Haikuo Li

Postdoctoral Research Associate @ Yale University

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EDUCATION

Doctor of Philosophy, Biological and Biomedical Sciences (Molecular Genetics and Genomics)   8/2019 – 12/2023

Washington University in St. Louis, MO, United States

- Thesis mentor: Benjamin D. Humphreys, M.D., Ph.D.
- Thesis committee: Ting Wang, Samantha Morris, Jeffrey Millman, Allegra Petti, Michael Meers

Bachelor of Science, Bioscience (Zhiyuan Honors Program)   9/2015 – 6/2019

Shanghai Jiao Tong University, Shanghai, China

- 2019 Top 1% Bachelor Thesis: Rank #1 in the program
- 2019 Outstanding Graduate in Bachelor Degree, Shanghai

WORK EXPERIENCE

Postdoctoral Research Associate   2/2024 – present

Yale University | Department of Biomedical Engineering | Rong Fan Lab

Visiting Student   6/2018 – 4/2019

Yale University | Department of Immunobiology | Aaron Ring Lab

PUBLICATIONS

First-author research articles

1. **Li, H.**, Bao, S., Farzad, N., Qin, X., Fung, A.A., Zhang, D., Bai, Z., Tao, B. and Fan, R., 2025. Spatially resolved genome-wide joint profiling of epigenome and transcriptome with spatial-ATAC-RNA-seq and spatial-CUT&Tag-RNA-seq. *Nature Protocols*, pp.1-35. (**DOI**)

- Research Highlights by *Nature Protocols* News & Views (**DOI**)

2. **Li, H.**, Li, D., Ledru, N., Xuanyuan, Q., Wu, H., Asthana, A., Byers, L.N., Tullius, S.G., Orlando, G., Waikar, S.S. and Humphreys, B.D., 2024. Transcriptomic, epigenomic, and spatial metabolomic cell profiling redefines regional human kidney anatomy. *Cell Metabolism*, 36(5), pp.1105-1125. (**DOI**)

- Research Highlights by *Nature Reviews Nephrology* 2024 Year in Review (**DOI**)
- Featured Content of the *Cell Metabolism* journal website

3. **Li, H.**, Dixon, E.E., Wu, H. and Humphreys, B.D., 2022. Comprehensive single-cell transcriptional profiling defines shared and unique epithelial injury responses during kidney fibrosis. *Cell Metabolism*, 34(12), pp.1977-1998. (**DOI**)

- Research featured by NIH NIDDK annual report (**URL**)
- Research Highlights by *Nature Reviews Nephrology* (**URL**)
- Research Highlights by *Kidney International* (**DOI**)

4. **Li, H.***, Li, D.* (co-first author) and Humphreys, B.D., 2024. Chromatin conformation and histone modification profiling across human kidney anatomic regions. **_Scientific Data_**, 11(1), p.797. **(URL)**
   - Highlighted in the collection of _Data for epigenetics research_ **(URL)**

5. **Li, H.** and Humphreys, B.D., 2024. Spatially resolved metabolomic dataset of distinct human kidney anatomic regions. **_Data in Brief_**, 54, p.110431. **(URL)**

6. **Li, H.** and Humphreys, B.D., 2024. Protocol for multimodal profiling of human kidneys with simultaneous high-throughput ATAC and RNA expression with sequencing. **_STAR Protocols_**, 5(3), p.103049. **(URL)**

7. **Li, H.** and Humphreys, B.D., 2022. Mouse kidney nuclear isolation and library preparation for single-cell combinatorial indexing RNA sequencing. **_STAR Protocols_**, 3(4), p.101904. **(URL)**

8. Ku, X.*, Wang, J.*, **Li, H.*** (co-first author), Meng, C., Yu, F., Yu, W., Li, Z., Zhou, Z., Zhang, C., Hua, Y. and Yan, W., 2023. Proteomic portrait of human lymphoma reveals protein molecular fingerprint of disease specific subtypes and progression. **_Phenomics_**, 3(2), pp.148-166. **(URL)**

9. Wang, J.*, Ku, X.*, Ma, Q.*, **Li, H.*** (co-first author), Huang, S.*, Mao, L., Yu, F., Jin, J. and Yan, W., 2024. Hsa_circ_0007099 and PIP4K2A coexpressed in diffuse large B-cell lymphoma with clinical significance. **_Genes & Diseases_**, 11(4), p.101056. **(URL)**

First-author review/commentary articles

10. **Li, H.** and Humphreys, B.D., 2024. Multimodal characterization of sexual dimorphism in the mammalian kidney. **_Kidney International_**, 105(4), pp.653-655. **(URL)**

11. **Li, H.** and Humphreys, B.D., 2024. Targeting de novo lipogenesis to mitigate kidney disease. **_The Journal of Clinical Investigation_**, _134_(4). **(URL)**

12. **Li, H.** and Humphreys, B.D., 2022. New functions for basophils identified in kidney fibrosis. **_Nature Immunology_**, 23(6), pp.824-825. **(URL)**

13. **Li, H.** and Humphreys, B.D., 2021. Single cell technologies: Beyond microfluidics. **_Kidney360_**, 2(7), pp.1196-1204. **(URL)**

14. **Li, H.** and Humphreys, B.D., 2020. Surveying the human single-cell landscape. **_Kidney International_**, 98(6), pp.1385-1387. **(URL)**

First-author book chapter

15. Muto, Y.*, **Li, H.*** (co-first author) and Humphreys, B.D., 2022. Single Cell Transcriptomics. **_Innovations in Nephrology: Breakthrough Technologies in Kidney Disease Care_** (pp. 87-102). Cham: Springer International Publishing. **(URL)**
   - Chapter has been translated into German **(DOI)**

Other publications

16. Malone, A.F., Paul, R., **Li, H.**, Leckie-Harre, A., Wu, H., Ledru, N., McPherson, G., Davies, H.B., Doty, T., Farney, A.C. and Jay, C.C., 2025. Mosaic Loss of Y Chromosome Defines a Proximal Tubular Cell State Associated with Recovery from DGF and of Allograft Quality and Functional Reserve Post DCD Kidney Transplantation. **_Annals of Surgery_**, pp.10-1097. **(DOI)**

17. Baysoy, A., Tian, X., Zhang, F., Renauer, P., Bai, Z., Shi, H., **Li, H.**, Tao, B., Yang, M., Enninful, A. and

Gao, F., 2024. Spatially resolved in vivo CRISPR screen sequencing via perturb-DBiT. bioRxiv, pp.2024-11. **(DOI)**

18. Bai, Z.#, Zhang, D.#, Gao, Y.#, Tao, B.#, Zhang, D.#, Bao, S.#, Enninful, A., Wang, Y., **Li, H.**, Su, G. and Tian, X., Zhang, N., Xiao, Y., Liu, Y., Gerstein, M., Li, M., Xing, Y., Lu, J., Xu, ML. and Fan, R. 2024. Spatially exploring RNA biology in archival formalin-fixed paraffin-embedded tissues. *Cell*, 187(23), pp.6760-6779. **(DOI)**

19. Zhao, C., Rong, K., Liu, P., Kong, K., **Li, H.**, Zhang, P., Chen, X., Fu, Q. and Wang, X., 2024. Preventing periprosthetic osteolysis in aging populations through lymphatic activation and stem cell-associated secretory phenotype inhibition. *Communications Biology*, 7(1), p.962. **(URL)**

20. Wilson, P.C., Verma, A., Yoshimura, Y., Muto, Y., **Li, H.**, Malvin, N.P., Dixon, E.E. and Humphreys, B.D., 2024. Mosaic loss of Y chromosome is associated with aging and epithelial injury in chronic kidney disease. *Genome biology*, 25(1), p.36. **(URL)**

21. Cheng, Z. et al. (special journal issue; author list alphabetically ordered) (2023). RNA-seq: questions and answers. *STAR Protocols*. **(URL)**

RESEARCH EXPERIENCE

Postdoctoral Research Associate, Rong Fan Lab   2/2024 – present
Department of Biomedical Engineering, School of Engineering & Applied Science, Yale University
- Single-cell and spatial genomics technology development
- Investigating mechanisms of gene expression regulation

Research Associate, Benjamin Humphreys Lab   12/2023 – 1/2024
Division of Nephrology, Washington University in St. Louis

Ph.D. Student, Benjamin Humphreys Lab   4/2020 – 12/2023
Division of Nephrology, Washington University in St. Louis
- Multiomics characterization of kidney physiology: developing an anatomically stratified human kidney atlas with single-cell combinatorial indexing multiomics sequencing
- Multiomics characterization of kidney pathology: studying mouse models of kidney fibrosis with single-cell combinatorial indexing RNA-seq and spatially resolved transcriptomics
- Studying metabolic mechanisms that drive kidney fibrosis
- Studying cell fate determination in kidney injury & regeneration and regional differentiation
- Method development: single-cell combinatorial indexing (split-pool barcoding) library generation and unique data analysis; computational pipeline of analyzing spatially resolved metabolomics data

Ph.D. Rotation Student, Tim Peterson, Sidharth Puram, Benjamin Humphreys Labs   8/2019 – 4/2020
Washington University in St. Louis
- Peterson Lab: Understanding the intracellular effects of Cationic Amphipathic Drugs on organelles
- Puram Lab: Studying head and neck cancer by CITE-seq
- Humphreys Lab: Characterizing kidney injury and repair markers by RNAscope

Visiting Student, Aaron Ring Lab   6/2018 – 4/2019
Department of Immunobiology, Yale University

- Modulating immune cytokines by protein engineering

Undergraduate Researcher, Wei Yan Lab   9/2016 – 7/2018

Shanghai Center for Systems Biomedicine, Shanghai Jiao Tong University
- Identification of biomarkers of lymphoma with mass spectrometry; clinic proteomics

Summer Intern, Manyuan Long Lab   6/2017 – 8/2017

Department of Ecology and Evolution, The University of Chicago
- Identification of mammalian positively selected genes by polygenetic analysis

Science Olympiad (Mathematics), Shandong Province Team, China   7/2014 – 2/2015
- Top10 students selected to participate in the Chinese Mathematics Olympics

SKILLS

Wet lab experiment
- Extensive experience in spatial genomics library generation including spatial-RNA-seq (DBiT-seq), spatial-ATAC-seq, spatial-CUT&Tag and spatial co-profiling
- Extensive experience in single-cell and single-nucleus library generation from diverse technologies, including 10X Genomics, sci-RNA-seq, SHARE-seq and INTACT, as well as multimodal profiling including RNA-seq, ATAC-seq, Hi-C, CUT&RUN, CARLIN and CITE-seq
- Extensive experience in molecular biology technologies such as cloning, vector construction, qPCR, immunohistology, and in-situ hybridization
- Extensive experience in tissue culture including primary cell isolation, immunocytochemistry and Seahorse metabolic measurement
- Strong experience in animal work such as mouse kidney disease surgery (UUO/IRI) and tumor implantation
- Strong experience in clinical sample management and processing such as human kidney dissection
- Strong background in protein chemistry including mass spectrometry sample preparation & recombinant protein preparation and protein liquid chromatography

Computational workflow
- Extensive experience in using Python, R, Shell and Jupyter
- Extensive experience in single-cell sequencing data preprocessing and analysis including UMAP visualization, data integration, sample demultiplexing, cell trajectory interference, fate mapping, gene activity prediction and multimodal analysis at the million-cell level.
- Extensive experience in spatial transcriptomics, epigenomics and metabolomics data processing and analysis
- Strong experience in analysis of bulk RNA-seq, proteomics and metabolomics data
- Extensive experience in data mining and discovering biological insights
- Strong training background in mathematics

TEACHING EXPERIENCE

1. Trainee Supervisory Experience

Bench Mentor, Yale University   5/2025-8/2025
- Emily H. (undergraduate student): Spatially resolved CUT&Tag on novel targets and bioinformatics

Rotation Project Bench Mentor, Washington University in St. Louis   9/2023-11/2023
- Rachel W. (Ph.D. student in CSB/DBBS): Functional analysis of human kidney single-cell multiomics

Peer Study Mentor, Washington University in St. Louis   3/2023-6/2023
- Jenna U. (Ph.D. student in MGG/DBBS): Genomics (Bio5488) and Python-based coding tutoring

Rotation Project Bench Mentor, Washington University in St. Louis   12/2022-1/2023
- Qiao X. (Ph.D. student in BIDS/DBBS): Spatially resolved metabolomics analysis and package development

Bench Mentor, Washington University in St. Louis   9/2022-7/2023
- Dian L. (Ph.D. student in CSB/DBBS): Single-cell multimodal integration on human kidney physiology

Peer Study Mentor, Washington University in St. Louis   1/2022 – 6/2022
- Julie C. (Ph.D. student in HSG/DBBS): Genomics (Bio5488) and Python-based coding tutoring

2. Course Instructor Experience

Guest Instructor, Yale University   1/2025 – 6/2025
- Single-Cell Biology, Technologies, and Analysis (BENG469)

Assistant Instructor, Washington University in St. Louis   8/2022 – 6/2023
- Structural bioinformatics of proteins (Bio4525)
- Acknowledged in a publication (https://doi.org/10.1107/S2053230X25001530) for supporting undergraduates with data analysis and manuscript preparation

Assistant Instructor, Washington University in St. Louis   1/2021 – 6/2021
- Genomics (Bio5488)

Undergraduate Teaching Assistant, Shanghai Jiao Tong University
- College Genetics Course (2/2019–6/2019)
- College Macrobiology Course (2/2018–6/2018)
- College Biochemistry Course (9/2017–1/2018)

SOFTWARE DEVELOPMENT

MALDIpy: Single-cell analysis of MALDI-MS imaging mass spectrometry data (first contributor)
- `pip install MALDIpy` (https://pypi.org/project/MALDIpy/)

PRESENTATIONS & POSTERS

POSTER | Yale Cancer Center Trainee Colloquium	6/2025
Oral Talk Speaker, American Society of Nephrology Annual Meeting (ASN Kidney Week)	11/2023
Retreat Talk (MGG/CSB/HSG/IMSD programs), Washington University in St. Louis	9/2023
POSTER (PDF) | PhD program retreat, Washington University in St. Louis	9/2023

- Transcriptomic, epigenomic and spatial metabolomic cell profiling redefines regional human kidney anatomy

Project Talk, CZI Single-Cell Biology Annual Meeting	11/2022
Speaker, Nephrology Division Research Seminars, Washington University in St. Louis	9/2022
Retreat Talk (MGG/CSB/HSG/IMSD programs), Washington University in St. Louis	9/2022
POSTER (PDF) | PhD program retreat, Washington University in St. Louis	9/2022

- Cell profiling defines metabolic dysregulation in kidney fibrosis

DBBS Friday Talks (MGG/CSB/HSG/IMSD programs), Washington University in St. Louis	5/2022
REBUILDING A KIDNEY Spring Meeting | lighting talk	4/2022
PhD Program Thesis Committee Meeting, Washington University in St. Louis	8/2021, 4/2022, 4/2023, 12/2023
REBUILDING A KIDNEY Work in Progress | small group meeting	12/2021
PhD Program Qualifying Examination Committee Meeting	9/2020
POSTER (PDF) | SJTU Academic Festival (Best Poster Award)	2/2019

- Modulating the Tumor-Targeting Specificity of "Decoy-Resistant" Interleukin-18 by Protein Engineering

POSTER (PDF) | Human Proteome Organization World Congress	10/2018

- Clinical Proteomics Analysis using Data Independent Acquisition-Mass Spectrometry (DIA-MS) Identified Classifiers for Molecular Characterization of Lymphoma

POSTER (PDF) | SJTU Academic Festival (Best Poster Award)	12/2017

- Detecting Positively Selected Genes among Mammalian Species Using Phylogenetic Analysis of Maximum Likelihood

HONORS & ACTIVITIES

Reviewed > 20 manuscripts as an invited peer reviewer for academic journals	Since 2023
Session Chair, International Mass Spectrometry Imaging Society Conference	2025
Member, HCA (Human Cell Atlas)	2025 - present
Member, SITC (the Society for Immunotherapy of Cancer)	2025 - present
Award for Outstanding Students Abroad [highest award granted by the Chinese government to students overseas (LINK)]	2023
Member, NCFDD (National Center for Faculty Development & Diversity)	2020 - 2025
Member, ASN (American Society of Nephrology)	2020 - 2024
Top 0.2% Bachelor Thesis of Shanghai Jiao Tong University (URL) (Thesis PDF)	2019
Outstanding Graduate in Bachelor Degree, Shanghai	2019
Academic Excellence Scholarship (First-class), Shanghai Jiao Tong University	2016, 2017, 2018
Rank #1 Student Presentation, National Biology Education Conference of Chinese Ministry of Education	2018
Vice President, Students' Union of Zhiyuan Honors Program, Shanghai Jiao Tong University	2017 - 2018
Top 0.1% in Chinese University Entrance Examination (681 pts)	2015
Bronze medal, Chinese Mathematical Olympiad (CMO)	2014