011 Graduate Research Assistant with Prof. Brian F. Volkman, Medical College of Wisconsin, USA
- 2006 Undergraduate Trainee with Prof. Linda Z. Holland, Scripps Institute of Oceanography, University of California-San Diego, USA
- 2004-2007 Undergraduate Research Assistant with Prof. J. Rudi Strickler, University of Wisconsin-Milwaukee, USA

Fellowship Awards

- 2015 Pathway to Independence Award (K99/R00), National Institutes of Health
- 2014 Postdoctoral Fellowship (Short-term), Japan Society for the Promotion of Science (*Declined*)
- 2012 Individual Ruth L. Kirschstein National Research Service Award (NRSA), National Institutes of Health
- 2011 Postdoctoral Fellowship in Cancer Research, Cancer Center of the Medical College of Wisconsin
- 2006 Research Experience for Undergraduates (REU) Fellowship, National Science Foundation

Awards and Honors

- 2016 Young Investigator Award, International Conference on Magnetic Resonance in Biological Systems
- 2012 Outstanding Doctoral Dissertation Award, Medical College of Wisconsin
- 2011 Friends of MCW Graduate Student Travel Award, Medical College of Wisconsin
- 2010 1st Prize in American Chemical Society Poster Session – Milwaukee Chapter
- 2010 Student Travel Award, American Chemical Society – Milwaukee Chapter (*Declined*)

Membership in Professional Societies

American Chemical Society
Protein Society
International Society of Magnetic Resonance

Editorships/Editorial Boards/Journal Reviews

Editorial Board

FEBS Letters, 2019-

Research Support

Ongoing

Title: Deciphering GPCR signal transduction through NMR structure and dynamics studies
Source: NIH Pathway to Independence Award R00 GM115814
Role: PI
Dates: 09/2017-08/2020
Direct funds: \$747,000

Completed

Title: Deciphering GPCR signal transduction through NMR structure and dynamics studies
Source: NIH Pathway to Independence Award K99 GM115814
Role: PI (Mentor: Gerhard Wagner, PhD)
Dates: 09/2015-08/2017

Title: Structural basis for SCAP/SREBP interaction
Source: NIH Individual NRSA Fellowship F32 GM103005
Role: PI (Mentor: Gerhard Wagner, PhD)
Dates: 09/2012-08/2015

Title: Inhibiting melanoma metastasis with an engineered chemokine
Source: Medical College of Wisconsin Cancer Center
Role: PI (Mentors: Samuel T. Hwang, MD, PhD and Brian F. Volkman, PhD)
Dates: 09/2011-08/2012

Invited Lectures/Workshops/Presentations

Regional

2019 Invited Speaker, Gateway NMR Meeting, Ann Arbor, MI
2010 Great Plains Regional Annual Symposium on Protein and Biomolecular NMR. Lawrence, KS
2005 University of Wisconsin Symposium for Undergraduate Research. Oshkosh, WI

National

2019 Invited Speaker, Gordon Research Conference: Molecular Pharmacology. Ventura Beach, CA
2015 Invited Lecture, University of Hawaii, Department of Chemistry, Honolulu, HA
2007 American Society of Limnology and Oceanography: Aquatic Sciences Meeting. Santa Fe, NM

International

2019 Invited Lecture, Technical University of Dortmund, Faculty of Chemistry and Chemical Biology, Dortmund, Germany
2017 Invited Lecture, Tohoku University, Graduate School of Pharmaceutical Sciences, Tohoku, Japan
2017 Invited Lecture, Tokyo Metropolitan University, Department of Chemistry, Tokyo, Japan
2017 Invited Speaker, Gordon Research Seminar: Molecular Pharmacology. Tuscany, Italy
2015 Plenary Speaker, Kyoto University RRR Workshop. Kyoto, Japan

- 2015 Invited Speaker, Annual Meeting of the NMR Society of Japan. Tokyo, Japan
2015 International Workshop: High Resolution Cell Biology. Nagoya, Japan
2013 Invited Lecture, Kyoto University, Biomolecular Function Chemistry Laboratory, Kyoto, Japan

University Service

- 2019- Social Committee, Biochemistry Graduate Program, IU
2018-2019 Member, Structural Biology Search Committee, Dept Biochemistry and Molecular Biology, IUSM
2017- Member, Biochemistry Program Graduate Admissions Committee, IU
2017- Co-organizer with Prof. Megan Thielges, StruBIO and MolBioPhys Working Groups, IU

Students, Faculty, Residents and Clinical/Research Fellows Mentored

Undergraduate Students Advised

- Yunping Wang, Indiana University, 2018-
Andrew Metzman, Indiana University, 2018-
Quinn Kaurich, Indiana University, 2018-
Seyda Balkan, Middle East Technical University (Turkey), Summer 2018
GianCarlo Montiel, UC Merced, Summer 2019

PhD Students Advised

- Austin Dixon, Indiana University, 2017-
James Bower, Indiana University, 2018-
Mingzhe Pan, Indiana University, 2018-

Clinical/Research Fellows Advised

- Cagdas Dag, PhD, Indiana University, 2017-2018
Fabian Bumbak, PhD, Indiana University, 2018-
Scott Robson, PhD, Indiana University, 2019-

Patent

US Patent 9,908,923. **Monomeric CXCL121 peptide and methods of use thereof.** Brian Volkman, [Joshua Ziarek](#), Christopher Veldkamp & Francis Peterson. Medical College of Wisconsin.

Publications Currently in Peer-Review

[Ziarek, J.J.](#), Goricanec, D., Hillenbrand, M., Yu, J., Schum, D., Pluckthun, A., Wagner, G. & F. Hagn. Activation of neurotensin receptor is governed by an agonist-dependent structural switch that regulates its intrinsic dynamics. *In review*.

Peer-Reviewed Publications (21 total; 889 citations; h-index 17)

Hitchinson, B., Eby, J., Gao, X., Guite-Vinet, F., [Ziarek, J.J.](#), Abdelkarim, H., Lee, Y., Majetschak, M., Heveker, N., Volkman, B.F., Tarasova, N. & V. Gaponenko. 2018. Biased antagonism of CXCR4 avoids antagonist tolerance. **Science Signaling**, 11:eaat2214.

Gruenhagen, T.C., [Ziarek, J.J.](#) & J.P. Schleich. 2018. Bicelle size modulates the rate of bacteriorhodopsin folding. **Protein Science**, 27(6):1109-1112.

Chhabra, S., Fischer, P., Takeuchi, K., Dubey, A., [Ziarek, J.J.](#), Boeszoermenyi, A., Mathieu, D., Bermel, W., Davey, N.E., Wagner, G. & Arthanari, H. A. 2018. ¹⁵N Detection Harnesses the Slow Relaxation Property of Nitrogen: Delivering enhanced resolution for intrinsically disordered proteins. **Proceedings of the National Academy of Sciences of the United States of America**, 115(8):E1710-1719.

[Ziarek, J.J.](#), Kleist, A.B, London, N., Raveh, B., Montpas, N., Bonnetterre, J., St-Onge, G., DiCosmo-Ponticello, C.J., Koplinski, C.A., Roy, I., Stephens, B., Thelen, S., Veldkamp, C.T., Coffman, F.D., Cohen, M.C., Dwinell, M.B., Thelen, M., Peterson, F.C., Heveker, N. & Volkman, B.F. 2017. Structural basis for chemokine recognition of a G protein-coupled receptor and implications for receptor activation. **Science Signaling**, 10:eaah5756.

Nihongi, A., [Ziarek, J.J.](#) Uttieri, M., Sandulli, R., Zambianchi, E. & Strickler, J.R. 2016. Behavioral interseasonal adaptations in

Daphnia pulicaria (Crustacea: Cladocera) as induced by predation infochemicals. **Aquatic Ecology**, doi:10.1007/s10452-016-9585-0.

- Smith, E., Liu, Y., Getschman, A.E., Peterson, F.C., Ziarek, J.J., Li, R., Volkman, B.F. & Chen, Y. 2014. Structural analysis of a novel small molecule ligand bound to the CXCL12 chemokine. **Journal of Medicinal Chemistry**, 57(22):9693-9699.
- Wommack, A.J., Ziarek, J.J., Tomaras, J., Chileveru, H.R., Zhang, Y., Wagner, G. & Nolan, E.M. 2014. Discovery and characterization of a disulfide-locked C2-symmetric defensin peptide. **Journal of the American Chemical Society**, 136(39):13494-13497.
- Verkaar, F., van Offenbeek, J., van der Lee, M.M.C., van Lith, L.H.C.J., Watts, A.O., Rops, A.L.W.M.M., Aguilar, D.C., Ziarek, J.J., van der Vlag, J., Handel, T.M., Volkman, B.F., Proudfoot, A.E.I., Vischer, H.F., Zaman, G.J.R., & Smit, M.J. 2014. Chemokine cooperativity is caused by competitive glycosaminoglycan binding. **Journal of Immunology**, 192(8):3908-3914.
- Ziarek, J.J.★, Getschman, A.E.★, Butler, S.J., Taleski, D., Stephens, B., Kufareva, I., Handel, T.M., Payne, R.J. & Volkman, B.F. 2013. Sulfopeptide probes of the CXCR4/CXCL12 interface reveal oligomer-specific contacts and chemokine allostery. **ACS Chemical Biology**, 8:1955-1963. ★*Equal contributors*.
- Ziarek, J.J., Veldkamp, C.T., Zhang, F. Murray, N.J., Kartz, G.A., Liang, X., Su, J., Baker, J.E., Lindhardt, R.J. & Volkman, B.F. 2013. Heparin Oligosaccharides Inhibit Chemokine (CXC Motif) Ligand 12 (CXCL12) Cardioprotection by Binding Orthogonal to the Dimerization Interface, Promoting Oligomerization, and Competing with the Chemokine (CXC Motif) Receptor 4 (CXCR4) N Terminus. **Journal of Biological Chemistry**, 288:737-746.
- Ziarek, J.J.★, Liu, Y.★, Smith, E., Chen, J., Peterson, F.C., Zhang, G., Yu, Y., Chen, Y., Volkman, B.F. & Li, R. 2012. Fragment-based optimization of small molecule CXCL12 inhibitors for antagonizing the CXCL12/CXCR4 interaction. **Current Topics in Medicinal Chemistry**, 12:2727-2740. ★*Equal contributors*.
- Takekoshi, T., Ziarek, J.J., Volkman, B.F. & Hwang, S.T. 2012. A locked, dimeric CXCL12 variant effectively inhibits pulmonary metastasis of CXCR4-expressing melanoma cells due to enhanced serum stability. **Molecular Cancer Therapeutics**, 11:2516-2525.
- Mysinger, M.M.★, Weiss, D.R.★, Ziarek, J.J.★, Gravel, S., Doak, A.K., Karpiak, J., Heveker, N., Shoichet, B.K. & Volkman, B.F. 2012. Structure-based ligand discovery for chemokine receptor CXCR4. **Proceedings of the National Academy of Sciences of the United States of America**, 109: 5517-5522. ★*Equal contributors*.
- Love, M., Sandberg, J.L., Ziarek, J.J., Rode, R.R., Gerarden, K.P., Jensen, D.R., McCastlin, D., Peterson, F.C. & Veldkamp, C.T. 2012. Solution structure of CCL21 and identification of a putative CCR7 binding site. **Biochemistry**, 51(3): 733-735.
- Drury, L.D.★, Ziarek, J.J.★, Gravel, S., Veldkamp, C.T., Takekoshi, T., Hwang, S.T., Heveker, N., Volkman, B.F. & Dwinell, M.B. 2011. Monomeric and dimeric CXCL12 inhibit metastasis through distinct CXCR4 interactions and signaling pathways. **Proceedings of the National Academy of Sciences of the United States of America**, 108: 17655-17660. ★*Equal contributors*.
- Saini, V., Staren, D.M., Ziarek, J.J., Nashaat, Z.N., Campbell, E.M., Volkman, B.F., Marchese, A. & Majetschak, M. 2011. The CXC chemokine receptor 4 ligands ubiquitin and stromal-cell derived factor-1 α function through distinct receptor interactions. **Journal of Biological Chemistry**, 286: 33466-33477.
- Ziarek, J.J., Heroux, M.S., Veldkamp, C.T., Peterson, F.C. & Volkman, B.F. 2011. Sulfo tyrosine recognition as marker for druggable sites in the extracellular space. **International Journal of Molecular Sciences**, 12(6), 3740-3756.
- Ziarek, J.J., Nihongi, A., Nagai, T., Uttieri, M., Zambianchi, E., & Stricker, J.R. 2011. Seasonal adaptations of *Daphnia pulicaria* swimming behaviour: the effect of water temperature. **Hydrobiologia**, 661: 317-327.
- Nihongi, A., Ziarek, J.J., Nagai, T., Uttieri, M., Zambianchi, E. & Strickler, J.R. 2011. *Daphnia pulicaria* hijacked by *Vibrio cholera*: Altered swimming behaviour and predation risk Implications. In: **Zooplankton and Phytoplankton**. Ed: Katell, G. Nova Science Publishers.
- Veldkamp, C.T., Ziarek, J.J., Peterson, F.C., Chen, Y. & Volkman, B.F. 2010. Targeting SDF-1/CXCL12 with a ligand that prevents activation of CXCR4 through structure based drug design. **Journal of the American Chemical Society**, 132: 7242-7243.

Veldkamp, C.T., Ziarek, J.J., Su, J., Basnet, H., Lennertz, R., Weiner, J.J., Peterson, F.C., Baker, J.E. & Volkman, B.F. 2009. Monomeric structure of the cardioprotective chemokine SDF-1/CXCL12. **Protein Science**, 18:1359-1369.

Reviews and Book Chapters (6 total; 133 citations)

Ziarek, J.J., Baptista, D. & Wagner, G. 2018. Recent developments in solution NMR-based molecular biology. **Journal of Molecular Medicine**, 96:1-8.

Kleist, A.B., Getschman, A.E., Ziarek, J.J., Nevins, A.M., Gauthier, P-A., Chevigne, A., Szpakowska, M. & Volkman, B.F. 2016. New paradigms in chemokine receptor signal transduction: moving beyond the two-site model. **Biochemical Pharmacology**, 114:53-68.

Luna, R.E.*[†], Akabayov, S.R.*[†], Ziarek, J.J.*[†] & Wagner, G. 2013. Examining weak protein-protein interactions in start codon recognition via nuclear magnetic resonance spectroscopy. **FEBS Journal**, 281(8):1965-1973. **Equal contributors*.

Ziarek, J.J. & Volkman, B.F. 2012. NMR in the analysis of functional chemokine interactions and drug discovery. **Drug Discovery Today: Technologies**, 9:e293-e299.

Ziarek, J.J., Peterson, F.C., Lytle, B.L. & Volkman, B.F. 2011. Chapter ten: Binding site identification and structure determination of protein-ligand complexes by NMR. **Methods in Enzymology**, 493:241-275.

Strickler, J.R., Udvadia, A.J., Marino, J., Radabaugh, N., Ziarek, J.J., & Nihongi, A. 2005. Visibility as a factor in the copepod – planktivorous fish relationship. **Scientia Marina**, 69(Suppl. 1):111-124.

Database, Video, or Other Research/Clinical Contributions

2N55, Structure of constitutively monomeric CXCL12 in complex with CXCR4 N-terminus, Deposited 2015-07-07, Released 2016-04-27. Ziarek, J.J., Peterson, F.C., Volkman, B.F.

2KOL, Solution structure of human SDF1-alpha H25R. Deposited 2009-09-24, Released 2010-10-06. Volkman, B.F., Ziarek, J.J., Peterson, F.C., Veldkamp, C.T.

2MIT, Solution structure of oxidized dimeric form of human defensin 5. Deposited 2013-12-19, Released 2014-09-17. Wommack, A.J., Ziarek, J.J., Wagner, G., Nolan, E.M.

References

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