D. Allan Drummond

Biochemistry & Molecular Biology, The University of Chicago
GCIS W234, 929 E. 57th St., Chicago, IL 60637
dadrummond@uchicago.edu | drummondlab.org

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.
    Member, Committee on Genetics, Genomics & Systems Biology, Institute for Biophysical Dynamics.
    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)

Irvin Isenberg Memorial Lecturer, Marine Biological Laboratories, 2022.
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.
Professor Mariam Hasson Memorial Lecture, Purdue University, 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.

Publications (selected)

1. Glauninger, H., Hickernell, C.J.W., Bard, J.A.M., **Drummond, D.A.**, "Stressful steps: progress and challenges in understanding stress-induced mRNA condensation and stress granule accumulation," *Molecular Cell* 82(14) (2022).
2. Yoo, H., Bard, J.B., Pilipenko, E.V., **Drummond, D.A.**, "Chaperones directly and efficiently disperse stress-triggered biomolecular condensates," *Molecular Cell* 82(4):741–755 (2022).
3. Cereghetti, G., Wilson-Zbinden, C., Kissling, V.M., Diether, M., Arm, A., Yoo, H., Piazza, I., Saad, S., Picotti, P., **Drummond, D.A.**, Sauer, U., Dechant, R., Peter, M., "Reversible amyloids of pyruvate kinase couple cell metabolism and stress granule disassembly," *Nature Cell Bio.* 23:1085–1094 (2021).
4. 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) (2020).
5. 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).
6. 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]

7. 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).
8. 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., Airoldi, 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).
9. Csárdi, G, Franks, A.M., Choi, D.S., Airoldi, 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).
10. Zaborske, 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).
11. Franks, A.M., Csárdi, G., **Drummond, D.A.**, and Airoldi 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).
12. Wallace, E.W.J., Airoldi, E.M., and **Drummond, D.A.**, "Estimating selection on synonymous codon usage from noisy experimental data," *Molecular Biology & Evolution* 30(6):1438–53 (2013).
13. 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).
14. Wilke, C.O. & **Drummond, D.A.**, "Signatures of protein biophysics in coding sequence evolution," *Curr. Opin. Struct. Bio.* 20(3):385–9 (2010). [review]
15. **Drummond, D.A.** and Wilke, C.O., "The evolutionary consequences of erroneous protein synthesis." *Nature Reviews. Genetics* 10 (10): 715–24 (2009). [review]
16. **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).
17. Wilke, C.O. and **Drummond, D.A.**, "Population genetics of translational robustness," *Genetics* 173:473–81 (2006).
18. **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).
19. **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).
20. **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).
21. **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).

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 (recent, selected)

1. Gordon Conference, Intrinsically Disordered Proteins, Les Diablerets, Switzerland, 2022.
2. Condensate Colloquium, 2022.

3. *Cell* Symposium: Biological Assemblies: Phase Transitions and More, 2022.
4. Proteostasis Consortium, 2022.
5. Session keynote and session chair, Biophysical Society annual meeting, 2021.

Support

NIGMS 1-R01-GM127406-01, "Signatures of interaction-driven selection on low-complexity sequences,"
2018–2022, PI: Drummond.

NIGMS 1-R35-GM144278. "Function and regulation of stress-induced adaptive condensates."
2022–12/31/2026, PI: Drummond.

Service

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.