

# Leland Nordin

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## Education

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- July 2016 – June 2021    **PhD in Electrical Engineering**, The University of Texas at Austin, Austin, TX
- July 2016 – May 2019    **MSE in Electrical Engineering**, The University of Texas at Austin, Austin, TX
- August 2012 – May 2016    **BA in Physics (Honors)**, Grinnell College, Grinnell, IA

## Appointments

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- 2021 – Present    **Postdoctoral Research Fellow** – Mukherjee Group, Stanford University, CA
- 2020 – 2021    **Graduate Research Fellow** – Mid-IR Photonics Lab, UT Austin, TX
- 2016 – 2020    **Graduate Research Assistant** – Mid-IR Photonics Lab, UT Austin, TX
- Summer 2015    **Research Assistant** – The Toor Lab, The University of Iowa, IA
- 2014 – 2016    **Teaching Assistant** – Physics Department, Grinnell College, IA

## Honors and Fellowships

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- 2021 – Present    **Geballe Laboratory for Advanced Materials Postdoctoral Fellowship**
- 2022    **The Ben Streetman prize for “Outstanding Research in Electronic and Photonic Materials and Devices”** from the University of Texas at Austin
- 2020 – 2021    **UT Austin Graduate School University Continuing Graduate Fellowship**
- Thrust 2000 - Jeff Heller Endowed Graduate Fellowship in Engineering**
- 2017 – 2020    **Dr. Brooks Carlton Fowler Endowed Presidential Graduate Fellowship in ECE**
- Spring 2017    **National Science Foundation Graduate Research Fellowship Honorable Mention**
- Spring 2016    **Grinnell College H. George Apostle Prize in Physics**
- 2014 – 2016    **Grinnell College Dean’s List**
- Summer 2015    **Noyce Intel Grant**

## Outreach

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- 2017 – 2020    **Introduce a Girl to Engineering Day at The University of Texas at Austin – Volunteer (Yearly)**
- 2016 – 2017    **Science Thursdays at Bob Bullock Mueseum – Volunteer (Monthly)**
- 2015    **Grinnell Physics’ booth at local STEM outreach event “Poweshiek County STEM Festival” – Organizer**
- Iowa First Nations College of Engineering visit – Student Leader**

## Mentorship

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- Summer 2020    **Jay Yadav, Wrote a robust Matlab function to compute layer by layer absorption given the fields produced from RCWA software**
- Alex Raterink, Modeled heat disipation in thin films of AlN**

## Mentorship (continued)

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- Summer 2019 ■ Cfir Bohm, Constructed a band structure model of In(Ga)Sb quantum dots using nextnano++ commercial software
- Summer 2019 ■ William “Tre” Anderson, Designed, built, and programmed an automated system to map the photoluminescence intensity across a sample’s surface
- Summer 2018 ■ Robert Adkins, Built and aligned a mid-infrared micro photoluminescence setup with in-situ CCD monitoring
- Summer 2018 ■ Chris Johnson, Measured phonon signatures in cryogenically cooled gallium arsenide crystals using differential electronic measurements
- John Le, Built a labview program to operate a mid to far-infrared spectrometer

## Research Publications

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### Journal Articles

- [1] M. Bergthold, P. Petluru, A. Kamboj, **L. Nordin**, A. J. Muhowski, and D. Wasserman, “All-epitaxial ultra-thin long-wave infrared detectors leveraging plasmonic semiconductors”, *Submitted* (2022).
- [2] A. Kamboj, **L. Nordin**, D. N. Woolf, and D. Wasserman, “Room-Temperature Mid-Wave Infrared Guided-Mode Resonance Detectors”, *In review* (2022).
- [3] **L. Nordin** and D. Wasserman, “All-Epitaxial Mid-IR Nanophotonics”, *In review* (2022).
- [4] A. J. Muhowski, A. Kamboj, A. F. Briggs, **L. Nordin**, S. R. Bank, and D. Wasserman, “Cascaded ingasb quantum dot mid-infrared leds”, *Journal of Applied Physics* **131**, 043105 (2022).
- [5] **L. Nordin**, A. J. Muhowski, and D. Wasserman, “High operating temperature plasmonic infrared detectors”, *Applied Physics Letters* **120**, 101103 (2022).
- [6] **L. Nordin**, P. Petluru, A. Kamboj, A. J. Muhowski, and D. Wasserman, “Ultra-thin plasmonic detectors”, *Optica* **8**, 1545–1551 (2021).
- [7] B. B. Haidet, **L. Nordin**, A. J. Muhowski, K. D. Vallejo, E. T. Hughes, J. Meyer, P. J. Simmonds, D. Wasserman, and K. Mukherjee, “Interface structure and luminescence properties of epitaxial PbSe films on InAs(111)A”, *Journal of Vacuum Science & Technology A* **39**, 023404 (2021).
- [8] A. Kamboj, **L. Nordin**, P. Petluru, A. J. Muhowski, D. N. Woolf, and D. Wasserman, “All-epitaxial guided-mode resonance mid-wave infrared detectors”, *Applied Physics Letters* **118**, 201102 (2021).
- [9] J. Meyer, A. J. Muhowski, **L. Nordin**, E. Hughes, B. Haidet, D. Wasserman, and K. Mukherjee, “Bright mid-infrared photoluminescence from high dislocation density epitaxial pbse films on gaas”, *APL Materials* **9**, 111112 (2021).
- [10] **L. Nordin**, P. Petluru, A. J. Muhowski, E. A. Shaner, and D. Wasserman, “All-epitaxial long-range surface plasmon polariton structures with integrated active materials”, *Journal of Applied Physics* **129**, 113102 (2021).
- [11] X. Xu, H. Kwon, S. Finch, J. Y. Lee, **L. Nordin**, D. Wasserman, A. Alù, and A. Dodabalapur, “Reflecting metagrating-enhanced thin-film organic light emitting devices”, *Applied Physics Letters* **118**, 053302 (2021).
- [12] A. F. Briggs, **L. Nordin**, A. J. Muhowski, E. Simmons, P. Dhingra, M. L. Lee, V. A. Podolskiy, D. Wasserman, and S. R. Bank, “Enhanced room temperature infrared LEDs using monolithically integrated plasmonic materials”, *Optica* **7**, 1355–1358 (2020).
- [13] I. Khan, Z. Fang, M. Palei, J. Lu, **L. Nordin**, E. L. Simmons, O. Dominguez, S. M. Islam, H. G. Xing, D. Jena, V. A. Podolskiy, D. Wasserman, and A. J. Hoffman, “Engineering the Berreman mode in mid-infrared polar materials”, *Opt. Express* **28**, 28590–28599 (2020).

- [14] R. H. El-Jaroudi, K. M. McNicholas, A. F. Briggs, S. D. Sifferman, **L. Nordin**, and S. R. Bank, “Room-temperature photoluminescence and electroluminescence of 1.3- $\mu\text{m}$ -range BGaInAs quantum wells on GaAs substrates”, *Appl. Phys. Lett.* **117**, 21102 (2020).
- [15] **L. Nordin**, A. Kamboj, P. Petluru, E. Shaner, and D. Wasserman, “All-Epitaxial Integration of Long-Wavelength Infrared Plasmonic Materials and Detectors for Enhanced Responsivity”, *ACS Photonics* **7**, 1950–1956 (2020).
- [16] A. F. Briggs, **L. Nordin**, A. J. Muhowski, P. Petluru, D. Silva, D. Wasserman, and S. R. Bank, “Mid-infrared electroluminescence from type-II In(Ga)Sb quantum dots”, *Appl. Phys. Lett.* **116**, 061103 (2020).
- [17] K. Li, E. Simmons, A. Briggs, **L. Nordin**, J. Xu, V. Podolskiy, and D. Wasserman, “Subdiffraction Limited Photonic Funneling of Light”, *Advanced Optical Materials* **8**, 2001321 (2020).
- [18] **L. Nordin**, K. Li, A. Briggs, E. Simmons, S. R. Bank, V. A. Podolskiy, and D. Wasserman, “Enhanced emission from ultra-thin long wavelength infrared superlattices on epitaxial plasmonic materials”, *Appl. Phys. Lett.* **116**, *Editor’s Pick* (2020).
- [19] Y. Wang, S. Dev, F. Yang, **L. Nordin**, Y. Wang, A. Briggs, M. Allen, J. Allen, E. Tutuc, and D. Wasserman, “InSb Pixel Loaded Microwave Resonator for High-Speed Mid-Wave Infrared Detection”, *Infrared Physics & Technology* **109**, 103390 (2020).
- [20] O. Dominguez, **L. Nordin**, J. Lu, K. Feng, D. Wasserman, and A. J. Hoffman, “Monochromatic Multimode Antennas on Epsilon-Near-Zero Materials”, *Adv. Opt. Mater.* **7** (2019).
- [21] Z. Dong, R. K. Vinnakota, A. F. Briggs, **L. Nordin**, S. R. Bank, D. A. Genov, and D. Wasserman, “Electrical modulation of degenerate semiconductor plasmonic interfaces”, *J. Appl. Phys.* **126** (2019).
- [22] T. G. Folland, **L. Nordin**, D. Wasserman, and J. D. Caldwell, “Probing polaritons in the mid- to far-infrared”, *J. Appl. Phys.* **125**, *Featured* (2019).
- [23] **L. Nordin**, O. Dominguez, C. M. Roberts, W. Streyer, K. Feng, Z. Fang, V. A. Podolskiy, A. J. Hoffman, and D. Wasserman, “Mid-infrared epsilon-near-zero modes in ultra-thin phononic films”, *Appl. Phys. Lett.* **111** (2017).
- [24] Y. Zhong, Z. Goldenfeld, K. Li, W. Streyer, L. Yu, **L. Nordin**, N. Murphy, and D. Wasserman, “Mid-wave infrared narrow bandwidth guided mode resonance notch filter”, *Opt. Lett.* **42**, 223 (2017).

## Conferences

- [1] **L. Nordin**, J. Meyer, P. Reddy, and K. Mukherjee, “Low growth temperature epitaxial pbse for heterogeneous mid-infrared emitters”, in 64<sup>th</sup> Electronic Materials Conference (June 2022).
- [2] **L. Nordin**, A. J. Muhowski, and D. Wasserman, “High operating temperature plasmonic detectors”, in Compound semiconductor week 2022 (June 2022).
- [3] **L. Nordin**, A. J. Muhowski, and D. Wasserman, “High operating temperature plasmonic detectors”, in 2022 Conf. Lasers Electro-Optics, CLEO 2022 - Proc. (May 2022).
- [4] A. Kamboj, **L. Nordin**, P. Petluru, A. Muhowski, D. Woolf, and D. Wasserman, “Guided-Mode Resonance Enhanced Ultra-Thin HOT Mid-Wave Infrared Detectors”, in 2021 Conf. Lasers Electro-Optics, CLEO 2021 - Proc. (Aug. 2021).
- [5] **L. Nordin**, A. J. Muhowski, P. Petluru, A. Kamboj, and D. Wasserman, “All-Epitaxial Optoelectronic Metasurfaces”, in IEEE RAPID 2021 (Aug. 2021).
- [6] **L. Nordin**, P. Petluru, T. Garrett, A. Kamboj, A. Muhowski, and D. Wasserman, “Ultra-Thin All-Epitaxial Plasmonically Enhanced Long-Wave Infrared Detectors”, in 2021 Conf. Lasers Electro-Optics, CLEO 2021 - Proc. (Aug. 2021).

- [7] E. Simmons, K. Li, A. Briggs, **L. Nordin**, J. Xu, V. A. Podolskiy, and D. Wasserman, “Understanding the Limits of Sub-diffraction Focusing of Light with Photonic Funnel”, in 2021 Conf. Lasers Electro-Optics, CLEO 2021 - Proc. (Aug. 2021).
- [8] Y. Wang, **L. Nordin**, A. J. Muhowski, C. White, P. Petluru, A. Kamboj, S. R. Bank, and D. Wasserman, “High-Speed Long-Wavelength Detector Architectures”, in IEEE RAPID 2021 (Aug. 2021).
- [9] A. F. Briggs, **L. Nordin**, A. J. Muhowski, E. S. Simmons, P. Dhingra, M. L. Lee, V. A. Podolskiy, D. Wasserman, and S. R. Bank, “Enhanced Double Heterostructure Infrared LEDs Using Monolithically Integrated Plasmonic Materials”, in 63<sup>rd</sup> Electronic Materials Conference (June 2021).
- [10] **L. Nordin**, P. Petluru, A. J. Muhowski, E. Shaner, and D. Wasserman, “All-Epitaxial Spectrally Selective Dual-Color Surface Plasmon-Polariton Infrared Detectors”, in 63<sup>rd</sup> Electronic Materials Conference (June 2021).
- [11] P. Petluru, **L. Nordin**, A. J. Muhowski, E. Shaner, and D. Wasserman, “Long-Range Surface Plasmon Polaritons in All-Epitaxial Structures”, in 63<sup>rd</sup> Electronic Materials Conference (June 2021).
- [12] R. C. White, A. J. Muhowski, **L. Nordin**, D. Wasserman, and S. R. Bank, “Growth Optimization of InSbBi Alloys for Wavelength Extension on InSb”, in 63<sup>rd</sup> Electronic Materials Conference (June 2021).
- [13] A. Kamboj, **L. Nordin**, P. Petluru, and D. Wasserman, “Guided-Mode Resonance Enhanced Mid-Wave Infrared Detector”, in IEEE RAPID 2020 (Aug. 2020).
- [14] A. J. Muhowski, A. F. Briggs, L. J. Nordin, A. M. Skipper, P. Petluru, S. R. Bank, and D. Wasserman, “Mid-Wave Infrared Quantum Dot Light Emitting Diodes”, in IEEE RAPID 2020 (Aug. 2020).
- [15] **L. Nordin**, A. Kamboj, P. Petluru, K. Li, A. Briggs, E. Simmons, V. A. Podolskiy, S. R. Bank, and D. Wasserman, “All-Epitaxial Plasmonic Optoelectronics for the Mid-Infrared (**Invited**)”, in IEEE RAPID 2020 (Aug. 2020).
- [16] P. Petluru, Z. Dong, **L. Nordin**, A. Kamboj, and D. Wasserman, “Engineering the Spectral Response of Long-Wave Infrared Detectors”, in IEEE RAPID 2020 (Aug. 2020).
- [17] B. Haidet, E. Hughes, **L. Nordin**, K. Vallejo, P. Simmonds, D. Wasserman, and K. Mukherjee, “Nucleation of IV-VI Rocksalt PbSe and PbSnSe on (001) and (111) Oriented III-V Zincblende Substrates”, in 62<sup>th</sup> Electronic Materials Conference (June 2020).
- [18] Y. Wang, S. Dev, F. Yang, **L. Nordin**, Y. Wang, M. Allen, J. Allen, E. Tutuc, and D. Wasserman, “High-Speed Mid-Infrared Detection Using InSb-Pixel-Loaded Microwave Resonators”, in 62<sup>th</sup> Electronic Materials Conference (June 2020).
- [19] **L. Nordin**, A. Kamboj, P. Petluru, N. Yoon, and D. Wasserman, “All-Epitaxial Integration of Long-wavelength Infrared Plasmonic Materials and Detectors for Enhanced Responsivity”, in 2020 Conf. Lasers Electro-Optics, CLEO 2020 - Proc. (May 2020).
- [20] **L. Nordin**, K. Li, A. Briggs, E. Simmons, S. R. Bank, V. A. Podolskiy, and D. Wasserman, “Enhanced Emission from a Long Wavelength Infrared Emitter”, in Infrared Terahertz Quantum Workshop 2019 (Sept. 2019).
- [21] A. F. Briggs, D. Silva, **L. Nordin**, D. Wasserman, and S. R. Bank, “Tunable InGaSb Emitters Coupled with InAs:Si through Molecular Beam Epitaxy”, in 61<sup>st</sup> Electronic Materials Conference (June 2019).
- [22] A. F. Briggs, A. Kamboj, Z. Dong, **L. Nordin**, D. Wasserman, and S. R. Bank, “Pairing Mid-Infrared Emitters with Epitaxial Epsilon-Near-Zero Metamaterial Grown by Molecular Beam Epitaxy”, in 60<sup>th</sup> Electronic Materials Conference (June 2018).

- [23] K. M. McNicholas, D. J. Ironside, R. H. El-Jaroudi, H. Maczko, G. Cossio, **L. Nordin**, S. D. Sifferman, R. Kudrawiec, E. T. Yu, D. Wasserman, and S. R. Bank, “BGaAs/GaP heteroepitaxy for strain-free luminescent layers on Si”, in 60<sup>th</sup> Electronic Materials Conference (June 2018).
- [24] O. Dominguez, **L. Nordin**, D. Wasserman, and A. J. Hoffman, “Engineering the coupling between the berreman mode and nanobar antennas in epsilon-near-zero materials”, in 2018 Conf. Lasers Electro-Optics, CLEO 2018 - Proc. (2018).
- [25] J. Lu, **L. Nordin**, O. Dominguez, L. Cao, J. Wang, P. Fay, D. Wassermann, and A. J. Hoffman, “Far-Infrared Emission from an Electrically-Injected Semiconductor Device”, in 31<sup>st</sup> Annu. Conf. IEEE Photonics Soc. IPC 2018 (2018).
- [26] O. Dominguez, **L. Nordin**, K. Feng, J. Lu, D. Wasserman, and A. J. Hoffman, “Epsilon-Near-Zero Mode Field Enhancement with Nanoantennas”, in 59<sup>th</sup> Electronic Materials Conference (June 2017).
- [27] D. J. Ironside, A. Skipper, S. March, **L. Nordin**, D. Wasserman, and S. R. Bank, “Epitaxial Integration of High-Contrast Photonic Structures”, in 59<sup>th</sup> Electronic Materials Conference (June 2017).
- [28] **L. Nordin**, O. Dominguez, S. Dev, Z. Dong, A. J. Hoffman, and D. Wasserman, “Strong Absorption from Berreman Modes in Thin AlN Films”, in 59<sup>th</sup> Electronic Materials Conference (June 2017).
- [29] O. Dominguez, **L. Nordin**, K. Feng, J. Lu, D. Wasserman, and A. J. Hoffman, “Exciting localized modes in polar epsilon-near-zero materials”, in 2017 Conf. Lasers Electro-Optics, CLEO 2017 - Proc. (May 2017).
- [30] L. Yu, D. Jung, S. Dev, N. Yoon, **L. Nordin**, A. Hoffman, M. L. Lee, and D. Wasserman, “New sources and sensors for mid- to far-IR optical sensing”, in 2017 Conference on Lasers and Electro-Optics, CLEO 2017 - Proceedings (May 2017).
- [31] A. Asgharzadeh Shishavan, **L. Nordin**, P. Tjossem, M. Abramoff, and F. Toor, “PMMA based ophthalmic contact lens for vision correction of strabismus”, in Proc. spie - int. soc. opt. eng. Vol. 9918 (Sept. 2016).

## Patents

- [1] D. Wasserman, S. Bank, A. Briggs, and **L. Nordin**, *Enhanced room temperature mid-ir leds with integrated semiconductor 'metals'*, Dec. 2021.