

PRIZES, AWARDS, FELLOWSHIPS

Postdoc Mobility Fellow , Swiss National Science Foundation, Switzerland	2023 – 2024
This fellowship enables postdocs to spend a two-year research stay abroad.	
Early Postdoc Mobility Fellow , Swiss National Science Foundation, Switzerland	2020 – 2022
This fellowship enables postdocs to spend a two-year research stay abroad.	
ETH Medal , ETH Zürich, Switzerland	2020
This award honors outstanding PhD theses at ETH Zürich.	
Travel Grant 20 Years Nanooptics Symposium , Max Planck Inst. of for the Science of Light, Germany	2017
Travel grant to present my work at the symposium.	
Fulbright Fellow , U.S. Department of State, USA	2013 – 2015
The Fulbright Scholarship enables exceptional graduate students to study in the U.S. Amount: \$20'000.	
Outstanding D-MAVT Bachelor Award , ETH Zürich, Switzerland	2012
Awarded to the top 5 of a 500 students graduating class.	
Outstanding D-MAVT Bachelor Award , ETH Zürich, Switzerland	2010
Awarded to the student with the best 1st year exam.	

PROFESSIONAL SERVICE

Optics Chapter ETH Zürich (SPIE, OSA, EPS), Zürich, Switzerland	2017 – 2020
<i>Vice President</i>	
Reviewer	
<i>Journals: Optics Express, Optical Materials Express, Applied Optics, JOSAB, Advanced Optical Materials, ACS Macro Letters.</i>	

TEACHING EXPERIENCE

California Institute of Technology, Dept. of Applied Physics, Pasadena, CA, USA	2022
<i>Lecturer</i>	
For the lecture 'Introduction to Nanophotonics' with 20 enrolled students.	
ETH Zürich, Swiss Federal Institute of Technology, Zürich, Switzerland	2017 – 2019
<i>Main Teaching Assistant</i>	
For the lectures 'Thermodynamics I & II' of Prof. Dimos Poulikakos with 370 enrolled students.	
ETH Zürich, Swiss Federal Institute of Technology, Zürich, Switzerland	2010 – 2012
<i>Teaching Assistant</i>	
For the lectures 'Quantum mechanics for engineers' of Prof. David J. Norris (spring 2012), 'Controls' of Prof. Lino Guzzella (fall 2011) and 'Calculus 1 & 2' of Prof. Marc Burger (fall 2010 and spring 2011).	

MENTORING EXPERIENCE

Mentor for Morgan Foley in graduate thesis work. Current Position: Fourth year graduate student in Physics at Caltech.	2022 – present
Mentor for Oliver Pranis in summer undergraduate research thesis. Current Position: Physics junior at Caltech.	2021
Mentor for Alex Melennec in master's thesis research. Current Position: Strategy consultant at AI Builders.	2019
Mentor for Fabian Dickhardt in bachelor's thesis research. Current Position: PhD student at MIT	2019
Mentor for Moritz Patriarca in semester thesis research. Current Position: Project engineer at Synhelion SA.	2019
Mentor for Martin Bohnenblust in master's thesis research. Current Position: Emission engineer at WinGD.	2018
Mentor for Preksha Tiwari in master's thesis research. Current Position: R&D engineer at Polariton.	2018
Mentor for Pius Theiler in semester thesis research. Current Position: PhD Student at ETH Zürich.	2016
Mentor for Mehdi Damak in master's thesis research. Current Position: Manager at Simon-Kucher & Partners.	2016

PUBLICATIONS

In Progress

- [1] L. Michaeli, R. Gao, M.D. Kelzenberg, **C.U. Hail**, J.E. Sader, H.A. Atwater, 'Direct Radiation Pressure Measurement for Lightsail Membranes', *under review*, (2024).
- [2] M. Musavinezhad, J. Renger, J. Zirkelbach, T. Utikal, **C.U. Hail**, D. Poulikakos, S. Götzinger, V. Sandoghdar. 'High-resolution cryogenic spectroscopy of single molecules in nanoprinted crystals', *under review*, (2024).

Published In Peer-Reviewed Scientific Journals

- [3] **C.U. Hail**, L. Michaeli, H.A. Atwater. 'Third harmonic generation enhancement and wavefront control with a local high-Q metasurface', *Nano Letters*, (2024).
URL: <https://pubs.acs.org/doi/full/10.1021/acs.nanolett.3c04476>
- [4] R. Sokhoyan, **C.U. Hail**, M. Foley, M.Y. Grajower, H.A. Atwater. 'All-dielectric dynamically tunable transmissive metasurfaces', *Laser & Photonics Reviews*, (2024).
URL: <https://onlinelibrary.wiley.com/doi/full/10.1002/lpor.202300980>
- [5] **C.U. Hail**, M. Foley, R. Sokhoyan, L. Michaeli, H.A. Atwater. 'High quality factor metasurfaces for two-dimensional wavefront manipulation', *Nature Communications* 14(1), p.8476, (2023).
URL: <https://www.nature.com/articles/s41467-023-44164-4>
- [6] M. Li*, **C.U. Hail***, S. Biswas, H.A. Atwater. 'Exitonic beam steering in an active van der waals metasurface'. *Nano Letters*, (2023). *Authors contributed equally.
URL: <https://pubs.acs.org/doi/full/10.1021/acs.nanolett.3c00032>
- [7] P. Thureja, R. Sokhoyan, **C.U. Hail**, J. Sisler, M. Foley, M.Y. Grajower, H.A. Atwater. 'Toward a universal metasurface for optical imaging, communication and computation', *Nanophotonics* 14(7), (2022).
URL: <https://doi.org/10.1515/nanoph-2022-0155>
- [8] M. Li, S. Biswas, **C.U. Hail**, H. Atwater. 'Refractive index modulation in monolayer molybdenum diselenide'. *Nano Letters*, 21(18), (2021).
URL: <https://pubs.acs.org/doi/abs/10.1021/acs.nanolett.1c02199>
- [9] M. J. Grotevent, **C. U. Hail**, S. Yakunin, D. Bachmann, M. Calame, D. Poulikakos, M. V. Kovalenko, I. Shorubalko, 'Colloidal HgTe quantum dot/graphene photodetector with spectral sensitivity beyond 3 μm ' *Advanced Science*, 8(6), (2021).
URL: <https://onlinelibrary.wiley.com/doi/full/10.1002/adv.202003360>
- [10] M. J. Grotevent, **C. U. Hail**, S. Yakunin, D. Bachmann, G. Kara, D. N. Dirin, M. Calame, D. Poulikakos, M. V. Kovalenko, I. Shorubalko, 'Temperature-dependent charge carrier transfer in colloidal quantum dot/graphene infrared photodetectors', *ACS Applied Materials & Interfaces*, (2020).
URL: <https://pubs.acs.org/doi/10.1021/acsami.0c15226>
- [11] **C.U. Hail**, G. Schnoering, M. Damak, D. Poulikakos, H. Eghlidi. 'A Plasmonic painter's method of color mixing for a continuous red-green-blue palette'. *ACS Nano* 14(2), (2020).
URL: <https://pubs.acs.org/doi/10.1021/acs.nano.9b07523>
- [12] **C.U. Hail**, C. Höller, K. Matsuzaki, P. Rohner, J. Renger, V. Sandoghdar, D. Poulikakos, H. Eghlidi. 'Nanoprinting organic molecules at the quantum level', *Nature Communications* 10(1) p.1880, (2019).
URL: <https://www.nature.com/articles/s41467-019-09877-5>
- [13] **C.U. Hail**, A.K.U. Michel, D. Poulikakos, H. Eghlidi. 'Optical metasurfaces: evolving from passive to adaptive', *Advanced Optical Materials* 14(7), (2019).
URL: <https://onlinelibrary.wiley.com/doi/full/10.1002/adom.201801786>
- [14] M.J. Grotevent, **C.U. Hail**, S. Yakunin, D.N. Dirin, K. Thodkar, G.B. Barin, P. Guyot-Sionnest, M. Calame, D. Poulikakos, M. V. Kovalenko, I. Shorubalko. 'Nanoprinted quantum dot – graphene photodetectors', *Advanced Optical Materials*, 11(7), (2019).
URL: <https://onlinelibrary.wiley.com/doi/10.1002/adom.201900019>
- [15] **C.U. Hail**, D. Poulikakos, H. Eghlidi. 'High-efficiency, extreme-numerical-aperture metasurfaces based on partial control of the phase of light', *Advanced Optical Materials* 6(22), (2018).
URL: <https://onlinelibrary.wiley.com/doi/full/10.1002/adom.201800852>
- [16] E. Mitridis, T.M. Schutzius, A. Sicher, **C.U. Hail**, H. Eghlidi, and D. Poulikakos. 'Metasurfaces leveraging solar energy for icephobicity', *ACS Nano* 12(7), (2018).
URL: <https://pubs.acs.org/doi/abs/10.1021/acsnano.8b02719>
- [17] **C.U. Hail**, P. Knodel, J.G. Brisson. 'An internally pressurized gas bearing for thermoacoustic engines', *Tribology International* 99 (2016): 151-158.
URL: <https://www.sciencedirect.com/science/article/pii/S0301679X16000141>

- [18] **C.U. Hail**, P. Knodel, J. Lang, J.G. Brisson. 'Linearly acting variable reluctance generator for thermoacoustic engines', *Energy Conversion and Management* 100 (2015): 168-176.
URL: <https://www.sciencedirect.com/science/article/pii/S0196890415004379>

PATENTS

- [1] M. Li, **C.U. Hail**, S. Biswas, H.A. Atwater., 'Spatial light modulator via amplitude and phase tuning with two-dimensional van der Waals-based metasurface'. Provisional patent, filed March 24, 2023.
- [2] R. Sokhoyan, **C.U. Hail**, M. Foley, M. Grajower, H. A. Atwater, 'All-dielectric high-Q dynamically tunable transmissive metasurfaces'. Provisional patent, filed February 8, 2023.
- [3] P. Thureja, A. W. Nyholm, P.R. Jahelka, **C.U. Hail**, H. A. Atwater, 'Barium titanate based active metasurfaces fabricated using spalling'. Provisional patent, filed November 28, 2022.
- [4] **C.U. Hail**, M. Foley, R. Sokhoyan, L. Michaeli, H. A. Atwater, 'High quality factor metasurfaces for two-dimensional wavefront manipulation'. Provisional patent, filed November 21, 2022.

CONFERENCE PRESENTATIONS

Upcoming presentations

- [1] L. Michaeli, R. Gao, M. Kelzenberg, **C.U. Hail**, J. Sader, H.A. Atwater. 'Direct Measurement of Radiation Pressure Forces on Membrane Lightsails', Oral presentation, Oral presentation, *APS March Meeting*, Minneapolis, USA, 2024.

Oral Presentations

- [2] **C.U. Hail**, L. Michaeli, H.A. Atwater. 'Enhancement and wavefront control of third harmonic generation with a local high-Q metasurface', Oral presentation, *Nanometa, 9th International Topical Meeting on Nanophotonics and Metamaterials*, Seefeld, Austria, 2024.
- [3] **C.U. Hail**, M. Foley, R. Sokhoyan, L. Michaeli, H.A. Atwater. 'High-Q wavefront shaping with higher-order Mie-resonant metasurfaces', Oral presentation, *Nanometa, 9th International Topical Meeting on Nanophotonics and Metamaterials*, Seefeld, Austria, 2024.
- [4] **C.U. Hail**, M. Foley, R. Sokhoyan, H.A. Atwater, 'High-numerical aperture metalenses with high quality factor', Oral presentation, *MRS Fall Meeting*, Boston, USA, 2023.
- [5] M. Li, **C.U. Hail**, S. Biswas, H.A. Atwater. 'Exciton resonances in two-dimensional materials for dynamic wavefront manipulation', Oral presentation, *META 2023*, Paris, France, 2023.
- [6] S. Biswas, J. Wong, S. Seah, M. Li, **C.U. Hail**, H.A. Atwater. '2D materials for near-unity absorption, polarization and phase modulation', Oral presentation, *MRS Spring Meeting*, San Francisco, USA, 2023.
- [7] R. Sokhoyan, **C.U. Hail**, M. Foley, H. A. Atwater, 'All-dielectric high-Q thermo-optically tunable transmissive metasurfaces', Oral presentation, *MRS Spring Meeting*, San Francisco, USA, 2023.
- [8] M. Li, **C.U. Hail**, S. Biswas, H.A. Atwater. 'Active wavefront shaping in transmission from tunable excitonic resonances', Oral presentation, *MRS Spring Meeting*, San Francisco, USA, 2023.
- [9] **C.U. Hail**, M. Foley, R. Sokhoyan, L. Michaeli, H. A. Atwater, 'Local wavefront manipulation with high quality factor metasurfaces', Oral presentation, *APS March Meeting*, Las Vegas, USA, 2023.
- [10] L. Michaeli, R. Gao, M.D. Kelzenberg, **C.U. Hail**, H. A. Atwater, 'Characterization of lightsail light-matter interaction and nonlinear dynamics by microscopic common-path vibrometry', Oral presentation, *APS March Meeting*, Las Vegas, USA, 2023.
- [11] **C.U. Hail**, M. Foley, R. Sokhoyan, H. A. Atwater, 'High quality factor metasurfaces for two-dimensional wavefront manipulation in transmission', Oral presentation, *MRS Fall Meeting*, Boston, USA, 2022.
- [12] M. Li, **C.U. Hail**, S. Biswas, H.A. Atwater. 'Excitonic beam steering in monolayer molybdenum diselenide based active metasurfaces', Oral presentation, *MRS Fall Meeting*, Boston, USA, 2022.
- [13] M. Li, **C.U. Hail**, S. Biswas, H.A. Atwater. 'Experimental demonstration of gate-dependent refractive index and phase modulation in monolayer molybdenum diselenide heterostructures for active metasurfaces', Oral presentation, SPIE Photonics West, *San Francisco*, USA, 2022.
URL: <https://doi.org/10.1117/12.2610029>
- [14] **C.U. Hail**, C. Höller, K. Matsuzaki, P. Rohner, J. Renger, V. Sandoghdar, D. Poulidakos, H. Eghlidi. 'Deterministic nanoprinting of single fluorescent molecules', Oral presentation, *CLEO Conference*, San Jose, USA, 2019.
URL: https://www.osapublishing.org/abstract.cfm?uri=CLEO_QELS-2019-FW3C.5
- [15] **C.U. Hail**, P. Tiwari, D. Poulidakos, H. Eghlidi. 'Metasurfaces, lenses and holograms based on partial control of the phase of light', Oral presentation, *MRS Fall Meeting*, Boston, USA, 2018.

- [16] **C.U. Hail**, D. Poulidakos, H. Eghlidi. 'Metasurfaces and metalenses based on partial control of the phase of light', Oral presentation, *OSA Advanced Photonics Congress*, Zürich, Switzerland, 2018. URL: <https://www.osapublishing.org/abstract.cfm?uri=NOMA-2018-NoW2D.3>
- [17] E. Mitridis, A. Sicher, **C.U. Hail**, H. Eghlidi, T. Schutzius, D. Poulidakos, 'Leveraging solar-energy with plasmonic absorbers for semi-transparent icephobic films', Oral presentation, *MRS Spring Meeting*, Phoenix, USA, 2018.

Poster Presentations

- [18] **C.U. Hail**, C. Höller, K. Matsuzaki, P. Rohner, J. Renger, V. Sandoghdar, D. Poulidakos, H. Eghlidi. 'Nanoprinting molecules at the quantum level', Poster presentation, *Swiss NanoConvention, Lausanne*, Switzerland, 2019.
- [19] **C.U. Hail**, C. Höller, K. Matsuzaki, P. Rohner, J. Renger, V. Sandoghdar, D. Poulidakos, H. Eghlidi. 'Deterministic nanoprinting of single fluorescent molecules', Poster presentation, *MaP Graduate Symposium, ETH Zürich*, Switzerland, 2019.
- [20] **C.U. Hail**, D. Poulidakos, H. Eghlidi. 'Metasurfaces based on partial phase control: flat high-NA immersion lenses', Poster presentation, *Symposium 20 Years Nanooptics*, Erlangen, Germany, 2017.
- [21] **C.U. Hail**, D. Poulidakos, H. Eghlidi. 'Optical metasurfaces for subwavelength resolution imaging', Poster presentation, *Kavli Prize Symposium*, Rüschlikon, Switzerland, 2017.
- [22] **C.U. Hail**, D. Poulidakos, H. Eghlidi. 'Reduced phase gradient metasurfaces for efficient light manipulation', Poster presentation, *Nanometa, 6th International Topical Meeting on Nanophotonics and Metamaterials*, Seefeld, Austria, 2017.

INVITED TALKS

- [23] 'Extreme manipulation of light with structured surfaces: Highly resonant optical materials and mechanical manipulation techniques', Physics Department Seminar, *University of Miami, Coral Gables, FL*, February 2024.
- [24] 'Higher-order Mie-resonant metasurfaces: high-Q wavefront shaping, third harmonic generation and active beam steering', Special Seminar, *Massachusetts Institute of Technology, Cambridge, MA*, November 2023.
- [25] 'Highly resonant optical nanostructures and mechanical manipulation techniques, Department seminar, *College of Optics and Photonics, University of Central Florida, Orlando*, 2023.
- [26] 'Active Metasurfaces for Meta-imaging Systems', Invited talk, *International Conference on Materials for Advanced Technologies (ICMAT)*, Singapore, 2023.
- [27] 'Engineering Light-Matter Interaction at the Nanoscale: Advances in Optical Devices and Manipulation Techniques', Department seminar, *University of Illinois Chicago, Chicago, USA*, 2023.
- [28] 'A Plasmonic Painter's Method of Color Mixing for a Continuous Red-Green-Blue (RGB)', Invited talk, *Max Planck Institute for the Science of Light, Erlangen, Germany*, on February 7th, 2020.

RESEARCH SKILLS

Cleanroom Fabrication: UV lithography, electron beam lithography, evaporation, DC/RF sputtering, atomic layer deposition, chemical vapor deposition, wet etching, dry etching, wire bonding, annealing, dicing.

Laboratory Skills: Designing and building optical microscopes, photon correlation measurements, atomic force microscopy, scanning electron microscopy, probe station, ellipsometry, optical spectrometry, ultrafast laser spectroscopy.

Mechanical Fabrication: Vertical CNC and manual mill, lathe, band saw, horizontal saw, drill press, laser cutter, water jet, 3D printing, soldering, welding, bench tools, bending machine, anodization.

Engineering Software: MATLAB, Python, Mathematica, Lumerical FDTD, Solidworks, NX, AutoCAD, ProEngineer, Ansys, CFX, LabView, Comsol, C++, Fortran, TecPlot, Gaussian.