RICH OLSON, PH.D.
DEPARTMENT OF MOLECULAR BIOLOGY AND BIOCHEMISTRY
MOLECULAR BIOPHYSICS PROGRAM
COLLEGE OF INTEGRATED SCIENCES
WESLEYAN UNIVERSITY
52 LAWN AVE
MIDDLETOWN, CT 06459
PHONE: 860-685-3070 rolson@wesleyan.edu

EDUCATION

1997-2003	Columbia University, New York, NY Ph.D. *with distinction* in Biochemistry and Molecular Biophysics Doctoral advisor: Dr. Eric Gouaux *Structure and function of pore forming toxins and ionotropic glutamate receptor ligand binding domains.*
1993-1997	Cornell University, Ithaca, NY B.A. *cum laude* in Biological Sciences, concentration in Biochemistry *Honors thesis: Expression and purification of lactose permease*

EMPLOYMENT

July 2016-present	Associate Professor Department of Molecular Biology and Biochemistry Molecular Biophysics Program College of Integrative Sciences Wesleyan University, Middletown, CT
July 2009-June 2016	Assistant Professor – MB&B, Wesleyan University
Jan. 2004-June 2009	Beckman Postdoctoral Fellow California Institute of Technology, Pasadena, CA Lab of Dr. Pamela Björkman *Structure and function of G protein-coupled receptors and associated MHC molecules.*

SCHOLARSHIP

Research Interests: Structural biology of proteins involved in infectious disease

My research broadly seeks to understand the structure and function of virulence factors produced by human pathogens with a particular focus on transmembrane and membrane-associated proteins. Recently, this research has focused on the mechanism of biofilm formation in the human pathogen *Vibrio cholerae*. I am interested in understanding the structural mechanism for how various biofilm components form three dimensional assemblies, and how biofilms adhere to varied surfaces. I primarily use X-ray crystallography in my investigations but complement my structural work with additional biophysical and biochemical techniques.

RESEARCH GRANTS

2021	Project Grant, Wesleyan University - $2,500
2012-2016	R15 AI101977-01 – NIH, NIAID – 08/12-07/16 - $460,197 "Mechanism of cell membrane targeting by *Vibrio cholerae* cytolysin"

2015-2016 Project Grant, Wesleyan University – 07/15-06/16 - $2,500
2012-2014 Project Grant, Wesleyan University - 06/12-06/14 - $2,500
2011-2012 Project Grant, Wesleyan University - 06/11-06/12 - $2,500
2010-2011 Project Grant, Wesleyan University - 12/10-06/11 - $2,500
2009-2010 Project Grant, Wesleyan University - 12/09-06/10 - $2,500

HONORS AND FELLOWSHIPS

2006-2009 Beckman Institute Fellowship, California Institute of Technology
2005 Outstanding Poster Award, Biology Departmental Retreat, California Institute of Technology
2004-2005 Rosalind Alcott Fellowship, California Institute of Technology
2000 Scholarship, National Analytical Ultracentrifugation Facility Training
1998 Honorable Mention, NSF Graduate Research Fellowship
1995, 1996 Howard Hughes Scholar, Cornell University, Summer 1995, 1996.

PUBLICATIONS (undergraduate authors in bold type)

Peer Reviewed Published Works At Wesleyan:

1. Jiang, Z., Nero, T., Mukherjee, S., Olson, R.,Yan, J., (2021) "Searching for the secret of stickiness: how biofilms adhere to surfaces," *Frontiers in Microbiology,* 12:686793.
2. Kaplan, A.R., Olson, R., & Alexandrescu, A.T., (2021) "Protein yoga: Conformational versatility of the Hemolysin II C-terminal domain detailed by NMR structures for multiple states," *Protein Science,* May;30(5):990-1005.
3. Kaus, K., **Biester, A., Chupp, E., Lu, J., Visudharomn, C.**, Olson, R., (2019) "The 1.9 Å crystal structure of the extracellular matrix protein Bap1 from *Vibrio cholerae* provides insights into bacterial biofilm adhesion," *Journal of Biological Chemistry*, 294(40), 14,499-511.
4. De., S., Kaus, K., **Sinclair, S.**, Case, B. C., Olson, R., (2018) "Structural basis of mammalian glycan targeting by *Vibrio cholerae* cytolysin and biofilm proteins." *PLOS Pathogens,* 14(2):e1006841.
5. Kaplan, A. R., Kaus, K., De, S., Olson, R., & Alexandrescu, A. T., (2017) "NMR structure of the *Bacillus cereus* hemolysin II C-terminal domain reveals a novel fold," *Scientific Reports,* 7(1):1-13.
6. Zhang, Q., Li, Y, Olson, R., Mukerji, I., & Oliver, D., (2016) "Conserved secA signal peptide-binding site revealed by engineered protein chimeras and förster resonance energy transfer," *Biochemistry*, 55(9):1291-300.
7. De, S., **Bubnys, A.**, Alonzo, F., **Hyun, J.**, Lary, J.W., Cole, J.L., Torres, V.J. & Olson, R., (2015) "The relationship between glycan-binding and direct membrane interactions in Vibrio cholerae cytolysin, a channel-forming toxin," *Journal of Biological Chemistry,* 290(47):28,402-15.
8. Kaus, K., Lary, J. W., Cole, J. L., and Olson, R., (2014) "Glycan specificity of the *Vibrio vulnificus* hemolysin lectin outlines evolutionary history of membrane targeting by a toxin family." *Journal of Molecular Biology,* 426(15):2800-2812.
9. Kaplan, A. R., Maciejewski, M.W., Olson, R., and Alexandrescu, A.T. (2013) "NMR Assignments for the *Cis* and *Trans* Forms of the Hemolysin II C-Terminal Domain." *Biomolecular NMR Assignments*, pp. 1-5.

10. **Levan, S.**, De, S., and Olson, R., (2013) "*Vibrio cholerae* cytolysin recognizes the heptasaccharide core of complex N-glycans with nanomolar affinity," *Journal of Molecular Biology,* 425:944-957.
11. De, S. and Olson, R., (2011) "Crystal structure of the Vibrio cholerae cytolysin heptamer reveals common features among disparate pore-forming toxins," *Proceedings of the National Academy of Sciences*, 108(18), 7385-90.

Peer Reviewed Published Works Prior to Wesleyan

12. He, Y. and Olson, R., (2010) "Three-dimensional structure of the detergent-solubilized *Vibrio cholerae* cytolysin (VCC) heptamer by electron cryomicroscopy," *Journal of Structural Biology*, 169(1), 6-13.
13. Arnon, T. I., Kaiser, J. T., West, A. P. Jr., Olson, R., Diskin, R., Viertlboeck, B. C., Göbel, T. W., and Bjorkman, P. J., (2008) "The crystal structure of CHIR-AB1: a primordial avian classical Fc receptor," *Journal of Molecular Biology,* 381(4), 1012-24.
14. Olson, R., Dulac, C., and Björkman, P. J., (2006) "MHC homologs in the nervous system – they haven't lost their groove," *Current Opinion in Neurobiology*, 16(3), 351-357.
15. Olson, R., K. E. Huey-Tubman, Dulac, C., and Björkman, P. J., (2005) "Structure of a pheromone receptor-associated MHC molecule with an open and empty groove," *PLOS Biology,* 3(8): e257, 1436-1448.
16. Olson, R. and Gouaux, E., (2005) "Crystal structure of the Vibrio cholerae cytolysin (VCC) pro-toxin and its assembly into a heptameric transmembrane pore," *Journal of Molecular Biology* 350(5), 997-1016.
17. Zagotta, W.N., Olivier, N.B., Black, K.D., Young, E.C., Olson, R., and Gouaux, E., (2003) "Structural basis for modulation and agonist specificity of HCN pacemaker channels," *Nature*, 425, 200-205.
18. Braunstein, J., Brutsaert, S., Olson, R., and Schindler, C., (2003) "STATs dimerize in the absence of phosphorylation," *Journal of Biological Chemistry*, 278, 34133-34140.
19. Olson, R. & Gouaux, E., (2003) "*Vibrio cholerae* cytolysin is composed of an α-hemolysin-like core," *Protein Science*, 12, 379-383.
20. Sun, Y., Olson, R., Horning, M., Armstrong, N., Mayer, M., and Gouaux, E., (2002) "Mechanism of glutamate receptor desensitization," *Nature*, 417, 245-253.
21. Mayer, M.L., Olson, R., and Gouaux, E., (2001) "Mechanisms for ligand binding to GluR0 ion channels: crystal structures of the glutamate and serine complexes and a closed apo state," *Journal of Molecular Biology*, 311, 815-836.
22. Olson, R., Nariya, H., Yokota, K., Kamio, Y., and Gouaux, E., (1999) "Crystal structure of staphylococcal LukF delineates conformational changes accompanying formation of a transmembrane channel," *Nature Structural Biology*, 6, 134-140.

SEMINARS AND TALKS

2019 Invited biochemistry colloquium at Freie Universität Berlin, Germany, June 13, "Host glycan targeting by *Vibrio* pathogens."

2017 Invited talk at the University of Connecticut Medical Center Department of Molecular Biology and Biophysics, Farmington, CT, March 2, "*Structural basis for host glycan targeting by Vibrio virulence factors*."

2015 Invited talk at the Wesleyan University Biophysics Retreat, "*Understanding membrane specificity in a family of bacterial pore-forming toxins*."

2014 Invited talk at the University of Connecticut Department of Molecular and Cell Biology, Storrs, CT, April 15, "*Structural insights into cell-targeting by bacterial pore-forming toxins*."

2011 Co-chaired membrane protein structure session and presented platform talk at Biophysical Society meeting, March 2011, Baltimore, MD, "*Crystal structure of the Vibrio cholerae cytolysin heptameric pore.*"

2010 Invited talk at the University of Connecticut Medical Center Department of Molecular, Microbial, and Structural Biology, Farmington, CT, February 18, "*Portable pores: structural studies of bacterial cytolytic toxins*."

2009 Invited talk at the Wesleyan University Biophysics Retreat, "*Poring over the structural basis of Vibrio cholerae cytolysin assembly*."

2004 Invited Talk and Session Chair. "*Uncovering the Structural Basis of Toxin Assembly*." Fifth Workshop on Pore-Forming Toxins, Mainz, Germany, October 10-13, 2004.

POSTER PRESENTATIONS (undergraduate authors in bold)

2015 De, S. and Olson, R. "*Key residues in Vibrio cholera cytolysin involved in membrane binding*." Biophysical Society annual meeting, February 2015, Baltimore, MD.

2014 Kaus, K. and Olson, R. "*Structure and glycan-binding properties of the Vibrio vulnificus hemolysin β-prism lectin*." Biophysical Society annual meeting, March 2014, San Francisco, CA.

2013 De, S. and Olson, R. "*Identification and characterization of the glycan binding site of Vibrio cholerae cytolysin*." Biophysical Society annual meeting, March 2013, Philadelphia, PA.

2012 **Levan, S.** and Olson, R. "*The carbohydrate binding activity of Vibrio cholerae cytolysin*." Gordon Conference on Microbial Toxins & Pathogenicity, Waterville Valley, NH, July 8-13, 2012.

2012 **Levan, S.** and Olson, R. "*The carbohydrate binding activity of Vibrio cholerae cytolysin*." Biophysical Society meeting, March 2012, San Diego.

2011 **Tyssowski, K**. and Olson, R. "*Expression of goldfish olfactory receptor in baculovirus-infected insect cells*." ASBMB annual meeting, April.

2011 De, S. and Olson, R. "*Crystal structure of the Vibrio cholerae cytolysin heptameric pore*." Biophysical Society annual meeting, March 5-9, Baltimore, MD.

2010 **Situ, R**. and Olson, R. "*Structural studies of the ORC45 receptor*," Annual biomedical research conference for minority students (ABRCMS), November 12, Charlotte, NC.

2009 He, Y. and Olson, R. "*Three-dimensional structure of the detergent-solubilized Vibrio cholerae cytolysin (VCC) heptamer by electron cryomicroscopy*." Gordon

conference on Microbial Adhesion and Signal Transduction, Regina Salve University, July 26-31.

2002 Olson, R. and Gouaux, E. "*Large Scale Expression, Purification, and Assembly of Vibrio Cholerae Cytolysin*." Biophysical Society 46th Annual Meeting, San Francisco, February 23-27.

PEDAGOGY

Courses at Wesleyan

MB&B 111 *Introduction to Environmental Toxicology* (4 times). In this science course for non-science majors, students learn about anthropogenic toxic chemicals in the environment, with a particular focus on human health concerns. Students learn about where toxins originate, how they move through the environment, and how they enter and affect the human body. Students also learn how scientists evaluate toxic chemical risk through dose-response and epidemiological studies.

MB&B 208 *Molecular Biology* (Co-taught with Prof. Amy MacQueen twice). Gateway molecular biology course for the MB&B major. A comprehensive survey of molecules and molecular mechanisms underlying biological processes. I taught the first half of the course focusing on macromolecular structure and function.

MB&B 237 *Signal Transduction* (5 times). This course examines how cells sense and integrate information from their environment on a molecular level. The approach includes cellular, molecular, and structural aspects of cell signaling with a focus on how changes in signal transduction lead to cancer.

MB&B 303/ 503 *Receptors, Channels, and Pumps: Advanced Topics in Membrane Protein Structure and Function* (5 times). The past 10 years have seen rapid technological advances that have lead to an exponential expansion in our knowledge about membrane protein structure. This advanced undergraduate/graduate level course engages with primary literature to understand what these new structures tell us about how these essential proteins function in the cell.

MB&B 307/ *Molecular Biophysics Journal Club* (multiple times). Undergraduate and graduate students meet weekly to present and discuss recent papers from the primary literature in the area of Molecular Biophysics.

MB&B 395 *Structural Biology Laboratory* (with Prof. Ishita Mukerji, 4 times, once solo). This course represents one of two capstone experiences for MB&B undergraduate majors. Students investigate protein structure through a variety of biophysical techniques using state-of-the-art instrumentation and hands-on instruction.

MB&B 516 *Advanced Topics in Structural Biology* (once). This course examines how researchers use the tools of structure determinination to explore current fundamental questions in the biological sciences.

MB&B 557/ *Research Seminars in Molecular Biology and Biochemistry* (once). This

558 course involves weekly presentations by graduate students and undergraduate thesis writers on the current state of their independent research.

***Prior to Wesleyan**:*

2008	Instructor, "Receptors, Channels, and Pumps: The Structure and Function of Membrane Proteins" (undergraduate course), California Institute of Technology, Spring 2008.
2004-2005	Research Advisor, Summer Undergraduate Research Fellowship Program, California Institute of Technology. Supervised 10-week research projects for exceptional undergraduate students at Caltech.
1998	Teaching Assistant, "Molecular Biophysics" (graduate course), Profs. Barry Honig, Arthur Palmer, Arthur Karlin, and Wayne Hendrickson.

Advising:

2010-present	Faculty advisor for freshmen and sophomores
2017-present	Faculty advisor for WesMASS program (for traditionally underrepresented students in mathematics and sciences)

STUDENTS

Graduate students
Ranjuna Weerasekera (MB&B, Ph.D., 2020-)
Alex Hinbest (MB&B, Ph.D., 2020-)
Swastik De (MB&B; Ph.D., 2009-2016)
Katie Kaus (MB&B; Ph.D., 2012-2018)
Sergei Pourmal (MB&B; BA/MA ABD, Ph.D. student at UCSF)

Rotation graduate students
Joyce Noble, Qi Zhang, Xeliang Zheng, Bo Song, Legairre Radden, Brandon Case, Lorencia Chigweshe, Meagan MacDonald, Jaime Alberto Carrazco-Carrillo.

Undergraduate students mentored in Olson lab research
Elizabeth Kenworthy '10 (U. of Stony Brook Medical School)
Kelsey Tyssowski '11 (Hughes Summer Research Fellow, Firshein Award, Ph.D. student at Harvard)
Sophie Levan '12 (Hughes Summer Research Fellow, Butterfield prize, Graham prize, Hawk prize, MD/Ph.D. student at UCSF)
Robert Situ '12 (McNair Summer Research Fellow)
Lee Gottesdiener '12 (Hughes Summer Research Fellow, Graham Prize, Hawk Prize)
Li Lin '14 (McNair Summer Research Fellow)
Adele Bubnys '14 (Hughes Summer Research Fellow, Ph.D. program at Rockefeller University)
Jinsol Hyun '15 (Hughes Summer Research Fellow)
Emily Gao (Hughes Summer Research Fellow, visiting from Williams College)
Shu Wang '13 (McNair Summer Research Fellow, joint with Prof. Erika Taylor)
Lucas McLaughlin '15
Chloe Leeds '16

Shada Sinclair ‘16
Benjamin Kaufman ’17 (Summer Research Program and College of Integrative Sciences Summer Program)
Mitchell Ramsey ’17 (Summer Research Program)
Kyle Hardy ’18 (Summer Research Program, Wesleyan Black Alumni Council Memorial Prize)
Simone Harrison (Summer Research Program) ‘18
Alison Biester ‘19
Jianyi Lu ‘17 (Summer Research Program)
Charlie Visudharomn ’17 (Summer Research Program)
Ethan Chupp ‘19 (Summer Research Program)
Nathan Gamble ‘21
Hang Yang ‘22
Shaquille Bowie ‘22
Isabella Gibaldi ‘22
Andrew Cao ‘24

Undergraduate honors student theses from the Olson lab
Sophie Levan ’12 (High Honors) – “Discovering the role of carbohydrate binding in cell recognition by *Vibrio cholerae* cytolysin”
Adele Bubnys ’14 (High Honors) - “Investigations of the membrane binding of *Vibrio cholerae* cytolysin”
Simone Harrison ’18 (Honors) – “Identification and characterization of a novel secreted β-prism lectin domain from *Vibrio crassostrea*”

Committee work
Qualifying exam and Ph.D. dissertation committees
BA/MA thesis committees
Honors thesis reader

SERVICE

Department

2020-2021	Grad student advising committee
2019-2020	Member, MB&B search committee for Biochemistry tenure-track position
2018	Member, Professor of the Practice search committee
2017-2018	Member, equipment committee
2015-2016	Member, faculty search committee for open Molecular Biophysics Program hire
2013-2014	Member, equipment committee
2013-2014	Member, first year graduate advising committee
2009-2016	Member, graduate admissions committee
2009-2012	Member, graduate oral exam committee
2009-present	Faculty advisor, MB&B majors

University

2021-	Faculty Director, Wesleyan Mathematics and Science Scholars Program (WesMaSS)
2020-2021	Service on new science building planning committee
2020	Service on Goldwater selection committee
2019-2021	Service on Advisory committee (Promotions and Tenure)
2019-2021	Service on Fries Center for Global Studies advisory committee
2018	Service on Library- Faculty Advisory Committee (L-FAC), Spring semester
2014-2016	Service on Faculty Committee on Rights and Responsibilities (elected)
2015,2016	Led 2-day Wesleyan Summer Research Program workshop on scientific abstract writing
2014-2015	Faculty Mentor for Wesleyan Math and Science Scholars Program (Kyle Hardy)
2014-2015	Wesleyan Orchestra (trombone)
2013-2014	Faculty Mentor for Wesleyan Connections Mentoring Program (William Hein)
2012-2014	Service on the University Majors Committee (chaired by Dean Marina Melendez)
2011-2015	Service on the Division III Information and Technology Services (ITS) computing committee.
Various dates	Participated in Wesfest sessions and tours, panelist in two 3D printing sessions and Div. III research soirée on molecules, initiated and organized Molecular Biophysics Program lab tours (2013-2015)

Scientific community

2004-present	Paper referee for *Structure*, *Proceedings of the National Academy of Sciences, PLoS One, Journal of Structural Biology, Biochemistry, Journal of Bacteriology, Journal of Biological Chemistry, BBA Biomembranes, Acta Crystallographica Section F, Biochemical Journal, Biophysical Journal, Nature Communications, Microbial Pathogenesis, Infection and Immunity,* and *FEBS Letters.* Served as an outside reviewer for NSF grants (2010, 2015).
2013	Poster judge for North Eastern Structure Symposium, Storrs CT.
2004-2009	Interviewer for Admissions to Graduate and MD/PhD Programs, California Institute of Technology and University of California, Los Angeles.
2004, 2005, 2008	Chair, Biology Culminating Session, Summer Undergraduate Research Fellowship Program, California Institute of Technology.

OTHER EXPERIENCE

2007-2008	Society for Neuroscience Meeting, San Diego, CA, October 31-November 3, 2007 and Washington DC, November 15-19, 2008.
2005, 2007	West Coast Protein Crystallography Workshop, Asilomar Conference Center, Pacific Grove, CA, March 20-23, 2005 and March 11-14, 2007.
2005	Surface Plasmon Resonance (Biocore) Training, California Institute of Technology.
2000	Analytical Ultracentrifugation: Theory and Practice, National Analytical Ultracentrifugation Facility, University of Connecticut, May 22-24, 2000.
1999	Analytical Ultracentrifugation Training, Beckman Coulter, Inc., Palo Alto, CA, May 3-5, 1999.

PROFESSIONAL SOCIETY MEMBERSHIPS

Biophysical Society
American Society for Biochemistry and Molecular Biology (ASBMB)