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

- **Center for Molecular Design and Biomimetics (MDB), Biodesign Institute & School of Molecular Sciences (SMS), Arizona State University** 08/2023-present
  Assistant professor
  Research themes: DNA topology and topoisomerases; RNA therapeutics; RNA nanotechnology & 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). (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

17. C. Li‡, J. Du‡, G. Wu, K. DeVore, A. Petrova, X. Tu, L. Chen, K. Sivakumar, Y. Kothari, P.-L. Chiu, D. Wen, H. Yan, N. M. Dunfield, **D. Liu***, "*Synthesis of a Molecular Four-Ring Brunnian Link*". ‡Co-first authors; *Corresponding authors. (*Submitted, Preprint available at ChemRxiv*)

16. L. Chen, Z. Li, J. Yan, S. Dey, C. Li, A. Petrova, A. Prasad, D. Satyabola, K. DeVore, X. Tu, Y. Qu, S. Wang, G. Wu, P.-L. Chiu, D. Wen*, J. C.-Y. Wang*, H. Yan, * P. Yin*, **D. Liu***, "*Programmable Self-Assembly of RNA Nanostructures with >100 Unique Components*". *Co-corresponding authors. (*Submitted, Preprint available at BioRxiv*)

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.*)

- **Before ASU**

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. Rothemund*, 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 (senior corresponding authored) in preparation:

22. "Integrating Left-Handed Z-DNA into DNA Nanostructures" (*Results shown in Di's talk at FNANO2025*)
21. "Braid-Based Synthesis of Molecular Topologies Enabled by Noncanonical DNA Structures" (*Results shown in Cong's talk at DNA32*)
20. "Novel DNA and RNA Nanostructure Motifs Designed with AZBMOST" (*Results shown in Gengshi's talk at DNA32*)
19. "RNA homooligomeric self-assembly mediated by kissing-bulge interactions"
18. "Programming the topologies of self-assembled RNA nanocages"

PATENTS AND INVENTION DISCLOSURES

11. **Liu, D.**, Du, J., Li, C., Nguyen, N., Wu, G., and Yan, H. A method for preparing positively and negatively supercoiled DNA minicircles with controlled linking number differences. Arizona State University Invention Disclosure D27-098 /

M27-161L (2026).

10. **Liu, D.**, Du, J., and Li, C. *Knotted DNA substrates for detecting type IB topoisomerase activity and screening type IB topoisomerase inhibitors.* Arizona State University Invention Disclosure D26-357 / M27-111L (2026).

9. **Liu, D.**, Li, C., Tu, X., Wang, W., and Yan, H. *Enhancing therapeutic mRNA stability through bioorthogonal chemistry.* Arizona State University Invention Disclosure D26-197 / M26-234L (2026).

8. **Liu, D.**, Du, J., Kothari, Y., and Li, C. *Constructing nucleic acid topological structures by programming triple helix motifs.* Arizona State University Invention Disclosure D26-168 / M26-205L (2025).

7. **Liu, D.**, Du, J., Li, C., and Sivakumar, I. *Constructing nucleic acid topological structures by programming switchback motifs.* Arizona State University Invention Disclosure D26-145 / M26-178L (2025).

6. **Liu, D.,** Yan, H., Li, C., Tu, X., and Petrova, A. *Synthesis of Cap-2 mRNA.* U.S. Patent Application Publication US20260308652A1 (2026).

5. Yan, H., Zhao, L., Xu, Y., Georges, J., Nakaji, P., **Liu, D.**, Wang, C., and Wu, T. *Methods and compositions for rapid intraoperative histopathologic diagnosis.* International Patent Application WO2026064804A1 (2026).

4. Yan, H., **Liu, D.**, Chen, L., Tu, X., and Petrova, A. *RNA nanostructures with base modifications for reducing innate immunogenicity.* U.S. Patent Application Publication US20260028622A1 (2026).

3. **Liu, D.**, Xu, B., Guo, J., and Li, Z. *DNA (RNA) assembly mediated by charged and charge-switching peptides.* International Patent Application WO2025264834A1 (2025).

2. **Liu, D.**, Wang, W., Yan, H., Li, C., and Tu, X. *Procapped mRNA for targeted cell translation.* International Patent Application WO2025231424A1 (2025).

1. **Liu, D.** and Yin, P. *Sub-3-Å cryo-EM structure of RNA enabled by engineered homomeric self-assembly.* International Patent Application WO2023018878A2 (2023). Harvard University.

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**

BCH564 *Bionanotechnology*	Spring, 2027 (Scheduled)
BCH494/598 *RNA Biochemistry*	Spring, 2026
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 AND OUTREACH

- **Service @ASU**

ASU Graduate College Focus on Finishing Your Degree (FFYD) Award, Reviewer Team Member	2026-present
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
Annual Biodesign Center for Molecular Design and Biomimetics Retreat, Committee Co-Chair	2023, 2025

- **Other service/outreach**

ASU In-VIBO Biology Research Fair, Research Exhibitor	Nov., 2026
Regeneron International Science and Engineering Fair (ISEF), Judge for Grand Awards	May, 2026
The Arizona Science and Engineering Fair (AzSEF), Judge for the Senior Division	April, 2026
NIH Study Section, Ad Hoc Member Chemical Biology & Probes (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

Ninh Nguyen, Ph.D. Graduate student, 2026-present
Jiarong Du, Ph.D. Graduate student, 2025-present
Nishinki Thakshana Muthumuni, Ph.D. Graduate student (co-advised with Prof. Jia Guo), 2024-present
Gengshi Wu, Ph.D. Graduate student (co-advised with Prof. Hao Yan), 2023-present
Aleksandra (Sasha) Petrova, Ph.D. Graduate student (co-advised with Prof. Hao Yan), 2023-present

Po-Yen Kuan, M.S. Graduate student, 2026-present
Fares Sweidan, M.S. Graduate student, 2025-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
Kamalesh Goggi, Undergraduate (Barrett Honors), 2025-present
Archisha Rajesh, Undergraduate (Barrett Honors), 2025-present
Lauren Goluba, Undergraduate (Barrett Honors), 2026-present
Mehnaz Rahman, Undergraduate (Barrett Honors), 2026-present

High-school students (ASU SCENE Program): Ahnaf Khan (Bioscience High School); Shlok Jha (Basis Chandler)

Other Graduate Students' Committees (Comprehensive Examination or Thesis): Justin Brower, Thong Diep, Liangxiao Chen, Ishraq R Rahman, David Mikhail, Ezinwanne Ikediuwa, Sunjay Yoon

Alumni/Past Members:
Zhishang Li, Postdoc, 2024-2026 (**Now** Associate Professor @ Ocean University of China)
Olivia Holman, Undergraduate (Barrett Honors; thesis: *Integration of Z-DNA into Novel Nanostructure Designs*), 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)
Purvaj Vanga, Undergraduate, 2025
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)
Nishanthi (Nisha) Jaikumar (Mountain Point High School)
Sriyuth Kesiraju (Basis Scottsdale)

Mentee Awards and Honors:
Cong Li, NSF DNA32 Travel Grant, 2026
Cong Li, Selected Oral Presentation at DNA32, 2026
Gengshi Wu, NSF DNA32 Travel Grant, 2026
Gengshi Wu, Selected Short Talk from Poster Submissions at DNA32, 2026
Kamalesh Goggi, Second Place Award at the 33rd Annual School of Life Sciences (SOLS) Undergraduate Research Poster Symposium (Immunology category), 2026
Yash Kothari, ACS Division of Analytical Chemistry Undergraduate Award, 2026
Olivia Holman, SMS Distinguished Biochemistry Merit Award, 2025
Olivia Holman, School of Life Sciences Undergraduate Research (SOLUR) Fellowship, 2025
Sasha Petrova, Selected Oral Presentation at the 5th Arizona RNA Salon Symposium, 2025
Cong Li, Selected Rapid Fire Presentation at Biodesign Retreat, 2025
Zhishang Li, Selected Oral Presentation at 2024 MRS Fall Meeting, 2024
Olivia Holman, Honorable Mention Award at the 31st Annual SOLS Undergraduate Research Poster Symposium (Molecular and Cellular Biology category), 2024
Olivia Holman, SOLUR Scholarship, 2024
Gengshi Wu, Best Poster Award at MDB Annual Retreat, 2023
Sasha Petrova, Best Poster Award at MDB Annual Retreat, 2023

(Students in collaborating laboratories whom I mentored)
Xinyi Tu, PhRMA Predoctoral Fellowship, 2024 [My contribution: Research mentorship / proposal development]
Liangxiao Chen, Seeman Student Travel Award & Best Poster Presentation Award at FNANO2024, 2024 [My contribution: Research mentorship] (**Now** Postdoc @ Harvard)

- **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)

RESEARCH FUNDING

- 2026–2028 (Active) | Stand Up To Cancer® (SU2C)-Nina Nicolai Pancreatic Cancer Innovation in Collaboration Award
  Project: *Potentiating TCR-T Cell Therapy in Pancreatic Cancer via Interferon-resilient Cap2 mRNA Vaccine*
  Role: ASU PI (Total $225,000, ASU subaward $100,000)

Sponsor: Stand Up To Cancer (subaward through Providence Portland Medical Center)
Project Period: 07/01/2026–06/30/2028

AWARDS AND HONORS

- Stand Up To Cancer® (SU2C)-Nina Nicolai Pancreatic Cancer Innovation in Collaboration Award 2026
- 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); IJMS (2025)

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