PONTIFICIA ACADEMIA SCIENTIARVM

THE AWARD
OF THE
PIUS XI GOLD MEDAL

2026

PONTIFICIA ACADEMIA SCIENTIARVM

THE AWARD
OF THE
PIUS XI GOLD MEDAL

2026

The aim of the Pontifical Academy of Sciences, which was founded on 28 October 1936 by the Holy Father Pius XI, is to honour pure science, wherever this may be found, to ensure its freedom, and to support the research essential for the progress of applied science.

On 28 October 1961, on the occasion of the 25th anniversary of the foundation of the Pontifical Academy of Sciences, the Holy Father John XXIII established the Pius XI Gold Medal in honour of the founder of the Academy. The medal should be awarded to a young scientist who has already gained an international reputation.

The Council of the Academy unanimously decided to award the "Pius XI Gold Medal" for the year 2026 to

PROF. FENG ZHANG

in recognition of his great merits as a scholar and the important contribution of his research to scientific progress.


PIVS · XI · PONTIFEX · MAXIMVS · FVNDATOR
PONTIFICIA · ACADEMIA · SCIENTIARVM
FENG ZHANG
A.D.
MMXXIV

FENG ZHANG



Full Name: Feng Zhang

Scientific Discipline: Biology

Current Professional Activity:

Investigator, Howard Hughes Medical Institute Core Member, Broad Institute of MIT and Harvard Investigator, McGovern Institute for Brain Research, MIT James and Patricia Poitras Professor in Neuroscience, MIT Departments of Brain and Cognitive Sciences and Biological Engineering, MIT

Date of Birth: October 22, 1981

Place of Birth: Shijiazhuang (Hebei Province, China)

Academic Qualifications:

2000 – 2004 A.B., Chemistry and Physics, Harvard College, Cambridge, MA
2004 – 2009 Ph.D., Chemistry, Stanford University, Stanford, CA

MEMBERSHIP OF PROFESSIONAL SOCIETIES

2016 – Genetics Society of America
2013 – American Society for Gene and Cell Therapy
2005 – Society for Neuroscience

HONOURS

Select Honors and Awards

2025 Elected Associate Member, The EMBO Membership
2025 National Medal of Technology and Innovation
2022 Elected Fellow, American Academy of Microbiology
2021 Elected Member, National Academy of Medicine
2021 Edward Novitski Prize, Genetics Society of America
2021 Richard Lounsbery Award, National Academy of Sciences
2020 Elected Fellow, National Academy of Inventors
2018 Keio Medical Science Prize
2018 Harvey Prize
2018 Elected Member, National Academy of Sciences
2018 Elected Member, American Academy of Arts and Sciences
2018 Vilcek Prize for Creative Promise in Biomedical Science
2017 Lemelson-MIT Prize
2017 Albany Medical Center Prize in Medicine and Biomedical Research
2017 Blavatnik Award for Young Scientists – National Award Winner
2017 Young Global Leader – World Economic Forum
2016 Tang Prize
2016 Canada Gairdner International Award
2015 Tsuneko and Reiji Okazaki Award
2014 Society for Neuroscience Young Investigator Award
2012 Searle Scholar
2012 Perl/UNC Neuroscience Prize
2010 Nature Medicine/Roche Junior Award for Translational Neuroscience
2009 Junior Fellowship, Society of Fellows, Harvard University
2008 Larry M. Katz Award at Cold Spring Harbor Laboratories for Best Graduate Thesis
2000 Third Place, Intel Science and Talent Search
1999 Pinnacle Award, Intel International Science and Engineering Fair

BRIEF ACCOUNT OF SCIENTIFIC ACTIVITY

I am a molecular biologist focused on developing and applying novel molecular technologies for studying and improving human health. My studies explore biological diversity with the goals of understanding nature and discovering systems and processes within nature that may be harnessed through bioengineering.

I played an integral role in the development of two revolutionary molecular technologies: optogenetics, which lets researchers control neurons with light to learn more about how the brain works, and CRISPR-Cas9-based gene editing, which allows researchers to make precise changes to the DNA in living cells. With my team, I have adapted multiple other CRISPR systems for use as genome and transcriptome engineering tools, as well as developed a number of applications of CRISPR systems including high-throughput genome screening, gene insertion, and detection of nucleic acids.

My long-term goal is to develop novel therapeutic strategies for complex diseases without a single underlying genetic change. Tackling brain diseases, specifically, has been a goal since college, when he saw friends suffering from severe mental illness.

PRINCIPAL PUBLICATIONS

1. Friedrich M, Pham J, Tian J, Chen H, Huang J, Kehl N, Liu S, Lash B, Chen F, Wang X, Macrae R & **Zhang F**. Transient hepatic reconstitution of trophic factors enhances aged immunity. *Nature* (2025).
2. Faure G, Saito M, Wilkinson M, Quinones-Olvera N, Xu P, Flam-Shepherd D, Kim S, Reddy N, Zhu S, Evegniou L, Koonin E, Macrae R & **Zhang F**. TIGR-Tas: A family of modular RNA-guided DNA-targeting systems in prokaryotes and their viruses. *Science* (2025).
3. Saito M, Xu P, Faure G, Maguire S, Kannan S, Altae-Tran H, Vo S, Desimone A, Macrae R & **Zhang F**. Fanzor is a eukaryotic programmable RNA-guided endonuclease. *Nature* (2023).
4. Kreitz J, Friedrich M, Guru A, Lash B, Saito M, Macrae R & **Zhang F**. Programmable protein delivery with a bacterial contractile injection system. *Nature* (2023).
5. Joung J, Ma S, Tay T, Geiger-Schuller K, Kirchgatterer P, Verdine V, Guo B, Arias-Garcia M, Allen W. Singh S, Kusenko O, Abudayyeh O, Gootenberg J, Fu Z, Macrae R, Buenrostro J, Regev A & **Zhang F**. A transcription factor atlas of directed differentiation. *Cell* (2023).
6. Altae-Tran H, Kannan S, Demircioglu F, Oshiro R, Nety S, Mckay L, Dlakic M, Inskeep W, Makarova K, Macrae R, Koonin E & **Zhang F.** The widespread IS200/605 transposon family encodes diverse programmable RNA-guided endonucleases. *Science* (2021).
7. Segel M, Lash B, Song J, Ladha A, Liu C, Jin X, Mekhedov S, Macrae R, Koonin E & **Zhang F**. Mammalian retrovirus-like protein PEG10 packages its own mRNA and can be pseudotyped for mRNA delivery. *Science* (2021).
8. Jin X, Simmon S, Guo A, Shetty A, Ko M, Nguyen L, Jokhi V, Robinson E, Oyler P, Curry N, Deangeli G, Lodato S, Levin J, Regev A, **Zhang F** & Arlotta P. In Vivo Perturb-seq Reveals Neuronal and Glial Abnormalities Associated with Autism Risk Genes. *Science* (2020).
9. Joung J, Ladha A, Saito M, Kim N-G, Woolley A, Segel M, Barretto R, Ranu A, Macrae R, Faure G, Ioannidi E, Krajeski R, Bruneau R, Huang M-L, Yu X, Li J, Walker B, Hung D, Greninger A, Jerome K, Gootenberg J, Abudayyeh O & **Zhang F**. Detection of SARS-CoV-2 with SHERLOCK one-pot testing. *New England Journal of Medicine* (2020).

10. Abudayyeh O, Gootenberg J, Franklin B, Koob J, Kellner M, Ladha A, Joung J, Kirchgatterer P, Cox D & **Zhang F**. A cytosine deaminase for programmable single-base RNA editing. *Science* (2019).
11. Strecker J, Ladha A, Gardner Z, Schmid-Burgk J, Makarova K, Koonin E & **Zhang F**. RNA-guided DNA insertion with CRISPR-associated transposases. *Science* (2019).
12. Cox D, Gootenberg J, Abudayyeh O, Franklin B, Kellner M, Joung J & **Zhang F**. RNA editing with CRISPR-Cas13. *Science* (2017).
13. Gootenberg J, Abudayyeh O, Lee J, Essletzbichler P, Dy A, Joung J, Verdine V, Donghia N, Daringer N, Freije C, Myhrvold C, Bhattacharyya R, Livny J, Regev A, Koonin E, Hung D, Sabeti P, Collins J & **Zhang F**. Nucleic acid detection with CRISPR-Cas13a/C2c2. *Science* (2017).
14. Sanjana N, Wright J, Zheng K, Shalem O, Fontanillas P, Joung J, Cheng C, Regev A & **Zhang F**. High-resolution interrogation of functional elements in the noncoding genome. *Science* (2016).
15. Habib N, Li Y, Heidenreich M, Swiech L, Avraham-Davidi I, Trombetta J, Hession C, **Zhang F*** & Regev A*. Div-Seq: Single-nucleus RNA-Seq reveals dynamics of rare adult newborn neurons. *Science* (2016).
16. Abudayyeh O, Gootenberg J, Konermann S, Joung J, Slaymaker I, Cox D, Shmakov S, Makarova K, Semenova E, Minakhin L, Severinov K, Regev A, Lander E, Koonin E & **Zhang F.** C2c2 is a single-component programmable RNA-guided RNA-targeting CRISPR effector. *Science* (2016).
17. Tabebordbar M, Zhu K, Cheng J, Chew W, Widrick J, Yan W, Maesner C, Wu E, Xiao R, Ran F, Cong L, **Zhang F**, Vandenberghe L, Church G & Wagers A. In vivo gene editing in dystrophic mouse muscle and muscle stem cells. *Science* (2015).
18. Nelson C, Hakim C, Ousterout D, Thakore P, Moreb E, Castellanos Rivera R, Madhavan S, Pan X, Ran F, Yan W, Asokan A, **Zhang F**, Duan D & Gersbach C. In vivo genome editing improves muscle function in a mouse model of Duchenne muscular dystrophy. *Science* (2015).
19. Slaymaker I, Gao L, Zetsche B, Scott D, Yan W & **Zhang F**. Rationally engineered Cas9 nucleases with improved specificity. *Science* (2015).
20. Canver M, Smith E, Sher F, Pinello L, Sanjana N, Shalem O, Chen D, Schupp P, Vinjmaur D, Garcia S, Luc S, Kurita R, Nakamura Y, Fujiwara Y, Maeda T, Yuan G, **Zhang F***, Orkin S* & Bauer DE*. Dissection of BCL11A enhancer by Cas9-mediated in situ saturation mutagenesis. *Nature* (2015).
21. Zetsche B, Gootenberg J, Abudayyeh O, Slaymaker I, Makarova K, Essletzbichler P, Volz S, Joung J, van der Oost J, Regev A, Koonin E & **Zhang F**. Cpf1 is a single RNA-guided endonuclease of a Class 2 CRISPR-Cas system. *Cell* (2015).

22. Nishimasu H, Cong L, Yan W, Ran F, Zetsche B, Li Y, Kurabayashi A, Ishitani R, **Zhang F*** & Nureki O*. Crystal structure of *Staphylococcus aureus* Cas9. *Cell* (2015).
23. Ran F, Cong L, Yan W, Scott D, Gootenberg J, Kriz A, Zetsche B, Shalem O, Wu X, Makarova K, Koonin E, Sharp P & **Zhang F**. In vivo genome editing using *Staphylococcus aureus* Cas9. *Nature* (2015).
24. Chen S, Sanjana N, Zheng K, Shalem O, Lee K, Shi X, Scott D, Song J, Pan J, Weissleder R, Lee H, **Zhang F*** & Sharp PA*. Genome-wide CRISPR screen in a mouse model of tumor growth and metastasis. *Cell* (2015).
25. Konermann S, Brigham M, Trevino A, Joung J, Abudayyeh O, Barcena C, Hsu P, Habib N, Gootenberg J, Nishimasu H, Nureki O & **Zhang F**. Genome-scale transcriptional activation by an engineered CRISPR-Cas9 complex. *Nature* (2014).
26. Platt R, Chen S, Zhou, Y, Yim M, Swiech L, Kempton H, Dahlman J, Parnas O, Eisenhaure T, Jovanovic M, Graham D, Jhunjhunwala S, Heidenreich M, Xavier R, Langer R, Anderson D, Hacohen N, Regev A, Feng G, Sharp P & **Zhang F**. CRISPR-Cas9 knockin mice for genome editing and cancer modeling. *Cell* (2014).
27. Hsu P, Scott D, Weinstein J, Ran F, Konermann S, Agarwala V, Li Y, Fine E, Wu X, Shalem O, Cradick T, Marraffini L, Bao G & **Zhang F.** DNA Targeting specificity of the RNA-guided Cas9 nuclease. *Nature Biotechnology* (2013).
28. Konermann S, Brigham M, Trevino A, Hsu P, Heidenreich M, Le Cong, Platt R, Scott D, Church G & **Zhang F**. Optical control of mammalian endogenous transcription and epigenetic states. *Nature* (2013).
29. Bikard D, Jiang W, Samai P, Hochschild A, **Zhang F** & Marraffini L. Programmable repression and activation of bacterial gene expression using an engineered CRISPR-Cas system. *Nucleic Acids Research* (2013).
30. Wang H, Yang H, Shivalila C, Dawlaty M, Cheng A, **Zhang F** & Jaenisch R. One-Step Generation of Mice Carrying Mutations in Multiple Genes by CRISPR/Cas-Mediated Genome Engineering. *Cell* (2013).
31. Jiang W, Bikard D, Cox D, **Zhang F** & Marraffini LA. RNA-guided editing of bacterial genomes using CRISPR-Cas systems. *Nature Biotechnology* (2013).
32. Cong L, Ran FA, Cox D, Lin S, Barretto R, Habib N, Hsu P, Wu X, Jiang W, Marraffini L & **Zhang F**. Multiplex genome engineering using CRISPR/Cas systems. *Science* (2013).
33. Cong L, Zhou R, Kuo Y, Cunniff M & **Zhang F**. Comprehensive interrogation of TAL Effector DNA binding modules and transcription repressor domains. *Nature Communications* (2012).

34. **Zhang F***, Cong L, Lodato S, Kosuri S, Church G & Arlotta P*. Efficient construction of sequence-specific TAL effectors for modulating mammalian transcription. *Nature Biotechnology* (2011).
35. Sohal V*, **Zhang F***, Izhar O & Deisseroth K. Theta and gamma oscillations enhance rate and temporal coding in neocortical microcuits. *Nature* (2009).
36. Tsai H*, **Zhang F***, Adamantidis A, Stuber G, Bonci A, de Lecea L & Deisseroth K. Phasic firing in dopaminergic neurons is sufficient for behavioral conditioning in the absence of reward. *Science* (2009).
37. **Zhang F**, Prigge M, Bayriere F, Tsunoda S, Mattis J, Izhar O, Hegemann P & Deisseroth K. Redshifted optogenetic excitation: A novel tool for fast neural control derived from *Volvox carteri*. *Nature Neuroscience* (2008).
38. Admantidis A*, **Zhang F***, Aravanis A, Deisseroth K & de Lecea L. Neural substrates of awakening probed with genetically targeted optical control of hypocretin neurons. *Nature* (2007).
39. **Zhang F***, Wang L*, Brauner M, Liewald J, Kay K, Watzke N, Wood P, Bamberg E, Nagel G, Gottschalk A & Deisseroth K. Multimodal fast optical interrogation of neural circuitry. *Nature* (2007).
40. Boyden E, **Zhang F**, Bamberg E, Nagel G & Deisseroth K. Millisecond-timescale, genetically targeted optical control of neural activity. *Nature Neuroscience* (2005).

Printed by
The Pontifical Academy of Sciences
Casina Pio IV

Vatican City 2026