

Emily F. Ruff

Assistant Professor of Biochemistry
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Education:

August 2009 – July 2014:

University of Wisconsin-Madison
Ph. D., Physical Chemistry
Thesis Advisor: Prof. M. Thomas Record, Jr.
Cumulative GPA: 3.63
Thesis Title: “Studies of Key Regions of *Escherichia coli* RNA Polymerase and Promoter DNA in Transcription Initiation”

September 2005 – June 2009:

Carleton College
B.A., Chemistry
Undergraduate Thesis Advisor: Prof. William Hollingsworth
Cumulative GPA: 3.67
Honors: *magna cum laude*, comprehensive exercise completed with distinction, certificate of advanced study in Chinese.

Professional Experience:

August 2017 – present:

Assistant Professor of Biochemistry at Winona State University

Research Focus: Using site-directed mutagenesis, protein purification, and spectroscopic techniques to investigate allosteric regulation of protein kinases.

Teaching Focus: Biochemistry lecture and lab.

April 2015 – August 2017:

Postdoctoral Scholar at the University of Minnesota with Prof. Nicholas Levinson

Research Focus: Used fluorescence techniques and kinetics to probe allosteric activation and inhibition of protein kinases.

November 2009 – March 2015:

Research Assistant and (as of July 2014) Postdoctoral Scholar at the University of Wisconsin-Madison with Prof. M. Thomas Record, Jr.

Research Focus: Investigating the mechanism of transcription initiation by *E. coli* RNA polymerase using fast kinetics, DNA footprinting, and other biochemical methods.

Professional Experience (continued):

March 2014 – June 2014: Research Assistant at Paris Diderot University – Institut Jacques Monod in collaboration with Dr. Terence Strick and Prof. M. Thomas Record Jr.

Research Focus: Single-molecule investigation of promoter sequence dependence of the initial steps of bacterial transcription initiation.

Publications:

Lake, E. W., Muretta, J. M., Thompson, A. R., Rasmussen, D. M., Majumdar, A., Faber, E. B., **Ruff, E. F.**, Thomas, D. D., Levinson, N. M. (2018) “Quantitative conformational profiling of kinase inhibitors reveals origins of selectivity for Aurora kinase activation states. *Proc. Natl. Acad. Sci. U.S.A.* 115 (51) e11894-e11903.

Ruff, E. F., Muretta, J. M., Thompson, A. R., Lake, E. W., Cyphers, S., Albanese, S. K., Hanson, S. M., Behr, J. M., Thomas, D. D., Chodera, J. D., Levinson, N. M. (2018) “A dynamic mechanism for allosteric activation of Aurora kinase A by activation loop phosphorylation. *eLife*, 7, e32766.

Cyphers, S., **Ruff, E. F.**, Behr, J., Chodera, J. D., Levinson, N. M. (2016) “A conserved water-mediated hydrogen bond network governs allosteric activation in Aurora kinase A.” *Nat. Chem. Biol.*, 13 (4), 402-408.

Henderson, K. L., Felth, L. C., Molzahn, C. M., Shkel, I., Wang, S., Chhabra, M., **Ruff, E. F.**, Bieter, L., Kraft, J. E., Record, M. T., Jr. (2017) “Mechanism of transcription initiation and promoter escape by *E. coli* RNA polymerase.” *Proc. Natl. Acad. Sci. U.S.A.* 114 (15) e3032-3040.

Ruff, E. F., Drennan, A. C., Capp, M. W., Poulos, M. A., Artismovitch, I., Record, M. T., Jr. (2015) “*E. coli* RNA Polymerase Determinants of Open Complex Lifetime and Structure,” *J. Mol. Biol.*, 427 (15), 2435-2450.

Ruff, E. F., Record, M. T., Jr., Artismovitch, I. (2015) “Initial Events in Bacterial Transcription Initiation,” *Biomolecules*, 5 (2), 1035-1062.

Ruff, E. F., Kontur, W. S., and Record, M. T., Jr. (2015) “Using Solutes to Probe Large Conformational Changes in the Steps of Transcription Initiation” In: *Bacterial Transcriptional Control: Methods and Protocols*, Springer, New York, NY, 241-261.

Drennan, A. C., Kraemer, M. R., Capp, M. W., Gries, T., **Ruff, E. F.**, Sheppard, C., Wigneshweraraj, S., Artismovitch, I., and Record, M. T., Jr. (2012) “Key Roles of the Downstream Mobile Jaw of *E. coli* RNA Polymerase in Transcription Initiation,” *Biochemistry*, 51 (47), 9447-9459.

Patents and Patent Applications:

Levinson, N. M., **Ruff, E. F.**, Muretta, J. M., Thomas, D. D. “Protein Kinase Allostery Sensor and Methods of Making and Using Same.” (2016) U.S. Provisional Patent Appl. 62/385,555, September 9, 2016.

Invited Short Talks:

- March 2017 **E. Ruff**, S. Cyphers, J.M. Muretta, D.D. Thomas, N. Levinson. “Novel Allosteric FRET Assays for Mechanistic Studies and Inhibitor Screening of Aurora A Kinase.” Keystone Symposium – Kinases: Next-Generation Insights and Approaches.
- February 2015 **E. Ruff**, A. Drennan, I. Artsimovitch, M. T. Record, Jr. “*E. coli* RNAP Determinants of Open Complex Lifetime and Structure.” University of Wisconsin-Superior, NSF ADVANCE Postdoctoral Seminar Program
- August 2013 **E. Ruff**, D. Svetlov, N. Bown, T. Persing, A. Drennan, I. Artsimovitch, M. T. Record, Jr. “Towards a general mechanism for transcription initiation.” Molecular Genetics of Bacteria and Phages meeting
- June 2013 **E. Ruff**, D. Svetlov, N. Bown, T. Persing, A. Drennan, I. Artsimovitch, M. T. Record, Jr. “Towards a general mechanism for transcription initiation.” FASEB Mechanism and Regulation of Prokaryotic Transcription SRC
- Poster Presentations:**
- March 2020: S. Lund, **E. Ruff**. “Investigation of activity and nucleotide binding of vaccinia-related kinase 3 (VRK3).” ACS Spring National Meeting & Expo. (*accepted, did not attend.*)
- March 2020: N. D. Becker, H. R. Tima, A. S. Guerrero, J. W. West, V. A. Stepanova, **E. Ruff**. “Bioactivities of synthesized curcumin, curcuminoids, and their metal complexes.” ACS Spring National Meeting & Expo. (*accepted, did not attend.*)
- August 2019: **E. Ruff**. “Purification and analysis of human protein kinase domains for undergraduate students.” ASBMB conference: Transforming Education in the Molecular Life Sciences.
- March 2017: **E. Ruff**, S. Cyphers, J.M. Muretta, D.D. Thomas, N. Levinson. “Novel Allosteric FRET Assays for Mechanistic Studies and Inhibitor Screening of Aurora A Kinase.” Keystone Symposium – Kinases: Next-Generation Insights and Approaches.
- September 2014: **E. Ruff**, D. Svetlov, N. Bown, T. Persing, A. Drennan, I. Artsimovitch, M. T. Record, Jr. “Towards a general mechanism for transcription initiation.” 76th Harden Conference: Total Transcription
- February 2014: **E. Ruff**, D. Svetlov, N. Bown, T. Persing, A. Drennan, I. Artsimovitch, M. T. Record, Jr. “Towards a general mechanism for transcription initiation.” Biophysical Society Meeting

Poster Presentations (continued):

- June 2013 **E. Ruff**, D. Svetlov, N. Bown, T. Persing, A. Drennan, I. Artsimovitch, M. T. Record, Jr. "Towards a general mechanism for transcription initiation." FASEB Mechanism and Regulation of Prokaryotic Transcription SRC
- February 2013 **E. Ruff**, D. Svetlov, I. Artsimovitch, M.T. Record, Jr. "Regulation of initiation and transcription by *E. coli* RNA polymerase $\sigma_{1.2}$ and promoter sequence." Biophysical Society Meeting
- June 2011 **E. Ruff**, K. Zorn, M. Capp, M.T. Record, Jr., R.M. Saecker. "Role of Upstream DNA in Accelerating DNA Opening by *E. coli* RNA Polymerase." FASEB Mechanism and Regulation of Prokaryotic Transcription SRC

Fellowships and Awards:

- January 2019 Winona State University Special Project Grant, "Conformational Regulation of the Noncanonical Kinase Haspin"
- April - August 2017: NIH Fellowship F32 GM120817, "Novel Kinase Allostery FRET Assays for Mechanistic Studies and Drug Design"
- Spring 2015: NSF ADVANCE Award for travel to speak at University of Wisconsin-Superior
- Fall 2014: 76th Harden Conference: Total Transcription Travel Bursary
- Spring 2014: University of Wisconsin-Madison Sigrid Leirimo Memorial Award in Biochemistry
- Spring 2014: EMBO Short-Term Fellowship for three months of work at Paris Diderot University
- Spring 2014: University of Wisconsin-Madison Vilas Research Travel Award
- Spring 2012: University of Wisconsin-Madison Chemistry Department GSFLC Conference Travel Award
- Winter 2008: Carleton College Kolenkow-Reitz Award for Undergraduate Research

Teaching Experience:

- Fall 2020: CHEM 107 Chemistry in Our World (lab only); CHEM 212 Principles of Chemistry I (lab only); CHEM 405 Biochemistry I; CHEM 406 Biochemistry I lab
- Summer 2020: CHEM 210 General, Organic and Biological Chemistry (online)

Teaching Experience (continued):

Spring 2020:	CHEM 210 General, Organic and Biological Chemistry; CHEM 212 Principles of Chemistry I (lab only); CHEM 475 Seminar in Chemistry
Fall 2019:	CHEM 213 Principles of Chemistry II (lab only); CHEM 405 Biochemistry I lecture; CHEM 406 Biochemistry I Lab
Spring 2019:	CHEM 210 General, Organic, and Biological Chemistry; CHEM 407 Biochemistry II lecture; CHEM 408 Biochemistry II lab
Fall 2018:	CHEM 405 Biochemistry I lecture; CHEM 406 Biochemistry I Lab
Spring 2018:	CHEM 408 Biochemistry II Lab; CHEM 439 Biochemistry of Drug Metabolism; CHEM 190 Forensic Chemistry (lab only)
Fall 2018:	CHEM 406 Biochemistry I Lab; CHEM 375 Clinical Biochemistry; CHEM 212 Introduction to Chemistry I (lab only)
Fall 2014, 2013, 2012, 2011, 2010:	Teaching Assistant for Biophysical Chemistry 565
Fall 2009; Spring 2010, 2011:	Teaching Assistant for General Chemistry

Mentoring Experience:

August 2017—present:	Serving as a mentor for 10 Winona State undergraduate researchers in the field of biochemistry
June 2016 – August 2016:	Served as a research mentor in the Levinson laboratory for one summer REU student from the University of Puerto Rico.
Spring 2010 – April 2015:	Served as research mentor to seven UW-Madison undergraduate research assistants for 1-5 semesters each; two graduates now at University of Wisconsin-Madison Medical School.
August 2014:	Volunteered with UW-Madison's Mentored Exposure to Scientific Exchange program (introducing underrepresented minority students to various aspects of the Molecular Genetics of Bacteria and Phages research conference).
Summer 2012:	Served as research mentor to one REU student from the University of the Incarnate Word (San Antonio, TX); student is now a UW-Madison Biological Chemistry Ph.D. candidate.

Professional Service:

August 2020 – present:	Faculty Senate member
January 2019 – present:	Faculty advisor for Winona State's chapter of Women in Science and Engineering (WISE)

Professional Service (continued):

- September 2017 – May 2020: Winona State University Course and Program Proposal Subcommittee (CPPS)
- May 2016 – August 2017: Volunteer with the University of MN Chemistry department performing science outreach demonstrations with Twin Cities GED students.
- Spring 2013 – Spring 2015: Volunteer demonstrating use of gold nanoparticles as salt sensors to the public at UW Madison science outreach events (Wisconsin Science Festival, UW-Madison Engineering Expo, others).
- Fall 2012 – Spring 2013: Co-organizer, Physical Chemistry Student Seminar series.
- Other Experience:**
- Spring 2018 – present: Co-organizer, Nerd Nite Winona
- Spring 2016: Independent consultant with Knewton (educational software development company) evaluating and fact checking General Chemistry tutoring materials
- Fall 2012 – Spring 2015: Performing member and teacher with Atlas Improv Co. (Madison, WI), a professional improv theater