

D. Allan Drummond

Biochemistry & Molecular Biology, The University of Chicago
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Academic Positions

The University of Chicago 2011– Chicago, IL
Associate Professor, 2018–, Dept. of Biochemistry & Molecular Biology
and Dept. of Medicine, Section of Genetic Medicine.
Assistant Professor, 2011–2018

Harvard University 2006–2011 Cambridge, MA
Bauer Fellow, FAS Center for Systems Biology.

Education

California Institute of Technology 2002–2006 Pasadena, CA
Ph.D. in Computation & Neural Systems, advised by Frances H. Arnold.
Thesis: “Misfolding Dominates Protein Evolution”

Princeton University 1991–1995 Princeton, NJ
B.S.E. *cum laude* in Mechanical and Aerospace Engineering.

Honors & Awards (Selected)

Scialog Fellow, Research Corporation for Scientific Advancement/Gordon & Betty Moore Foundation, 2018.
Junior Faculty Award, Biopolymers In Vivo subgroup, Biophysical Society, 2018.
Distinguished Faculty Award, The University of Chicago Biological Sciences Division, 2017.
W.J. Youden Award (with 3 coauthors), American Statistical Association, 2015.
Pew Scholar in the Biomedical Sciences, 2012–2016.
Sloan Fellow in Computational & Evolutionary Molecular Biology, 2012.
Milton and Francis Clauser Doctoral Prize (Caltech thesis prize, all fields), 2006.

Selected Publications

1. Triandafillou, C.G., Katanski, C.D., Dinner, A.R., and **Drummond, D.A.** “Transient Intracellular Acidification Regulates the Core Transcriptional Heat Shock Response.” *eLife* 9 (August). <https://doi.org/10.7554/eLife.54880> (2020).
2. Pattanayak, G.K., Liao, Y., Wallace, E.W.J., Budnik, B.A., **Drummond, D.A.**, and Rust, M.J.. “Daily cycles of reversible protein condensation in cyanobacteria.” *Cell Reports* 32 (7): 108032 (2020).
3. Yoo, H., Triandafillou, C.G., and **Drummond, D.A.** “Cellular sensing by phase separation: Using the process, not just the products.” *The Journal of Biological Chemistry* 294 (18): 7151–59 (2019). [review]
4. Riback, J.A.* , Katanski, C.D.* (co-first authors), Kear-Scott, J.L., Pilipenko, E.V., Rojek, A.E., Sosnick, T.R., and **Drummond, D.A.**, “Stress-triggered phase separation is an adaptive, evolutionarily tuned response,” *Cell* 168(6):1028–1040 (2017).
5. Wallace, E.W.J., Kear-Scott, J.L., Pilipenko, E.V., Schwartz, M.H., Laskowski, P.R., Rojek, A.E., Katanski, C.D., Riback, J.A., Dion, M.F., Franks, A.M., Airoidi, E.M., Pan, T., Budnik, B.A., and **Drummond, D.A.**, “Reversible, specific, active aggregates of endogenous proteins assemble upon heat stress,” *Cell* 162(6):1286–1298 (2015).
6. Csárdi, G, Franks, A.M., Choi, D.S., Airoidi, E.M., and **Drummond, D.A.**, “Accounting for experimental noise reveals that mRNA levels, amplified by post-transcriptional processes, largely determine steady-state protein levels in yeast,” *PLOS Genetics* 11(5):e1005206 (2015).

7. Zaborse, J., Bauer DuMont, V.L., Wallace, E.W.J., Pan, T., Aquadro, C.F., and **Drummond, D.A.**, “A nutrient-driven tRNA modification alters translational fidelity and genome-wide protein coding across an animal genus,” *PLOS Biology* 12(12):e1002015 (2014).
8. Franks, A.M., Csárdi, G., **Drummond, D.A.**, and Airoidi E.M., “Estimating a structured covariance matrix from multi-lab measurements in high-throughput biology,” *Journal of the American Statistical Association* 110 (509) :27–44 (2014).
9. Wallace, E.W.J., Airoidi, E.M., and **Drummond, D.A.**, “Estimating selection on synonymous codon usage from noisy experimental data,” *Molecular Biology & Evolution* 30(6):1438–53 (2013).
10. Geiler-Samerotte, K.A., Dion, M.F., Budnik, B.A., Hartl, D.L., and **Drummond, D.A.**, “Misfolded proteins impose a dosage-dependent fitness cost and trigger a cytosolic unfolded protein response in yeast,” *Proc. Nat'l. Acad. Sci. USA* 180(2):680–685 (2011).
11. Wilke, C.O. & **Drummond, D.A.**, “Signatures of protein biophysics in coding sequence evolution,” *Curr. Opin. Struct. Bio.* 20(3):385–9 (2010). [review]
12. **Drummond, D.A.** and Wilke, C.O., “The Evolutionary Consequences of Erroneous Protein Synthesis.” *Nature Reviews. Genetics* 10 (10): 715–24 (2009). [review]
13. **Drummond, D.A.** and Wilke, C.O., “Mistranslation-induced protein misfolding as a dominant constraint on coding-sequence evolution,” *Cell* 134(2):341–52 (2008).
14. Wilke, C.O. and **Drummond, D.A.**, “Population genetics of translational robustness,” *Genetics* 173:473–81 (2006).
15. **Drummond, D.A.**, Raval, A., and Wilke, C.O., “A single determinant dominates the rate of yeast protein evolution,” *Molecular Biology & Evolution* 23(2):327–37 (2006).
16. **Drummond, D.A.**, Bloom, J.D., Adami, C., Wilke, C.O., and Arnold, F.H., “Why highly expressed proteins evolve slowly,” *Proc. Nat'l. Acad. Sci. USA* 102(40):14338–43 (2005).
17. **Drummond, D.A.**, Iverson, B.L., Georgiou, G.G., and Arnold, F.H., “Why high-error-rate mutagenesis libraries are enriched in functional and improved proteins,” *J. Mol. Biol.* 350(4):806–16 (2005).
18. **Drummond, D.A.**, Silberg, J.J., Meyer, M.M., Wilke, C.O., and Arnold, F.H., “On the conservative nature of intragenic recombination,” *Proc. Nat'l. Acad. Sci. USA* 102(15):5380–5 (2005).

Selected Commentary

1. Triandafillou, C.G. & **Drummond, D.A.** “Heat Shock Factor 1: from fire chief to crowd-control specialist,” *Molecular Cell* 63(1):1–2 (2016).
2. Wallace, E.W.J. & **Drummond, D.A.** “Dying mRNA tells a story of its life,” *Cell* 161(6) (2015).
3. **Drummond, D.A.**, “How infidelity creates a sticky situation,” *Molecular Cell* 48(5): 663–664 (2012).

Invited Speaking (most recent)

1. IDP Seminars, virtual, 2020.
2. Research seminar, Dept. of Biology, MIT, 2019.
3. Research seminar, Dept. of Chemistry and Biochemistry, UCSD, 2019.
4. Research seminar, University of Colorado Anschutz Medical Campus, 2019.
5. Stress Proteins in Growth, Development, and Disease, Gordon Research Conference, 2019.
6. Biomolecular Condensates, Keystone Symposium, 2019.

Support

- NIGMS 1-R01-GM127406-01, “Signatures of interaction-driven selection on low-complexity sequences,” 2018–2022, PI: Drummond.
- NIGMS 1-R01-GM126547-01, “Determining the molecular basis of adaptive stress-triggered protein phase separation,” 2018–2021, PI: Drummond (co-PI Tobin Sosnick).

US ARO W911NF-14-1-0411, “Mechanisms of prokaryotic evolution,” 2014–2019, PI: Lynch.

Service

Chair, graduate recruiting, Dept. of Biochemistry and Molecular Biology

Program co-organizer, 2018 Biopolymers In Vivo subgroup meeting, Biophysical Society

Co-organizer, 2016 Midwest Stress & Molecular Chaperones meeting, Northwestern University

Guest Editor: *PNAS*; *PLOS Genetics*; *PLOS Computational Biology*

Reviewer: *Science*; *Nature*; *Cell*; *PNAS*; *eLife*, *PLOS Biology*; *PLOS Genetics*; *Molecular Cell*; and others.

Membership

American Association for the Advancement of Science

American Society for Biochemistry and Molecular Biology

American Society for Cell Biology

Biophysical Society

Society for Molecular Biology and Evolution

Industry Experience

1995–2002

Trilogy Software, Inc.

Austin, TX

Multiple positions; finished as Director, Trilogy University (180-person organization). Responsible for research direction, curriculum, external relations for nationally known corporate university and R&D incubator (subject of April 2001 *Harvard Business Review* feature “No Ordinary Boot Camp”). Led leadership development program.