Matthew J. Gage

Department of Chemistry
University of Massachusetts Lowell
Lowell, MA 08154
(978) 934-3683 matthew_gage@uml.edu

Education

2001 **Ph.D.** in Biochemistry and Molecular Biology *Purdue University*
Dissertation title: *"Interaction of the Virally Encoded Fungal Toxin KP4 with Calcium Channels"*
Advisor: *Prof. Thomas J. Smith*

1996 **B.S.** in Chemistry with Honors *University of Wyoming*
B.S. in Molecular Biology with Honors *University of Wyoming*

Professional experience

2015 – Present **Associate Professor**
University of Massachusetts Lowell, Department of Chemistry

2011 – 2014 **Associate Professor**
Northern Arizona University, Department of Chemistry and Biochemistry

2005 – 2011 **Assistant Professor**
Northern Arizona University, Department of Chemistry and Biochemistry

2001 – 2005 **Postdoctoral Research Associate**
University of Delaware, Department of Chemical Engineering
Advised by Professor Anne Skaja Robinson

1996 – 2001 **Research Assistant**
Purdue University, Department of Biology
Advised by Professor Thomas J. Smith

1995-1996 **Undergraduate Research Assistant**,
University of Wyoming, Department of Chemistry
Advisor – Dr. Dean Roddick

1994-1995 **Undergraduate Research Assistant**,
University of Wyoming, Department of Chemistry
Advisor – Dr. Edward Clennan

Peer-Reviewed Publications

1. Purohit, R., B. G. Fritz, J. The, A. Issaian, A. Weichsel, C. L. David, E. V. Campbell, A. C. Haurath, L. Rassouli-Taylor, E. D. Garcin, **M. J. Gage**, W. R. Montfort. (2014) "YC-1 Binding to the Beta Subunit of Soluble Guanylyl Cyclase Overcomes Allosteric Inhibition by the Alpha Subunit." Biochemistry Manuscript ID: bi4015133.

2. Ma, W. K., R. Hendrix, C. Stewart, E. V. Campbell, M. Lavarias, K. Morris, S. Nichol, **M.J. Gage.** (2013) "FlgM proteins from different bacteria exhibit different structural characteristics." Biochimica et Biophysica Acta (BBA) - Proteins & Proteomics 1834: 808-816.
3. Heintze, E., C. Aguilera, M. Davis, A. Fricker, Q. Li, J. Martinez, **M.J. Gage**. (2011) "Exposure to uranium complexes results in upregulation of p53 mediated pathways." J Inorg Biochem 105(2): 142-8.
4. Molloy, R.G., W. K. Ma, A. C. Allen, K. Greenwood, L. Bryan, R. Sacora, L. Williams, **M. J. Gage**. "*Aquifex aeolicus* FlgM protein does not exhibit the disordered character of the *Salmonella Typhimurium* FlgM protein." Biochimica et Biophysica Acta (BBA) - Proteins & Proteomics doi:10.1016/j.bbapap.2010.03.002
5. Webber, T. M., A. C. Allen, W.K. Ma, R.G. Molloy, C. N. Kettelkamp, C.A. Dow, **M.J. Gage**. (2009). "Conformational detection of p53's oligomeric state by FlAsH Fluorescence." Biochem Biophys Res Commun 384(1): 66-70.
6. Webber, T., S. Gurung, J. Saul, T. Baker, M. Spatara, M. Freyer, A.S. Robinson, **M.J. Gage**. (2009). "The C-terminus of the P22 tailspike protein acts as an independent oligomerization domain for monomeric proteins." Biochem J 419(3): 595-602.
7. Gage, M.J., J.L. Zak, and A.S. Robinson, 2005. Three Amino Acids that are Critical to Formation and Stability of the P22 Tailspike Trimer. Protein Science, 14(9): 2333-2343
8. Gage M.J., B.L. Lefebvre, A.S. Robinson, Determinants of P22 Tailspike Folding and Aggregation., in *Misbehaving Proteins: Protein (Mis)Folding, Aggregation, and Stability*, eds R. Murphy and A. Tsai, ACS press, invited review.
9. Lefebvre, B.L., N.K. Comolli, M.J. Gage, A.S. Robinson, 2004. Pressure Dissociation Studies Provide Insight Into Oligomerization Competence of Temperature-Sensitive Mutants of P22 Tailspike, Protein Science. 13(6): 1538-46.
10. Lefebvre, B.L., M.J. Gage, A.S. Robinson, 2004. Maximizing Recovery of Native Protein from Aggregates by Optimizing Pressure Treatment, Biotechnology Progress. 20(2): 623-9.
11. Gage, M.J., A. S. Robinson, 2003. C-Terminal Hydrophobic Interactions Play a Critical Role in Oligomeric Assembly of the P22 Tailspike Trimer Protein Science. 12(12): 2732-47.
12. Gage, M.J., S. G. Rane, G. H. Hockerman, T. J. Smith, 2002. The Virally Encoded Fungal Toxin KP4 Specifically Blocks L-Type Voltage Gated Calcium Channels. Molecular Pharmacology 61 (4) 936-944.
13. Gage, M.J., J. Bruenn, M. Fischer, D. Sanders, T. J. Smith, 2001. KP4 Fungal Toxin Inhibits Growth in *Ustilago maydis* by Blocking Calcium Uptake. Molecular Microbiology. 41(4):775-785.

Provisional Patents

1. Allen, A..C., Gilmore, S., Browder, C.B., Gage, M..J. U.S. Provisional Application # 61/305,816. Filed 2/10

2. Holguin, T.R., Browder, C.B., Gage, M..J. U.S. Provisional Application # 61/305,807. Filed 2/10

Poster and Seminar Presentations (past 5 years)

1. "Structural Studies on the N2A-IS Region of Titin" **Poster,** Kanchan Sonkar, Holly Tiffany, and Matthew Gage, February 2014, Biophysical Society Annual Meeting, San Francisco, CA
2. "Characterization of the Intrinsically Disordered Region of Soluble Guanylate Cyclase Alpha-1 Subunit" **Poster,** Candice V. Benally, Parul Singh, and Matthew Gage, February 2014, Biophysical Society Annual Meeting, San Francisco, CA

3. "Intrinsically Disordered Proteins: Understanding Protein Function in the Absence of Structure" **Invited Seminar,** Matthew Gage, February 2013, North Dakota State University, Fargo, ND
4. "Exploring the World of Intrinsically Disordered Proteins" **Invited Talk,** Matthew Gage, January 2013, IMSD Regional Meeting, Arizona State University, AZ
5. "Characterizing the Structure and Function of Truncations from the Anti-Sigma Factor FlgM from Aquifex aeolicus" **Poster** and **Talk**, Claire Stewart and Matthew Gage, August 2012, Protein society Meeting, San Diego, CA.
6. "Developing Inhibitors for E. coli Tryptophan Synthase and Indole-3-Glycerol Phosphate Synthase Utilizing in vitro and in silico techniques" **Poster**, Rhett Molloy, Andrew Allen, Dorothy Kampf and Matthew Gage, August 2012, Protein society Meeting, San Diego, CA.
7. "Thrombospondin-1 Binding to CD47 in the Regulation of Nitric Oxide Signaling" **Poster**, Sarah Young, Toni Greene, William Monrtfort and Matthew Gage, August 2012, Protein society Meeting, San Diego, CA.
8. "Developing Inhibitors for E. coli Tryptophan Synthase and Indole-3-Glycerol Phosphate Synthase Utilizing in vitro and in silico techniques" **Poster**, Rhett Molloy, Andrew Allen, Dorothy Kampf and Matthew Gage, August 2012, Protein society Meeting, San Diego, CA.
9. "Structural Characterization of the Unique Sequence Region from the N2A Domain of Titin" **Poster**, Holly Tiffany and Matthew Gage, August 2012, Protein society Meeting, San Diego, CA.
10. "Developing Inhibitors for Tryptophan Synthase Utilizing in Vitro and in Silico studies," **Poster**, Rhett Molloy, Dorothy Kampf and Matthew Gage, July 2011 Protein Society Meeting, Boston, MA.
11. "Assessing Various Ways to Mimic the Cellular Environment," **Poster and Talk**, Avery Fricker, Chad Park and Matthew Gage, July 2011 Protein Society Meeting, Boston, MA.
12. "Development of Novel Inhibitors of Indole Glycerol-3-Phosphate, Andrew Allen, Dorothy Kampf and Matthew Gage, July 2011 Protein Society Meeting, Boston, MA.
13. "Assessing the Degree of Disorder in Homologous FlgM Proteins," **Poster and Talk**, Rachel Brackett, Wai Kit Ma and Matthew Gage, July 2011 Protein Society Meeting, Boston, MA.
14. "Determining if Different FlgM Proteins Cn Bind Nno-Homologous Sigma-28 Proteins," **Poster**, Whitney Brown, Rachel Brackett and Matthew Gage, July 2011 Protein Society Meeting, Boston, MA.
15. "Determining the Effects of Various Crowding Agents on eGFP to Model Folding within the Cell," **Poster**, Amber Enriquez and Matthew Gage, July 2011 Protein Society Meeting, Boston, MA.
16. "Aquifex aeolicus FlgM protein exhibits a temperature dependent disordered nature," **Poster**, Matthew Gage, Rhett Molloy, Wai Kit Ma, Andrew Allen, Kevin Greenwood, Lynn Bryan, Rebecca Sacora, LaBrittney Williams, July 2010, Protein Society Meeting, San Diego CA.
17. "Exploring conformational changes associated with binding of YC-1 to soluble guanylyl cyclase," **Poster**, Malia Davis, Camille Aguilera, Shauna Cooney, Matthew Gage. July 2010, Protein Society Meeting, San Diego CA.
18. "Designing novel antimicrobial compounds to inhibit unexplored metabolic pathways," **Poster,** Andrew Allen, Samuel Gilmore, Rhett Molloy, Allison Grace, Jason McCabe, Cindy Browder, Matthew Gage. July 2010, Protein Society Meeting, San Diego CA.
19. "Development of Inhibitors of the Methionine and Tryptophan Biosynthetic Pathways" **Seminar**, Matthew Gage, DTRA TMT Quarterly Meeting, July 2010
20. "*Aquifex aeolicus* FlgM protein exhibits a temperature dependent disordered nature" **Poster**, Rhett G. Molloy, Wai Kit Ma, Andrew C. Allen, Kevin Greenwood, Lynn Bryan, Rebecca

Sacora, LaBrittney Williams, Matthew J. Gage, Feb 2010, Biophysical Society Meeting, San Francisco, CA

21. "Assessing the degree of disorder in homologous FlgM proteins", **Poster**, Wai Kit Ma, Matthew J. Gage, Feb 2010, Biophysical Society Meeting, San Francisco, CA
22. "Applying Thermodynamics to Fragment-Based Drug Development", **Poster**, Tomas R. Holguin, Michael T. Pass, Cindy C. Browder, Matthew J. Gage, Feb 2010, Biophysical Society Meeting, San Francisco, CA

Funding

External

1. Defense Threat Reduction Agency (Mar 2010 – Mar 2013) $1,355,079
   Development of Inhibitors of the Methionine and Tryptophan Biosynthetic Pathways
2. Science Foundation Arizona Competitive Advantage Award (2007) $101,727
   Developing Techniques to Measure the Structural State of Intrinsically Disordered Proteins *in vivo*

Internal

1. RIF Post-Doc Proposal $148,000
   NMR structural studies on the N2A region of titin
2. Full Proposal (NACP, U54) (2011-2014) $373,761
   Molecular Mechanism in Thrombospondin I in Mediated Antiangiogenesis
3. Pilot Project (NACP, U54) (2009-2011) $143,285
   Allostery and Cellular Distribution of the Nitric Oxide Receptor, Soluble Guanylyl Cyclase
4. Growing Biotech Initiative (2008-9) $25,000
   Identification of novel targets for antibiotic development
5. Intramural Grant Program (2008-9) $13,000
   Identification of novel antibiotics
6. Growing Biotech Initiative (2007) $25,000
   Developing a method to measure subunit-subunit interactions inside of a cell
7. Growing Biotech Initiative (2007) $75,000
   Enhancement of Translational Research and Workforce Development at NAU: Acquisition of a Dynamic Light Scattering Apparatus
8. Intramural Grant Program (2007) $9,600
   Investigating the link between aggregation of p53 and tumor formation
9. Pilot Project (NACRP, U54) (2006) $60,404
   Deciphering the folding pathway of the p53 tumor suppressor protein
10. Growing Biotech Initiative (2006) $25,000
    Developing a method to measure subunit-subunit interactions inside of a cell
11. Intramural Grant Program (2006) $6,800
    Investigating the link between aggregation of p53 and tumor formation

Teaching Experience

2007 - present **Professor, Biochemistry I and II**
Professor, Biochemistry Laboratory

Professor, Fundamental Biochemistry
Professor, Protein structure and Function
Northern Arizona University, Department of Chemistry and Biochemistry

2004-2005 **Instructor, Introductory Biochemistry**
University of Delaware, Department of Chemistry

1996-2005 **Research Supervisor**
University of Delaware, Department of Chemical Engineering
Purdue University, Department of Biology

1999 **Teaching Assistant, Immunology**
Purdue University, Department of Biology

1994-1996 **Teaching Assistant, General Chemistry**
University of Wyoming, Department of Chemistry

1995 **Chemistry tutor,**
University of Wyoming, Department of Chemistry

Mentored Students

Masters: Tawnya Webber (Graduated 2008), Ellie Heintze (Graduated 2008), Malia Davis (Graduated, September 2010), Camille Aguilera (Graduated, Fall 2010), Andy Allen (Graduated, Fall 2010), Michael Pass, Rhett Molloy (Graduated, Fall 2011), Lynn Bryan, Sarah Young (Graduating Summer 2014), Holly Tiffany (Graduating Summer 2014), Candice Benally, Jon Rice, James Osei-Owusu

Undergraduate: Sarsati Gurung, Trenton Baker, Justin Saul, Kristin Heath, Karim Hackler, Eric Fanucci, Casey Goodyear, Ashley Steiner, Jilleen Jones, LaBrittney Williams, Eric Johansen, Catherine Stepnitz, Caitlin Dow, Holly Tiffany, Tomas Holguin, Wai Kit Ma, Lynn Bryan, Amber Enriquez, Avery Fricker, Allison Grace, Rachel Brackett, Shauna Cooney, K.C. Fossum, Whitney Brown, Claire Stewart, Eric Campbell, Rachelle Eddie, Nathaniel Jim, Victoria Mitchell, Kolyn Morris, Jacob Milton, Mitchell Lavarias, Ethan Paddock, April Rodriguez, Millicent Chandler, Tiana Bartholomew, Bridger Rodini (current), Lauren Newland

Academic Honors

1999 – 2001 NIH Biophysics Training Grant, Purdue University
1996 Honor Book, Department of Molecular Biology, University of Wyoming
1995 NSF REU Fellow, Department of Chemistry, University of Wyoming
1994 – 1996 Outstanding Student, Department of Chemistry, University of Wyoming
1994 – 1996 Dean's List, University of Wyoming

Professional Service

National and local organization leadership

2005 - 2010 Chair, Institutional Biosafety Committee, NAU
2000 Member, 6th Annual Biophysics and Cell Biology Symposium organizing committee, Purdue University

1994-1995 President, Student Affiliated ACS Organization, University of Wyoming

Reviewer for the following journals and organizations

Biomacromolecules
Biotech Progress
Proteins
Protein Science
Protein Society

Memberships

2001 - Biophysical Society
2004 - Protein Society
2008 - Arizona Cancer Center
2010 - American Chemical Society