

Curriculum Vitae

Steven J. Koester, Ph.D.

Academic Rank

Professor, Electrical & Computer Engineering
University of Minnesota-Twin Cities

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Education

- 1995-1997 Postdoctoral Researcher, IBM T. J. Watson Research Center, Yorktown Heights, New York
- 1991-1995 Ph.D., Electrical & Computer Engineering, University of California, Santa Barbara, California
Dissertation: Quantized Conductance in InAs/AlSb Ballistic Constrictions, Dr. Evelyn L. Hu, Advisor
Committee: Drs. Evelyn L. Hu, Herbert Kroemer, Nadir Dagli, James Allen
- 1989-1991 M.S.E.E., University of Notre Dame, Notre Dame, Indiana
Thesis: Fabrication of Ultrasmall Single-Electron Tunnel Junctions by Electron-Beam Lithography, Dr. Gary H. Bernstein, Advisor
- 1985-1989 B.S.E.E., University of Notre Dame, Notre Dame, Indiana

Positions

- 2021-pres Director, Minnesota Nano Center, University of Minnesota-Twin Cities, Minneapolis, Minnesota
- 2020-2021 Director Designate, Minnesota Nano Center, University of Minnesota-Twin Cities, Minneapolis, Minnesota
- 2019-pres Graduate Faculty, Mechanical Engineering, University of Minnesota-Twin Cities, Minneapolis, Minnesota
- 2012-pres Graduate Faculty, Biomedical Engineering, University of Minnesota-Twin Cities, Minneapolis, Minnesota
- 2010-pres Professor, Electrical and Computer Engineering, University of Minnesota-Twin Cities, Minneapolis, Minnesota
- 2006-2010 Manager, Exploratory Technology, IBM T. J. Watson Research Center, Yorktown Heights, New York

- 1997-2006 Research Staff Member, IBM T. J. Watson Research Center, Yorktown Heights, New York
- 1995-1997 Postdoctoral Researcher, IBM T. J. Watson Research Center, Yorktown Heights, New York
- 1991-1995 Graduate Student Researcher, QUEST Science and Technology Center, University of California, Santa Barbara, California
- 1989-1991 Graduate Student Fellow, Department of Electrical Engineering, University of Notre Dame, Notre Dame, Indiana

Memberships in Professional Organizations

- Institute of Electrical and Electronics Engineers (IEEE), Fellow; IEEE Electron Devices Society; IEEE Photonics Society; IEEE Microwave Theory and Techniques Society; IEEE Nuclear and Plasma Sciences Society; Materials Research Society (MRS); Optica (formerly OSA), Fellow; Tau Beta Pi

Honors and Awards

- 2022 Elevated to Fellow of Optica (formerly OSA)
- 2021 Named Russell J. Penrose Professor in Nanotechnology
- 2021 Student Qun Su co-author on best student poster award for session EN03 at 2021 Fall MRS Meeting.
- 2019 Named Louis John Schnell Professor of Electrical and Computer Engineering
- 2017 Elevated to IEEE Fellow
- 2017 Student Qun Su, co-author on best student poster award at 2017 Fall MRS Meeting.
- 2016 Student Yao Zhang, finalist for best student paper award at 2016 IEEE Sensors Conference.
- 2014-2015 Student Yulong Li, finalist for best student paper award at IEEE Nuclear and Space Radiation Effects Conference (NSREC).
- 2010 George Abraham Outstanding Paper Award: S. J. Koester, I. Lauer, A. Majumdar, T. P. O'Regan, J. Cai, J. Sleight, and L. Chang, P. Tomasini, and S. G. Thomas, "Design and fabrication of planar Si/SiGe heterojunction tunneling transistors," Government Microcircuit Applications & Critical Technology Conference (GOMACTech), Orlando, FL, Mar. 16-19, 2009.
- 2009 Best Paper Award: D. Kim, Y. Lee, D. Sylvester, D. Blaauw, Y. Lee, J. Cai, I. Lauer, L. Chang and S. J. Koester, "Heterojunction tunneling transistor (HETT)-based extremely low power applications," International Symposium on Low Power Electronics and Design (ISLPED), San Francisco, CA, Aug. 19-21, 2009.
- 2008 Best Student Paper Award: A. Madan, J.D. Cressler, and S. Koester, "Low-frequency noise in buried channel SiGe n-MODFETs," 4th International SiGe

Technology and Devices Meeting (ISTDM 2008), Hsinchu, Taiwan, May 11-14, 2008.

- 2006 IBM supplemental patent award (for a top 10% patent at IBM)
- 2001-2010 10 IBM Invention Plateau Awards
- 1995 UCSB Graduate Dissertation Fellowship
- 1993-1994 UCSB Vice-Chancellor's Fellowship for Advanced Research on Quantum Structures
- 1989-1991 Notre Dame Burn's Graduate Fellowship

Research Funding (>\$9.2M for Koester group, >\$17M as lead PI at Minnesota)

- Agency: Georgia Institute of Technology
Title: "Multiplexed POC Biosensing"
Investigators: Steven J. Koester (PI), Michael McAlpine (co-PI)
Amount: \$66,250 [50%]
Duration: 06/01/22-11/30/22
- Agency: Intel Corporation
Title: "Center for 2D PMOSFETs with Ultimate Scalability"
Investigators: Steven J. Koester (PI)
Amount: \$150,000 [100%]
Duration: 09/01/22-08/31/23
- Agency: State of Minnesota - Legislative-Citizen Commission on Minnesota Resources
Title: "Green Solar Cells from a Minnesota Natural Resource"
Investigators: Chris Leighton (PI), Steven J. Koester, George Hudek, and Renee Frontiera (co-PIs)
Amount: \$756,000 [25%]
Duration: 07/01/22-06/30/25
- Agency: Defense Advanced Research Projects Agency (DARPA)
Title: "YETI: Cryogenic Energy-Efficient Computing"
Investigators: Mingo Seok (PI), Steven J. Koester and Chris Kim (co-PIs)
Amount: \$415,043 [53%]
Duration: 12/01/21-08/30/23
- Agency: National Science Foundation
Title: "Workshop on Quantum Engineering Infrastructure"
Investigators: Steven J. Koester (PI)
Amount: \$18,389 [100%]
Duration: 2021
- Agency: Grip Molecular Technologies
Title: "DEP-enhanced Multiplexed Graphene Sensors for Rapid Detection of Infectious Diseases"
Investigators: Steven J. Koester (PI), Michael McAlpine and Sang-Hyun Oh (co-PIs)
Amount: \$689,139 [45%]

Duration: 10/01/20-03/31/23

- Agency: National Science Foundation
Title: “Collaborative Research: AccelNet: Global Quantum Leap”
Investigators: Steven J. Koester (PI), Vlad Pribiag and several others (co-PIs)
Amount: \$1,671,545 [5%]
Duration: 10/01/2020-09/30/2025
- Agency: National Science Foundation
Title: “NNCI: Enabling Nanotechnology Excellence in the Midwest Renewal”
Investigators: Steven J. Koester (PI), several others (co-PIs)
Amount: \$5,000,000 [4%]
Duration: 09/01/2020-08/31/2025
- Agency: Intel
Title: “Ultimate Scaled Contact Solutions for Monolayer FETs”
Investigators: Steven J. Koester (PI)
Amount: \$327,267 [100%]
Duration: 06/01/20-05/31/23
- Agency: National Science Foundation
Title: “DMREF: Collaborative Research: Machine Learning Exploration of Atomic Heterostructures Towards Perfect Light Absorber and Giant Piezoelectricity”
Investigators: Tony Low (PI), Steven J. Koester (co-PI), several other (co-PIs)
Amount: \$1,600,000 [24.9%]
Duration: 09/01/19-08/31/23
- Agency: University of Minnesota
Title: “Ultra-Efficient Wide-Bandgap Power Converters: Material, Device, Circuit, and System-level Challenges and Opportunities”
Investigators: Xiaojia Wang (PI), Steven J. Koester (co-PI), several other (co-PIs)
Amount: \$250,000 [22.5%]
Duration: 07/01/19-06/30/22
- Agency: AFOSR
Title: “Stannate Perovskite Semiconductor Materials for Novel High Power Devices”
Investigators: Steven J. Koester (PI), Bharat Jalan (co-PI)
Amount: \$750,000 [50%]
Duration: 05/15/19-09/14/22
- Agency: Seagate Corporation
Title: “Development of Novel Neuromorphic Device Building Blocks”
Investigators: Steven J. Koester (PI)
Amount: \$130,000 [100%]
Duration: 07/01/18-12/31/20
- Agency: Army Research Office
Title: “Sensing with Antimicrobial Peptides: Multiplexed Graphene Sensors for High-Throughput Detection of and Discrimination between Various LPS Containing Bacteria”

Investigators: Michael McAlpine (PI), Steven J. Koester (co-PI)
Amount: \$117,484 [40%]
Duration: 2018-2019

- Agency: Minnesota's Discovery, Research, and Innovation Economy (MnDRIVE)
Title: "Novel Approaches to Realize Multiplexed Graphene Sensors for Point of Care Detection"
Investigators: Steven J. Koester (PI), Michael McAlpine (co-PI)
Amount: \$75,000 [50%]
Duration: 2017-2018
- Agency: TheoremDx
Title: "Multiplexed Graphene Sensors for Point of Care Zika Virus Detection"
Investigators: Steven J. Koester (PI), Michael McAlpine (co-PI)
Amount: \$285,000 [52%]
Duration: 2017-2018
- Agency: National Science Foundation
Program: ECCS / CCSS
Title: "GOALI: Transparent Beam Steering Antennas Enabled by Graphene Quantum Capacitance Varactors"
Investigators: Steven J. Koester (PI), James Schaffner (co-PI)
Amount: \$330,000 [100%]
Duration: 2017-2021
- Agency: National Science Foundation
Program: ECCS / EPMD
Title: "Negative Capacitance Phosphorene Tunneling Field Effect Transistors"
Investigators: Steven J. Koester (PI)
Amount: \$370,000 [100%]
Duration: 2017-2021
- Agency: University of Minnesota
Program: Institute of Engineering in Medicine (IEM) Group Program Grant
Title: "Development of low-cost, functional MRI systems with multi-modal integrated sensors"
Investigators: Steven J. Koester (co-PI), several other (co-PIs)
Amount: \$75,000 [17%]
Duration: 2017
- Agency: National Science Foundation
Title: "EAGER: Understanding Carrier Multiplication in Black Phosphorus for High-Gain MWIR Avalanche Photodiodes"
Investigators: Steven J. Koester (PI), Mo Li (co-PI)
Amount: \$125,000 [50%]
Duration: 2016-2018
- Agency: Seagate Corporation

Title: “Graphene Non-Local Spin Valves for High-Sensitivity and Compact Hard Drive Read Heads”

Investigators: Steven J. Koester (PI)

Amount: \$135,000 [100%]

Duration: 2016-2018

- Agency: National Science Foundation
Title: “NNCI: Midwest Nano Infrastructure Corridor (MINIC)”
Investigators: Stephen Campbell (PI), Steven J. Koester and others (co-PIs)
Amount: \$4,500,000 [2%]
Duration: 2015-2020
- Agency: Minnesota Partnership for Biotechnology and Medical Genomics
Title: “Development of ultrasmall wireless radiation sensors for *in vivo* dosimetry in cancer therapy”
Investigator: Steven J. Koester (PI), Bruce J. Gerbi (co-PI), Margaret Reynolds (co-I), Michael Grams (co-I), Sean Park (co-I)
Amount: \$71,619 [80%]
Duration: 2016
- Gift: Honeywell Corporation
Title: “Black phosphorus research fund”
Investigator: Steven J. Koester, Mo Li, Stephen A. Campbell
Amount: \$50,000 [48%]
- Agency: Boston Scientific Corporation
Title: “Biosensors for Early Disease Detection”
Investigators: Arthur Erdman (PI), Steven J. Koester and others (co-PIs)
Amount: \$3,663,488 [23.2%]
Duration: 2015-2020
- Agency: University of Minnesota
Program: Institute of Engineering in Medicine (IEM) Working Group Grant
Title: “Biomedical Sensor Technology Working Group”
Investigators: Steven J. Koester (co-PI), Bruce J. Gerbi (co-PI)
Amount: \$6,000 [100%]
Duration: 2015-2016
- Agency: University of Minnesota
Program: Institute of Engineering in Medicine (IEM) Seed Grant
Title: “Radiation Dosimeters for Cancer Therapy with Enhanced Sensitivity and Reliability Using Two-Dimensional Materials”
Investigators: Steven J. Koester (co-PI), Bruce J. Gerbi (co-PI)
Amount: \$25,000 [50%]
Duration: 2015
- Agency: National Science Foundation
Program: Division of Materials Research (DMR)
Title: Materials Research Science and Engineering Center (MRSEC)

Investigators: Timothy Lodge (PI), and others
Amount: \$17,800,000 [4%]
Duration: 2014-2020

- Agency: Air Force Office of Scientific Research
Program: Basic Research Initiative: 2D Materials and Devices Beyond Graphene
Title: “2D Heterostructures for Integrated Nano-Optoelectronics”
Investigators: Xiaodong Xu (PI), Steven J. Koester (co-PI), Mo Li (co-PI), Fengnian Xia (co-PI), Di Xiao (co-PI), David Cobden (co-PI), David Cohen (co-PI), Robert Moore (co-PI), Zhi-Xun Shen (co-PI)
Amount: \$ 3,000,000 [14%]
Duration: 2014-2017
- Agency: Defense Threat Reduction Agency
Program: Basic Research for Combating Weapons of Mass Destruction (C-WMD)
Title: “Radiation Effects in Two-Dimensional Material / High-K Dielectric Interfaces”
Investigators: Steven J. Koester (PI), Chris H. Kim (co-PI), Michael Alles (co-PI), Ronald Schrimpf (co-PI), Daniel Fleetwood (co-PI), Robert Reed (co-PI), Enxia Zhang (co-PI)
Amount: \$ 1,400,000 [37%]
Duration: 2014-2018
- Agency: National Institutes of Health
Program: National Institute of Diabetes and Digestive and Kidney Disease (NIDDK)
Title: “Glucose Monitor with Graphene-Based Disposable Wireless Sensors”
Investigators: Gary Havey (PI) and Steven J. Koester (co-PI)
Amount: \$ 69,402 [100%] – University of Minnesota subcontract funding.
Duration: 2013-2015
- Agency: National Institutes of Health
Program: National Cancer Institute (NCI)
Title: “Ultrasmall Wireless Dosimeters for *in vivo* Radiation Dosimetry”
Investigators: Steven J. Koester (PI), Bruce J. Gerbi (co-PI), Margaret Reynolds (co-I)
Amount: \$330,038 [61%]
Duration: 2013-2015
- Agency: Minnesota Partnership for Biotechnology and Medical Genomics
Program: Decade of Discovery in Diabetes
Title: “A Revolutionary Multiple-Input Sensor Platform for Realizing the Artificial Pancreas”
Investigators: Steven J. Koester (co-PI), Yogish Kudva (co-PI), Ananda Basu (co-I)
Amount: \$500,000 [80%]
Duration: 2013-2015
- Agency: SRC/DARPA
Program: STARnet
Title: “Center for Spintronic Materials, Interfaces and Novel Architectures (C-SPIN)”
Investigators: Jianping Wang (director), Steven J. Koester (co-director), P. M. Crowell (co-director), 28 other co-PIs.
Amount: \$29,654,508 [3.5%]

Duration: 2013-2017

- Agency: Minnesota Partnership for Biotechnology and Medical Genomics
Program: Decade of Discovery in Diabetes
Title: “Graphene-Based Wireless Glucose Sensing for the Artificial Pancreas”
Investigators: Steven J. Koester (co-PI), Yogish Kudva (co-PI), Ananda Basu (co-I)
Amount: \$500,000 [71%]
Duration: 2012-2013
- Agency: National Science Foundation
Program: Grant Opportunities for Academic Liaison with Industry (GOALI)
Title: “GOALI: Nanowire broken-gap tunneling field-effect transistors for high-performance, ultra-low-power logic applications”
Investigators: Steven J. Koester (PI) and Wilfried E. Haensch (co-PI, IBM)
Amount: \$330,000 [100%]
Duration: 2011-2015
- Agency: University of Minnesota
Program: Institute of Engineering in Medicine Seed Grant (IEM)
Title: “Novel radiation-sensitive varactors to enable ultrasmall wireless dosimeters for radiation cancer therapy”
Investigators: Steven J. Koester (co-PI), Bruce J. Gerbi (co-PI)
Amount: \$39,796 [53%]
Duration: 2011
- Agency: University of Minnesota
Program: Grant-in-Aid
Title: “Nanowire devices fabricated using block copolymer lithography”
Investigator: Steven J. Koester (PI)
Amount: \$33,516 [100%]
Duration: 2010-2012
- Agency: National Science Foundation
Program: ECCS / EPMD
Title: “Scalable perpendicular all-spin non-volatile logic devices and circuits with hybrid interconnection”
Investigators: Jianping Wang (PI), Steven J. Koester (co-PI), Paul M. Crowell (co-PI), Chris Kim (co-PI)
Amount: \$1,300,000 [25%]
Duration: 2011-2015
- Agency: Semiconductor Research Corporation
Program: Nanoelectronics Research Initiative
Title: “Scalable perpendicular all-spin non-volatile logic devices and circuits with hybrid interconnection”
Investigators: Jianping Wang (PI), Steven J. Koester (co-PI), Paul M. Crowell (co-PI), Chris Kim (co-PI)
Amount: \$200,000 [25%]
Duration: 2011-2015

- Gift: Alice M. O'Brien Foundation
Title: "Artificial pancreas research fund"
Investigator: Steven J. Koester
Amount: \$133,500 [100%]
- Agency: National Science Foundation
Program: Division of Materials Research (DMR)
Title: Materials Research Science and Engineering Center (MRSEC) Seed Project –
"Ultrasmooth graphene nanoribbon formation using templated nanoparticle crystallographic etching"
Investigators: Steven J. Koester (PI) of seed program
Amount: \$100,000 [100%]
Duration: 2010-2012
- Agency: DARPA (MTO)
Program: Steep-subthreshold-slope transistors for electronics with extremely-low power (STEEP)
Title: "Strained Si/SiGe/Ge Heterojunction Tunneling Transistor (HETT) Technology with Steep Subthreshold Slope for Extremely Low Power Electronics"
Investigators: Steven J. Koester (PI), J. Sturm (co-PI), S. Chou (co-PI), D. Sylvester (co-PI), and S. Thomas (co-PI)
Duration: 2008-2009
- Agency: DARPA (MTO)
Program: Technology for Efficient, Agile Mixed Signal Microsystems (TEAM)
Title: "Si/SiGe strained-layer FET technology"
Investigator: Steven J. Koester (PI)
Duration: 2000-2005

Publications and Presentations as of 1/18/23 (Citations = 12776, H = 58 (Google Scholar), Citations = 7252, H = 46 (Scopus))

- 7 volumes edited, 4 book chapters, 143 peer-reviewed journal articles, 16 peer-reviewed published conference proceedings, 170 conference abstracts, and 74 U.S. patents.

Volumes Edited (7)

- [V1] S. J. Koester, T.-J. King Liu, J.-M. Hartmann, R. Loo, Y.-C. Yeo, and M. S. Carroll, "Selected papers from the 6th International SiGe Technology and Device Meeting (Berkeley, California, USA, 4-6 June 2012) (ISTDM 2012)," *Solid State Electron.* **83**, (2013).
- [V2] C. S. Tan, K.-N. Chen, and S. J. Koester, editors, "3D Integration for VLSI Systems," Pan Stanford, ISBN 978-981-4303-81-1, 2011.
- [V3] D. Harame, J. Boquet, M. Östling, Y. Yeo, G. Masini, M. Caymax, T. Krishnamohan, B. Tillack, S. Bedell, S. Miyazaki, A. Reznicek, and S. Koester, editors, "SiGe, Ge, and Related Compounds 4: Materials, Processing, and Devices," *Electrochemical Society Transactions*, vol. 33, no. 6, Proceedings of the Electrochemical Society Meeting, Las Vegas, NV, Oct. 10-15, 2010.

- [V4] D. Harame, J. Boquet, M. Caymax, J. Cressler, S. Koester, G. Masini, S. Miyazaki, A. Reznicek, K. Rim, S. Takagi, and B. Tillack, editors, “SiGe, Ge, and Related Compounds 3: Materials, Processing, and Devices,” *Electrochemical Society Transactions*, vol. 16, no. 10, Proceedings of the Electrochemical Society Meeting, Honolulu, HI, Oct. 12-17, 2008.
- [V5] M. C. Öztürk, H. Iwai, D.-L. Kwong, P. J. Timans, E. P. Gusev, S. J. Koester, and F. Roozeboom, editors, “Advanced Gate Stack, Source/Drain and Channel Engineering for Si-Based CMOS 3: New Materials, Processes and Equipment,” *Electrochemical Society Transactions*, vol. 6, no. 1, Proceedings of the Electrochemical Society Meeting, Chicago, IL, May 6-10, 2007.
- [V6] D. Harame, J. Boquet, M. Caymax, J. Cressler, H. Iwai, S. Koester, G. Masini, J. Murota, A. Reznicek, K. Rim, B. Tillack, S. Zaima, editors, “SiGe & Ge: Materials, Processing, and Devices,” *Electrochemical Society Transactions*, vol. 3, no. 7, Proceedings of the Electrochemical Society Meeting, Cancun, Mexico, Oct. 29-Nov. 3, 2006.
- [V7] J. Sturm, E. Fitzgerald, S. Koester, J. Kolodzey, J. Murota, D. Paul, B. Tillack, S. Zaima, B. Ghyselen, and S. Takagi, editors, “Papers from the 3rd International SiGe Technology and Device Meeting (Princeton, New Jersey, USA, 15-17 May 2006) (ISTDM 2006),” *Semicond. Sci. Technol.* **22**, (2007).

Book Chapters (4)

- [B1] J. Michel, S. J. Koester, J. Liu, X. Wang, M. W. Geis, S. J. Spector, M. E. Grein, J. U. Yoon, T. M. Lyszczarz, and N.-N. Feng, “Photodetectors,” *Handbook of Silicon Photonics (Series in Optics and Optoelectronics)*, L. Vivien and L. Pavesi, Eds., CRC Press, 2013.
- [B2] F. Liu, R. R. Yu, A. M. Young, L. Shi, K. A. Jenkins, X. Gu, N. R. Klymko, S. Purushothaman, S. J. Koester and W. Haensch, “A 300-mm wafer-level three-dimensional integration scheme using tungsten through-silicon via and hybrid Cu-adhesive bonding,” *3D Integration for VLSI Systems*, C. S. Tan, K.-N. Chen and S. J. Koester, Eds., Pan Stanford, Singapore, 2011.
- [B3] A. M. Young and S. J. Koester, “3D process technology considerations,” *Three-Dimensional Integrated Circuit Design EDA, Design and Microarchitectures*, Y. Xie, J. Cong, and S. Sapatnekar, Eds., Springer, New York, 2010.
- [B4] A. W. Topol, S. J. Koester, D. C. La Tulipe, and A. M. Young, “3-D fabrication options for high performance CMOS Technology,” *Wafer Level 3-D ICs Process Technology*, C. S. Tan, R. J. Gutmann, and L. R. Rafael, Eds., Springer, New York, 2008.

Peer-Reviewed Journal Articles (143)

- [J1] H. Yoon, T. K. Truttman, F. Liu, B. E. Matthews, S. Choo, Q. Su, V. Saraswat, S. Manzo, M. S. Arnold, M. E. Bowden, J. K. Kawasaki, S. J. Koester, S. R. Spurgeon, S. A. Chambers, and B. Jalan, “Free-standing epitaxial SrTiO₃ nanomembranes via remote epitaxy using hybrid molecular beam epitaxy,” *Sci. Adv.* **8**, eadd5328 (2022).

- [J2] N. S. S. Capman, X. V. Zhen, J. T. Nelson, V. R. S. K. Chaganti, R. C. Finc, M. J. Lyden, T. L. Williams, M. Freking, G. J. Sherwood, P. Bühlmann, C. J. Hogan Jr., and S. J. Koester, “Machine learning-based rapid detection of volatile organic compounds in a graphene electronic nose,” *ACS Nano* **16**, 19567-19583 (2022).
- [J3] E. Harrington, S. Dhople, X. Wang, J. Choi, and S. Koester, *Issues in Sci. & Technol.* **39**, Fall, 2022.
- [J4] P. Golani, C. N. Saha, P. P. Sundaram, F. Liu, T. K. Truttmann, V. R. S. K. Chaganti, B. Jalan, U. Singiseti, and S. J. Koester, “Self-heating in ultra-wide bandgap n-type SrSnO₃ thin films,” *Appl. Phys. Lett.* **121**, 162102 (2022).
- [J5] Z. Cheng, C.-S. Pang, P. Wang, S. T. Le, Y. Wu, D. Shahrjerdi, I. Radu, M. C. Lemme, L.-M. Peng, X. Duan, Z. Chen, J. Appenzeller, S. J. Koester, E. Pop, A. D. Franklin, and C. A. Richter, “How to report and benchmark emerging field-effect transistors,” *Nat. Electron.* **5**, 416-423 (2022).
- [J6] L. Jin, and S. J. Koester, “Contact gating in dual-gated WS₂ MOSFETs with semi-metallic Bi contacts,” *IEEE Elect. Dev. Lett.* **43**, 1575-1578 (2022).
- [J7] P. P. Sundaram, F. Alema, A. Osinsky, and S. J. Koester, “ β -(Al_xGa_{1-x})₂O₃/Ga₂O₃ heterostructure Schottky barrier diodes for improved V_{BR}^2/R_{ON} ,” *J. Vac. Sci. & Technol. A* **40**, 043211 (2022).
- [J8] J. Wen, V. R. S. K. Chaganti, and S. J. Koester, “Backgated graphene varactors with quality factor-frequency product above 300 GHz,” *IEEE Elect. Dev. Lett.* **43**, 820-823 (2022).
- [J9] L. Jin, and S. J. Koester, “High-performance dual-gated single-layer WS₂ MOSFETs with Bi contacts,” *IEEE Elect. Dev. Lett.* **43**, 639-642 (2022).
- [J10] S. Kundu, P. Golani, H. Yun, S. Guo, K. Youssef, S. J. Koester, and K. A. Mkhoyan, “Tunable metal contacts at layered black-arsenic/metal interface forming during metal deposition for device fabrication,” *Commun. Materials* **3**, 11 (2022).
- [J11] S.-H. Oh, H. Altug, X. Jin, T. Low, S. J. Koester, A. P. Ivanov, J. B. Edel, P. Avouris, and M. S. Strano, “Nanophotonic biosensors harnessing van der Waals materials,” *Nat. Commun.* **12**, 3824 (2021).
- [J12] N. Izquierdo, J. C. Myers, P. Golani, A. De Los Santos, N. C. A. Seaton, S. J. Koester, and S. A. Campbell, “Growth of black arsenic phosphorus thin films and its application for field-effect transistors,” *Nanotechnol.* **32**, 325601 (2021).
- [J13] V. R. S. K. Chaganti, P. Golani, T. Truttmann, F. Liu, B. Jalan, and S. J. Koester, “Optimizing Ohmic contacts to Nd-doped n-type SrSnO₃,” *Appl. Phys. Lett.* **118**, 142104 (2021).
- [J14] C. Kai, K. Agarwal, H. A. Bechtel, C. Liu, D. Joung, A. Nemilentsau, Q. Su, T. Low, S. J. Koester, and J.-H. Cho, “Hybridized radial and edge coupled 3D plasmon modes in self-assembled graphene nanocylinders,” *Small* **17**, 2100079 (2021).
- [J15] S. Namgung, S. J. Koester, and S.-H. Oh, “Ultraflat sub-10 nanometer gap electrodes for two-dimensional optoelectronic devices,” *ACS Nano* **15**, 5276-5283 (2021).

- [J16] J. Wen, V. R. S. K. Chaganti, T. K. Truttmann, F. Liu, B. Jalan, and S. J. Koester, “SrSnO₃ metal-semiconductor field-effect transistor with GHz operation,” *IEEE Elect. Dev. Lett.* **42**, 74-77 (2021).
- [J17] Q. Su, X. V. Zhen, J. T. Nelson, R. Li, P. Bühlmann, G. Sherwood, and S. J. Koester, “Ultra-clean graphene transfer using a sacrificial fluoropolymer nanolayer: implications for sensor and electronic applications,” *ACS Appl. Nano Mater.* **3**, 11998-12007 (2020).
- [J18] Y. Yoo, J. S. Jeong, R. Ma, S. J. Koester, and J. E. Johns, “Ultrathin one-dimensional molybdenum telluride quantum wires,” *Chem. Mater.* **32**, 9650-9655 (2020).
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- [C43] S. J. Koester, "Two-dimensional materials: from properties to applications," Materials Research Society Meeting, Phoenix, AZ, Apr. 17-21, 2017 (invited).
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Colloquia and Seminars

- “Perspectives on Applications for 2D Materials in Future CMOS Nodes”
Seminar
Host: Cesar Javier Lockhart de la Rosa
IMEC, Leuven, Belgium, Nov. 10, 2022
- “Perspectives on Establishing a Quantum-Ready Fabrication Facility”
Seminar
Host: Thomas Schäpers
Forschungszentrum Jülich, Jülich, Germany, Nov. 2, 2022
- “Are TMDCs an End-of-Roadmap Solution for MOSFET Scaling?”
Seminar
Host: Heike Riel
IBM Zurich, Rüschlikon, Switzerland, Oct. 28, 2022
- “Are TMDCs an End-of-Roadmap Solution for MOSFET Scaling?”
Seminar
Host: Mathieu Luisier
ETH Zurich, Zurich, Switzerland, Oct. 27, 2022
- “Enhancing Biosensor Response with Graphene “Lighting-Rods”
31th Aachen Graphene-Center Seminar & Theodore-von-Kármán-Fellow Presentation
Host: Max Lemme
RWTH Aachen, Aachen, Germany, Oct. 11, 2022
- “Emerging Device Applications of 2D Materials”
3M Tech Forum
Host: Essam Elnashar
3M, Woodbury, MN, May 24, 2022
- “A Novel Sensing Platform Enabled by Graphene Varactors”
3M Technology Seminar Series
Host: Aloka Khanna
3M, Woodbury, MN, Jan. 23, 2020
- “Novel Graphene-Based Sensor Platforms”

CESTA Workshop on Novel Sensing Technologies
University of Minnesota, Minneapolis, MN, Oct. 24, 2019

- “2D Materials for a New Generation of Multi-Functional Devices”
Seminar
Host: Lifeng Dong
Hamline University, St. Paul, MN, Oct. 4, 2019
- “Healthcare Innovations Enabled by Two-Dimensional Nanomaterials”
UMN CSE 50th Alumni Reunion
Host: Joelle Larson
University of Minnesota, Minneapolis, MN, May 9, 2019
- “Novel Biosensor Platforms Enabled by Graphene”
Seminar
Host: Chris Hogan
University of Minnesota, Minneapolis, MN, Mar. 13, 2019
- “Novel electronic and photonic devices enabled by back phosphorus”
Seminar
Host: Han Wang
University of Southern California, Los Angeles, CA, Oct. 18, 2018
- “Progress in graphene non-local spin valves and prospects for use in hard drive read heads”
Seminar
Host: Mark Kief
Seagate Technology, Edina, MN, Jun. 13, 2018
- “Varactors, tweezers and spin. Finding new applications for graphene in unexpected places”
Seminar
Host: Kaustav Banerjee and Clint Schow
University of California, Santa Barbara, CA, May 16, 2018
- “Varactors, tweezers and spin, oh my! Finding new applications for graphene in unexpected places”
Seminar
Host: Ethan Wang
University of California, Los Angeles, CA, May 14, 2018
- “Designing a revolutionary wireless sensor for the artificial pancreas”
39th Annual District 5M4 Lions Club Midwinter Convention
Host: Leslie Palmieri
Willmar Convention Center, Willmar, MN, Jan. 29, 2017
- “Progress in understanding transport in graphene non-local spin valves and prospects for use in hard drive read heads”
Seminar
Host: David Deen
Seagate Technology, Edina, MN, Jul. 26, 2016
- “Spintronics as an Enabler for a New Paradigm in Computational Technology”
NSCI seminar
Host: Daniel Gopman

NIST, Gaithersburg, MD, Jul. 19, 2016

- “A Novel Wireless Platform for Biosensing Enabled by Graphene”
Seminar
Host: Federica Sgolastra
3M, Woodbury, MN, Apr. 13, 2016
- “Is Black Phosphorus the 2D Material We’ve Been Waiting For?”
Seminar
Host: Terrance O’Regan
Army Research Laboratory, Adelphi, MD, Dec. 7, 2015
- “Graphene Non-Local Spin Valves for Ultra-Compact Hard Drive Readers”
Seminar
Host: David Deen
Seagate Technology, Edina, MN, Sep. 3, 2015
- “Designing a revolutionary wireless sensor for the artificial pancreas”
Lunch seminar
Host: Jean Gorrel
University of Minnesota, Minneapolis, MN, Apr. 10, 2015
- “Practical Applications of Graphene (and other 2D Materials)”
Seminar
Host: Luigi Colombo
Texas Instruments, Dallas, TX, Feb. 18, 2015
- “Practical Applications of Graphene (and other 2D Materials)”
3M Innovation Tech Forum
Host: Stephen Willett
3M, Woodbury, MN, Nov. 21, 2014
- “Quantum Capacitance in Graphene – What is it Really Good For?”
Special Physical Sciences Seminar
Host: Fengnian Xia
IBM T. J. Watson Research Center, Yorktown Heights, NY, Apr. 22, 2013
- “Quantum Capacitance in Graphene – What is it Really Good For?”
Columbia University MURI Special Seminar
Host: Prof. Ioannis Kymissis
Columbia University, New York, NY, Apr. 19, 2013
- “Graphene Quantum Capacitance Devices”
Seminar
Host: Prof. Jeong-Sun Moon
HRL Laboratories, Malibu, CA, Oct. 9, 2012
- “Graphene Quantum Capacitance Devices”
UCLA Electrical Engineering Seminar Series
Host: Prof. Bahram Jalali
UCLA, Westwood, CA, Oct. 8, 2012
- “Graphene Quantum Capacitance Devices”

UCLA Materials Science and Engineering Seminar Series
Host: Prof. Ya-Hong Xie
UCLA, Westwood, CA, Jun. 1, 2012

- “New device concepts for wireless biomedical sensing”
University of Minnesota ECE Spring 2012 Alumni Lunch & Learn Seminar Series
Host: Prof. David Lilja
University of Minnesota, Minneapolis, MN, Apr. 22, 2012
- “Graphene Quantum Capacitance Devices”
Center for Nanostructure Applications (CNA) Seminar
Organizer: Prof. Chris Leighton
University of Minnesota, MN, Apr. 2, 2012
- “Ultrasmall Wireless Dosimeters for Radiation Therapy”
Radiation Oncology Seminar
Host: Dr. Robert Miller
Mayo Clinic, Rochester, MN, Sep. 9, 2011
- “Ultrasmall Wireless Dosimeters for Radiation Therapy”
Center for Advanced Radiotherapy Technologies (CART) Seminar Series
Host: Dr. Kevin Murphy
UCSD, La Jolla, CA, May 27, 2011
- “Tunneling Field-Effect Transistors: Are They a Solution to the Power Problem in Computational Systems?”
Center for Nanostructure Applications (CNA) Seminar
Organizer: Prof. Beth Stadler
University of Minnesota, MN, Sep. 16, 2010
- “Tunneling Field-Effect Transistors: Can They Solve The Computational Power Problem?”
Seminar
Organizer: Dr. David Gundlach
National Institute of Standards (NIST), Gaithersburg, MD, Aug. 4, 2010
- “Tunneling Field-Effect Transistors: Are They a Solution to the Power Problem in Computational Systems?”
Center for Nanostructure Applications Seminar
Organizer: Prof. Beth Stadler
University of Minnesota, Minneapolis, MN, Feb. 22, 2010
- “Defining Electrical Characteristics of Tunneling Field-Effect Transistors, (or How Can you Tell A TFET from a MOSFET?)”
Notre Dame Electrical Engineering Seminar Series
Organizer: Prof. Alan Seabaugh
University of Notre Dame, Notre Dame, IN, Jan. 21, 2010
- “Nano-scale or wafer-scale? At what dimension will we solve the power problem in computation?”
Princeton University EMD/CE Seminar
Host: Prof. James Sturm
Princeton University, Princeton, NJ, Oct. 6, 2008

- “Nano-scale or wafer-scale? At what dimension will we solve the power problem in computation?”
Seminar
Organizer: Prof. Andy Knights
McMaster University, Hamilton, Ontario, April, 2008
- “SiGe Heterostructures: One-Hit Wonder or the Next Rolling Stones?”
Notre Dame Electrical Engineering Seminar Series
Host: Prof. Alan Seabaugh
University of Notre Dame, Notre Dame, IN, Feb. 28, 2006
- “Opportunities and Challenges for III-V/CMOS Integration”
DARPA COSMOS Workshop
Host: Prof. Dr. Mark Rosker
Lake Tahoe, NV, Sep. 15, 2005
- “SiGe Heterostructure Devices: Overview and Outlook”
Ohio State University Electrical Engineering Seminar
Host: Prof. Paul Berger
Ohio State University, Columbus, OH, Apr. 21, 2005
- Numerous other presentations while at IBM, both internally and at DARPA program reviews (1997–2005)

Teaching

Lecture and lab courses

- EE8950 - Advanced Semiconductor Transistors (Spring 2015, Spring 2018, Spring 2019)
- EE5164 - Semiconductor Properties and Devices II (Spring 2011, Spring 2012, Spring 2013, Spring 2014)
- EE5163 - Semiconductor Properties and Devices I (Fall 2016, Fall 2018, Fall 2021)
- EE4951 - Senior Design (Spring 2012, Spring 2014, Spring 2015, Spring 2017, Spring 2018, Spring 2019)
- EE3161 - Semiconductor Devices (Fall 2010, Fall 2011, Fall 2013, Fall 2014, Fall 2015, Fall 2017, Spring 2020, Fall 2020)
- EE3102 - Circuits and Electronics Laboratory II (Fall 2012)
- EE3101 - Circuits and Electronics Laboratory I (Fall 2012, Fall 2017, Spring 2019)

Discussion sections

- EE3161 - Semiconductor Devices (Spring 2010, Spring 2011, Spring 2012, Spring 2013, Fall 2013, Fall 2014, Fall 2015, Fall 2017, Fall 2018, Spring 2020, Fall 2020, Fall 2021)

Advising and Mentoring

Undergraduate Students

- Directed Undergraduate Research Opportunities Program (UROP) projects for: Steve Brown (2010), He Shao (2011), Jake Odom (2015)

- Directed Senior Honors projects for: Yoska Anugrah (2011), Andrew Arnold (2012), Rui Ma (2014), Kothai Seelen (2021)
- Directed Research Experiences for Undergraduates (REU) projects for: Robert Jacobberger (2010), Nathaniel Sheehan (2011), Andrew Stephan (2013), Chad Auginash (2014), James Outlaw (2015), Matthew Stiller (2017), Ahmad El Shakoushy (2018)
- Other Undergraduate Research Mentoring: Huilong Zhang (2010), Ivan Roth (2011), James Mishra (2013), Qiyue Wang (2013–2014), Qun Su (2013–2015), Wei Liu (2016–2017), Abhishek Aravalli (2019), Alex LaValley (2020)

Masters Students

- Giridharan Vaidhyathan (2010–2011), Moumita Maiti (2022–pres)

Ph.D. Students (Former)

- Mona Ebrish (2010–2015) – currently with the Naval Research Laboratory; Chaitanya Kshirsagar (2010–2016) – currently with Intel; Yoska Anugrah (2011–2016) – currently with Intel; Yulong Li (2011–2016) – currently with IBM; Nazila Haratipour (2011–2017) – currently with Intel; Yang Su (2011–2017) – currently with Intel; Yao Zhang (2013–2018) – currently with KLA Tencor; Jiayi Hu (2013–2018) – currently with Apple; Matthew Robbins (2014–2019) – currently with Honeywell, Saran Kumar Chaganti (2015–2020) – currently with Intel, Rui Ma (2014–2020) – currently with Apple; Andrew Stephan (2015–2020) – currently with the University of Minnesota; Qun Su (2015–2020) – currently with Micron Technology; Praful Golani (2017–2022) – currently with Western Digital; Lun Jin (2019–2022) – currently with Micron Technology

Ph.D. Students (Current)

- Prakash Palamedu Sundaram (2018–pres), Nyssa Capman (2018–pres); Jiakuan Wen (2019–pres); Chin-Hsiang Liao (2019–pres), Ruixue Li (2020–pres).

Postdoctoral Researchers (Former)

- Brian Olmsted (2011–2012) – currently with Honeywell, David Deen (2012–2013) – currently with Seagate, Eric Olson (2012–2014) – currently with 3M, Jing Li (2013–2015) – currently with University of Tennessee-Knoxville, Mahmoud Atalla (2016–2018) – currently with University of Montreal, Sandhaya Koirala (2017–2018), Seon Namgung (2015–2019), Nezhueyotl Izquierdo (2020–2022)

Postdoctoral Researchers (Current)

- Dongjea Seo (2020–pres), Shivanshu Mishra (2023–pres)

Degree Committees

- Ph.D. Final Committee for: Dongjin Lee (ME), Yu Chen (ECE), Ayan Paul (ECE), Forrest Johnson (ECE), Nathan Youngblood (ECE), Liyuan Zhang (ECE), Jongyeon Kim (ECE), Sha Shi (ECE), Gordon Stecklein (Physics), Patrick Quarterman (ECE), Tim Peterson (Physics), Saurabh Kumar (ECE), Xue Zhen (Chemistry), Ryan Wu (CEMS), Justin Watts (CEMS), Che Chen (ECE), Yipeng Jiao (ECE), Dan Klemme (ECE), Fazel Zare Bidoky (CEMS), Abhinav Prakash (CEMS), several others.

- Ph.D. Preliminary Committee for: Yu Chen (ECE), Forrest Johnson (ECE), Ayan Paul (ECE), Nathan Youngblood (ECE), Liyuan Zhang (ECE), Peng Xu (CEMS), Ryan Wu (CEMS), Xue Zhen (Chemistry), Justin Watts (CEMS), Tim Peterson (Physics), Sha Shi (ECE), Brian Benton (ECE), Yipeng Jiao (ECE), Rizvi Ahmed (ECE), Che Chen (ECE), Saurabh Kumar (ECE), Javad Ghasemi Azadani (ECE), Brandon Zink (ECE), Wei-Heng Hsu (ECE), Nakul Pande (ECE), Nikolaos Memmos (CEMS), Brett Heischmidt (Physics), Abhimanyu Ravindranath (ECE), Yuhang Sun (ECE), several others.
- M.S. Committee for: Aditi Goswami (ECE)

Service

Conference Organization

- NSF Workshop on Quantum Engineering Infrastructure (WQEI):
 - Organizer and Chair (2021)
- IEEE Nuclear and Space Radiation Effects Conference (NSREC):
 - Abstract Reviewer (2018)
- Compound Semiconductor Week (CSW):
 - Sub-Committee Chair (2018)
- Optical Fiber Communication Conference (OFC):
 - Co-Organizer for Symposium on Future Photonic Devices and Materials for Optical Communications (2018)
- Electronic Materials Conference (EMC):
 - Symposium Organizer (2015)
- Materials Research Society Meeting (MRS):
 - Symposium Co-Organizer (2014)
- IEEE International Electron Devices Meeting (IEDM):
 - Technical Program Committee Member (2010–2011)
- Device Research Conference (DRC):
 - Technical Program Committee Member (2006–2009)
 - Technical Program Vice-Chair (2007)
 - Technical Program Chair (2008)
 - Conference General Chair (2009)
 - President, Board of Directors (2010–2018)
- Electrochemical Society Meeting: SiGe, Ge, and Related Compounds: Materials, Processing, and Devices Symposium:
 - Technical Program Committee Member (2006–2012, 2018, 2022)
 - Co-Organizer, Sub-Committee Chair (2006–2010)
 - Panel Session Co-Organizer (2008–2010)
- International SiGe Technology and Device Meeting (ISTDM):
 - Technical Program Committee Member (2006–2008, 2012–2019)
 - Technical Program Vice-Chair (2008)

- Advisory Committee Member (2008–pres)
- Technical Program Chair (2012)
- Panel Session Co-Organizer (2006, 2012)
- Minnesota Nanotechnology Conference
 - Co-Organizer for Carbon-Based Devices Session (2010)
- International Group-IV Photonics Conference (GFP):
 - Technical Program Committee Member (2006–2008)
- International Symposium on Compound Semiconductors (ISCS):
 - Technical Program Committee Member (2007)
- European Materials Research Society Meeting (E-MRS):
 - Technical Program Committee Member (2006)
- European Solid-State Device Research Conference (ESSDERC):
 - Technical Program Committee Member (2005–2006)

Journals

- Associate Editor of *IEEE Electron Device Letters* (2012–2021)
- Reviewer for numerous IEEE, AIP, Nature, ACS, AAAS, and IBM journals (1995–pres)

Panels / Review Boards

- IEEE EDS Fellow Evaluator (2017–2019)
- Served on NSF proposal review panels (2011–2022)
- Member of Executive Committee for SRC NRI MIND Center (2008–2009)
- IBM Representative to SRC GRC Device Sciences Committee (2007–2009)
- Served on UCSB Faculty Advisory Board (2005)
- IBM Shared University Research Program (2003)
- IBM Faculty Partnership Review Board (2000)

University / Departmental Service

- ECE Graduate Committee (2018–2019)
- Member of University Faculty Senate (2016–2018)
- Co-organizer of University of Minnesota Annual 2D Materials Summer School (2016–2019)
- Associate director of STARnet C-SPIN center (2013–2017)
- Program co-leader of IPRIME Electronic Materials and Devices Program (2013–pres)
- Member of Safety Committee (2012–2018, chair from 2014–2015)
- ECE Recruiting Committee (2016–2018, 2019–2020, chair from 2017–2018, 2021–pres)
- ECE Curriculum Committee (2014–2015)
- Member of ECE Consultative Committee (2012–2015)
- Member of External Relations Committee (2010–2014, chair from 2011–2013)

Other Service

- Project Lead The Way (PLTW) advisor, South High School, Minneapolis, 2015

- Breakout session leader, IEEE Region 4 Student Leadership Conference, Oct. 5, 2013
- Volunteer at Science Museum of Minnesota 'Nano Days' Event, Apr. 5-6, 2013
- Guest lecturer at Columbia University Semiconductor Devices Class (2004–2009)