Erik Dylan Holmstrom

Assistant Professor
Department of Molecular Biosciences
Department of Chemistry (courtesy)
email: erik.d.holmstrom@ku.edu

University of Kansas
3007 Haworth Hall
1200 Sunnyside Ave.
Lawrence KS, 66045

Education

2008-2014	Ph.D. in Biochemistry from the University of Colorado
2004-2008	B.A. in Biology from Willamette University
2004-2008	B.A. in Chemistry from Willamette University

Professional Appointments

2019-present	Assistant Professor at University of Kansas
2017-2018	Postdoctoral Research Scientist at the University of Zurich
2015-2017	EMBO Postdoctoral Fellow at the University of Zurich
2014-2015	Postdoctoral Research Scientist at the University of Zurich

Publications

1. S.M. Gunawardhana, E.D. Holmstrom*. "Apolar chemical environments compact unfolded RNAs and can promote folding." *Biophys. Rep.* (2021) **DOI:** 10.1016/j.bpr.2021.100004
2. Z.Tang, S. Akhter, A.Ramprasad, X. Wang, M. Reibarkh, J.Wang, S. Aryal, S.S. Thota, J. Zhao, J.T. Douglas, P. Gao, E.D. Holmstrom, Y. Miao*, J. Wang* " Recognition of single-stranded nucleic acids by small-molecule splicing modulators." *Nucleic. Acids. Res.* (2021) **DOI:** 10.1093/nar/gkab602
3. J.C. Sanders, E.D. Holmstrom*. "Integrating single-molecule FRET and biomolecular simulations to study diverse interactions between nucleic acids and proteins" *Essay Biochem.* (2021) **DOI:** 10.1042/EBC20200022
4. Y.M.O. Alhammad, M.M. Kashipathy, A. Roy, J. Gagné, P. McDonald, P. Gao, L. Nonfoux, K.P. Battaile, D.K. Johnson, E.D. Holmstrom, G.G. Poirier, S. Lovell, A.R. Fehr*. " The SARS-CoV-2 conserved macrodomain is a mono-ADP-ribosylhydrolase" *J. Virol.* (2020) **DOI:** 10.1128/JVI.01969-20
5. R. Sharma, S. KK, E.D. Holmstrom*, F. Westerlund*. "Real-time Compaction of Nanoconfined DNA by an Intrinsically Disordered Macromolecular Counterion" *Biochem. Biophys. Res. Commun*. (2020) **DOI:** 10.1016/j.bbrc.2020.06.051
6. S. Sen, E.D. Holmstrom*. "A Single Molecule FRET Approach for Investigating the Binding Mechanisms of Anti-viral Aptamers" *RNA Nanotechnology and Therapeutics, 2nd Edition.* P. Guo. (in press)
7. B. Schuler*, A. Borgia, M. Borgia, P. Heidarsson, E.D. Holmstrom, D. Nettels, A. Sottini. “Binding without folding – the biomolecular function of disordered polyelectrolyte complexes” *Curr. Opin. Struct. Biol.* (2019) **DOI:** 10.1016/j.sbi.2019.12.006

   ††*The following reflect work carried out prior to starting my lab at the University of Kansas* ††

8. E.D. Holmstrom*, Z. Liu, D. Nettles, R.B. Best, B. Schuler*. “Disordered RNA chaperones enhance nucleic acid folding via local charge screening.” *Nat. Commun.* (2019) **DOI:** 10.1038/s41467-019-10356-0
9. E.D. Holmstrom, A. Holla, W. Zheng, D. Nettels, R.B. Best*, B. Schuler*. “Accurate transfer efficiencies and distance distributions of unfolded and intrinsically disordered proteins using single-molecule FRET.” *Methods Enzymol.* (2018) **DOI:** 10.1016/bs.mie.2018.09.030
10. K.K. Grotz, M. Nüesch, E.D. Holmstrom, M. Heinz, L.S. Stelzl, B. Schuler*, G. Hummer*. “Dispersion Correction Alleviates Dye Stacking of Single-Stranded DNA and RNA in Simulations of Single-Molecule Fluorescence Experiments.” *J. Phys. Chem. B* (2018) **DOI:** 10.1021/acs.jpcb.8b07537

11. F. Sturzenegger, F. Zosel, E.D. Holmstrom, D.E. Makarov, D. Nettels, B. Schuler*. “Transition path times of coupled folding and binding reveal the formation of an encounter complex.” *Nat. Commun.* (2018) **DOI:** 10.1038/s41467-018-07043-x
12. N.F. Dupuis, E.D. Holmstrom, D.J. Nesbitt*. “Tests of Kramers’ Theory at the Single-Molecule Level: Evidence for Folding of an Isolated RNA Tertiary Interaction at the Viscous Speed Limit.” *J. Phys. Chem. B* (2018) **DOI:** 10.1021/acs.jpcb.8b04014
13. Y. Liu, E.D. Holmstrom, P. Yu, K. Tan, X. Zuo, D.J. Nesbitt, R. Sousa, J.R. Stagno, Y. Wang*. “Incorporation of isotopic, fluorescent, and heavy-atom-modified nucleotides into RNAs by position-selective labeling of RNA.” *Nat. protoc.* (2018) **DOI:** 10.1038/nprot.2018.002
14. E.D. Holmstrom*, D. Nettles, B.Schuler*. “Conformational plasticity of the hepatitis C virus core protein during RNA-induced formation of nucleocapsid-like particles.” *J. Mol. Bio.*(2017) **DOI:** 10.1016/j.jmb.2017.10.010
15. E.D. Holmstrom, D.J. Nesbitt*. “Biophysical Insights from Temperature-Dependent Single-Molecule Förster Resonance Energy Transfer.” *Annu. Rev. Phys. Chem.* (2016) **DOI:** 10.1146/annurev-physchem-040215-112544
16. J.T. Polaski, E.D. Holmstrom, D.J. Nesbitt, R.T. Batey*. “Mechanistic Insights into Cofactor-Dependent Coupling of RNA Folding and mRNA Transcription/Translation by a Cobalamin Riboswitch.” *Cell Reports*. (2016) **DOI:** 10.1016/j.celrep.2016.03.087
17. M. Vieweger, E.D. Holmstrom, D.J. Nesbitt*. “Single-Molecule FRET Reveals Three Conformations for the TLS Domain of Brome Mosaic Virus Genome.” *Biophys. J.* (2015) **DOI:** 10.1016/j.bpj.2015.10.006
18. Y. Liu, E.D. Holmstrom, J. Zhang, P. Yu, J. Wang, M.A. Dyba, D. Chen, J. Ying, S. Lockett, D.J. Nesbitt, A. R. Ferré-D’Amaré, R. Sousa, J.R. Stagno, Y. Wang*. “Synthesis and applications of RNAs with position-selective labelling and mosaic composition” *Nature.* (2015) **DOI:** 10.1038/nature14352
19. E.D. Holmstrom, N.F. Dupuis, and D.J. Nesbitt*. “Kinetic and Thermodynamic Origins of Osmolyte-Influenced Nucleic Acid Folding.” *J. Phys. Chem. B* (2015) **DOI:** 10.1021/jp512491n
20. E.D. Holmstrom, J.T. Polaski, R.T. Batey*, D.J. Nesbitt*. “Single-Molecule Conformational Dynamics of a Biologically Functional Hydroxocobalamin Riboswitch.” *JACS* (2015) **DOI:** 10.1021/ja5076184
21. E.D. Holmstrom and D.J. Nesbitt*. “Kinetic and Thermodynamic Studies of the Human Telomerase RNA Pseudoknot Using smFRET.” *J. Phys. Chem. B* (2014) **DOI:** 10.1021/jp501893c
22. N.F. Dupuis, E.D. Holmstrom, and D.J. Nesbitt*. “Molecular Crowding Effects on Single Molecule RNA Folding/Unfolding Thermodynamics and Kinetics” *PNAS* (2014) **DOI:** 10.1073/pnas.1316039111
23. E.D. Holmstrom, N.F. Dupuis, and D.J. Nesbitt*. “Pulsed IR Heating Studies of Single-Molecule DNA Duplex Dissociation Kinetics and Thermodynamics.” *Biophys. J.* (2014). **DOI:** 10.1016/j.bpj.2013.11.008
24. N.F. Dupuis, E.D. Holmstrom, and D.J. Nesbitt*. “Single Molecule Kinetics Reveal Cation Promoted DNA Duplex Formation Through Ordering of Single-Stranded Helices.” *Biophys. J.* (2013). **DOI:** 10.1016/j.bpj.2013.05.061
25. E.D. Holmstrom J.L. Fiore, and D.J. Nesbitt*. “Thermodynamic Origins of Monovalent-Facilitated RNA folding.” *Biochemistry* (2012). **DOI:** 10.1021/bi201420a
26. J.L. Fiore, E.D. Holmstrom and D.J. Nesbitt*. “Entropic origin of Mg^{2+}-facilitated RNA folding.” *PNAS* (2012). **DOI:** 10.1073/pnas.1114859109
27. J.L. Fiore, E.D. Holmstrom, L.R. Fiegland, J.H. Hodak, and D.J. Nesbitt*. “The Role of Counterion Valence and Size in GAAA Tetraloop–Receptor Docking/Undocking Kinetics.” *J. Mol. Bio.* (2012). **DOI:** 10.1016/j.jmb.2012.07.006
28. E.D. Holmstrom and D.J. Nesbitt*. “Real-Time Infrared Overtone Laser Control of Temperature in Picoliter H_2O Samples: ‘Nanobathtubs’ for Single Molecule Microscopy” *J. Phys. Chem. Lett.* (2010). **DOI:** 10.1021/jz100663e

Scientific Conferences

1. Biophysical Society Meeting. San Francisco, CA. (2022). **Poster**.
2. Biophysical Society Meeting. San Diego,CA. (2020). **Poster**.
3. ACS Midwest Regional Meeting. Wichita, KS. (2019). **Invited Talk**
4. Biomotors, Virus Assembly, and Nanobiotechnology. Columbus, OH. (2019). **Invited Talk.**
5. Biophysical Society Meeting. Baltimore, MD, USA. (2019). **Talk**.
6. Single Molecule Biophysics at the Aspen Center for Physics. Aspen, CO. (2019). **Poster**.
7. PicoQuant: Single Molecule Workshop. Berlin, GER. (2018). **Talk**.
8. GRC: Single Molecule Approaches to Biology. Mt. Snow, VT. (2018). **Poster**.
9. PicoQuant: Single Molecule Workshop. Berlin, GER. (2017). **Talk**.
10. Biophysics by the Sea. Alcúdia, Mallorca, Spain. (2016). **Invited Talk**.
11. GRC: Single Molecule Approaches to Biology. Hong Kong, HK. (2016). **Poster**.
12. GRS: Single Molecule Approaches to Biology. Hong Kong, HK. (2016). **Poster**.
13. FRET2: Förster Resonance Energy Transfer in the Life Sciences. Göttingen, GER. (2016). **Poster**.
14. FASEB: Machines on Genes. Snowmass, CO. (2014). **Poster**.
15. Single Molecule Biophysics at the Aspen Center for Physics. Aspen, CO. (2013). **Poster**.
16. Biophysical Society Meeting. San Diego, CA. (2012). **Poster**.

Research Seminars

1. Department of Medicinal Chemistry, University of Kansas City (2021)
2. Division of Biological Sciences, University of Missouri - Kansas City (2021)
3. Analytical Chemistry Group, University of Kansas. (2020).
4. Cancer Biology Interest Group, University of Kansas. (2019).
5. Department of Computational Biology, University of Kansas. (2019).
6. Department of Biochemistry and Molecular Biology, University of Kansas Medical Center. (2019).
7. Bioengineering Graduate Program, University of Kansas. (2019).

Teaching and Mentoring Experience

University of Kansas

- Instructor for:
  BIOL 918 — *Modern Biophysical Techniques*
  BIOL 750 — *Advanced Topics in Biochemistry*
  BIOL 636 — *Biochemistry I* (for majors)
- Supervised three post-doctoral researchers (S. Sen, S. Ungawardhana, and S.Nepal) to use confocal microscopes for a variety of single-molecule experimental techniques.
- Supervised three graduate researcher assistants (J. Sanders, P. Sperstad, G. Perkins) to use confocal microscopes for a variety of single-molecule experimental techniques.
- Supervised Molecular Biosciences rotation student (B. May, G. Perkins, K. Accilien, and H. Hapugaswatta)
- Supervised post-bachelorette summer research project for (A. Galbraith)
- Supervised research projects for KU Undergraduate students (D. Frank, H. Hutsell, R. Bachmuth, and S. Einhaus)
- Supervised capstone research project of a Drake University undergraduate student (M. Magee)

University of Zurich

- Supervised the research projects of master's students (F. Sturzenegger, M. Nueesch, and Z. Liu)
- Supervised the research projects of four bachelor students (M. Nueesch, G. Galeno, S. Frei)
- Organized and directed three practical lab courses on ELISA (BCH308, BCH309, BCH408)

University of Colorado at Boulder

- Trained two post-doctoral researchers (N.F. Dupuis and M. Vieweger) and two graduate students to use confocal and wide field microscopes for a variety of single-molecule experimental techniques.
- Lead three biochemistry study sections for:
  CHEM 4711 — *General Biochemistry 1*
  CHEM 4731 — *General Biochemistry 2*
  CHEM 4611 — *Survey of Biochemistry*

Professional Development

2020	Reviewer for University of Kansas Undergraduate Research Award
2019 - 2021	External Grant Reviewer for Swiss National Science Foundation
2017	Preparing to Postdoc Workshop, University of Zurich
2016	Gordon Research Symposium Section Chair, Hong Kong, HK
2013	CU Wizards Scientific Outreach Program, University of Colorado
2011	CENECI Community Outreach Program, Salish-Kootenai College
2010 - 2011	RNA Club Co-organizer, University of Colorado
2009 - 2021	Biophysical Society Member

Awards

2019	Single Molecule Biophysics Conference Travel Award, Aspen Center for Physics
2014	Machines on Genes Conference Graduate Student Travel Award, FASEB
2013	Single Molecule Biophysics Conference Travel Award, Aspen Center for Physics
2011	Graduate School Student Travel Award, University of Colorado

Professional References

Prof. Ben Schuler
University of Zurich
Biochemistry
Winterthurerstrasse 190
8057 Zurich, CH
e: schuler@bioc.uzh.ch
p: +41 44 635 5535
f: +41 44 635 5907

Prof. David J. Nesbitt
University of Colorado/JILA
Chemistry and Biochemistry
UCB 440
Boulder, CO 80309
e: djn@jila.colorado.edu
p:(303) 492-8857
f: (303) 735-1424

Prof. Rob T. Batey
University of Colorado
Chemistry and Biochemistry
Campus Box 596
Boulder, CO 80309-0596
e: robert.batey@colorado.edu
p:(303) 735-2159
f: (303) 492-5894