A. CONTACT INFORMATION

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B. DEGREES AND TRAINING

1987	BSc	Chemistry	Brown University
1994	PhD	Biochemistry & Molecular Biology	University of Chicago
2000	Postdoc	Structural Biology	University of Colorado, Boulder
2018, 2021	Sabbatical	Neuroscience	University of Texas Southwestern, Dallas

C. APPOINTMENTS

2018	Associate Professor School of Biological Sciences	University of Utah
2007	Associate Professor of Biology	University of Utah
2000	Assistant Professor of Biology	University of Utah
1995	Post-doctoral Fellow with Dr. Steve Schultz	University of Colorado, Boulder
1988	Doctor of Philosophy Candidate with Dr. Marvin Makinen; Dr. Robert Copeland; Dr. Tom Terwilliger	University of Chicago
1987	Guest Research Scholar with Dr. Ulf Petterson	Uppsala University
1986	Undergraduate Research with Dr. Art Landy	Brown University
1986	Undergraduate Research Participant (URP) with Dr. Bruce Stillman	Cold Spring Harbor Laboratory

D. AWARDS

2020	Beckman Scholar Mentor	University of Utah
1997	Helen Hay Whitney Postdoctoral Fellow	University of Colorado, Boulder
1995	Dr. Harold Lamport Biomedical Research Award for Best Dissertation in Biomedical Science	University of Chicago
1988	National Science Foundation Predoctoral Fellow	University of Chicago

E. FUNDING

E1. FUNDING CURRENT

E1.1. Martin P. Horvath (PI) 01/SEP/2022 – 31/AUG/2025
NSF CHE $393,263
Chemistry of Life Processes, Collaborative proposal: Chemical Biology of DNA Repair CLP #2204229
Illuminate the structures and mechanisms for DNA repair enzymes, the BER glycosylases: 1. Mechanism and specificity for hOGG1 2. High throughput screens for BER functions 3. Structure and mechanism of MutY-like enzymes from iron-restricted and extreme environments 4. Biotechnology application of MutY as mutagen and base editor.
Role: PI

E1.2. Paul Bernstein (PI) 01/June/2022 – 31/MAY/2026
NIH NIE $1,500,000
Biochemistry and Pharmacology of the Macular Carotenoids R01 EY 11600
Elucidate the molecular mechanisms driving uptake of the macular carotenoids and how they protect against age-related macular degeneration. Specific Aims: 1.Investigate the Enzymatic Mechanism of RPE65 as the Lutein / meso-Zeaxanthin Isomerase 2. Define the Transport Pathway of Macular Carotenoids from the RPE to the Retina 3. Imaging the Spatial Distribution of Individual Macular Carotenoids with Confocal RR spectroscopy
Role: Senior Key Personnel

E2. FUNDING PENDING AND IN PREPARATION

E2.1. Talia Karasov (PI) 01/OCT/2024 – 30/SEP/2027
NSF BIO / UKRI/BBSRC $1,880,000
Collaborative Research: DCL NSF23-143: Interbacterial warfare in plant colonization: tradeoffs, structural complexity and evolutionary dynamics
Role: PI

E2.2. Maureen Mathison (PI) 01/SEP/2024 – 31/AUG/2027
NSF DER (IUSE) $300,000
Science Writing Instructional Modules for Undergraduate STEM Education Success
Create an innovative curriculum for science writing instruction encoded in the form of online modules with film, text, game, and quiz components.
Role: Co-PI

E3. FUNDING COMPLETED

E3.1. Martin P. Horvath (PI) 01/DEC/2019 – 30/NOV/2022
NSF CHE $160,000
Collaborative Proposal: Elucidating Chemical Mechanisms of DNA Repair Using Transition State Analogs CLP #1905249
Illuminate the structural and mechanistic features of transition states as found in the active sites of a class of DNA repair enzymes, the BER glycosylases.
Role: PI

E3.2. Sheila S. David (PI) 01/DEC/2019 – 30/NOV/2022
NSF CHE $290,000
Collaborative Proposal: Elucidating Chemical Mechanisms of DNA Repair Using Transition State Analogs CLP #1905304

Illuminate the structural and mechanistic features of transition states as found in the active sites of a class of DNA repair enzymes, the BER glycosylases.
Role: Co-PI

E3.3. Paul S. Bernstein (PI) 01/JUN/2017 – 31/MAY/2022
NIH $1,875,000
Biochemistry and Pharmacology of the Macular Carotenoids R01 EY 11600
Identify and characterize the binding proteins responsible for specific uptake of the macular carotenoids and elucidation of the role in protection against age-related macular degeneration.
Role: Collaborator

E3.4. Martin P. Horvath (PI) 01/SEP/2016 – 30/APR/2020
NSF CHE $247,091
Collaborative Proposal: Elucidating Chemical Mechanisms of DNA Repair Using Transition State Analogs CLP #1608934
Illuminate the structural and mechanistic features of transition states as found in the active sites of a class of DNA repair enzymes, the BER glycosylases.
Role: PI

E3.5. Sheila S. David (PI) 01/SEP/2016 – 30/APR/2020
NSF CHE $510,000
Collaborative Proposal: Elucidating Chemical Mechanisms of DNA Repair Using Transition State Analogs CLP # 1610721
Illuminate the structural and mechanistic features of transition states as found in the active sites of a class of DNA repair enzymes, the BER glycosylases.
Role: Co-PI

E3.6. Martin P. Horvath (PI) 30/JUN/2018–30/MAR/2019
University of Utah Seed Funding $20,000
Structure of the a9 receptor, a non-opioid receptor target for chronic neuropathic pain
Determine a medium/low resolution structure of the alpha9 nicotinic acetylcholine receptor by single-particle cryo-electron microscopy.
Role: PI

E3.7. Martin P. Horvath (PI) 20/JUN/2018
University of Utah Research Instrumentation Fund $13,800
Model 2475 Fluorescence Detector for a College of Science FSEC platform
The FSEC platform made possible by this funding makes it possible to analyze expression levels and molecular status of fluorophore-tagged proteins without labor-intensive purification steps.
Role: PI

E3.8. Paul S. Bernstein (PI) 01/JUN/2013 – 31/MAY/2017
NIH $1,500,000
Biochemistry and Pharmacology of the Macular Carotenoids R01 EY 11600
Identify and characterize the binding proteins responsible for specific uptake of the macular carotenoids and elucidation of the role in protection against age-related macular degeneration.
Role: Collaborator

E3.9. Martin P. Horvath (PI) 01/JUN/2011 – 31/MAY/2012
UNIV OF UTAH SEED GRANT $30,000
Structures of conus toxins in complex with glutamate receptor targets
Express in bacteria, purify, and crystallize NMDA receptor ligand-binding domains in complex with small calcium-folded peptide toxins from predatory cone snails.
Role: PI

E3.10. Martin P. Horvath (PI) 01/MAY/2003 – 30/APR/2008
NIH R01 GM067994 $1,500,000
Structures of the ends of telomeres
Understand the thermodynamics and structures of telomere ends from *Oxytricha nova* and *Euplotes crassus*.
Role: PI

E4. FUNDING APPLICATIONS REJECTED (PAST 5 YEARS)

E4.1. Martin P. Horvath (PI) Submitted January 2023, Reviewed April 2023
NSF CHE $1,509,994
IntBIO: Understanding Insect Olfaction via Structure-aware and Interpretable Machine Learning. Proposal #95192
Collaborative effort with biologists and computer scientists to develop machine learning approaches that facilitate our understanding of the structural mechanisms underlying chemical detection by insects. Provide interdisciplinary training for students that bridges between sub-disciplines of biology (from structural biology to neurobiology and behavior) and machine learning to address fundamental biological questions.
Role: PI

E4.2. Martin P. Horvath (PI)
NSF CHE 2226758 Submitted April 2022, Reviewed October 2022
Molecular Foundations in Biotechnology: Machine learning to discover protein function for insect odorant receptors
Develop structure-aware, generalizable, robust, and interpretable ML models for understanding protein function for olfaction in insects.
Role: PI

E4.3. Eric Schmidt (Program PI)
Michael McIntosh (Project PI), Ryan Hibbs (Project Co-PI)
DOD GRANT13454144 Submitted August 2021, Reviewed October 2021
Novel strategies to prevent or treat the disease of chronic pain
Project Title. Alpha9 Nicotinic Receptors as a Novel Target for the Treatment and Prevention of Pain
Role: Senior Key Personnel

E4.4. Martin P. Horvath (PI)
Raphael Franzini (Co-PI)
NIH 1R21NS116609-01 Submitted June 2019, Reviewed October 2019
DNA-encoded library screening of a chronic pain target, the alpha-9 nicotinic acetylcholine receptor
Role: PI

E4.5. Martin P. Horvath (PI)
David Belnap (Co-PI)

NIH 1R61NS114381-01 Submitted February 2019, Reviewed June 2019
Structure and screening of the alpha-9 nicotinic acetylcholine receptor for non-opioid pain drug discovery
Role: PI

F. RESEARCH SUPERVISION

F1. COMPLETED AND ONGOING PRIMARY SUPERVISION OF GRADUATE STUDENTS

Takahito Suzuki (Biological Chemistry, Univ of Utah), Cathy Dy (Biological Chemistry, Univ of Utah, PhD 2009, Scientist Myriad Genetics), Kigen Curtice (Biological Chemistry, Univ of Utah, PhD 2014), Peyton Russelburg (Biology, Univ of Utah, PhD 2023), Nicolas Loyola (SBS, Univ of Utah, BS 2022, MS - not completed), Keelah Barger (SBS, Univ of Utah, MS - not completed), Vincent Mays (SBS, Univ of Utah, PhD 2026 - expected), Hiroshi Aoki (SBS, Univ of Utah, BS 2023 expected, MS - leave of absence)

F2. COMPLETED AND ONGOING CO-SUPERVISION OF GRADUATE STUDENTS

Valerie O'Shea (Chemistry, Univ of Utah, PhD 2008, Biotechnology Specialist SKGF), Ryan Woods (Chemistry, UC Davis, PhD 2014, R&D Process Scientist AMPAC Fine Chemicals), Mihret Lemma (Biology, Univ of Utah, PhD), Merve Demir (Chemistry, UC Davis, PhD 2022), Melody Malik (Chemistry, UC Davis, PhD 2024 expected)

F3. COMPLETED AND ONGOING SUPERVISION OF POST-DOCS

Pawel Buczek, PhD., Irene Ota, PhD., Larry Whiting, PhD., Carlos Trasvina Arenas, PhD.

F4. COMPLETED AND ONGOING SUPERVISION OF HIGH SCHOOL STUDENTS

Pooja Jairam, Sophie Janes, Alex Anderl, Steven Deng, Gabe Zharov, Sarah Lee, Anya Hsu, Robert Song

F5. COMPLETED AND ONGOING SUPERVISION OF UNDERGRADUATE STUDENTS

Sean Pyper, Rochelle Orr, Hosuk Kim, Rachel Safran, Mili Shum, Brian Evans, Jake Stanton, Mirjana Jojic, Jennifer Andeline, Amanda Wanlass, Ryan Paul, Jared Twitchel, Elijah Gregory, Angela Hansen, Katie Carlson, Jonathan Penfield, Sally Yoo, Millie Boyd, Sierra Wilen, Ty Daly, Tiffanie Hales, Mark Krstyen, Michael Reynolds, David Judd (Honors Thesis), Tiffani Erickson, Archana Murugesan, Liron Gokovski, Lana Smith, Bianca Rich, Anna Vickrey (Shaprio lab, Biology), Sara Mann (Dearing lab, Biology), Joseph Dawson (Hill lab, Biochemistry), Erik Aguirre (Sieberth lab, Biology), Hassan Sharifzadeh (Bernstein lab, Ophthalmology), Alex Cao, Bodrie Jensen, Alyssa Fredbo (UROP), Kacey Davis (ACCESS, Honors, UROP), Evan George (UROP), Quang (Don) Tran, Kody Baumgardner, Daniel Simpson, Lori Healey, Evan Drage, Cecily Bader (Honors), Jenna Gardner (Honors), Karina Cedeno (UROP), Sonia Seghal (ACCES, Beckman Scholar), Ashley Ikegami, Kyle Knutsen, Alya Hussain, Abigail Sondreal, Nathan Sanders, Pamela Giahi, Payton Utzman, Hyelan Lee, McKenna Kondel (UROP), Christopher Reynolds, Emily Martin (Honors), Kyle Wynn (UROP), Markell Kolendrianos (UROP), Nicholas Loyola (Honors), Annabel Lee (UROP), Mary Fairbanks (ACCESS), Kathia Clawson, James Tran, Vincent Nguyen, Harini Srinivasan (Honors), Maggie Leavitt (ACCESS), My Nha Quyen Tran (UROP), Tara Tazehabadi (Honors), Alex Ballinger, Bridget Raymundo (ACCESS), Mackenzie Montzingo (Honors, UROP), Aidan Conner, Krish Kotak

(UROP), Kobi Baker (UROP), Maddion Bailey, Lauren Winn (Honors thesis), Genesis Michelle Viquez Pinzon.

F6. COMPLETED AND ONGOING SUPERVISION OF GRADUATE ROTATION STUDENTS
Chris Sans (MB), Chris Pickett (MB), Mary Nelson (MB), Anna Sivatchenko (MB), Athena Webster (Chemistry) Soma Ganguly (Biol), Jason Foulks (MB), Yun-yu Shi (Biol), Shawn Gerum (BC), Valerie O'Shea (Chem), Brian Kelly (BC), Devin Close (BC), Lincoln Hunt (NB), Xiao-hui Cang (BC), Megan Bestwick (BC), Elizabeth Ott (BC), Olyesa Ilkun (BC), Jay Keener (BC), Tammy Busche (MB), Kigen Curtice (BC), John van Vranken (BC), Raghav Kalia (BC), Jayaram Bhandari (MCEB), Malcolm Zachariah (BC), Adam Gardner (MB), Steven Denham (MB), Mihret Lemma (MCEB), Peyton Russelberg (MCEB), Alya Hussain (BIOL), Jasmine Phan (MCEB), Vincent Mays (MCEB), Boyden Myers (BC), Paulina Martinez (MCEB).

G. PUBLICATIONS

G1. PUBLISHED ORIGINAL ARTICLES IN PEER-REVIEWED JOURNALS [1–24]

(1) Demir, M.; Russelburg, L. P.; Lin, W.-J.; Trasviña-Arenas, C. H.; Huang, B.; Yuen, P. K.; Horvath, M. P.; David, S. S. Structural Snapshots of Base Excision by the Cancer-Associated Variant MutY N146S Reveal a Retaining Mechanism. *Nucleic Acids Res.* **2023**, gkac1246. https://doi.org/10.1093/nar/gkac1246.

(2) Russelburg, L. P.; O'Shea Murray, V. L.; Demir, M.; Knutsen, K. R.; Sehgal, S. L.; Cao, S.; David, S. S.; Horvath, M. P. Structural Basis for Finding OG Lesions and Avoiding Undamaged G by the DNA Glycosylase MutY. *ACS Chem. Biol.* **2020**, *15* (1), 93–102. https://doi.org/10.1021/acschembio.9b00639.

(3) Yuen, P. K.; Green, S. A.; Ashby, J.; Lay, K. T.; Santra, A.; Chen, X.; Horvath, M. P.; David, S. S. Targeting Base Excision Repair Glycosylases with DNA Containing Transition State Mimics Prepared via Click Chemistry. *ACS Chem. Biol.* **2019**, *14* (1), 27–36. https://doi.org/10.1021/acschembio.8b00771.

(4) Shyam, R.; Gorusupudi, A.; Nelson, K.; Horvath, M. P.; Bernstein, P. S. RPE65 Has an Additional Function as the Lutein to Meso-Zeaxanthin Isomerase in the Vertebrate Eye. *Proc. Natl. Acad. Sci. U. S. A.* **2017**, *114* (41), 10882–10887. https://doi.org/10.1073/pnas.1706332114.

(5) Woods, R. D.; O'Shea, V. L.; Chu, A.; Cao, S.; Richards, J. L.; Horvath, M. P.; David, S. S. Structure and Stereochemistry of the Base Excision Repair Glycosylase MutY Reveal a Mechanism Similar to Retaining Glycosidases. *Nucleic Acids Res.* **2016**, *44* (2), 801–810. https://doi.org/10.1093/nar/gkv1469.

(6) Horvath, M. P.; George, E. W.; Tran, Q. T.; Baumgardner, K.; Zharov, G.; Lee, S.; Sharifzadeh, H.; Shihab, S.; Mattinson, T.; Li, B.; Bernstein, P. S. Structure of the Lutein-Binding Domain of Human StARD3 at 1.74 Å Resolution and Model of a Complex with Lutein. *Acta Crystallogr. Sect. F Struct. Biol. Commun.* **2016**, *72* (Pt 8), 609–618. https://doi.org/10.1107/S2053230X16010694.

(7) Curtice, K. J.; Leavitt, L. S.; Chase, K.; Raghuraman, S.; Horvath, M. P.; Olivera, B. M.; Teichert, R. W. Classifying Neuronal Subclasses of the Cerebellum through Constellation Pharmacology. *J. Neurophysiol.* **2016**, *115* (2), 1031–1042. https://doi.org/10.1152/jn.00894.2015.

(8) Vickrey, A. I.; Domyan, E. T.; Horvath, M. P.; Shapiro, M. D. Convergent Evolution of Head Crests in Two Domesticated Columbids Is Associated with Different Missense Mutations in EphB2. *Mol. Biol. Evol.* **2015**, *32* (10), 2657–2664. https://doi.org/10.1093/molbev/msv140.

(9) Olivera, B. M.; Seger, J.; Horvath, M. P.; Fedosov, A. E. Prey-Capture Strategies of Fish-Hunting Cone Snails: Behavior, Neurobiology and Evolution. *Brain. Behav. Evol.*

2015, *86* (1), 58–74. https://doi.org/10.1159/000438449.
(10) Platt, R. J.; Curtice, K. J.; Twede, V. D.; Watkins, M.; Gruszczyński, P.; Bulaj, G.; Horvath, M. P.; Olivera, B. M. From Molecular Phylogeny towards Differentiating Pharmacology for NMDA Receptor Subtypes. *Toxicon Off. J. Int. Soc. Toxinology* **2014**, *81*, 67–79. https://doi.org/10.1016/j.toxicon.2014.01.016.
(11) Zakharova, E.; Horvath, M. P.; Goldenberg, D. P. Structure of a Serine Protease Poised to Resynthesize a Peptide Bond. *Proc. Natl. Acad. Sci. U. S. A.* **2009**, *106* (27), 11034–11039. https://doi.org/10.1073/pnas.0902463106.
(12) Zakharova, E.; Horvath, M. P.; Goldenberg, D. P. Functional and Structural Roles of the Cys14-Cys38 Disulfide of Bovine Pancreatic Trypsin Inhibitor. *J. Mol. Biol.* **2008**, *382* (4), 998–1013. https://doi.org/10.1016/j.jmb.2008.07.063.
(13) Hanson, W. M.; Domek, G. J.; Horvath, M. P.; Goldenberg, D. P. Rigidification of a Flexible Protease Inhibitor Variant upon Binding to Trypsin. *J. Mol. Biol.* **2007**, *366* (1), 230–243. https://doi.org/10.1016/j.jmb.2006.11.003.
(14) Suzuki, T.; McKenzie, M.; Ott, E.; Ilkun, O.; Horvath, M. P. DNA Binding Affinity and Sequence Permutation Preference of the Telomere Protein from Euplotes Crassus. *Biochemistry* **2006**, *45* (28), 8628–8638. https://doi.org/10.1021/bi060388w.
(15) Dy, C. Y.; Buczek, P.; Imperial, J. S.; Bulaj, G.; Horvath, M. P. Structure of Conkunitzin-S1, a Neurotoxin and Kunitz-Fold Disulfide Variant from Cone Snail. *Acta Crystallogr. D Biol. Crystallogr.* **2006**, *62* (Pt 9), 980–990. https://doi.org/10.1107/S0907444906021123.
(16) Buczek, P.; Horvath, M. P. Structural Reorganization and the Cooperative Binding of Single-Stranded Telomere DNA in Sterkiella Nova. *J. Biol. Chem.* **2006**, *281* (52), 40124–40134. https://doi.org/10.1074/jbc.M607749200.
(17) Buczek, P.; Horvath, M. P. Thermodynamic Characterization of Binding Oxytricha Nova Single Strand Telomere DNA with the Alpha Protein N-Terminal Domain. *J. Mol. Biol.* **2006**, *359* (5), 1217–1234. https://doi.org/10.1016/j.jmb.2006.02.082.
(18) Buczek, P.; Orr, R. S.; Pyper, S. R.; Shum, M.; Kimmel, E.; Ota, I.; Gerum, S. E.; Horvath, M. P. Binding Linkage in a Telomere DNA-Protein Complex at the Ends of Oxytricha Nova Chromosomes. *J. Mol. Biol.* **2005**, *350* (5), 938–952. https://doi.org/10.1016/j.jmb.2005.05.040.
(19) Horvath, M. P.; Schultz, S. C. DNA G-Quartets in a 1.86 A Resolution Structure of an Oxytricha Nova Telomeric Protein-DNA Complex. *J. Mol. Biol.* **2001**, *310* (2), 367–377. https://doi.org/10.1006/jmbi.2001.4766.
(20) Horvath, M. P.; Copeland, R. A.; Makinen, M. W. The Second Derivative Electronic Absorption Spectrum of Cytochrome c Oxidase in the Soret Region. *Biophys. J.* **1999**, *77* (3), 1694–1711. https://doi.org/10.1016/S0006-3495(99)77016-5.
(21) Horvath, M. P.; Schweiker, V. L.; Bevilacqua, J. M.; Ruggles, J. A.; Schultz, S. C. Crystal Structure of the Oxytricha Nova Telomere End Binding Protein Complexed with Single Strand DNA. *Cell* **1998**, *95* (7), 963–974. https://doi.org/10.1016/s0092-8674(00)81720-1.
(22) Terwilliger, T. C.; Zabin, H. B.; Horvath, M. P.; Sandberg, W. S.; Schlunk, P. M. In Vivo Characterization of Mutants of the Bacteriophage F1 Gene V Protein Isolated by Saturation Mutagenesis. *J. Mol. Biol.* **1994**, *236* (2), 556–571. https://doi.org/10.1006/jmbi.1994.1165.
(23) Felsch, J. S.; Horvath, M. P.; Gursky, S.; Hobaugh, M. R.; Goudreau, P. N.; Fee, J. A.; Morgan, W. T.; Admiraal, S. J.; Ikeda-Saito, M.; Fujiwara, T. Probing Protein-Cofactor Interactions in the Terminal Oxidases by Second Derivative Spectroscopy: Study of Bacterial Enzymes with Cofactor Substitutions and Heme A Model Compounds. *Protein Sci. Publ. Protein Soc.* **1994**, *3* (11), 2097–2103. https://doi.org/10.1002/pro.5560031123.
(24) Zabin, H. B.; Horvath, M. P.; Terwilliger, T. C. Approaches to Predicting Effects of Single Amino Acid Substitutions on the Function of a Protein. *Biochemistry* **1991**, *30* (25), 6230–6240. https://doi.org/10.1021/bi00239a022.

G2. REVIEW ARTICLES AND INVITED PAPERS [25]

(25) Horvath, M. P. Structural Anatomy of Telomere OB Proteins. *Crit. Rev. Biochem. Mol. Biol.* **2011**, *46* (5), 409–435. https://doi.org/10.3109/10409238.2011.609295.

G3. BOOK CHAPTERS [26–29]

(26) Olivera, B.; Safavi-Hemami, H.; Horvath, M.; Teichert, R. Conopeptides, Marine Natural Products from Venoms: Biomedical Applications and Future Research Applications. In *Marine Biomedicine: From Beach to Bedside*; Baker, B., Ed.; Taylor & Francis: Boca Raton, 2015; p 612.

(27) Teichert, R. W.; Olivera, B. M.; McIntosh, J. M.; Bulaj, G.; Horvath, M. P. CHAPTER 6:The Molecular Diversity of Conoidean Venom Peptides and Their Targets: From Basic Research to Therapeutic Applications. In *Venoms to Drugs*; 2015; pp 163–203. https://doi.org/10.1039/9781849737876-00163.

(28) Horvath, M. P. Evolution of Telomere Binding Proteins. In *Origin and Evolution of Telomeres*; Tomaska, L., Nosek, J, Eds.; Landes Bioscience: Austin, Texas, 2013.

(29) Horvath, M. P. Chapter 5:Single-Stranded Nucleic Acid (SSNA)-Binding Proteins. In *Protein-Nucleic Acid Interactions*; 2008; pp 91–128. https://doi.org/10.1039/9781847558268-00091.

G4. MANUSCRIPTS IN PREPARATION / PREPRINT [30,31]

(30) Utzman, P. H.; Mays, V.; Miller, B.; Brazelton, W. J.; Horvath, M. P. Metagenome Mining and Functional Analysis Reveal Oxidative DNA Repair at the Lost City Hydrothermal Field. *PLoS ONE* **2024 - in revision**.

(31) Utzman, P. H.; Mays, V. P.; Miller, B. C.; Fairbanks, M. C.; Brazelton, W. J.; Horvath, M. P. Metagenome Mining and Functional Analysis Reveal Oxidized Guanine DNA Repair at the Lost City Hydrothermal Field. bioRxiv April 9, 2023, p 2023.04.05.535768. https://doi.org/10.1101/2023.04.05.535768.

H. TEACHING

H1. CURRENT TEACHING

H1.1 BIOL 3510 Biological Chemistry. Cross-listed with CHEM 3525. Undergraduate students learn the fundamentals of biochemistry including metabolism, protein folding and structure, enzyme catalysis and regulation, and the chemistry of DNA replication and protein translation (genetic code). Spring 2004-2007, 2009-2023; Co-Instructors Blair, D. 2004-2006, 2022-2024, Olivera, B. 2004-2021; current enrollment 202; 3 credits; 1 lecture section; 7 discussion sections; CEL section in collaboration with Amy Sibul / Amanda Hoepfner 2010-2023.

H1.2. BIOL 3525 Molecular Biology of DNA Lab. Cross-listed with CHEM 3525. Learn and practice scientific method and scientific discourse with focus on DNA damage and repair. Includes an open-ended independent project in the final half of the semester. Fall 2001-2007, 2009-2016, 2018-2022; Co-Instructors Blair D. 2001, 2004-2007, 2009-2011, Dy, C. 2012, Phadnis, N. 2013-2014, Gardett, I. 2015, Kinney, T. 2016, Rupper 2022-2023; enrollment 72 students; 3 credits; 8 lab sections; 1 lecture section

H1.3. BIOL 2870 Faculty Research Seminar. 1 guest lecture each fall to showcase structural biology research for undergraduate students. Instructor Hoepfner A.

H1.4. BIOL 7961 Advanced Topics in Biochemistry and Molecular Biology. 1 guest seminar each fall to discuss recent discoveries in structural biology. Instructor Werner M.

H2. PAST TEACHING

H2.1 BIOL2800-002 Macromolecules: nanobots with real superpowers. Describe biomolecules at many levels of organization from chemical components to bioactive complex assemblies; reduce a complex system to simple parts and explain how the parts work together; generate a simple animation storyboard for a molecular system of interest; execute the animation in a medium of choice (modeling clay, 2-D shapes, 3D-graphics). Fall half-semester 2016; current enrollment 16; 1 credit; 1 discussion section.

H2.2. BIOL 7964-001, Biology Boot Camp. Organized and moderated a component focused on delivering scientific presentations for first-year graduate students. Fall 2011-2016, Co-instructors Potts, W. 2011 Adler, F. 2012-2013, Bowling D. Fall 2014-2015, Pataki D. Fall 2016; Anderegg W. Fall 2018; enrollment 18.

H2.3. BIOL 4995 Honors Research. Recruit Biology majors in the Honors College. Address questions and concerns for students searching for a research lab. Facilitate mentor-student communication as needed. Evaluate written summaries of research. Spring, Summer, Fall 2014-2017; enrollment 27; 3 credits.

H2.4. BIOL 4999 Honors Thesis. Advise students and mentors regarding format and content of honors thesis. Oversee the review and departmental approval of honors theses, including the assignment of managing editors and recruitment of reviewers, and preparation of actionable items for students to meet expectations. Spring, Summer, Fall 2015-2017; enrollment 6 - 18; 3 credits.

H2.5. BIOL 7962-003, Seminal Papers. Selected for discussion three papers plus optional reading related to structure determination of DNA (Watson & Crick, 1953), myoglobin (Kendrew et al., 1958, 1960), and lysozyme (Blake et al., 1965). Co-instructors Golic, K., Jorgensen, E., Clark, R. et al. Spring 2012-2015, 2020

H2.6. MOL BIOL 6100, Protein-Nucleic acid complexes in DNA replication, repair, and expression. Graduate students read and present journal articles related to the structural biology of DNA replication and repair. Spring 2001, Spring 2003.

H2.7. BIOL 4955, Independent Research. Students participate in on-going research projects, some of which are listed here: structural biology and molecular physiology of telomere ends; molecular interactions driving inhibition of neuroreceptors by peptide toxins from marine snails; structures of plant proteins that regulate root-leaf signaling. I strive to include students from under-represented groups. Many of these students have been accepted in medical school or graduate research programs.

H2.8. BA/BS degree with an emphasis in Biochemistry. Successfully argued for the need to include an emphasis designation for Biology majors wishing to show special competence in the field of biological chemistry. With Biology advising, I designed the course requirements for students to navigate completion of a degree in Biology with an emphasis in Biochemistry.

I. SERVICE

I1. CURRENT SERVICE

I1.1. SBS Co-chair, Graduate Program Admissions Committee 2022-present

I1.2. SBS Diversity Fellows Mentor 2019-present
I1.3. Biological Chemistry steering committee, Biology Representative 2011-2017, 2019-present
I1.4. Beckman Scholars Mentor 2019-present
I1.5. University Writing Board 2013-present
I1.6. Academic Senate, 2023-2026

I2. COMPLETED SERVICE
I2.2. College of Science Panel to review education proposals 2016
I2.3. MCEB research in progress graduate student seminar series coordinator 2011-2016
I2.4. CSC building design committee 2014-2015
I2.5. Academic Senate, Biology Representative 2009-2012
I2.6. Biological Chemistry Admissions committee 2003-2005, 2008
I2.7. NIH Biological Chemistry Training Grant Selection committee 2005
I2.8. University Studies committee 2004-2007
I2.9. Molecular Biology Admissions committee 2000-2003
I2.10. Biology Department Graduate Program admissions committee 2013-2014
I2.11. Biology Department Graduate Program committee 2009-2014
I2.12. Biology Department Computer Advisory committee 2009-2014
I2.13. Biology Department Undergraduate Scholarship committee 2000-2008
I2.14. Biology Department Communications committee 2005-2006
I2.15. Biology Department Biochemistry Search committee 2000-2001
I2.16. Biology Department Microbiology Search committee 2002-2003
I2.17. Biology Department Admissions committee 2001-2002, 2014
I2.18. Chair of Honors Biology Committee 2014-2017. Committee oversees ~60 undergraduate students seeking to complete an honors thesis project. Committee executes departmental review of honors thesis. Under my leadership the Honors Biology Program has created flexibility to encourage inclusion of more students. The review process has been restructured to follow peer-review practices of journals. It ensures a thoughtful reading of the student's thesis by an anonymous reviewer and by a member of the honors biology committee.

I2.19. Honors Biology Faculty Advisor 2014-2017. Recruit Biology majors in the Honors College. Address questions and concerns for students searching for a research lab. Evaluate written summaries of research. Advise students and mentors regarding format and content of honors thesis. Oversee the review and departmental approval of honors theses, including the assignment of managing editors and recruitment of reviewers, and preparation of actionable items for students to bring the thesis to up to expectations. When a mentor-student relationship breaks down, I intervene and develop strategies for the student to complete a thesis.

I2.20 MCEB Faculty Advisor 2014-2019. Point of contact for incoming graduate students of the Molecular, Cellular, Evolutionary Biology program. Help students find rotation labs. Intervene as a student advocate and find workable strategies for students.

I2.21. MCEB Capstone Exam Chairperson 2018, 2019. Design, organize exam committees, and evaluate exams for 5-11 students each year.

I2.22. SBS Cryo-EM Structural Biologist Search Committee 2018-2019
I2.23. SBS Molecular Biologist, Molecular Plant Biologist Search Committee 2020-2021
I2.24. College of Science Academic Appeals Committee and Academic Misconduct

Committee 2020-2023
I2.25. SBS Graduate Program Admissions Committee 2019-2021

J. HOSTED SPEAKERS

Sylvie Doublié, University of Vermont, 2002
Enrico Di Cera, Washington University, 2004
Olve Peersen, Colorado State University, 2005
Tom Terwilliger, Los Alamos National Laboratory, 2006
Douglas Theobald, Brandeis University, 2008
Michael Klymkowsky, University of Colorado, 2015
Ryan Hibbs, University of Texas Southwestern, 2019
Ruhma Syeda, University of Texas Southwestern, 2021
Josefina del Mármol, Harvard Medical School, 2023 (canceled)

K. THESIS COMMITTEES

Mike Hanson (Biology, PhD), Bryan Lowdor (Biology, PhD), Jung-Hoon Yang (Biology, MS), Emily Kimmel (Biology, MS), Valerie O'Shea (Chemistry, PhD), Sujiet Puthenveetil (Chemistry, PhD), Scott Roberts (Chemistry, PhD), Xiaobei Zhao (Chemistry, PhD), Athena Webster (Chemistry, PhD), Brian Kelly (Biochemistry, PhD), Kianoush Sadre-Bazzaz (Biochemistry, PhD), Stacey Drosner (Biology, PhD), Beth Stadtmueller (Biochemistry, PhD), Koushik Paul (Biology, MS), Qianting Zhai (Biochemistry, PhD), Elliott Ferris (Biochemistry, MS), Raghav Kalia (Biochemistry, PhD), Edward Hujber (Biology, PhD), Gourab Bhattacharje (Biology, MS), Ji Eun Lee (Biology, PhD), Leonardo Parra (Biology, PhD), Trevor Feagin (Chemistry, PhD), Mike Akinjero (Biology, MS), Sven Miller (Chemistry, PhD), Julia McGonigle (Biology, PhD), Mihret Lemnna (Biology, PhD), Leo Parra (Neuroscience, PhD), Eddie Hujber (SBS, PhD), Peyton Russelburg (SBS, PhD), Nicholas Loyla (SBS, MS), Sarai Smith (SBS, PhD), Spencer Gordon (SBS, PhD), Georgina (Gina) Reyes Guerrero (SBS, PhD), Keelah Barger (SBS, MS), Vincent Mays (SBS, PhD), Victor Chua (SBS, PhD), Brianna Trabucco (Chemistry, PhD), Markell Kolendiranos (SBS, PhD).

L. MEETING PRESENTATIONS AND INVITED SEMINARS

L1. INVITED SEMINARS

L1.1. DNA G-quartets in a 1.86 Å resolution structure of an Oxytricha nova telomeric protein-DNA complex. Department of Biochemistry, Purdue University. January 17, 2001

L1.2. Structure of a protein-DNA telomere end complex. Department of Biochemistry, Tulane University Health Sciences Center. March 17, 2003

L1.3. Crystal structure of the O. nova telomere end binding protein complexed with single strand DNA. Department of Biochemistry, Tulane University Health Sciences Center. March 18, 2003

L1.4. Protein-DNA interactions at the ends of telomeres. American Chemical Society Rocky Mountain Regional Meeting. June 7, 2004

L1.5. Telomere DNA-protein stability is linked to curious protein-protein interactions in the Oxytricha nova telomere end structure. Institute of Molecular Biology, University of Oregon. November 30, 2004.

L1.6. Structure, thermodynamics, and evolution of telomere ends. Biochemistry & Molecular Biology, Colorado State University, April 3, 2006

L1.7. Allosteric regulation of DNA-binding affinity at the ends of telomeres. Microbiology and Molecular Genetics, University of Vermont, June 9, 2006

L1.8. Molecular physiology of telomere ends. Biochemistry and Molecular Biology, The University of Chicago, November 8, 2006.

L1.9. Sequence specific recognition of single-stranded DNA at telomere ends from *Sterkiella nova*, University of California, Davis, May 26, 2009

L1.10. Molecular physiology of telomere end-binding proteins from *Sterkiella nova*, Martin Weiner Speaker, Brandeis University, Davis, March 10, 2010

L1.11. Challenges in crystallography, Informal seminar, University of Oregon, June 2014

L1.12. Structure of MutY complexed to DNA with a transition state mimic reveals mechanism and predicts a class of retaining BER glycosylases. American Crystallography Association (ACA) 66th annual meeting, Denver Colorado, July 2016

L1.13. Physics in Structural Biology. Colloquium in Physics & Astronomy, Department of Physics and Astronomy, University of Utah, March 2017

L1.14. Mechanism and evolution of the DNA repair enzyme MutY. American Crystallography Association (ACA) 67th annual meeting, New Orleans Louisiana, May 2017

L1.14. Mechanism and evolution of the DNA base excision repair enzyme MutY. University of Copenhagen, May 2022

L2. MEETING POSTERS

L2.1 MEETING POSTERS PRESENTED BY UNDERGRADUATES

L2.1.1 Rachel S. Orr and MP Horvath (March 2003) Human nicotinic acetylcholine receptor-Expression of subunit domains in *E. coli*. National Conference of Undergraduate Research, Salt Lake City Utah, USA.

L2.1.2. Marjana Jojic and MP Horvath (August 2004) Bypass1 – A plant protein involved in leaf development – contains one protease-resistant domain. Undergraduate Summer Internship Symposium, Salt Lake City Utah, USA.

L2.1.3. Marjana Jojic and MP Horvath (October 2004) Bypass1 – A plant protein involved in leaf development – contains one protease-resistant domain. Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Convention, Austin Texas.

L2.1.4. Angela A. Hansen and MP Horvath (April 2007) Conformational flexibility in telomere-capping protein-DNA complexes. 32nd West Coast Biological Sciences Undergraduate Research Conference, Los Angeles California, USA.

L2.1.5. James T. Daly and MP Horvath (January 2012) Using natural snail venom to look for drugs to cure neurodegenerative diseases. Posters on the Hill, Utah State Capital

Rotunda, Salt Lake City, USA.

L2.1.6. James T. Daly and MP Horvath (April 2012) Using natural snail venom to look for drugs to cure neurodegenerative diseases. University of Utah Undergraduate Symposium, Salt Lake City, USA

L2.1.7. Tiffany D. Hales and MP Horvath (April 2012) Towards a molecular picture for a neuroreceptor-snail venom toxin complex. University of Utah Undergraduate Symposium, Salt Lake City, USA

L2.1.8. David P. Judd and MP Horvath (April 2013) Telomeric proteins from *Drosophila melanogaster*, Honors Thesis Presentation, University of Utah Bioscience Symposium, Salt Lake City, USA

L2.1.9. Archana Murugesan and MP Horvath (April 2013) Biochemistry of cone snail toxin activation. National Conference for Undergraduate Research, University of Illinois, Chicago Illinois, USA

L2.1.10. Bianca E. Rich and MP Horvath (April 2014) Toward crystallizing proteins from NMDA receptor in complex with toxins from marine snails, National Conference for Undergraduate Research, University of Kentucky, Lexington Kentucky, USA

L2.1.11. Sara L. Mann and MP Horvath (April 2014) Purification and characterization of aryl alcohol dehydrogenase, a detoxification enzyme found in the gut of woodrats that eat a poison diet, University of Utah Undergraduate Symposium, Salt Lake City Utah, USA

L2.1.12. Alyssa I. Fredbo and MP Horvath (March 2015) Bacterial expression of predatory cone snail toxins to identify potential novel therapeutic drugs, University of Utah Undergraduate Symposium, Salt Lake City Utah, USA.

L2.1.13. Alyssa I. Fredbo and MP Horvath (April 2015) Bacterial expression of predatory cone snail toxins to identify potential novel therapeutic drugs, National Conference for Undergraduate Research, Eastern Washington University, Spokane Washington, USA.

L2.1.14. Alexander M. Cao and MP Horvath (March 2015) Refolding of protein domains derived from the NMDA receptor, University of Utah Undergraduate Symposium, Salt Lake City Utah, USA.

L2.1.15. Alexander M. Cao and MP Horvath (April 2015) Refolding of protein domains derived from the NMDA receptor, National Conference for Undergraduate Research, Eastern Washington University, Spokane Washington, USA.

L2.1.16. Evan George and MP Horvath (April 2015) Structural discovery of StARD3 bound with lutein using X-ray crystallography and refinement techniques. Undergraduate Research Symposium, University of Utah, Salt Lake City Utah, USA

L2.1.17. Evan George and MP Horvath (April 2015) Structural discovery of StARD3 bound with lutein using X-ray crystallography and refinement techniques. National Conference for Undergraduate Research, University of North Carolina, Asheville North Carolina, USA

L2.1.18. Kacey A. Davis and MP Horvath (February 2016) Predatory Marine Snail Toxins: A Study of Protein Folds. Utah Conference for Undergraduate Research (UCUR), Utah Valley University, American Fork, Utah, USA

L2.1.19. Kacey A. Davis and MP Horvath (April 2016) Predatory Marine Snail Toxins: a Study of Protein Folds. Undergraduate Research Symposium, University of Utah, Salt Lake City Utah.

L2.1.20. Kacey A. Davis and MP Horvath (February 2017) Predatory Marine Snail Toxins: a Study of Protein Folds. Utah Conference for Undergraduate Research (UCUR), Utah Valley University, American Fork, Utah, USA

L2.1.21. Kacey A. Davis and MP Horvath (April 2017) Predatory Marine Snail Toxins: A Study of Protein Folds. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.22. Cecily T. Bader, Sieburth LE and MP Horvath (April 2017) The response of *Arabidopsis* mutant *bps 1-2* on salt media. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.23. Malika Kadirova, MP Horvath (April 2018) Structure determination for lutein-complexed proteins in the human eye. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.24. Sonia Ling Sehgal, LP Russelburg, MP Horvath (April 2018) Role of the MutY Gene in DNA Base Excision Repair. ACCESS Women in Science and Mathematics Symposium, University of Utah, Salt Lake City, USA

L2.1.25. Karina Cedeno, MP Horvath (April 2019) Alpha-9 nicotinic acetylcholine receptor, a non-opioid target for treatment of chronic neuropathic pain. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.26. Sonia Ling Sehgal, MP Horvath (August 2019) Improving Expression in Lost City MutY DNA Repair Enzymes. Undergraduate Research Scholars, SBS 2019 Science Retreat & Gordon Lark Symposium, University of Utah, Salt Lake City, USA

L2.1.27. Mary Fairbanks, MP Horvath (April 2020) The role of calcium on MutY. ACCESS Women in Science and Mathematics Symposium, University of Utah, Salt Lake City, USA

L2.1.28. Payton Utzman, MP Horvath (June 2020) A Structural Analysis of the LC MutY Metagenome. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.29. Sonia Ling Sehgal, MP Horvath (June 2020) Finding the Role of Biological Probes in MUTYH. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.30 Sonia Ling Sehgal, MP Horvath (March 2021) Exploring the Role of Biological Probes on MUTYH. National Conference for Undergraduate Research, USA

L2.1.31 Sonia Ling Sehgal, MP Horvath (August 2021) Exploring the Role of Biological Probes on MUTYH. Beckman Foundation Virtual Research Symposium, California, USA

L2.1.32 Harini Srinivasan, MP Horvath (April 2022) Molecular Drug Docking and Biochemical Performance of Adenine Specific Glycosylase Enzyme MutY in the Presence of 8-Oxo-7,8-Dihydroguanine (OG) Nucleotide. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.33 Mary Fairbanks, MP Horvath (April 2022) Examining Impact of FDA Approved Drugs on DNA Repair Enzymes. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.34. Maggie Leavitt, Mary Fairbanks, MP Horvath (April 2022) . ACCESS Women in Science and Mathematics Symposium, University of Utah, Salt Lake City, USA

L2.1.35 Tara Tazehabadi, MP Horvath (August 2022) Bioinformatics Detecting Functional Interactions Important for DNA Repair Enzyme MUTYH. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.36. Bridget Raymundo, LP Russelburg, MP Horvath (April 2023) Inhibition of the DNA Protein MutT. ACCESS Women in Science and Mathematics Symposium, University of Utah, Salt Lake City, USA

L2.1.37. My Nha Quyen Tran, MP Horvath (August 2023) Measuring Biochemical Activity of DNA Repair Enzyme MutY from Lost City. Undergraduate Research Symposium, University of Utah, Salt Lake City, USA

L2.1.38. My Nha Quyen Tran, Tara Tazehabadi, MP Horvath (October 2023) Testing Importance of Recently Discovered MUTYH Dimer Interface with Bioinformatics. Undergraduate Research Scholars, SBS 2023 Science Retreat & Gordon Lark Symposium, University of Utah, Salt Lake City, USA

L2.1.39. My Nha Quyen Tran, MP Horvath (February 2024) A Glance into the Origin of Life through the Lens of the DNA Repair Enzyme MutY from the Lost City Metagenomes. Utah Conference for Undergraduate Research 2024, Utah Valley University, Orem, Utah, USA

L2.2 MEETING POSTERS

L2.2.1. S Pyper, R Orr, R Safran, MP Horvath (July 2003) Protein-DNA interactions at the ends of telomeres. 15th Symposium on Affinity Interactions, St. John's College, Cambridge, UK.

L2.2.2. T Suzuki, MP Horvath (May 2003) Biochemical characterization of Euplotes crassus telomere end binding protein. Telomeres and Telomerase Meeting, Cold Spring Harbor Laboratory, New York, USA.

L2.2.3. P McKenzie, MP Horvath (December 2003) In vitro protein evolution of nicotinic acetylcholine receptor subunit domains through DNA shuffling. Biology Department

Symposium, Salt Lake City Utah, USA.

L2.2.4. MP Horvath, MW Hanson, DP Goldenberg (July 2004) Spacegroup ambiguity encountered during refinement of BPTI-trypsin complex to 1.6 Å resolution limit. Northwest Crystallography Workshop, Seattle Washington, USA.

L2.2.5. P Buczek, E Kimmel, R Orr, M Shum, I Ota, MP Horvath (September 2004) Telomere DNA-protein stability is linked to curious protein-protein interactions. Biological Programs Symposium, Salt Lake City Utah, USA.

L2.2.6. CY Dy, MP Horvath (August 2004) Structure determination of a novel potassium-channel blocker, Conkunitzin-S1. Biological Programs Symposium, Salt Lake City Utah, USA.

L2.2.7. P Buczek, MP Horvath (July 2005) Co-folding in the Oxytricha nova telomere end complex. Protein Society Meeting, Boston Massachusetts, USA.

L2.2.8. MP Horvath (June 2006) Allosteric regulation of DNA-binding affinity in a telomere end ssDNA-protein complex. Nucleic Acid Enzymes FASEB Summer Research Conferences, Vermont, USA.

L2.2.9. P Buczek, MP Horvath (August 2006) Thermodynamic studies and structural model of the Oxytricha nova alpha protein N-terminal domain with multimer (TTTTGGGG)n single strand DNA. Protein Society Meeting, San Diego California, USA.

L2.2.10. MP Horvath, T Suzuki, CY Dy (July 2007) Telomere end recognition. Ciliate Molecular Biology FASEB Summer Research Conferences, Tucson Arizona, USA.

L2.2.11. CY Dy and MP Horvath (June 2008) Sequence specificity for single-stranded telomere DNA-binding proteins measured by HPLC. Nucleic Acid Enzymes FASEB Summer Research Conferences, Vermont, USA

L2.2.12. TA Erickson, TD Hales, and MP Horvath (July 2012) Towards optimized expression, extraction, capture, and purification for NMDA glutamate receptor ligand-binding domains. Northwest crystallography workshop, Montana State University, Bozeman Montana, USA

L2.2.13. MP Horvath, B Li, H Sharifzadeh and PS Bernstein (June 2014) Electron density difference maps calculated for an ocular carotenoid-binding protein GSTP1. Northwest crystallography workshop, Oregon State University, Corvallis Oregon, USA

L2.2.14. MP Horvath, E George, Q Tran, B Li and PS Bernstein (July 2016) Structure of the luteinbinding domain of human STARD3 with phase extension to 1.74 Å and model of a complex with lutein. American Crystallography Association (ACA) 66th annual meeting, Denver Colorado, USA

L2.2.15. MP Horvath, EP Drage, E Dart, LP Russelburg, VL O'Shea, RD Woods, A Chu, S Cao, JL Richards, SS David (May 2017) Mechanism and evolution of the DNA repair enzyme MutY. Understanding Biology Through Structure, Santa Fe New Mexico, USA.

L2.2.16. MP Horvath (March 2020 / CANCELED) Finding the adenine exit tunnel in the DNA repair enzyme MutY. Understanding Biology Through Structure, Santa Fe New Mexico, USA.

L2.2.17. LP Russelburg, M Demir, K Cedeno, SS David, MP Horvath (May 2021) Beyond acid catalysis: the importance of glutamate 43 for adenine removal by MutY. PDB50: A special symposium celebrating the 50th anniversary of the Protein Data Bank, Virtual, USA.

L2.2.18 M Demir, LP Russelburg, J Lin, CH Trasvina-Arenas, MP Horvath, SS David (May 2021) Structural and biochemical insights into adenine excision by MutY. PDB50: A special symposium celebrating the 50th anniversary of the Protein Data Bank, Virtual, USA.

M. COLLABORATIONS AND AFFILIATIONS

M1. COLLABORATORS AND CO-EDITORS

Goldenberg, D. P., Professor, School of Biological Sciences, University of Utah, Salt Lake City, Utah, USA
Olivera, B. M., Distinguished Professor, School of Biological Sciences, University of Utah, Salt Lake City, Utah, USA
David, S. S., Professor of Chemistry, University of California, Davis, California, USA
Bernstein, P. S., Professor, Ophthalmology and Visual Sciences, Moran Eye Center, University of Utah School of Medicine, Salt Lake City, Utah, USA
Mathison, M. A., Associate Professor, Writing and Rhetoric Studies, University of Utah, Salt Lake City, Utah, USA
McIntosh, J. M., Professor, Psychiatry, University of Utah, Salt Lake City, USA
Franzini, R. M., Assistant Professor, Medicinal Chemistry, University of Utah, Salt Lake City, Utah, USA
Hibbs, R. E., Associate Professor, Neuroscience, Biophysics, University of Texas Southwestern, Dallas, Texas, USA
Phillips, B. W., Assistant Professor, Computational Science, University of Utah, Salt Lake City, Utah, USA
Zhao, Y., Assistant Professor, Computational Engineering, University of Utah. Salt lake City, Utah, USA
Vicker, N., Professor, School of Biological Sciences, University of Utah, Salt Lake City, Utah, USA
Karasov, T., Assistant Professor, School of Biological Sciences, University of Utah, Salt Lake City, Utah, USA

M2. GRADUATE AND POSTDOCTORAL MENTORS

Schultz, S. C., Professor, NSF Division of Undergraduate Education, Washington D.C. USA
Makinen, M. W., Professor, University of Chicago, Chicago Illinois, USA
Terwilliger, T. C., Los Alamos National Laboratory, Los Alamos New Mexico, USA
Copeland, R. A., Accent Therapeutics, Cambridge, Massachusetts, USA

N. PROFESSIONAL ACTIVITIES

N1. REVIEW WORK

Reviewer for NIH and NSF grant proposals, both *ad hoc* and panelist
Reviewer for Kentucky Science and Engineering Foundation Research & Development awards

Reviewer for ALS General User beam line request proposals
Reviewer for manuscripts submitted to the following journals: *Biochemistry, Biochemical Journal, Chirality, FEBS letters, Journal of Biological Chemistry, Journal of Eukaryotic Microbiology, Journal of Molecular Biology, Journal of Molecular Structure, Nucleic Acids Research, Molecular and Cellular Biology, Journal of Chemical Education, Proceedings of the National Academy of Sciences USA, PLoS ONE, Molecular Pharmacology*

O. STRUCTURES DETERMINED

O1. STRUCTURES DEPOSITED WITH PROTEIN DATA BANK

1otc The *Oxytricha nova* telomere end binding protein complexed with single strand DNA 2.8 Å, 1998
1jb7 DNA G-quartets in a 1.86 Å resolution structure of an *Oxytricha nova* telomeric protein-DNA complex, 1.86 Å, 2001
1y62 Crystal structure of conkunitzin-S1, a novel Kunitz-fold cone snail neurotoxin, 2.45 Å, 2005
2fi5 Crystal structure of a BPTI variant (Cys38→Ser) in complex with trypsin, 1.58 Å, 2006
2fi4 Crystal structure of a BPTI variant (Cys14→Ser) in complex with trypsin, 1.58 Å, 2006
2fi3 Crystal structure of a BPTI variant (Cys14→Ser, Cys38→Ser) in complex with trypsin, 1.58 Å, 2006
2ftm Crystal structure of trypsin complexed with the BPTI variant (Tyr35→Gly), 1.65 Å, 2006
2ftl Crystal structure of trypsin complexed with BPTI at 100K, 1.62 Å, 2006
2i0q Crystal structure of a telomere single-strand DNA-protein complex from *O. nova* with full-length alpha and beta telomere proteins, 1.91 Å, 2006
3fp8 Anionic trypsin variant S195A in complex with bovine pancreatic trypsin inhibitor (BPTI) determined to the 1.46 Å resolution limit, 1.46 Å, 2009
3fp6 Anionic trypsin in complex with bovine pancreatic trypsin inhibitor (BPTI) determined to the 1.49 Å resolution limit, 2009
3fp7 Anionic trypsin variant S195A in complex with bovine pancreatic trypsin inhibitor (BPTI) cleaved at the scissile bond (LYS15-ALA16) determined to the 1.46 Å resolution limit, 2009
3fsq MutY adenine glycosylase bound to a transition state analog (1N) paired with d(8-oxoG) in duplexed DNA, 2.3 Å, 2010
3fsp MutY adenine glycosylase bound to a transition state analog (1N) paired with d(8-oxoG) in duplexed DNA, 2.2 Å, 2010
2m7r NMDA receptor antagonist, conantokin bk-b, 20 structure ensemble by NMR, 2014
5dpk MutY adenine glycosylase bound to a transition state analog (1N) paired with d(8-oxoG) in duplexed DNA to 2.2 Å, 2015
5i9j Structure of the cholesterol and lutein-binding domain of human STARD3 at 1.74A, 2016
6u7t MutY adenine glycosylase bound to DNA containing a transition state analog (1N) paired with d(8-oxo-G), 2019
6q0c MutY adenine glycosylase bound to DNA containing a transition state analog (1N) paired with undamaged dG, 2019
8dvp Glycosylase MutY variant N146S in complex with DNA containing d(8-oxo-G) paired with substrate purine, 1.54 Å, 2022
8dw7 DNA glycosylase MutY variant N146S in complex with DNA containing the

transition state analog 1N paired with d(8-oxo-G), 1.96 Å, 2022

8dw0 Glycosylase MutY variant N146S in complex with DNA containing d(8-oxo-G) paired with an enzyme-generated abasic site (AP) product and crystallized with sodium acetate, 1.68 Å, 2022

8dvy DNA glycosylase MutY variant N146S in complex with DNA containing d(8-oxo-G) paired with an enzyme-generated abasic site product (AP) and crystalized with calcium acetate, 2.36 Å, 2022

8dw4 Glycosylase MutY variant N146S in complex with DNA containing d(8-oxo-G) paired with an abasic site product (AP) generated by the enzyme in crystals by removal of calcium, 2.49 Å, 2022

8dwd Adenine glycosylase MutY variant E43S in complex with DNA containing d(8-oxo-G) paired with an AP site generated by the enzyme acting on purine, 1.68 Å, 2022 - on hold for publication.

8dwe Adenine glycosylase MutY variant E43Q in complex with DNA containing d(8-oxo-G) paired with substrate purine, 2.20 Å, 2022 - on hold for publication.

8dwf Glycosylase MutY variant E43S in complex with DNA containing d(8-oxo-G) paired with substrate adenine, 2.60 Å, 2022 - on hold for publication.

8fay Human MUTYH adenine glycosylase bound to DNA containing a transition state analog (1N) paired with d(8-oxo-G), 1.91 Å, 2022 - on hold for publication.

O2. STRUCTURES IN PROGRESS

rw01 MutY adenine specific glycosylase bound to transition state analog (1NBn) paired with d(8-oxoG) in DNA to 1.9 Å. June 2009

sr17 MutY adenine specific glycosylase bound to product analog (THF) paired with d(8-oxoG) in DNA to 2.20 Å. January 2010

sr16 MutY adenine specific glycosylase bound to substrate analog (rFA) paired with d(8-oxoG) in DNA to 1.95 Å. January 2010

rw03 MutY adenine specific glycosylase active site variant (Tyr126→Phe) bound to transition state analog (1N) paired with d(8-oxoG) in DNA to 2.10 Å. June 2009

cg11 MutY adenine specific glycosylase active site variant (Tyr126→Ser) bound to transition state analog (1N) paired with d(8-oxoG) in DNA to 2.05 Å. October 2011

sr03 MutY adenine specific glycosylase clinical variant (Tyr88→Cys) bound to transition state analog (1N) paired with d(8-oxoG) in DNA to 1.90 Å. January 2010

pr21 MutY adenine specific glycosylase active site variant (Glu43→Gln) bound to DNA containing purine paired with d(8-oxo-G) to 2.2 Å / 2.9 Å anisotropic resolution. December 2020

pr23 MutY adenine specific glycosylase active site variant (Glu43→Gln) bound to DNA containing purine paired with d(8-oxo-G) to 1.8 Å / 2.2 Å anisotropic resolution. December 2020

pr41 MutY adenine specific glycosylase active site variant (Glu43→Ser) bound to DNA containing adenine paired with d(8-oxo-G) to 2.3 Å / 3.0 Å anisotropic resolution. December 2020

pr42 MutY adenine specific glycosylase active site variant (Glu43→Ser) bound to DNA containing adenine paired with d(8-oxo-G) to 2.3 Å / 3.1 Å anisotropic resolution. December 2020

pr43 MutY adenine specific glycosylase active site variant (Glu43→Ser) bound to DNA containing purine paired with d(8-oxo-G) to 2.5 Å / 3.1 Å anisotropic resolution. December 2020

pr44 MutY adenine specific glycosylase active site variant (Glu43→Ser) bound to DNA containing purine paired with d(8-oxo-G) to 2.1 Å / 2.5 Å anisotropic resolution. December 2020

pr46 MutY adenine specific glycosylase active site variant (Glu43→Ser) bound to DNA containing adenine paired with d(8-oxo-G) to 2.5 Å / 3.1 Å anisotropic resolution. December 2020

pr50 MutY adenine specific glycosylase active site variant (Glu43→Ser) bound to DNA containing purine paired with d(8-oxo-G) to 2.1 Å / 2.5 Å anisotropic resolution. December 2020

pr51 MutY adenine specific glycosylase active site variant (Glu43→Ser) bound to DNA containing purine paired with d(8-oxo-G) to 2.2 Å / 2.4 Å anisotropic resolution. December 2020

nhu02 OGG1 d(8-oxo-G) specific glycosylase bound to DNA containing the transition state analog 1N paired with C to 2.6 Å resolution. June 2021