Stanford

Longzhi Tan

Assistant Professor of Neurobiology

Bio

BIO

Originally from Wuhan, China, Tan received his S.B. in Physics (minor: Biology) from MIT in 2012, studying evolution with Jeff Gore and Pardis Sabeti. He earned his Ph.D. in Systems Biology from Harvard in 2018, developing high-precision methods for single-cell genomics with Sunney Xie. He uncovered the 3D structure of the human genome in a single cell, revealed unique chromosome organization in the mouse eye and nose, and measured the true mutation spectrum of single neurons in the normal human brain. Tan also attended the Neurobiology course at MBL in 2014, and worked with Ibrahim Cisse at MIT in 2019. As a postdoc in Karl Deisseroth's lab at Stanford Bioengineering (co-mentor: Howard Chang), Tan discovered major 3D genome transformation in the mouse brain after birth.

Tan is an Assistant Professor of Neurobiology at Stanford, and started his lab in Dec 2022. Tan's awards include BWF CASI (2021), ISFS (2021), Berry Fellowship (2020), Science & SciLifeLab Grand Prize (2019), HHMI ISRF (2015), and IPhO Gold Medal (2008). Outside of the lab, he enjoys designing holiday cards, t-shirts, and music videos, and is a scientific illustrator.

ACADEMIC APPOINTMENTS

- Assistant Professor, Neurobiology
- Member, Bio-X
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Innovation Award, Sanofi (2024)
- Faculty Scholar, Donald E. and Delia B. Baxter Foundation (2023)
- Finalist, Freeman Hrabowski Scholars Program, Howard Hughes Medical Institute (2023)
- Innovators Under 35 (China Region), MIT Technology Review (2023)
- Uytengsu-Hamilton 22q11 Neuropsychiatry Research Award, Stanford Maternal and Child Health Research Institute (2023)
- Career Award at the Scientific Interface, Burroughs Wellcome Fund (2022 – 2027)
- Bio-X Undergraduate Summer Research Program Star Mentor Award, Stanford University (2021)
- Intersections Science Fellow, Yale University (2021)
- Walter V. and Idun Berry Postdoctoral Fellowship, Stanford University (2020 – 2022)
- School of Medicine Dean's Postdoctoral Fellowship, Stanford University (2020 – 2021)
- Grand Prize, Science & SciLifeLab Prize for Young Scientists (2019)
- International Student Research Fellowship, Howard Hughes Medical Institute (2015 – 2017)

- Member, Sigma Pi Sigma (2012)

- Member, Phi Beta Kappa (2012)

- Philip Morse Memorial Award, Massachusetts Institute of Technology (2012)

- Freshman Fellowship, Peking University (2008)

- Gold Medal, Asian Physics Olympiad (2008)

- Gold Medal and "the Absolute Winner", International Physics Olympiad (2008)

PROFESSIONAL EDUCATION

- Ph.D., Harvard University , Systems Biology (2018)

- Summer course, Marine Biological Laboratory , Neurobiology (2014)

- S.B., Massachusetts Institute of Technology , Physics (minor: Biology) (2012)

- Freshman student, Peking University , Physics (2009)

PATENTS

- Xiaoliang Sunney Xie, Dong Xing, Chi-Han Chang, Longzhi Tan. "United States Patent 11,530,436 Multiplex end-tagging amplification of nucleic acids", President And Fellows Of Harvard College, Dec 20, 2022

LINKS

- Tan Lab Website: 3dgeno.me: https://3dgeno.me

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The Tan Lab studies the single-cell 3D genome architectural basis of neurodevelopment and aging by developing the next generation of in vivo multi-omic assays and algorithms, and applying them to the human and mouse cerebellum.

Teaching

STANFORD ADVISEES

Med Scholar Project Advisor

Yunji Seo

Postdoctoral Faculty Sponsor

Bibudha Parasar

Doctoral Dissertation Advisor (AC)

Emma Follman, Siavash Moghadami

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biophysics (Phd Program)

- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Simultaneous single-cell three-dimensional genome and gene expression profiling uncovers dynamic enhancer connectivity underlying olfactory receptor choice.** *Nature methods*
  Wu, H., Zhang, J., Jian, F., Chen, J. P., Zheng, Y., Tan, L., Sunney Xie, X.

2024

- **Opposing, spatially-determined epigenetic forces impose restrictions on stochastic olfactory receptor choice.** *eLife*
Bashkirova, E. V., Klimpert, N., Monahan, K., Campbell, C. E., Osinski, J., Tan, L., Schieren, I., Pourmorady, A., Stecky, B., Barnea, G., Xie, X. S., Abdus-Saboor, I., Shykind, et al
2023; 12

- **Lifelong restructuring of 3D genome architecture in cerebellar granule cells.** *Science (New York, N.Y.)*
Tan, L., Shi, J., Moghadami, S., Parasar, B., Wright, C. P., Seo, Y., Vallejo, K., Cobos, I., Duncan, L., Chen, R., Deisseroth, K.
2023; 381 (6662): 1112-1119

- **Cardiogenic control of affective behavioural state.** *Nature*
Hsueh, B., Chen, R., Jo, Y., Tang, D., Raffiee, M., Kim, Y. S., Inoue, M., Randles, S., Ramakrishnan, C., Patel, S., Kim, D. K., Liu, T. X., Kim, et al
2023

- **Highly sensitive single-cell chromatin accessibility assay and transcriptome coassay with METATAC.** *Proceedings of the National Academy of Sciences of the United States of America*
Wu, H., Li, X., Jian, F., Yisimayi, A., Zheng, Y., Tan, L., Xing, D., Xie, X. S.
2022; 119 (40): e2206450119

- **Every gene everywhere all at once: High-precision measurement of 3D chromosome architecture with single-cell Hi-C.** *Frontiers in molecular biosciences*
Chi, Y., Shi, J., Xing, D., Tan, L.
2022; 9: 959688

- **Determining the 3D genome structure of a single mammalian cell with Dip-C.** *STAR protocols*
Tan, L.
2021; 2 (3): 100622

- **Accurate SNV detection in single cells by transposon-based whole-genome amplification of complementary strands.** *Proceedings of the National Academy of Sciences of the United States of America*
Xing, D. n., Tan, L. n., Chang, C. H., Li, H. n., Xie, X. S.
2021; 118 (8)

- **Changes in genome architecture and transcriptional dynamics progress independently of sensory experience during post-natal brain development.** *Cell*
Tan, L. n., Ma, W. n., Wu, H. n., Zheng, Y. n., Xing, D. n., Chen, R. n., Li, X. n., Daley, N. n., Deisseroth, K. n., Xie, X. S.
2021

- **Three-dimensional genome structure of a single cell.** *Science (New York, N.Y.)*
Tan, L.
2019; 366 (6468): 964–65

- **Three-dimensional genome structures of single sensory neurons in mouse visual and olfactory systems** *NATURE STRUCTURAL & MOLECULAR BIOLOGY*
Tan, L., Xing, D., Daley, N., Xie, X.
2019; 26 (4): 297-+

- **Three-dimensional genome structures of single diploid human cells** *SCIENCE*
Tan, L., Xing, D., Chang, C., Li, H., Xie, S.
2018; 361 (6405): 924–28

- **A Near-Complete Spatial Map of Olfactory Receptors in the Mouse Main Olfactory Epithelium** *CHEMICAL SENSES*
Tan, L., Xie, X.
2018; 43 (6): 427–32

- **Single-cell whole-genome analyses by Linear Amplification via Transposon Insertion (LIANTI)** *SCIENCE*
Chen, C., Xing, D., Tan, L., Li, H., Zhou, G., Huang, L., Xie, X.
2017; 356 (6334): 189–94

- **Olfactory sensory neurons transiently express multiple olfactory receptors during development** *MOLECULAR SYSTEMS BIOLOGY*
Tan, L., Li, Q., Xie, X.
2015; 11 (12): 844

- **Single Cell Transcriptome Amplification with MALBAC** *PLOS ONE*

  Chapman, A. R., He, Z., Lu, S., Yong, J., Tan, L., Tang, F., Xie, X.

  2015; 10 (3): e0120889

- **Rare event of histone demethylation can initiate singular gene expression of olfactory receptors** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*

  Tan, L., Zong, C., Xie, X.

  2013; 110 (52): 21148–52

- **Modeling Recent Human Evolution in Mice by Expression of a Selected EDAR Variant** *CELL*

  Kamberov, Y. G., Wang, S., Tan, J., Gerbault, P., Wark, A., Tan, L., Yang, Y., Li, S., Tang, K., Chen, H., Powell, A., Itan, Y., Fuller, et al

  2013; 152 (4): 691–702

- **SLOWLY SWITCHING BETWEEN ENVIRONMENTS FACILITATES REVERSE EVOLUTION IN SMALL POPULATIONS** *EVOLUTION*

  Tan, L., Gore, J.

  2012; 66 (10): 3144–54

- **Hidden Randomness between Fitness Landscapes Limits Reverse Evolution** *PHYSICAL REVIEW LETTERS*

  Tan, L., Serene, S., Chao, H., Gore, J.

  2011; 106 (19): 198102