

FEIQIAO BRIAN YU

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EDUCATION

Stanford University, Stanford, CA

Doctor of Philosophy in Electrical Engineering 2010 – 2017

Advisers Professor Stephen R. Quake, Professor Mark A. Horowitz

Thesis *Characterizing bacterial physiology and diversity using microfluidic systems*

Master of Science in Electrical Engineering 2010 – 2012

California Institute of Technology, Pasadena, CA

Bachelor of Science in Electrical Engineering 2006 – 2010

Advisers Professor Yu-Chong Tai, Professor Changhuei Yang

RESEARCH EXPERIENCES

Senior Scientist – Chan Zuckerberg Biohub Jan 2022 – Present

Scientist II – Chan Zuckerberg Biohub Feb 2019 – Dec 2021

Scientist I – Chan Zuckerberg Biohub Oct 2017 – Feb 2019

Genomics Platform

- Designed, built, maintained, and continuously updated the Genomics Platform's sample submission, meta-data tracking, sequencing, and data delivery infrastructure at CZ Biohub for the past 4 years. The sequencing submission infrastructure automates aspects of interactions between Genomics Team members, all internal groups, and ~30% of external Biohub investigators, enabling efficient operation at scale with limited personnel.
- Created and maintained czbgenomics.org website which acts as a portal into the sequencing submission environment and provides essential information on the Illumina sequencing process.
- Evaluated and integrated emerging sequencing methodologies (e.g. long read sequencing) into the Genomics Platform to enable the utilization of genomic measurements in new applications.
- Currently leading the effort to build the second generation of user-facing infrastructure and database to consolidate multi-omics meta-data from different technology platforms (Genomics, Mass Spec, Microscopy) with the goal of interfacing with various data portals.

Microbiome Initiative

- Implemented CZ Biohub's Microbiome Initiative. Collaborated on scientific projects focused on microbiome research with 8 faculties from Stanford, Berkeley, and UCSF.
- Developed and benchmarked 3 high-throughput experimental protocols for low-cost, large-scale metagenomics sample preparation, enabling human microbiome projects that would be otherwise financially infeasible. The Stanford MITI Initiative has since adopted these processes.
- Designed and built one of the world's largest anaerobic chambers containing automated capabilities for cultivating microbial isolates, creating complex synthetic microbial communities, and high-throughput measurement of growth curves.
- Purified more than 100 different strains from the human gut and, using Multi-Omics (metagenomics, meta-transcriptomics, and metabolomics), investigated interactions and resource utilization in complex synthetic communities through nutrient and strain dropout experiments.
- Lead the development of nanopore long read technology to enable whole genome sequencing of microbial isolates and hybrid assembly at scale. Closed 120 genomes at \$250 per genome.
- Developed AWS-based computational tools, bioinformatic infrastructure, and dockerized processes for the analyses of microbiome sequencing data.

Postdoctoral Scholar – Stanford Quake Lab

Jan 2017 – Oct 2017

- Explored microbial diversity in extreme environments in terms of temperature, pH, and nutrient availability using microfluidic-based mini-metagenomics.

Ph.D. Candidate – Stanford Quake Lab

Mar 2011 – Jan 2017

Advisers: Professor Stephen R. Quake, Professor Mark A. Horowitz

- Developed a microfluidic-based mini-metagenomic method to uncover genomes of novel microbial lineages from environmental or host derived samples. Mini-metagenomics increases throughput while maintaining single-cell resolution.
- Developed automated imaging and liquid handling around the experimental process of single cell RNA-seq based on Fluidigm's C1 microfluidic platform and the Nextera XT library protocol.
- Explored single cell growth and division characteristics of *Synechocystis*, a model cyanobacterium, using a custom and integrated microfluidic cell culture system.
- Designed and fabricated a microfluidic serial digital to analog pressure converter to provide different on-chip pressures, allowing versatile on-chip parallelization of biological experiments.

Undergraduate Research Assistant – Caltech Micromachining Laboratory

Jun 2008 – Jun 2010

Adviser: Professor Yu-Chong Tai

- Designed and fabricated slant tethered bioMEMS check valve for ocular implants
- Studied adhesion of a biocompatible coating, parylene, to various material surfaces.
- Characterized performance of biocompatible and passive parylene intraocular pressure actuators

TEACHING EXPERIENCES

- Stanford Pre-Collegiate Studies Instructor (Topic: Embedded Systems) Jun 2018 – July 2019
- Stanford Science Circle Instructor (Topic: Electrical Engineering) May 2019 – Dec 2019
- Lecturer for Graduate Level Microfluidic Fabrication Class Jan 2013 – Mar 2014
- Designed a Laboratory Class in Embedded Systems Jan 2014 – Mar 2014
- Teaching Assistant for Feedback and Control Class Mar 2009 – Jun 2010

JOURNAL PUBLICATIONS

1. Vasquez, K.S., Willis, L., Cira, N.J., Ng, K.M., Pedro, M.F., Aranda-Díaz, A., Rajendram, M., **Yu, F.B.**, Higginbottom, S.K., Neff, N., Sherlock, G., Xavier, K.B., Quake, S.R., Sonnenburg, J.L., Good, B.H., Huang, K.C. “Quantifying rapid bacterial evolution and transmission within the mouse intestine”, *Cell Host & Microbe*. September 1, 2021. doi.org/10.1016/j.chom.2021.08.003
2. Wastyk, H.C., Fragiadakis, G.K., Perelman, D., Dahan, D., Merrill, B.D., **Yu, F.B.**, Topf, M., Gonzalez, C.G., Treuren, W.V., Han, S., Robinson, J.L., Elias, J.E., Sonnenburg, E.D., Gardner, C.D., Sonnenburg, J.L. “Gut-microbiota-targeted diets modulate human immune status”, *Cell*, July 6, 2021. Volume 184, Issue 16, Pages 4137-4153.e14, DOI: 10.1016/j.cell.2021.06.019
3. West PT, Peters SL, Olm MR, **Yu FB**, Gause H, Lou YC, Firek BA, Baker R, Johnson AD, Morowitz MJ, Hettich RL, Banfield JF. Genetic and behavioral adaptation of *Candida parapsilosis* to the microbiome of hospitalized infants revealed by in situ genomics, transcriptomics, and proteomics. *Microbiome*. June 21, 2021;9(1):142. DOI: 10.1186/s40168-021-01085-y. PMID: 34154658.
4. Cesar S, Anjur-Dietrich M, **Yu B**, Li Ethan, Rojas E, Neff N, Cooper TF, Huang KC, “Bacterial evolution in high-osmolarity environments”, *mBio*, vol. 11, issue 4, e01101-20, August 4, 2020
5. Schaum N, Lehallier B, Hahn, O, Palovics R, Hosseinzadeh S, Lee SE, Sit R, Lee DP, Losada PM, Zardeneta ME, Fehlmann T, Webber JT, McGeever A, Calcuttawala K, Zhang H, Berdnik D, Mathur V,

- Tan W, Zee A, Tan M, **The Tabula Muris Consortium**, Pisco A, Karkanias J, Neff NF, Keller A, Darmanis S, Quake SR, Wyss-Coray T, "Ageing hallmarks exhibit organ-specific temporal signatures," *Nature*, vol. 583, pp. 596-602, July 15, 2020
6. **The Tabula Muris Consortium**, "A single-cell transcriptomic atlas characterizes ageing tissues in the mouse" *Nature*, vol. 583, pp. 590-595, July 15, 2020
 7. Bisanz JE, Soto-Perez P, Noecker C, Aksenov AA, Lam KN, Kenney GE, Bess EN, Haiser HJ, Kyaw TS, **Yu FB**, Rekdal VM, Ha CWY, Devkota S, Balskus E, Dorrestein PC, Allen-Vercoe E, Turnbaugh PJ, "A Genomic Toolkit for the Mechanistic Dissection of Intractable Human Gut Bacteria" *Cell Host & Microbe*, vol. 27, issue 6, pp. 1001-1013, June 10, 2020
 8. Gulati GS, Sikandar SS, Wesche DJ, Manjunath A, Bharadwaj A, Berger MJ, Ilagan F, Kuo AH, Hsieh RW, Cai S, Zabala M, Scheeren FA, Lobo NA, Qian D, **Yu FB**, Dirbas FM, Clarke MF, Newman AM, "Single-cell transcriptional diversity is a hallmark of developmental potential," *Science*, vol. 367, issue 6476, pp. 405-411, January 24, 2020
 9. Ng KM, Aranda-Diaz A, Tropini C, Frankel MR, Van Treuren WW, O'Laughlin C, Merrill BD, **Yu FB**, Pruss KM, Oliveira RA, Higginbottom SK, Neff NF, Fischbach MA, Xavier KB, Sonnenburg JL, Huang KC, "Recovery of the gut microbiota after antibiotics depends on host diet and environmental reservoirs," *Cell Host & Microbe*, vol. 26, issue 5, pp. 650-655, November 13, 2019
 10. Schmidt ST, **Yu FB**, Blainey PC, May AP, Quake SR, "Nucleic Acid Cleavage with a Hyperthermophilic Cas9 from an Unculturable Ignavibacterium," *PNAS*, vol. 116, no. 46, pp.23100-23105, October 28, 2019
 11. Deaton J*, **Yu FB***, Quake SR, "Mini-Metagenomics and Nucleotide Composition Aid the Identification and Host Association of Novel Bacteriophage Sequences," *Advanced Biosystems*, vol. 3, issue 11, pp. 1900108, August 16, 2019
 12. Berghuis BA, **Yu FB**, Schulz F, Blainey PC, Woyke T, Quake SR, "Hydrogenotrophic methanogenesis in archaeal phylum *Verstraetearchaeota* reveals the shared ancestry of all methanogens," *PNAS*, vol 116, issue. 11, pp. 5037-5044. March 12, 2019.
 13. Schulz F, Alteio L, Goudeau D, Ryan EM, **Yu FB**, Malmstrom RR, Blanchard J, Woyke T, "Hidden diversity of soil giant viruses," *Nat. Comm.* 9, 4881, November 19, 2018.
 14. Gasch AP*, **Yu FB***, Hose J, Escalante E, Place M, Bacher R, Kanbar J, Ciobanu D, Sandor L, Grigoriev I, Kendzierski C, Quake SR, McClean MN, "Single-cell RNA-seq reveals intrinsic and extrinsic regulatory heterogeneity in yeast responding to stress," *Plos Biology*, December 14, 2017.
 15. **Yu FB**, Blainey P, Schulz F, Woyke T, Horowitz MA, Quake SR, "Microfluidic-based mini-metagenomics enables discovery of novel microbial lineages from complex environmental samples," *eLife* 6:e26580, July 5, 2017.
 16. **Yu FB**, Willis L, Chau R, Zambon A, Horowitz MA, Bhaya D, Huang KC, Quake SR, "Long-term microfluidic tracking of coccoid cyanobacterial cells reveals robust control of division timing," *BMC Biology*, vol 15, issue 1, pp. 11, February 2017.
 17. Hu K, **Yu FB**, Ho TY, Chakrabarty K, "Testing of Flow-Based Microfluidic Biochips: Fault Modeling, Test Generation, and Experimental Demonstration," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, vol 33, issue 10, pp. 1463-1475, October 2014.
 18. **Yu FB**, Horowitz MA, Quake SR, "Microfluidic serial digital to analog pressure converter for arbitrary pressure generation and contamination-free flow control," *Lab on a Chip*, vol. 13, pp. 1911-8, May 21 2013.
 19. Cerny R, Cattell M, Sauka-Spengler R, Bronner-Fraser M, **Yu FB**, Medeiros DM, "Evidence for the prepattern/cooption model of vertebrate jaw evolution," *PNAS*, vol. 107, pp. 17262-17267, Oct 5 2010.

CONFERENCE PUBLICATIONS

1. **Yu F**, Horowitz MA, Quake SR, "High throughput microfluidic sample preparation for metagenomic analysis," *Proceedings of the 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2014)*, San Antonio, U.S.A., October 2014, pp. 129-131.
2. **Yu F**, Horowitz MA, Quake SR, "Robust Layout Techniques Decrease Volume Injection and Capacitive Mismatch due to Alignment Errors," *Proceedings of the 17th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2013)*, Freiburg, Germany, November 2013, pp. 940-942.
3. **Yu F**, Song K, Horowitz MA, Quake SR, "Single Cell Tracking of Synechocystis Growth in a Microfluidic Culture Device Using a Probabilistic Automated Image Analysis Technique," *Proceedings of the 17th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2013)*, Freiburg, Germany, November 2013, pp. 1689-1691.
4. **Yu F**, Kibardin V, Horowitz MA, Quake SR, "Microfluidic Serial DAC for Analog Pressure Generation," *Proceedings of the 16th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS 2012)*, Okinawa, Japan, November 2012, pp. 70-72.
5. Lin JCH, **Yu F**, Tai YC, "Integration of slanted tether check-valves for high pressure applications," *Proceedings of 6th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2011)*, Kaohsiung, Taiwan, February 2011, pp. 715-718.
6. Lin JCH, **Yu F**, Tai YC, "Cracking pressure control of parylene check valve using slanted tensile tethers," *Proceedings of 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010)*, Hong Kong, China, January 2010.
7. **Yu F**, Lin JCH, Chen PJ, Tai YC, "Parylene stiction," *Proceedings of 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010)*, Hong Kong, China, January 2010.
8. Lin JCH, **Yu F**, Saati S, Varma R, Humayun MS, Tai YC, "Ex vivo implantation study of minimally invasive glaucoma drainage device," *Proceedings of the 5th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2010)*, Xiamen, China, January 2010.
9. **Yu F**, Lin JCH, Chen PJ, Tai YC, "Stiction of parylene C to silicon surface measured using blister tests," *Proceedings of the 5th IEEE International Conference on Nano/Micro Engineered and Molecular Systems (NEMS 2010)*, Xiamen, China, January 2010.
10. Lin YCH, Chen PJ, **Yu B**, Humayun M, Tai YC, "Minimally Invasive Parylene Dual-Valved Flow Drainage Shunt for Glaucoma Implant," *Proceedings of 22nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2009)*, Sorrento, Italy, January 2009, pp. 196-199.

AWARDS

- ASM Microbe 2016 Outstanding Student Abstract Jun 2016
- Donald O. Pederson Best Paper Award for *IEEE Transactions on Computer Aided Design* Jun 2015
- NSF Graduate Fellowship Apr 2011
- Stanford Graduate Fellowship Mar 2010
- Hertz Fellowship Finalist Feb 2010
- Best Paper at the 5th IEEE NEMS Conference in Xiamen, China Jan 2010
- Tau Beta Pi Scholarship Apr 2009

INVITED SEMINARS AND LECTURES

1. Center for Business Innovation; 10th Microfluidic Consortium February 10, 2019
2. IEEE Nano Council; Keynote Speaker March 20, 2018
3. Bay Area Microfluidics Network February 01, 2018
4. Hopkins Marine Station; Hopkins Genomic Club Seminar March 22, 2016
5. Santa Clara University; Department of Bioengineering February 10, 2016
6. Joint Genome Institute; Science and Technology Seminar July 29, 2015