

Soon Wei Daniel Lim

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EMPLOYMENT

Alice Y. Hung Assistant Professor in Science and Technology From Sep 2026

Nanyang Assistant Professor, Nanyang Technological University, Singapore

Principal Investigator, Bioinformatics Institute (BII), A*STAR (joint appointment)

Designing of low-cost, high-accessibility medical diagnostics and therapeutics based on unconventional acoustic devices. NTU School: Mechanical and Aerospace Engineering (MAE).

Schmidt Science Postdoctoral Fellow, Stanford University School of Medicine Nov 2023 - present

Advisor: Prof. Steven Chu. Developing low cost, high efficiency intracellular delivery techniques and non-linear ultrasound contrast diagnostics. Department: Molecular and Cellular Physiology.

Postdoctoral Fellow, Harvard University Sep 2023 - Oct 2023

Doctoral Researcher, Harvard University Sep 2018 - Sep 2023

Advisor: Prof. Federico Capasso. Investigated counter-intuitive fundamental behavior of structured wavefields containing singularities (“dark” regions of light). Achieved a flat lens that uses extremely deep and narrow holes, the highest aspect ratio nanostructures for wavefront shaping.

Research Assistant, Bioprocessing Technology Institute, A*STAR Jan 2018 - Jun 2018

Advisor: Prof. Shireen Goh (now at SUTD, Singapore). Modeled multiphase computational fluid dynamics for inertial focusing in dense particle-laden flows.

Research Engineer, Singapore Institute of Manufacturing Technology, A*STAR Jul 2017 - Dec 2017

Advisor: Prof. Wong Liang Jie (now at NTU, Singapore). Simulated strong-field light-matter interactions in laser-based particle acceleration.

Undergraduate Researcher, California Institute of Technology Jan 2015 - Jun 2017

Advisor: Prof. Sandra Troian. Developed microlens arrays in polymer using spatially-varying surface tension.

Research Intern, Institute for Infocomm Research, A*STAR Jun 2014 - Aug 2014

Advisor: Dr. Ng Tian Tsong. Designed analytical tools for the medical application of micro-NMR devices.

Research Intern, Institute of Materials Research and Engineering, A*STAR May 2013 - Jul 2013

Advisor: Prof. Chin Jia Min (now at University of Vienna). Self-assembly of non-closed packed pore arrays.

Research Intern, National Neuroscience Institute, Singapore Dec 2007 - Dec 2009

Advisor: Dr. Jeanne Tan. Mouse model study on the role of heat shock proteins in neurodegeneration.

EDUCATION

2018 - 2023 Ph.D. Applied Physics, **Harvard University** **GPA: 4.0/4.0**

Advisor: Prof. Federico Capasso; Thesis: *Sculpting the dark: Singularity engineering with metasurfaces*

2013 - 2017 B.S. Physics, **California Institute of Technology** **GPA: 4.3/4.3, rank 1/254**

Advisor: Prof. Sandra Troian; Thesis: *Revolution in large-area curved surface lithography: Nanofilm sculpting by thermocapillary modulation*

2016 Caltech Cambridge Scholar, **Cambridge University** **Class: First**

PUBLICATIONS - REFEREED PAPERS

*equal contribution.

1. J.S. Park*, S.W.D. Lim*, A. Amirzhan, H. Kang, K. Karrfalt, D. Kim, J. Leger, A. Urbas, M. Ossiander, Z. Li, F. Capasso, All-Glass 100 mm Diameter Visible Metalens for Imaging the Cosmos, *ACS Nano*, 18, 4, 3187–3198, 2024, [10.1021/acsnano.3c09462](https://doi.org/10.1021/acsnano.3c09462) and [Cover Art](#).
2. R.J. Tang*, S.W.D. Lim*, M. Ossiander, X. Yin, F. Capasso, Time reversal differentiation of FDTD for photonic inverse design, *ACS Photonics*, 10, 12, 4140–4150, 2023, [10.1021/acsp Photonics.3c00694](https://doi.org/10.1021/acsp Photonics.3c00694).
3. J. Lu, V. Ginis, S.W.D. Lim, F. Capasso, Helicity and Polarization Gradient Optical Trapping in Evanescent Fields, *Physical Review Letters*, 131, 14, 143803, 2023, [10.1103/PhysRevLett.131.143803](https://doi.org/10.1103/PhysRevLett.131.143803).
4. D. Hazineh*, S.W.D. Lim*, Q. Guo, F. Capasso, T. Zickler, Polarization Multi-Image Synthesis with Birefringent Metasurfaces, *IEEE Intl. Conf. on Computational Photography (ICCP)*, 2023, [10.1109/ICCP56744.2023.10233735](https://doi.org/10.1109/ICCP56744.2023.10233735).
5. C.M. Spaegele, M. Tamagnone, S.W.D. Lim, M. Ossiander, M.L. Meretska, F. Capasso, Topologically protected optical polarization singularities in four-dimensional space, *Science Advances*, 9, 24, 2023, [10.1126/sciadv.adh0369](https://doi.org/10.1126/sciadv.adh0369).
6. S.W.D. Lim*, J.S. Park*, D. Kazakov, C.M. Spaegele, A.H. Dorrah, M.L. Meretska, F. Capasso, Point singularity array with metasurfaces, *Nature Commun.*, 14, 3237, 2023, [10.1038/s41467-023-39072-6](https://doi.org/10.1038/s41467-023-39072-6).
7. M. Ossiander*, M.L. Meretska*, H.K. Hampel*, S.W.D. Lim, N. Knefz, T. Jauk, F. Capasso, M. Schultze, Extreme ultraviolet metalens by vacuum guiding, *Science*, 380, 59–63, 2023, [10.1126/science.adg6881](https://doi.org/10.1126/science.adg6881).
8. G. Palermo, A. Lininger, A. Guglielmelli, L. Ricciardi, G. Nicoletta, A. De Luca, J.S. Park, S.W.D. Lim, M.L. Meretska, F. Capasso, G. Strangi, All-optical tunability of metalenses permeated with liquid crystals, *ACS Nano*, 16, 10, 16539–16548, 2022, [10.1021/acsnano.2c05887](https://doi.org/10.1021/acsnano.2c05887).
9. S.W.D. Lim*, M.L. Meretska*, F. Capasso, A high aspect ratio inverse-designed holey metalens, *Nano Letters*, 21, 8642–8649, 2021, [10.1021/acs.nanolett.1c02612](https://doi.org/10.1021/acs.nanolett.1c02612).
10. S.W.D. Lim, J.S. Park, M.L. Meretska, A.H. Dorrah, F. Capasso, Engineering phase and polarization singularity sheets, *Nature Commun.* 12, 4190, 2021, [10.1038/s41467-021-24493-y](https://doi.org/10.1038/s41467-021-24493-y).
11. S. Yu, J. Lu, V. Ginis, S. Kheifets, S.W.D. Lim, M. Qiu, T. Gu, J. Hu, F. Capasso, On-chip optical tweezers based on freeform optics, *Optica* 8, 3, 409–414, 2021, [10.1364/OPTICA.418837](https://doi.org/10.1364/OPTICA.418837).
12. M. Shen, S.W.D. Lim, E.S. Tan, H.H. Oon, E.C. Ren, HLA correlations with clinical phenotypes and risk of metabolic comorbidities in Singapore Chinese psoriasis patients, *Molecular Diagnosis & Therapy* 23, 6, 751–760, 2019, [10.1007/s40291-019-00423-z](https://doi.org/10.1007/s40291-019-00423-z).
13. A.Z. Thong, S.W.D. Lim, A. Ahsan, T.W.G. Goh, J.W. Xu, and J.M. Chin, Non-closed-packed pore arrays through one-step breath figure self-assembly and reversal, *Chemical Science* 5, 1375–1382, 2014, [10.1039/C3SC52258J](https://doi.org/10.1039/C3SC52258J).

MANUSCRIPTS UNDER REVIEW

1. S.W.D. Lim, Y.H. Kee, S.N.A. Smith, S.M. Tan, A.E. Lim, Y. Yang, S. Goh, “Dense Suspension Inertial Microfluidic Particle Theory (DENSE-IMPACT) Model for Elucidating Outer Wall Focusing at High Cell Densities”, ArXiv [2409.12488](https://arxiv.org/abs/2409.12488)
2. S.W.D. Lim, C.M. Spaegele, F. Capasso, “Multidimensional optical singularities and their applications”, ArXiv [2406.00784](https://arxiv.org/abs/2406.00784).
3. Z. Li, S.D. Campbell, J.S. Park, R.P. Jenkins, S.W.D. Lim, D.H. Werner, F. Capasso, “Heterogeneous Freeform Metasurfaces: A Platform for Advanced Broadband Dispersion Engineering”, ArXiv [2412.12028](https://arxiv.org/abs/2412.12028).
4. C.M. Spaegele, M. Rezaee, T. Werkmeister, S.W.D. Lim, K. Vaillancourt, J.S. Park, P. Chevalier, I. Kaminer, P. Kim, F. Capasso, M. Tamagnone, “A scalable platform for nanometer-scale quantum confinement”, ArXiv [2604.08957](https://arxiv.org/abs/2604.08957).

PATENTS

1. M.L. Meretska, S.W.D. Lim, and F. Capasso, “High-aspect ratio metalens,” U.S. patent [US11860336B2](https://patents.google.com/patent/US11860336B2), granted 02 Jan 2024.
2. M.T. Ossiander, M.L. Meretska, S.W.D. Lim, F. Capasso, “Nanooptics with high refractive index apertures”,

CONFERENCE TALKS

1. J. Lenaerts, D. Cassara, P. Chevalier, J.S. Park, L. Sacchi, [S.W.D. Lim](#), R. Pestourie, V. Ginis, M.L. Meretska, F. Capasso, “Polychromatic metalens in the NIR for CO₂ detection”, *SPIE OPTO* 2025, [10.1117/12.3041398](#).
2. [S.W.D. Lim](#), C.M. Spaegele, F. Capasso, “Singularity engineering with metasurfaces: from 0D to 4D”, *SPIE Photonics West* 2024, [10.1117/12.3004234](#).
3. [S.W.D. Lim](#), J.S. Park, D. Kazakov, C.M. Spaegele, A.H. Dorrah, M.L. Meretska, F. Capasso, “Point singularity array with metasurfaces for blue-detuned atomic traps”, *SPIE Nanosci. + Eng.* 2023, [10.1117/12.2676740](#).
4. R.J. Tang, [S.W.D. Lim](#), M. Ossiander, X. Yin, F. Capasso, “Minimal memory differentiable FDTD for photonic inverse design”, *SPIE Nanoscience + Engineering* 2023, [10.1117/12.2677131](#).
5. M. Ossiander, M.L. Meretska, H.K. Hampel, [S.W.D. Lim](#), N. Knefz, T. Jauk, F. Capasso, M. Schultze, “Holey metalens focusing of extreme ultraviolet light”, *Optica Imaging Congress* 2023, [10.1364/FLATOPTICS.2023.FTh3G.3](#).
6. D. Hazineh, [S.W.D. Lim](#), Q. Guo, F. Capasso, T. Zickler, Polarization Multi-Image Synthesis with Birefringent Metasurfaces, *ICCP* 2023, [10.1109/ICCP56744.2023.10233735](#).
7. R. Jun, [S.W.D. Lim](#), D. Hazineh, F. Capasso, “Computing the Optical Response of Metasurfaces Under Partially Coherent Illumination”, *CLEO* 2023, [10.1364/CLEO_FS.2023.FW4H.6](#).
8. C.M. Spaegele, M. Tamagnone, S.W.D. Lim, M. Ossiander, M.L. Meretska, F. Capasso, “Topologically protected polarization singularities in four dimensions”, *CLEO* 2023, [10.1364/CLEO_FS.2023.FTh3C.7](#).
9. M. Ossiander, M.L. Meretska, H.K. Hampel, [S.W.D. Lim](#), N. Knefz, T. Jauk, M. Schultze, F. Capasso, “Extreme Ultraviolet Metaoptics enabled by Vacuum Guiding”, *CLEO* 2023, [10.1364/CLEO_FS.2023.FM3D.6](#).
10. Z. Sun, M.L. Meretska, F.H.B. Somhorst, J.S. Park, [S.W.D. Lim](#), Y. Hou, J.S. Mooder, F. Capasso, “Free-standing Metasurface-based Faraday Rotator”, *CLEO* 2023, [10.1364/CLEO_AT.2023.JW2A.98](#).
11. J.S. Park, K. Vaillancourt, [S.W.D. Lim](#), C.M. Spaegele, F. Capasso, “All-dielectric, visible wavelength focusing metalens with planar surface for mechanical robustness”, *CLEO* 2023, [10.1364/CLEO_SI.2023.SF3K.3](#).
12. J.S. Park, [S.W.D. Lim](#), A. Amirzhan, H. Kang, D. Kim, M. Ossiander, Z. Li, F. Capasso, *The International Conference on Surface Plasmon Photonics 10*, 2023.
13. [S.W.D. Lim](#), J.S. Park, M.L. Meretska, A.H. Dorrah, D. Kazakov, F. Capasso, “Metasurface blue-detuned atom trap arrays using singularity engineering”, *CLEO* 2022, [10.1364/CLEO_QELS.2022.FF4D.4](#).
14. J.S. Park, [S.W.D. Lim](#), M. Ossiander, Z. Li, A. Amirzhan, F. Capasso, “All-Glass, Mass-Productible, Large-Diameter Metalens at Visible Wavelength for 100 mm Aperture Optics and Beyond”, *CLEO* 2022, [10.1364/CLEO_AT.2022.AW4I.1](#).
15. R. Tang, [S.W.D. Lim](#), X. Yin, F. Capasso, “Minimal memory differentiable FDTD for inverse design”, *CLEO* 2022, [10.1364/CLEO_QELS.2022.FM5H.4](#).
16. [S.W.D. Lim](#), J.S. Park, M.L. Meretska, A.H. Dorrah, F. Capasso, “Structuring phase and polarization singularity sheets in 2D”, *CLEO* 2021, [10.1364/CLEO_QELS.2021.FW4G.5](#).
17. [S.W.D. Lim](#), M.L. Meretska, F. Capasso, “A high aspect-ratio holey metalens”, *CLEO* 2021, [10.1364/CLEO_SI.2021.SM4I.4](#).
18. J. Lu, S. Yu, V. Ginis, S. Kheifets, [S.W.D. Lim](#), M. Qiu, T. Gu, J. Hu, F. Capasso, “On-Chip Optical Tweezers Based on Micro-Reflectors”, *CLEO* 2021, [10.1364/CLEO_SI.2021.SW3B.1](#).
19. [S.W.D. Lim](#), J. S. Park, M.L. Meretska, A.H. Dorrah, F. Capasso, “Singularity engineering: sculpting the dark”, *SPIE OPTO* 2021, [10.1117/12.2577222](#).
20. M.L. Meretska, [S.W.D. Lim](#), F. Capasso, “Monolithic focusing metasurfaces”, *SPIE OPTO* 2021, [10.1117/12.2577320](#).
21. J. Lu, S. Yu, V. Ginis, S. Kheifets, [S.W.D. Lim](#), M. Qiu, T. Gu, J. Hu, F. Capasso, “On-chip optical tweezers based on free-form optics”, *SPIE Nanoscience + Engineering* 2021, [10.1117/12.2594988](#).
22. [S.W.D. Lim](#), K. Fiedler, C. Zhou, S.M. Troian, “Fabrication of Converging and Diverging Polymeric Microlens Arrays By Spatiotemporal Control of Thermocapillary Forces”, *APS March Meeting* 2017.
23. [S.W.D. Lim](#), K. Fiedler, S.M. Troian, “Fabrication of Converging and Diverging Polymeric Microlens Arrays By A Thermocapillary Replication Technique”, *APS Division of Fluid Dynamics* 2016.
24. [S.W.D. Lim](#), K. Fiedler, S.M. Troian, “Fabrication of Converging and Diverging Polymeric Microlens Arrays

SELECTED AWARDS

- **Schmidt Science Fellowship** (2024).
 - A postdoctoral fellowship enabling the world’s best emerging scientists to pivot from their PhD discipline and pursue their goals through bold interdisciplinary research [Source: [Schmidt Science Fellows](#)].
 - First Singaporean (jointly) to receive this fellowship, one of 32 fellows for 2024.
- **Lindau Young Scientist** (2019).
 - One of eight young scientists selected to represent Singapore in the 2019 Lindau Nobel Laureate Meetings.
- **A*STAR Roll of Honor** (2017).
 - One of six A*STAR scholars recognized for top undergraduate academic achievement.
- **D.S. Kothari Prize in Physics** (2017), California Institute of Technology.
 - Given to a graduating senior in physics who has produced an outstanding research project during the past year [Source: [Caltech Physics](#)].
- **Friends of the Caltech Libraries Senior Thesis Prize** (2017), California Institute of Technology.
 - Recognizes senior theses that exemplify excellent research, writing, and the effective use of library resources [Source: [Caltech Libraries](#)].
- **Haren Lee Fisher Memorial Award in Junior Physics** (2016), California Institute of Technology.
 - Awarded annually to a physics major who has completed their second year and demonstrates great promise for future contributions to the field [Source: [Caltech Physics](#)].
- **Jack E. Froehlich Memorial Award** (2016), California Institute of Technology.
 - Awarded to a junior in the upper 5 percent of their class who shows outstanding promise for a creative professional career [Source: [Caltech Deans](#)].
- **Ken Hass Outstanding Student Paper Award** (2017), American Physical Society.
 - Recognizes an outstanding student paper addressing the subject of industrial applications of physics [Source: [APS](#)].
 - Paper: “Fabrication of Converging and Diverging Polymeric Microlens Arrays By Spatiotemporal Control of Thermocapillary Forces”
- **International Physics Olympiad Silver Medal** (2010).
 - One of five students selected to represent Singapore.

FELLOWSHIPS AND GRANTS

Named Professorship	Alice Y. Hung Assistant Professor in Science and Technology (2026-2030).
Start-up grant	Nanyang Assistant Professorship , Nanyang Technological University (2026-2030).
US\$220,000	Schmidt Science Fellowship , Schmidt Sciences (2024-2026).
SGD\$20,000	NUS Development Grant , National University of Singapore (2024-2025).
8 years full funding	National Science Scholarship , A*STAR Singapore (2013-2023).

TEACHING

- Fall 2019: Harvard University Physics 123/223, “**Laboratory Electronics**”, Teaching Fellow
- Fall 2016: California Institute of Technology Physics 5/105, “**Analog Electronics for Physicists**”, Teaching Fellow

MENTORSHIP

1. 2019-2020: Rui Jie Tang (Waterloo co-op intern). Co-led the Time Reversal Differentiation FDTD project, resulting in co-first authorship on Tang*, Lim*, et al., *ACS Photonics* 10, 4140–4150 (2023). Now Ph.D. candidate at the University of Toronto.
2. 2021-2023: Revin Jun (research intern). Co-authored CLEO 2023 talk “Computing the Optical Response of Metasurfaces Under Partially Coherent Illumination”. Now undergraduate at Harvard University.

PEER REVIEW SERVICE

ACS Omega (American Chemical Society)	2
Journal of the Optical Society of America A (Optica Publishing Group)	1
Journal of the Optical Society of America B (Optica Publishing Group)	2
Laser & Photonics Reviews (Wiley-VCH)	11
Light: Science & Applications (Nature Portfolio)	1
Nanophotonics (de Gruyter)	1
Nature Communications (Nature Portfolio)	4
Nature Physics (Nature Portfolio)	1
Optica (Optica Publishing Group)	1
Optics Express (Optica Publishing Group)	9
Optics Letters (Optica Publishing Group)	2
Photonix (Springer)	1
Total	36

LEADERSHIP AND COMMUNITY SERVICE

- **Head**, National Science Challenge Scientific Working Committee (2017 - 2018)
 - Spearheaded a diverse team of 15 members across multiple organizations, overseeing the planning and implementation of scientific projects, competitive rounds, and outreach initiatives for the National Science Challenge, a nationally-broadcast inter-school science contest. Provided expert advice to the national broadcaster (Mediacorp) throughout competition and filming stages.
 - Successfully concluded with the [2017 broadcast](#) (6 episodes) and [2018 broadcast](#) (6 episodes).

SELECTED MEDIA COVERAGE

- **Schmidt Science Fellowship (2024)**
 - Schmidt Science Fellows: [Fellow profile, Soon Wei Daniel Lim](#)
 - Harvard Gazette: [Recent Harvard Grad Named 2024 Schmidt Science Fellow](#)
 - Harvard SEAS: [Lim Named Schmidt Science Fellow](#)
- **All-Glass 100 mm Diameter Visible Metalens for Imaging the Cosmos** (*ACS Nano* 18, 2024)
 - Harvard SEAS: [The Metalens Meets the Stars](#)
 - Phys.org: [Large, All-Glass Metalens Images Sun, Moon and Nebulae](#)
 - Photonics Spectra: [Large-scale, Mass-producible Metalens Enables Astral Imaging](#)
 - Interesting Engineering: [First 10-cm Glass Metalens Promises Stunning Views of Sun, Moon, Cosmos](#)
- **Point Singularity Array with Metasurfaces** (*Nat. Commun.* 14, 2023) and **Topologically Protected Optical Polarization Singularities in Four-Dimensional Space** (*Sci. Adv.* 9, 2023)
 - Harvard SEAS: [Building Robust Optical Structures Made of Darkness](#)
 - Phys.org: [Building Robust Optical Structures Made of Darkness](#)
 - Photonics Spectra: [Metasurfaces Exert Control Over Darkness](#)
 - The Debrief: [Controlling Points of Darkness with Metasurfaces Could Enable New Covert Detection Technologies, Harvard Team Says](#)
- **A High Aspect Ratio Inverse-Designed Holey Metalens** (*Nano Lett.* 21, 2021)
 - Harvard SEAS: [Holey Metalens!](#)
 - Phys.org: [Holey Metalens! New Metalens Focuses Light with Ultra-Deep Holes](#)
 - Photonics Spectra: [Metalens Design Uses Millions of Holes to Focus Light into Single Point](#)
 - Optics.org: [Pitted Metalens Gives Light Holey Orders](#)
- **Engineering Phase and Polarization Singularity Sheets** (*Nat. Commun.* 12, 2021)
 - Harvard SEAS: [Harnessing the Dark Side](#)
 - Physics World: [Metamaterial Sculpts Heart-Shaped Darkness from Light](#)
 - Phys.org: [Optical Singularities Could be Used for a Wide Range of Applications](#)
 - Photonics Spectra: [On-Demand Optical Singularities Strengthen Range of Applications](#)
- **A*STAR National Science Scholarship** (BrightSparks Magazine, July 2018)
 - BrightSparks Magazine: [The Science of Tomorrow](#)

- **Friends of the Caltech Libraries Senior Thesis Prize (2017)**

- Caltech News: *The 2017 Library Thesis Prize*

REFEREES

- **Prof. Federico Capasso**, Robert L. Wallace Professor of Applied Physics and Vinton Hayes Senior Research Fellow in Electrical Engineering, Harvard University: capasso@seas.harvard.edu
- **Prof. Steven Chu**, William R. Kenan Jr. Professor, Professor of Molecular and Cellular Physiology and of Energy Science and Engineering, Stanford University: schu@stanford.edu
- **Prof. Sandra Troian**, Professor of Applied Physics, Aeronautics, and Mechanical Engineering, California Institute of Technology: stroian@caltech.edu
- **Prof. Todd Zickler**, William and Ami Kuan Danoff Professor of Electrical Engineering and Computer Science, Harvard University: zickler@seas.harvard.edu