

FUGUO JIANG, PH.D.

Curriculum Vitae

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Assistant Professor
Department of Cancer Biology
University of Texas MD Anderson Cancer Center
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EDUCATION & TRAINING

- 2013-2018 Postdoctoral training in RNA Biology and Biophysics
(Advisor: **Dr. Jennifer A. Doudna**, co-mentor in cryoEM: **Dr. Eva Nogales**)
Department of Molecular & Cell Biology, University of California, Berkeley, USA
- 2017 Practical Courses on Cryo-Electron Microscopy and 3D Image Processing
Birkbeck, University of London, UK
- 2006-2013 Ph.D. in Chemistry (Advisor: **Dr. Joseph Marcotrigiano**)
Department of Chemistry & Chemical Biology, Rutgers University, New Brunswick, USA
- 2002-2005 M.Sc. in Biophysics (Advisor: **Dr. Zihe Rao**)
Tsinghua University School of Medicine, Beijing, P.R. China
- 1998-2002 Bachelor of Medicine (with honors), Shandong University, Jinan, P.R. China

RESEARCH EXPERIENCE

- 01/2019-present **Assistant Professor**
Department of Cancer Biology, The University of Texas MD Anderson Cancer Center
- 01/2016-12/2018 **Damon Runyon Cancer Research Merck Fellow**
Department of Molecular & Cell Biology, University of California, Berkeley
Postdoctoral Mentor: Dr. Jennifer A. Doudna & Dr. Eva Nogales (co-mentor)
Research topic: Dissecting anti-CRISPR mediated Cas9 inhibition mechanism by single-particle cryo-EM
- 08/2014-12/2015 **Damon Runyon Cancer Research Merck Fellow**
Department of Molecular & Cell Biology, University of California, Berkeley
Postdoctoral Mentor: Dr. Jennifer A. Doudna
Research topic: Molecular mechanisms of single-guide RNA recognition and target dsDNA cleavage by CRISPR/Cas9
- 08/2013-07/2014 **Postdoctoral Associate**
Department of Molecular & Cell Biology, University of California, Berkeley
Postdoctoral Advisor: Dr. Jennifer A. Doudna
Research topic: Structure determination of the CRISPR RNA-guided DNA endonuclease Cas9 in the apo state
- 03/2007-05/2013 **Graduate Research Assistant (PhD Graduate Student)**
CABM, Rutgers University –New Brunswick
Ph.D. Thesis Advisor: Dr. Joseph Marcotrigiano
Research topic: Structural basis for RNA recognition and activation by human innate immune receptor RIG-I (Ph.D dissertation)
- 09/2006-02/2007 **Graduate Teaching Assistant**
Department of Chemistry & Chemical Biology, Rutgers University –New Brunswick
Research Advisor: Dr. Aaron J. Shatkin & Dr. Eddy Arnold
Research topic: Biochemical characterization and crystallographic analysis of human mRNA capping enzyme (lab rotations)
- 09/2002-07/2005 **M.Sc. Graduate Student**
Laboratory of Structural Biology, Tsinghua University
M.Sc. Thesis Advisor: Dr. Zihe Rao
Research topic: Biochemical and structural determination of human ovarian cancer related protein –spindlin1 (M.Sc. thesis)

09/2001-07/2002 **Undergraduate Independent Research**
 State Key Laboratory of Microbial Technology, Shandong University
 Research Advisor: Dr. Xiaoming Bao

Research topic: Genetic engineering of the budding yeast *Saccharomyces cerevisiae* for enhanced production of sustainable bio-ethanol from lignocelluloses

HONORS & AWARDS

2019	MD Anderson CCSG New Faculty Award
2019	UT System Rising STARS Award
2018	CPRIT Recruitment of First-Time Tenure-Track Faculty Award
2018	The RNA Society Scaringe Award
2018	The Protein Society Hans Neurath Outstanding Promise Travel Award
2017	MCB Outstanding Postdoctoral Fellow Award, University of California, Berkeley
2017	Damon Runyon-Dale F. Frey Award for Breakthrough Scientists, Finalist
2017	Janelia Conference Travel Scholarship
2014	Merck Fellow of the Damon Runyon Cancer Research Foundation
2014	Jane Coffin Childs Memorial Fund for Medical Research – Fellowship Alternate (declined because of DRCRF Award)
2013	Future of Science Fund Scholarship, Keystone Symposia
2012, 2013	Thomas Duff Graduate Travel Award, Rutgers University
2012	Harold M. Weintraub Graduate Student Award Nomination – Rutgers CABM/CCB Nominee
2012	Chinese Government Award for Outstanding Students Abroad
2012	Dean's Award for Excellence in Research, Rutgers University
2012	American Society for Biochemistry and Molecular Biology Graduate Travel Award
2011	Thomas Reid Award for Exceptional Performance in Doctoral Research, Rutgers University
2005	Outstanding Graduate Research Award, Tsinghua University School of Medicine
2004	Outstanding Graduate Student Leadership Award, Tsinghua University
2002	Outstanding Graduate of Higher Educational Institutions, honored by Shandong Province Government
2002	Outstanding Graduate Award, Shandong University
1998-2001	Outstanding Student Leadership Award, Shandong University
1998-2001	Outstanding Student Scholarship (Grade 1), Shandong University

TEACHING EXPERIENCE

2019	Lecturer in the MD Anderson MD/Ph.D. program's course - GS21 1611 Topics in Molecular Medicine (2019 Fall semester)
2017	Lecturer for the Short Course 27: A Primer to Gene Editing: Tools and Applications, Molecular Medicine Tri-Conference 2017, San Francisco, CA
2011	Leader of CABM Summer Undergraduate Research Experience (SURE) Program, Rutgers University
2006-2007	Teaching Assistant for Chemistry 171, Rutgers University

MENTORING EXPERIENCE

2019-present	Mentoring postdoctoral fellows and undergraduate students at UT MD Anderson Cancer Center <ul style="list-style-type: none"> • Zhenhuang Yang (Ph.D., Universität zu Lübeck/UKSH, Germany) • Min Liu (Ph.D., Institute of Biophysics, Chinese Academy of Sciences) • Yan Zeng (Ph.D., Institute of Biophysics, Chinese Academy of Sciences) • Lance Edward Lumahan (undergraduate student from University of Houston)
2019	Mentoring PhD graduate students at UT MD Anderson Cancer Center <ul style="list-style-type: none"> • Hanghui Ye (PhD rotation student from MD Anderson/UTHealth GSBS program)
2018	Supervising a PhD rotation student from MCB program of UC-Berkeley <ul style="list-style-type: none"> • Andrew Plebanek Topic: Molecular insights into programmed DNA destruction by miniature CRISPR-Cas enzymes
2017-2018	Supervisor of an undergraduate student from Chemical Biology of UC-Berkeley <ul style="list-style-type: none"> • Michael Xu Topic: Characterization of type II-A anti-CRISPRs for regulating CRISPR-Cas9 gene editing

- 2015 Co-supervisor of a master's thesis from Ludwig Maximilian University of Munich, Germany
- Saskia-Berenice Gressel
- Topic: Establishing human genome editing by orthogonal *N.meningitidis* Cas9 (NmeCas9)
- 2009-2013 Student supervised in graduate research at Rutgers University:
- Chen Wang (rotation student in Chemistry Graduate Program), Spring 2013
 - Fei Wang (rotation student in Molecular Biosciences Graduate Program), Fall 2012
 - Swapnil Devarkar (rotation student in Molecular Biosciences Program), Spring 2012
 - Xia Tang (rotation student in Molecular Biosciences Graduate Program), Spring 2011
 - Patricia Yau (summer undergraduate from Chemistry, Harvard University), 2010
 - Thomas W. Ehrlich (undergraduate from Chemical Engineering Dept.) Summer 2009

PEER-REVIEWED PUBLICATIONS (*co-first author, #co-corresponding author)

Citation indices	All	Since 2014	(Google Scholar)
Citations	3229	2677	

As a principal investigator:

1. Jiang F. CRISPR off-target: where does it come from and how much can we improve it? *RNA, the Journal*, (Invited review, in preparation)
2. Chen J, Jiang F, Ma E, Lin L. Array-based Sensing of Point Mutation DNA Using CRISPR Nose. (in preparation)
3. Chen J, Jiang F, Huang C-W, Lin L. Determination of antibiotic-resistant urobacteria using CRISPR. (submitted)

As a postdoc fellow:

4. Jiang F*, Liu J-J*, Osuna BA*, Xu M, Berry JD, Rauch BJ, Nogales E, Bondy-Denomy J & Doudna JA. (2019) Temperature-responsive competitive inhibition of CRISPR-Cas9. *Molecular Cell*, 73(3):601-610.e5. doi: 10.1016/j.molcel.2018.11.016. Epub 2018 Dec 27.
5. Park HM, Liu H, Wu J, Chong A, Mackley V, Fellmann C, Rao A, Jiang F, Chu H, Murthy N, Lee K. (2018) Extension of the crRNA enhances Cpf1 gene editing in vitro and in vivo. *Nature Communication*, 17;9(1):3313.
6. Lee K, Conboy M, Park HM, Jiang F, Kim HJ, Dewitt MA, Mackley VA, Chang K, Rao A, Skinner C, Shobha T, Mehdipour M, Liu H, Huang W, Lan F, Bray NL, Li S, Corn JE, Kataoka K, Doudna JA, Conboy I, Murthy N. (2017) Nanoparticle delivery of Cas9 ribonucleoprotein and donor DNA in vivo induces homology-directed DNA repair. *Nature Biomedical Engineering*, 1:889-901
7. Shin J*, Jiang F*, Liu JJ*, Bray NL, Rauch BJ, Baik SH, Nogales E, Bondy-Denomy J, Corn JE, Doudna JA. (2017) Disabling Cas9 by an anti-CRISPR DNA mimic. *Science Advances*, 3(7):e1701620 (*co-first author)

Highlighted by News and Views:

- An 'anti-CRISPR' tool cleans up gene edits, *Nature*, July 20, 2017
- Anti-CRISPR proteins decrease off-target side effects of CRISPR-Cas9, *Berkeley News*, July 12, 2017
- Anti-CRISPR protein reduces off-target effects, *The Scientist*, July 12, 2017.

8. Jiang F#, Doudna JA#. (2017) CRISPR-Cas9 Structures and Mechanisms. *Annual Review of Biophysics*, 46:505-529. doi: 10.1146/annurev-biophys-062215-010822. (#co-corresponding author)

Reviewer's comment: "I recommend the acceptance and publication of this excellent review article as is without any delay."

9. Isaac RS, Jiang F, Doudna JA, Lim WA, Narlikar GJ, Almeida R. (2016) Nucleosome breathing and remodeling constrain CRISPR-Cas9 function. *Elife*, 5:e13450.
10. Jiang F*, Taylor DW*, Chen JS, Kornfeld JE, Zhou K, Thompson AJ, Nogales E, Doudna JA. (2016) Structures of a CRISPR-Cas9 R-loop complex primed for DNA cleavage. *Science*, 351(6275):867-71. (*co-first author)

Highlighted by News and Views:

- Rated as "Exceptional" by *Faculty of 1000*
- Chen H, Bailey S. (2016) Cas9, poised for DNA cleavage. *Science*, 351(6275):811-2.
- Riddihough G. (2016) CRISPR Cas9 molecular scissors. *Science*, 351(6275):827.
- DNA does a backbend to help CRISPR Cas9 proteins work. *The STAT*, January 15, 2016.

- CRISPR/Cas9: Ready for Action. *Berkeley Lab News*, February 5, 2016.
11. Jiang F, Zhou K, Ma L, Gressel S, Doudna JA. (2015) A Cas9-guide RNA complex preorganized for target DNA recognition. *Science*, 348(6242):1477-81.
Featured in Research Highlights/Views:
 - This structure was featured on the cover of the January 2016 issue of *RNA Journal*. (<http://rnajournal.cshlp.org/content/22/1.cover-expansion>)
 - Riddihough G. (2015) An RNA seed poised to meet its target. *Science*, 348(6242):1441.
 - Attar N. (2015) CRISPR preorders for Cas. *Nature Reviews Microbiology*, 13, 459.
 - Kamiya Y, Asanuma H. (2015) Pre-organized guide RNA in the Cas9 complex is ready for the selection of target double-stranded DNA. *ChemBioChem*, 16, 2273 –2275.
 12. Jiang F, Doudna JA. (2015) The Structural Biology of CRISPR-Cas Systems. *Current Opinion in Structural Biology*, 30:100-11.
 13. Jinek M*, Jiang F*, Taylor DW*, Sternberg SH*, Kaya E, Ma E, Anders C, Hauer M, Zhou K, Lin S, Kaplan M, Iavarone AT, Charpentier E, Nogales E, Doudna JA. (2014) Structures of Cas9 endonucleases reveal RNA-mediated conformational activation. *Science*, 343(6176):1247997. (*co-first author)

Featured in Research Highlights and News & Views:

- Rated as “Exceptional” by *Faculty of 1000*
- Garside EL, MacMillan AM. (2014) Cas9 in close-up. *Nature Biotechnology*, 32(4):338-40.
- Du Toit A. (2014) Activating and guiding Cas9. *Nature Reviews Microbiology*, 12(4):236-7.
- Krasteva PV. (2014) CRISPR snapshots of a gene-editing tool. *Nature Methods*, 11(4):365
- Bhat P. (2014) Genome editing just got a lot easier. *Berkeley Scientific Journal*
- Cas9 structures. *BioTechniques – News*, April 7, 2014.
- Seeing how Cas9 got its groove back, in 3D. *GENNews Highlights*, February 7, 2014.
- New insight into an emerging genome-editing tool. *Berkeley Lab News*, February 6, 2014.
- A crisper view of DNA-snipping enzyme. *HHMI News*, February 6, 2014.

As a Ph.D. student:

14. Liu HM, Jiang F, Loo YM, Hsu S, Hsiang TY, Marcotrigiano J, Gale M Jr. (2016) Regulation of retinoic acid inducible Gene-I (RIG-I) activation by the histone deacetylase 6. *EBioMedicine*, 9:195–206.
15. Devarkar SC, Wang C, Miller MT, Ramanathan A, Jiang F, Khan AG, Patel SS, Marcotrigiano J. (2016) Structural basis for m⁷G recognition and 2'-O-methyl discrimination in capped RNAs by the innate immune receptor RIG-I. *Proceedings of the National Academy of Sciences USA*, 113(3):596-601.

Highlighted in News & Views articles:

- Recommended in *Faculty of 1000*
 - Leung DW, Amarasinghe GK. (2016) When your cap matters: structural insights into self vs non-self recognition of 5' RNA by immunomodulatory host proteins. *Current Opinion Structural Biology*, 36:133-41.
16. Ramanathan A, Devarkar SC, Jiang F, Miller MT, Khan AG, Marcotrigiano J, Patel SS. (2015) The autoinhibitory CARD2-Hel2i Interface of RIG-I governs RNA selection. *Nucleic Acids Research*, 44(2):896-909.
 17. Jiang F*, Ramanathan A*, Miller MT, Tang GQ, Gale M Jr, Patel SS, Marcotrigiano J. (2011) Structural basis of RNA recognition and activation by innate immune receptor RIG-I. *Nature*, 479(7373):423-7. (*co-first author)

Featured in Research Highlights and News & Views:

- Selected as “Must Read” paper by *Faculty of 1000*
- Listed as one of the major fundamental advances in immunological research reported in 2011 by Liu J, Liu S, Cao X. (2012) Highlights of the advances in basic immunology in 2011, *Cellular & Molecular Immunology*, 9(3):197-207
- Jiang QX, Chen ZJ. (2011) Structural insights into the activation of RIG-I, a nanosensor for viral RNAs. “Hot off the Press” section of *EMBO Reports*, 13(1):7-8.
- Helicases: unwinding while staying on track. *National Institute of General Medical Sciences – Inside Life Science*, January 11, 2012
- Who goes there? Recognizing cellular enzymes. *Argonne National Laboratory Science*, 2011

- Structural basis of RNA recognition, *CHESS (Cornell University Cornell High Energy Synchrotron Source) News*, 2011.
18. Saito T, Owen DM, **Jiang F**, Marcotrigiano J, Gale M Jr. (2008) Innate immunity induced by composition-dependent RIG-I recognition of hepatitis C virus RNA. *Nature*, 454(7203):523-7.

Featured in Research Highlights:

- Rated as “Must Read” article by *Faculty of 1000*
- Borowski C, Braaten DC, Dempsey LA. (2008) RIG-Ing viral RNA. *Nature Immunology*, 9, 837.

As a M.Sc. student:

19. Zhao Q*, Qin L*, **Jiang F**, Wu B, Yue W, Xu F, Rong Z, Yuan H, Xie X, Gao Y, Bai C, Bartlam M, Pei X, Rao Z. (2007) Structure of human spindlin1: tandem tudor-like domains for cell cycle regulation. *The Journal of Biological Chemistry*, 282(1): 647-56. (*co-first author)
20. **Jiang F**, Zhao Q, Qin L, Pang H, Pei X, Rao Z. (2006) Expression, purification, crystallization and preliminary X-ray analysis of human spindlin1, an ovarian cancer-related protein. *Protein and Peptide Letters*, 13(2): 203-5.
21. Pang H, Liu Y, Han X, Xu Y, **Jiang F**, Wu D, Kong X, Bartlam M, Rao Z. (2004) Protective humoral responses to severe acute respiratory syndrome-associated coronavirus: implications for the design of an effective protein-based vaccine. *Journal of General Virology*, 85(10):3109-13.

PATENTS

1. Doudna JA, Sternberg SH, Jinek M, **Jiang F**, Taylor D, Kaya E. “Cas9 Crystals and Methods of Use Thereof.” U.S. Patent Application No.: PCT/US2014/072590; Priority date: Dec 31, 2013; Publication date: Jul 9, 2015; Granted date: May 8, 2018.
2. **Jiang F**. “A simple method of the preparation of non-gradient gel electrophoresis for separating any size proteins.” China Patent Application No.: CN102875712 A; Priority date: Sep 20, 2012; Publication date: Jan 16, 2013; Granted date: Sep 24, 2014.

INVITED OR SELECTED TALKS

- 2019 Houston Biophysics Symposium (**scheduled**), Houston, TX
- 2019 Baylor College of Medicine MCB Research and Development Seminar (**scheduled**), Houston, TX
- 2019 Department of Genetics Research Exchange Seminar (**scheduled**), MD Anderson Cancer Center
- 2019 MCB Research and Development Seminar, Baylor College of Medicine, Houston, TX
- 2019 Invited speaker at MD Anderson Center for Cancer Epigenetics (CCE) retreat, Round Top, TX
- 2018 32nd Annual Symposium of The Protein Society - Young Investigator Talk, Boston, MA
- 2018 Rutgers New Jersey Medical School, Newark, NJ
- 2018 RNA Society Scaringe Award Talk, Berkeley, CA
- 2018 14th Annual PEGS Summit—CRISPR for Genome Editing, Boston, MA
- 2018 St. Jude Children's Research Hospital Department of Structural Biology, Memphis, TN
- 2018 University of Wisconsin-Madison Department of Biochemistry, Madison, WI
- 2018 UCLA Physiology Faculty Candidate Symposium, Los Angeles, CA
- 2018 UCSB Department of Chemistry & Biochemistry, Santa Barbara, CA
- 2018 University of Florida Department of Chemistry Seminar, Gainesville, FL
- 2018 MD Anderson Cancer Center Cancer Biology Department Seminar, Houston, TX
- 2017 Emory University School of Medicine, Atlanta, GA
- 2017 Mayo Clinic Biochemistry and Molecular Biology Department, Rochester, MN
- 2017 Columbia University Biochemistry and Biophysics Faculty Candidate Symposium, New York
- 2017 QB3 Structure Supergroup Seminar, Berkeley, CA
- 2017 Westlake Institute for Advanced Study, Hangzhou, China
- 2017 Zhejiang University College of Pharmaceutical Sciences, Hangzhou, China
- 2017 Fudan University Institute of Biomedical Sciences, Shanghai, China
- 2017 Zhejiang University School of Medicine, Hangzhou, China
- 2017 West Coast Protein Crystallography Workshop, Asilomar, CA
- 2017 Molecular Medicine Tri-Conference: A Primer to Gene Editing, San Francisco, CA
- 2016 GETA Fall Symposium: From Cutting Edge Science to Collaborative Research, Oakland, CA

- 2016 16th Annual Damon Runyon Fellows' Retreat, San Jose, CA
- 2016 UC Berkeley Biophysics Annual Retreat, Marshall, CA
- 2016 Stanford University Bioengineering Seminar invited by Prof. Stanley Qi, Stanford, CA
- 2016 Keystone Symposia: Small RNA Silencing: Little Guides, Big Biology, Keystone, CO
- 2014 QB3 Structure Supergroup Seminar, Berkeley, CA
- 2014 Bay Area Genome Engineering Forum, UCSF-Gladstone Institutes, San Francisco, CA
- 2012 Cornell High Energy Synchrotron Source (CHESS) Users' Meeting, Ithaca, NY
- 2012 American Society for Biochemistry and Molecular Biology Annual Meeting, San Diego, CA
- 2011 Rutgers University – Chemistry Thomas Reid Award Talk, Piscataway, NJ

POSTER PRESENTATIONS

- 2019 CRISPR Conference 2019, Québec, Canada
- 2019 Gordon Research Conference: Three Dimensional Electron Microscopy Meeting, Hong Kong
- 2018 Bay Area CryoEM Meeting, SLAC National Accelerator Laboratory/Stanford University, CA
- 2017 Janelia Conference 'Challenges in Structural Biology', Ashburn, VA
- 2017 EMBO Practical Course on Image Processing for Cryo-electron Microscopy, London, UK
- 2017 5th Annual Re-writing Genomes Symposium: A New Era in Genome Engineering, Berkeley, CA
- 2015 3rd Annual Re-writing Genomes Symposium: A New Era in Genome Engineering, Berkeley, CA
- 2015 CRISPR Conference 2015, New York City, NY
- 2014 Damon Runyon Cancer Research Foundation Annual Retreat, Boston, MA
- 2013 Keystone Symposia: Positive strand RNA viruses, Boston, MA
- 2011 25th Anniversary CABM Symposium, Piscataway, NJ
- 2011 18th Annual International Symposium of Hepatitis C Virus and Related Viruses, Seattle, WA
- 2004 10th International Conference on the Crystallization of Biological Macromolecules, China

ACADEMIC SERVICE & OUTREACH

Reviewer for Peer-reviewed Journals:

Trends in Molecular Medicine, Cell Report, ACS Catalysis, Journal of Chemical Information and Modeling, RNA Biology, Scientific Reports, Physics Today, JoVE, BioEssays, Molecular Therapy, Immunity, Molecular Therapy - Nucleic Acids, Journal of Virology, Acta Crystallographica. Section F, Structural Biology Communications, Journal of Gene Medicine, Cellular & Molecular Biology, Medicinal Chemistry

Participation in Advisory Boards, Editorial Boards, Conference Organization and Keynote Lectures

- 2019 Session Chair, Inaugural Symposium on Cancer Metastasis, Houston, TX
- 2018 Invited Speaker and Panelist, Tsinghua BioMed Alumni Reunion, Richmond, CA
- 2018 Scientific Committee, Personalized and Precision Medicine International Conference, Paris
- 2017 Session Chair, HHMI Janelia Conference 'Challenges in Structural Biology', Ashburn, VA
- 2015 Member of the Advisory Board, CRISPR Summit, London, United Kingdom

Faculty Service (Committee on graduate student education)

- 2019 Ph.D. Candidacy Exam Committee (Shipping Jiao, Dr. Padmanee Sharma's Lab/Immunology)

Service in Federal Agencies and International Review Panels

- 2019 Grant Reviewer for the Wellcome Trust DBT India Alliance Fellowship Application

Professional Memberships:

- 2018-present The Protein Society
- 2017-present The Biophysical Society
- 2015-present The RNA Society
- 2011-present American Society for Biochemistry and Molecular Biology (ASBMB)
- 2010-present American Chemical Society

MEDIA COVERAGE

CPRIT Profile, Damon Runyon Bay Area Science Spotlight - Technology Innovators, Berkeley News, STAT - Boston Globe Media, Ensia magazine, GEN News, The Daily Californian, HHMI News, Lawrence Berkeley National Laboratory News, PLOS Blogs, Berkeley Scientific Journal, National Institutes of Health- Inside Life Science, Argonne National Laboratory's APS Science publication, Cornell University's CHESS News, UMDNJ Research Magazine, Rutgers Today (Profile Feature Article).