

# FAN HONG, PH.D.

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## EDUCATION AND ACADEMIA TRAINING

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**Wyss Institute for Biologically Inspired Engineering &  
Harvard Medical School**

Postdoctoral Fellow

Advisors: Peng Yin

*Sept 2019 - Present*

**Arizona State University, USA**

PhD in Biochemistry

Advisors: Hao Yan, Alexander A. Green, Petr Sulc

*Aug 2014 - May 2019*

**Huazhong University of Science and Technology, China**

B.S. with honor in Chemistry.

*July 2010 - June 2014*

## JOURNAL PUBLICATIONS

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### First-authored research articles

1. **Fan Hong**, Duo Ma, Kaiyue Wu, Lida A. Mina, Rebecca C. Luiten, Yan Liu, Hao Yan\*, Alexander A. Green\* . Precise and Programmable Detection of Mutations Using Ultraspecific Riboregulators. *Cell*, 2020, 180, 1018-1032. (**Featured as Cover Article**)

- SNIPRs are RNA riboregulators that can resolve single nucleotide mutations in *E.Coli*.
- SNIPR is able to identify single RNA epigenetic modification in cellular environment
- Automated in silico design allows SNIPRs to detect many different harmful mutations

2. **Fan Hong**, John Schreck, Petr Šulc\*. Understanding DNA interactions in crowded environments with a coarse-grained model. *Nucleic Acid Research*, 2020,48,10726.

- A software package to simulate DNA interactions in cellular environment with molecular dynamics
- Studied three basic nucleic acid interactions: duplex formation, looping, strand displacement

3. **Fan Hong**, Shuoxing Jiang, Xiang Lan, Raghu Pradeep Narayanan, Petr, Sulc, Fei Zhang\*, Yan Liu\*, Hao Yan\*. Layered-Crossover Tiles with Precisely Tunable Angles for 2D and 3D DNA Crystal Engineering, *J. Am. Chem. Soc.* 2018, 140, 14670-14676

- Developed a method to assemble macroscopic 2D and 3D crystal with from bottom up

4. Shuoxing Jiang#, **Fan Hong**#, Hao Yan\*, Yan Liu\*. Understanding the Elementary steps in DNA tile-based self-assembly. *ACS Nano*, 2017, 11, 9370-9381.

- Studied the individual steps of DNA tile assembly
- Developed a generalized independent-loop model to explain the tile growth process

5. **Fan Hong**, Shuoxing Jiang, Tong Wang, Yan Liu\*, Hao Yan\*. 3D framework DNA origami structures with layered DNA motifs, *Angew. Chem. Int. Ed.*, 2016, 128(41): 13024-13027.

- Selected as the Hot paper by the editor
- Developed a method to fold DNA origami structures with 3D framework features

6. Wei Guo#, **Fan Hong**#, Nannan Liu, Jiayu Huang, Boya Wang, Xiaoding Lou, Fan Xia\*. Target-Specific 3D DNA Gatekeepers for Biomimetic Nanopores, *Advanced Materials*, 2015, 27, 2090-2095.

- A smart nanopore gating system with ultra-high performance based on the DNA's structural self-assembly and functionalized smart responsiveness.
- The gating efficiency has been improved over 1000 fold by the described method

#### Invited review/opinion articles

1. **Fan Hong**, Fei Zhang Yan Liu\*, Hao Yan\*. DNA origami: scaffolds to creating high order structure. *Chem. Rev.*, 2017,117, 12584-12640.
2. **Fan Hong**, Petr Šulc\*. Strand displacement: a fundamental mechanism in RNA biology? *Journal of Structural Biology*. 2019. 207, 241-249.
3. Fei Zhang, **Fan Hong**, Hao Yan. Nanoscale Mazes. *Nature Nanotechnology* 2017, 12, 189–190.

#### Other Co-authored publications

1. Longlong Si, Haiqing Bai, Crystal Yuri Oh, Tian Zhang, **Fan Hong**, Amanda Jiang, Yongxin Ye, Tristan X. Jordan, James Logue, Chaitra Belgur, Atiq Nurani, Wuji Cao, Rachele Prantil-Baun, Steven P Gygi, Rani K. Powers, Matthew Frieman, Benjamin R. tenOever, Donald E. Ingber, Short duplex RNAs induce potent immunostimulation via Hoogsteen G-G base pairing-mediated dimerization. *In revision*
2. Shuoxing Jiang, Nibedita Pal, **Fan Hong**, Nour Eddine Fahmi, Huiyu Hu, Matthew Vrbanac, Hao Yan\*, Nils G. Walter\*, Yan Liu\*. Regulating DNA Self-Assembly Dynamics with Controlled Nucleation, *ACS Nano* 2021, 15, 3, 5384-5396.
3. Youngeun Kim, Adam B Yaseen, Jocelyn Y Kishi, **Fan Hong**, Sinem K Saka, Kuanwei Sheng, Nikhil Gopalkrishnan, Thomas E Schaus, Peng Yin. Single-stranded RPA for rapid sensitive detection of SARS-Cov-2 RNA. *MedRxiv*, 2020.
4. Xiaowen Ou, **Fan Hong**, Fan Xia\*, A highly sensitive and facile graphene oxide-based nucleic acid probe: Label-free detection of telomerase activity in cancer patient's urine using AIEgens, *Biosensors and Bioelectronics*, 2016, 89, 417-421
5. Boya Wang, Ruixue Duan, **Fan Hong**, Fan Xia\*, Real-time monitoring of enzyme-free strand displacement cascades by colorimetric assays. *Nanoscale*, 2015, 7, 5719-5725.
6. Di Kang, Ruixue Duan, Yerpeng Tan, **Fan Hong**, et al, Fan Xia\*, Speeding up the self-assembly of DNA nanodevice by variety of polar solvents. *Nanoscale*, 2014, 6, 14153-14157.
7. Abdul Hakeem, **Fan Hong**, Fan Xia\*, Dual Stimuli-Responsive Nano-Vehicle for Controlled Drug Delivery: Mesoporous Silica Nanoparticles End-Capped with Natural Chitosan, *Chem. Comm.* 2014,50, 13268-13271.
8. Yongmei Jia, Ruixue Duan, **Fan Hong**, Fan Xia\*. Electrochemical Biocomputing: A New Class of Molecular-Electronic Logic Devices. *Soft Matter*, 2013, 9, 6571-6577.

#### PATENTS

1. Alexander A. Green, **Fan Hong**. Ultraspecific riboregulators having robust single-nucleotide specificity and in vitro and in vivo uses thereof. WO2018026762A1.
2. Alexander A. Green, **Fan Hong**, Hao Yan, Soma Chaudary, Anli Tang, Ultraspecific nucleic acid sensors for low-cost liquid biopsies. WO2018093898
3. **Fan Hong**, Peng Yin, Nikhil Gopalkrishnan, Jocelyn Kishi, Kuanwei Sheng, Youngeun Kim, Adam Yassen, Multiplexed, sensitive and rapid nucleic acid detection, PCT/US21/38942

## SELECTED AWARDS AND HONORS

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<b>2020</b>	XPRIZE Rapid Covid Testing Finalist (Molecular System Lab Team) (Global wide)
<b>2020</b>	Harvard Chinese Scholar Distinguished Life Science Research Award
<b>2019</b>	Outstanding Graduate Research Assistant (2 out of department wide)
<b>2017</b>	Best poster award in the Future Trend of DNA nanotechnology
<b>2017</b>	Outstanding Graduate Research Assistant (4 out of department wide).
<b>2015</b>	Travel Award for 21st International Conference on DNA Computing and Molecular Programming
<b>2014</b>	ASU Graduate Fellowship (4 out of department wide)
<b>2014</b>	Outstanding Graduates of Huazhong University of Science and Technology
<b>2014</b>	Dalian Institute of Chemical Physics scholarship (Top 0.5% University Wide)
<b>2013</b>	The First Paper Prize of the 6th Symposium of Extracurricular Achievement of Undergraduates
<b>2012</b>	National Endeavour Scholarship (Top 0.5% University Wide)
<b>2012-2014</b>	Outstanding Academic Record Awards (Received every year, Top 1% University Wide)
<b>2011</b>	Outstanding Freshman Scholarship (Top 1% University Wide)

## PRESENTATIONS AND SEMINARS

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1. Seminar, Programmable nucleic acid tools for biology, *Synthetic Biology Young Speaker Series (Engineering Biology Research Consortium)*, Jan, 2022 (In Comming)
2. Seminar, Programmable dynamic and structural nucleic acid devices, *University of Science and Technology of China*, April, 2021 (Virtual)
3. Seminar, Programmable dynamic and structural nucleic acid devices, *Shanghai Jiaotong University* March, 2021 (Virtual)
4. Seminar, De-Novo-Designed RNA for ultra-specific Gene Regulation and Paper-Based Mutation detection Diagnostics,, *Harvard Medical School*, Oct, 2020 (Virtual)
5. Seminar, Computational design and study of structural and dynamic nucleic acid systems, *Flagship Pioneering Research Labs*, June, 2020
6. Seminar, Computational design and study of structural and dynamic nucleic acid systems, *Wyss Institute for Biologically Inspired Engineering at Harvard University*, March, 2019
7. Talk, De-Novo-Designed Ultra-Specific Riboregulators for Gene Regulation and Low Cost Paper-Based Diagnostics, *Gorden Conference:RNA nanotechnology*, Jan, 2019, Ventura, CA
8. Poster, Rapid, low-cost nucleic acid detection using paper-based synthetic biology, *Biotechnology for the nation*, Nov, 2018, Johns Hopkins Applied Physics Lab Washington DC.
9. Poster, Computational study of DNA interactions undercrowded environment, *Statistical Physics in Biology*, Oct, 2018, Tempe, AZ.
10. Poster, De-Novo-Designed Ultra-Specific Riboregulators, *Synthetic Biology: Engineering, Evolution & Design (SEED)*, June, 2018, Scottsdale, AZ.
11. Poster, De-novo-designed ultraspecific riboregulators for gene regulation in vivo and in low-cost paper-based diagnostics, *the 23rd International Conference on DNA Computing and Molecular Programming*, Aug, 2017, Austin, TX.
12. Poster, Layered crossover motifs for DNA nanostructure design. *DNAtec17 Workshop: The Future trend of DNA nanotechnology*, June, 2017, Dresden.

13. Poster, Framework DNA origami structure based on layered crossover motifs. *The Foundation of Nanoscience Conference.*, Apr, 2016, Dresden.

14. Poster, Thermodynamics and Kinetics of DNA Tile binding during the nucleation process in the DNA self-assembly. *the 21st International Conference on DNA Computing and Molecular Programming*, June, 2015, Boston.

## **MEDIA COVERAGE**

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**Nature Method**, 17,365 (2020): [Pinpoint RNA mutations](#)

**EurekAlert**: [SNIPRs take aim at disease-related mutations](#)

**TechnologyNetworks**: [SNIPRs take aim at disease-related mutations](#)

**ScienceDaily**: [SNIPRs take aim at disease-related mutations](#)

**Phys.Org**: [SNIPRs take aim at disease-related mutations](#)

**Science Codex**: [SNIPRs take aim at disease-related mutations](#)

**Genetic Engineering & Biotechnology News:GEN**

[RNA Probes Reveal Point Mutations, May Ease Detection of Disease Genes, Viral Strains](#)

**Genomeweb**

[New Method for Detecting Point Mutations Could Significantly Impact Low-Cost Diagnostics](#)

**Coriell Research for Medical Research**: [Featured Publication Archive: Spring 2020](#)

## **JOURNAL REVIEWER**

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Journal of American Chemical Society

ACS Applied Materials & Interface

ACS Applied Electronic Materials

ACS Synthetic Biology

Chemical Communications

ChemBioChem

## **TEACHING EXPERIENCE**

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2015-2016 Teaching assistant for CHEM113

- Giving lectures and guide students to conduct basic chemistry experiments

## **MENTEES ADVISED**

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Undergraduate student: Zach Ticktin, Hengyuan Liu

## **SCIENCE OUTREACH**

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Run demonstrations for ASU Night of the Open Door, 2014-2019

## **SCOCIETY MEMBERSHIPS**

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International Society for Nanoscale Science, Computation and Engineering