Lacramioara Bintu

Associate Professor of Bioengineering

NIH Biosketch available Online   Curriculum Vitae available Online

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BIO

Lacra Bintu is an Associate Professor of Bioengineering and a member of the Biophysics Program and Bio-X Institute at Stanford University. She earned undergraduate degrees in Physics, Mathematics, and Neuroscience from Brandeis University. As an undergraduate working with Jane Kondev and Rob Phillips, she used statistical mechanics to model transcription factor binding and gene regulation. She completed her Physics Ph.D. at U.C. Berkeley with Carlos Bustamante, where she used single-molecule approaches to study transcription on nucleosomal templates. As a postdoctoral scholar at Caltech with Michael Elowitz, she used live-cell microscopy to investigate chromatin-mediated gene regulation.

Her group seeks to discover fundamental principles of gene regulation and advance mammalian synthetic biology, with an emphasis on causal mechanisms, dynamic responses, and single-cell variability that enable signal integration at the population level. The lab develops tools to manipulate gene expression, for example by recruiting chromatin, transcriptional, or RNA regulators to defined genomic loci, or building DNA regulatory elements such as signal-responsive enhancers or silencers. To assess gene regulation responses at scale, the lab is using and developing new sequencing and imaging based techniques such as: delivery of large DNA libraries to cells coupled with sorting based on fluorescent and magnetic reporters, time-lapse fluorescence microscopy and in situ sequencing, or single-molecule footprinting of transcription factors and nucleosomes binding in live cells. Her group uses mathematical modeling to capture the fundamental principles underlying the observed gene expression responses and to predict new behaviors. This work provides insight into epigenetic mechanisms underlying development, cancer, and immune function and informs strategies for gene therapies that correct aberrant expression states.

Lacra lives in Menlo Park with her husband Anton and son Manu. They enjoy hiking, cooking, reading, playing board games, and watching birds in their backyard with their two cats.

ACADEMIC APPOINTMENTS

- Associate Professor, Bioengineering
- Member, Bio-X

HONORS AND AWARDS

- Maximizing Investigators' Research Award, NIH-NIGMS (2018-2028)
- Career Award at the Scientific Interface, Burroughs Wellcome Fund (2015-2020)
- Postdoctoral Fellowship, Jane Coffin Childs Memorial Fund for Medical Research (2011-2014)
- Beckman Fellowship, California Institute of Technology (2011-2014)

- Harold M. Weintraub Graduate Student Award, Fred Hutchinson Center (2011)
- Outstanding Graduate Student Instructor Award, University of California, Berkeley (2006)
- Doris Brewer Cohen Endowment Award for best senior thesis, Brandeis University (2005)
- Wien International Scholarship, Brandeis University (2001-2005)

PROFESSIONAL EDUCATION

- Postdoctoral Fellow, California Institute of Technology , Biology and Biological Engineering (2016)
- Ph.D., University of California, Berkeley , Physics (2010)
- B.S., Brandeis University , Physics, Mathematics, Neuroscience (2005)

LINKS

- Bintu Lab Site: https://bintulab.com/

Teaching

COURSES

2025-26

- Genetic and Epigenetic Engineering: BIOE 204 (Spr)
- Introduction to Bioengineering (Engineering Living Matter): BIOE 80, ENGR 80 (Spr)

2024-25

- Introduction to Bioengineering (Engineering Living Matter): BIOE 80, ENGR 80 (Spr)
- Molecular and Cellular Bioengineering: BIOE 300A (Win)

2023-24

- Genetic and Epigenetic Engineering: BIOE 204 (Spr)
- Molecular and Cellular Bioengineering: BIOE 300A (Win)

2022-23

- Genetic and Epigenetic Engineering: BIOE 204 (Spr)
- Molecular and Cellular Bioengineering: BIOE 300A (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Noor Al-Sayyad, Aidan Cabral, Owen Dunkley, Ibtihal Elfaki, Tania Fabo, Isabel Goldaracena Aguirre, Yuxi Ke, Sopida Pimcharoen, Katelyn Randal, Maya Sheth

Postdoctoral Faculty Sponsor

Xinyu Feng, Yaara Finkel, Ron Shanderson

Doctoral Dissertation Advisor (AC)

Cecelia Andrews, Shawn Cai, Eli Costa, Simon Gaudin, Geo Janer Carattini, Bianca Linden, Carolina Rios-Martinez, Masaru Shimasawa, Abby Thurm

Doctoral Dissertation Co-Advisor (AC)

Lillian Petersen

Doctoral (Program)

Bella Archibald, Sophia Chen, Bianca Edozie, Maylin Fu, Khoa Hoang, Yuxi Ke, Tianyu Lu, Dagny Reese, Lara Weed, Mica Yang

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Bioengineering (Phd Program)
- Biophysics (Phd Program)

Publications

PUBLICATIONS

- **Structural probing of RNA hairpins quantifies protein occupancy on RNA and links it to function in human cells.** *bioRxiv : the preprint server for biology*
  Thurm, A. R., Nguyen, T. H., Campos, J. D., Mansfield, M., Bintu, L., Hagler, L. D.
  2026
- **What do you most hope we will achieve with mammalian synthetic biology within the next decade?** *CELL SYSTEMS*
  Fussenegger, M., Chen, Y. Y., Wong, W., Borth, N., Rosser, S., Morsut, L., Di Ventura, B., Garton, M., Leonard, J. N., Bintu, L.
  2025; 16 (12): 1-5
- **Bifunctional transcriptional effector domains control gene expression pulses in an occupancy-dependent manner.** *bioRxiv : the preprint server for biology*
  Andrews, C. J., Costa, E. J., Janer Carattini, G. L., DelRosso, N. V., Fujimori, T., Shimasawa, M., Bintu, L.
  2025
- **High-throughput mapping of modular regulatory domains in human RNA-binding proteins.** *Cell systems*
  Thurm, A. R., Finkel, Y., Andrews, C., Cai, X. S., Benko, C., Bintu, L.
  2025: 101450
- **Reduced Cas9 transgene silencing by incorporation of intron sequences.** *Nature communications*
  Arana, S., Du, P. P., Vaughan-Jackson, A., Enright, N., Spees, K., Valbuena, R., Garcia, C. A., Nguyen, T., Venida, A., Seczynska, M., Bintu, L., Lehner, P. J., Prolo, et al
  2025; 16 (1): 10656
- **Epigenetic editing: from concept to clinic.** *Nature reviews. Drug discovery*
  Heller, E. A., Bintu, L., Rots, M. G.
  2025
- **FAIR sharing of Chromatin Tracing datasets using the newly developed 4DN FISH Omics Format.** *ArXiv*
  Navelkar, R., Cosolo, A., Bintu, B., Cheng, Y., Gardeux, V., Gutnik, S., Fujimori, T., Hafner, A., Jay, A., Jia, B. B., Jussila, A. P., Llimos, G., Lioutas, et al
  2025
- **Machine-guided dual-objective protein engineering for deimmunization and therapeutic functions.** *Cell systems*
  Wolfsberg, E., Paul, J. S., Tycko, J., Chen, B., Bassik, M. C., Bintu, L., Alizadeh, A. A., Gao, X. J.
  2025: 101299
- **Human Synthetic Biology and Programmable Gene Regulation Control.** *Annual review of genomics and human genetics*
  Thurm, A. R., Janer Carattini, G. L., Bintu, L.
  2025
- **Single-molecule states link transcription factor binding to gene expression.** *Nature*
  Doughty, B. R., Hinks, M. M., Schaepe, J. M., Marinov, G. K., Thurm, A. R., Rios-Martinez, C., Parks, B. E., Tan, Y., Marklund, E., Dubocanin, D., Bintu, L., Greenleaf, W. J.
  2024
- **High-throughput development and characterization of new functional nanobodies for gene regulation and epigenetic control in human cells.** *bioRxiv : the preprint server for biology*
  Wan, J., Thurm, A. R., Allen, S. J., Ludwig, C. H., Patel, A. N., Bintu, L.
  2024
- **Development of compact transcriptional effectors using high-throughput measurements in diverse contexts.** *Nature biotechnology*

Tycko, J., Van, M. V., , DelRosso, N., Ye, H., Yao, D., Valbuena, R., Vaughan-Jackson, A., Xu, X., Ludwig, C., Spees, K., Liu, K., Gu, M., et al
2024

- **Tunable, self-contained gene dosage control via proteolytic cleavage of CRISPR-Cas systems.** *bioRxiv : the preprint server for biology*
  Katz, N., An, C., Lee, Y. J., Tycko, J., Zhang, M., Kang, J., Bintu, L., Bassik, M. C., Huang, W. H., Gao, X. J.
  2024
- **The H3.3K36M oncohistone disrupts the establishment of epigenetic memory through loss of DNA methylation.** *Molecular cell*
  Sinha, J., Nickels, J. F., Thurm, A. R., Ludwig, C. H., Archibald, B. N., Hinks, M. M., Wan, J., Fang, D., Bintu, L.
  2024
- **High-throughput affinity measurements of direct interactions between activation domains and co-activators.** *bioRxiv : the preprint server for biology*
  DelRosso, N., Suzuki, P. H., Griffith, D., Lotthammer, J. M., Novak, B., Kocalar, S., Sheth, M. U., Holehouse, A. S., Bintu, L., Fordyce, P.
  2024
- **Using High-Throughput Measurements to Identify Principles of Transcriptional and Epigenetic Regulators.** *Methods in molecular biology (Clifton, N.J.)*
  DelRosso, N., Bintu, L.
  2024; 2842: 79-101
- **Laminin-associated integrins mediate Diffuse Intrinsic Pontine Glioma infiltration and therapy response within a neural assembloid model.** *Acta neuropathologica communications*
  Sinha, S., Huang, M. S., Mikos, G., Bedi, Y., Soto, L., Lensch, S., Ayushman, M., Bintu, L., Bhutani, N., Heilshorn, S. C., Yang, F.
  2024; 12 (1): 71
- **Harmonizing the Generation and Pre-publication Stewardship of FAIR Image data.** *ArXiv*
  Bialy, N., Alber, F., Andrews, B., Angelo, M., Beliveau, B., Bintu, L., Boettiger, A., Boehm, U., Brown, C. M., Maina, M. B., Chambers, J. J., Cimini, B. A., Eliceiri, et al
  2024
- **The H3.3 K36M oncohistone disrupts the establishment of epigenetic memory through loss of DNA methylation.** *bioRxiv : the preprint server for biology*
  Sinha, J., Nickels, J. F., Thurm, A. R., Ludwig, C. H., Archibald, B. N., Hinks, M. M., Wan, J., Fang, D., Bintu, L.
  2023
- **Single-cell chromatin state transitions during epigenetic memory formation.** *bioRxiv : the preprint server for biology*
  Fujimori, T., Rios-Martinez, C., Thurm, A. R., Hinks, M. M., Doughty, B. R., Sinha, J., Le, D., Hafner, A., Greenleaf, W. J., Boettiger, A. N., Bintu, L.
  2023
- **High-throughput functional characterization of combinations of transcriptional activators and repressors.** *Cell systems*
  Mukund, A. X., Tycko, J., Allen, S. J., Robinson, S. A., Andrews, C., Sinha, J., Ludwig, C. H., Spees, K., Bassik, M. C., Bintu, L.
  2023
- **Spatial and temporal organization of the genome: Current state and future aims of the 4D nucleome project.** *Molecular cell*
  Dekker, J., Alber, F., Aufmkolk, S., Beliveau, B. J., Bruneau, B. G., Belmont, A. S., Bintu, L., Boettiger, A., Calandrelli, R., Disteche, C. M., Gilbert, D. M., Gregor, T., Hansen, et al
  2023
- **High-throughput discovery and characterization of viral transcriptional effectors in human cells.** *Cell systems*
  Ludwig, C. H., Thurm, A. R., Morgens, D. W., Yang, K. J., Tycko, J., Bassik, M. C., Glaunsinger, B. A., Bintu, L.
  2023; 14 (6): 482
- **CasKAS: direct profiling of genome-wide dCas9 and Cas9 specificity using ssDNA mapping.** *Genome biology*
  Marinov, G. K., Kim, S. H., Bagdatli, S. T., Higashino, S. I., Trevino, A. E., Tycko, J., Wu, T., Bintu, L., Bassik, M. C., He, C., Kundaje, A., Greenleaf, W. J.
  2023; 24 (1): 85
- **Large-scale mapping and mutagenesis of human transcriptional effector domains.** *Nature*
  DelRosso, N., Tycko, J., Suzuki, P., Andrews, C., , Mukund, A., Liongson, I., Ludwig, C., Spees, K., Fordyce, P., Bassik, M. C., Bintu, L.
  2023

- **Single-Molecule Mapping of Chromatin Accessibility Using NOMe-seq/dSMF.** *Methods in molecular biology (Clifton, N.J.)*
  Hinks, M., Marinov, G. K., Kundaje, A., Bintu, L., Greenleaf, W. J.
  2023; 2611: 101-119
- **The sound of silence: Transgene silencing in mammalian cell engineering.** *Cell systems*
  Cabera, A., Edelstein, H. I., Glykofrydis, F., Love, K. S., Palacios, S., Tycko, J., Zhang, M., Lensch, S., Shields, C. E., Livingston, M., Weiss, R., Zhao, H., Haynes, et al
  2022; 13 (12): 950-973
- **Systematic discovery of recombinases for efficient integration of large DNA sequences into the human genome.** *Nature biotechnology*
  Durrant, M. G., Fanton, A., Tycko, J., Hinks, M., Chandrasekaran, S. S., Perry, N. T., Schaepe, J., Du, P. P., Lotfy, P., Bassik, M. C., Bintu, L., Bhatt, A. S., Hsu, et al
  2022
- **Dynamic spreading of chromatin-mediated gene silencing and reactivation between neighboring genes in single cells.** *eLife*
  Lensch, S., Herschl, M. H., Ludwig, C. H., Sinha, J., Hinks, M. M., Mukund, A., Fujimori, T., Bintu, L.
  2022; 11
- **Temporal signaling, population control, and information processing through chromatin-mediated gene regulation.** *Journal of theoretical biology*
  Mukund, A., Bintu, L.
  1800: 110977
- **Nanobody-mediated control of gene expression and epigenetic memory.** *Nature communications*
  Van, M. V., Fujimori, T. n., Bintu, L. n.
  2021; 12 (1): 537
- **High-Throughput Discovery and Characterization of Human Transcriptional Effectors.** *Cell*
  Tycko, J. n., DelRosso, N. n., Hess, G. T., Aradhana, n. n., Banerjee, A. n., Mukund, A. n., Van, M. V., Ego, B. K., Yao, D. n., Spees, K. n., Suzuki, P. n., Marinov, G. K., Kundaje, et al
  2020
- **Mapping chromatin modifications at the single cell level.** *Development (Cambridge, England)*
  Ludwig, C. H., Bintu, L. n.
  2019; 146 (12)
- **Mitigation of off-target toxicity in CRISPR-Cas9 screens for essential non-coding elements.** *Nature communications*
  Tycko, J. n., Wainberg, M. n., Marinov, G. K., Ursu, O. n., Hess, G. T., Ego, B. K., Aradhana, n. n., Li, A. n., Truong, A. n., Trevino, A. E., Spees, K. n., Yao, D. n., Kaplow, et al
  2019; 10 (1): 4063
- **Advancing towards a global mammalian gene regulation model through single-cell analysis and synthetic biology** *Current Opinion in Biomedical Engineering*
  Tycko, J., Van, M. V., Elowitz, M. B., Bintu, L.
  2017; 4: 174-193