

THOMAS E. KUHLMAN, PH.D.
CURRICULUM VITAE

University of Illinois at Urbana-Champaign
Department of Physics
315 Loomis Laboratory of Physics, MC-704
1110 W. Green St.
Urbana, IL 61801

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RESEARCH EXPERIENCE

University of Illinois at Urbana-Champaign, Department of Physics

Assistant Professor of Physics and Biophysics
Center for the Physics of Living Cells
Center for Biophysics and Quantitative Biology
Computational Science and Engineering Faculty Affiliate
Sept. 2012 - Present

Princeton University, Department of Molecular Biology

Postdoctoral Fellow
Adviser: Prof. Edward C. Cox
Biophysical consequences of genome organization for transcriptional regulation
June 2008 - Sept. 2012

University of California San Diego, Department of Physics

Postdoctoral Researcher, Center for Theoretical Biophysics
Graduate Student Researcher, Center for Theoretical Biophysics
Adviser: Prof. Terence Hwa
Dissertation Title: A Quantitative Analysis of Genetic Transcriptional and Post-
Transcriptional Regulation in *Escherichia coli*
May 2007 - June 2008
June 2003 - May 2007

Institute for Nonlinear Science, University of California, San Diego

Undergraduate Student Researcher
Adviser: Prof. Henry Abarbanel
Information processing in biological neural assemblies
June 1997 - Aug. 1997

EDUCATION

University of California, San Diego

Ph.D. Physics
M.S. Physics
May 2007
Dec. 2002

Ball State University

B.A. Cellular and Molecular Biology, Genetics, and Physics
Summa Cum Laude
May 2000

HONORS AND AWARDS

University of Illinois at Urbana-Champaign

Research Corporation for Science Advancement Scialog Fellow
Center for Advanced Study Fellow
Alfred P. Sloan Research Fellow in Physics
Provisional Patent
An Integrated System for Precise Genome Modification in *E. coli*
2016 - 2017
2016 - 2017
2015 - 2017
Sept. 2014

Princeton University

NIH F32 Ruth L. Kirschstein National Research Service Fellowship
Invention Docket 10-2603-1
Site specific chromosomal integration of large synthetic constructs
July 2010 - July 2012
Jan. 2010

University of California, San Diego

Certificate of Recognition 2002 - 2003
For Contribution to Graduate Dean's Select Committee on TA Training
Office of Graduate Studies and Research and the Center for Teaching Development
Teaching Assistant Excellence Award, Department of Physics June 2001

Ball State University

Department of Physics Outstanding Senior Award 2000
Presidential Scholarship 1995 - 2000

Professional Memberships

Sigma Xi
American Physical Society
Biophysical Society
American Society for Microbiology

PUBLICATIONS

- [1] Sherer NA, Lee G, Kim NH, Rajic E, Kaur D, Xue C, Martini KM, Shih HY, Goldenfeld N, and Kuhlman TE (2017). Activity and Effects of a Human LINE-1 Retrotransposon in Bacteria. In Preparation.
- [2] Martini KM, Kim NH, Xhu M, Sherer NA, Lee G, Goldenfeld N, and Kuhlman TE (2017). Dynamic Scaling of Bacterial Population Size. In Preparation.
- [3] Sherer NH, Kim NH, Martini KM, Lee G, Goldenfeld N, and Kuhlman TE (2017). Quantitative Characterization of a Transposable Element Input-Output Function. In Preparation.
- [4] Kim NH, Tas H, Nguyen CT, and Kuhlman TE (2017). DNA Condensation Alters Transcription Factor Specific Binding Energetics *In Vivo*. In Preparation
- [5] Englaender JA, Jones JA, Cress BF, Kuhlman TE, Linhardt RJ, Koffas MAG (2016). Genomic Integration for Heterologous Protein Expression and Metabolic Engineering in *E. coli*: Location Matters. In Submission.
- [6] Atay O, Amosova O, Kuhlman TE, Cox EC, and Fresco JR (2016). DNA Self-catalytic Depurination Sequences Reduce Gene Expression and Result in Stochastic Switching. In Review.
- [7] Fraebel D, Mickalide H, Merritt J, Schnitkey D, Shih HY, Goldenfeld N, Kuhlman TE, and Kuehn S (2016). Evolution of Bacterial Motility Through a Porous Environment. In Review
- [8] Kim NH, Lee G, Sherer NA, Martini KM, Goldenfeld N, and Kuhlman TE (2016). Real Time Transposable Element Activity in Individual Live Cells. *Proc Natl Acad Sci* 113(26): 7278-83.
- [9] Earnest TM, Cole J, Peterson J, Hallock M, Kuhlman TE, and Luthey-Schulten Z (2016). Ribosome Biogenesis in Replicating Cells: Integration of Experiment and Theory. *Biopolymers* 105(10): 735-51.
- [10] Zhang J, Fei J, Leslie B, Young HK, Kuhlman TE, and Ha TJ (2015). Tandem Spinach Array for mRNA Imaging in Live Cells. *Scientific Reports* 5: p.17295.
- [11] Tas H, Nguyen CT, Patel R, Kim NH, and Kuhlman TE (2015). An Integrated System for Precise Genome Modification in *Escherichia coli*. *PLoS ONE* 10(9): e0136963.
- [12] Johnson-Chavarria EM, Agrawal U, Tanyeri M, Kuhlman TE, and Schroeder CM (2014). Automated Single Cell Microbioreactor for Monitoring Intracellular Dynamics and Cell Growth in Free Solution. *Lab on a Chip*, 14(15):2688-2697.
- [13] Kuhlman TE, Cox EC (2013). DNA Binding Protein Inhomogeneity in *E. coli* Modeled as Bi-Phasic Facilitated Diffusion. *Physical Review E*, 88(2):022701.

- [14] Kuhlman TE, Cox EC (2012). Gene Location and DNA Density Determine Transcription Factor Distributions in *E. coli*. *Molecular Systems Biology*, 8:610.
- [15] Kuhlman TE, Cox EC (2010). A Place for Everything: Chromosomal Integration of Large Constructs. *Bioengineered Bugs*, 1(4): pp. 298-301
- [16] Kuhlman TE, Cox EC (2010). Site Specific Chromosomal Integration of Large Synthetic Constructs. *Nucleic Acids Research Methods Online*. PMID: 20047970
- [17] Garcia HG, Sanchez A, Kuhlman TE, Phillips R, and Kondev J (2010). Transcriptional Regulation by the Numbers Redux: Experiments and Calculations That Surprise. *Trends in Cell Biology*, 20(12): pp. 723-733
- [18] Kuhlman TE, Zhang Z, Saier MH, and Hwa T (2007). Combinatorial Transcriptional Control of the Lactose Operon of *E. coli*. *Proc Natl Acad Sci*, 104(14): pp. 6043-48.
- [19] Levine E, Zhang Z, Kuhlman TE, and Hwa T (2007). Quantitative Characteristics of Gene Regulation by Small RNA. *PLoS Biology*, 2(9) e229.
- [20] Bintu L, Buchler NE, Garcia H, Gerland U, Hwa T, Kondev J, Kuhlman TE, and Phillips R (2005). Transcriptional Regulation by the Numbers: Applications. *Curr Op Genet Dev* 15: 125-135.

PRESENTATIONS & ABSTRACTS

- [21] Kuhlman TE. *Real Time Transposable Element Activity in Individual Live Cells*. Molecular Mechanisms in Evolution Gordon Research Conference (Easton, MA) 2017. Invited talk.
- [22] Kuhlman TE. *Real Time Transposable Element Activity in Individual Live Cells*. Physics and Astronomy Complex System Seminar, Northwestern University (Evanston, IL) 2017. Invited talk.
- [23] Kuhlman TE. *Real Time Transposable Element Activity in Individual Live Cells*. Stochastic Physics in Biology Gordon Research Conference (Ventura, CA) 2017. Invited talk.
- [24] Kuhlman TE. *Real Time Transposable Element Activity in Individual Live Cells*. Carl R. Woese Institute for Genomic Biology Biocomplexity Seminar (Urbana, IL) 2016. Invited talk.
- [25] Kuhlman TE. *Mutations and Evolution in Live Cells and in Real Time*. Department of Physics Colloquium (Urbana, IL) 2016. Invited talk.
- [26] Kuhlman TE. *Real Time Transposable Element Activity in Individual Live Cells*. Winter q-Bio Meeting (Honolulu, HI) 2016. Contributed talk.
- [27] Kuhlman TE. *Real Time Transposable Element Activity in Individual Live Cells*. Institute for Genomic Biology BCXT Seminar (Urbana, IL) 2016. Invited talk.
- [28] Kuhlman TE. *Real Time Transposable Element Activity in Individual Live Cells*. Purdue University Biophysics Seminar (West Lafayette, IN) 2016. Invited talk.
- [29] Kuhlman TE. *Quantification of Genome Plasticity and Evolutionary Dynamics*. International Center for Theoretical Science Winter School (Bangalore, India). Invited talk.
- [30] Kuhlman TE. *Real Time Transposable Element Activity and Evolutionary Dynamics in Live Cells*. University of California, San Diego Quantitative Biology Seminar (La Jolla, CA) 2015. Invited talk.
- [31] Kuhlman TE. *Real Time Transposable Element Dynamics*. Biophysical Society Annual Meeting (Baltimore, MD) 2015. Abstract for short talk.
- [32] Kuhlman TE. *The Physics of Gene Regulation and Decision Making in E. coli*. Illinois State University Physics Colloquium (Normal, IL) 2014. Invited talk.

- [33] Kuhlman TE. *Decisions, Decisions! How Cells Sense Their Environment and Make Decisions to Adapt and Respond*. UIUC Saturday Physics for Everyone (Urbana, IL) 2014. Invited talk.
- [34] Kuhlman TE. *Real Time Genomic and Evolutionary Dynamics*. UIUC Microbiology Seminar (Urbana, IL) 2014. Invited talk.
- [35] Kuhlman TE. *Growth state dependent transcription factor diffusion in Escherichia coli*. International Physics of Living Systems Annual Meeting (Munich, Germany) 2014. Invited talk.
- [36] Kuhlman TE. *Real-time evolutionary dynamics*. Annual CB2 Symposium (Urbana, IL) 2014. Invited talk
- [37] Kuhlman TE. *Growth state dependent intracellular diffusion in E. coli*. 2nd Winter Q-Bio Meeting (Kona, HI) 2014. Abstract for short talk.
- [38] Kuhlman TE. *Growth state dependent intracellular diffusion in E. coli*. 1st Korea Symposium on Current Trends in Biophysics (Jeju, Korea) 2013. Invited talk.
- [39] Kuhlman TE and Cox EC. *Growth-state dependent intracellular diffusion in Escherichia coli*. Edward C. Cox Symposium, Princeton University (Princeton, NJ) 2013. Invited talk.
- [40] Kuhlman TE and Cox EC. *Gene location and DNA density determine transcription factor distributions in Escherichia coli*. American Physical Society March Meeting (Baltimore, MD) 2013. Abstract for short talk.
- [41] Kuhlman TE and Cox EC. *Gene location and DNA density determine transcription factor distributions in Escherichia coli*. Biophysical Society Annual Meeting (Philadelphia, PA) 2013. Abstract for short talk.
- [42] Kleemann G, Cherg HJ, Yang A, Bloom J, Kuhlman TE, Cox EC, Kruglyak L, and Murphy C. *Natural genetic polymorphisms in set-15 and a casein kinase 1a homolog shape the mortality schedule of worms*. 19th International *C. elegans* Meeting (Los Angeles, CA) 2013. Abstract for poster presentation.
- [43] Kleemann G, Cherg HJ, Yang A, Bloom J, Kuhlman TE, Cox EC, Kruglyak L, and Murphy C. *Delimiting two polymorphic longevity loci with high-throughput assays*. 2012 National Centers for Systems Biology Meeting (Chicago, IL) 2012. Abstract for short talk.
- [44] Kuhlman TE and Cox EC. *Gene location and chromosomal compaction determine transcription factor distributions in Escherichia coli*. Workshop on DNA Reactions and DNA/Chromosome Dynamics (Woods Hole, MA) 2012. Abstract for short talk.
- [45] Kuhlman TE and Cox EC. *Gene location and DNA density determine transcription factor distributions in Escherichia coli*. California Institute of Technology (Pasadena, CA) 2012. Invited talk.
- [46] Kuhlman TE and Cox EC. *Gene location and DNA density determine transcription factor distributions in Escherichia coli*. UIUC CPLC seminar (Urbana, IL) 2012. Invited talk.
- [47] Kuhlman TE and Cox EC. *Gene location and DNA density determine transcription factor distributions in Escherichia coli*. UC San Diego Molecular Biology Seminar (La Jolla, CA) 2012. Invited talk.
- [48] Kuhlman TE and Cox EC. *Gene location and DNA density determine transcription factor distributions in Escherichia coli*. UC Irvine Center for Complex Biological Systems (Irvine, CA) 2012. Invited talk.
- [49] Kuhlman TE, and Cox EC. *Genome Organization and its Consequences for Gene Regulation in E. coli*. Gordon Conference on Single Molecule Methods in Biology (Lucca, Italy) 2010. Abstract for short talk.
- [50] Kuhlman TE, Lee P, Zhang Z, and Hwa T, 2008. *The characterization and application of a synthetic autoregulatory circuit*. San Diego Microbiology Group (San Diego, CA) 2008. Abstract for poster presentation.
- [51] Kuhlman TE, Zhang Z, Saier MH, and Hwa T. *Quantitative Dissection of a Bacterial Promoter: Cooperativity, Sensitivity, and Combinatorial Control*. APS March Meeting (Baltimore, MD) 2006. Abstract for poster presentation.

- [52] Levine E, Kuhlman TE, Zhang Z, and Hwa T. *Quantitative Study of Gene Regulation Mediated by Small RNA*. Abstract for poster presentation.
- [53] Kuhlman TE, Zhang Z, Saier MH, and Hwa T. *Quantitative Characterization and Modeling of Gene Regulation*. Federation of American Societies for Experimental Biology (FASEB) Summer Research Conference on Mechanisms and Regulation of Prokaryotic Transcription (Saxtons River, VT) 2005. Abstract for poster presentation.
- [54] Levine E, Kuhlman TE, Zhang Z, and Hwa T. *Gene Regulation by Small RNA*. Abstract for poster presentation. Federation of American Societies for Experimental Biology (FASEB) Summer Research Conference on Mechanisms and Regulation of Prokaryotic Transcription (Saxtons River, VT) 2005.
- [55] Kuhlman TE, Zhang Z, Saier MH, and Hwa T. *Quantitative Dissection of a Bacterial Promoter*. CalTech Summer School on Quantitative Biology and Transcriptional Regulation (Pasadena, CA) 2005. Abstract for talk.

TEACHING AND SERVICE

University of Illinois at Urbana-Champaign

Assistant Professor

Lecturer

PHYS 101 - College Physics: Mechanics and Heat (500 students)

Ranked Excellent Teacher by Students, Fall 2013

PHYS 435 - Electricity and Magnetism (100 students)

PHYS 436 - Electromagnetic Fields (100 students)

Aug. 2013 - Present

Discussion Coordinator

PHYS 101 - College Physics: Mechanics and Heat (500 students)

Aug. 2012 - Dec. 2012

Organizer

CPLC Summer School Modules on genome modification, microfluidics,
and live-cell single molecule microscopy

2012 - 2016

CPLC Biophysics Seminar Organizer

2013 - 2104

CPLC Undergraduate Fellows Program

2014 - 2015

CPLC Graduate Fellows Program

2014 - 2016

Biophysics Boot Camp (with Seppe Kuehn)

Aug. 2014, Aug. 2015

Platform Co-chair, 59th Annual Biophysical Society Meeting

Feb. 2015

CPLC Graduate and Postdoc Symposium Organizer

May 2015

Committees

Biophysics and Quantitative Biology Graduate Admissions

Department of Physics Graduate Admissions

Diversity Committee

Faculty Advisory Committee

Laboratory Safety Committee

Qualifying Exam Committee

Princeton University

Teaching Fellow

Responsible for delivering lectures and review sections, as well as grading exams

MOL215 - Quantitative Principles in Biology (60 students)

Sept. 2008 - Aug. 2012

Mira Costa College

Associate Faculty, Department of Physics

Physics instructor responsible for all aspects of course design and administration

Physics I Series - Introductory Physics for pre-med and similar areas (30 students)

Aug. 2007 - Dec. 2007

University of California, San Diego

Senior Teaching Assistant, Department of Physics

Sept. 2002 - Sept. 2003

Responsible for training and evaluation of new and continuing physics teaching assistants.
Department of Physics Qualifying Exam Tutor

June 2002 - Aug. 2002

Teaching Assistant

Sept. 2000 - Sept. 2003

Responsible for delivering lectures at discussion and problem-solving sections, as well as grading quizzes and exams and maintaining records and course web pages

Physics 130A-C - Quantum Physics for physics majors (30 students)

Physics 1 Series - Intro physics for life-science majors (300 students)

Physics 2 Series - Intro physics for science and engineering majors (200 students)