

Tyler M. Earnest

Curriculum vitae

Roger Adams Laboratory
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Education

- 2008–2016 **M.S. Physics, Ph.D Physics**, *University of Illinois, Urbana-Champaign*, GPA: 3.81/4.00.
Advisor: Zan Luthey-Schulten. Dissertation: Stochastic and physical modeling of fundamental biological processes.
- 2003–2008 **B.S. Chemistry, B.S. Physics**, *South Dakota School of Mines and Technology*, GPA: 3.98/4.00.
Advisor: Steve Smith. Senior thesis: “Single Lanthanide-doped Nanoparticles Observed by Total Internal Reflection Fluorescence Microscopy”

Research Experience

- 2016– **Postdoctoral Research**, *National Center for Supercomputing Applications, UIUC*.
Developing techniques adding higher biological realism to stochastic reaction–diffusion simulations. Supervised by Zan Luthey-Schulten
- 2010–2016 **Graduate Research**, *Center for the Physics of Living Cells, UIUC*.
Modeled various biological systems using both computational and analytic methods. Supervised by Taekjip Ha, Zan Luthey-Schulten, and Karin A. Dahmen
- 2015 **Graduate Research**, *Center for Molecular Biophysics, Oak Ridge National Lab*.
Worked on model development pursuant to the Advanced Biosystems Imaging initiative. Supervised by Jeremy Smith and Zan Luthey-Schulten.
- 2010–2011 **Graduate Research**, *University of Illinois, Urbana-Champaign*.
Analyzed experimental data for the presence of critical phenomena in granular systems. Supervised by Karin A. Dahmen
- 2009 **Graduate Research**, *University of Illinois, Urbana-Champaign*.
Developed software to process data from single-molecule microscopy experiments. Supervised by Paul Selvin
- 2007–2008 **Undergraduate Research**, *South Dakota School of Mines and Technology*.
Designed a custom total internal reflection fluorescence illuminator for use in single molecule imaging. Data processing in IDL. Supervised by Steve Smith
- 2006 **Research Experience for Undergraduates**, *University of Nevada, Reno*.
Devised a functionalization scheme to immobilize synthetic molecular motors to fused silica slides for laser spectroscopy. Supervised by Joseph I. Cline
- 2006–2007 **Undergraduate Research**, *South Dakota School of Mines and Technology*.
Synthesized itaconic acid derivatives as a crosslinking agent in epoxidized vegetable oil to produce bio-based resins. Supervised by David A. Boyles
- 2004–2005 **Undergraduate Research**, *South Dakota School of Mines and Technology*.
Developed an analytical technique to determine volatile organic compound concentration in ground water using infrared spectroscopy. Supervised by Daniel Heglund

Publications

- 2017 Earnest TM, Watanabe R, Stone JE, Mahamid J, Baumeister W, Villa E, Luthey-Schulten Z, "Challenges of Integrating Stochastic Dynamics and Cryo-Electron Tomograms in Whole-Cell Simulations," *J. Phys. Chem. B* **121**(15):3871–3881 (2017), 10.1021/acs.jpcc.7b00672.
- 2016 Earnest TM, Cole JA, Peterson JR, Hallock MJ, Kuhlman TE, Luthey-Schulten Z, "Ribosome biogenesis in replicating cells: integration of experiment and theory," *Biopolymers* **105**(10):735–751 (2016), 10.1002/bip.22892.
- 2015 Earnest TM, Lai J, Chen K, Hallock MJ, Williamson JR, Luthey-Schulten Z, "Toward a Whole-Cell Model of Ribosome Biogenesis: Kinetic Modeling of SSU Assembly," *Biophys. J.* **109**(6):1117–1135 (2015), 10.1016/j.bpj.2015.07.030.
- 2014 Vafabakhsh R, Kondabagil K, Earnest T, Lee KS, Zhang Z, Dai L, Dahmen KA, Rao VB, Ha T, "Single-molecule packaging initiation in real time by a viral DNA packaging machine from bacteriophage T4," *Proc. Natl. Acad. Sci. USA* **111**(42):15 096–15 101 (2014), 10.1073/pnas.1407235111.
- 2013 Earnest TM, Roberts E, Assaf M, Dahmen K, Luthey-Schulten Z, "DNA looping increases the range of bistability in a stochastic model of the lac genetic switch," *Phys. Biol.* **10**(2):026 002 (2013), 10.1088/1478-3975/10/2/026002.
- 2011 Liu C, McKinney MC, Chen YH, Earnest TM, Shi X, Lin LJ, Ishino Y, Dahmen K, Cann IKO, Ha T, "Reverse-Chaperoning Activity of an AAA+ Protein," *Biophys. J.* **100**(5):1344–1352 (2011), 10.1016/j.bpj.2011.01.057.

Conference Presentations

- 2016 **Ribosome Biogenesis in Replicating Cells**, Tyler M. Earnest, John A. Cole, Joseph R. Peterson, Michael A. Hallock, Thomas E. Kuhlman, Zan Luthey-Schulten.
Poster, Spatially Distributed Stochastic Dynamical Systems in Biology, June 20-24, Cambridge, UK.
- 2016 **Simulating ribosome biogenesis in replicating whole cells**, Tyler M. Earnest, Zan Luthey-Schulten.
NCSA Blue Waters Symposium for Petascale Science and Beyond, June 13-15, Sunriver, OR, USA.
- 2015 **Towards a whole-cell model of ribosome biogenesis: Kinetic modeling of SSU assembly**, Tyler M. Earnest, Ke Chen, Jonathan Lai, and Zan Luthey-Schulten.
2015 Annual Meeting of the International Physics of Living Systems (iPoLS) Network. July 16-20, 2015. Arlington, VA, USA.
- 2015 **Towards a Whole-Cell Model of Ribosome Biogenesis: Kinetic Modeling of SSU Assembly**, Tyler M. Earnest, Ke Chen, Jonathan Lai, and Zan Luthey-Schulten.
Poster, 59th Annual Meeting of the Biophysical Society. February 7-11, 2015. Baltimore, MD.
- 2014 **Coarse-grained Simulations of Nucleoid Structure**, Tyler M. Earnest, Yu-Hang Tang, and Zan Luthey-Schulten.
Poster, 58th Annual Meeting of the Biophysical Society. February 15-19, 2014. San Francisco, CA.
- 2013 **The addition of a coarse-grained looping state enhances bistability in a gene expression model of lac**, Tyler M. Earnest, Elijah Roberts, Michael Assaf, Karin A. Dahmen, and Zan Luthey-Schulten.
Talk, March Meeting of the American Physical Society, March 18-22, 2013. Baltimore, MD.

- 2011 **Switching Rates in a Three-state Genetic Switch**, *Tyler M. Earnest, Elijah Roberts, Michael Assaf, Karin A. Dahmen, and Zan Luthey-Schulten*.
Poster, 5th Annual q-bio Conference on Cellular Information Processing. August 10-14, 2011. Santa Fe, NM.
- 2011 **Switching Rates in a Three-state Genetic Switch**, *Tyler M. Earnest, Elijah Roberts, Michael Assaf, Karin A. Dahmen, and Zan Luthey-Schulten*.
Talk, Physics of Living Systems - Student Research Network. June 21, 2011. UCSD, La Jolla, CA.
- 2011 **Statistics of slip avalanches in sheared granular materials: Theory and experiments**, *Tyler M. Earnest*.
Talk, 1st Annual Illinois/Purdue Dynamics Research Meeting. February 26, 2011. Urbana, IL
- 2010 **Kinetic modeling of RFC assisted replication clamp assembly**, *Tyler M. Earnest*.
Talk, Center for the Physics of Living Cells Postdoc and Graduate Symposium. Fall 2010. Urbana, IL
- 2008 **Fluorescence Intermittency in Single Lanthanide Ions Observed by Total Internal Reflection Microscopy**, *Tyler M. Earnest and Steve Smith*.
Poster, Nanoscience Energy Research and Development Symposium. April 12, 2008. Rapid City, SD
- 2006 **Amino-terminated Self-assembled Monolayers on Silica for Molecular Immobilization**, *Tyler M. Earnest and Joseph I. Cline*.
Poster, UNR REU Student Poster Session. Summer 2006. Reno, NV.
- 2006 **Characterization of Thermal-cured and Photo-cured Bio-based Systems for Novel Resins**, *Bobbie Laurenz, Mohammed Al-Omar, Tyler M. Earnest, and David A. Boyles*.
Poster, South Dakota EPSCoR Student Research Poster Session, Rapid City, SD

Professional Training

- 2011 **The Fifth q-bio Summer School on Cellular Information Processing**, *July 25 – August 9, 2011. Los Alamos, NM*.
Participated in the “Stochastic Biochemistry” theme.

Service

- 2011-2012 **Physics of Living Systems - Student Research Network**, *Student Ambassador from UIUC*.

Honors and Awards

- 2015 **DOE Office of Science Graduate Student Research (SCGSR) Program**, *DOE/BER*.
The SCGSR program provides supplemental awards to outstanding U.S. graduate students to pursue part of their graduate thesis research at a DOE laboratory in areas that address scientific challenges central to the Office of Science mission.
- 2012 **L.S. Edelheit Family Biological Physics Fellowship**, *UIUC*.
Provides an graduate fellowship for an exceptional student in biological physics (experiment or theory).
- 2006 **Outstanding Physics Senior Award**, *SDSMT*.
- 2006 **McDowell Chemistry Alpha Chi Sigma Award**, *SDSMT*.
- 2006 **Junior Science and Letters Academic Achievement Award**, *SDSMT*.
- 2006 **Frank and Marilyn Richardson Scholarship Award**, *SDSMT*.
Award of \$5,000 to the three top undergraduates.
- 2005 **Sophomore Science Academic Achievement Award**, *SDSMT*.

- 2005 **Nelson Outstanding Scholar Award, SDSMT.**
Award of \$8,700 to one outstanding undergraduate who is in the upper fourth of his/her class.
- 2005 **Member of Phi Eta Sigma—Freshman Honor Society.**
- 2005 **Member of the National Scholars Honor Society.**
- 2005 **Freshman Chemistry Achievement Award, SDSMT.**
- 2004 **Freshman Science Academic Achievement Award, SDSMT.**