HATTIE CHUNG

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EDUCATION

Harvard University 2011 – 2016
Ph.D., Systems Biology
Thesis: "Genome evolution in structured systems"

Massachusetts Institute of Technology 2007 – 2011
S.B., Biological Engineering. Minor in Applied International Studies.

RESEARCH TRAINING

Broad Institute of MIT and Harvard - Postdoctoral Researcher 2017 – Present
Advisors: Profs. Aviv Regev and Fei Chen
Developed novel proteogenomic single-cell method for jointly measuring nuclear proteins and RNA *in vivo*, and a multi-view neural network for extracting the features of small molecules for predictive modeling.

Harvard Medical School, Department of Systems Biology - Graduate Researcher 2012 – 2016
Advisor: Prof. Roy Kishony
Developed experimental and computational tools to study the spatiotemporal evolution of antibiotic resistance in bacterial pathogens during respiratory infections.

OTHER RESEARCH

Harvard Kennedy School, Belfer Center for Science & International Affairs 2016 – 2017
Advisor: Andrew C. Weber, former Assistant Secretary of Defense for Nuclear, Chemical & Biological Defense
Authored white paper on North Korea's bioweapons program featured in *The Washington Post* and *FiveThirtyEight*, advocating for dual-response surveillance to counter bioterrorism and natural epidemics.

PUBLICATIONS

* equal contribution, # corresponding author

Peer-reviewed Journals

1. **Chung, H.#**, Parkhurst, C.P., Magee, E.M., Phillips, D.N., Habibi, E., Chen, F., Yeung, B.Z., Waldman, J.A., Artis, D., Regev, A.# Joint single-cell measurements of nuclear proteins and RNA in vivo. ***Nature Methods*** 18, 1204–1212 (2021). **Highlighted in Technology Feature, *Nature Methods*.**

2. **Chung, H.**, Merakou, C., Schaefers, M.M., Flett, K.B., Martini, S., Lu, R., Blumenthal, J.A., Webster, S.S., Cross, A.R, Al Ahmar, R., Halpin, E., Anderson, M., Moore, N.S., Snesrud, E.C., Yu, H.D., Goldberg, J.B., O'Toole, G.A., McGann, P., Stam, J.A., Hinkle, M., McAdam, A.J., Kishony, R., Priebe, G.P. Rapid expansion and extinction of antibiotic resistance mutations during treatment of acute bacterial respiratory infections. ***Nature Communications*** 13, 1-10 (2022).

3. Muus, C.*, Luecken, M.*, Eraslan, G.*, Waghray, A.*, Heimberg, G.*, Sikkema, L.*, Kobayashi, Y.*, Vaishnav, E.D.*, Subramanian, A.*, Smillie, C.S.*, Jagadeesh, K.*, Duong, E.T.*, Fiskin, E.*, Torlai Triglai, E.*, Ansari, M.*, Cai, P.*, Lin, B.*, Buchanan, J.*, Chen, S.*, Shu, J.*, Haber, A.L.*, **Chung, H.***, Montoro, D.T.*, ... , NHLBI LungMAP Consortium. Single-cell meta-analysis of SARS-CoV-2 entry genes across tissues and demographics. ***Nature Medicine*** 27, 546-559 (2021).

4. Chu, C., Murdock, M., Jing, D., Won, T.H., **Chung, H.**, Kressel, A.M., Tsaava, T., Addorisio, M.E., Putzel, G.G., Zhou, L., Bessman, N.J., Yang, R., Moriyama, S., Parkhurst, C.N., Li, A., Meyer, H.C., Teng, F., Chavan, S.S., Tracey, K.J., Regev, A., Schroeder, F.C., Liston, C., Artis, D. The microbiota regulate neuronal function and fear extinction learning. ***Nature*** 574, 543-548 (2019).

5. **Chung, H.**, Lieberman, T.D., Vargas, S.O., Flett, K.B., McAdam, A.J., Priebe, G.P., Kishony, R. Global and local selection acting on the pathogen *Stenotrophomonas maltophilia* in the human lung. ***Nature Communications*** 8, 1-7 (2017).

6. Kelsic, E.D.*, **Chung, H.***, Cohen, N., Park, J., Wang, H.H., Kishony, R. RNA structural determinants of optimal codons revealed by MAGE-seq. ***Cell Systems*** 3, 563-571.e6 (2016).
7. Baym, M.*, Kryazhimskiy, S.*, Lieberman, T.D.*, **Chung, H.***, Desai, M.M., Kishony, R. Inexpensive Multiplexed Library Preparation for Megabase-Sized Genomes. ***PLoS ONE*** 10, e0128036 (2015).
8. Gyorgy, A., Jimenez, J.I., Yazbek, J., Huang, H.H., **Chung, H.**, Weiss, R., Del Vecchio, D. Isocost lines describe the cellular economy of genetic circuits. ***Biophysical Journal*** 109, 639-646 (2015).
9. Nguyen, D.N., Mahon, K.P., Chikh, G., Kim, P., **Chung, H.**, Vicari, A.P., Love, K.T., Goldberg, M., Chen, S., Krieg, A.M., Chen, J., Langer, R., Anderson, D.G. Lipid-derived nanoparticles for immunostimulatory RNA adjuvant delivery. ***Proceedings of the National Academy of Sciences*** 109, E797-E803 (2012).

Conference Proceedings

10. Yin, J.[*], **Chung, H.**[*,#], Regev, A[#]. A multi-view generative model for small molecule representation improves prediction tasks. ***NeurIPS*** Learning Meaningful Representations of Life workshop. **Selected paper** (2020).

White Papers

11. Kim, H.K., Phillipp, E., **Chung, H.** "North Korea's Biological Weapons Program: The Known and Unknown." Belfer Center for Science and International Affairs, Harvard Kennedy School, online (2017).

PATENTS

Method for extracting nuclei or whole cells from formaldehyde-fixed paraffin-embedded tissues. PCT/US2019/055894 (2020).

TALKS

Invited

MGH Termeer Center for Targeted Therapeutics, Boston, MA (virtual) 2021

Cellular and Tissue Genomics Division, Seminar, Genentech, South San Francisco, CA (virtual) 2021

Emerging Scholars in Genome Sciences Seminar, Center for Public Health Genomics, University of Virginia, Charlottesville, VA (virtual) 2021

Single Cell Proteomics Conference, Boston, MA 2021

Cell Circuits & Epigenomics Seminar, Broad Institute, Cambridge, MA 2021

Single Cell Genomics Day, New York Genome Center, New York, NY (virtual) 2021

Center for Integrated Cellular Analysis, New York, NY (virtual) 2021

Department of Neuroscience Seminar, Brown University, Providence, RI (virtual) 2020

Bacterial Genomics meeting, Infections Disease & Microbiome, Broad Institute, Cambridge, MA 2017

New York Genome Center, New York, NY 2015

Selected

Conference on Neural Information Processing Systems (NeurIPS), Learning Meaningful Representations of Life workshop (virtual) 2020

Workshop on Genome Evolution in Pathogen Transmission and Disease, Society for Molecular Biology and Evolution (SMBE), Shiga Kogen, Japan 2016

Rapid Next Gen Sequencing & Bioinformatics Pipelines, American Society for Microbiology (ASM), Washington, DC 2015
Awarded ASM travel grant.

Boston Evolutionary Genomics Supergroup Fall Retreat, Boston, MA 2015

International Synthetic and Systems Biology Summer School, Taormina, Italy 2014
Best presentation award.

SELECT AWARDS & FELLOWSHIPS

Broad Institute Excellence Award	2020
Johns Hopkins Center for Health Security, Emerging Leaders in Biosecurity Fellow	2018
FDA Naloxone App Competition, Honorable Mention	2018
Merit Fellowship, Harvard Graduate School of Arts and Sciences	2014
Paul & Daisy Soros Fellowship for New Americans	2011
MIT Institute Award, for service to bioengineering community	2011
Sigma Xi, inductee	2011
MIT Amgen Scholarship	2010
MIT Public Service Grant for field research in Tanzania	2008
MIT $100K Elevator Pitch Competition, winner of healthcare division	2007
MIT Emerson Music Scholarship	2007 – 2011

TEACHING FELLOW/ASSISTANT

Studying evolution through models & experiments (Harvard Sysbio301qc) - Prof. Roy Kishony	Winter 2014
Quantitative Methods for Biologists (Harvard Neurobiology 306qc) - Prof. Mike Springer	Summer 2013
Fields, Flows, and Forces in Biological Systems (MIT 20.330) - Prof. Scott Manalis	Spring 2011

ACADEMIC SERVICE & OUTREACH

Cajal Advanced Neuroscience Training Programme 2022
Invited Instructor, *Single cell profiling and analysis in neuroscience*. Teach inCITE-seq in a hands-on experimental workshop for 2 weeks in Bordeaux, France.

***Ad hoc* Specialty Reviewer for Paul & Daisy Soros Fellowship** 2013, 2021

American Society of Human Genetics (ASHG) Virtual Meeting 2021
Invited moderator for session on *New approaches for single cell sequencing and analysis*.

Harvard College, Eliot House, Resident Tutor 2015 – 2021
Fellowships Committee Chair. Advised >200 students on major fellowships (e.g. Rhodes Scholarship), led a team of 2-4 other tutors, and contributed to community building.

Broadie for a Week 2018, 2019
Designed and led interactive laboratory experiments for local high school students.

The Calculus Project 2014
Designed and led interactive laboratory experiments for low income and underrepresented high school students.

MIT Department of Biological Engineering, Curriculum Committee member	2011
MIT Bioengineering-Biomedical Engineering Society, Co-President	2010 – 2011
MIT Corporation Joint Advisory Committee (CJAC)	2009 – 2011

RESEARCH MENTORSHIP

Deep Learning in the Life Sciences (MIT 6.802/6.874), Project Mentor 2021
Supervised 3 Ph.D. students on deep generative modeling of transcription factor – gene expression relationships. Accepted poster to *NeurIPS LMRL* 2021.

MIT Department of Mathematics, Program for Research in Mathematics, Engineering and Science (PRIMES) for High School Students, Research Mentor 2019
Directed high school student on a machine learning project to develop a multi-view generative model of small molecules, culminating in an oral presentation and a *NeurIPS LMRL* workshop paper.

Broad Summer Research Program, Research Mentor 2018, 2019
Mentor for summer research program for undergraduate students. Designed independent project for each student, taught computational and experimental methods, and prepared students for oral presentations.

Research students

- Emma Magee. Research Associate — 2019 – 2021
  Current - incoming Ph.D. student, Chemical and Systems Biology, Stanford
- Jonathan Yin. Acton-Boxborough Regional High School & MIT PRIMES program — 2019 – 2021
  Joint work accepted to NeurIPS LMRL workshop
  Current - undergraduate student, Computer Science and Data Science, Yale University
- Michael Truell. MIT UROP student — 2019 – 2020
  Current - undergraduate student, Computer Science, MIT
- Maria Lysandrou. University of Chicago & Broad BSRP program — 2019
  Awarded best poster in computational biology,
  Annual Biomedical Research Conference for Minority Students (2019)
- Marie Goemans, Lexington High School — 2019
  Current - undergraduate student, MIT
- Sofia Mrowka. Cambridge Rindge and Latin School — 2019
  Current - undergraduate student, Brown University
- Nathan Han. MIT UROP student — 2019
- Julia Waldman. Research Associate, Regev Lab — 2019
  Current - D.O. student, Touro College of Osteopathic Medicine
- Karl Keat. University of Virginia undergrad & Broad BSRP program — 2018
  Current - Ph.D. student, Genomics and Computational Biology, UPenn
- Eyal Bairey. Masters student, Technion - Israel Institute of Technology. — 2014
  Current - Ph.D. student, Physics, Technion

UNDERGRADUATE RESEARCH

MIT Department of Biological Engineering - Undergraduate Researcher — 2009 – 2011
Advisor: Prof. Ron Weiss
Designed an RNA circuit to evaluate cell states and selectively kill cancer cells.

Harvard-MIT Health Sciences & Technology - Undergraduate Researcher — 2007 – 2009
Advisor: Prof. Robert Langer
Engineered lipid nanoparticles to deliver immunostimulatory RNA.