

# DI LIU

Center for Molecular Design and Biomimetics, Biodesign Institute &  
School of Molecular Sciences, Arizona State University

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## EDUCATION AND ACADEMIC EXPERIENCE

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- **Center for Molecular Design and Biomimetics, Biodesign Institute & School of Molecular Sciences, Arizona State University** 08/2023-present  
Assistant professor  
Research themes: DNA topology and topoisomerases; RNA therapeutics; RNA structural biology
- **Wyss Institute for Biologically Inspired Engineering & Department of Systems Biology, Harvard Medical School** 01/2017-08/2023  
Postdoctoral researcher  
Mentor: Prof. Peng Yin  
Research themes: RNA nanostructures; RNA cryo-EM  
Research highlights: solved the first crystal structure of RNA 3D nanocage (P#12) and the first sub-3 Å RNA-only structure (the *Tetrahymena* group I intron) by cryo-EM (P#14); designed and constructed the most complex RNA nanostructure (P#17). (P#x denotes publication x in the list of Publications)
- **Department of Chemistry, the University of Chicago** 9/2011-12/2016  
Ph.D. in Chemistry (2016); M.S. Degree in Organic Chemistry (2012); GPA: 4.0/4.0  
Advisor: Prof. Yossi Weizmann  
Thesis: Synthetic DNA/RNA Topology  
Research highlights: invented the four-way junction-based method to construct complex topological structures from DNA (P#6) and RNA (P#7); designed the RNA branched kissing-loop motif for robust RNA self-assembly (P#10)
- **School of Chemistry and Chemical Engineering, Nanjing University** 9/2007-6/2011  
B.S. in Chemistry (2011); Ranking: 1/136; Overall GPA: 94/100; Major GPA: 96/100  
Advisor: Prof. Zijian Guo  
Research in the design and synthesis of photoactivatable platinum-based anticancer drugs (P#3)

## PUBLICATIONS

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15. T. Shen‡, Z. Hu‡, S. Sun‡\*, D. Liu‡\*, F. Wong, J. Wang, J. Chen, Y. Wang, L. Hong, J. Xiao, L. Zheng, T. Krishnamoorthi, I. King, S. Wang, P. Yin\*, J. J. Collins\*, Y. Li\*, "Accurate RNA 3D structure prediction using a language model-based deep learning approach", *Nature Meth.*, 2024, 21(12), 2287-2298. ‡Co-first authors; \*Co-corresponding authors.
14. D. Liu‡, F. A. Thelot‡, J. A. Piccirilli, M. Liao\*, P. Yin\*, "Sub-3-Å cryo-EM structure of RNA enabled by engineered homomeric self-assembly", *Nature Meth.*, 2022, 19: 576-585. ‡ Co-first authors.
13. Y. Wang, M. Wang, M. N. Djekidel, H. Chen, D. Liu, F. W. Alt, Y. Zhang\*, "eccDNAs are apoptotic products with high innate immunostimulatory activity", *Nature*, 2021, 599 (7884): 308-314.
12. D. Liu‡, Y. Shao‡, J. A. Piccirilli\*, Y. Weizmann\*, "Structures of artificially designed discrete RNA nanoarchitectures at near-atomic resolution", *Science Advances*, 2021, 7(39): abf4459. ‡ Co-first authors. ([Cover Story](#))
11. J. Shen, W. Sun, D. Liu, T. Schaus, P. Yin\*, "Three-dimensional nanolithography guided by DNA modular epitaxy", *Nature Mater.*, 2021, 20(5): 683-690.

10. **D. Liu**, C. W. Geary, G. Chen, Y. Shao, M. Li, C. Mao, E. S. Andersen, J. A. Piccirilli, P. W. K. Rothmund\*, Y. Weizmann\*, "Branched kissing loops for the construction of diverse RNA homooligomeric nanostructures", *Nature Chem.*, 2020, 12(3): 249–259. (Highlighted in [Nature Chem.](#))
9. G. Chen‡, K. J. Gibson‡, **D. Liu**, H. C. Rees, J-H. Lee, W. Xia, R. Lin, H. L. Xin, O. Gang, Y. Weizmann\*, "Regioselective surface encoding of nanoparticles for programmable self-assembly", *Nature Mater.*, 2019, 18: 169-174.
8. M. Li, M. Zheng, S. Wu, C. Tian, **D. Liu**, Y. Weizmann, W. Jiang, G. Wang\*, C. Mao\*, "In vivo Production of RNA Nanostructures via Programmed Folding of Single-stranded RNAs", *Nature Commun.*, 2018, 9: 2196.
7. **D. Liu**, Y. Shao, G. Chen, Y. Tse-Dinh, J. A. Piccirilli, Y. Weizmann\*, "Synthesizing Topological Structures Containing RNA", *Nature Commun.*, 2017, 8: 14936.
6. **D. Liu**, G. Chen, U. Akhter, T. M. Cronin, Y. Weizmann\*, "Creating Complex Molecular Topologies by Configuring DNA Four-way Junctions", *Nature Chem.*, 2016, 8(10): 907-914. ([Cover Story](#))
5. D. Wen, Y. Peng, **D. Liu**, Y. Weizmann and Ram I. Mahato\*. "Mesenchymal Stem Cell and Derived Exosome as Small RNA Carrier and Immunomodulator to Improve Islet Transplantation", *J. Control Release*, 238, 166-175 (2016).
4. G. Chen‡, **D. Liu**‡, C. He‡, T. R. Gannet, W. Lin, Y. Weizmann\*, "Enzymatic Synthesis of Periodic DNA Nanoribbons for Intracellular pH Sensing and Gene Silencing", *J. Am. Chem. Soc.*, 137, 3844-3851 (2015). ‡ Co-first authors. ([Cover Story](#) and highlighted in [JACS Spotlights](#))
3. **D. Liu**, J. L. Ma, W. Zhou, W. J. He\* and Z. J. Guo\*, "Synthesis and Photoactivity of a Pt(II) Complex Based on an *o*-Nitrobenzyl-derived Ligand", *Inorganica Chimica Acta*, 2012, 393:198-203.
2. **D. Liu**, H. F. Zhang and Y. Lu\*, "Computer Modeling of Linear Condensation Polymerization", *Chinese Polymer Bulletin (Gaofenzi Tongbao, Chinese)*, 2012, (02):103-107.
1. **D. Liu**, H. F. Zhang and Y. Lu\*, "Computer Modeling of Probability Effect in the Chemical Reactions of Polymers", *Chinese Polymer Bulletin (Gaofenzi Tongbao, Chinese)*, 2011, (06):94-99.

#### **Manuscripts (first or corresponding authored) in submission/preparation:**

18. "RNA homooligomeric self-assembly mediated by kissing-bulge interactions".
17. "dsRNA bricks: complex self-assembled RNA nanostructures of more than 100 unique components".
16. "Programming the topologies of self-assembled RNA nanocages".

#### **PRESENTATIONS AND TALKS**

18. "Nanoarchitectural engineering of DNA and RNA for biological discovery" (Invited talk), *BME Seminar Series*, School of Biological and Health Systems Engineering, Arizona State University, Tempe, AZ, Oct. 2024.
17. "Nanoarchitectural engineering of RNA for structural determination using cryo-EM" (Invited talk), *The 73rd ACA Annual Meeting*, Baltimore, MD, July 2023.
16. "Programmed self-assembly of nucleic acids for topological construction and structural determination" (Invited talk), *HOPE Young Scientist Forum*, Virtual Meeting, March 2023.
15. "Programmed self-assembly of nucleic acids for topological construction and structural determination" (Invited talk), Department of Medical Biochemistry and Biophysics, Karolinska Institutet, Stockholm, Sweden, March 2023.
14. "Programmed self-assembly of nucleic acids for topological construction and structural determination" (Invited talk), School of Molecular Sciences, Arizona State University, Tempe, AZ, Feb. 2023.

13. "Programmed self-assembly of nucleic acids for topological construction and structural determination" (Invited talk), Department of Chemistry, Brandeis University, Waltham, MA, Jan. 2023.
12. "Sub-3 Å cryo-EM structure of RNA enabled by engineered homomeric self-assembly" (Talk), *LSRF Annual Meeting*, Zoom Virtual Meeting, May 2021.
11. "Approaching RNA Structural Biology with cryo-EM" (Poster), *LSRF Annual Meeting*, Baltimore, MD, Oct. 2019.
10. "Construction and applications of synthetic DNA/RNA topologies" (Invited talk), *International Young Scholar Forum of Shanghai Jiao Tong University School of Medicine*, Shanghai Jiao Tong University School of Medicine, Shanghai, China, April 2019.
9. "Approaching RNA Structural Biology with cryo-EM" (Poster), *LSRF Annual Meeting*, Houston, TX, Oct. 2018.
8. "Crystallizing Artificially Designed Complex RNA Nanostructures" (Poster), *HHMI Science Meeting*, Janelia Research Campus, Ashburn, VA, Sep. 2016.
7. "Crystallizing Artificially Designed Complex RNA Nanostructures" (Poster), *13<sup>th</sup> Annual Conference on Foundations of Nanoscience: Self-Assembled Architectures and Devices (FNANO16)*, Snowbird, UT, April 2016.
6. "Synthetic Nucleic Acid Topology" (Oral presentation), *Tiger Talk*, Department of Chemistry, the University of Chicago, Chicago, IL, Dec. 2015.
5. "Synthetic RNA Topology via Programmed Self-assembly" (Oral presentation), *Chicagoland RNA Club*, the University of Chicago, Chicago, IL, Nov. 2015.
4. "Controlling the Bending and Twist of RNA Assemblies via Artificially Designed Loop-Bulge Kissing Interactions" (Poster), *21<sup>st</sup> International Conference on DNA Computing and Molecular Programming (DNA21)*, Harvard University, Aug. 2015.
3. "Folding a Single Strand of RNA into Nanocages" (Poster), *Gordon Research Conference on RNA Nanotechnology*, Ventura, CA, Feb. 2015.
2. "Creating Complex Molecular Topologies by Configuring DNA Four-Way Junctions" (Contributed talk), *20<sup>th</sup> International Conference on DNA Computing and Molecular Programming (DNA20)*, Kyoto University, Japan, Sep. 2014.
1. "Creating Complex Molecular Topologies by Configuring DNA Four-Way Junctions" (Poster), *AAAS 2014 Annual Meeting*, Chicago, IL, Feb. 2014.

## TEACHING

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- **Teaching @ASU**

- BCH367 Elementary Biochemistry Lab**

Fall, 2024

- BCH564 Bionanotechnology**

Fall, 2023

- **Before ASU**

- Harper Core Tutor of Organic Chemistry, the College at the University of Chicago**

2012-2016

- Provide one-on-one assistance and small group support to undergraduate students (four hours per week)

- Teaching Assistant, Department of Chemistry, the University of Chicago**

2011-2012

- Organic chemistry, one discussion session + one laboratory session per week

- Awarded with the Gerhard Closs Teaching Award in Organic Chemistry (2012)

Nominated for the Physical Sciences Division Teaching Award (2012, 2013, 2014)

## SERVICE

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- **Service @ASU**

School of Molecular Sciences Committee on Seminars, Committee Member	2023-present
ASU Red Team Review, Reviewer Team Member	2024-present
2023 Annual Biodesign Center for Molecular Design and Biomimetics Retreat, Committee Co-Chair	2023

- **Outreach**

Mentor for the SCience and ENgineering Experience ( <a href="#">SCENE</a> ) program	2024-present
The Arizona Science and Engineering Fair ( <a href="#">AzSEF</a> ), Judge for the Senior Division	April, 2024

## MENTORING

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- **Mentoring @ASU**

Cong Li, Postdoc, 2024-present  
Zhishang Li, Postdoc, 2024-present

Nishinki Thakshana Muthumuni, Graduate student (co-mentored with Prof. Jia Guo), 2024-present  
Gengshi Wu, Graduate student (co-advised with Prof. Hao Yan), 2023-present  
Aleksandra (Sasha) Petrova, Graduate student (co-advised with Prof. Hao Yan), 2023-present

Ilakkian (Keshav) Sivakumar, Undergraduate (Barrett Honors), 2024-present  
Ryan Truong, Undergraduate (Barrett Honors), 2024-present  
Olivia Holman, Undergraduate (Barrett Honors), 2024-present  
Yanzhe Qu, Undergraduate, 2023-present  
Tejas Krishnamoorthi, Undergraduate, 2024-present  
Kashvi Agarwal, Undergraduate, 2023-2024  
Anuvi Batra, Undergraduate, 2023-present

High-school students (ASU [SCENE Program](#)): Elaine Tang (Gilbert Classical Academy); Archisha Rajesh (Basis Peoria); Nishanthi (Nisha) Jaikumar (Mountain Point High School); Sriyuth Kesiraju (Basis Scottsdale)

Other Graduate Students' Committees (Comprehensive Examination or Thesis): Justin Brower, Thong Diep, Liangxiao Chen

- **Before ASU**

Swarup Dey, Postdoc @Harvard, 2021-2022 (Now senior scientist @ Thermo Fisher)  
Jun Yan, Visiting undergraduate from Tsinghua Univ., 2017 (Now PhD candidate @ Princeton)  
François A. Th  lot, Rotation graduate student @Harvard, 2017 (Now associate @ McKinsey)  
Anna Le, Undergraduate @UChicago, 2016 (Now PhD candidate @ MIT)  
Usman Akhter, Undergraduate @UChicago, 2014 - 2015 (Now manager @ OneOncology)

## AWARDS AND HONORS

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- Merck Postdoctoral Fellowship of the Life Sciences Research Foundation ([LSRF](#)) 2018-2021
- 2016 Chinese National Award for Outstanding Self-financed Students Abroad 2017
- [ISNSCE](#) Student Award (DNA20) 2014
- Howard Hughes Medical Institute ([HHMI](#)) International Predoctoral Fellowship 2014-2016
- Everett E. Gilbert Memorial Prize for the Best Third Year Experimentalist in Organic Chemistry 2014
- AAAS 2014 Student Poster Competition, Honorable Mention in Physical Sciences Category 2014

- Martha Ann and Joseph A. Chenicek Graduate Research Fellowship 2013
  - Gerhard Closs Teaching Award in Organic Chemistry 2012
  - National Scholarship (Ministry of Education of the P.R. China) 2008 & 2010
  - 1<sup>st</sup> Province-wide Undergraduate Chemistry Experiment Competition (Jiangsu Chemistry Society), awarded with First Prize 2010
  - National Undergraduate Innovation Program, awarded with Excellent Work Prize 2010
  - [JIANG Wenruo](#) Scholarship 2009
  - National Chemistry Olympiad Competition for High School Students, awarded with First Prize in Shandong Province (Guaranteed for Admission to Nanjing University) 2006
- Travel Awards: Windt Graduate Student Travel Award (2016), DNA20 Student Travel Award (2014), GSA Travel Award (2014)
- Reviewer Awards: Journal of Nanobiotechnology (2022)

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