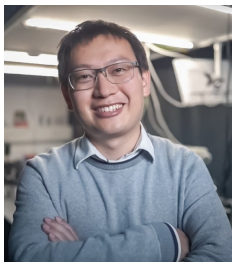
Dr. Haoran Ren
School of Physics and Astronomy
Email: Haoran.Ren@monash.edu



Biography

I am an ARC Future (former DECRA) Fellow and lead the Monash NanoMeta Group at Monash University. My research in nanophotonics explores the full potential and multi-dimensional nature of light, focusing on controlled light-matter interactions at the nanoscale. Driven by the fascinating optical physics and photonic applications across various fields, my work spans many topical areas in optics-related research.
I have available PhD and Honours projects. I have recent major foci on 1) metasurface waveguides as a platform for photonic applications like structured light/single photons manipulation; 2) meta-optics enabled computational imaging and endoscopic imaging; 3) laser-reconfigurable optical materials ; 4) quantum valleytronics. If you are interested in our nanophotonics research—a dynamic field in applied physics where you can bring your innovative designs to life in breakthrough experiments—please reach out.

Qualifications

Optics, PhD, Nanophotonics manipulation of angular momentum of light for information optics, Swinburne University of Technology
20 Mar 2013 → 17 Feb 2017
Award Date: 17 Feb 2017

Employment

Senior Research Fellow
School of Physics and Astronomy
MONASH UNIVERSITY
11 Dec 2025 → present

Secretary
Australia and New Zealand Optical Society
Lindfield, Australia
1 Jan 2025 → 1 Jan 2026

Chair of the Photonic Metamaterials Technical Group at OPTICA (formly OSA)
Optica LLC
Washington, United States of America
1 Jan 2024 → 31 Dec 2026

Honorary Research Fellow
Macquarie University
North Ryde, Australia
1 Jun 2022 → 31 May 2027

Prizes

2016 Chinese Government Prize for Outstanding Self-financed Students Abroad
Ren, H. (Recipient), 2016

Australian National Fabrication Facilities (ANFF) Technology Fellow Ambassador
Ren, H. (Recipient), 2024

Candidate Award for the 2023 Rising Star of Light
Ren, H. (Recipient), 2023

Emerging Leaders
Ren, H. (Recipient), 2022

Faculty of Science Award for Excellence in Research by an ECR
Ren, H. (Recipient), 2024

Humboldt Research Fellowship
Ren, H. (Recipient), 2019

Macquarie University Research Fellowship
Ren, H. (Recipient), 2020

OSA Robert S. Hilbert Student Travel Grant
Ren, H. (Recipient), 2015

SPIE 3D Printing, Fabrication, and Manufacturing Award for OPTO.
Ren, H. (Recipient), 2024

The Geoff Opat Early Career Researcher Prize
Ren, H. (Recipient), 2022

Victoria Fellowship
Ren, H. (Recipient), 1 Oct 2018

Projects

3D metafibre optics for advanced imaging
Ren, H. (Primary Chief Investigator (PCI))
1/06/22 → 22/08/25

All-on-chip twisted light modulator for ultrahigh-capacity data processing
Ren, H. (Primary Chief Investigator (PCI)), Maier, S. (Chief Investigator (CI)), Dawes, J. M. (Chief Investigator (CI)) & Omatsu, T. (Primary Chief Investigator (PCI))
10/11/22 → 1/06/26

Reconfigurable Integrated Meta-Photonic Platform On-a-Chip
Ren, H. (Primary Chief Investigator (PCI))
11/12/25 → 10/12/29

Activities

Workshop on 3D Printing of Photonics Materials
Ren, H. (Organiser)
11 Dec 2022

Optics Express (Journal)
Ren, H. (Editor in chief)
9 Sept 2022

APL Photonics (Journal)
Ren, H. (Editorial board member)
2022 → …

Australia and New Zealand Conference on Optics and Photonics
Ren, H. (Organiser)
2021

Light: Science and Applications (Journal)
Ren, H. (Peer reviewer)
2020 → …

Nature Photonics (Journal)
Ren, H. (Peer reviewer)
2020 → …

Optica (Journal)
Ren, H. (Peer reviewer)
2020 → …

Science Advances (Journal)
Ren, H. (Peer reviewer)
2020 → …

ACS Photonics (Journal)
Ren, H. (Peer reviewer)
2019 → …

Communications Physics (Journal)
Ren, H. (Peer reviewer)
2019 → …

Nano Letters (Journal)
Ren, H. (Peer reviewer)
2019 → …

Nature Electronics (Journal)
Ren, H. (Peer reviewer)
2019 → …

Nature Communications (Journal)
Ren, H. (Peer reviewer)
2018 → …

Nature (Journal)
Ren, H. (Peer reviewer)
2018 → …

Research outputs

Ultrathin BIC Metasurfaces Based on Ultra-Low-Loss Sb_2Se_3 Phase-Change Material
Xie, Z., Li, C., Murali, K., Yu, H., Liu, C., Lu, Y., Maier, S. A., Bhaskaran, M. & Ren, H., 8 Jan 2025, In: Nano Letters. 25, 1 , p. 251-260 10 p.

Optically addressable spin defects coupled to bound states in the continuum metasurfaces
Sortino, L., Gale, A., Kühner, L., Li, C., Biechteler, J., Wendisch, F. J., Kianinia, M., Ren, H., Toth, M., Maier, S. A., Aharonovich, I. & Tittl, A., Dec 2024, In: Nature Communications. 15, 1, 8 p., 2008.

Wavelength-multiplexed orbital angular momentum meta-holography
Jang, J., Moon, S. W., Kim, J., Mun, J., Maier, S. A., Ren, H. & Rho, J., Dec 2024, In: PhotoniX. 5, 1, 14 p., 27.

Two-photon polymerization lithography for imaging optics
Wang, H., Pan, C. F., Li, C., Menghrajani, K. S., Schmidt, M. A., Li, A., Fan, F., Zhou, Y., Zhang, W., Wang, H., Nair, P. N. S., Chan, J. Y. E., Mori, T., Hu, Y., Hu, G., Maier, S. A., Ren, H., Duan, H. & Yang, J. K. W., Aug 2024, In: International Journal of Extreme Manufacturing. 6, 4, 40 p., 042002.

Electronically Controlled Semiconductor Nanoparticle Array for Tunable Plasmonic Metasurfaces
Kaushik, V., Rajput, S., Babu, P., Pandey, S. K., Mishra, R. D., Ren, H., Maier, S., Sorger, V. J., Dalir, H. & Kumar, M., 15 May 2024, In: Journal of Lightwave Technology. 42, 10, p. 3814-3819 6 p.

Multiplication of the orbital angular momentum of phonon polaritons via sublinear dispersion
Mancini, A., Nan, L., Berté, R., Cortés, E., Ren, H. & Maier, S. A., 2 Apr 2024, In: Nature Photonics. 18, 7, p. 677–684 9 p.

Unraveling the Chirality Transfer from Circularly Polarized Light to Single Plasmonic Nanoparticles
Lee, S., Fan, C., Movsesyan, A., Bürger, J., Wendisch, F. J., de S. Menezes, L., Maier, S. A., Ren, H., Liedl, T., Besteiro, L. V., Govorov, A. O. & Cortés, E., 11 Mar 2024, In: Angewandte Chemie - International Edition. 63, 11, 9 p., e202319920.

Nonlinear Boost of Optical Angular Momentum Selectivity by Hybrid Nanolaser Circuits
He, C., Tang, Z., Liu, L., Maier, S. A., Wang, X., Ren, H. & Pan, A., 24 Jan 2024, In: Nano Letters. 24, 5, p. 1784–1791 8 p.

Active Huygens' metasurface based on in-situ grown conductive polymer
Lu, W., Menezes, L. D. S., Tittl, A., Ren, H. & Maier, S. A., Jan 2024, In: Nanophotonics. 13, 1, p. 39-49 11 p.

Dispersion engineering of metalenses
Yu, H., Xie, Z., Li, C., Li, C., de S. Menezes, L., Maier, S. A. & Ren, H., 11 Dec 2023, In: Applied Physics Letters. 123, 24, 9 p., 240503.

Arbitrarily structured quantum emission with a multifunctional metalens
Li, C., Jang, J., Badloe, T., Yang, T., Kim, J., Kim, J., Nguyen, M., Maier, S. A., Rho, J., Ren, H. & Aharonovich, I., Dec 2023, In: eLight. 3, 1, 10 p., 19.

Metafiber transforming arbitrarily structured light
Li, C., Wieduwilt, T., Wendisch, F. J., Márquez, A., Menezes, L. D. S., Maier, S. A., Schmidt, M. A. & Ren, H., Dec 2023, In: Nature Communications. 14, 1, 10 p., 7222.

Information multiplexing from optical holography to multi-channel metaholography
Márquez, A., Li, C., Beléndez, A., Maier, S. A. & Ren, H., 27 Nov 2023, In: Nanophotonics. 12, 24, p. 4415-4440 26 p.

Roadmap on structured waves
Bliokh, K. Y., Karimi, E., Padgett, M. J., Alonso, M. A., Dennis, M. R., Dudley, A., Forbes, A., Zahedpour, S., Hancock, S. W., Milchberg, H. M., Rotter, S., Nori, F., Özdemir, Ş. K., Bender, N., Cao, H., Corkum, P. B., Hernández-García, C., Ren, H., Kivshar, Y. & Silveirinha, M. G. & 30 others, Engheta, N., Rauschenbeutel, A., Schneeweiss, P., Volz, J., Leykam, D., Smirnova, D. A., Rong, K., Wang, B., Hasman, E., Picardi, M. F., Zayats, A. V., Rodríguez-Fortuño, F. J., Yang, C., Ren, J., Khanikaev, A. B., Alù, A., Brasselet, E., Shats, M., Verbeeck, J., Schattschneider, P., Sarenac, D., Cory, D. G., Pushin, D. A., Birk, M., Gorlach, A., Kaminer, I., Cardano, F., Marrucci, L., Krenn, M. & Marquardt, F., 30 Aug 2023, In: Journal of Optics. 25, 10, 79 p., 103001.

Engineering Quantum Nanophotonic Components from Hexagonal Boron Nitride
Nonahal, M., Li, C., Ren, H., Spencer, L., Kianinia, M., Toth, M. & Aharonovich, I., Aug 2023, In: Laser & Photonics Reviews. 17, 8, 8 p., 2300019.

Nanophotonic Materials for Twisted-Light Manipulation
Ren, H. & Maier, S. A., Aug 2023, In: Advanced Materials. 35, 34, 16 p., 2106692.

Disorder-Induced Topological State Transition in the Optical Skyrmion Family
Liu, C., Zhang, S., Maier, S. A. & Ren, H., 23 Dec 2022, In: Physical Review Letters. 129, 26, 7 p., 267401.

Plasmonic bound states in the continuum to tailor light-matter coupling
Aigner, A., Tittl, A., Wang, J., Weber, T., Kivshar, Y., Maier, S. A. & Ren, H., 7 Dec 2022, In: Science Advances. 8, 49, 8 p. , eadd4816.

Radial bound states in the continuum for polarization-invariant nanophotonics
Kühner, L., Sortino, L., Berté, R., Wang, J., Ren, H., Maier, S. A., Kivshar, Y. & Tittl, A., Dec 2022, In: Nature Communications. 13, 1, 8 p., 4992.

Near-Field Retrieval of the Surface Phonon Polariton Dispersion in Free-Standing Silicon Carbide Thin Films
Mancini, A., Nan, L., Wendisch, F. J., Berté, R., Ren, H., Cortés, E. & Maier, S. A., 16 Nov 2022, In: ACS Photonics. 9, 11 , p. 3696-3704 9 p.

Metasurface Measuring Twisted Light in Turbulence
Dinter, T., Li, C., Kühner, L., Weber, T., Tittl, A., Maier, S. A., Dawes, J. M. & Ren, H., 21 Sept 2022, In: ACS Photonics. 9 , 9, p. 3043-3051 9 p.

Strong Polarization Dependent Nonlinear Excitation of a Perovskite Nanocrystal Monolayer on a Chiral Dielectric Nanoantenna Array
Vinçon, I., Wendisch, F. J., De Gregorio, D., Pritzl, S. D., Akkerman, Q. A., Ren, H., De S. Menezes, L., Maier, S. A. & Feldmann, J., 17 Aug 2022, In: ACS Photonics. 9, 11, p. 3506–3514 9 p.

An achromatic metafiber for focusing and imaging across the entire telecommunication range
Ren, H., Jang, J., Li, C., Aigner, A., Plidschun, M., Kim, J., Rho, J., Schmidt, M. A. & Maier, S. A., 19 Jul 2022, In: Nature Communications. 13, 1, 10 p., 4183.

Optical Metasurfaces for Energy Conversion
Cortés, E., Wendisch, F. J., Sortino, L., Mancini, A., Ezendam, S., Saris, S., De S. Menezes, L., Tittl, A., Ren, H. & Maier, S. A., 21 Jun 2022, In: Chemical Reviews. 122, 19, p. 15082–15176 95 p.

Vectorial wavefront holography based on a polarisation-insensitive hologram
Ren, H., Jun 2022, In: Journal of Optics. 24, 6, 7 p., 064008.

Nanophotonic manipulation of optical angular momentum for high-dimensional information optics
Fang, X., Ren, H., Li, K., Luan, H., Hua, Y., Zhang, Q., Chen, X. & Gu, M., 31 Dec 2021, In: Advances in Optics and Photonics. 13, 4, p. 772-833 62 p.

Ultrahigh numerical aperture meta-fibre for flexible optical trapping
Plidschun, M., Ren, H., Kim, J., Förster, R., Maier, S. A. & Schmidt, M. A., Dec 2021, In: Light: Science and Applications. 10, 1, 11 p., 57.

Orbital-Angular-Momentum-Controlled Hybrid Nanowire Circuit
Ren, H., Wang, X., Li, C., He, C., Wang, Y., Pan, A. & Maier, S. A., 28 Jul 2021, In: Nano Letters. 21, 14, p. 6220-6227 8 p.

纳米光子学中的光学涡旋
Li, C. H., Maier, S. A. & Ren, H. R., Jul 2021, In: Chinese Optics. 14, 4, p. 792-811 20 p.

Self-Constructed Multiple Plasmonic Hotspots on an Individual Fractal to Amplify Broadband Hot Electron Generation
Wang, X., Liu, C., Gao, C., Yao, K., Masouleh, S. S. M., Berté, R., Ren, H., Menezes, L. D. S., Cortés, E., Bicket, I. C., Wang, H., Li, N., Zhang, Z., Li, M., Xie, W., Yu, Y., Fang, Y., Zhang, S., Xu, H. & Vomiero, A. & 4 others, Liu, Y., Botton, G. A., Maier, S. A. & Liang, H., 22 Jun 2021, In: ACS Nano. 15, 6, p. 10553-10564 12 p.

Nanointerferometric Discrimination of the Spin-Orbit Hall Effect
Zhang, M., Ren, H., Ouyang, X., Jiang, M., Lu, Y., Hu, Y., Fu, S., Li, Z., Chen, Z., Guan, B. O., Cao, Y. & Li, X., 21 Apr 2021, In: ACS Photonics. 8, 4, p. 1169-1174 6 p.

Optically Tunable Mie Resonance VO_2 Nanoantennas for Metasurfaces in the Visible
Kepič, P., Ligmajer, F., Hrtoň, M., Ren, H., Menezes, L. D. S., Maier, S. A. & Šikola, T., 21 Apr 2021, In: ACS Photonics. 8 , 4, p. 1048-1057 10 p.

Topological-insulator-based gap-surface plasmon metasurfaces
Aigner, A., Maier, S. A. & Ren, H., Feb 2021, In: Photonics. 8, 2, 14 p., 40.

Complex-amplitude metasurface-based orbital angular momentum holography in momentum space
Ren, H., Fang, X., Jang, J., Bürger, J., Rho, J. & Maier, S. A., 1 Nov 2020, In: Nature Nanotechnology. 15, 11, p. 948-955 8 p.

Three-dimensional vectorial holography based on machine learning inverse design
Ren, H., Shao, W., Li, Y., Salim, F. & Gu, M., 17 Apr 2020, In: Science Advances. 6, 16, 7 p., eaaz4261.

Orbital angular momentum holography for high-security encryption
Fang, X., Ren, H. & Gu, M., 1 Feb 2020, In: Nature Photonics. 14, 2, p. 102-108 7 p.

Metasurface-integrated vertical cavity surface-emitting lasers for programmable directional lasing emissions
Xie, Y. Y., Ni, P. N., Wang, Q. H., Kan, Q., Briere, G., Chen, P. P., Zhao, Z. Z., Delga, A., Ren, H.-R., Chen, H. D., Xu, C. & Genevet, P., Feb 2020, In: Nature Nanotechnology. 15, 2, p. 125-130 6 p.

Metasurface orbital angular momentum holography
Ren, H., Briere, G., Fang, X., Ni, P., Sawant, R., Héron, S., Chenot, S., Vézian, S., Damilano, B., Brändli, V., Maier, S. A. & Genevet, P., 1 Dec 2019, In: Nature Communications. 10, 1, 8 p., 2986.

Angular-momentum nanometrology in an ultrathin plasmonic topological insulator film
Yue, Z., Ren, H., Wei, S., Lin, J. & Gu, M., 24 Oct 2018, In: Nature Communications. 9, 1, 7 p., 4413.

Angular Momentum-Reversible Near-Unity Bisignate Circular Dichroism
Ren, H. & Gu, M., May 2018, In: Laser & Photonics Reviews. 12, 5, 6 p., 1700255.

On-chip noninterference angular momentum multiplexing of broadband light
Ren, H., Li, X., Zhang, Q. & Gu, M., 13 May 2016, In: Science. 352, 6287, p. 805-809 5 p.

Athermally photoreduced graphene oxides for three-dimensional holographic images
Li, X., Ren, H., Chen, X., Liu, J., Li, Q., Li, C., Xue, G., Jia, J., Cao, L., Sahu, A., Hu, B., Wang, Y., Jin, G. & Gu, M., 22 Apr 2015, In: Nature Communications. 6, 6984.

Catenary optics for achromatic generation of perfect optical angular momentum
Pu, M., Li, X., Ma, X., Wang, Y., Zhao, Z., Wang, C., Hu, C., Gao, P., Huang, C., Ren, H., Li, X., Qin, F., Yang, J., Gu, M., Hong, M. & Luo, X., 2015, In: Science Advances. 1, 9, 1500396.

Polarization-Multiplexed multifocal arrays by a π-phase-stepmodulated azimuthally polarized beam
Ren, H., Li, X. & Gu, M., 15 Dec 2014, In: Optics Letters. 39, 24, p. 6771-6774 4 p.

Super-resolved pure-transverse focal fields with an enhanced energy density through focus of an azimuthally polarized first-order vortex beam
Li, X., Venugopalan, P., Ren, H., Hong, M. & Gu, M., 15 Oct 2014, In: Optics Letters. 39, 20, p. 5961-5964 4 p.

Three-dimensional parallel recording with a Debye diffraction-limited and aberration-free volumetric multifocal array
Ren, H., Lin, H., Li, X. & Gu, M., 15 Mar 2014, In: Optics Letters. 39, 6, p. 1621-1624 4 p.

A parametric model of estimating sea state bias based on JASON-1 altimetry
Li, S. G., Wang, Y. H., Miao, H. L., Zhou, X. G., Ren, H. R., Wang, G. Z. & Zhang, J., Apr 2013, In: Zhongguo Shiyou Daxue Xuebao (Ziran Kexue Ban)/Journal of China University of Petroleum (Edition of Natural Science). 37, 2, p. 181-185+196 6 p.

Study on energy transfer of supercapacitor in photovoltaic illumination
Miao, H., Tian, Q., Ren, H. & Wei, S., Aug 2012, In: Bandaoti Guangdian/Semiconductor Optoelectronics. 33, 4, p. 607-610 4 p.

Study on altimeter-based inversion model of mean wave period
Miao, H., Ren, H., Zhou, X., Wang, G. & Zhang, J., Jan 2012, In: Journal of Applied Remote Sensing. 6, 1, 8 p., 63591.

Study on empirical model in junction-temperature measurement of LED
Miao, H., Zhou, X., Zhou, C., Haoran, R. & Tian, Q., Jun 2011, In: Acta Optica Sinica. 31, SUPPL.1, 6 p., s100313.