Jeffrey S. Mugridge, Ph.D.

✉ mugridgelab@gmail.com
mugridgelab.org

Assistant Professor
Dept. of Chemistry & Biochemistry
University of Delaware
Brown Laboratory
Newark, DE 19711

Education & Training

Postdoctoral Fellow in Biochemistry & Structural Biology ***2011 – 2019***
University of California, San Francisco
Advisor: John D. Gross
Research focus: Structural and molecular mechanisms controlling mRNA decapping

Ph.D. in Chemistry ***2006 – 2010***
University of California, Berkeley
Advisor: Kenneth N. Raymond (co-advisor: Robert G. Bergman)
Thesis: "Supramolecular Host-Guest Interactions, Dynamics and Structure"

B.S. in Chemistry ***2002 – 2006***
University of Chicago
Advisor: Michael D. Hopkins
Honors Thesis: "Conjugated Ditungsten Dialkylidyne Complexes with Various Ligand Systems"

Summary of Past Research

University of California, San Francisco, Department of Pharmaceutical Chemistry ***2011 – 2019***
NIH F32 NRSA Postdoctoral Fellow with John D. Gross.
I investigated the structural and molecular mechanisms that regulate the dynamic, multiprotein mRNA decapping complex, which removes the 5' cap modification found on all eukaryotic mRNA transcripts during a critical step in RNA decay. My work at UCSF defined the structural basis for substrate recognition and catalysis by the mRNA decapping enzyme Dcp2, and complementary mechanisms that different protein cofactors use to engage the decapping complex and tune decapping activity (Mugridge *et al*, *NSMB* 2016; Mugridge *et al*, *Nat. Commun.* 2018).

University of California, Berkeley, Department of Chemistry ***2006 – 2010***
NSF Graduate Research Fellow with Kenneth Raymond and in collaboration with Robert Bergman.
I studied molecular recognition and the physical organic chemistry of small molecules encapsulated within a synthetic, enzyme-like supramolecular host-guest complex. These studies showed how host dynamics and structure can manipulate guest binding and reactivity in a model host-guest system, and laid the groundwork for my current and future interests in enzyme-substrate recognition and the regulation of biological reactivity by conformational dynamics and protein-protein or protein-RNA interactions.

University of Chicago, Department of Chemistry ***2004 – 2006***
Undergraduate researcher with Michael Hopkins.
I explored the synthesis and physical and electronic properties of air-sensitive, dialkylidyne complexes with different ligand systems as precursors to molecular wires.

Selected Awards & Honors

- NIH Ruth L. Kirschstein (F32) Postdoctoral Fellowship (2013 – 2015)
- National Science Foundation Graduate Student Research Fellowship (2007 – 2010)

Publications – Research Articles

16. **Mugridge JS**, Ziemniak M, Jemielity J, Gross JD. Structure of the activated Edc1-Dcp1-Dcp2-Edc3 mRNA decapping complex with substrate analog poised for catalysis. *Nat. Commun.* 2018, 9, 1152.

15. Paquette DR, **Mugridge JS**, Weinberg D, Gross JD. Application of a Schizosaccharomyces pombe Edc1-fused Dcp1-Dcp2 decapping enzyme for transcription start site mapping. *RNA* 2017, 24, 251-257.

14. **Mugridge JS**, Ziemniak M, Jemielity J, Gross JD. Structural basis of mRNA-cap recognition by Dcp1–Dcp2. *Nat. Struct. Mol. Biol.* 2016, 23, 987 – 994.
****This article was highlighted in NSMB News & Views piece: mRNA decapping in 3D by Jeff Coller****

13. Ziemniak M, **Mugridge JS**, Kowalska J, Rhoads RE, Gross JD, Jemielity J. Two-headed tetraphosphate cap analogs are inhibitors of the Dcp1/2 RNA decapping complex. *RNA* 2016, 22, 518 – 529.

12. Sgarlata C, **Mugridge JS**, Pluth MD, Zito V, Arena G, Raymond KN. Different and often opposing forces drive the encapsulation and multiple exterior binding of charged guests to a M4L6 supramolecular vessel in water. *Chem. Eur. J.* 2017, 23, 16813-16818.

11. **Mugridge JS**, Zahl A, van Eldik R, Bergman RG, Raymond KN. Solvent and pressure effects on the bond rotational barriers of encapsulated guests: probing the flexibility of a supramolecular host. *J. Am. Chem. Soc.* 2013, *135*, 4299 – 4306.

10. **Mugridge JS**, Bergman RG, Raymond KN. Equilibrium isotope effects on noncovalent host-guest interactions. *J. Am. Chem. Soc.* 2012, *134*, 2057 – 2066.

09. **Mugridge JS**, Bergman RG, Raymond KN. ^{1}H NMR chemical shift calculations as a probe of supramolecular host-guest geometry. *J. Am. Chem. Soc.* 2011, *133*, 11205 – 11212.

08. **Mugridge JS**, Szigethy G, Bergman RG, Raymond KN. Encapsulated guest-host dynamics: guest rotational barriers and tumbling as a probe of host interior cavity space. *J. Am. Chem. Soc.* 2010,*132*, 16256 – 16264.

07. **Mugridge JS,** Fiedler D, Raymond KN. A ferrocene-based catecholamide ligand: the consequences of ligand swivel for directed supramolecular self-assembly. *J. Coord. Chem.* 2010, *63*, 2779 – 2789.

06. **Mugridge JS**, Bergman RG, Raymond KN. Does size really matter? The steric isotope effect in a supramolecular host-guest exchange reaction. *Angew. Chem. Int. Ed.* 2010, *49*, 3635 – 3637.
****This article was highlighted with inside cover art in this issue of Angew. Chem. Int. Ed.****

05. Sun J, Shaner SE, Jones MK, O'Hanlon DC, **Mugridge JS**, Hopkins MD. Synthesis, structures, bonding, and redox chemistry of ditungsten butadiyne complexes with WCCW backbones. *Inorg. Chem.* 2010, *49*, 1687 – 98.

04. **Mugridge JS**, Bergman RG, Raymond KN. High-precision measurement of isotope effects on noncovalent host-guest interactions. *J. Am. Chem. Soc.* 2010, *132*, 1182 – 1183.

03. Sgarlata C, **Mugridge JS**, Pluth MD, Tiedemann BE, Zito V, Arena G, Raymond KN. External and internal guest binding of a highly charged supramolecular host in water: deconvoluting the very different thermodynamics. *J. Am. Chem. Soc.* 2010, *132*, 1005 – 1009.

02. Pluth MD, Fiedler D, **Mugridge JS**, Bergman RG, Raymond KN. Encapsulation and characterization of proton-bound amine homodimers in a water-soluble, self-assembled supramolecular host. *Proc. Natl. Acad. Sci. U.S.A.* 2009, *106*, 10438 – 10443.

01. Davenport TC, Gleason AE, Liska PL, **Mugridge JS**, Pluth MD. N,N'-(pyrene-1,8-diyl)bis(2,3-dimethoxybenzaldehyde). *Acta Cryst.* 2007, *E63*, O3621.

Publications – Reviews & Commentary

Mugridge JS, Coller J, Gross JD. Structural and molecular mechanisms of eukaryotic 5'-3' mRNA decay. *Nat. Struct. Mol. Biol.* 2018, 25, 1077 – 1085. *Review Article.*

Mugridge JS, Gross JD. Decapping enzymes STOP 'cancer' ribosomes in their tracks. *EMBO J.* 2018, 37(23). *News & Views Article.*

Mugridge JS, Gross JD. Judge, jury, and executioner: DXO functions as a decapping enzyme and exoribonuclease in pre-mRNA quality control**.** *Mol. Cell.* 2013, 50, 2 – 4. *Preview Article.*

Selected Presentations

"Multimodal activation of decapping during 5'-3' mRNA decay."
Mugridge JS, Paquette DW, Tibble RW, Lobel J, Ziemniak M, Jemielity J, Gross JD. The Complex Life of an RNA EMBL Symposia. Heidelberg, Germany, October 2018. Short talk & poster presentation.

"The structural basis of mRNA decapping: cap recognition and activation of the Edc1-Dcp1-Dcp2-Edc3 mRNA decapping complex with substrate analog poised for catalysis."
Mugridge JS, Tibble RW, Ziemniak M, Jemielity J, Gross JD. RNA Society Annual Meeting. Berkeley, CA, June 2018. Oral presentation.

"Cap recognition, activation, and conformational control of the mRNA decapping complex."
Mugridge JS, Tibble RW, Ziemniak M, Jemielity J, Gross JD. Biophysical Society Annual Meeting. San Francisco, CA, February 2018. Poster presentation.

"Cap recognition and catalytic activation of the Dcp1/Dcp2 mRNA decapping complex."
Mugridge JS, Ziemniak M, Jemielity J, Gross JD. FASEB Conference on Post-transcriptional Control of Gene Expression. Lisbon, Portugal, July 2016. Oral presentation.
****Awarded prize for best postdoc/student talk of the meeting****

"Short linear motifs and activation of Dcp2-mediated mRNA decapping."
Mugridge JS, Gross JD. Biophysical Society International Conference on Disordered Motifs and Domains in Cell Control. Dublin, Ireland, October 2014. Poster presentation.

"Toward a Structural Understanding of Dcp2-mediated Decapping Activation."
Mugridge JS, Ullmann J, Mund M, Floor SN, Sprangers R, Gross JD. FASEB Conference on Post-transcriptional Control of Gene Expression. Big Sky, MT, July 2014. Poster presentation.

"Solvent effects on guest exchange, binding and encapsulated dynamics in a supramolecular host."
Mugridge JS, Sgarlata C, Bergman RG, Raymond KN. Pacifichem International Conference. Honolulu, HI, December 2010. Poster presentation.

"Isotope effects on noncovalent interactions in a supramolecular host-guest system."
Mugridge JS, Bergman RG, Raymond KN. 239th American Chemical Society National Meeting. San Francisco, CA, March 2010. Oral presentation.

"Encapsulated host-guest dynamics: bond rotational barriers as a probe of host interior cavity space." **Mugridge JS**, Zahl A, van Eldik R, Szigethy G, Bergman RG, Raymond KN. 239th American Chemical Society National Meeting. San Francisco, CA, March 2010. Poster presentation.

"Conjugated Ditungsten Dialkylidyne Complexes with Various Ligand Systems."
Mugridge JS, Hopkins MD. 230th ACS National Meeting. Washington, D.C., August 2005. Poster presentation.