

Exponent®
Engineering & Scientific Consulting

Valerie Hsieh, Ph.D.

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Professional Profile

Dr. Hsieh is an experimental physicist with expertise in nanoscale characterization, scanning probe microscopy, and semiconductor physics. Her experience spans multiple areas, including materials synthesis, device fabrication, surface metrology, and nanoscale electronic characterization.

Dr. Hsieh has extensive experience with electron-beam lithography, thin-film deposition, etching, and device integration, as well as experimental troubleshooting across fabrication and measurement workflows. She has a strong foundation in materials growth and optical characterization, using atomic force microscopy and X-ray diffraction to assess film quality and defects in complex oxides grown using pulsed-layer deposition. She additionally has hands-on experience with optical and spectroscopic techniques supporting studies of electronic and excitonic behavior in low-dimensional systems.

Prior to joining Exponent, Dr. Hsieh completed her Ph.D. at Columbia University, where her research focused on using advanced atomic force microscopy techniques to study graphene-based moiré heterostructures and other two-dimensional materials. Her work leveraged nanoscale characterization to probe electronic and mechanical properties in complex material systems, combining precision experimentation with quantitative data analysis pipelines.

Academic Credentials & Professional Honors

Ph.D., Physics, Columbia University in the City of New York, 2025

M.Phil., Physics, Columbia University in the City of New York, 2023

M.A., Physics, Columbia University in the City of New York, 2022

B.A., Physics, University of California, Berkeley, 2020

B.A., German, University of California, Berkeley, 2020

Columba Physics, Allan M. Sachs Teaching Award, 2025

Materials Research Society, Science as Art Award, 2023

US Department of Energy, Graduate Fellow, 2020

Academic Appointments

Lecturer, Physics, Columbia University, 2023–2025

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Senior Lead Teaching Fellow, Center for Teaching and Learning, Columbia University, 2022–2023

Teaching Assistant, Physics, Columbia University, 2020–2022

Publications

Olsen N, Yoon S, Holbrook M, Thinel M, Holtzman LN, Liu Y, Hsieh V, Li Y, Xu DD, Rojas-Gatjens E, Gavilanes D, Handa T, Arsenault EA, Huang CY, Guo Y, Dean CR, Barmak K, Pasupathy AN, Hone JC, Zhu X. Macroscopic transition metal dichalcogenide monolayers from gold-tape exfoliation retain intrinsic properties. Nano Letters 2025;25(42):15198–205.

DiScala MF, Hsieh V, Jessen BS, Gu Y, Rizzo DJ, Amontree JM, Yan X, Wang Q, Kapfer M, Kim T, Geiwitz M, Natale G, Pelliciari J, Hone JC, Burch KS, Basov DN, Dean CR, Bisogni V, Plumb KW. Characterizing sample degradation from synchrotron based X-ray measurements of ultra-thin exfoliated flakes. Frontiers in Electronic Materials. 2025; 5:1572940.

Vitalone RA, Jessen BS, Jing R, Rizzo DJ, Xu S, Hsieh V, Cothrine M, Mandrus DG, Wehmeier L, Carr GL, Bisogni V, Dean CR, Hone JC, Liu M, Weinstein MI, Fogler MM, Basov DN. Charge transfer plasmonics in bespoke graphene/α-RuCl3 cavities. ACS nano. 2024 Oct 18;18(43):29648–57.

Kapfer M, Jessen BS, Eisele ME, Fu M, Danielsen DR, Darlington TP, Moore SL, Finney NR, Marchese A, Hsieh V, Majchrzak P, Jiang Z, Biswas D, Dudin P, Avila J, Watanabe K, Taniguchi T, Ulstrup S, Bøggild P, Schuck PJ, Basov DN, Hone JC, Dean CR. Programming twist angle and strain profiles in 2D materials. Science. 2023; 381(6658):677–81.

Hsieh V, Halbertal D, Finney NR, Zhu Z, Gerber E, Pizzochero M, Kucukbenli E, Schleder GR, Angeli M, Watanabe K, Taniguchi T, Kim EA, Kaxiras E, Hone JC, Dean CR, Basov DN. Domain-dependent surface adhesion in twisted few-layer graphene: platform for moiré-assisted chemistry. Nano Letters. 2023; 23(8):3137–43.

Halbertal D, Turkel S, Ciccarino CJ, Profe JB, Finney N, Hsieh V, Watanabe K, Taniguchi T, Hone JC, Dean CR, Narang P, Pasupathy AN, Kennes DM, Basov DN. Unconventional non-local relaxation dynamics in a twisted trilayer graphene moiré superlattice. Nature Communications. 2022; 13(1):7587.

Halbertal D, Klebl L, Hsieh V, Cook J, Carr S, Bian G, Dean CR, Kennes DM, Basov DN. Multilayered atomic relaxation in van der Waals heterostructures. Physical Review X. 2023; 13(1):011026.

Chen S, He M, Zhang YH, Hsieh V, Fei Z, Watanabe K, Taniguchi T, Cobden DH, Xu X, Dean CR, Yankowitz M. Electrically tunable correlated and topological states in twisted monolayer–bilayer graphene. Nature Physics. 2021;17(3):374–80.

Presentations

Hsieh V. Probing graphene heterostructures with atomic force microscopy techniques. Invited speaker, Inaugural Edgerton Merrill Colloquium, Columbia University, New York NY, 2025.

Hsieh V, Halbertal D, Finney NR, Zhu Z, Gerber E, Pizzochero M, Kucukbenli E, Schleder GR, Angeli M, Watanabe K, Taniguchi T, Kim EA, Kaxiras E, Hone JC, Dean CR, Basov DN. Domain-dependent surface adhesion in twisted few-layer graphene. Oral presentation, American Physical Society March Meeting, Las Vegas, NV, 2023.

Hsieh V, Halbertal D, Finney NR, Zhu Z, Gerber E, Pizzochero M, Kucukbenli E, Schleder GR, Angeli M, Watanabe K, Taniguchi T, Kim EA, Kaxiras E, Hone JC, Dean CR, Basov DN. Domain-dependent surface adhesion in twisted few-layer graphene. Oral presentation, Materials Research Society Spring Meeting, San Francisco, CA, 2023.

Hsieh V, Chen S, Dean CR, Yankowitz M. Understanding correlated physics in twisted monolayer-bilayer graphene systems. Poster presentation, Columbia University Materials Research REU Symposium, New York, NY, 2019.

Peer Reviews

Nano Letters