# Tyler M. Earnest

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## Education

2008–2016 **M.S. Physics, Ph.D Physics**, *University of Illinois, Urbana-Champaign.*
Adviser: 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.*
Adviser: Steve Smith. Senior thesis: "Single Lanthanide-doped Nanoparticles Observed by Total Internal Reflection Fluorescence Microscopy"

## Research Experience

2017– **Postdoctoral Research**, *Department of Physics, UIUC.*
Developing hybrid simulation methods to simulate whole-cells. Supervised by Zan Luthey-Schulten

2016–2017 **Postdoctoral Research**, *National Center for Supercomputing Applications, UIUC.*
Developed 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

2018 Bianchi D, Peterson J, **Earnest T**, Hallock M, Luthey-Schulten Z, "Hybrid CME–ODE Method for Efficient Simulation of the Galactose Switch in Yeast," *IET Syst. Biol.* (2018), doi:10.1049/iet-syb.2017.0070.

2018 **Earnest TM**, Cole JA, Luthey-Schulten Z, "Simulating Biological Processes: Stochastic Physics from Whole Cells to Colonies," *Rep. Prog. Phys.* **81**(5):052 601 (2018), doi:10.1088/1361-6633/aaae2c, *TME and JAC share first authorship.*

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), doi:10.1021/acs.jpcb.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), doi: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), doi: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), doi: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), doi: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), doi:10.1016/j.bpj.2011.01.057.

## Conference Presentations

2018 **Integration of Reaction–Diffusion Master Equation and Brownian Dynamics Methodologies for Whole-Cell Simulations**, *Earnest TM, Hallock MA, Luthey-Schulten Z.*
Poster, Multi-resolution simulations of intracellular processes, September 24-25, Chicheley, UK.

2016 **Ribosome Biogenesis in Replicating Cells**, *Earnest TM, Cole JA, Peterson JR, Hallock MA, Kuhlman TE, Luthey-Schulten Z.*
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**, *Earnest TM, Chen K, Lai J, Luthey-Schulten Z.*
Poster, 59$^{th}$ Annual Meeting of the Biophysical Society. February 7-11, 2015. Baltimore, MD.

2014 **Coarse-grained Simulations of Nucleoid Structure**, *Earnest TM, Tang Y-H, and Luthey-Schulten Z.*
Poster, 58$^{th}$ 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***, *Earnest TM, Roberts E, Assaf M, Dahmen KA, Luthey-Schulten Z.*
Talk, March Meeting of the American Physical Society, March 18-22, 2013. Baltimore, MD.

2011 **Switching Rates in a Three-state Genetic Switch**, *Earnest TM, Roberts E, Assaf M, Dahmen KA, Luthey-Schulten Z.*
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.

## Teaching

2018 **"Hands-On" Workshop on Cell Scale Simulations**, *NIH Workshop on Theoretical and Computational Biophysics, Urbana, IL.*
Lectured and developed materials for course on designing whole-cell simulations.

2017 **Graduate Statistical Mechanics**, *Department of Chemistry, UIUC.*
Lectured and developed materials for course.

2014 **Computational Analysis of Cellular Structures and Processes**, *Physics of Living Cells Summer School, Center for the Physics of Living Cells, UIUC.*
Lectured on stochastic methods in biology and supervised tutorial on Lattice Microbes.

2013 **Graduate Statistical Mechanics**, *Department of Chemistry, UIUC.*
Graded homework and contributed to course materials.

2013 **Graduate Nonequilibrium Statistical Mechanics**, *Department of Chemistry, UIUC.*
Graded homework and contributed to course materials.

2011 **Single-molecule Fluorescence**, *Physics of Living Cells Summer School, Center for the Physics of Living Cells, UIUC.*
Lectured and supervised lab on hidden Markov model analysis of data from single-molecule fluorescence experiments.

2008–2010 **Undergraduate Physics**, *Department of Physics, UIUC.*.
Taught 100-level physics labs. Four semesters.

## 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*.