

Jeremy Lenn England

*Curriculum Vitae*

**Degrees and Education**

Ph.D. V. Pande and G. Haran	Physics	Stanford University	2009
Doctoral student J. Cardy	Physics	University of Oxford	2003-05
A. B. <i>summa cum laude</i> E. Shakhnovich	Biochemical Sciences	Harvard University	2003

**Employment**

Lecturer and independent fellow	Department of Physics	Princeton University	2009-11
Assistant Professor	Department of Physics	MIT	2011-16
Associate Professor	Department of Physics	MIT	2016-19
Vice President	Artificial Intelligence	GlaxoSmithKline	2023-
Senior Director	Artificial Intelligence	GlaxoSmithKline	2019-23
Principal Research Scientist	School of Physics	Georgia Inst. of Tech.	2020-23

**Honors**

American Physical Society Irwin Oppenheim Award (2021)  
James S. McDonnell Complexity Science Scholar Award (2016)  
Thomas D. and Virginia W. Cabot Career Development Assistant Professorship (MIT, 2014)  
Forbes Magazine 30 Under 30 Rising Stars in Science (2011)  
Associate fellowship at the Princeton Center for Theoretical Science (Princeton, 2009)  
Lewis-Sigler Theory Fellowship (Princeton, 2009)  
Hoopes Senior Thesis Prize (Harvard, 2003)  
Hertz Foundation Graduate Fellowship (2003)  
Rhodes Scholarship (2002)  
Junior election to Phi Beta Kappa (2002)  
Barry M. Goldwater Scholarship (2002)

**Publications**

Keinan, G., Sayal, K., Gonen, A., Zhu, J., Granovsky, L., & England, J. . Learning Perturbation-specific Cell Representations for Prediction of Transcriptional Response across Cellular Contexts., ICML (2023)

Kedia, H., Pan, D., Slotine, J. J., & England, J. L. Drive-specific adaptation in disordered mechanical networks of bistable springs, submitted.

Wang, C. H., Vetsigian, K., Lin, C., Firth, F., Bradley, G., Granovsky, L., & England, J. L. (2023). Simple Causal Relationships in Gene Expression Discovered through Deep Learned Collective Variables. *bioRxiv*, 2023-01, in revision.

Zhong, W., Gold, J. M., Marzen, S., England, J. L., & Yunger Halpern, N. (2021). Machine learning outperforms thermodynamics in measuring how well a many-body system learns a drive. *Scientific Reports*, *11*(1), 9333.

Chvykov, P. et al, "Low-rattling: a predictive principle for self-organization in active collectives", *Science*, **371**, 90-95 (2021)

Zhong, W., et al, "Learning about learning in many-body systems," *ICML*, (2020).

Sarkar, S. and England, J. L., "Design of conditions for self-replication," *Phys Rev E*, **100**, 022414 (2019)

Bisker, G. and England, J. L., "Nonequilibrium associative retrieval of multiple stored assembly targets." *Proc. Natl. Acad. Sci.*, **115**, E10531 (2018)

Marsland, R. A. and England, J. L. "Active regeneration unites high-and low-temperature features in cooperative self-assembly." *Physical Review E* **98.2**, 022411 (2018).

Chvykov, P. and England, J. L., "Least-rattling feedback from strong time-scale separation," *Phys. Rev. E*, **97**, 032115 (2018).

Marsland, R. A., and England, J. L., "Limits of predictions in thermodynamic systems: a review," *Rep. Prog. Phys.*, *81*, 016601 (2018)

Horowitz, J. M., and England, J. L., "Spontaneous Fine-tuning to Environment in Many-species Chemical Reaction Network." *Proc. Natl. Acad. Sci.*, **114**, 7565 (2017).

Kachman, T., Owen, J. O., and England J. L., "Self-organized Resonance during Search of a Diverse Chemical Space." *Phys. Rev. Lett.*, **119**, 038001 (2017).

Sadovsky, R. G., Brielle, S., Kaganovich, D., & England, J. L., "Measurement of Rapid Protein Diffusion in the Cytoplasm by Photo-Converted Intensity Profile Expansion." *Cell Reports*, *18*(11), 2795-2806, (2017).

Zhou, K., Horowitz, J. M., and England, J. L., "Minimum Dissipative Cost of Maintaining a Nonequilibrium State." *Phys. Rev. E*, *95*, 042102 (2017).

Perunov, N., Marsland, R., and England, J. L., "Statistical Physics of Adaptation." *Phys. Rev. X*, *6*, 021036 (2016).

Gingrich, T., Horowitz, J. M., Perunov, N., and England, J. L., "Dissipation Bounds All Steady-state Current Fluctuations." *Phys. Rev. Lett.*, *116*, 120601 (2016).

Marsland, R. M. and England, J. L. "Far-from-equilibrium distribution from near-steady-state work fluctuations." *Phys. Rev. E*, *92*, 052120 (2015).

England, J. “Dissipative Adaptation in Driven Self-assembly.” *Nature Nanotechnology*, 10, 920 (2015).

Brock, K., Werdiger, A., Amen, T., Kaganovich, D., and England, J. “Structural Basis for Modulation of Quality Control Fate in a Marginally Stable Protein.” *Structure (Cell Press)*, 23(7): 1169-78 (2015).

Perunov, N. and England, J. L. “Quantitative Theory of Hydrophobic Effect as a Driving Force of Protein Structure.” *Protein Science*, 23, 387 (2014).

England, J. L. “Statistical physics of self-replication.” *Journal of Chemical Physics*, 139, 121923 (2013).

Spokoini, R., Moldavski O., Nahmias Y., England, J. L., Schuldiner M., and Kaganovich, D. “Confinement to Organelle-Associated Inclusion Structures Mediates Asymmetric Inheritance of Aggregated Proteins in Budding Yeast.” *Cell Reports*, 2, 738 (2012).

England, J. L. “Allostery in protein domains reflects a balance of steric and hydrophobic effects.” *Structure (Cell press)*, 19, 967 (2011).

England, J. L. and Kaganovich, D. “Polyglutamine shows a urea-like affinity for unfolded protein.” *FEBS Lett.*, 585, 381 (2011).

England, J. L. and Pande, V. S., “Charge, hydrophobicity, and confined water: putting past simulations into a simple theoretical framework” *Biochemistry and Cell Biology*, 88, 359 (2010).

England, J. L., Lucent, D., and Pande, V. S., “A Role for Confined Water in Chaperonin Function.” *Journal of the American Chemical Society*. 130, 11838 (2008).

England, J. L., Pande, V. S., and Haran, G. “Chemical Denaturants Inhibit the Onset of Dewetting” *Journal of the American Chemical Society*, 130, 11854 (2008).

England, J. L. and Pande, V. S., “Potential for modulation of the hydrophobic effect inside chaperonins.” *Biophysical Journal*. 95, 3391 (2008).

England, J. L., Park, S., and Pande, V. S., “Theory for an order-driven disruption of the liquid state in water.” *Journal of Chemical Physics*. 128, 044503 (2008).

England, J. L. and Cardy, J., “Morphogen gradient from a noisy source.” *Physical Review Letters*. 94, 078101 (2005).

England, J. L., Shakhnovich, B., and Shakhnovich, E., “Natural selection of more designable folds: A mechanism for thermophilic adaptation.” *Proceedings of the National Academy of Sciences*. 100,15 (2003).

England, J. L. and Shakhnovich, E. I., “Structural Determinant of Protein Designability.” *Physical Review Letters*. 90, 21 (2003).

### Invited Talks

<i>Spring 2023</i>	ILASOL (BGU)
<i>Fall 2022</i>	Weizmann
<i>Spring 2022</i>	PLEP, APS
<i>Winter 2022</i>	Edinburgh, UGA
<i>Summer 2021</i>	U. Leiden, Imperial
<i>Spring 2021</i>	Hebrew U.
<i>Fall 2020</i>	Berkeley Redwood Institute, UBC Physics
<i>Fall 2018</i>	Harvard CMSA, Princeton CTS

*Summer 2018* Amazon, IBM Research  
*Spring 2018* Harvard OLI, Harvard Chemistry, NYU  
*Winter 2018* MediaSlopes (Deer Valley, UT)  
*Fall 2017* MIT  
*Summer 2017* Air Force Academy  
*Fall 2016* Harvard, Air Force Research Laboratory  
*Summer 2016* Georgia Tech, Templeton Foundation  
*Spring 2016* Brandeis, Harvard, UMass-Amherst  
*Fall 2015* Rice, UConn, SUNY Stonybrook, Northeastern, Boston Joint PChem, NYU  
*Summer 2015* Hebrew U. (EMBO Meeting)  
*Spring 2015* U. Chicago, Scialog  
*Winter 2015* UC Berkeley, Stanford  
*Fall 2014* Karolinska Institutet, ASU, Perimeter Institute, Caltech, Rutgers  
*Summer 2014* Harvard  
*Spring 2014* Simons Foundation  
*Winter 2014* Wellesley  
*Fall 2013* Oxford, Harvard  
*Summer 2013* Telluride, Harvard  
*Spring 2013* Cornell, UTSW-Dallas, Caltech  
*Winter 2013* Israeli Chemical Society  
*Fall 2012* Princeton, U. Penn  
*Summer 2012* Hebrew University in Jerusalem  
*Spring 2012* Harvard  
*Fall 2011* Brandeis, BU  
*Summer 2011* NIH  
*Spring 2011* Vertex Pharma. Inc., UC-Berkeley, Stanford

### **Selected Broader Impacts**

*Every Life is on Fire*, Basic Books, 2020.

*Quanta Magazine*

<https://www.quantamagazine.org/first-support-for-a-physics-theory-of-life-20170726/>

*Essay in Aeon*

<https://aeon.co/essays/does-the-flow-of-heat-help-us-understand-the-origin-of-life>

*Interview with Carl Zimmer of the New York Times*

<http://caveat.nyc/event/what-is-life-night-3-is-life-inevitable/>

*Feature Article in Nautilus Magazine*

<http://nautil.us/issue/34/adaptation/how-do-you-say-life-in-physics>

*Editorial in Nature Nanotechnology*

<http://www.nature.com/nnano/journal/v10/n11/full/nnano.2015.273.html>

*Interview on 7<sup>th</sup> Avenue Public Radio*

<http://7thavenueproject.com/post/118064180870/biophysicist-jeremy-england-new-theory-of-life>

*Academic Minute on NYPR*

<http://academicminute.org/2015/03/jeremy-england-mit/>

*'Thesis' write-up in Nature Physics*

[http://www.nature.com/nphys/journal/v11/n2/full/nphys3246.html?WT.ec\\_id=NPHYS-201502](http://www.nature.com/nphys/journal/v11/n2/full/nphys3246.html?WT.ec_id=NPHYS-201502)

*Quanta Magazine*

<https://www.simonsfoundation.org/quanta/20140122-a-new-physics-theory-of-life/>

*Boston Museum of Science Podcast: The Physics of Evolution*

<http://www.mos.org/node/1638205>

*Nature News*

<http://www.nature.com/news/bacteria-replicate-close-to-the-physical-limit-of-efficiency-1.11446>

*Boston Museum of Science Podcast: Shape-shifting Proteins*

<http://www.youtube.com/watch?v=QRXrV3C7gwk>

*Forbes Magazine's "30 under 30 Rising Stars in Science."*

<http://www.forbes.com/sites/matthewherper/2011/12/19/rising-stars-of-sciencethe-forbes-30-under-30/>