Pin-Chung (Tony) Cheng

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San Diego, CA, United States

Summary

Ph.D. candidate at UC San Diego and Altos Labs specializing in single-cell genomics technology development and multi-omic data analysis (RNA, DNA, methylation, ATAC). Experienced in stem cell biology, cell culture, animal models, and microfluidics, with a medical background as a licensed physician in Taiwan. Passionate about advancing aging, cancer, and regenerative medicine research using high-throughput technologies and computational tools.

Skills

- **Computational:** Python, R, Linux/Bash, Scanpy, Seurat, DESeq2, variant calling (SNP/CNV), HipSTR, bwa, Bismark, MethylPy, samtools, bcftools, bedtools, VSCode, Cursor, AWS, Nextflow, Git/Github.
- **Statistics:** T-test, Mann-Whitney U, Correlation Test, Permutation Test, Bootstrapping.
- **Single Cell Genomics:** Single cell/nuclei DNA extraction (Singulator, 10X nuclei isolation kit), restriction enzyme digestion, adapter ligation, end repair, DNA amplification, Illumina Sequencing.
- **Probe-Based Target Enrichment:** IDT xGEN Hybridization Kit; DNA probe production via in vitro transcription and reverse transcription from DNA oligo pools (Twist Bioscience, up to 169,000 oligos).
- **Methylation Library Preparation:** Zymo Bisulfite Conversion Kit, NEB EM-Seq.
- **Molecular biology:** PCR, qPCR, PCR-clean up, capillary electrophoresis, immunohistochemistry, immunofluorescence, microscopy, western-blot, immunoprecipitation, size-exclusion chromatography.
- **Cell Biology:** mouse primary stem cell isolation and culture, FACS.
- **Animal work:** mouse IP/IV injection, intracerebral injection, tissue cryosection, animal surgery.

Education

Doctor of Philosophy (Ph.D.), Biological Sciences / Quantitative Biology — *2019 – Summer 2025*
University of California San Diego, San Diego, CA

Master of Science (M.S.), Stem Cell Biology and Regenerative Medicine — *2017 – 2018*
University of Southern California, Los Angeles, CA

Doctor of Medicine (M.D.), Medicine — *2007 – 2014*
Kaohsiung Medical University, Kaohsiung, Taiwan

Professional Experience

Graduate Student Researcher
Altos Labs, San Diego, CA — *2023 – Present*

- Developed RETrace v2, achieving a 300-fold improvement in single-cell lineage tracing resolution.

- Improved probe target capture efficiency (on-target 20% to 80%, 3-fold increase in target coverage) and reduced PCR cycles (n=44 to 11) by optimizing probe design, blocker and single-cell lysis protocol.
- Identified targets that are 4X more informative and expanded probe panel from 11,000 to 92,000 targets, resulting in 30X improvement in lineage tracing resolution.
- Built an oligonucleotide model to evaluate microsatellite PCR accuracy across multiple polymerases, reducing error rates by 15%.
- Benchmarked homopolymer sequencing accuracy on Illumina MiSeq, NextSeq 2000 and Element Bio AVITI platform, achieving a 20% error reduction.
- Applied RETrace v2 to cell lines and mouse models (WT, HET3, microsatellite instability) and built a custom computational pipeline for phylogenetic tree reconstruction.

Graduate Student Researcher *2019 – 2023*
University of California San Diego, Kun Zhang Lab, San Diego, CA

- Optimized a retrospective single-cell lineage tracing and methylation profiling technology.
- Analyzed single-nucleus chromatin accessibility and mRNA expression (SNARE-seq2) data in the human fetal heart and glioblastoma samples.

Graduate Instructional Apprentice (IA) *2020 – 2023*
University of California San Diego, San Diego, CA

- Courses: FA20 BICD100 Genetics, FA21 & FA22 BGGN213 Bioinformatics.

Research Associate *2017 – 2019*
University of Southern California, Joseph Rodgers Lab, Los Angeles, CA

- Pharmacologically targeted metabolic pathways to rejuvenate aged muscle stem cells.

Graduate Research Assistant *2016 – 2017*
Academia Sinica, Yun-Ru Chen Lab, Taipei, Taiwan

- Characterized a novel antibody targeting TDP-43 oligomers in an ALS mouse model.
- Preclinical drug screen targeting amyloid precursor protein pathway in an Alzheimer's mouse model.

Honors and Certificates

- J Yang Scholarship Award, UC San Diego Institute of Engineering in Medicine
- Excellence in Teaching Award UC San Diego, Bioinformatics
- ECFMG Certificate, Australian Medical Council MCQ Exam, Taiwan Medical License – Passed

Publications

- **Pin-Chung Cheng**, Polina Kameneva, Dmitrii Kamenev, Igor Adameyko, Peter V Kharchenko, Kun Zhang. RETrace2: Single Cell Lineage Tracing using Highly-Mutable Homopolymer in Microsatellite Instability Mouse Model. *Manuscript in Preparation*. (2025)

- Manmeet H. Raval, **Pin-Chung Cheng**, Nicholas Guardino, … Keyue Shen, Andrew S. Brack, and Joseph T. Rodgers. PDH Mediated Mitochondrial Respiration Controls the Speed of Muscle Stem Cell Activation in Muscle Repair and Aging. BioRxiv. (2020)