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CURRENT POSITION

University of Washington

12/2019 – present

Postdoctoral scholar (Advisor: Prof. David Baker)

- Developed the first “top-down” reinforcement learning-based approach to design custom protein architectures, leading to potent influenza vaccines based on designed compact icosahedral capsids
- Pioneered the computational design of *de novo* 3D protein crystals, showing high thermal stability, and internal porosity, and capable of hosting inorganic particles and crystallization in living cells
- Devised *de novo* design strategies for creating quasi-symmetric virus-like particles as intracellular delivery vehicles and genetically encodable probes for studying biophysical properties of cytoplasm

EDUCATION AND RESEARCH EXPERIENCE

Northwestern University

Postdoctoral fellow (Advisor: Prof. Chad A. Mirkin)

1/2019 – 11/2019

- Discovered particle analogs of electrons in DNA-programmed colloidal crystals, and illustrated their critical roles in the emergence of valency and symmetry breaking
- Devised design principles to synthesize colloidal “metallic”, “intermetallic”, and “alloy” phases

Ph.D. in Chemistry (Advisor: Prof. Chad A. Mirkin)

9/2013 – 12/2018

- Designed colloidal crystal engineering strategies with DNA functionalized inorganic-organic nanomaterials for plasmonic, photonic and stimuli-responsive materials
- Developed chemical approaches to interface metal-organic framework nanoparticles (MOF NPs) with oligonucleotides for biological probes and intracellular protein delivery vehicles
- Resolved structures of complex nanoparticle colloidal crystals with small-angle X-ray scattering (SAXS) and electron microscopy (EM) techniques

University of North Carolina at Chapel Hill

8/2009 – 5/2013

B.S. in Chemistry (Highest Honors, Advisors: Prof. Wenbin Lin and Prof. Maurice Brookhart)

- Studied nanoscale coordination polymers as catalysts, drug delivery vehicles, and energy storage materials. Synthesized Iridium PCP pincer complexes for transfer dehydrogenation of alkanes

AWARDS AND HONORS

Career Award at the Scientific Interface (CASI), Burroughs Wellcome Fund	2024
Outstanding Research Award, International Institute for Nanotechnology	2018
PPG Fellowship, Northwestern University	2017
Ryan Fellowship, International Institute for Nanotechnology	2015
Basolo Fellowship, Northwestern University	2013
Highest Honors, UNC Chapel Hill	2013
The William and Ida Taylor Honors Research Fellowship, UNC Chapel Hill	2012

SCIENTIFIC PUBLICATIONS

[†]Equal author contribution, *co-corresponding Author

- (21) Lutz, I. D.;[†] **Wang, S.**;^{†*} Norn, C.;[†] Courbet A.; Borst, A.; Zhao, Y.T.; Dosey, A.; Cao, L.; Xu, J.; Leaf, E.M.; Treichel, C.; Litvicov, P.; Li, Z.; Goodson, A.D.; Rivera-Sanchez, P.; Bratovianu, A.; Baek, M.; King, N.P.; Ruohola-Baker, H.; Baker, D.* "Top-Down Design of Protein Architectures with Reinforcement Learning," *Science* **2023**, *380*, 266-273. (S.W. and I.D.L. author order was chosen arbitrarily).
- (20) Li, Z.;[†] **Wang, S.**;[†] Nattermann, U.;[†] Bera, A.K.; Borst, J.A.; Bick, M.J.; Yang, E.C.; Sheffler, W.; Lee, B.; Nguyen, H.; Kan, A.; Dalal, R.; Lubner, J.M.; Hsia, Y.; Haddox, H.; Corbet, A.; Dowling, Q.; Favor, A.; Etemadi, A.; Edman, N.I.; Yang, W.; Sankaran, B.; Negahdari, B.; Baker, D. "Accurate computational design of genetically encoded 3D protein crystals," *Nat. Mater.* **2023**, *22*, 1556-563.
- (19) Said, M.;[†] Kang, C.;[†] **Wang, S.**;[†] Sheffler, W.; Salvesson, P.J.; Bera, A.K.; Kang, A.; Nguyen, H.; Ballard, R.; Li, X.; Bai, H.; Stewart, L.; Levine, P.; Baker, D.* "Exploration of Structured Symmetric Cyclic Peptides as ligands for Metal-Organic Frameworks," *Chem. Mater.* **2022**, *34*, 9736-9744.
- (18) **Wang, S.**; Ben-Sasson, A.* "Precision Materials: Computational Design Methods of Accurate Protein Materials," *Curr. Opin. Struct. Biol.* **2022**, *74*, 102367.
- (17) **Wang, S.**;[†] Lee, S.;[†] Du, J. S.;[†] Partridge, B.; Cheng, H.; Zhou, W.; Das, A.; Dravid, V. P.; Lee, B.; Glotzer, S.;^{*} Mirkin, C. A.* "The Emergence of Valency in Colloidal Crystals through Electron Equivalents," *Nat. Mater.* **2022**, *21*, 580-587.
- (16) Cheng, H.;[†] **Wang, S.**;[†] Mirkin, C. A.* "Electron Equivalent Valency Through Molecularly Well-defined Multivalent DNA," *J. Am. Chem. Soc.* **2021**, *143*, 1752-1757.
- (15) **Wang, S.**; Park, S.; Buru, C.; Lin, H.; Chen, P. C.; Roth, E. W.; Farha, O. K.; Mirkin, C. A.* "Colloidal Crystal Engineering with Metal-Organic Framework Nanoparticles and DNA," *Nat. Commun.* **2020**, *11*, 2495.
- (14) **Wang, S.**; Du, J. S.; Dierks, N.; Zhou, W.; Roth, E. W.; Dravid, V. P.; Mirkin, C. A.* "Colloidal Crystal 'Alloys'," *J. Am. Chem. Soc.* **2019**, *141*, 20443-20450.
- (13) Girard, M.;[†] **Wang, S.**;[†] Du, J. S.;[†] Das, A.;[†] Huang, Z.; Dravid, V. P.; Lee, B.; Mirkin, C. A.* Olvera de la Cruz, M.* "Particle Analogs of Electrons in Colloidal Crystals," *Science* **2019**, *364*, 1174-1178.
- (12) **Wang, S.**;[†] Chen, Y.;[†] Wang, S.; Li, P.; Mirkin, C. A.* Farha, O. K.* "DNA-Functionalized Metal-Organic Framework Nanoparticles for Intracellular Delivery of Proteins," *J. Am. Chem. Soc.* **2019**, *141*, 2215-2219.
- (11) **Wang, S.**; Liao, Y.; Farha, O.; Xing, H.;^{*} Mirkin, C. A.* "Electrostatic Purification of Mixed-Phase Metal-Organic Framework Nanoparticles," *Chem. Mater.* **2018**, *30*, 4877-4881.
- (10) **Wang, S.**; McGuirk, C. M.; d'Aquino, A.; Mason, J. A.; Mirkin, C. A.* "Metal-Organic Framework Nanoparticles," *Adv. Mater.* **2018**, *30*, 201800202.
- (9) **Wang, S.**; McGuirk, C. M.; Ross, M.; Wang, S.; Chen, P. C.; Xing, H.; Liu, Y.; Mirkin, C. A.* "General and Direct Method for Preparing Oligonucleotide-Functionalized Metal-Organic Framework Nanoparticles," *J. Am. Chem. Soc.* **2017**, *139*, 9827-9830.
- (8) Morris, W.;[†] **Wang, S.**;[†] Cho, D.; Auyeung, E.; Li, P.; Farha, O. K.; Mirkin, C. A.* "Role of Modulators in Controlling the Colloidal Stability and Polydispersity of the UiO-66 Metal-Organic Frameworks," *ACS Appl. Mater. Interfaces* **2017**, *9*, 33413-33418.
- (7) **Wang, S.**;[†] Morris, W.;[†] Liu, Y.; Zhou, Y.; Hupp, J.; Farha, O.; Mirkin, C. A.* "External Surface-Specific Functionalization of Nanoscale Metal-Organic Frameworks," *Angew. Chem., Int. Ed.* **2015**, *54*, 14378-14742.

- (6) Ennist, N.; **Wang, S.**; Kennedy, M.; Curti, M.; Sutherland, G.; Vasilev, C.; Redler, R.; Maffei, V.; Shareef, S.; Sica, A.; Hua, A.; Deshmukh, A.; Moyer, A.; Hicks, D.; Swartz, A.; Cacho, R.; Novy, N.; Bera, A.; Kang, A.; Sankaran, B.; Johnson, M.; Reppert, M.; Ekiert, D.; Bhabha, G.; Stewart, L.; Caram, J.; Stoddard, B.; Romero, E.; Hunter, C.N.; Baker, D.* "De novo design of proteins housing excitonically coupled chlorophyll special pairs," *Nat. Chem. Biol.* **2024**, <https://doi.org/10.1038/s41589-024-01626-0>.
- (5) Chen, P. C.; Liu, M.; Du, J. S.; Meckes, B.; **Wang, S.**; Lin, H.; Dravid, V. P.; Wolverton, C.; Mirkin, C. A.* "Interface and Heterostructure Design in Polyelemental Nanoparticles," *Science* **2019**, *363*, 959-964.
- (4) Zhu, J.; Kim, Y.; Lin, H.; **Wang, S.**; Mirkin, C. A.* "pH-Responsive Nanoparticle Superlattices with Tunable DNA Bonds," *J. Am. Chem. Soc.* **2018**, *140*, 5061-5064.
- (3) Chen, P. C.; Liu, X.; Hedrick, J. L.; Xie, Z.; **Wang, S.**; Lin, Q. Y.; Hersam, M. C.; Dravid, V. P.; Mirkin, C. A.* "Poly-Elemental Nanoparticle Libraries," *Science* **2016**, *352*, 1565-1569.
- (2) Liu, D.; Wu, H.; **Wang, S.**; Xie, Z.; Li, J.; Lin, W.* "A High Connectivity Metal–Organic Framework with Exceptional Hydrogen and Methane Uptake Capacities," *Chem. Sci.* **2012**, *3*, 3032-3037.
- (1) Liu, D.; Kramer, A. S.; Huxford, R. C.; **Wang, S.**; Rocca, J. D.; Lin, W.* "Coercing Bisphosphonates to Kill Cancer Cells with Nanoscale Coordination Polymers," *Chem. Commun.* **2012**, *48*, 2668-2670.

TEACHING AND MENTORING EXPERIENCE

Mentor, BURP undergraduate literature discussion program, University of Washington	2022-present
Mentor, recruit and advise undergrads from underrepresented groups, IPD JUPYTER program	2022-present
Graduate Mentor, mentor five PhD students and one master student, Northwestern and UW	2016-present
Undergraduate Tutor, General Chemistry and Organic Chemistry, Northwestern	2013-2018
Teaching Assistant, Organic Chemistry Lab, Northwestern (3 quarters)	2013-2014
Teaching Assistant, Advanced Organic Chemistry Lab, Northwestern (1 quarter)	2013

CONTRIBUTED AND INVITED PRESENTATIONS

- (13) "Crystal Growth and Assembly" Gordon Research Conference – Manchester, NH, June **2023**
- (12) "Complex Active and Adaptive Material Systems" Gordon Research Conference – Ventura, CA, Jan **2023**
- (11) *Pacificchem* "Computational design of 3D protein crystals" (Oral) – Honolulu, HI, Dec **2021**
- (10) *RosettaCon* "Computational design of 3D protein crystals" (Oral) – Seattle, WA, Aug **2021**
- (9) *MRS Spring Meeting* "Colloidal crystal engineering with metal-organic framework nanoparticles and DNA" (Oral) – Seattle, WA, Apr **2021**
- (8) *MRS Spring Meeting* "Particle analogs of electrons in colloidal crystals" (Oral) – Seattle, WA, Apr **2021**
- (7) *RosettaCon* "Colloidal crystal engineering with de novo protein building blocks" (online poster) – Seattle, WA, Aug **2020**
- (6) *UCLA* "Particle Analogs of Electrons in Colloidal Crystals" (Oral) – Los Angeles, CA, Feb **2020**
- (5) "Crystal Growth and Assembly" Gordon Research Conference (poster) – Manchester, NH, Jun **2019**
- (4) *Northwestern SPIE-MRSEC Student Seminar Series* (Oral) – Evanston, IL, Aug **2018**
- (3) *ACS* "Metal-Organic Frameworks: What are next?" Symposium (Oral) – New Orleans, LA, Mar **2018**
- (2) "Multifunctional Materials & Structures" Gordon Research Conference (poster) – Ventura, CA, Jan **2018**
- (1) "Bioinspired Materials" Gordon Research Conference (poster) – Les Diablerets, Switzerland, May **2016**

PATENTS

- (5) "De Novo Design of Compact Icosahedral Self-Assembling Protein Nanomaterials and Vaccines by Reinforcement Learning," U.S. Provisional Pat.
- (4) "Computationally Designed Genetically Encoded 3D Protein Crystals," U.S. Provisional Pat.
- (3) "Structured Symmetric Cyclic Peptides as Ligands for Metal-Organic Frameworks," U.S. Provisional Pat.
- (2) "De Novo Designed pH Responsive Components and Self-assembling Nanocages for Endosomal Escape and Drug Delivery," U.S. Provisional Pat.

- (1) "A General and Direct Method for Preparing Oligonucleotide Functionalized Metal-Organic Framework Nanoparticles," U.S. Pat. No. US11690920B2.