Robert Hovden, PhD

Prof. Materials Science & Engineering, Physics

CURRICULUM VITÆ / 2026

University of Michigan, Ann Arbor
hovdenlab.com hovden@umich.edu KF8DKA

EDUCATION

2014	**PhD, Applied Physics (Advisor: David Muller)**	*Cornell University*
2010	**MSc, Applied Physics**	*Cornell University*
2007	**BSc, Physics, summa cum laude**	*Georgia Institute of Technology*

APPOINTMENTS

2024-	**Associate Professor, Materials Science, Physics**	*University of Michigan*	MI
2017-2023	**Assistant Professor, Materials Science**	*University of Michigan*	MI
2014-2017	**Postdoctoral Associate (Mentor: Lena Kourkoutis)**	*Cornell University*	NY
2007-2013	**Research Assistant, Applied Physics**	*Cornell University*	NY
2006, 2005	**Summer Researcher, Computer Science**	*Jet Propulsion Labs*	CA
2004-2007	**Teaching Assistant, Mathematics**	*Georgia Tech*	GA

SELECTED PUBLICATIONS

10 selected / 104 total · h-index 54 · 13,000+ citations · Erdős #4

10. *Melting of Charge Density Waves in Low Dimensions*, J.M. Shen, A. Stangel, S.H. Sung, N. Agarwal, G. Ye, C. Nnokwe, L. Zhao, Y. Zhang, R. He, I. El Baggari, K. Sun, **R. Hovden**, **Matter** **9** (4) (2026)
9. *Ultracold cryogenic TEM with liquid helium and high stability*, E. Rennich, S.H. Sung, N. Agarwal, M. Gates, R. Kerns, **R. Hovden**, I. El Baggari, **Proc. Natl. Acad. Sci. U.S.A.** **122** (36), e2509736122 (2025)
8. *Optimal 3D chemical imaging with multimodal electron tomography*, J. Manassa, W. Millsaps, J. Schwartz, **R. Hovden**, **npj Computational Materials** **11** (1), 275 (2025)
7. *Endotaxial stabilization of 2D charge density waves with long-range order*, S. H. Sung, N. Agarwal, I. El Baggari, P. Kezer, Y.M. Goh, N. Schnitzer, J. M. Shen, T. Chiang, Y. Liu, W. Lu, Y. Sun, L. F. Kourkoutis, J. T. Heron, K. Sun, **R. Hovden**, **Nature Communications** **15**, 1403 (2024)
6. *Imaging 3D chemistry at 1 nm resolution with fused multi-modal electron tomography*, J. Schwartz, Z. Wendy Di, Y. Jiang, J. Manassa, J. Pietryga, Y. Qian, M. G. Cho, J. L. Rowell, H. Zheng, R. D. Robinson, J. Gu, A. Kirilin, S. Rozeveld, P. Ercius, J. A. Fessler, T. Xu, M. Scott, **R. Hovden**, **Nature Communications** **15**, 3555 (2024)
5. *Two-dimensional charge order stabilized in clean polytype heterostructures*, S. H. Sung, N. Schnitzer, S. Novakov, I. El Baggari, X. Luo, J. Gim, N. Vu, Z. Li, T. Brintlinger, Y. Liu, W. Lu, Y. Sun, P. Deotare, K. Sun, L. Zhao, L. F. Kourkoutis, J. T. Heron, **R. Hovden**, **Nature Communications** **13**, 413 (2022)
4. *Robotic Four-Dimensional Pixel Assembly of van der Waals Solids*, A. J. Mannix, A. Ye, S. H. Sung, A. Ray, F. Mujid, C. Park, M. Lee, J. H. Kang, R. Shreiner, A. A. High, D. A. Muller, **R. Hovden**, J. Park, **Nature Nanotechnology** **17**, 361 (2022)
3. *Magnetic anisotropy reversal driven by structural symmetry-breaking in monolayer α-RuCl3*, B. Yang, Y. M. Goh, S.H. Sung, G. Ye, S. Biswas, D.A.S. Kaib, R. Dhakal, S. Yan, C. Li, S. Jiang, F. Chen, H. Lei, R. He, R. Valentí, S.M. Winter, **R. Hovden**, A.W. Tsen, **Nature Materials** **22**, 50-56 (2023)
2. *Imaging of nanoscale polar textures in quantum paraelectric $SrTiO_3$*, Y. Zhang, S.H. Sung, N. Agarwal, M. Gates, C. Li, P. Yu, **R. Hovden**, I. El Baggari, **Nature** **656**, 54–59 (2026)
1. *Limits of Three-Dimensional Resolution and Dose for Aberration-Corrected Electron Tomography*, R. Yalisove, S.H. Sung, P. Ercius, **R. Hovden**, **Physical Review Applied** **15**, 014003 (2021)

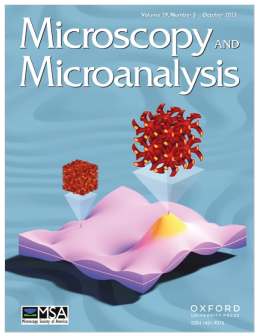
INVITED TALKS

48. *DOE Oak Ridge Materials Colloquium*, **ORNL**, Jan. 2026
47. *Liquid Helium Cryogenic TEM below 1 Å*, **2nd Annual Rice University Center for Nanoscale Imaging Sciences Conference**, Rice University, Nov. 2025
46. *Pushing Atoms by Picometers in Low Dimensional Materials*, **Department Seminar, Materials Science, U.I.U.C.**, Jan. 2025
45. *Chemical Electron Tomography at Lower Dose and Higher Resolution*, **Department Seminar, Chemistry, University of Waterloo**, Nov. 2024
44. *Pushing Atoms by Picometers in Low Dimensional Materials*, **Department Seminar, Materials Science, Northwestern**, Nov. 2024
43. *DOE Cryo-EM (ICE) Workshop for Advanced Materials*, **ORNL**, July 2024
42. *Seeing Charge Density Waves with Low Temperature STEM*, **Lena F. Kourkoutis Memorial Symposium, Cornell University**, June 2024
41. *Pushing Atoms by Picometers in Low Dimensional Materials*, **Condensed Matter Department Seminar, Physics, GaTech**, Mar. 2024
40. *Pushing Atoms by Picometers*, **Condensed Matter Department Seminar, Physics, U.C. Irvine**, Feb. 2024
39. *Fused Multi-Modal Electron Microscopy and Tomography*, **International Microscopy Conference**, Sept. 2023
38. *The Structure of Charge Density Waves in TaS2 Across Temperature and Dimensionality*, **Microscopy & Microanalysis**, Aug. 2023
37. *Periodic Lattice Distortions in Low Dimensional Materials*, **Wayne State Physics Seminar**, Feb. 2023
36. *Real-Time 3D Analysis During Electron Tomography Experiments*, **MIT Automation, AI, and Machine Learning in Electron Microscopy**, Nov. 2022
35. *Periodic Lattice Distortions in Low Dimensional Materials*, **AVS 68**, Pittsburgh PA, Nov. 2022
34. *Measuring with Pixels and Voxels*, **Open Metrology, MIT Center for Bits and Atoms**, Aug. 2022
33. *Periodic Lattice Distortions in Low Dimensional Materials*, **University of Michigan Department of Physics, Condensed Matter–Quantum Computing Seminars**, Apr. 2022
32. *Stabilizing 2D Charge Density Waves using Confined TaS2 Polytypes*, **3rd Joint Annual Meeting of the IEEE Magnetics Society and Nanotechnology Council**, COVID, Dec. 2021
31. *2D Electronic Order Stabilized in Clean Polytype Heterostructures*, **LBL Molecular Foundry Seminar**, COVID, Sept. 2021
30. *Room-Temperature Stabilization of Commensurate 2D Charge Density Waves in Confined TaS2 Polytypes*, **IEEE RAPID**, COVID, Aug. 2021
29. *Linear Imaging Theory*, **Cornell University NSF-PARADIM Summer School and Workshop on Electron Microscopy**, COVID, June 2021
28. *Defining Theoretical Limits of Aberration-Corrected Electron Tomography: New Bounds for Resolution, Object Size, and Dose*, **APS March Meeting**, COVID, Mar. 2021
27. *Room-Temperature Stabilization of Commensurate 2D Charge Density Waves in Confined TaS2 Polytypes*, **Cornell University NSF-PARADIM User Meeting**, COVID, Dec. 2020
26. *Electron Tomography for Functional Nanomaterials*, Robert Hovden, University of Michigan, **MRS OnDemand Webinar Series**, Apr. 2020 (560 attendees)
25. *Maximal Resolution from the Ronchigram: Human vs. Deep Learning*, **AI for Atoms, Oak Ridge National Lab**, Dec. 2020
24. *Defining Theoretical Limits of Aberration-Corrected Electron Tomography: New Bounds for Resolution, Object Size, and Dose*, **APS March Meeting**, Denver CO, Mar. 2020 *(cancelled COVID-19)*
23. *Probing Atomic Structure Across Higher Dimensional Materials Using sub-Angstrom Electron Beams*, **Physics Colloquium at Wayne State University**, Detroit MI, Jan. 2020
22. *Defining Theoretical Limits of Aberration-Corrected Electron Tomography: New Bounds for Resolution, Object Size, and Dose*, **Frontiers of Electron Microscopy and Materials Science**, Asheville NC, Sept. 2019
21. *From 2D to 3D with High-Resolution Electron Tomography and Live Reconstruction*, **Leadership Computer Facility, Argonne National Lab**, Lemont IL, July 2019
20. *Probing Atomic Lattice Distortions Across Scale & Dimensions with sub-Angstrom Electron Beams*, **Dow Chemical**, Midland MI, Dec. 2018
19. *Determining Atomic Structure from 2D to 3D with High-Energy Electron Beams*, **Midwest Imaging and Microanalysis Workshop at Notre Dame**, Notre Dame University, May 2018
18. *Removing Stripes, Scratches, and Curtaining with Irrecoverable Compressed Sensing*, Jonathan Schwartz and Robert Hovden, **11th Annual FIB-SEM Workshop**, Canadian Centre for Electron Microscopy, McMaster University, May 2018

17. *Probing Atomic Structure across Scale and Dimensions with Highly Convergent Electron Beams* [Keynote], **Michigan Microscopy & Microanalysis Society**, Ann Arbor MI, Nov. 2017
16. *Applications of Advanced Electron Microscopy Methods in Materials/Chemistry Research*, **McMaster University**, Hamilton ON, June 2017
15. *Reconstruction Algorithms and Data Processing for Nanoscale Tomography*, **Canadian Centre for Electron Microscopy**, Hamilton ON, June 2017
14. *Tomography Practical Aspects*, **Cornell University PARADIM Summer School and Workshop on Electron Microscopy**, Ithaca NY, 2017
13. *Linear Imaging Theory*, **Cornell University PARADIM Summer School and Workshop on Electron Microscopy**, Ithaca NY, June 2017
12. *Probing Atomic Structure Across Scale and Dimensions with sub-Angstrom Electron Beams*, **Applied Physics Program at the University of Michigan**, Mar. 2017
11. *Probing Atomic Structure Across Scale and Dimensions with sub-Angstrom Electron Beams*, **Department of Materials Science, University of Michigan**, Mar. 2016
10. *Structure, Symmetry, and Stacking of 2D Materials*, **University of Pennsylvania Department of Materials Science Colloquium**, Feb. 2016
9. *Determining Atomic Structure in 3D with the Modern Electron Microscope*, **NION Inc.**, Kirkland WA, Feb. 2016
8. *Atomic Imaging of 2D and 3D Materials with Scanning Transmission Electron Microscopy*, **Portland State Physics Colloquium**, Portland OR, Feb. 2016
7. *Observing Symmetry and Stacking Order in 2D Materials with Electron Microscopy*, **Molecular Foundry at Lawrence Berkeley Lab**, Berkeley CA, Jan. 2016
6. *Atomic Imaging of 2D and 3D Materials with Scanning Transmission Electron Microscopy*, **Naval Research Lab**, Washington DC, Oct. 2014
5. *When Art Exceeds Perception*, **CCA Biennial Symposium: Intimate Cosmologies**, Ithaca NY, Sept. 2014
4. *Artifact Reduction in Fourier Analysis of Atomic Resolution Images / The Cornell Spectrum Imager*, **NION International Workshop on Electron Microscopy Software**, Iceland, Mar. 2014
3. *Open-Source Visualization of 3D Data: From Tomography to Spectroscopy*, **Kitware Inc.**, Albany NY, Mar. 2014
2. *Imaging Limitations from 2D to 3D in Scanning Transmission Electron Microscopes*, **NION Inc.**, Kirkland WA, Sept. 2013
1. *3D and Spectroscopic Characterization of Devices at the Atomic Scale Using Aberration-Corrected Electron Microscopy*, **Frontiers of Characterization and Metrology for Nanoelectronics at NIST**, Gaithersburg MD, Mar. 2013

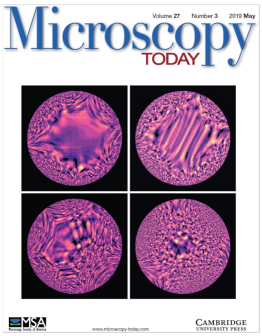
COVER ART

Matter
9(4) / 2026

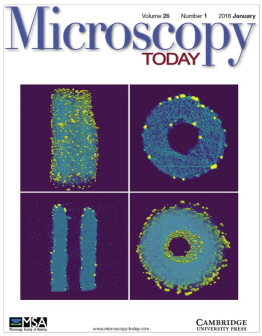


Microsc. & Microanal.
29(5) / 2023

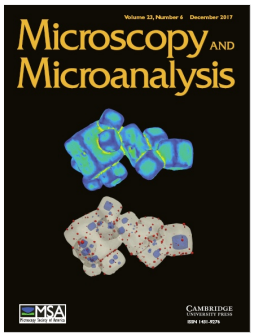
Nature
615(7952) / 2023



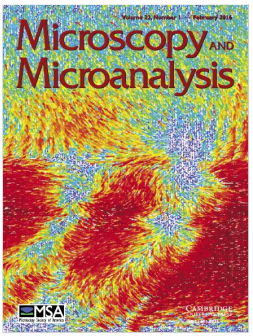
Microscopy Today
27(3) / 2019



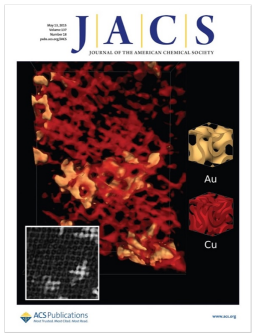
Microscopy Today
26(1) / 2018



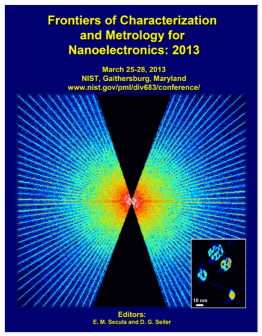
Microsc. & Microanal.
23(6) / 2017



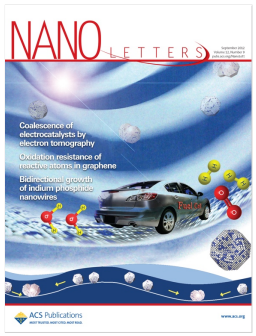
Microsc. & Microanal.
22(1) / 2016



J. Am. Chem. Soc.
137(18) / 2015



FCMN Proceedings
2013



Nano Letters
12(9) / 2012

SCIENTIFIC PUBLICATIONS

2026

104. *Probing first-cycle electrochemical kinetics and discontinuities in NMC cathodes using single-particle electrochemistry*, J. Lim, M. Krishna, W. Suk, J. Min, J. Günther, **R. Hovden**, Y. Li, **Journal of Materials Chemistry A** **14** (53), 36316–36326 (2026).

103. *Imaging of nanoscale polar textures in quantum paraelectric $SrTiO_3$*, Y. Zhang, S.H. Sung, N. Agarwal, M. Gates, C. Li, P. Yu, **R. Hovden**, I. El Baggari, **Nature** **656**, 54–59 (2026).

102. *Imaging of a van der Waals spin-orbit torque system using spin ensembles in hBN*, X. Zhang, J. Zhou, C. Hu, P.Y. Cai, K. Deng, C. Wang, N. Agarwal, H. Jin, F.A. Al-Matouq, S. Xu, R.S. Trivedi, S. Li, S. Rathi, H. Lu, Z. Jiang, V. Taufour, **R. Hovden**, L. Zhao, R. Cheng, X. Xu, E.J.G. Santos, J.-H. Chu, C.R. Du, H. Wang, **Nature Communications** **17**, 7350 (2026).

101. *Melting point depression of the charge density wave in 1T-$TiSe_2$ due to size effects*, S. Siddique, M.T. Kiani, O. Lesser, S.D. Funni, N. Agarwal, M. Gates, M. Shah, W. Millsaps, S.H. Sung, N. Schnitzer, L. Bhatt, D.A. Muller, **R. Hovden**, I. El Baggari, E.-A. Kim, J.J. Cha, **Physical Review B** **113** (22), 224106 (2026).

100. *Tunable symmetry breaking in a hexagonal-stacked moiré magnet*, Z. Sun, G. Ye, X. Wan, N. Mao, C. Nnokwe, S. Li, N. Agarwal, S. Sarkar, Z. Zhai, B. Lv, **R. Hovden**, C.R. Du, Y. Zhang, K. Sun, R. He, L. Zhao, **Nature Physics** **22**, 870–876 (2026).

99. *Melting of Charge Density Waves in Low Dimensions*, J.M. Shen, A. Stangel, S.H. Sung, N. Agarwal, G. Ye, C. Nnokwe, L. Zhao, Y. Zhang, R. He, I. El Baggari, K. Sun, **R. Hovden**, **Matter** **9** (4), 102665 (2026).

98. *Strain mapping of three-dimensionally structured two-dimensional materials*, A. Mireles, J. Park, S.H. Sung, C. Shi, B. Shin, J. Lou, C. Ophus, **R. Hovden**, K. Kang, Y. Han, **Science Advances** **12** (9), eadz7908 (2026).

97. *Emergent ferromagnetism and unusual irreversible magnetoresistance in an intercalated van der Waals antiferromagnet*, Z. Zhai, W. Liu, X. Guo, D.J. Schulze, T.-W. Kuo, N. Agarwal, A. Stangel, P. Joshi, J.P. Liu, L. Deng, **R. Hovden**, L. Zhao, C.-W. Chu, B. Lv, **Proc. Natl. Acad. Sci. U.S.A.** **123** (4), e2527293123 (2026).

96. *Delayed 1T to 2H phase transition upon electrochemical delithiation of $LiMoS_2$*, Y. Hong, J. Lim, J. Min, N. Agarwal, **R. Hovden**, A.A. Bol, Y. Li, **Physical Review Materials** **10** (1), 014002 (2026).

2025

95. *Liquid Helium Cryogenic TEM below 1 Å*, S.H. Sung, M. Gates, N. Agarwal, Y. Zhang, W. Millsaps, M. Shah, E. Rennich, C. Li, P. Yu, M. Chi, B.H. Savitzky, I. El Baggari, **R. Hovden**, **arXiv**:**2509.12475** (2025)
94. *Ultracold cryogenic TEM with liquid helium and high stability*, E. Rennich, S.H. Sung, N. Agarwal, M. Gates, R. Kerns, **R. Hovden**, I. El Baggari, **Proc. Natl. Acad. Sci. U.S.A.** **122** (36), e2509736122 (2025)
93. *Quantitative approaches for multiscale structural analysis with atomic resolution electron microscopy*, N. Schnitzer, L. Bhatt, I. El Baggari, **R. Hovden**, B.H. Savitzky, M.A. Smeaton, B.H. Goodge, **Physical Review Materials** **9** (9), 093802 (2025)
92. *Strain in Core-Shell Spinel Nanocrystals Enhances ORR Activity*, J.L. Rowell, A. Joshi, H. Tan, D. Yoon, J. Manassa, A. Stangel, C. Bundschu, Y. Jia, H.D. Abruña, **R. Hovden**, D.A. Muller, R.D. Robinson, **ACS Catalysis** **15** (11), 9738-9748 (2025)
91. *Optimal 3D chemical imaging with multimodal electron tomography*, J. Manassa, W. Millsaps, J. Schwartz, **R. Hovden**, **npj Computational Materials** **11** (1), 275 (2025)

2024

90. *In-Plane Chirality Control of a Charge Density Wave by Means of Shear Stress*, W. Qi, S. Ponzoni, G. Huitric, R. Grasset, Y. Laplace, L. Cario, A. Zobelli, M. Marsi, E. Papalazarou, A. Alekhin, Y. Gallais, A. Bendounan, S. H. Sung, N. Schnitzer, B. H. Goodge, **R. Hovden**, L. Perfetti, **Advanced Materials** **36**, 2410950 (2024)
89. *Native Defects Hybridization and Electronic Transport in Cu2Se-CuGaSe2 Hierarchical Composites*, Z. Yin, Y. Zhang, Y. Huang, J. Schwarz, Z. Xi, C. Uher, **R. Hovden**, L. Qi, P.F.P. Poudeu, **Advanced Functional Materials** **34**, 2408063 (2024)
88. *Extraordinary phase transition revealed in a van der Waals antiferromagnet*, X. Guo, W. Liu, J. Schwartz, S.H. Sung, D. Zhang, M. Shimizu, A.L.N. Kondusamy, L. Li, K. Sun, H. Deng, H. O. Jeschke, I. I. Mazin, **R. Hovden**, B. Lv, L. Zhao, **Nature Communications** **15**, 6472 (2024)
87. *Observation of stacking engineered magnetic phase transitions within moire supercells of twisted van der Waals magnets*, S. Li, Z. Sun, N. J. McLaughlin, A. Sharmin, N. Agarwal, M. Huang, S. H. Sung, H. Lu, S. Yan, H. Lei, **R. Hovden**, H. Wang, H. Chen, L. Zhao, C. R. Du, **Nature Communications** **15**, 5712 (2024)
86. *Elastic plate basis for the deformation and electron diffraction of twisted bilayer graphene on a substrate*, C. Mook-Ki, S.H. Sung, **R. Hovden**, E. B. Tadmor, **Physical Review B** **110**, 024116 (2024)
85. *Imaging 3D chemistry at 1 nm resolution with fused multi-modal electron tomography*, J. Schwartz, Z. Wendy Di, Y. Jiang, J. Manassa, J. Pietryga, Y. Qian, M. G. Cho, J. L. Rowell, H. Zheng, R. D. Robinson, J. Gu, A. Kirilin, S. Rozeveld, P. Ercius, J. A. Fessler, T. Xu, M. Scott, **R. Hovden**, **Nature Communications** **15**, 3555 (2024)
84. *Endotaxial stabilization of 2D charge density waves with long-range order*, S. H. Sung, N. Agarwal, I. El Baggari, P. Kezer, Y.M. Goh, N. Schnitzer, J. M. Shen, T. Chiang, Y. Liu, W. Lu, Y. Sun, L. F. Kourkoutis, J. T. Heron, K. Sun, **R. Hovden**, **Nature Communications** **15**, 1403 (2024)

2023

83. *Revealing intrinsic domains and fluctuations of moire magnetism by a wide-field quantum microscope*, M. Huang, Z. Sun, G. Yan, H. Xie, N. Agarwal, G. Ye, S. H. Sung, H. Lu, J. Zhou, S. Yan, S. Tian, H. Lei, **R. Hovden**, R. He, H. Wang, L. Zhao, C. R. Du, **Nature Communications** **14**, 5259 (2023)
82. *Evidence of non-collinear spin texture in magnetic moire superlattices*, H. Xie, X. Luo, Z. Ye, Z. Sun, G. Ye, S. H. Sung, H. Ge, S. Yan, Y. Fu, S. Tian, H. Lei, K. Sun, **R. Hovden**, R. He, L. Zhao, **Nature Physics** **19**, 1150 (2023)
81. *On Infinite Series of Bessel Functions of the First Kind*, S.H. Sung, **R. Hovden**, **arXiv**:**2211.01148** (2023)
80. *Autonomous Electron Tomography Reconstruction with Machine Learning*, W. Millsaps, J. Schwartz, Z. W. Di, Y. Jiang, **R. Hovden**, **Microscopy and Microanalysis** **29**, 1650-1657 (2023)
79. *Photonically Active Bowtie Nanoassemblies with Chirality Continuum*, P. Kumar, T. Vo, M. Cha, A. Visheratina, J. Kim, W. Xu, J. Schwartz, A. Simon, D. Katz, V.P. Nicu, E. Marino, W. Choi, M. Veksler, S. Chen, C. Murray, **R. Hovden**, S. Glotzer, N.A. Kotov, **Nature** **615**, 418-424 (2023)
78. *Ferrorotational domain walls revealed by electric quadrupole second harmonic generation microscopy*, X. Guo, R. Owen, A. Kaczmarek, X. Fang, C. De, Y. Ahn, W. Hu, N. Agarwal, S.H. Sung, **R. Hovden**, S.W. Cheong, L. Zhao, **Physical Review B** **107**, L180102 (2023)
77. *Magnetic anisotropy reversal driven by structural symmetry-breaking in monolayer α-RuCl3*, B. Yang, Y. M. Goh, S.H. Sung, G. Ye, S. Biswas, D.A.S. Kaib, R. Dhakal, S. Yan, C. Li, S. Jiang, F. Chen, H. Lei, R. He, R. Valentí, S.M. Winter*, **R. Hovden***, A.W. Tsen*, **Nature Materials** **22**, 50-56 (2023)
76. *Batch Production of High-Quality Graphene Grids for Cryo-EM: Cryo-EM Structure of Methylococcus capsulatus Soluble Methane Monooxygenase Hydroxylase*, E. Ahn, B.Kim, S. Park, A.L. Erwin, S.H. Sung, **R. Hovden**, S. Mosalaganti, U.S. Cho, **ACS Nano** **17**, 6011 (2023)

2022

75. *Torsional Periodic Lattice Distortions and Diffraction of Twisted 2D Materials*, S. H. Sung, Y.M. Goh, H. Yoo, R. Engelke, H. Xie, K. Zhang, Z. Li, A. Ye, P.B. Deotare, E.B. Tadmor, A.J. Mannix, J. Park, L. Zhao, P. Kim, **R. Hovden**, **Nature Communications** **13**, 7826 (2022)
74. *Real-time 3D analysis during electron tomography using tomviz*, J. Schwartz, C. Harris, J. Pietryga, H. Zheng, P. Kumar, A. Visheratina, N. A. Kotov, B. Major, P. Avery, P. Ercius, U. Ayachit, B. Geveci, D.A. Muller, A. Genova, Y. Jiang, M. Hanwell, **R. Hovden**, **Nature Communications** **13**, 4458 (2022)
73. *A Three-Stage Magnetic Phase Transition Revealed in Ultrahigh-Quality van der Waals Bulk Magnet CrSBr*, W. Liu, X. Guo, J. Schwartz, H. Xie, N. U. Dhale, S. H. Sung, A. L. N. Kondusamy, X. Wang, H. Zhao, D. Berman, **R. Hovden**, L. Zhao, B. Lv, **ACS Nano** **16**, 15917 (2022)
72. *Scalable Synthesis of Monolayer Hexagonal Boron Nitride on Graphene with Giant Bandgap Renormalization*, P. Wang, W. Lee, J. P. Corbett, W. H. Koll, N. M. Vu, D. A. Laleyan, Q. Wen, Y. Wu, A. Pandey, J. Gim, D. Wang, D. Y. Qiu, **R. Hovden**, M. Kira, J. T. Heron, J. A. Gupta, E. Kioupakis, Z. Mi, **Advanced Materials**, 2201387 (2022)
71. *Imaging Atomic-Scale Chemistry from Fused Multi-Modal Electron Microscopy*, J. Schwartz, Z. Di, Y. Jiang, A. Fielitz, D. Ha, S. Perera, I. El Baggari, R. Robinson, J. Fessler, C. Ophus, S. Rozeveld, **R. Hovden**, **npj Computational Materials** **8**, 16 (2022)
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PATENTS AND COMMERCIALIZED TECHNOLOGIES

4. **Liquid-helium electron microscopy specimen holder.** PCT/US2023/063942. U.S. Design Patent Application No. 29/927,197. Enables ultracold TEM operation while preserving the mechanical stability required for high-resolution imaging. Inventors: Ismail El Baggari (Harvard University), Emily Rennich (Harvard University), and Robert Hovden (University of Michigan).
3. **Recovering atomic-scale chemistry from fused multimodal electron microscopy.** Fuses complementary electron-microscopy modalities to reconstruct atomic-scale chemical information. Inventors: R. Hovden and J. Schwartz (University of Michigan); Y. Jiang and Z. Wendy Di (Argonne National Laboratory); and S. Rozeveld (Dow).
2. **Electron Microscope Detector (EM-PAD) for STEM.** Docket D-7319. Inventors: Sol M. Gruner, David A. Muller, Kayla X. Nguyen, Prafull Purohit, Mark W. Tate, Katherine Shanks, Hugh Phillipp, and Robert Hovden. **Commercialized through a worldwide license to Thermo Fisher Scientific.**
1. **tomviz: 3D scientific analysis and visualization platform** *(200,000+ downloads across GitHub releases and conda-forge).* Co-founded tomviz to make advanced electron tomography practical during and beyond the microscope session. The cross-platform system delivers end-to-end workflows for reconstruction, segmentation, quantitative analysis, and interactive 3D visualization, including real-time experimental feedback and reproducible offline processing independent of proprietary microscope workstations.

BOOKS

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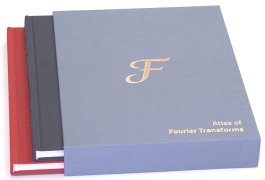

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PRIME NUMBERS DISCOVERED

$850825168695 \times 2^{1290000} - 1, \quad 7905 \times 2^{1216342} + 1, \quad 9125 \times 2^{1186051} + 1$

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PROFESSIONAL SERVICE

Current and past professional service spans scientific societies and their subcommittees, principally MSA and APS. Roles include chairing and organizing symposia for APS, Microscopy & Microanalysis, Gordon Research Conferences, and other scientific meetings, as well as serving on proposal-review committees for DOE and NSF. Service at the University of Michigan has included a range of departmental and institutional committees and advisory boards.

Reviewer for *Nature*, *Nature Materials*, *Nature Computer Science*, *Nature Communications*, *Nano Letters*, and several others.

Board of Directors for *Ithaca Voice*, the most read newspaper in central NY (2014-2017)