Danqing Wang

Sandoghdar Division
Max Planck Institute for the Science of Light
Staudtstraße 2
Erlangen, Germany 91058

49-17663053125 (phone)
danqing.wang@mpl.mpg.de
ORCID: 0000-0002-7369-1944
https://danqing-wang.github.io

EDUCATION

Max Planck Institute for the Science of Light 2023 –
Postdoctoral Fellow
Division: Vahid Sandoghdar

University of California, Berkeley, Berkeley, CA 2019 – 2022
Miller Research Fellow
Faculty host: Junqiao Wu
Department of Materials Science and Engineering

Northwestern University, Evanston, IL 2019
Ph.D. in Applied Physics
Co-advisors: Teri W. Odom, George C. Schatz
Thesis: *Manipulating Light-Matter Interactions with Plasmonic Nanoparticle Lattices*

Nanjing University, Nanjing, China 2013
B.S. in Physics

FELLOWSHIPS & AWARDS

2023 Rising Stars of Light (3 awardees globally, before faculty track)

2022 Rising Stars in EECS, USA

2020 Forbes 30 Under 30 in Science, USA

2019 Miller Research Fellowship, University of California, Berkeley

2018 Material Research Society Graduate Student Award (GSA) Silver Award

2018 Excellent Poster Award, Gordon Research Conference on Lasers in Micro, Nano and Bio Systems

2018 Honorable Mention, International Precious Metals Institute (IPMI) Student Award

2017 Outstanding Research Award, International Institute for Nanotechnology (Northwestern University)

2013 Excellence Award in National Undergraduate Innovation Training Program, China

PUBLICATIONS

[h-index: 21, i10-index: 23, total citations > 2100. Google Scholar link.]

First and co-first author

0. **Wang, D.***; Lu, Z.; Warkander, S.; Gupta, N.; Wang, Q.; Ci, P.; Guo, R.; Li, J.; Javey, A.; Yao, J.; Wang, F.; Wu, J.* "Long-range Optical Coupling with Epsilon-near-zero Materials," *submitted* (*corresponding author)

1. **Wang, D.***; Yang, A. "Emerging Optics from Structured Nanoscale Optical Cavities," *Invited review*, *in press* (*corresponding author)

2. **Wang, D.**; Hu, J.; Schatz, G.C.; Odom, T.W. "Superlattice Surface Lattice Resonances in Plasmonic Nanoparticle Arrays with Patterned Dielectrics," ***Journal of Physical Chemistry Letters*** 14, 38, 8525–8530 (2023) DOI: 10.1021/acs.jpclett.3c02158

3. **Wang, D.***; Dong, K.; Li, J.; Grigoropoulos, C.; Yao, J.; Hong, J.; Wu, J.* "Low-loss, Geometry-invariant Optical Waveguides with Near-zero-index Materials," ***Nanophotonics*** 11, 21, 4747–4753 (2022) DOI: 10.1515/nanoph-2022-0445 (*corresponding author)

4. **Wang, D.**; Bourgeois, M.R.; Guan, J.; Fumani, A.K.; Schatz, G.C.; Odom, T.W. "Lasing from Finite Plasmonic Nanoparticle Lattices," ***ACS Photonics*** 7, 630-636 (2020) DOI: 10.1021/acsphotonics.0c00231

5. Fernandez-Bravo, A.[+]; **Wang, D.**[+]; Barnard, E.S.; Teitelboim, A.; Tajon, C.; Guan, J.; Schatz, G.C.; Cohen, B.E.; Chan, E.; Schuck, P.J.; Odom, T.W. "Ultralow-threshold, Continuous-wave Upconverting Lasing from Subwavelength Plasmons," ***Nature Materials*** 18, 1172–1176 (2019) [Highlighted by News and Views, *Nature Materials*] DOI: 10.1038/s41563-019-0482-5 ([+]equal contribution)

6. **Wang, D.**; Guan, J.; Hu, J.; Bourgeois, M.R.; Odom, T.W. "Manipulating Light-matter Interactions in Plasmonic Nanoparticle Lattices," ***Accounts of Chemical Research*** 52, 2997-3007 (2019) DOI: 10.1021/acs.accounts.9b00345

7. **Wang, D.**; Bourgeois, M.R.; Lee, W.; Li, R.; Trivedi, D.; Knudson, M.P.; Wang, W.; Schatz, G.C.; Odom, T.W. "Stretchable Nanolasing from Hybrid Quadrupole Plasmons," ***Nano Letters*** 18, 4549–4555 (2018) DOI: 10.1021/acs.nanolett.8b01774

8. **Wang, D.**; Yang, A.; Wang. W.; Hua, Y.; Schaller, R.D.; Schatz, G.C.; Odom, T.W. "Band-edge Engineering for Controlled Multi-modal Nanolasing in Plasmonic Superlattices," ***Nature Nanotechnology*** 12, 889 (2017) [Highlighted by News and Views, *Nature Nanotechnology*] DOI: 10.1038/nnano.2017.126

9. **Wang, D.**; Wang. W.; Knudson, M.P.; Schatz, G.C.; Odom, T.W. "Structural Engineering in Plasmon Nanolasers," ***Chemical Reviews*** 118, 2865–2881 (2017) DOI: 10.1021/acs.chemrev.7b00424

10. Tran, T.T.[+]; **Wang, D.**[+]; Xu, Z-Q.[+]; Yang, A.; Toth, M.; Odom, T.W.; Aharonovich, I. "Deterministic Coupling of Quantum Emitters in 2D Materials to Plasmonic Nanocavity Arrays," ***Nano Letters*** 17, 2634-2639 (2017) DOI: 10.1021/acs.nanolett.7b00444 ([+]equal

contribution)

11. **Wang, D.**; Yang, A.; Hryn, A.J.; Schatz, G.C.; Odom, T.W. "Superlattice Plasmons in Hierarchical Au Nanoparticle Arrays," ***ACS Photonics*** 2, 1789 (2015) DOI: 10.1021/acsphotonics.5b00546

Co-author

12. Dong, K.; Zhang, T.; Li, J.; Wang, Q.; Yang, F.; Rho, Y.; **Wang, D.**; Grigoropoulos, C.P.; Wu, J.; Yao J. "Flat bands in magic-angle bilayer photonic crystals at small twists," ***Phys. Rev. Lett.*** 126, 223601 (2021) DOI:10.1103/PhysRevLett.126.223601

13. Guan, J.; Sagar, L.K.; Li, R.; **Wang, D.**; Bappi, G; Wang, W.; Watkins, N.; Bourgeois, M.R.; Levina, L.; Fan, F.; Hoogland, S.; Voznyy, O.; Martins, J.; Schaller, R.D.; Schatz, G.C.; Sargent, E.H.; Odom, T.W. "Quantum dot-plasmon lasing with controlled polarization patterns," ***ACS Nano*** 14, 3426–3433 (2020) DOI: 10.1021/acsnano.9b09466

14. Guan, J.; Sagar, L.K.; Li, R.; **Wang, D.**; Bappi, G; Watkins, N.; Bourgeois, M.R.; Levina, L.; Fan, F.; Hoogland, S.; Voznyy, O.; Martins, J.; Schaller, R.D.; Schatz, G.C.; Sargent, E.H.; Odom, T.W. "Engineering Directionality in Quantum Dot Shell Lasing Using Plasmonic Lattices," ***Nano Letters*** 20, 1468-1474 (2020) DOI: 10.1021/acs.nanolett.9b05342

15. Lin, Y.; **Wang, D.**; Hu, J.; Liu, J.; Wang, W.; Schaller, R.D.; Odom, T.W. "Engineering Symmetry-breaking Nanocrescent Arrays for Nanolasing," ***Adv. Funct. Mater.*** 1904157 (2019) DOI: 10.1002/adfm.201904157

16. Hu, J.; **Wang, D.**; Bhowmik, D.; Liu, T.; Deng, S.; Knudson, M.P.; Ao, X.; Odom, T.W. "Lattice-Resonance Metalenses for Fully Reconfigurable Imaging," ***ACS Nano*** 13, 4613-4620 (2019) DOI: 10.1021/acsnano.9b00651

17. Ao, X.; **Wang, D.**; Odom, T.W. "Enhanced Fields in Mirror-backed Low-Index Dielectric Structures," ***ACS Photonics*** 6, 2612-2617 (2019) DOI: 10.1021/acsphotonics.9b00931

18. Li, R.; **Wang, D.**; Guan, J.; Wang, W.; Ao, X.; Schatz, G.C.; Schaller, R.C.; Odom, T.W. "Plasmon nanolasing with aluminum nanoparticle arrays," ***J. Opt. Soc. Am. B*** 36, 104-111 (2019) DOI: 10.1364/josab.36.00e104

19. Liu, J.; Wang, W.; **Wang, D.**; Hu, J.; Ding, W.; Schaller, R.D.; Schatz, G.C.; Odom, T.W. "Spatially Defined Molecular Emitters Coupled to Plasmonic Nanoparticles," ***Proc. Natl. Acad. Sci.*** 116, 5925-5930 (2019) DOI.org/10.1073/pnas.1818902116

20. Hooper, D. C.; Kuppe, C.; **Wang, D.**; Wang, W.; Guan, J.; Odom, T.W.; Valev, V.K. "Second harmonic spectroscopy of surface lattice resonances," ***Nano Letters*** 19, 165-172 (2019) DOI: 10.1021/acs.nanolett.8b03574

21. Knudson, M.P.; Li, R.; **Wang, D.**; Wang, W.; Schaller, R.D.; Odom, T.W. "Polarization-Dependent Lasing Behavior from Low-Symmetry Nanocavity Arrays," ***ACS Nano*** 13, 7435-7441 (2019) DOI: 10.1021/acsnano.9b01142

22. Cherqui, C.; Bourgeois, M.R.; **Wang, D.**; Schatz, G.C. "Plasmonic Surface Lattice Resonances: Theory and Computation," ***Accounts of Chemical Research*** 52, 2548-2558 (2019) DOI: 10.1021/acs.accounts.9b00312

23. Li, R.; Bourgeois, M.R.; Cherqui, C.; Guan, J.; **Wang, D.**; Hu, J.; Schaller, R.D.; Schatz, G.C.; Odom, T.W. "Hierarchical Hybridization in Plasmonic Honeycomb Lattices," ***Nano Letters*** 19, 6435-6441 (2019) DOI: 10.1021/acs.nanolett.9b02661

24. **Wang, D.**; Wang, W.; Odom, T.W. *et al.* "Roadmap on Plasmonics: Nanoarray Lasing Spasers," ***Journal of Optics*** 20, 043001 (2018) DOI: 10.1088/2040-8986/aaa114

25. Trivedi, D.; **Wang, D.**; Odom, T.W.; Schatz, G.C. "Model for Describing Plasmonic Nanolasers Using Maxwell-Liouville Equations with Finite-difference Time-domain Calculations," ***Phys. Rev. A.*** 96**,** 053825 (2017) DOI: 10.1103/PhysRevA.96.053825

26. Yang, A.; **Wang, D.**; Wang, W.; Odom, T. W. "Coherent Light Sources at the Nanoscale," ***Annu. Rev. Phys. Chem.*** 68, 83-99 (2017) DOI: 10.1146/annurev-physchem-052516-050730

27. Wang, S.; **Wang, D.**; Hu, X.; Li, T.; Zhu, S. "Compact Surface Plasmon Amplifier in Nonlinear Hybrid Waveguide," ***Chinese Physics B*** 25, 7 (2016)

Patent

1. Hong, J.; Wu, J.; **Wang, D.** "Method and Apparatus of Hybrid Integrated Photonics Devices" (US Patent Application no. 18,111,532)—filed on Feb. 18 2023

RESEARCH EXPERIENCE

University of California, Berkeley, Berkeley, CA

- Postdoctoral research hosted by Junqiao Wu

  Highlight activities include:

  - Achieved long-range optical interactions between epsilon-near-zero thin film materials and their analogy to superconducting proximity effect in electronic systems
  - Demonstrated that near-zero-index materials can serve as a cladding layer for low-loss and geometry-invariant optical waveguides for miniaturized photonics

  These works are funded by the Miller research fellowship.

Northwestern University, Evanston, IL

- Graduate research co-advised by Teri W. Odom and George C. Schatz

  Highlight activities include:

  - Achieved controlled multi-modal lasing from metal nanoparticle superlattices that enable access to multiple band-edge states in the photonic band structure
  - Realized a mechanically tunable nanolaser based on metal nanoparticles on a flexible polymer matrix, as inspired by color changes of chameleons in nature

- Collaboratively demonstrated deterministic coupling of quantum emitters in hBN to plasmonic nanocavities for enhanced single-photon emission
- Collaboratively achieved continuous-wave nanoscale lasing at visible frequencies under near-infrared pumping with *record-low* power thresholds
- Established a robust computational approach in finite-difference time-domain methods to investigate time- and spatial- dependent lasing buildup in small photonic cavities

These works resulted in 8 first-author publications in Nature Nanotechnology, *Nature Materials*, *Nano Letters*, *ACS Photonics etc.*

CONFERENCES & PRESENTATIONS

1. **International Workshop on Quantum Materials for 2D Photonics & Optoelectronics** Singapore 2023
   Invited talk: "Emerging Optics from Structured Nanoscale Cavities"
2. **MRS Fall Meeting** Boston, MA 2022
   Talk: "Low-loss, geometry-invariant optical waveguides with zero-index materials"
3. **San Francisco State University Physics Colloquium** San Francisco, CA 2022
   Invited talk: "Emerging Optics from Structured Nanomaterials"
4. **UC Berkeley Quantum Materials Seminar** Berkeley, CA 2019
   Invited talk: "Extraordinary Optics from Structured Nanoparticles"
5. **UC Berkeley Nano Seminar Series** Berkeley, CA 2019
   Invited talk: "Extraordinary Optics from Structured Nanoparticles"
6. **ACS Fall Meeting** San Diego, CA 2019
   Invited talk: "Extraordinary Optics from Structured Nanoparticles"
7. **Vannevar Bush Faculty Fellows Annual Meeting** Washington, D.C. 2019
   Poster: "Functional and Hierarchical Nanoscale Metamaterials"
8. **MRS Fall Meeting** Boston, MA 2018
   Talk: "Stretchable Nanolasing from Hybrid Quadrupole Plasmons"
9. **Gordon Conference** Waterville Valley, NH 2018
   Poster: "Structural Engineering in Plasmon Nanolasers"
10. **Nanjing University Tiandi Symposium** Nanjing, China 2017
    Invited talk: "Structural Engineering in Plasmon Nanolasers"
11. **MRS Fall Meeting** Boston, MA 2017
    Talk: "Band-edge Engineering for Controlled Multi-modal Nanolasing in Plasmonic Superlattices"

12. **Northwestern SPIE-MRSEC Student Seminar Series** Evanston, IL 2017
    Invited talk: "Structural Engineering in Plasmon Nanolasers"
13. **OSA Incubator on Science & Applications of Nanolasers** Washington, DC 2016
    Invited talk: "Lasing from Plasmonic Nanocavity Arrays"
14. **Gordon Conference** Newry, ME 2016
    Poster: "Band-edge Engineering in Hierarchical Plasmonic Nanolasers"
15. **APS March Meeting** San Antonio, TX 2015
    Poster: "Superlattice Plasmons in Finite Nanoparticle Arrays"

PRESS RELEASES

1. "Structuring Nanomaterials for Optics", *Miller Fellow Focus*, *Miller Institute Newsletter* (Winter 2021)
2. "Forbes 30 Under 30 2021 List", *Forbes* (December 2020)
3. "Upconverting Nanolasers from Subwavelength Plasmons: Stability and Ultralow Powers", *energy.gov* (March 2020)
4. "Tiny laser packs a punch", *Berkeley Lab's Molecular Foundry News* (Nov. 2019)
5. "Tiny, biocompatible laser could function inside living tissues", *National Science Foundation Research News* (Oct. 2019)
6. "Biocompatible nanolaser small enough to treat brain diseases", *springwise.com* (Oct. 2019)
7. "Lasing under ultralow pumping", *Nature Materials News and Views* (Oct. 2019)
8. "Tiny, Biocompatible Laser Could Function Inside Living Tissues", *Columbia Engineering News* (Oct. 2020)
9. "Tiny, biocompatible laser could function inside living tissues", *phys.org* (Sep. 2020)
10. "Tiny, biocompatible nanolaser could function inside living tissues", *Northwestern Now* (Sep. 2019)
11. "Nanolaser functions inside living human tissue", *Laboratory News* (Sep. 2019)
12. "Tiny, biocompatible laser could function inside living tissues", *Nanotechnology Now* (Sep. 2019)
13. "The chameleon and the crystal maze", *Laboratory News, UK* (Sep. 2018) [Highlighted as the featured article and the cover story]
14. "Mimicking the Master of Camouflage", *Chicago Biomedical Consortium Success Story* (July 2018)
15. "Nanolaser Changes Color when Stretched", *Chemical & Engineering News* (July 2018)
16. "Chameleon-inspired Nanolaser Changes Colors", *National Science Foundation's*

webhomepage (June 2018)

17. "Chameleons Inspire Mechanochromic Nanolaser", *Physics World* (June 2018)
18. "Chameleon-inspired Nanolaser Changes Colors", *ScienceDaily* (June 2018)
19. "Chameleon-inspired Nanolaser Changes Colors", *Northwestern Now* (June 2018)
20. "Northwestern's New Chameleon-Inspired Laser Changes Colors", *WTTW* (June 2018)
21. "Nanolasing: Multimode Superlattice Arrays", *Nature Nanotechnology News and Views* (Sep. 2017)
22. "New Laser Design Offers More Inexpensive Multi-color Output", *Northwestern Now* (July 2017)
23. "Controlling Multi-modal Nanolasing with Plasmonic Superlattices", *Nanowerk News* (July 2017)

TEACHING EXPERIENCE

Guest Lecturer, University of California, Berkeley Fall 2019

Course: Optical Materials and Devices

Responsibilities: Invited to present one lecture on my research work to graduate students. Developed and delivered a 90-minute lecture with interactive sections.

Graduate Teaching Assistant, Northwestern University Spring 2018

Course: Introductory Physics of Materials

Responsibilities: Hosted the office hours, refined assignments questions, and graded for an undergraduate-level course with 22 students.

SERVICE & OUTREACH

Co-chair, Gordon Research Seminar June 2023

Subsection: Lasers in Micro, Nano and Bio Systems, West Dover, VT

Miller Institute Ambassador 2022

University of California, Berkeley

Invited panelist, WISE National Conference, Canada Jan. 2022

University of Toronto

"Meet with a Miller Fellow" outreach program at El Cerrito High School 2020-21

University of California, Berkeley

Morning mentor, Tutoring program at Nichols Middle School Winter 2018

Northwestern University

Professional Development Co-chair, McCormick Graduate Leadership Council 2014-16

Northwestern University

Ad Hoc Reviewer

ACS Photonics, *Optica, Optics Letters, Applied Optics*, *Optics and Laser Technology*, *Materials*

REFERENCE CONTACTS

Professor Junqiao Wu

Chair, Department of Materials Science and Engineering, University of California, Berkeley
Email: wuj@berkeley.edu
Phone: 01-510-642-4391

Professor Teri W. Odom

Chair, Department of Chemistry, Northwestern University; Editor-in-Chief, *Nano Letters*
Email: todom@northwestern.edu
Phone: 01-847-491-7674

Professor George C. Schatz

Department of Chemistry, Department of Biological Engineering, Northwestern University
Email: g-schatz@northwestern.edu
Phone: 01-847-491-5657

Professor Vahid Sandoghdar

Managing director, Max Planck Institute for the Science of Light
Email: vahid.sandoghdar@mpl.mpg.de
Phone: 49-9131-7133300