Stanford



Gheorghe Chistol

Assistant Professor of Chemical and Systems Biology

Bio

ACADEMIC APPOINTMENTS

- Assistant Professor, Chemical and Systems Biology
- Member, Bio-X
- Member, Stanford Cancer Institute

HONORS AND AWARDS

- Interdisciplinary Initiatives Program Seed Grant Award, Stanford BioX (2021-2023)
- Postdoctoral Fellowship, Jane Coffin Childs Memorial Fund (2014-2017)
- Outstanding Graduate Student Instructor Award, University of California, Berkeley (2008)
- Silver Medal, International Physics Olympiad (2002)

PROFESSIONAL EDUCATION

- Postdoctoral, Harvard Medical School , Biological Chemistry & Molecular Pharmacology (2019)
- Ph.D., University of California, Berkeley , Physics (Biophysics) (2013)
- M.A., University of California, Berkeley , Physics (Biophysics) (2012)
- B.S., Massachusetts Institute of Technology , Physics (2007)

LINKS

- Chistol Laboratory: https://chistol.stanford.edu/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Research in my laboratory is aimed at understanding how eukaryotes replicate their DNA despite numerous challenges (collectively known as replication stress), and more generally – how eukaryotic cells safeguard genome integrity. Specifically, we are investigating: (i) mechanisms that regulate the activity of the replicative helicase during replication stress, (ii) mechanisms that control the inheritance of epigenetic information during replication, and (iii) mechanisms of ubiquitin-mediated regulation of genome maintenance. We utilize single-molecule microscopy to directly image fluorescently-labeled replication factors and track them in real time in Xenopus egg extracts. I developed this system as a postdoctoral fellow, and used it to monitor how the eukaryotic replicative helicase copes with DNA damage. We plan to further extend the capabilities of this platform to directly visualize other essential replication factors, nucleosomes, and regulatory post-translational modifications like ubiquitin chains. By elucidating molecular mechanisms

responsible for maintaining genome stability, we aim to better understand the link between genome instability and cancer, and how these mechanisms can be harnessed to improve disease treatment.

Teaching

COURSES

2026-27

- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Research Seminar: CSB 270 (Aut, Win, Spr)
- The Biology of Chromatin Templated Processes: CSB 250 (Win)

2025-26

- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Research Seminar: CSB 270 (Aut, Win, Spr)

2024-25

- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Research Seminar: CSB 270 (Aut, Win, Spr)
- The Biology of Chromatin Templated Processes: CSB 250 (Win)

2023-24

- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Research Seminar: CSB 270 (Aut, Win, Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Carlos Alvarado, Kristen Frombach, Michael Palo, Steven Truong

Postdoctoral Faculty Sponsor

Benjamin Duewell, Zhitong Feng, Jinho Park

Doctoral Dissertation Advisor (AC)

Larissa Sambel

Publications

PUBLICATIONS

- **Metazoan lagging-strand DNA synthesis is distributive.** *Cell*
  Lynch, L. D., Park, J., Chistol, G.
  2026
- **Single-molecule imaging reveals the mechanism of bidirectional replication initiation in metazoa.** *Cell*
  Terui, R., Berger, S. E., Sambel, L. A., Song, D., Chistol, G.
  2024
- **Visualizing the dynamics of DNA replication and repair at the single-molecule level.** *Methods in cell biology*
  Berger, S., Chistol, G.
  2024; 182: 109-165
- **In silico protein interaction screening uncovers DONSON's role in replication initiation.** *Science (New York, N.Y.)*

Lim, Y., Tamayo-Orrego, L., Schmid, E., Tarnauskaite, Z., Kochenova, O. V., Gruar, R., Muramatsu, S., Lynch, L., Schlie, A. V., Carroll, P. L., Chistol, G., Reijns, M. A., Kanemaki, et al
2023: eadi3448

- **Single-strand DNA breaks cause replisome disassembly** *Molecular Cell*
  Vrtis, K. B., Dewar, J. M., Chistol, G., Wu, R., Graham, T. G., Walter, J. C.
  2021; 81 (6): 1309-18

- **The DNA replication fork suppresses CMG unloading from chromatin before termination** *Genes & Development*
  Low*, E., Chistol*[@], G., Zaher, M. S., Kochenova, O. V., Walter[@], J. C.
  2020; 34: 1534-45

- **TRAIP is a master regulator of DNA interstrand crosslink repair** *Nature*
  Wu, R. A., Semlow, D. R., Kamimae-Lanning, A. N., Kochenova, O. V., Chistol, G., Hodskinson, M. R., Amunugama, R., Sparks, J. L., Wang, M., Deng, L., Mimoso, C. A., Low, E., Patel, et al
  2019; 567 (7747): 267–72

- **The CMG Helicase Bypasses DNA-Protein Cross-Links to Facilitate Their Repair** *Cell*
  Sparks*, J. L., Chistol*, G., Gao, A. O., Räschle, M., Larsen, N. B., Mann, M., Duxin, J. P., Walter, J. C.
  2019; 176 (1-2): 167-81.e21

- **Mechanochemical coupling and bi-phasic force-velocity dependence in the ultra-fast ring ATPase SpoIIIE** *eLife*
  Liu*, N., Chistol*, G., Cui, Y., Bustamante, C.
  2018; 7

- **Two-subunit DNA escort mechanism and inactive subunit bypass in an ultra-fast ring ATPase** *eLife*
  Liu*, N., Chistol*, G., Bustamante, C.
  2015; 4

- **Single-Molecule Visualization of MCM2-7 DNA Loading: Seeing Is Believing** *Cell*
  Chistol, G., Walter, J. C.
  2015; 161 (3): 429-30

- **Molecular watchdogs on genome patrol** *eLife*
  Chistol, G., Walter, J.
  2014; 3: e02854

- **Mechanical operation and intersubunit coordination of ring-shaped molecular motors: insights from single-molecule studies** *Biophysical Journal*
  Liu*, S., Chistol*, G., Bustamante, C.
  2014; 106 (9): 1844-58

- **A viral packaging motor varies its DNA rotation and step size to preserve subunit coordination as the capsid fills** *Cell*
  Liu*, S., Chistol*, G., Hetherington*, C., Tafoya, S., Aathavan, K., Schnitzbauer, J., Grimes, S., Jardine, P. J., Bustamante, C.
  2014; 157 (3): 702-13

- **High degree of coordination and division of labor among subunits in a homomeric ring ATPase** *Cell*
  Chistol*, G., Liu*, S., Hetherington, C. L., Moffitt, J. R., Grimes, S., Jardine, P. J., Bustamante, C.
  2012; 151 (5): 1017-28

- **ClpX(P) Generates Mechanical Force to Unfold and Translocate Its Protein Substrates** *Cell*
  Maillard, R. A., Chistol, G., Sen, M., Righini, M., Tan, J., Kaiser, C. M., Hodges, C., Martin, A., Bustamante, C.
  2011; 145 (3): 459-69