

# Stanford

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## Xiaojing Gao

Assistant Professor of Chemical Engineering

### Bio

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#### BIO

How do we design biological systems as “smart medicine” that sense patients’ states, process the information, and respond accordingly? To realize this vision, we will tackle fundamental challenges across different levels of complexity, such as (1) protein components that minimize their crosstalk with human cells and immunogenicity, (2) biomolecular circuits that function robustly in different cells and are easy to deliver, (3) multicellular consortia that communicate through scalable channels, and (4) therapeutic modules that interface with physiological inputs/outputs. Our engineering targets include biomolecules, molecular circuits, viruses, and cells, and our approach combines quantitative experimental analysis with computational simulation. The molecular tools we build will be applied to diverse fields such as neurobiology and cancer therapy.

#### ACADEMIC APPOINTMENTS

- Assistant Professor, Chemical Engineering
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance
- Faculty Fellow, Sarafan ChEM-H
- Member, Stanford Cancer Institute
- Member, Wu Tsai Neurosciences Institute

#### HONORS AND AWARDS

- Cancer Innovation Award, Stanford Cancer Institute (2023-2024)
- Trailblazer Award (R21), National Institutes of Health/NIBIB (2022-2025)
- NARSAD Young Investigator Grant, Brain & Behavior Research Foundation (2022-2024)
- Dementia Society of America Seed Grant, Brain Research Foundation (2021-2023)
- Cancer Innovation Award, Stanford Cancer Institute (2021-2022)
- 35 under 35, China, MIT Tech Review (2021)
- Terman Faculty Fellow, Stanford University (2020-2023)
- Pathway to Independence Award (K99/R00), National Institutes of Health (2019-2023)
- DARPA Riser, DARPA’s 60th Anniversary Symposium (2018)
- HHWF Postdoctoral Fellowship, Helen Hay Whitney Foundation-HHMI (2016-2019)
- Enlight Foundation/Bio-X Interdisciplinary Fellowship, Stanford University (2012-2015)

## BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, Engineering Biology Research Consortium (2021 - present)

## PROFESSIONAL EDUCATION

- Postdoctoral Fellow, California Institute of Technology , Biology and Biological Engineering (2020)
- Ph.D., Stanford University , Biology (2015)
- B.S., Peking University , Biology (2009)

## LINKS

- Gao Lab: <https://gaolab.blog/>

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

How do we design biological systems as “smart medicine” that sense patients’ states, process the information, and respond accordingly? To realize this vision, we will tackle fundamental challenges across different levels of complexity, such as (1) protein components that minimize their crosstalk with human cells and immunogenicity, (2) biomolecular circuits that function robustly in different cells and are easy to deliver, (3) multicellular consortia that communicate through scalable channels, and (4) therapeutic modules that interface with physiological inputs/outputs. Our engineering targets include biomolecules, molecular circuits, viruses, and cells, and our approach combines quantitative experimental analysis with computational simulation. The molecular tools we build will be applied to diverse fields such as neurobiology and cancer therapy.

## Teaching

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### COURSES

#### 2022-23

- Chemical Kinetics and Reaction Engineering: CHEMENG 320 (Spr)
- Colloquium: CHEMENG 699 (Aut, Win, Spr)
- Introduction to kinetics and reactor design: CHEMENG 130B (Aut)

#### 2021-22

- Colloquium: CHEMENG 699 (Aut, Win, Spr)
- Introduction to kinetics and reactor design: CHEMENG 130B (Aut)

#### 2020-21

- Colloquium: CHEMENG 699 (Aut, Win, Spr)
- Graduate Practical Training: CHEMENG 299 (Sum)
- Introduction to kinetics and reactor design: CHEMENG 130B (Aut)

#### 2019-20

- Graduate Practical Training: CHEMENG 299 (Sum)

### STANFORD ADVISEES

#### Doctoral Dissertation Reader (AC)

Eva de la Serna

#### Postdoctoral Faculty Sponsor

Noa Katz, Alex Vlahos

**Doctoral Dissertation Advisor (AC)**

Carlos Aldrete, Connor Call, Jeewoo Kang, Natalie Kolber, Luis Mille Fragoso, Eric Wolfsberg, Xiaowei Zhang

**Doctoral Dissertation Co-Advisor (AC)**

Phil Kim, Jocelyn Valenzuela

**Postdoctoral Research Mentor**

Noa Katz, Alex Vlahos

**GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS**

- Biophysics (Phd Program)
- Cancer Biology (Phd Program)
- Neurosciences (Phd Program)

**Publications**

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**PUBLICATIONS**

- **Modular, programmable RNA sensing using ADAR editing in living cells.** *Nature biotechnology*  
Kaseniit, K. E., Katz, N., Kolber, N. S., Call, C. C., Wengier, D. L., Cody, W. B., Sattely, E. S., Gao, X. J.  
2022
- **Protease-controlled secretion and display of intercellular signals.** *Nature communications*  
Vlahos, A. E., Kang, J., Aldrete, C. A., Zhu, R., Chong, L. S., Elowitz, M. B., Gao, X. J.  
2022; 13 (1): 912
- **Engineering multiple levels of specificity in an RNA viral vector** *BioRxiv*  
Gao, X. J., Chong, L. S., Ince, M. H., Kim, M. S., Elowitz, M. B.  
2020
- **Programmable protein circuits in living cells.** *Science (New York, N.Y.)*  
Gao, X. J., Chong, L. S., Kim, M. S., Elowitz, M. B.  
2018; 361 (6408): 1252-1258
- **Topological Organization of Ventral Tegmental Area Connectivity Revealed by Viral-Genetic Dissection of Input-Output Relations.** *Cell reports*  
Beier, K. T., Gao, X. J., Xie, S., DeLoach, K. E., Malenka, R. C., Luo, L.  
2019; 26 (1): 159
- **Synthetic biology: Precision timing in a cell.** *Nature*  
Gao, X. J., Elowitz, M. B.  
2016; 538 (7626): 462-463
- **Cas9-triggered chain ablation of cas9 as a gene drive brake.** *Nature biotechnology*  
Wu, B. n., Luo, L. n., Gao, X. J.  
2016; 34 (2): 137-38
- **Viral-genetic tracing of the input-output organization of a central noradrenergic circuit.** *Nature*  
Schwarz, L. A., Miyamichi, K., Gao, X. J., Beier, K. T., Weissbourd, B., DeLoach, K. E., Ren, J., Ibanes, S., Malenka, R. C., Kremer, E. J., Luo, L.  
2015; 524 (7563): 88-92
- **Circuit Architecture of VTA Dopamine Neurons Revealed by Systematic Input-Output Mapping** *CELL*  
Beier, K. T., Steinberg, E. E., DeLoach, K. E., Xie, S., Miyamichi, K., Schwarz, L., Gao, X. J., Kremer, E. J., Malenka, R. C., Luo, L.  
2015; 162 (3): 622-634
- **A transcriptional reporter of intracellular Ca(2+) in Drosophila.** *Nature neuroscience*

Gao, X. J., Riabinina, O., Li, J., Potter, C. J., Clandinin, T. R., Luo, L.  
2015; 18 (6): 917-925

● **Extremely sparse olfactory inputs are sufficient to mediate innate aversion in *Drosophila*.** *PloS one*

Gao, X. J., Clandinin, T. R., Luo, L.  
2015; 10 (4)

● ***Drosophila* chemotaxis** *FLY*

Gao, X. J.  
2014; 8 (1): 3-6

● **Specific Kinematics and Motor-Related Neurons for Aversive Chemotaxis in *Drosophila*** *CURRENT BIOLOGY*

Gao, X. J., Potter, C. J., Gohl, D. M., Silies, M., Katsov, A. Y., Clandinin, T. R., Luo, L.  
2013; 23 (13): 1163-1172

● **A versatile in vivo system for directed dissection of gene expression patterns** *NATURE METHODS*

Gohl, D. M., Silies, M. A., Gao, X. J., Bhalerao, S., Luongo, F. J., Lin, C., Potter, C. J., Clandinin, T. R.  
2011; 8 (3): 231-U71