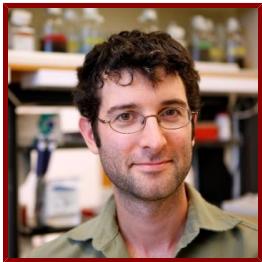


# Stanford

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## Hunter Fraser

Professor of Biology

Curriculum Vitae available Online

### Bio

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#### ACADEMIC APPOINTMENTS

- Professor, Biology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Stanford Cancer Institute
- Member, Wu Tsai Neurosciences Institute

#### LINKS

- Fraser Lab: <https://web.stanford.edu/group/fraserlab/>

### Research & Scholarship

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#### CURRENT RESEARCH AND SCHOLARLY INTERESTS

We study the evolution of complex traits by developing new experimental and computational methods.

Our work brings together quantitative genetics, genomics, epigenetics, and evolutionary biology to achieve a deeper understanding of how genetic variation shapes the phenotypic diversity of life. Our main focus is on the evolution of gene expression, which is the primary fuel for natural selection. Our long-term goal is to be able to introduce complex traits into new species via genome editing.

### Teaching

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#### COURSES

##### 2023-24

- Evolutionary Genomics: BIO 191, BIO 332 (Win)
- The Science and Ethics of Personalized Genomic Medicine: BIO 4N (Win)

##### 2021-22

- The Science and Ethics of Personalized Genomic Medicine: BIO 4N (Win)

##### 2020-21

- Evolutionary Genomics: BIO 332 (Spr)
- Problem solving in infectious disease: BIO 60 (Sum)

## STANFORD ADVISEES

### Doctoral Dissertation Reader (AC)

Joel Erberich, Katherine Liu

### Doctoral Dissertation Advisor (AC)

Alex Starr

### Master's Program Advisor

Adam Behrendt

## GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)
- Biomedical Informatics (Phd Program)

## Publications

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### PUBLICATIONS

#### • Primate cell fusion disentangles gene regulatory divergence in neurodevelopment. *Nature*

Agoglia, R. M., Sun, D. n., Birey, F. n., Yoon, S. J., Miura, Y. n., Sabatini, K. n., Pascua, S. P., Fraser, H. B.  
2021

#### • Human-chimpanzee fused cells reveal cis-regulatory divergence underlying skeletal evolution. *Nature genetics*

Gokhman, D. n., Agoglia, R. M., Kinnebrew, M. n., Gordon, W. n., Sun, D. n., Bajpai, V. K., Naqvi, S. n., Chen, C. n., Chan, A. n., Chen, C. n., Petrov, D. A., Abituv, N. n., Zhang, et al  
2021

#### • Detecting selection with a genetic cross. *Proceedings of the National Academy of Sciences of the United States of America*

Fraser, H. B.  
2020

#### • The somatic mutation landscape of the human body. *Genome biology*

Garcia-Nieto, P. E., Morrison, A. J., Fraser, H. B.  
2019; 20 (1): 298

#### • Fine-mapping cis-regulatory variants in diverse human populations. *eLife*

Tehranchi, A., Hie, B., Dacre, M., Kaplow, I., Pettie, K., Combs, P., Fraser, H. B.  
2019; 8

#### • Tissue-Specific cis-Regulatory Divergence Implicates eloF in Inhibiting Interspecies Mating in *Drosophila*. *Current biology : CB*

Combs, P. A., Krupp, J. J., Khosla, N. M., Bua, D., Petrov, D. A., Levine, J. D., Fraser, H. B.  
2018

#### • Functional Genetic Variants Revealed by Massively Parallel Precise Genome Editing *CELL*

Sharon, E., Chen, S. A., Khosla, N. M., Smith, J. D., Pritchard, J. K., Fraser, H. B.  
2018; 175 (2): 544+

#### • Functional Genetic Variants Revealed by Massively Parallel Precise Genome Editing. *Cell*

Sharon, E., Chen, S. A., Khosla, N. M., Smith, J. D., Pritchard, J. K., Fraser, H. B.  
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#### • Pooled ChIP-Seq Links Variation in Transcription Factor Binding to Complex Disease Risk *CELL*

Tehranchi, A. K., Myrthil, M., Martin, T., Hie, B. L., Golan, D., Fraser, H. B.  
2016; 165 (3): 730-741

#### • Dissecting the Genetic Basis of a Complex cis-Regulatory Adaptation. *PLoS genetics*

- Naranjo, S., Smith, J. D., Artieri, C. G., Zhang, M., Zhou, Y., Palmer, M. E., Fraser, H. B.  
2015; 11 (12)
- **Genetic conflict reflected in tissue-specific maps of genomic imprinting in human and mouse.** *Nature genetics*  
Babak, T., Deveale, B., Tsang, E. K., Zhou, Y., Li, X., Smith, K. S., Kukurba, K. R., Zhang, R., Li, J. B., van der Kooy, D., Montgomery, S. B., Fraser, H. B.  
2015; 47 (5): 544-549
  - **Gene expression drives local adaptation in humans** *GENOME RESEARCH*  
Fraser, H. B.  
2013; 23 (7): 1089-1096
  - **Polygenic cis-regulatory adaption in the evolution of yeast pathogenicity** *GENOME RESEARCH*  
Fraser, H. B., Levy, S., Chavan, A., Shah, H. B., Perez, J. C., Zhou, Y., Siegal, M. L., Sinha, H.  
2012; 22 (10): 1930-1939
  - **Cell-type-specific cis-regulatory divergence in gene expression and chromatin accessibility revealed by human-chimpanzee hybrid cells.** *eLife*  
Wang, B., Starr, A. L., Fraser, H. B.  
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  - **Chromatin activity identifies differential gene regulation across human ancestries.** *Genome biology*  
Pettie, K. P., Mumbach, M., Lea, A. J., Ayroles, J., Chang, H. Y., Kasowski, M., Fraser, H. B.  
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  - **Cell type-specific cis-regulatory divergence in gene expression and chromatin accessibility revealed by human-chimpanzee hybrid cells.** *bioRxiv : the preprint server for biology*  
Wang, B., Starr, A. L., Fraser, H. B.  
2023
  - **Allele-specific expression reveals genetic drivers of tissue regeneration in mice.** *Cell stem cell*  
Mack, K. L., Talbott, H. E., Griffin, M. F., Parker, J. B., Guardino, N. J., Spielman, A. F., Davitt, M. F., Mascharak, S., Downer, M., Morgan, A., Valencia, C., Akras, D., Berger, et al  
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  - **Gene-by-environment interactions are pervasive among natural genetic variants.** *Cell genomics*  
Chen, S. A., Kern, A. F., Ang, R. M., Xie, Y., Fraser, H. B.  
2023; 3 (4): 100273
  - **Widespread epistasis among beneficial genetic variants revealed by high-throughput genome editing.** *Cell genomics*  
Ang, R. M., Chen, S. A., Kern, A. F., Xie, Y., Fraser, H. B.  
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  - **Evolution of spatial and temporal cis-regulatory divergence in sticklebacks.** *Molecular biology and evolution*  
Mack, K. L., Square, T. A., Zhao, B., Miller, C. T., Fraser, H. B.  
2023
  - **Accounting for cis-regulatory constraint prioritizes genes likely to affect species-specific traits.** *Genome biology*  
Starr, A. L., Gokhman, D., Fraser, H. B.  
2023; 24 (1): 11
  - **Existing methods are effective at measuring natural selection on gene expression.** *Nature ecology & evolution*  
Fraser, H. B.  
2022
  - **Bacterial Retrons Enable Precise Gene Editing in Human Cells**  
Zhao, B.  
CELL PRESS.2022: 102
  - **Transcriptome diversity is a systematic source of variation in RNA-sequencing data.** *PLoS computational biology*  
García-Nieto, P. E., Wang, B., Fraser, H. B.  
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- **Bacterial Retrons Enable Precise Gene Editing in Human Cells.** *The CRISPR journal*  
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- **cis-Regulatory changes in locomotor genes are associated with the evolution of burrowing behavior.** *Cell reports*  
Hu, C. K., York, R. A., Metz, H. C., Bedford, N. L., Fraser, H. B., Hoekstra, H. E.  
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- **Divergent patterns of selection on metabolite levels and gene expression.** *BMC ecology and evolution*  
Kern, A. F., Yang, G. X., Khosla, N. M., Ang, R. M., Snyder, M. P., Fraser, H. B.  
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- **GRINS: Genetic elements that recode assembly-line polyketide synthases and accelerate their diversification.** *Proceedings of the National Academy of Sciences of the United States of America*  
Nivina, A., Herrera Paredes, S., Fraser, H. B., Khosla, C.  
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- **The cis-regulatory effects of modern human-specific variants.** *eLife*  
Weiss, C. V., Harshman, L., Inoue, F., Fraser, H. B., Petrov, D. A., Ahituv, N., Gokhman, D.  
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- **Lineage-specific selection and the evolution of virulence in the Candida clade.** *Proceedings of the National Academy of Sciences of the United States of America*  
Singh-Babak, S. D., Babak, T. n., Fraser, H. B., Johnson, A. D.  
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- **Molecular mechanisms of coronary disease revealed using quantitative trait loci for TCF21 binding, chromatin accessibility, and chromosomal looping.** *Genome biology*  
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- **Fine-mapping cis-regulatory variants in diverse human populations** *ELIFE*  
Tehranchi, A., Hie, B., Dacre, M., Kaplow, I., Pettie, K., Combs, P., Fraser, H. B.  
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- **Improving Estimates of Compensatory cis-trans Regulatory Divergence** *TRENDS IN GENETICS*  
Fraser, H. B.  
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- **Tissue-Specific cis-Regulatory Divergence Implicates eloF in Inhibiting Interspecies Mating in Drosophila** *CURRENT BIOLOGY*  
Combs, P. A., Krupp, J. J., Khosla, N. M., Bua, D., Petrov, D. A., Levine, J. D., Fraser, H. B.  
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- Behavior-dependent cis regulation reveals genes and pathways associated with bower building in cichlid fishes. *Proceedings of the National Academy of Sciences of the United States of America*  
York, R. A., Patil, C., Abdilleh, K., Johnson, Z. V., Conte, M. A., Genner, M. J., McGrath, P. T., Fraser, H. B., Fernald, R. D., Streelman, J. T.  
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- Spatially varying cis-regulatory divergence in *Drosophila* embryos elucidates cis-regulatory logic. *PLoS genetics*  
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- Spatially varying cis-regulatory divergence in *Drosophila* embryos elucidates cis-regulatory logic *PLOS GENETICS*  
Combs, P. A., Fraser, H. B.  
2018; 14 (11)
- Improving Estimates of Compensatory cis-trans Regulatory Divergence. *Trends in genetics : TIG*  
Fraser, H. B.  
2018
- High-resolution mapping of cis-regulatory variation in budding yeast *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Kita, R., Venkataram, S., Zhou, Y., Fraser, H. B.  
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Carja, O., MacIsaac, J. L., Mah, S. M., Henn, B. M., Kobor, M. S., Feldman, M. W., Fraser, H. B.  
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- Worldwide patterns of human epigenetic variation. *Nature ecology & evolution*  
Carja, O., MacIsaac, J. L., Mah, S. M., Henn, B. M., Kobor, M. S., Feldman, M. W., Fraser, H. B.  
2017; 1 (10): 1577–1583
- Cis-regulatory evolution in prokaryotes revealed by interspecific archaeal hybrids *SCIENTIFIC REPORTS*  
Artieri, C. G., Naor, A., Turgeman-Grott, I., Zhou, Y., York, R., Gophna, U., Fraser, H. B.  
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- Local Adaptation of Sun-Exposure-Dependent Gene Expression Regulation in Human Skin. *PLoS genetics*  
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Sharon, E., Sibener, L. V., Battle, A., Fraser, H. B., Garcia, K. C., Pritchard, J. K.  
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Agoglia, R. M., Fraser, H. B.  
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Artieri, C. G., Fraser, H. B.  
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● **Transcript length mediates developmental timing of gene expression across Drosophila.** *Molecular biology and evolution*

Artieri, C. G., Fraser, H. B.  
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● **Evolution at two levels of gene expression in yeast.** *Genome research*

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● **A Novel Test for Selection on cis-Regulatory Elements Reveals Positive and Negative Selection Acting on Mammalian Transcriptional Enhancers.** *Molecular biology and evolution*

Smith, J. D., McManus, K. F., Fraser, H. B.  
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● **Ancient cis-regulatory constraints and the evolution of genome architecture** *TRENDS IN GENETICS*

Irimia, M., Maeso, I., Roy, S. W., Fraser, H. B.  
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● **The molecular mechanism of a cis-regulatory adaptation in yeast.** *PLoS genetics*

Chang, J., Zhou, Y., Hu, X., Lam, L., Henry, C., Green, E. M., Kita, R., Kobor, M. S., Fraser, H. B.  
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● **The molecular mechanism of a cis-regulatory adaptation in yeast.** *PLoS genetics*

Chang, J., Zhou, Y., Hu, X., Lam, L., Henry, C., Green, E. M., Kita, R., Kobor, M. S., Fraser, H. B.  
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● **Cell-cycle regulated transcription associates with DNA replication timing in yeast and human** *GENOME BIOLOGY*

Fraser, H. B.  
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● **Differences in enhancer activity in mouse and zebrafish reporter assays are often associated with changes in gene expression** *BMC GENOMICS*

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● **Population-specificity of human DNA methylation** *GENOME BIOLOGY*

Fraser, H. B., Lam, L. L., Neumann, S. M., Kobor, M. S.  
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● **Genome-wide approaches to the study of adaptive gene expression evolution Systematic studies of evolutionary adaptations involving gene expression will allow many fundamental questions in evolutionary biology to be addressed** *BIOESSAYS*

Fraser, H. B.  
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Fraser, H. B., Babak, T., Tsang, J., Zhou, Y., Zhang, B., Mehrabian, M., Schadt, E. E.  
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- **Genetic validation of whole-transcriptome sequencing for mapping expression affected by cis-regulatory variation** *BMC GENOMICS*  
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- **Common polymorphic transcript variation in human disease** *GENOME RESEARCH*  
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- **Ab initio construction of a eukaryotic transcriptome by massively parallel mRNA sequencing** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
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- **Using protein complexes to predict phenotypic effects of gene mutation** *GENOME BIOLOGY*  
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- **Coevolution, modularity and human disease** *CURRENT OPINION IN GENETICS & DEVELOPMENT*  
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- **Codon usage and selection on proteins** *JOURNAL OF MOLECULAR EVOLUTION*  
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- **Aging and gene expression in the primate brain** *PLOS BIOLOGY*  
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- **Functional genomic analysis of the rates of protein evolution** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
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- **Adjusting for selection on synonymous sites in estimates of evolutionary distance** *MOLECULAR BIOLOGY AND EVOLUTION*  
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Plotkin, J. B., Dushoff, J., Fraser, H. B.  
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