

DI LIU

Center for Molecular Design and Biomimetics, Biodesign Institute &
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EDUCATION AND ACADEMIC EXPERIENCE

- **Center for Molecular Design and Biomimetics (CMDB), Biodesign Institute & School of Molecular Sciences (SMS), 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

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. ([Research Briefing by Nature Meth.](#))
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. "Complex self-assembled RNA nanostructures of more than 100 unique components".
16. "Programming the topologies of self-assembled RNA nanocages".

PRESENTATIONS AND TALKS

21. "Gen Z DNA Nanostructures: Harnessing Left-Handed Z-DNA for Programmable Design" (Contributed talk), 22nd Annual Conference on Foundations of Nanoscience: Self-Assembled Architectures and Devices (FNANO25), Snowbird, UT, April 2025.
20. "Nanoarchitectural Approaches to Synthetic DNA Topology" (Invited talk), *Mathematical Biology Seminar*, School of Mathematical and Statistical Sciences, Arizona State University, Tempe, AZ, April 2025.
19. "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.
18. "Developing Topological Nucleic Acid Nanoarchitectures as Novel Probes for Studying Topoisomerases" (Poster), 2024 *Topoisomerases in Biology and Medicine Conference*, Miami, FL, July 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), *13th 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), *21st 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), *20th 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

- Teaching @ASU

BCH367 Elementary Biochemistry Lab	Fall, 2025
BCH564 Bionanotechnology	Spring, 2025
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

- **Service @ASU**

School of Molecular Sciences Committee on Undergraduate Research, Committee Member 2025-present
School of Molecular Sciences Committee on Seminars, Committee Member 2023-2025
ASU Red Team Review, Reviewer Team Member 2024-present
2023 Annual Biodesign Center for Molecular Design and Biomimetics Retreat, Committee Co-Chair 2023

- **Other service/outreach**

NIH Study Section, Ad Hoc Member CBP June, 2025
The Arizona Science and Engineering Fair ([AzSEF](#)), Judge for the Senior Division April, 2025
Mentor for the SCience and ENgineering Experience ([SCENE](#)) program 2024-present
The Arizona Science and Engineering Fair ([AzSEF](#)), Judge for the Senior Division April, 2024

MENTORING

- **Mentoring @ASU**

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

Nishinki Thakshana Muthumuni, Graduate student (co-advised 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
Yash Kothari, Undergraduate (Barrett Honors), 2025-present
Rohan Shrestha, Undergraduate, 2025-present
Purvaj Vanga, Undergraduate, 2025-present
Yusra Azam, Med Chem (BS/MS) Program, 2025-present
Kamalesh Goggi, Undergraduate (Barrett Honors), 2025-present

High-school students (ASU [SCENE Program](#)): 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, Ishraq R Rahman, David Mikhail

Alumni/Past Members:

Olivia Holman, Undergraduate (Barrett Honors), 2024-2025 (Now in the MD/PhD program @ the University of Arizona College of Medicine)
 Anuvi Batra, Undergraduate, 2023-2025 (Now in the PhD program @ Georgia Institute of Technology)
 Yanzhe Qu, Undergraduate, 2023-2025 (Earned B.S. degree in two years)
 Kashvi Agarwal, Undergraduate, 2023-2024
 Tejas Krishnamoorthi, Undergraduate, 2024
 Elaine Tang, SCENE High-School Student (Gilbert Classical Academy), 2024-2025 (Now undergraduate @ UPenn)
 Archisha Rajesh, SCENE High-School Student (Basis Peoria), 2024-2025 (Now undergraduate @ ASU Barrett Honors)

Awards and Honors by Mentees:

Olivia Holman, SMS Distinguished Biochemistry Merit Award, 2025
 Olivia Holman, School of Life Sciences Undergraduate Research ([SOLUR](#)) Fellowship, 2025
 Cong Li, Rapid Fire Presentation at Biodesign Retreat, 2025
 Olivia Holman, Honorable Mention Award at the 31st Annual SOLUR Poster Symposium (Molecular and Cellular Biology category), 2024
 Olivia Holman, SOLUR Scholarship, 2024

● Before ASU

Swarup Dey, Postdoc @Harvard, 2021-2022 (Now senior scientist @ Regeneron)
 Jun Yan, Visiting undergraduate from Tsinghua Univ., 2017 (Now PhD candidate @ Princeton)
 François A. Thélot, 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
 - 1st 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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