

## Curriculum: Hao Yan

School of Molecular Sciences & Center for Molecular Design, Biodesign Institute  
Arizona State University  
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### RESEARCH PROGRAM SUMMARY:

I am a (bio)molecular designer and engineer. The theme of my research is to use nature's design rules as inspiration to advance biomedical, energy-related, and other technological innovations through the use of self-assembling molecules and materials. I aim to create intelligent materials with better component controls at the atomic and molecular levels. Our interdisciplinary team is interested in designing bio-inspired molecular building blocks such as DNA, RNA and proteins and programming their higher order assembly into systems that will perform complex functions. My ultimate goals are 1) to engineer an information guided self-assembling molecular system for the finest possible interactions of molecules in a three-dimensional space; and 2) to create man-made molecular machines/molecular robotics through molecular design, molecular programming, directed molecular evolution and molecular systems engineering.

### EDUCATION

Ph.D. in Chemistry	New York University, New York, NY Advisor: Nadrian C. Seeman	August 2001
B.S. in Chemistry	Shandong University, Jinan, P.R.China	July 1993

### EMPLOYMENT AND APPOINTMENT

- 09/2013 to Present Director, Center for Molecular Design and Biomimetics  
Biodesign Institute, Arizona State University, Tempe, AZ
- 09/2015 to Present Milton D. Glick Distinguished Professor  
School of Molecular Sciences & Biodesign Institute, Arizona State University, Tempe, AZ
- 01/2012 to 08/2015 Milton D. Glick Distinguished Professor  
Department of Chemistry and Biochemistry & Biodesign Institute,  
Arizona State University, Tempe, AZ
- 08/2008 to 01/2012 Professor  
Department of Chemistry and Biochemistry & Biodesign Institute,  
Arizona State University, Tempe, AZ
- 08/2004 to 08/2008 Assistant Professor  
Department of Chemistry and Biochemistry & Biodesign Institute,  
Arizona State University, Tempe, AZ
- 09/2001 to 07/2004 Assistant Research Professor  
Department of Computer Science, Duke University, Durham, NC

## **ENTREPRENEURSHIP**

- 02/2021 to Present Co-founder, Exodigm Biosciences, Inc.

## **AWARDS and HONORS**

- Elected Foreign Member, European Academy of Sciences, 2024.
- Humboldt Research Award, Alexander von Humboldt Foundation, 2023.
- Named to the World's Top 2% Scientists' List Ranked by Stanford University for the 4<sup>th</sup> Consecutive Years, 2020-2023.
- Elected Fellow of the American Institute for Medical and Biological Engineering, 2023.
- Elected Fellow of the National Academy of Inventors, 2022.
- Feynman Prize in Nanotechnology, Experimental Category, Foresight Institute, 2020.
- Elected Fellow of American Association for the Advancement of Science (AAAS), 2019.
- Fast Company's 100 Most Creative People in Business, 2019.
- Web of Science 2018 – present, Highly Cited Researcher in Cross-Field.
- The Rozenberg Tulip Award in DNA Computing, 2013
- NIH Director's Transformative Research Award, 2012
- Arizona Technology Enterprise Achievement Award, 2014
- Finalist, Arizona State University Outstanding Doctoral Mentor Award, 2013
- Inaugural Milton D. Glick Distinguished Professor in Chemistry and Biochemistry, 2012
- Member of Steering Committee, International Meeting on DNA Computing and Molecular Programming, 2012 to present
- Arizona State University Promotion and Tenure Faculty Exemplar, 2008
- Alfred P. Sloan Research Fellowship, 2008
- Air Force Office of Scientific Research Young Investigator Award, 2007
- National Science Foundation CAREER Award, 2006
- Arizona Technology Enterprise Innovator of Tomorrow Award, 2006
- New York University GSAS Dean's Dissertation Fellowship, 2006

## **EDITORIAL BOARDS**

- Associate Editor, ACS Applied Biomaterials, 2021 to Present
- Academic Associate Editor, Science Advances, 2021 to Present
- Member of Editorial Board, J. of Nanobiotechnology, 2019 to Present

- Member of Editorial Board, Nano Research, 2014 to Present
- Member of Editorial Board, Nature Scientific Report, 2016 to Present
- Member of Editorial Advisory Board, Langmuir, 2011 to 2015

### **HONORARY AND KEYNOTE LECTURESHIPS**

- Ohio State University Institute for Materials Research Distinguished Lecturer, 2023
- Keynote speaker, World Congress of Nephrology, 2022
- BASF Lectureship in Chemical Sciences, University of California, Berkeley, 2018
- Keynote speaker, The 4<sup>th</sup> International Conference on DNA Nanotechnology, Xi'an, China, 2015.
- Keynote speaker, 40<sup>th</sup> Annual Naff Symposium on Chemistry and Molecular Biology, U. of Kentucky, 2014.
- Keynote speaker, Bio-Inspired Computing: Theories and Applications 2013 (BIC-TA 2013), Huangshan, China, 2013.
- Keynote speaker, 10<sup>th</sup> Annual Conference, Foundation of Nanoscience, Self-assembled Architectures and Devices, Snowbird, Utah, 2013.
- Keynote speaker, 7<sup>th</sup> Foundations of Nanoscience: Self-assembled Architectures and Devices, Snowbird, Utah, 2010.

### **SERVICE TO SCIENTIFIC SOCIETY AND CONFERENCES**

- General co-chair, Annual Conference Foundation of Nanoscience, Snowbird, Utah, Starting in 2024
- Elected President, International Society for Nanoscale Science, Computation and Engineering, 2013-2015
- Steering Committee Member, International Meeting on DNA Computing and Molecular Programming, 2012-present
- Track Chair, Annual Conference Foundation of Nanoscience, Snowbird, Utah, 2021-present
- Chair, Organizing Committee, 19<sup>th</sup> International Meeting on DNA Computing and Molecular Programming, Tempe, AZ, 2013
- Co-Chair, Program Committee, 13<sup>th</sup> International Meeting on DNA Computing and Molecular Programming, Memphis, TN, 2007
- Chair, MRS Symposium on DNA Nanotechnology, 2012
- Chair, Session on DNA Nanomachines in vitro and inside Living Cells, 54<sup>th</sup> Annual Biophysical Society Meeting, 2010
- Co-Chair for the Seventh International DNA Nanotechnology Conference, Co-chair,

China, 2019

- Co-organizer and Scientific Coordinator for DNATEC17, Dresden, Germany, 2017
- Co-organizer for the Fifth International DNA Nanotechnology Conference, Nanjing, China, 2016
- Co-organizer for the Fourth International DNA Nanotechnology Conference, Xi'an, China, 2015
- Co-organizer for the Third International DNA Nanotechnology Conference, Suzhou, China, 2014
- Co-organizer for DNATEC14: Digital Chemistry, Dresden, Germany, 2014
- International Advisory Board Member of *Symposium H "Mining Smartness from Nature"* of CIMTEC, 2012
- Chair, Symposium in Honor of Ned Seeman, Snowbird, Utah, 2011
- Member of Steering Committee, International Conference on Bio-Inspired Computing: Theory and Applications (*BIC-TA*), 2011
- Chair, Workshop on "Bio-directed Assembly", Keystone, CO, 2010
- Co-Organizer, DNA Nanotechnology Workshop, Beijing, China, 2009
- Co-Organizer, International Workshop on DNA-based Nanotechnology: Construction, Mechanics, and Electronics, Dresden, Germany, May 11-15 (2009).
- Co-Organizer, DNA Nanotechnology Workshop, Beijing, China, 2009
- Session Chair: The Seventh International Meeting on Scanning Probe Microscopy, Cancun, Mexico (2005).

## RESEARCH BIBLIOGRAPHY

### 1. Journal Publications

**Google scholar profile:** <http://scholar.google.com/citations?user=arJVgNsAAAAJ&hl=en>

**h-index:** 100

#### A. At Arizona State University

240. H. Liu, M. Matthies, J. Russo, L. Rovigatti, R. Narayanan, T. Diep, D. McKeen, O. Gang, N. Stephanopoulos, F. Sciortino, H. Yan, F. Romano, P. Sulc\*, Inverse Design of a Pyrochlore Lattice of DNA Origami Through Model-driven Experiments, *Science*, 384, 776-781 (2024).

239. S. Fan, S. Wang, L. Ding, T. Speck, H. Yan\*, S. Nussberger\*, N. Liu\*, Shape Matters: Autonomously Self-organized DNA Nanorobots as Masseur and Gatekeeper for Synthetic Cells, *Nature Materials*, in revision (2024).

238. C. Zhang\*, R. Wu, F. Sun, Y. Lin, Y. Zhang, Y. Liang, Y. Chen., L. Liu\*, Q. Ouyang\*, L. Qian\*, H. Yan\*. Parallel DNA Storage by Programming and Printing Epigenetic Bits, *Nature*, in revision (2023).
237. Y. Gao, Y. Sha, Y. Liu, J. Chen, M. Li, S. Gao, Q. Li, X. Zuo, C. Chen, T. Zhang, K. Wang, P. Wang, G. Chen, X. Liu\*, H. Yan\*, C. Fan\*, Massively Parallel sub-10-nanometer lithography of Graphene with DNA-silica Composite Masked Material Manufacturing, *Nature Nanotechnology*, submitted (2023).
236. G. B. M. Wisna, D. Sukhareva, J. Zhao, D. Satyabola, H. Yan\*, R. F. Hariadi\*, DNA Origami Cryptography in 2D and 3D Space with Improved Detection and Fast Readout Enabled by High-Speed DNA-PAINT and Unsupervised Clustering, *Nature Communications*, submitted (2023).
235. Y. Xu‡, R. Zheng‡, A. Prasad‡, M. Liu, X. Zhou, R. Porter, M. Sample, E. Poppleton, J. Procyk, H. Liu, H. Lee, H. Yan\*, P. Sulc\*, N. Stephanopoulos\*, High-affinity binding to the SARS-CoV-2 spike trimer by a multivalent protein-DNA synthetic antibody, *J. Am. Chem. Soc.*, Submitted.
234. Y. Wang, H. Wang, Y. Li, C. Yang, Y. Tang, X. Lu, J. Fan, W. Tang, Y. Shang, H. Yan\*, J. Liu\*, B. Ding\*, Chemically Conjugated Branched Staples for Super-DNA Origami, *J. Am. Chem. Soc.*, in press (2024).
233. T. Yip, X. Qi, H. Yan\*, Y. Chang\*, RNA Origami Functions as a Self-adjuvanted Nanovaccine Platform for Cancer Immunotherapy, *ACS Nano*, 18, 4056-4067 (2024).
232. C. Simmons, H. Skyler, P. Sulc, N. Stephanopoulos\*, H. Yan\*, Site-specific Arrangement and Structure Determination of Minor Groove Binding Molecules in Self-assembled Three-dimensional DNA Crystals, *J. Am. Chem. Soc.*, 145, 26075-26085 (2023).
227. R.P. Narayanan, A. Prasad, A. Buchberger, L. Zhou, J. Bernal-Chanchavac, T. MacCulloch, N.E. Fahmi, H. Yan, F. Zhang M.J. Webber\*, N. Stephanopoulos\*, Supramolecular polymerization of DNA nanostructures using high-affinity host-guest interactions. *Small*, 230785 (2023).
226. L. Yu, H. Yan\*, DNA-based Computation for Multiple Biomarkers. *Nature Biomedical Engineering* 7, 1535-1536 (2023).
225. L. Yu, Y. Xu, M. Al-Amin, S. Jiang, M. Sample, A. Prasad, N. Stephanopoulos, P. Sulc, H. Yan\*, CytoDirect: a Nucleic Acid Nanodevice for Specific and Efficient Delivery of Functional Payloads to the Cytoplasm. *J. Am. Chem. Soc.*, 145, 27336-27347 (2023).
224. Y. Tang, H. Liu, Q. Wang, X. Qi, L. Yu, P. Sulc, F. Zhang, H. Yan\*, S. Jiang\*, DNA Origami Tessellations, *J. Am. Chem. Soc.*, 145, 13858-13868 (2023).
223. J. Yang, K. Jahnke, L. Xin, X. Jing, P. Zhan, A. Peil, A. Griffo, M. Skugor, D. Yang, S. Fan, K. Gopfrich\*, H. Yan\*, P. Wang\*, N. Liu\*, Modulating Lipid Membrane Morphology by Dynamic DNA Origami Networks, *Nano Letters*, 23, 6330-6336 (2023).
222. K. Dai, C. Gong, Y. Xu, F. Ding, X. Qi, X. Tu, L. Yu, X. Liu, J. Li, C. Fan, H. Yan\*, G. Yao\* Single-Stranded RNA Origami-based Epigenetic Immunomodulation, *Nano Letters* 23, 7188-7196 (2023).
221. K. Dai, Y. Xu, Y. Yang, J. Shen, X. Liu, X. Tu, L. Yu, X. Qi, J. Li, L. Wang, X. Zuo, Y. Liu\*, H. Yan\*, C. Fan\*, G. Yao\*, Edge Length-Programmed Single-Stranded RNA Origami for Predictive Innate Immune Activation and Therapy, *J. Am. Chem. Soc.*, 145, 17112-17124 (2023).

220. Y. Tang, H. Liu, Q. Wang, X. Qi, L. Yu, P. Sulc, F. Zhang, H. Yan\*, S. Jiang\*, DNA Origami Tessellations, *J. Am. Chem. Soc.*, 145, 13858-13868 (2023).
219. D. Fu, R. P. Narayanan, A. Prasad, F. Zhang, D. Williams, J. S. Schreck, H. Yan\*, J. Reif\*. Automated Design of 3D DNA Origami with Non-rasterized 2D Curvature, *Science Advances*, 8, eade445 (2022).
218. X. Zhou', D. Satyabola, H. Liu, S. Jiang, X. Qi, L. Yu, S. Lin, Y. Liu, N.W. Woodbury\*, H. Yan\*. Two-Dimensional Excitonic Networks Directed by DNA Templates as an Efficient Model Light-Harvesting and Energy Transfer System, *Angew. Chem. Int. Ed.* 61, e2022112 (2022).
217. R. P. Narayanan, J. Procyk, P. Nandi, A. Prasad, Y. Xu, E. Poppleton, D. Williams, F. Zhang, H. Yan, P. Chiu\*, N. Stephanopoulos\*, and P. Šulc\*, Coarse-Grained Simulations for the Characterization and Optimization of Hybrid Protein–DNA Nanostructures, *ACS Nano* 16, 14086- 14096 (2022).
216. L. Ma, Y. Liu, C. Han, A. Movsesyan, P. Li, H. Li, P. Tang, Y. Yuan, S. Jiang, W. Ni, H. Yan, A. Govorov, Z. Wang, X. Lan\*, DNA-Assembled Chiral Satellite-Core Nanoparticle Superstructures: Two-State Chiral Interactions from Dynamic and Static Conformations, *Nano Letters* 22, 4784-4791 (2022).
215. K. Chen, F. Xu, Y. Hu, H. Yan\*, L. Pan\*, DNA Kirigami Driven by Polymerase-Triggered Strand Displacement, *Small* 18, 2201478 (2022).
214. X. Zhou, H. Liu, F. Djutanta, D. Satyabola, S. Jiang, X. Qi, L. Yu, S. Lin, R.F. Hariadi, Y. Liu, N.W. Woodbury\*, H. Yan\*, DNA-Templated Programmable Excitonic Wires for Micron-Scale Exciton Transport, *Chem.* 8, 2442-2459 (2022).
213. X. Zhou, S. Lin, H. Yan\*, Interfacing DNA nanotechnology and biomimetic photonic complex: advances and prospects in energy and biomedicine, *J. Nanobiotechnology* 20: 257 (2022).
212. C. Simmons, T. MacCulloch, M. Krepl, M. Matthies, A. Buchberger, I. Crawford, J. Sponer, P. Sulc, N. Stephanopoulos\* and H. Yan\*, The influence of Holliday junction sequence and dynamics on DNA crystal self-assembly *Nature. Communications* 13, article number 3112 (2022).
211. J. Bohlin', E. Poppleton', M. Matthies', J. Procyk', A. Mallya, H. Yan & P. Sulc\*, Design and simulation of DNA, RNA, and hybrid protein-nucleic acid nanostructures with OxView, *Nature Protocols* 17, 1762-1788 (2022).
210. L. Liu, F. Hong, H. Liu, X. Zhou, S. Jiang, P. Sulc, J. Jiang\*, H. Yan\*, A localized DNA Finite State Machine with Temporal Resolution, *Science Advances* 8, DOI: 10.1126/sciadv.abm9530 (2022).
209. C. Zhang\*, X. Ma, X. Zheng, Y. Ke, K. Chen, D. Liu, Z. Lu, J. Yang\* and H. Yan\*, Programmable Allosteric DNA Regulations for Molecular Networks and Nanomachines, *Science Advances* 5, DOI: 10.1126/sciadv.abl4589 (2022).
208. S. Dey, A. Dorey, L. Abraham, Y. Xing, I. Zhang, F. Zhang, S. Howorka\*, H. Yan\*, A Reversibly Gated Protein-Transporting Membrane Channel Made of DNA, *Nature Communications* 13, Article number: 2271 (2022)

207. H. Liu, F. Hong, F. Smith, J. Goertz, T. Ouldridge, M. Stevens, H. Yan & P. Sulc\*, Kinetics of RNA and RNA:DNA hybrid strand displacement, *ACS Synth. Biol.* 10, 3066-3073 (2021).
206. Y. Liu, L. Ma, S. Jiang, C. Han, P. Tang, H. Yang, X. Duan, N. Liu\*, H. Yan\* & X. Lan\*, DNA Programmable Self-Assembly of Planar, Thin-Layered Chiral Nanoparticle Superstructures with Complex Two-Dimensional Patterns, *ACS Nano* 15, 16664-16672 (2021).
205. T. Yuan, Y. Shao, X. Zhou, Q. Liu, Z. Zhu, B. Zhou, Y. Dong, N. Stephanopoulos, S. Gui\*, H. Yan\*, D. Liu\*, Highly Permeable DNA Supramolecular Hydrogel Promotes Neurogenesis and Functional Recovery after Completely Transected Spinal Cord Injury, *Advanced Materials* 33, 2102428, (2021).
204. Y. Zhang, Z. Qu, . Jiang, Y. Liu, R. Narayanan, D. Williams, X. Zuo, L. Wang, H. Yan, H. Liu\* & C. Fan, Prescribing Silver Chirality with DNA Origami, *J. Am. Chem. Soc* 143, 8639-8646, (2021).
203. S. Jiang, N. Pal, F. Hong, N. E. Fahmi, H. Hu, M. Vrbanac, H. Yan\*, N. G. Walter\*, Y. Liu\*, Regulating DNA Self-Assembly Dynamics with Controlled Nucleation, *ACS Nano* 15, 5384-5396, (2021).
202. S. Dey, C. Fan\*, K. V. Gothelf\*, J. Li\*, C. Lin\*, L. Liu, N. Liu\*, M. A. D. Nijenhuis, B. Sacca\*, F. C. Simmel\*, H. Yan\* & P. Zhan, DNA Origami, *Nat. Rev. Methods Primers* 1, 13, (2021).
201. S. Jiang, Z. Ge, S. Mou, H. Yan\*, C. Fan\*, Designer DNA Nanostructures for Therapeutics, *Chem* 7, 1156-1179, (2020).
200. G. Yao', F. Zhang', F. Wang', T. Peng, H. Liu, E. Poppleton, P. Sulc, S. Jiang, L. Liu, C. Gong, X. Jing, X. Liu, L. Wang, Y. Liu, C. Fan\*, H. Yan\*, Meta-DNA Structures, *Nat. Chem.* 12, 1067-1075, (2020).
199. C.R. Simmons, T. MacCulloch, F. Zhang, Y. Liu, N. Stephanopoulos & H. Yan, A Self-Assembled Rhombohedral DNA Crystal Scaffold with Tunable Cavity Sizes and High Resolution Structural Detail, *Angew. Chem. Int. Ed.* 59, 18619-18626, (2020).
198. S. Jiang, F. Zhang & H. Yan, Complex assemblies and crystals guided by DNA, *Nat. Mater.* 19, 694-700, (2020).
197. J. Georges, X. Qi, X. Liu, Y. Zhou, E. C. Woolf, A. Valeri, Z. Al-Atrache, E. Belykh, B. Feuerstein, M. Preul, A. C. Scheck, M. Reiser, T. Anderson, J. Gopez, D. Appelt, S. Yocom, J. Eschbacher, H. Yan, P. Nakaji, A Fluorescent Aptamer Provides Rapid and Specific Ex Vivo Diagnosis of Central Nervous System Lymphoma from Rodent Xenograft Biopsies, *J. Neurosurg.* in press, (2020).
196. J. Li', J. Dai', S. Jiang', M. Xie', T. Zhai, L. Guo, S. Cao, S. Xing, Z. Qu, Y. Zhao, F. Wang, Y. Yang, L. Liu, X. Zuo, L. Wang\*, H. Yan\*, C. Fan\*, Encoding quantized fluorescence states with fractal DNA frameworks, *Nat. Commun.* 11, 2185, (2020).
195. X. Qi, X. Liu, L. Matiski, R. Rodriguez Del Villar, T. Yip, F. Zhang, S. Sokalingam, S. Jiang, L. Liu, H. Yan, Y. Chang, RNA Origami Nanostructures for Potent and Safe Anti-Cancer Immunotherapy, *ACS Nano* 14, 4727-4740, (2020).

194. F. Hong, D. Ma, K. Wu, L.A. Mina, R.C. Luiten, Y. Liu, H. Yan\*, A.A. Green\*, Precise and Programmable Detection of Mutations Using Ultraspecific Riboregulators, *Cell* 180, 1018-1032, (2020).
193. G. Yao, J. Li, Q. Li, X. Chen, X. Liu, F. Wang, Z. Qu, Z. Ge, R.P. Narayanan, D. Williams, H. Pei, X. Zuo, L. Wang, H. Yan, B.L. Feringa\*, C. Fan\*, Programming nanoparticle valence bonds with single-stranded DNA encoders, *Nature Materials* 19, 781-788, (2020).
192. Z. Zhao, C. Wang, H. Yan,\* Y. Liu\*, Soft Robotics Programmed with Double Crosslinking DNA Hydrogels, *Advanced Functional Materials* 1905911, (2019).
191. C. Zhang\*, Z. Wang, Y. Liu, J. Yang, X. Zhang, Y. Li, L. Pan, Y. Ke\*, H. Yan\*, Nicking-Assisted Reactant Recycle to Implement Entropy-Driven DNA Circuit, *J. Am. Chem. Soc.* 141, 17189-17197 (2019).
190. X. Jing, F. Zhang, P. Pan, X. Dai, J. Li, L. Wang, H. Yan, C. Fan, Solidifying framework nucleic acids with silica, *Nature Protocols* 14, 2416-2436, (2019).
189. Y. Zhou, X. Qi, Y. Liu, F. Zhang, H. Yan\*, DNA Nanoscaffold-Assisted Selection of Femtomolar Bivalent Aptamers for Human  $\alpha$ -Thrombin with Potent Anticoagulant Activity, *ChemBioChem* 20, 2494-2503, (2019).
188. X. Wang, A. Chandrasekaran, R. Arun, Z. Shen, Y. Ohayon, T. Wang, M. Kizer, R. Sha, C. Mao, H. Yan, X. Zhang, S. Liao, B. Ding, B. Chakraborty, N. Jonoska, D. Niu, H. Gu, J. Chao, X. Gao, Y. Li, T. Ciengshin, N. Seeman, Paranemic Crossover DNA: There and Back Again, *Chemical Reviews*, 119, 6273-6289, (2019).
187. X. Zhou, S. Mandal, S. Jiang, S. Lin, J. Yang, Y. Liu, D. Whitten, N. Woodbury\*, H. Yan\*, Efficient Long-range, Directional Energy Transfer through DNA-Templated Dye Aggregates, *J. Am. Chem. Soc.* 141, 8473-8481 (2019).
186. S. Mandal, X. Zhou, S. Lin, H. Yan\*, N. Woodbury\*, Directional Energy Transfer through DNA-Templated J-aggregates, *Bioconjugate Chemistry* 30, 1870-1879 (2019).
185. Z. Ge, Z. Su, C. R. Simmons, J. Li, S. Jiang, W. Li, Y. Yang, Y. Liu\*, W. Chiu, C. Fan\*, H. Yan\*, Redox Engineering of Cytochrome c using DNA Nanostructure-Based Charge Encapsulation and Spatial Control, *ACS Applied Materials & Interfaces* 11, 13874-13880 (2019).
184. Z. Ge, J. Fu, M. Liu, S. Jiang, A. Andreoni, X. Zuo, Y. Liu, H. Yan\*, C. Fan\*, Constructing Submonolayer DNA Origami Scaffold on Gold Electrode for Wiring of Redox Enzymatic Cascade Pathways, *ACS Applied Materials & Interfaces* 11, 13881-13887 (2019).
183. L. Xin, M. Lu, S. Both, M. Pfeifer, M. Urban, C. Zhou, H. Yan, T. Weiss, N. Liu, K. Lindfors, Watching a Single Fluorophore Molecule Walk into a Plasmonic Hotspot, *ACS Photonics* 6, 985-993 (2019).
182. Y. Xu, S. Jiang, C. Simmons, R. Narayanan, F. Zhang, A. Aziz, H. Yan, N. Stephanopoulos\*, Tunable Nanoscale Cages from Self-Assembling DNA and Protein Building Blocks, *ACS Nano* 13, 3545-3554, (2019).
181. H. Jun, F. Zhang, T. Shepherd, S. Ratanalert, X. Qi, H. Yan, M. Bathe, Autonomously designed free-form 2D DNA origami, *Science Advances*, 5, eaav0655 (2019).



180. D. Jiang, Z. Ge, H. Im, C. England, D. Ni, J. Hu, L. Zhang, C. Kuttyreff, Y. Yan, Y. Liu, S. Cho, J. Engle, J. Shi, P. Huang, C. Fan\*, H. Yan\*, W. Cai\*, DNA-origami nanostructures can exhibit preferential renal uptake and alleviate acute kidney injury, *Nature Biomed. Eng.* 2, 865-877 (2018).
179. X. Qi, F. Zhang\*, Z. Su', S. Jiang, D. Han, B. Ding, Y. Liu, W. Chiu, P. Yin, H. Yan\*, Programming Molecular Topologies from Single-stranded Nucleic Acids, *Nature Communications* 9, 4579 (2018).
178. F. Hong, S. Jiang, X. Lan, R. Narayanan, P. Sulc, F. Zhang\*, Y. Liu\*, H. Yan\*, Layered-Crossover Tiles with Precisely Tunable Angles for 2D and 3D DNA Crystal Engineering, *J. Am. Chem. Soc.* 140, 14670-14676 (2018).
177. X. Lan, T. Liu, Z. Wang, A. Govorov, H. Yan, Y. Liu, DNA-Guided Plasmonic Helix with Switchable Chirality, *J. Am. Chem. Soc.* 140, 11763-11770 (2018).
176. F. Zhang, C. Simmons, J. Gates, Y. Liu, H. Yan\*, Self-Assembly of a 3D DNA Crystal Structure with Rationally Designed Six-Fold Symmetry, *Angew Chem Int Ed.* 57, 12504-12507 (2018).
175. X. Liu, F. Zhang, X. Ling, M. Pan, P. Liu, W. Li, B. Zhu, J. Li, H. Chen, L. Wang, J. Lin, Y. Liu, D. Zhao, H. Yan\*, C. Fan\*, Complex Silica Composite Nanomaterials Templated with DNA Origami, *Nature*, 559, 593-598, (2018).
174. Z. Ge, Z. Su, C. R. Simmons, J. Li, S. Jiang, W. Li, Y. Yang, Y. Liu, W. Chiu, C. Fan, H. Yan\* *ACS Appl. Mater. Interfaces*, , Redox Engineering of Cytochrome c using DNA Nanostructure-Based Charged Encapsulation and Spatial Control, DOI:10.1021/acsami.8b07101 (2018).
173. Li, A. Johnson-Buck, Y. Yang, W. Shih, H. Yan, N. Walter, Exploring the speed limit of toehold exchange with a cartwheeling DNA acrobat, *Nature Nanotechnology* 13, 723-729, (2018).
172. S. Li, Q. Jiang, C. Song, Y. Tian, J. Wang, S. Liu, Y. Zhang, Y. Zou, G. Anderson, J. Han, Y. Chang, Y. Liu, H. Yan\*, G. Nie\*, B. Ding, Y. Zhao\*, A DNA nanorobot functions as a cancer therapeutic in response to a molecular trigger in vivo, *Nature Biotechnology*, 36, 258-264 (2018).
171. E. Boulais, N. Sawaya, R. Veneziano, A. Andreoni, S. Lin, N. Woodbury, H. Yan\*, M. Bathe\* Programmed coherent coupling in a DNA-based excitonic circuit, *Nature Materials*, 17, 159-166 (2018).
170. D. Han, X. Qi, C. Myhrvold, B. Wang, M. Dai, S. Jiang, M. Bates, Y. Liu, B. An\*, F. Zhang\*, H. Yan\*, P. Yin\* Single-stranded DNA and RNA Origami, *Science*, 358, 1402 (2017).
169. F. Zhang, H. Yan\* DNA Self-assembly scaled up, *Nature*, 552, 34 (2017).
168. Y.R. Yang; J. Fu, S. Wootten, X. Qi, M. Liu, H. Yan, Y. Liu\* 2D Enzyme Cascade Network with Efficient Substrate Channeling by Swinging Arms. *ChemBioChem*. DOI: 10.1002/cbic.201700613 (2017).
167. J. Li, A. A. Green, H. Yan, C. Fan, Engineering nucleic acid structures for programmable molecular circuitry and intracellular biocomputation, *Nature Chem*. DOI:10.1038/nchem.20405, in press (2017).

166. C. Simmons, F. Zhang, T. MacCulloch, N. Fahmi, N. Stephanopoulos, Y. Liu, N. Seeman, H. Yan, Tuning the Cavity Size and Chirality of Self-Assembling 3D DNA Crystals. *J. Am. Chem. Soc.* 139, 11254-11260 (2017).
165. D. Mieritz, X. Li, A. Volosin, M. Liu, H. Yan, N. Walter, D. Seo, Tracking Single DNA Nanodevices in Hierarchically Meso-Macroporous Antimony-Doped Tin Oxide Demonstrates Finite Confinement, *Langmuir* 33, 6410-6418 (2017).
164. H. Zhang, A. Carey, K. Jeon, M. Liu, T. Murell, J. Locsin, S. Lin, H. Yan, N. Woodbury, D. Seo, A Highly Stable and Scalable Photosynthetic Reaction Center-Graphene Hybrid Electrode System for Biomimetic Solar Energy Transduction, *J. Mater. Chem. A.* 5, 6038–6041, (2017).
163. A. Carey, H. Zhang, M. Liu, D. Sharaf, N. Akram, H. Yan, S. Lin, N. Woodbury\*, D. Seo\*, Enhancing Photocurrent Generation in Photosynthetic Reaction Center-based Photoelectrochemical Cells with Biomimetic DNA Antenna, *ChemSusChem* 10, 4457- 4460 (2017).
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### 3. Patents and Patent Applications

#### A. Issued Patents

- 1 A Polynucleic Acid Nanomechanical Device Controlled By Hybridization Topology  
U.S. Patent issued #7,612,184, Issue date: November 03, 2009.  
Inventors: N. C. Seeman, **H. Yan**, X. Zhang and Z. Shen
- 2 Novel DNA Nanostructures that Promote Cell-Cell Interaction and Use Thereof  
U.S Patent issued: #8,440,811, Issue date: May 14, 2013  
Inventors: Y. Chang, **H. Yan**
- 3 Multifunctional Aptamer-nucleic Acid Nanostructures for Tumor-targeted Killing  
U.S. Patent issued: #8,552,167, Issue date: October 8, 2013  
Inventors: Y. Chang, **H. Yan**
- 4 Modified Nucleic Acid Nanoarrays and Uses Therefor  
US Patent issued: #8,685,894, Issue date: April 1, 2014  
Inventors: J. Chaput, S. Lindsay, **H. Yan**, P. Zhang
- 5 Quantum Dot Barcode Structures and Uses Thereof  
US Patent issued: #8895072, Issue date: Nov. 25, 2014  
Inventors: **H. Yan**, Q. Wang, Y. Liu
6. Methods for Obtaining Information from Single Cells Within Populations using DNA Origami Nanostructures Without the Need for Single Cell Sorting  
US Patent issued: #9,944,923, Issue date: April 17, 2018  
Inventors: Joseph Blattman, **Hao Yan**, Louis Schoettle, Xixi Wei
- 7 Synthetic Antibodies  
US Patent issued: #9,863,938, Issue date: Jan. 9, 2018  
Inventors: S. Jonhston, N. Woodbury, J. Chaput, Chris, Diehnelt, **H. Yan**
- 8 Quantum Dots, Rods, Wires, Sheets, and Ribbons, and Uses Thereof  
US Patent issued: #9,732,273, Issue date: August 15, 2017  
Inventors: **Hao Yan**, Zhengtao Deng, Yan Liu
- 9 Nanocrystals containing CdTe core with CdS and ZnS coatings  
US Patent issued: #9,202,867, Issue date: December 1, 2015  
Inventors: **Hao Yan**, Zhengtao Deng, Yan Liu
- 10 DNA Gridiron Compositions and Methods  
US Patent issued: #10,189,874, Issue date: Jan. 29, 2019  
Inventors: Dongran Han, **Hao Yan**

- 11 Nanocaged Enzymes with Enhanced Catalytic Activity and Increased Stability  
US Patent issued: #10,669,534, Issue date: June 2, 2020  
Inventors: Jinglin Fu, Zhao Zhao, Neal Woodbury, **Hao Yan**
- 12 Structure Assisted Directed Evolution of Multivalent Aptamers  
US Patent issued: #11,168,320, Issue date: November 9, 2021  
Inventors: **Hao Yan**
- 13 DNA Origami Nanostructures for Treatment of Acute Kidney Injury  
US Patent issued: #10,987,373, Issue date: April 27, 2021  
Inventors: **Hao Yan**, Dawei Jiang, Zhilei Ge, Christopher England, Peng Huang, Chunhai Fan, Weibo Cai
- 14 RNA Nanostructures and Methods of Making and Using RNA Nanostructures  
EP Patent issued: #3676380, Issue date: May 18, 2022  
Inventors: **Hao Yan**, Yung Chang, Xiaowei Liu, Fei Zhang, Xiaodong Qi
- 15 RNA Nanostructures and Methods of Making and Using RNA Nanostructures  
US Patent issued: #11,254,941, Issue date: Feb. 22, 2022  
Inventors: **Hao Yan**, Yung Chang, Xiaowei Liu, Fei Zhang, Xiaodong Qi
- 16 RNA-Nanostructured Double Robots and Methods of Use Thereof  
US Patent issued: #111,242,533, Issue date: Feb. 08, 2022  
Inventors: Yung Chang, **Hao Yan**, Xiaodong Qi, Fei Zhang

## **B. Pending Patents**

- 17 TLR Ligand-Nucleic Acid Nanostructure as a Novel Immune Modulatory Agent and Method of Using the Same  
PCT/US09/065508  
Inventors: Yung Chang and Hao Yan
- 18 Oligonucleotides Functionalized Quantum Dots  
PCT/US61/771,728  
Inventors: Hao Yan, Yan Liu, Zhengtao Deng, Anirban Samanta
- 19 Novel Nicotine DNA Vaccines  
PCT/US 61/798,635  
Inventors: Yung Chang, Hao Yan, Sidney Hecht, Paul Pentel, Xiaowei Liu, Rumit Maini
- 20 Novel DNA-Origami Nanovaccines  
PCT/US 61/595,501  
Inventors: Yung Chang, Hao Yan, Giovanna Ghirlanda
- 21 Self-Assembled Combinatorial Encoding Nanoarrays for Multiplexed Biosensing  
PCT/US 60/846,539  
Inventors: Hao Yan, Chenxiang Lin, Evaldas Katilius, Yan Liu
- 22 Self-Assembled Nucleic Acid Nanoarrays and Uses Therefor  
PCT/US 60/680,32

- Inventors: Stuart Lindsay, Hao Yan, John Chaput, Yan Liu, Peiming Zhang
- 23 Aptamer Probe for Locating Molecules and Method of Use  
PCT/US 60/868,295  
Inventors: Liyun Lin, Hao Yan, Yan Liu, Stuart Lindsay
  - 24 Methods for Obtaining Information from Single Cells within Populations using DNA Origami Nanostructures without the need for Single Cell Sorting  
Continuation: US 2018/0216102  
Inventors: Joseph Blattman, **Hao Yan**, Louis Schoettle, Xixi Wei
  - 25 DNA Gridiron Compositions and Methods  
Continuation: US 2021/0061845  
Inventors: Dongran Han, **Hao Yan**
  - 26 Nanocaged Enzymes with Enhanced Catalytic Activity and Increased Stability  
Continuation: US 2020/0270599  
Inventors: Jinglin Fu, Zhao Zhao, Neal Woodbury, **Hao Yan**
  - 27 Ultraspecific Nucleic Acid Sensors for Low-Cost Liquid Biopsies  
US 2020/0071777  
Inventors: Alexander Green, Fan Hong, **Hao Yan**
  - 28 RNA Nanostructures and Methods of Making and Using RNA Nanostructures  
Continuation: US 2022/0056450  
Inventors: **Hao Yan**, Yung Chang, Xiaowei Liu, Fei Zhang, Xiaodong Qi
  - 29 DNA-Chimeric Antigen Receptor T Cells for Immunotherapy  
US 2020/0390814  
Inventors: **Hao Yan**, Bo Ning
  - 30 Highly Knotted Molecular Topologies from Single-stranded Nucleic Acids  
US 2021/0230601  
Inventors: **Hao Yan**, Fei Zhang, Xiaodong Qi
  - 31 Transmembrane Nanosensor Arrays for Rapid, Ultra-sensitive and Specific Digital Quantification of Internal Micro-RNA Content of Intact Exosomes  
US 2021/0230601  
Inventors: **Hao Yan**, Rizal Hariadi, Swarup Dey
  - 32 Transmembrane Sensors and Molecular Amplifiers for Lysis-free Detection of Intracellular Targets  
PCT/US2021/054861  
Inventors: **Hao Yan**, Rizal Hariadi
  - 33 Rapid and Specific Ex-Vivo Diagnosis of Central Nervous System Lymphoma  
US Provisional: 63/225,305  
Inventors: **Hao Yan**, Xiaowei Liu, Xiaodong Qi, Joseph George, Peter Nakaji



- 34 A Reversibly Gated Protein-Transporting Membrane Channel Made of DNA  
US Provisional: 63/255,867  
Inventors: **Hao Yan**, Swarup Dey, Fei Zhang
- 35 Delivery Platforms for Small RNA Structures  
US Provisional: 63/255,826  
Inventors: **Hao Yan**, Xiaodong Qi, Yang Xu, Lu Yu
- 36 High Sensitivity DNA linked Immunosorbent Signal Amplification Assay (DLISA) for Detection of Infectious SARS-Cov-2 Virus and Variants  
US Provisional: 63/257,838  
Inventors: **Hao Yan**, Yang Xu, Shaopeng Wang, Nicholas Stephenopoulos
- 37 Neutralizing Trivalent Protein-DNA Molecules (Tri-PDbody) for Sars-CoV-2 Infection Treatment  
US Provisional: 63/257,832  
Inventors: **Hao Yan**, Yang Xu, Shaopeng Wang, Nicholas Stephenopoulos
- 38 DNA Origami Subunit Vaccine for Prevention of SARS-CoV-2 Variant Infection  
US Provisional: 63/257,835  
Inventors: **Hao Yan**, Yang Xu, Petr Sulc, Nicholas Stephenopoulos
- 39 Folding mRNA into a nanoscale delivery vehicle  
US Provisional Filed  
Inventors: Nicholas Stephenopoulos, Petr Sulc, **Hao Yan**, Skalar Henry
- 40 5FU and RNAOG Combined Immunochemotherapy for Pancreatic Cancer Treatment  
US Provisional: 63/298,129  
Inventors: **Hao Yan**, Xiaodong Qi, Yang Xu, Yung Chang, Guangbao Yao, Zhen Gong

#### 4. Invited Presentations

149. “Designer Nucleic Acid Architectures for Programable Molecular Systems”, Department of Chemistry, Humboldt University of Berlin, Berlin, Germany June 26, 2024
148. “Designer Nucleic Acid Architectures for Programable Molecular Systems”, Department of Physics, University of Fribourg, Fribourg, Switzerland June 6, 2024
147. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, ACS-Korea University Symposium on Frontiers of Chemistry, Korea University, Seoul, Korea Oct. 23, 2023
146. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, DNA nanotechnology summit, Seoul National University, Seoul, Korea Oct. 14, 2023.
145. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, Univeristy Ca’Foscari Venice, Venice, Italy, June 8, 2023.
144. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, University of Barcelona, Barcelona, Spain, June 5, 2023.
143. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, IQAC-CSIC, Barcelona, Spain, June 2, 2023.

142. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, Department of Chemistry, University College London, London, UK May 30, 2023.
141. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, Ohio State University Institute for Materials Research Distinguished Lecturer, March 2, 2023
140. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, Department of Chemistry, U. of Massachusetts, Amherst, Oct. 13, 2022.
139. “Designer Nucleic Acid Nanostructures for Programable Self-assembly ”, ACS Fall 2022, Chicago, Session on Supracolloidal Self-Assembly of DNA-Based Hybrid Materials, Aug. 24, 2022.
138. “Designer DNA Architectures for Programable Self-assembly ”, Functional DNA nanotechnology, Rome, Italy, May 27. 2022.
137. “Designer DNA Architectures for Programable Self-assembly ”, Engineering Life Seminar, LMU, Munich, Germany, May 19, 2022.
136. “Designer DNA Architectures for Programable Self-assembly ”, 2<sup>nd</sup> Physics Institute, U. of Stuttgart, Germany, May 16, 2022.
135. “DNA Nanobot ”, September 7, 2021, SIP of Science (Virtual)
134. “Designer DNA Architectures for Programable Self-assembly ”, August 10, 2021 International Conference in DNA Nanotechnology (Virtual)
133. “Designer DNA Architectures for Programable Self-assembly ”, Department of Chemistry, Northeastern University, Boston, Oct. 9, 2019.
132. “Designer DNA Architectures for Programable Self-assembly ”, “8<sup>th</sup> International Conference on DNA Nanotechnology”, Wuxi, China, July 24-27, 2019.
131. “BASF Lectureship”, University of California, Berkeley, Nov. 9, 2018.
130. “Wyss Institute Symposium on Molecular Robotics”, Harvard University, Cambridge, MA, Sept. 24-25, 2018.
129. “ACS Symposium on Innovation in Materials”, Shanghai, China, July 29-31, 2018.
128. “7<sup>th</sup> International Conference on DNA Nanotechnology”, Chongqing, China, June 1-4, 2018.
127. “Designer DNA Nanostructures for Programmable Self-assembly”, College of Chemistry, Changsha, China, August 29, 2017.
126. “Designer DNA Nanostructures for Programmable Self-assembly”, Sixth International Meeting on DNA Nanotechnology, Beijing, China, August 27-28, 2017.
125. “Self-replicating DNA nanostructures”, ONR PI meeting, Arlington, DC, August 2-4, 2017.
124. “DNA Nanostructure Directed Excitonic Networks”, DOE Biomolecular Materials PI meeting, August 2-4, 2017.
123. “DNA Actuated Enzyme Nanoreactors”, SRC/IBM Workshop on Biological pathways

- for electronic nanofabrication and materials , San Jose, Nov. 17-18, 2016.
122. “Single Stranded DNA and RNA Origami”, RNA Nanotechnology Conference, Berkshire, UK, August 4-8, 2016.
  121. “Designer DNA Architectures for Programmable Self-assembly”, 5<sup>th</sup> International Conference on DNA Nanotechnology, Nanjing, China, May 7-9, 2016.
  120. “Designer DNA Architectures for Programmable Self-assembly”, Molecular Engineering and Sciences Institute, U. of Washington, Seattle, May 17, 2016.
  119. “Designer DNA Architectures for Programmable Self-assembly”, National Center for Nanoscience and Technology, Beijing, Dec. 2, 2015.
  118. “Designer DNA Architectures for Programmable Self-assembly”, Department of Chemistry, Tsinghua University, Beijing, Dec. 2, 2015.
  117. “Designer DNA Architectures for Programmable Self-assembly”, Department of Chemistry, Peking University, Beijing, Dec. 1, 2015.
  116. “Designer DNA Architectures for Programmable Self-assembly”, Workshop on DNA Meets Plasmonics, Bad Honnef, Germany, Dec. 8-10, 2015.
  115. “Designer DNA Architectures for Programmable Self-assembly”, Department of Nanoengineering, UCSD, San Diego, Nov. 18, 2015.
  114. “Designer DNA Architectures for Programmable Self-assembly”, Nanoday of the 21<sup>st</sup> International Meeting on DNA Computing and Molecular Programming, Boston, August, 21, 2015.
  113. “Designer DNA Architectures for Programmable Self-assembly”, KSI Meinsberg, Meinsberg, Germany, June 22, 2015.
  112. “Designer DNA Architectures for Programmable Self-assembly”, Department of Physics, Leipzig University, Leipzig, Germany, June 9, 2015.
  111. “Designer DNA Architectures for Programmable Self-assembly”, Department of Chemistry, Technical University Dresden, Dresden, Germany, June 4, 2015.
  110. “Complex Wireframe DNA Origami Architectures Self-assembled from Multi-arm Junction Vertices”, The 4<sup>th</sup> International Conference on DNA Nanotechnology, Xi’an, China, June 27-29, 2015. Chair of Organizing Committee and Keynote speaker.
  109. “Designer DNA Architectures for Programmable Self-assembly”, Materials Beyond Symposium, Fudan University, Shanghai, China, April 27-28, 2015.
  108. “Designer DNA Architectures for Programmable Self-assembly”, Department of Chemistry, U. of Pittsburg, Pittsburg, PA, April 2, 2015.
  107. “Designer DNA Architectures for Programmable Self-assembly”, RNA Nanotechnology Gordon Research Conference, Ventura, CA, Feb. 2-4, 2015.
  106. “Designer DNA Nanoarchitectures for Multivalency”, 3<sup>rd</sup> International Symposium on Multivalency in Chemistry and Biochemistry, Berlin, Germany, Oct.22-24, 2014.
  105. “Designer DNA Nanoarchitectures for Programmable Self-assembly”, ACS Central Regional Meeting, Session on DNA/RNA Nanostructures, Pittsburgh, Oct.1-4, 2014.

- 104 “Designer DNA Nanoarchitectures for Programmable Self-assembly”, Department of Chemistry, U. of Pittsburgh, Oct.2, 2014.
- 103 “DNA Origami and the Different Functionalization Techniques”, Plasmonics: Manipulating Light-Matter Interaction at the Nanoscale, Gordon Research Conference, Newry, ME, July 6-11, 2014.
- 102 “Designer DNA Nanoarchitectures for Programmable Self-assembly”, The Third International DNA Nanotechnology Conference, Suzhou, China, May 25-28, 2014. Co-Chair of Organizing Committee and Plenary speaker.
- 101 “Designer DNA Nanoarchitectures for Programmable Self-assembly”, International Workshop on DNA-Based Nanotechnology: Digital Chemistry, Dresden, Germany, May 5-9, 2014. Co-Organizer and Invited speaker.
- 100 “Designer DNA Nanoarchitectures for Programmable Self-assembly”, 40<sup>th</sup> Annual Naff Symposium on Chemistry and Molecular Biology, April 25, 2014. (Keynote speaker).
- 99 “Designer DNA Nanoarchitectures for Programmable Self-assembly”, Department of Chemistry, U. of Michigan, April 1, 2014.
- 98 “Designer DNA Nanoarchitectures for Programmable Self-assembly”, Department of Chemistry, U. of Chicago, March 31, 2014.
- 97 “New Innovations in Biotechnology: Molecular Design and Biomimicry”, Presidential Engagement Program, Building Solutions to Grand Challenges: Creating Societal Impact Through Use-Inspired Research, Arizona State University, March 13, 2014.
- 96 “Designer DNA Architectures for Programmable Self-assembly”, Bio-Inspired Computing: Theories and Applications 2013 (BIC-TA 2013), Huangshan, China, July 12-14, 2013. (Keynote speaker).
- 95 “Designer DNA Architectures for Programmable Self-assembly”, 10<sup>th</sup> Annual Conference, Foundation of Nanoscience, Self-assembled Architectures and Devices, Snowbird, Utah, April 15-18, 2013. (Keynote speaker)
- 94 “Designer DNA Architectures for Programmable Self-assembly”, Wyss Institute of Bioinspired Engineering, Harvard University, May 13, 2013.
- 93 “Designer DNA Architectures for Programmable Self-assembly”, Department of Bioengineering, MIT, May 9, 2013.
- 92 “Designer DNA Architectures for Programmable Self-assembly”, Department of Chemistry, Penn State Univ, April 3, 2013.
- 91 “Designer DNA Architectures”, DNATEC workshop, Aarhus, Denmark, August 13, 2012.
- 90 “Designer DNA Nanostructures for Nanobiotechnology”, Biochemistry and Molecular Pharmacology, University of Massachusetts Medical School, Worcester, MA, May 9, 2012.
- 89 “Designer DNA Nanostructures”, Department of Chemistry, University of Nebraska - Lincoln, NE, April 6, 2012.
- 88 “Designer DNA Nanostructures”, Seminar Series in Chemical Biology, Yale University – New Haven CT, April 4, 2012.

- 87 “Designer DNA Architectures for Nanotechnology”, the 243rd ACS National Meeting, San Diego, CA, March 25, 2012.
- 86 “Designer DNA Architectures”, DNA Nanotechnology Conference: From Structure to Function, Shanghai, China, March 16-19, 2012.
- 85 “Designer DNA Nanostructures”, the 14th IUPAC conference on Polymers and Organic Chemistry, Doha, Qatar, Jan. 6-9, 2012.
- 84 “Designer DNA Nanostructures”, the 17th International Conference on DNA Computing and Molecular Programming, Pasadena, CA, Sept. 19-23, 2011. (Plenary Talk).
- 83 “Designer DNA Nanostructures”, Symposium In Honor of Ned Seeman, The 8th meeting for Foundations of Nanoscience: Self-assembled Architectures and Devices, Snowbird, Utah, April 11-15, 2011.
- 82 “Designer DNA Nanostructures”, iNANO, University of Aarhus, Aarhus, Denmark, Feb. 7. 2011.
- 81 “Designer DNA Nanostructures for Nanobiotechnology”, The 8th iCeMS International Symposium on Meso-Control of Functional Architecture, Kyoto, Japan. November 9-11, 2010.
- 80 “Designer DNA Nanostructures for Nanobiotechnology”, Graduate summer school in molecular self-assembly hosted by the Interdisciplinary Nanoscience Center at Aarhus University, Denmark, Aug. 7-12, 2010.
- 79 “Designer DNA Nanostructures for Nanobiotechnology”, Gordon Research Conference on Nobel Metal Nanoparticles, Mount Holyoke College, MA, June 20-25, 2010.
- 78 “Designer DNA Nanostructures for Nanobiotechnology”, School of Chemistry and Molecular Engineering, East China University of Science & Technology, Shanghai, China, June 13, 2010.
- 77 “Designer DNA Nanostructures for Nanobiotechnology”, Fifth Sino-US Nano Forum, Suzhou Institute of Nanotechnology and Nanobioncs (SINANO), Chinese Academy of Sciences, June 5-7, 2010.
- 76 “Designer DNA Nanostructures for Nanobiotechnology”, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, China, June 1, 2010.
- 75 “Designer DNA Nanostructures for Nanobiotechnology”, School of Chemistry, Shandong University, Jinan, China, May 21, 2010.
- 74 “Designer DNA Nanostructures for Nanobiotechnology”, Workshop on Bio-directed Assembly, Keystone, CO, May 17-18, 2010.
- 73 “Designer DNA Nanostructures for Directed Self-assembly”, Center for Nanofabrication, U. of Washington, Seattle, WA, May 4, 2010.
- 72 “Designer DNA Nanostructures for Nanobiotechnology”, Department of Biomedical Engineering, U. of Washington, Seattle, WA, May 3, 2010.
- 71 “Designer DNA Nanostructures for Nanobiotechnology”, Foundations of Nanoscience: Self-assembled Architectures and Devices, Snowbird, Utah, April 27-29, 2010. (Keynote speaker).

- 70 “Designer DNA Nanostructures for Nanobiotechnology”, Symposium OO: Hierarchical Self Assembly of Functional Materials from Nanoscopic- to Mesoscopic-Length Scales: 2010 Material Research Society Spring Meeting, San Francisco, CA, April, 5-9, 2010.
- 69 “Designer DNA Nanostructures for Nanobiotechnology”, Workshop on Soft Nanomaterial Synthesis, Molecular Foundry, Lawrence Berkeley National Lab, CA, March 19-20, 2010.
- 68 “Designer DNA Nanostructures for Nanobiotechnology”, Symposium on “Probing the BioNano Self-assembly World”, Pittcon 2010, Orlando, FL, Feb. 28-March 5, 2010.
- 67 “Designer DNA Nanostructures for Nanobiotechnology”, Session on “DNA Nanomachines in Vitro and Inside Living Cells”, 54<sup>th</sup> Annual Biophysical Society Meeting, San Francisco, CA, Feb. 20-24, 2010.
- 66 “Designer DNA Nanostructures for Nanobiotechnology”, Biophysics Seminar, Dept. of Physics and Astronomy, Rice University, Houston, TX, Nov. 6, 2009.
- 65 “Designer DNA Nanostructures for Nanobiotechnology”, nanoUtah2009: 5<sup>th</sup> Annual Utah Statewide Nanotechnology Conference, Salt Lake City, Utah, Oct.16, 2009.
- 64 “Designer DNA Nanostructures for Nanobiotechnology”, Dept. of Chemical and Nuclear Engineering, U. of New Mexico, Albuquerque, NM, Sept. 29, 2009.
- 63 “Designer DNA Nanostructures for Nanobiotechnology”, DNA Nanotechnology workshop, National Center for Nanoscience and Technology, Beijing, July 16, 2009.
- 62 “Designer DNA Nanostructures for Nanobiotechnology”, Dept. of Chemistry, Univ. of Science and Technology of China, Hefei, July 10, 2009.
- 61 “Designer DNA Nanostructures for Nanobiotechnology”, Institute of Applied Physics, CAS, Shanghai, July 8, 2009.
- 60 “Designer DNA Nanostructures for Nanobiotechnology”, Materials Science and Engineering Department, Iowa State University, Ames, IA, April. 9, 2009.
- 59 “Designer DNA Nanostructures for Nanobiotechnology”, Mini-symposium of Center for DNA Nanotechnology, Duke University, Durham, NC, March. 20, 2009.
- 58 “Designer DNA Nanostructures for Nanobiotechnology”, Department of Chemistry, Florida State University, Tallahassee, FL, Feb. 27, 2009.
- 57 “Designer DNA Nanostructures for Nanobiotechnology”, Joint MIT and Harvard Inorganic Chemistry Seminar Series, Department of Chemistry, MIT, Cambridge, MA, Jan. 21, 2009.
- 56 “Designer DNA Nanostructures for Nanobiotechnology”, Departments of Material Science and Mechanical Engineering , UC Santa Babara, Santa Barbara, CA Oct. 31, 2008.
- 55 “Designer DNA Nanostructures for Nanobiotechnology”. the Joint Symposium of 18th International Roundtable on Nucleosides, Nucleotides and Nucleic Acids (IRT XVIII) and 35th International Symposium on Nucleic Acids Chemistry (SNAC), Kyoto, Japan, September 8th – 12th, 2008.
- 54 “Designer DNA Nanostructures for Nanobiotechnology”. SPIE Optics and Photonics Meeting (Biosensing Symposium), San Diego, CA, August 10-14, 2008.

- 53 “Structural DNA Nanotechnology: Information Guided Self-assembly”, Gordon Research Conference, Session on Bioorganic Chemistry (Organizer: W. A. Van Der Donk & P. L. Richardson), Andover, NH, June. 15-20, 2008.
- 52 “Designer DNA Nanostructures for Nanobiotechnology”. Conference of International Materials and Technologies (CIMTEC08: Symposium E), Sicilly, Italy, June 8-13, 2008.
- 51 “Designer DNA Nanostructures for Nanobiotechnology”. International Symposium for DNA based nanodevices, Jena, German, May 29-30, 2008.
- 50 “Designer DNA Nanostructures for Nanobiotechnology”. Foundations of Nanoscience: Self-assembled Architectures and Devices (FNANO08), Snowbird, Utah, April 22-25, 2008.
- 49 “DNA based Nanscale Scaffolds, Assembly and Molecular Robotics”. Office of Naval Research Workshop on DNA based Nanofabrication, Washington DC, April 11, 2008.
- 48 “Designer DNA Nanostructures for Nanobiotechnology”. 3<sup>rd</sup> Annual Arizona Nanotechnology Cluster Symposium, Scottsdale, AZ, April 10, 2008.
- 47 “Designer DNA Nanostructures for Nanobiotechnology”. Department of Chemistry, Texas A &M University, College Station, TX, April 4, 2008.
- 46 “Structural DNA Nanotechnology: Information Guided Self-assembly”, Department of Chemistry and Biochemistry, Brigham Young University, Provo, Utah, March. 27, 2008.
- 45 “Designer DNA Nanostructures for Nanobiotechnology”, 2008 William H. Nichols Symposium, New York Section of the American Chemical Society, White Plains, NY, March. 14, 2008.
- 44 “Structural DNA Nanotechnology: Information Guided Self-assembly”, Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA, March. 12, 2008.
- 43 “Structural DNA Nanotechnology: Information Guided Self-assembly”, Department of Chemistry, U. of Central Florida, Orlando, FL, Oct. 12, 2007.
- 42 “DNA Based Self-assembly of Nanostructures”, Symposium MM: Biomolecular and Biologically-Inspired Interfaces and Assemblies, Fall 2007 Materials Research Society National Meeting, Boston, MA, Nov 27-Dec. 1, 2007.
- 41 “DNA Based Self-assembly of Nanostructures”, Symposium on Advances in Bio-based Nanostructures and Nanomaterials, 234<sup>th</sup> ACS National Meeting, Boston, MA, Aug. 19-23, 2007.
- 40 “DNA Based Self-assembly of Nanostructures”, Mini-symposium on DNA based Nanotechnology University of Aarhus, Aarhus, Denmark, Aug. 17, 2007.
- 39 “DNA Based Self-assembly of Nanostructures”, The Second Advanced Materials Workshop, Dalian, China, June 23-24, 2007.
- 38 “DNA Based Self-assembly of Nanostructures”, Albany 2007: The 15<sup>th</sup> Conversation, Albany, New York, June 21, 2007.
- 37 “DNA Based Self-assembly of Nanostructures”, NSF Center for Hierarchical Manufacturing, U. of Massachusetts, Amherst, MA, May 17, 2007.

- 36 “DNA Based Self-assembly of Nanostructures”, Nanoscience and Nanotechnology Session 2006 SACNAS, Tampa, FL, Oct. 27, 2006.
- 35 “DNA Based Self-assembly of Nanostructures”, Bionanotechnology Symposium organized by Canadian institute for advanced research, Toronto, Canada, Oct. 14-15, 2006.
- 34 “DNA Based Self-assembly of Nanostructures”, Department of Chemistry, Hunter College, CUNY, New York, NY, Sept. 29, 2006.
- 33 “DNA Based Self-assembly of Nanostructures”, National Center for Nanoscience and Technology, Beijing, China, June 19, 2006.
- 32 “DNA Based Self-assembly of Nanostructures”, Department of Chemistry, Tsinghua University, Beijing, China, June 19, 2006.
- 31 “DNA Based Self-assembly of Nanostructures”, Interdisciplinary Nanoscience Center (iNANO), University of Aarhus, Aarhus, Denmark, May 24, 2006.
- 30 “DNA Based Self-assembly of Nanostructures”, Department of Physics, Leiden University, Leiden, Netherland, May 22, 2006.
- 29 “DNA Based Self-assembly of Nanostructures”, International Symposium on DNA-Based Nanoscale Integration, Jena, Germany, May 18-20, 2006.
- 28 “DNA Based Self-assembly of Nanostructures”, Symposium on Frontier of Nanoscience, Auburn University, Auburn, AL, May. 2, 2006.
- 27 “DNA Based Self-assembly of Nanostructures”, NSF workshop: The Synthesis of Complex Chemical Systems, Oxfordshire, UK, March 19-21, 2006.
- 26 “DNA Based Self-assembly of Nanostructures”, Department of Physics, University of Oxford, Oxford, UK, Mar. 17, 2006.
- 25 “DNA Based Self-assembly of Nanostructures”, VIII Annual Linz Winter Workshop on Single Molecule Research, Linz, Austria, Feb. 3-7, 2006.
- 24 “DNA Based Self-assembly of Hierarchical Nanostructures”, Arizona Nanocluster Symposium, Organized by Quanttera Co., Tempe, AZ, Jan. 26, 2006.
- 23 “DNA Based Self-assembly of Hierarchical Nanostructures”, Mini-Symposium on DNA Self Assembly and Robotics, Columbia University, New York, NY, Dec. 16, 2005.
- 22 “DNA Based Self-assembly of Hierarchical Nanostructures”, NSF Workshop: Emerging Opportunities of Nanoscience to Energy Conversion and Storage, Arlington, VA, Nov 21-22, 2005.
- 21 “DNA Based Nanobiotechnology”, Department of Biomedical Engineering, Cornell University, Ithaca, NY, Oct. 6, 2005.
- 20 “DNA Based Nanobiotechnology”, Department of Chemical Engineering, Hong Kong University of Science and Technology, Hong Kong, Aug. 2, 2005.
- 19 “DNA Based Nanobiotechnology”, 2005 Scanning Probe Microscopy, Sensors and Nanostructures Meeting, Cancun, Mexico, June 6, 2005.
- 18 “DNA Based Nanobiotechnology”, Session on Developing Nano-Bio Interfaces, 2005 MRS Spring Meeting, San Francisco, CA. March 28-April 1, 2005.



- 17 “DNA Based Nanobiotechnology”, 2005 Arizona Imaging and Microanalysis Society Annual Meeting, Tempe, AZ, March 22, 2005.
- 16 “DNA Based nanotechnology: pattern and motion”, Engineering a DNA World, Workshop sponsored by California Institute of Technology, Center for Biological Circuit Design Rock Auditorium, Broad Center for Biological Sciences, Pasadena, CA, Jan. 7, 2005.
- 15 “DNA Based Nanobiotechnology”, Structure of Nanocrystals Workshop Sponsored by Michigan State University, Tempe, AZ, Dec. 5-8, 2004.
- 14 “DNA Based Nanotechnology: Pattern and Motion”. ACS Rocky mountain analytical section, Denver, CO, Aug. 2, 2004.
- 13 “DNA Self-assembly, Nanoactuators and Autonomous Unidirectional DNA Motor”. Max Bergmann Zentrum fur Biomaterialien, Technische Universitat Dresden, Germany, May 18, 2004.
- 12 “New Structures for DNA based Nanotechnology”. DNA-Based Molecular Electronics, International Symposium, Jena, Germany, May 15, 2004.
- 11 “DNA Nanoactuator in Self-assembly”. Foundations of Nanoscience: Self-assembled Architectures and Devices, Snowbird, Utah, April 21-23, 2004.
- 10 “DNA Self-assembly, Nanoactuators and Autonomous Unidirectional DNA Motor”. 320th WE-Heraeus-Seminar "Nano-Physics of DNA" Physikzentrum Bad Honnef, Germany, Mar. 23, 2004.
- 9 “DNA Nanoactuators in Self-assembly”. DARPA IPTO Workshop for Molecular Architectures from Self-Assembled Nanostructures, Adelphi, MD, Feb. 3-5, 2004.
- 8 “DNA self-assembly for nanoconstruction and molecular robotics”. Dept. of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, Jan. 18, 2003.
- 7 “Overview of New Structures for DNA-based Nanofabrication and Computation”. 6<sup>th</sup> International Conference on Computational Intelligence and Natural Computing, Cary, NC, Sept. 26-30, 2003.
- 6 “Self-assembly of DNA for Computing and Molecular Robotics”. Department of Chemistry, Duke University, Durham, NC, Sept. 12, 2003.
- 5 “Self-assembly of DNA for Nanofabrication, Computing and Molecular Robotics”. Department of Quantum Molecular Devices. Osaka University, Osaka, Japan, Aug. 11, 2003.
- 4 “Self-assembly of DNA for Nanofabrication and Molecular Robotics”. Graduate School of Arts and Sciences, College of Arts and Science, University of Tokyo, Tokyo, Japan, Aug. 9, 2003.
- 3 “Self-assembly of DNA for Nanofabrication, Computing and Molecular Robotics”. Graduate School of Engineering, Hokkaido University, Sapporo, Japan, Aug. 5, 2003.
- 2 “Tutorial: Self-assembly of Nanostructures”. 9<sup>th</sup> International Meeting on DNA Based Computers, Madison, WI, June 1, 2003.
- 1 “Molecular Robotics for DNA Nanostructures”. DARPA IPTO/NSF Bio-Computation/QIS Joint PI Meeting, Fort Lauderdale, FL, May 16, 2003.

## RESEARCH GRANTS

### 1. Past research grants

<i>National Science Foundation</i> “Molecular Robotics for DNA Nanostructures” Award amount: \$349,950 Role: PI	8/02-08/06
<i>National Science Foundation</i> “NANO: Combinatorial Self-assembly of Nanocircuit on Addressable DNA Nanoscaffolds” Award amount: \$300,000 Role: PI	8/04-07/07
<i>AZTE Innovation Catalyst Fund</i> “A Protein Detection Technology based on Aptamer Binding” Award amount: \$40,000 Role: PI	8/05-07/06
<i>National Science Foundation</i> “Career: DNA Directed-Self-assembly of Multicomponent Nanoarchitectures” Award amount: \$400,000 Role: PI	8/06-07/11
<i>National Institute of Health</i> “R21: Water-soluble Arrays for Personalized Medicine” Award amount: \$560,255 Role: co-PI; PI: S. Lindsay, co-PI: H. Yan, P. Zhang	9/06-08/09
<i>National Science Foundation</i> “NIRT: Self-assembly at Photonic and Electronic Scale” Award amount: \$1,100,000 Role: co-PI; PI: S. Lindsay, co-PI: H. Yan, D. Gust, R. Diaz	9/06-08/10
<i>Office of Naval Research</i> “Nanodisplay: A Self-assembly Approach to Inorganic Nanoarrays” Award amount: \$450,000 Role: PI; co-PI: J. Chaput	12/06-11/09
<i>Air Force Office of Scientific Research</i> AFOSR-YIP “Self-assembled Combinatorial Encoding Nanoarrays for Multiplexed Biosensing” Award amount: \$355,533 Role: PI	1/07-11/09
<i>National Science Foundation</i> “Material World Network: Self-assembled DNA Nanotubes: Biomimetic Design, Controlled Surface Alignment and Templated Nanowire Formation” Award amount: \$276,000 Role: PI	08/07-07/10

*National Science Foundation* 09/07-08/10  
 “Emerging Model Technology: Self-assembled Inductors: A New Paradigm for Nanoelectronic Designs”  
 Award amount: \$650,001  
 Role: co-PI; PI: Hongbin Yu, co-PI: H. Yan, Y. Cao, B. Bakkaloglu

*Alfred P. Sloan Foundation* 04/08-03/10  
 Research Fellowship  
 Award amount: \$50,000  
 Role: PI

*National Institute of Health* 07/08-07/12  
 “1R01 DA026296-01: Feasibility Demonstration of an Artificial Electrocyte for Neuronal Observation and Stimulation”  
 Award amount: \$1,200,000  
 Role: co-PI; PI: R. Diaz, co-PI: T. Moore

*National Science Foundation* 07/08-07/12  
 “EMT-MISC: Behavior Based Molecular Robotics”  
 Award amount: \$2,200,000  
 Role: co-PI; PI: M. Stojanovic and 5 other co-PIs

*Army Research Office* 08/08-07/11  
 “Self-assembling DNA architectures for Bio-inspired Engineering of Discrete and Multifunctional Nanostructures”  
 Award amount: \$300,000  
 Role: PI; co-PI: Yan Liu

*Office of Naval Research* 12/08-11/10  
 “Guided DNA Fabrication of Nanometer Scale Electron Devices and Sensors”  
 Award amount: \$960,000  
 Role: co-PI; PI: N. C. Seeman, co-PIs: S. Chou, C. Mao

*DOD-CDMRP*  
 “Multi-Specific Aptamer-nanoscaffolds to Induce Aptamer-dependent Cellular Cytotoxicity (ApDCC) against Breast Cancer Cells”  
 Award amount: \$106,848  
 Role: co-PI, PI: Yung Chang, co-PI: Yan Liu

*Office of Naval Research* 01/10-12/12  
 “Protein Arrays with Precisely Controlled Orientation and Position”  
 Award amount: \$470,000  
 Role: PI; co-PI: William Shih

*Army Research Office* 03/10-08/10  
 “Workshop on Bio-Directed Assembly, Keystone, Co, 18-19 May 2010”

Award amount: \$49,500

Role: PI

*National Institute of Health*

05/10-04/12

“1R21CA141021-01A2: Tunable DNA-nanostructure to Induce NK-mediated Killing of Tumor Cells”

Award amount: \$352,735

Role: co-PI; PIs: Y. Chang, co-PI: Y. Liu, H. Yan

*Army Research Office*

07/10-06/11

“High School Student Training Opportunity in a Structural DNA Nanotechnology Laboratory”

Award amount: \$9,150

Role: PI

*National Science Foundation*

12/10-11/13

Enzymology of Multi-enzyme Systems on Self-assembled Surfaces

Award amount: \$401,000

Role: Co-PI; PI: Neal Woodbury

*National Institute of Health*

04/11-03/12

“R21 DA030045: Tunable Nicotine DNA-Nanovaccines”

Award amount: \$319,120

Role: co-PI; PI: Y. Chang, co-PI: H. Yan, S. Hecht

*Office of Naval Research*

06/11-06/12

“High Speed Atomic Force Microscope for Real Time Imaging of Biomolecular Assembly”

Award amount: \$ 309,123

Role: PI

*Department of Energy*

08/09-07/14

EFRC: Bio-inspired Solar Fuel

Award amount: \$14.2 million

Role: co-PI with 10 others

*Office of Naval Research*

08/09-08/14

“DNA-based Three-dimensional Nanofabrication”

Award amount: \$3,200,000

Role: PI; co-PI: 8 others

*National Science Foundation*

09/11-08/14

“DNA Origami Nanostructures with Complex Curvatures in 3D Space”

Award amount: \$400,000

Role: PI; co-PI: Y. Liu

*National Institute of Health*

08/09-05/14

“1R01 GM088818-01: Water Soluble Nanoarrays for Single Cell Proteomics”  
Award amount: \$1,500,000  
Role: PI; co-PIs: S. Lindsay, Y. Liu, D. Meldrum

*National Science Foundation* 07/12-06/16  
“INSPIRE: Mimicking the Functional Complexity of Biology with Man-Made Systems”  
Award amount: \$1,000,000  
Role: co-PI; PI: N. Woodbury, co-PI: H. Yan, S. Johnson, S. Lindsay

*Army Research Office* 05/11-05/15  
“Molecular Engineering of Self-assembled Nanoreactors”  
Award amount: \$470,000  
Role: PI; co-PI: Y. Liu

*Army Research Office* 08/12-07/17  
“MURI-Translating Biochemical Pathways to Non-cellular Environments”  
Award amount: \$6,250,000  
Role: PI; 5 other co-PIs

*National Institute of Health* 09/12-08/17  
“1R01GM104960: NIH-Transformative Research Award: Theranostic Nano-objects:  
Basic Principles and Initial Applications”  
Award amount: \$5,400,000  
Role: co-PI; PI: Milan Stojanovic

*National Institute of Health* 04/13-03/17  
“1R01DA035554-01: Rational Design and Targeted Selection of DNA-scaffolded  
Nicotine Vaccines”  
Award amount: \$3,350,000  
Role: co-PI; PI: Yung Chang

*National Science Foundation* 01/14-12/17  
“DMREF: Computational Design Principles for Functional DNA-Based Materials”  
Award amount: \$1,706,468  
Role: co-PI; PI: M. Bathe, co-PI: P. Yin

*National Science Foundation* 07/14-7/17  
“Self-assembling Quasi-crystals from DNA Tiles”  
Award amount: \$390,000  
Role: PI; co-PI: Y. Liu

*Office of Naval Research* 09/15-08/18  
“Self-replicating DNA Nanostructures”  
Award amount: \$450,000  
Role: PI; co-PI: Y. Liu

*National Science Foundation* 08/15-07/17

“EAGER: Collaborative Research: Algorithmic Design Principles for Programmed DNA Nanocages”

Award amount: \$145,000

Role: PI

*National Institute of Health*

08/15-07/17

“Single Cell Technologies for Rapid Detection of Tumor Heterogeneity”

Award amount: \$796,130

Role: Co-I; PI: Karen Anderson, co-PI: Joseph Blattman

*National Institute of Health*

06/16-05/18

“DNA Origami Nanostructures for Single-Cell Multi-Gene Analysis Without Single Cell Sorting”

Award amount: \$440,000

Role: co-PI; PI: Joseph Blattman

*National Institute of Health*

03/16-02/18

“Switchable Molecular Nanoprobes for Fast and Specific Intraoperative Diagnosis of Brain Tumors”

Award amount: \$410,000

Role: PI; co-PI: Peter Nakaji

*National Science Foundation*

04/16-03/20

“AF: Medium: Collaborative Research: Top-down algorithmic design of structured nucleic acid assemblies”

Award amount: \$560,755

Role: PI

*Department of Energy*

08/16-06/19

“DNA nanostructure directed designer excitonic networks”

Award amount: \$899,000

Role: PI; co-PIs: Neal Woodbury, Mark Bathe, Yan Liu, David Whitten

*National Science Foundation*

08/16-07/19

“Bilateral NSF/BIO-BBSRC: Synthetic DNA Nanopores for Selective Transmembrane Transport”

Award amount: \$500,000

Role: PI

*Office of Naval Research*

8/16-8/17

“Mass Spectrometry Instrument for Mass Determination of Protein and Nucleic Acid Conjugates”

Award amount: \$300,000

Role: PI

*National Science Foundation*

8/16-8/19

“DMREF: Computational Design of Next-generation Nanoscale DNA-based Materials”

Award amount: \$1,600,000

Role: co-PI

*Army Research Office*

09/18-08/19

“Extension Project: MURI-Translating Biochemical Pathways to Non-cellular Environments”

Award amount: \$1,250,000

Role: PI; 2 other co-PIs

*Department of Energy*

08/19-07/23

“Biomimetic Light Harvesting Complexes Based on Self-Assembled Dye-DNA Nanostructures”

Award amount: \$1500,000

Role: PI; co-PIs: Neal Woodbury, Su Lin

*National Science Foundation*

08/19-07/23

“Elements: Models and tools for on-line design and simulations for DNA and RNA nanotechnology”

Award amount: \$436,607

Role: co-PI; PI: Petr Sulc

*National Science Foundation*

07/20-06/23

“Rational design of self-assembled, three-dimensional DNA crystals”

Award amount: \$450,000

Role: PI; co-PI: Petr Sulc & Nick Stephanopoulos

*National Science Foundation*

10/20-09/23

“SemiSynBio-II: DNA-Based Memory for High-Density Information Storage and Molecular Cryptography with Fast Readout Methods”

Award amount: \$1,500,000

Role: PI; co-PI: Rizal Hariadi & Chao Wang

*Office of Naval Research*

09/20-08/23

“Modeling Driven Design and Assembly of 3D DNA Nanomaterials”

Award amount: \$563,994

Role: co-PI; PI: Petr Sulc

## 2. Active research grants

*National Science Foundation*

11/22-10/25

“SemiSynBio-III: DNA Templated Chiral Metamaterials for Information Storage”

Award amount: \$1,500,000

Role: PI; co-PI: Rizal Hariadi, Petr Sulc, Sui Yang

*National Institute of Health/NCI*

05/23-04/26

“5R61CA278558-02 High-throughput, purification-free, and ultrasensitive Transmembrane nanosensor arrays for digital counting of microRNA biomarkers of intact exosomes”

Award amount: \$706,500

Role: PI; co-PI: Rizal Hariadi

*National Science Foundation*

07/23-06/26

“Self-assembled DNA Crystals as Scaffolds for Macromolecules”

Award amount: \$500,000

Role: PI; co-PI: Nick Stephanopoulos

*NIH/NIGMS*

08/24-07/28

“1R01GM155563-01 Programmable and Conditional Proteolysis Targeting Chimeras Enabled by DNA Nanotechnology”

Budget: \$1,254,307

Role: PI

## TEACHING AND MENTORING

### 1. Courses Taught

Year	Semester	Course	Title	Credit hours	Enrollment
2024	Spring	BCH461	General Biochemistry	3	47
2023	Spring	BCH461	General Biochemistry	3	42
2022	Spring	BCH461	General Biochemistry	3	43
2021	Spring	BCH461	General Biochemistry	3	51
2020	Spring	BCH361	Principles of Biochemistry	3	173
2019	Spring	BCH361	Principles of Biochemistry	3	138
2018	Spring	CHM460	Biological Chemistry	3	12
2017	Spring	BCH361	Principle of Biochemistry	3	170



2016	Fall	BCH461	General Biochemistry	3	105
2016	Spring	BCH361	Principle of Biochemistry	3	157
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2014	Fall	CHM460	Biological Chemistry	3	14
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2012	Fall	BCH461	Biochemistry	3	134
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2011	Fall	BCH461	Biochemistry	3	108
2011	Spring	BCH494	Bionanotechnology	3	24
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2010	Fall	Sabbatical			
2009	Spring	Teaching Release			
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2009	Fall	BCH461	Biochemistry	3	85
2009	Spring	CHM598	Bionanotechnology	3	24
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2008	Fall	CHM461	Biochemistry	3	140
2008	Spring	BCH598	Bionanotechnology	3	14
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2007	Fall	CHM460	Biological Chemistry	3	20
2007	Spring	BCH598	Bionanotechnology	3	6
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2006	Fall	CHM460	Biological Chemistry	3	15
2006	Spring	BCH561	Advanced Topics in Biochemistry	3	11
2006	Spring	BCH598	Nucleic Acid and Nanobiotechnology	3	23
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2005	Fall	<i>Approved Release Before Tenure</i>			
2005	Spring	<i>Approved Release Before Tenure</i>			
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2004	Fall	BCH501	Current Topics in Biochemistry	1	21
2004	Fall	CHM598	Nucleic Acid and Nanobiotechnology	3	24
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## 2. Graduate Student Mentees

Student	Year Enrolled	Research Area
Kyle Lund	Fall 04	Self-assembled DNA Molecular Pegboards and Spiral Tubes
Rahul Chhabra	Fall 04	DNA Tweezer and Templated Nanoparticle Assembly
Sherri Harvey	Fall 04	<i>in-vivo</i> Replication of DNA Nanostructures
Yonggang Ke	Spring 05	Water-soluble Nanoarrays for Gene Expression Detection
Chenxiang Lin	Spring 05	Combinatorial Barcode Nanoarrays
Jaswinder Sharma	Spring 05	Quantum Dot Based Nanoassembly and Biosensing
Jeanette Nangreave	Fall 07	Thermodynamics and Kinetics of DNA Nanostructures
Zhe Li	Fall 07	Higher Order Assembly of DNA Nanostructures
Zhao Zhao	Fall 08	Complementary Geometry for Self-assembly
XiXi Wei	Fall 08	Interfacing DNA nanostructures with live cells
Minghui Liu	Fall 08	Multi-enzyme Cascade Engineering
Suchetan Pal	Fall 08	DNA templated Nanophotonics
Xiaowei Liu	Fall 08	DNA Nanostructure Vaccines
Wei Li	Fall 09	DNA Computing
Palash Dutta	Fall 09	Multifunctional and Multicomponent Nanostructures
Dongran Han	Fall 09	3D DNA Origami with Complex Curvatures
Anirban Samanta	Fall 09	Quantum Dot Nanobiotechnology
Fei Zhang	Fall 10	Complex DNA Nanostructures
Shuoxing Jiang	Fall 11	Kinetics of DNA Self-assembly
Yuhe Yang	Fall 11	DNA Directed Enzyme Cascades
Saswata Banerjee	Fall 12	Theranostic Nanorobots
Angela Edwards	Fall 12	Thermodynamics and Kinetics of DNA Nanostructures
Yu Zhou	Fall 13	Single cell Analysis
Fan Hong	Fall 14	Dynamic DNA nanotechnology
Swarup Dey	Fall 15	DNA nanopore
Raghu Narayanan	Fall 15	DNA-peptide hybrid materials
Xu Zhou	Fall 16	DNA-directed excitonic networks
Hao Liu	Fall 18	Computational modeling of DNA nanostructures
Yue Tang	Fall 18	Algorithmic DNA self-assembly

Leeza Abraham	Fall 18	DNA nanotechnology for immunotherapy
Liangxiao Chen	Fall 19	Allosteric control of DNA nanostructures
Lu Yu	Fall 19	DNA nanotechnology for Cancer Therapy
Deeksha Soboyata	Fall 20	DNA based light harvesting
Abhay Prasad	Fall 20	DNA nanotechnology for synthetic biology
Rong Zheng	Fall 21	DNA nanotechnology for immunotherapy
Xinyi Tu	Fall 21	DNA nanotechnology for Cancer therapy
Lanshen Zhao	Fall 21	DNA nanotechnology for Cancer therapy
Gengshi Wu	Fall 23	DNA nanotechnology for intracellular medicine
Aleksandra Petrova	Fall 23	RNA nanomedicine

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**Other Graduate Student Thesis Committees:** Lisha Lin, Margaret Barnhart, Devendra Chauhan, Vikas Garg, Netra Joshi, Rawiwan Laocharoensuk, Yun Xiang, Sandip Shinde, Balakumar Thangaraj, Yang Li, Christopher Bley, Justin York, Jessica Troxel, Jinglei Zhang, Shahid Omar, Mingyi Xie, Di Wu, Xiaodong Qi, Qin Yan, Yinan Liu, Berea Williams, Jennifer Watkins, Qiang Fu, Wen Wen, Terannie Vazquez-Alvarez, Su Zhang, Kaushik Gurunathan, Smitha Pillai, Jinglin Fu, Brandon Forrest, Linda Stearns, Jeanine Cordova, Anindya Roy, Jesse Bergkamp, Benjamin Sherman, Katherine Wong, Robin Paul, Justin Flory, Hao Liu, Annie Tang, Yangyang Tang, Kaiyue Wu

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**3. Postdoctoral Researcher Mentees:** Dr. Junping Zhang, Dr. Qiangbin Wang, Dr. Xiaoju Guan, Dr. Zhengtao Deng, Dr. Reji Varghese, Dr. Yang Yang, Dr. Jinglin Fu, Dr. Alessio Andreoni, Dr. Ryan Nangreave, Dr. Sarah Henry, Dr. Xiaodong Qi, Dr. Zhilei Ge, Dr. Xiaowei Liu, Dr. Nour Eddine, Dr. Xiang Lan, Dr. Zhi Zhao, Guangbo Yao, Yinan Zhang

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**4. Undergraduate Student Mentees:** David Hirschak, Thuy Thong, Bruce Norish, Mike Pease, Henry Lu, Christina Calhoun, Enoch Chiang, Danielle Niren, Sam Gowland, Ashely Hunt, Lucas Johnson, Matthew Vrbanac

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**5. High School Student and Teacher Mentees:** Robert Barish, Patrick Vedeou, Alex Foyer, Tom Bundy, Jimmy Wang, Sharon New (Barsha High School teacher).

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**6. Current Status of Lab Alumni:**

Chengxiang Lin, Associate Professor, Yale University  
 Qiangbin Wang, Professor, Suzhou Institute of Nanotech and Nano-bionics, CAS, China  
 Baoquan Ding, Professor, National Center of Nanoscience and Nanotechnology, CAS, China  
 Reji Varghese, Assistant Professor, Indian Institute of Science Education and Research  
 Kyle Lund, Liaison Officer and Biodefense Scientist at Centre de Transfusion Sanguine des

Armées

Yonggang Ke, Associate Professor, Joint Bioengineering Department, Emory and Georgia Tech.

Suchetan Pal, Assistant Professor, IIT-Bhilai, India

Jaswinder Sharma, Staff Scientist, Oak Ridge National Lab

Rahul Chhabra, Senior Scientist, Nanoanalytics Inc.

Sherri Rinker, Research Scientist II at AIT Bioscience

Dongran Han, Professor, Beijing University of Chinese Medicine

Zhengtao Deng, Professor, Nanjing University

Jinglin Fu, Associate Professor, Rutgers University, Camden

Zhe Li, Professor, Nanjing University, China

Yang Yang, Professor, Shanghai Jiao Tong University, China

Jeanette Nangreave, Teaching faculty, ASU

Ryan Nangreave, Teaching faculty, ASU

Andre Pinheiro, Consultant at ICON P&MA

*Junping Zhang*, Material Scientist, Carestream Health-Advanced Materials

Zhao Zhao, Postdoc, Harvard Medical School

Anirban Samanta, Assistant Professor, Ramakrishna Mission Vidyamandira, Belur Math, India

Palash Dutta, Scientist, Illumina

Yuhe Yang, Professor, National Center for Nanoscience and Nanotechnology, China

Alessio Andreoni, Postdoc, NIH

Yuanchen Dong, Professor, Beijing Institute of Chemistry, CAS, China

Zhilei Ge, Associate Professor, Shanghai Jiao Tong University, China

Xiaowei Liu, Scientist, Caris Life.

Xixi Wei, Senior Scientist, Caris Life.

Wei Li, Scientist, Agilent

Saswata Banajee, Postdoc, Columbia University

Yen-ting Lai, Postdoc, NIH

Xiang Lan, Professor, Donghua University

Bryan Wei, Professor, Tsinghua University, China

Guoliang Ke, Associate Professor, Hunan University, China

Shuoxing Jiang, Associate Professor, Nanjing University, China

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## SERVICE

### 1. University and Departmental Service

Chair, SMS Faculty Search Committee for MDB position (2022-2023)

Chair, SMS Seminar Committee (2019-present)

Biodesign Institute Executive Directorate Committee (2015-present)

President Crow's Academic Council (2014-present)

Member: Faculty Search Committee for Cryo-EM faculty search (2015)

Chair: Faculty Mentoring Committee, SMS (2016-present)

Chair: Faculty Search Committee for Molecular Design and Biomimetics (2016)

Co-Chair: Faculty Search Committee for Molecular Design and Biomimetics (2015)

Chair: Faculty Search Committee for Molecular Design and Biomimetics (2014)  
Chair: Faculty Search Committee for Molecular Design and Biomimetics (2013)  
Member: Faculty Search Committee for Joint Physics/Biodesign Biophysics Appointment (2011&2012)  
Member: Departmental Strategic Planning Committee (2012-present)  
Member: Departmental Graduate Program Committee (2010 - 2012)  
Chair: Departmental Seminar Committee (2008 - 2010)  
Co-chair: Biodesign Institute Personnel Committee (2009-present)  
Member: Departmental Seminar Committee (2006-2008)  
Member: Departmental Seminar Committee (2004-2005)  
Member: Departmental Septannual Review Committee (2005)  
Member: Faculty Search Committee for biophysical theory position (2005)

## **2. Outside of ASU**

### **A. Conference Program Committees:**

Co-Chair for the Seventh International DNA Nanotechnology Conference, Co-chair, China (2019).  
President, International Society for Nanoscale Science, Computation and Engineering (2013-2015).  
Co-organizer and Scientific Coordinator for DNATEC17, Dresden, Germany (2017).  
Co-organizer for the Fifth International DNA Nanotechnology Conference, Nanjing, China (2016).  
Co-organizer for the Fourth International DNA Nanotechnology Conference, Xi'an, China (2015).  
Co-organizer for the Third International DNA Nanotechnology Conference, Suzhou, China (2014).  
Co-organizer for DNATEC14: Digital Chemistry, Dresden, Germany (2014).  
Chair of Organizing Committee for the 19<sup>th</sup> International Meeting in DNA Computing and Molecular Programming (2013).  
Member of Steering Committee for International Meeting in DNA Computing and Molecular Programming (2013).  
Co-organizer, Symposium "DNA Nanotechnology" MRS Spring Meeting (2012).  
International Advisory Board Member of *Symposium H "Mining Smartness from Nature"* of CIMTEC (2012).  
Chair, Symposium in Honor of Ned Seeman, Snowbird, Utah, April 11 (2011).  
Member of Steering Committee, International Conference on Bio-Inspired Computing: Theory and Applications (*BIC-TA*) (2011).  
Chair, Workshop on "Bio-directed Assembly", Keystone, CO, May 18-19 (2010).

Chair, Session on “DNA Nanomachines *in vitro* and Inside Living Cells”, 54<sup>th</sup> Annual Biophysical Society Meeting, San Francisco, CA, Feb. 20-24 (2010).

Co-Organizer, DNA Nanotechnology Workshop, Beijing, China, July 15-18 (2009).

Co-Organizer, International Workshop on DNA-based Nanotechnology: Construction, Mechanics, and Electronics, Dresden, Germany, May 11-15 (2009).

International Advisory Board Member: 3<sup>rd</sup> International Conference on “Smart Materials, Structures and Systems”--Symposium E: “Mining Smartness from Nature”, Sicily, Italy (2008).

Treasurer, International Society for Nanoscale Science, Computation and Engineering (2008).

Program track co-Chair, Track on Self-assembled DNA nanostructures, Fifth Conference on Foundations OF Nanoscience: Self-assembled Architectures and Devices (FNANO08), Snowbird, Utah (2008).

Program Committee Member: the 16<sup>th</sup> International Meeting for DNA Computing, Hong Kong (2010).

Program Committee Member: the 15<sup>th</sup> International Meeting for DNA Computing, Little Rock, Arkansas (2009).

Program Committee co-Chair: the 13<sup>th</sup> International Meeting for DNA Computing, Memphis (2007).

Program Committee Member: the 12<sup>th</sup> International Meeting for DNA Computing, Seoul, Korea (2006).

Program Committee Member: the 11<sup>th</sup> International Meeting for DNA Computing, London, Ontario, Canada (2005).

Program Committee Member: the 10<sup>th</sup> International Meeting on DNA-based Computers, Milano, Italy (2004).

Program Committee Member: DNA-Based Semantic Information Processing, KES'04- 8th Int'l Conference on Knowledge-Based Intelligent Information & Engineering Systems, Wellington, New Zealand (2004).

Session Chair: The Seventh International Meeting on Scanning Probe Microscopy, Cancun, Mexico (2005).

### **3. Editorial:**

Associate Editor, ACS Applied Bio Materials, 2021 to Present

Academic Associate Editor, Science Advances, 2021 to Present

Member of Editorial Board, Nano Research, 2014 to Present

Member of Editorial Board, Nature Scientific Report, 2016 to Present

Editorial Advisory Board Member, Langmuir (2012-present).

Guest Co-editor: Natural Computing: Special Issue: DNA Computing Conference (2007).

Guest editor: *Proc. Natl. Acad. Sci.*

Guest co-editor: *Accounts of Chemical Research* special issue on DNA nanotechnology

### **3. Grant Review Panel:**

Panelist and Ad Hoc Reviewers for Department of Energy (2006-present).

Panelist and Ad Hoc Reviewers for National Science Foundation (2003-present).

Panelist: National Institute of Health (2004).

Ad Hoc Reviewer: ACS petroleum fund (2005).

Ad Hoc Reviewer: Research Cooperation (2007).

Ad Hoc Reviewer: Department of Energy (2010-present).

Invited Member of Review Panel at the Molecular Foundry in Lawrence Berkeley Laboratory.

Invited Member of Review Panel at the Los Alamos National Laboratory.

### **4. Manuscript Review:**

Review of manuscripts for: *Science, Nature, Nature Materials, Nature Nanotechnology, Nature Protocols, Nature Chemistry, Nature Communication, Nature Methods, Proc. Natl. Acad. Sci., J. Am. Chem Soc., Angew Chem. Int. Ed., Nano Letter, Small, ACS Nano, Advanced Material, Advanced Functional Materials, Nanotechnology, Chemistry of Materials, Chem. Comm, Biomacromolecules, Langmuir, ChemBioChem, ChemPhysChem, Nanomedicine, Nucleic Acid Research*

### **5. Professional Affiliations:**

Member of American Chemical Society, Material Research Society, American Association for the Advancement of Science, International Society for Nanoscale Science, Computation and Engineering.