Stanford

Kenneth Goodson

Vice Provost for Graduate Education and Postdoctoral Affairs, Davies Family Provostial Professor, and Professor, by courtesy, of Materials Science and Engineering

Mechanical Engineering

Curriculum Vitae available Online

CONTACT INFORMATION

- **Administrative Contact**

  Jules Porter Thompson - Executive Assistant

  Email Jules.Thompson@stanford.edu

  Tel (650) 723-8110

Bio

BIO

Ken Goodson specializes in heat transfer and energy conversion with a focus on data centers and AI infrastructure. He has mentored 60+ Stanford graduate students to their doctorates including dozens now at tech firms and more than 20 professors at MIT, Princeton, Stanford and other schools. Under the DARPA ICECool Programs, his group built a world-record heat sink for power conversion.

Goodson is a member of the National Academy of Engineering, recipient of the ASME Kraus Thermal Management Medal, co-author of 35 patents, and Fellow with the National Academy of Inventors. He co-founded Cooligy, which built heat sinks for Apple and was acquired by Emerson. He is a Fellow with IEEE, ASME, APS, and AAAS and recipient of the AIChE Kern and IEEE Chu Awards.

While serving as Mechanical Engineering Chair & Vice Chair (2008-2019), Goodson led two strategic plans and recruited 15 faculty. Before starting as Stanford's Vice Provost for Graduate Education and Postdoctoral Affairs in 2025, Goodson served in Stanford Engineering as the Senior Associate Dean for Research & Faculty Affairs.

Goodson moonlights as a baritone oratorio soloist with appearances at Davies Symphony Hall and the Bing Concert Hall. He held voice fellowships at the Tanglewood Music Festival and received the Sudler Prize for Arts Achievement. His wife, Laura Dahl, is a concert pianist with the Stanford music faculty.

ACADEMIC APPOINTMENTS

- Professor, Mechanical Engineering
- Professor (By courtesy), Materials Science and Engineering
- Member, Bio-X
- Affiliate, Precourt Institute for Energy

ADMINISTRATIVE APPOINTMENTS

- Vice Provost for Graduate Education & Postdoctoral Affairs, Stanford University, (2025- present)
- Senior Associate Dean for Research & Faculty Affairs, School of Engineering, (2019-2025)
- Department Chair, Mechanical Engineering, (2013-2019)
- Vice Department Chair, Mechanical Engineering, (2008-2013)
- Presidential Search Committee, Stanford University, (2015-2016)
- Strategic Planning Co-Chair, Mechanical Engineering, (2009-2010)
- Faculty Search Committee Chair, Mechanical Engineering, (2009-2010)
- Associate Chair for Graduate Admissions, Mechanical Engineering, (2005-2008)
- Faculty Search Committee Chair, Mechanical Engineering, (2004-2005)
- Faculty Search Committee Co-Chair, Mechanical Engineering, (2001-2002)

HONORS AND AWARDS

- Member, National Academy of Engineering (2020)
- Aristotle Award, Semiconductor Research Corporation (2020)
- Fellow, National Academy of Inventors (2020)
- University Researcher Award, Semiconductor International Association (2019)
- Inaugural Richard Chu Achievement Award, IEEE (2018)
- InterPACK Achievement Award, ASME (2017)
- Charles Russ Richards Memorial Award, Pi Tau Sigma & ASME (2016)
- Aisinjioro-Soo Distinguished Lectureship, University of Illinois Urbana-Champaign (2015)
- Donald Q. Kern Heat Transfer Award, AIChE (2015)
- Hawkins Lectureship, Purdue University (2015)
- Rohsenow Lectureship, MIT (2015)
- Heat Transfer Memorial Award for Science, ASME (2014)
- Technical Excellence Award, Semiconductor Research Corporation (2014)
- THERMI Award, IEEE (2013)
- Best/Outstanding Paper, ITHERM, SemiTherm, IEDM (2012, 2001, 1992)
- Elected Fellow: AAAS, ASME, IEEE, APS (2010-2016)
- Golden/Outstanding Reviewer, IEEE, ASME (2010, 1999)
- Dusinberre Lectureship, Penn State University (2010)
- Kraus Thermal Management Medal, ASME (2010)
- Plenary Lectures, ITHERM, PHONONS, InterPACK, ISSCC, Therminic, SemiTherm (2002-present)
- CAREER Award, National Science Foundation (1996)
- JSPS Visiting Professorship, Tokyo Institute of Technology (1996)
- Young Investigator Award, Office of Naval Research (1996)
- Voice Fellow, Tanglewood Music Festival (1990, 1991)
- Graduate Fellowship, Office of Naval Research (1989-1992)
- Luis Sudler Prize for Arts Achievement, MIT (1989)

- Tau Beta Pi, Phi Beta Kappa, Burchard Scholar, MIT (1988, 1989)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- ASME (Fellow), IEEE (Fellow), APS (Fellow), AAAS (Fellow), NAI (Fellow) (2010 - present)
- Chief Editor, Nanoscale & Microscale Thermophysical Engineering (2007 - 2012)
- Associate Editor, Journal of Heat Transfer (2008 - 2012)
- Member, Tau Beta Pi, Phi Beta Kappa, Sigma Xi (1989 - present)

PROGRAM AFFILIATIONS

- Stanford SystemX Alliance

PROFESSIONAL EDUCATION

- PhD ME, MIT (1993)
- MSME, MIT. ONR Graduate Fellow (1991)
- BSME, MIT. Tau Beta Pi, Pi Tau Sigma (1989)
- BS Humanities, MIT. Phi Beta Kappa. Sudler Prize (1989)

PATENTS

- "SELECTED PATENTS FROM 35 TOTAL"
- US Patent 9601452 (2017): Barako, Goodson, et al. "High-Conductivity Bonding of Metal Nanowire Arrays", assigned to Northrop Grumman & Stanford
- US Patent 7104312 (2006): Goodson, Upadhya, Zhou, et al. "Method and Apparatus for Achieving Temperature Uniformity and Hot Spot Cooling in a Heat Producing Device", assigned to Cooligy (acquired by Emerson)
- US Patent 5843224 (1998): Zachai, Gutheit, Goodson. "Composite structure comprising a semiconductor layer arranged on a diamond or diamond-like layer and process for its production", assigned to DaimlerBenz
- US Patent 6942018 (2005): Goodson, Santiago, Kenny, et al. "Electroosmotic Microchannel Cooling System", assigned to Stanford, licensed to Cooligy (acquired by Emerson)

LINKS

- Stanford VPGE: https://vpge.stanford.edu
- Research Lab: http://nanoheat.stanford.edu
- Google Scholar: http://scholar.google.com/citations?user=oUhOkhUAAAAJ&hl=en
- Singing at the Bing: https://www.facebook.com/reel/2242304789929282
- Singing in class: https://www.youtube.com/watch?v=z-JoRuy2pGY
- Woodworking: https://www.instagram.com/kgoodson2004/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The Nanoheat Lab studies heat transfer in electronic nanostructures, microfluidic heat sinks, and packaging, with an emphasis on basic transport physics and industrial impact. We work closely with companies on novel cooling strategies for power devices, portables, ASICs, & data centers.

Current projects (see list below) include microfluidic heat sinks and vapor chambers for power electronics and 3D logic chips, also electron and phonon conduction and energy conversion in nanostructures. We collaborate with EE and MatSci experts, and current sponsors include ARPA-E, the NSF POETS Center, SRC ASCENT, Google, Toyota, Ford, Bosch, and Intel.

Historically, the lab pioneered phonon free path measurements using silicon nanolayers and helped IC companies commercialize SOI transistors, PCRAM, low-k dielectric passivation, and other thermally-hard technologies. Professor Goodson has 35 patents including several that launched Cooligy, a startup that built heat sinks for Apple products and was acquired by Emerson.

More recently, the Nanoheat Lab developed a record-breaking heat sink with Raytheon as part of DARPA ICECOOL, achieving low superheat using diamond channels, porous copper inverse opals, and 3D manifolding. We leveraged this progress to help UIUC launch an NSF Center for power electronics (POETS), which is an ongoing, major research catalyst for the lab.

Over the decades, lab sponsorship has been split between government grants and customized corporate contracts and gifts. We tailor our research for the benefit of both companies and our PhD students. Dozens of Goodson's PhD graduates now work at IC and energy companies, and 20+ are Professors at MIT, UC Berkeley, Stanford, UIUC, Purdue, UCLA, and other schools.

PROJECTS

- Exploring the Limits of Cooling for Extreme Heat Flux Applications: Data Centers and Power Electronics (ARPA-E) (1/1/2020)
- Development of a High Performance Microcooler with Minimal Packaging Overhead (NSF POETS) (8/1/2019)
- Nanomaterial-Based Thermal Management Solutions for 3D Monolithic Chips (SRC ASCENT) (7/1/2018)
- Microchannel & 3D Manifold for Power Electronics Cooling Applications (Ford Motor Company) (1/1/2018)
- Interfacial Phase Change Memory: Scaling, Performance, Optimization and Understanding the Physics of Switching (SRC) (7/1/2018)
- Thermal Engineering, Optimization, and Understanding the Physics of Electron & Phonon Conduction at Solid Interfaces (SRC) (1/1/2019)
- Microporous Copper Inverse Opal (CIO) Wick Technology for High Heat Flux Vapor Chamber Application (Bosch) (10/1/2019)
- High Aspect Ratio Vertically Aligned Copper Nano/Micro Wire PDMS Composites for Thermal Interface Materials (Google + Intel) (1/1/2020)
- Nanopatterning and Temporal Control of Phase-Change Materials for High-Bandwidth Devices (NSF) (8/15/2017)

Teaching

COURSES

2025-26

- Fundamentals of Heat Conduction: ME 352B (Win)

2024-25

- Fundamentals of Heat Conduction: ME 352B (Win)

2023-24

- Heat Transfer: ME 131 (Win)

2022-23

- Heat Transfer: ME 131 (Win)

STANFORD ADVISEES

Doctoral Dissertation Advisor (AC)

Jillian Anderson, Yujui Lin, Luke Min

Master's Program Advisor

Venkata Sai Saran Grandhe, Dhruval Javia, Sumantra Luitel

Doctoral (Program)

Naomi Lutz, Carson Tucker

Publications

PUBLICATIONS

- **Publication Overview: 250 Journal Articles, 330 Conference Papers, 36 Patents, 13 Book Chapters, 2 Books.** *42000+ Citations, H = 97 (Google Scholar). 23000+ Citations, H = 70 (Web of Science)*
  Goodson, K. E.
  2023

- **Dominant Energy Carrier Transitions and Thermal Anisotropy in Epitaxial Iridium Thin Films** *ADVANCED FUNCTIONAL MATERIALS*
  Perez, C., Jog, A., Kwon, H., Gall, D., Asheghi, M., Kumar, S., Park, W., Goodson, K. E.
  2022

- **An electrochemical thermal transistor** *NATURE COMMUNICATIONS*
  Sood, A., Xiong, F., Chen, S., Wang, H., Selli, D., Zhang, J., McClellan, C. J., Sun, J., Donadio, D., Cui, Y., Pop, E., Goodson, K. E.
  2018; 9

- **Enhanced Capillary-Fed Boiling in Copper Inverse Opals via Template Sintering** *ADVANCED FUNCTIONAL MATERIALS*
  Zhang, C., Palko, J. W., Barako, M. T., Asheghi, M., Santiago, J. G., Goodson, K. E.
  2018; 28 (41)

- **Extreme Two-Phase Cooling from Laser-Etched Diamond and Conformal, Template-Fabricated Microporous Copper** *ADVANCED FUNCTIONAL MATERIALS*
  Palko, J. W., Lee, H., Zhang, C., Dusseault, T. J., Maitra, T., Won, Y., Agonafer, D. D., Moss, J., Houshmand, F., Rong, G., Wilbur, J. D., Rockosi, D., Mykyta, et al
  2017; 27 (45)

- **Modulation of thermal and thermoelectric transport in individual carbon nanotubes by fullerene encapsulation** *NATURE MATERIALS*
  Kodama, T., Ohnishi, M., Park, W., Shiga, T., Park, J., Shimada, T., Shinohara, H., Shiomi, J., Goodson, K. E.
  2017; 16 (9): 892-+

- **Thermal transport: Cool electronics.** *Nature materials*
  Cho, J., Goodson, K. E.
  2015; 14 (2): 136-137

- **Ordering up the Minimum Thermal Conductivity of Solids** *SCIENCE*
  Goodson, K. E.
  2007; 315: 342-343

- **Heat generation and transport in nanometer-scale transistors** *PROCEEDINGS OF THE IEEE*
  Pop, E., Sinha, S., Goodson, K. E.
  2006; 94 (8): 1587-1601

- **High-Precision Thermal Characterization of Ultra-Low Thermal Resistance Copper Nano-Wire-Polydimethylsiloxane Composite Thermal Interface Materials Tape** *JOURNAL OF ELECTRONIC PACKAGING*
  Jiang, K., Kwon, H., Qiao, H., He, Y., Asheghi, M., Goodson, K. E.
  2026; 148 (1)

- **Mitigation of Boiling-Induced Thermal Degradation Using Microporous Nickel Inverse Opals Structures** *JOURNAL OF ELECTRONIC PACKAGING*
  Jiang, K., Kong, D., Narumanchi, S., Palko, J. W., Dede, E. M., Ahn, C., Lee, H., Asheghi, M., Goodson, K. E.
  2025; 147 (4)

- **Computational Fluid Dynamics Modeling and Optimization of Large-Scale (3 CM x 3 CM) Silicon-Based Embedded Microchannels With Three-Dimensional Manifold Microcoolers** *JOURNAL OF ELECTRONIC PACKAGING*
  Kong, D., Kwon, H., Lee, H., Lee, H., Asheghi, M., Goodson, K. E.
  2025; 147 (4)

- **Development of a capillary-driven two-phase microcooler using copper wiremesh 3D manifold and silicon micropin fin wicks** *INTERNATIONAL JOURNAL OF MECHANICAL SCIENCES*
  Kong, D., Giglio, R., Shattique, M. R., Wu, Q., Kwon, H., Palko, J. W., Lee, H., Dede, E. M., Asheghi, M., Goodson, K. E.
  2025; 305

- **Applications, Design Methods, and Challenges for Additive Manufacturing of Thermal Solutions for Heterogeneous Integration of Electronics** *JOURNAL OF ELECTRONIC PACKAGING*
  Dede, E. M., Zhou, F., Zhou, Y., Lohan, D. J., Asheghi, M., Goodson, K. E., Erickson, K.
  2025; 147 (2)

- **Porous mesh manifold for enhanced boiling performance** *APPLIED THERMAL ENGINEERING*
  Giglio, R., Shattique, M. R., Dede, E. M., Narumanchi, S., Asheghi, M., Goodson, K. E., Palko, J. W.
  2025; 260

- **Triply periodic minimal surfaces for thermo-mechanical protection.** *Scientific reports*
  Cheung, S., Kang, J., Lin, Y., Goodson, K. E., Asheghi, M., Gu, X. W.
  2025; 15 (1): 1688

- **Virtual Testbed for Economical and Reliability Analysis of Battery Thermal Management Control Strategies** *JOURNAL OF ELECTRONIC PACKAGING*
  Olyaei, M., Singh, S., Jiang, K., Gurumukhi, Y., Goodson, K., Asheghi, M., Miljkovic, N.
  2024; 146 (4)

- **Thermal Characterization of Ultrathin MgO Tunnel Barriers.** *Nano letters*
  Su, H., Kwon, H., Xue, F., Sato, N., Bhat, U., Tsai, W., Bosman, M., Asheghi, M., Goodson, K. E., Pop, E., Wang, S. X.
  2024

- **Extreme heat flux cooling from functional copper inverse opal-coated manifold microchannels** *ENERGY CONVERSION AND MANAGEMENT*
  Kong, D., Kwon, H., Jang, B., Kwon, H., Asheghi, M., Goodson, K. E., Lee, H.
  2024; 315

- **Capillary-enhanced two-phase micro-cooler using copper-inverse-opal wick with silicon microchannel manifold for high-heat-flux cooling application** *INTERNATIONAL COMMUNICATIONS IN HEAT AND MASS TRANSFER*
  Kwon, H., Wu, Q., Kong, D., Hazra, S., Jiang, K., Narumanchi, S., Lee, H., Palko, J. W., Dede, E. M., Asheghi, M., Goodson, K. E.
  2024; 156

- **Design of Manifolded 3-D µ-Coolers Enabling High Heat Flux Capillary-Driven Boiling Over Large Areas** *IEEE TRANSACTIONS ON COMPONENTS PACKAGING AND MANUFACTURING TECHNOLOGY*
  Wu, Q., Kwon, H., Asheghi, M., Goodson, K. E.
  2024; 14 (8): 1367-1373

- **Thermal optimization of two-terminal SOT-MRAM** *JOURNAL OF APPLIED PHYSICS*
  Su, H., Kwon, H., Hwang, W., Xue, F., Koroglu, C., Tsai, W., Asheghi, M., Goodson, K. E., Wang, S. X., Pop, E.
  2024; 136 (1)

- **AlN: An Engineered Thermal Material for 3D Integrated Circuits** *ADVANCED FUNCTIONAL MATERIALS*
  Vaziri, S., Perez, C., Datye, I. M., Kwon, H., Hsu, C., Chen, M. E., Noshin, M., Lee, T., Asheghi, M., Woon, W., Pop, E., Goodson, K. E., Liao, et al
  2024

- **Point-Contact Bonding of Integrated Three-Dimensional Manifold Microchannel Cooling Within Direct Bonded Copper Platform** *JOURNAL OF ELECTRONIC PACKAGING*
  Lin, Y., Wei, T., Moy, W., Chen, H., Gupta, M., Degner, M., Asheghi, M., Mantooth, H., Goodson, K. E.
  2024; 146 (2)

- **Thermomechanical Modeling and Stress Analysis of Copper Inverse Opal (CIO) Structure for Capillary-Fed Boiling** *IEEE TRANSACTIONS ON COMPONENTS PACKAGING AND MANUFACTURING TECHNOLOGY*
  Lyu, S., Wu, Q., Gong, Z., Wang, K., Goodson, K. E., Wei, T.
  2024; 14 (6): 1025-1035

- **Probing the Thermal and Electrical Properties of Ultrawide Bandgap Nitrogen-Polar AlGaN Heterostructures** *ADVANCED FUNCTIONAL MATERIALS*
  Noshin, M., Kwon, H., Khan, A., Alaei, S. P., Meng, C., Asheghi, M., Suzuki, Y., Salahuddin, S., Goodson, K., Chowdhury, S.
  2024
- **Picosecond carrier dynamics in InAs and GaAs revealed by ultrafast electron microscopy.** *Science advances*
  Perez, C., Ellis, S. R., Alcorn, F. M., Smoll, E. J., Fuller, E. J., Leonard, F., Chandler, D., Talin, A. A., Bisht, R. S., Ramanathan, S., Goodson, K. E., Kumar, S.
  2024; 10 (20): eadn8980
- **Development of a Hybrid Capillary-Driven Single-Phase and Two-Phase Micro-Cooler for Power Electronics Cooling** *IEEE TRANSACTIONS ON COMPONENTS PACKAGING AND MANUFACTURING TECHNOLOGY*
  Lin, Y., Kwon, H., Chen, H., Gupta, M., Degner, M., Asheghi, M., Mantooth, H., Goodson, K. E.
  2024; 14 (5): 810-823
- **Multi-Level Embedded Three-Dimensional Manifold Microchannel Heat Sink of Aluminum Nitride Direct Bonded Copper for the High-Power Electronic Module** *JOURNAL OF ELECTRONIC PACKAGING*
  Lin, Y., Wei, T., Moy, W., Chen, H., Gupta, M., Degner, M., Asheghi, M., Mantooth, H., Goodson, K. E.
  2024; 146 (1)
- **Boiling-induced thermal degradation of copper inverse opals and its mitigation** *INTERNATIONAL COMMUNICATIONS IN HEAT AND MASS TRANSFER*
  Kong, D., Kim, K., Jung, E., Jiang, K., Wu, Q., Jang, B., Kwon, H., Asheghi, M., Goodson, K. E., Lee, H.
  2024; 151
- **MITIGATION OF BOILING-INDUCED THERMAL DEGRADATION USING MICROPOROUS NICKEL INVERSE OPAL (NIIOS) STRUCTURES**
  Jiang, K., Kong, D., Narumanchi, S., Palko, J., Dede, E. M., Ahn, C., Lee, H., Asheghi, M., Goodson, K. E., ASME
  AMER SOC MECHANICAL ENGINEERS.2024
- **HIGH-PRECISION THERMAL CHARACTERIZATION OF ULTRA-LOW THERMAL RESISTANCE COPPER NANO-WIRE (CUNWS)-POLYDIMETHYLSILOXANE (PDMS) COMPOSITE THERMAL INTERFACE MATERIALS (TIMS) TAPE**
  Jiang, K., Kwon, H., Qiao, H., He, Y., Asheghi, M., Goodson, K. E., ASME
  AMER SOC MECHANICAL ENGINEERS.2024
- **SCALABLE LARGE-AREA TWO-PHASE CAPILLARY-ENHANCED MICRO-COOLER USING SILICON MICROCHANNEL FIN ARRAY WITH 3D SILICON MANIFOLD FOR HIGH-HEAT-FLUX ELECTRONICS COOLING APPLICATION**
  Kwon, H., Kong, D., Lee, H., Palko, J., Dede, E. M., Asheghi, M., Goodson, K. E., ASME
  AMER SOC MECHANICAL ENGINEERS.2024
- **CAPILLARY-BASED TWO-PHASE COOLING FOR HIGH POWER DENSITY POWER ELECTRONICS**
  Lin, Y., Kwon, H., He, Y., Chen, H., Gupta, M., Degner, M., Asheghi, M., Mantooth, H., Goodson, K. E., ASME
  AMER SOC MECHANICAL ENGINEERS.2024
- **COMPUTATIONAL FLUID DYNAMICS (CFD) MODELING AND OPTIMIZATION OF LARGE-SCALE (3 CM X 3 CM) SILICON-BASED EMBEDDED MICROCHANNELS WITH 3D MANIFOLD MICRO-COOLERS**
  Kong, D., Kwon, H., Lee, H., Lee, H., Asheghi, M., Goodson, K. E., ASME
  AMER SOC MECHANICAL ENGINEERS.2024
- **Cooling future system-on-chips with diamond inter-tiers** *CELL REPORTS PHYSICAL SCIENCE*
  Malakoutian, M., Kasperovich, A., Rich, D., Woo, K., Perez, C., Soman, R., Saraswat, D., Kim, J., Noshin, M., Chen, M., Vaziri, S., Bao, X., Shih, et al
  2023; 4 (12)
- **High Thermal Conductivity of Submicrometer Aluminum Nitride Thin Films Sputter-Deposited at Low Temperature.** *ACS nano*
  Perez, C., McLeod, A. J., Chen, M. E., Yi, S. I., Vaziri, S., Hood, R., Ueda, S. T., Bao, X., Asheghi, M., Park, W., Talin, A. A., Kumar, S., Pop, et al
  2023
- **Permeability of Single-Layer-Free-Standing Meshes at Varying Capillary Pressure via a Novel Method** *ADVANCED MATERIALS INTERFACES*
  Shattique, M. R., Giglio, R., Dede, E. M., Narumanchi, S., Asheghi, M., Goodson, K. E., Palko, J. W.
  2023

- **Non-volatile electrically programmable integrated photonics with a 5-bit operation.** *Nature communications*
  Chen, R., Fang, Z., Perez, C., Miller, F., Kumari, K., Saxena, A., Zheng, J., Geiger, S. J., Goodson, K. E., Majumdar, A.
  2023; 14 (1): 3465

- **Numerical Study of Large Footprint (24 x 24 mm(2)) Silicon-Based Embedded Microchannel Three-Dimensional Manifold Coolers** *JOURNAL OF ELECTRONIC PACKAGING*
  Wei, T., Hazra, S., Lin, Y., Gupta, M., Degner, M., Asheghi, M., Goodson, K. E.
  2023; 145 (2)

- **Linking Interfacial Bonding and Thermal Conductivity in Molecularly-Confined Polymer-Glass Nanocomposites with Ultra-High Interfacial Density.** *Small (Weinheim an der Bergstrasse, Germany)*
  Wang, Y., Collinson, D. W., Kwon, H., Miller, R. D., Lionti, K., Goodson, K. E., Dauskardt, R. H.
  2023: e2301383

- **Energy Efficient Neuro-inspired Phase Change Memory Based on Ge4 Sb6 Te7 as a Novel Epitaxial Nanocomposite.** *Advanced materials (Deerfield Beach, Fla.)*
  Khan, A. I., Yu, H., Zhang, H., Goggin, J. R., Kwon, H., Wu, X., Perez, C., Neilson, K. M., Asheghi, M., Goodson, K. E., Vora, P. M., Davydov, A., Takeuchi, et al
  2023: e2300107

- **Techno-economic feasibility analysis of an extreme heat flux micro-cooler.** *iScience*
  Dede, E. M., Zhang, C., Wu, Q., Seyedhassantehrani, N., Shattique, M., Roy, S., Palko, J. W., Narumanchi, S., Kekelia, B., Hazra, S., Goodson, K. E., Giglio, R., Asheghi, et al
  2023; 26 (1): 105812

- **EXPERIMENTAL CHARACTERIZATION OF CONFINED, PACKAGE-LEVEL DIRECT TWO-PHASE JET IMPINGEMENT COOLING WITH MICRO-PIN FIN SURFACE ENHANCEMENT**
  Wu, Q., Gong, Z., Chan, C., Kwon, H., Goodson, K., Wei, T., AMER SOC MECHANICAL ENGINEERS
  AMER SOC MECHANICAL ENGINEERS.2023

- **RELIABILITY OF COPPER INVERSE OPAL SURFACES FOR EXTREME-HEAT-FLUX MICRO-COOLERS IN LOW-GLOBAL-WARMING-POTENTIAL REFRIGERANT R-1233ZD POOL BOILING EXPERIMENTS**
  Kekelia, B., Wu, Q., Narumanchi, S., Major, J., Moreno, G., Asheghi, M., Dede, E. M., Palko, J., Goodson, K., AMER SOC MECHANICAL ENGINEERS
  AMER SOC MECHANICAL ENGINEERS.2023

- **VIRTUAL TESTBED FOR ECONOMICAL AND RELIABILITY ANALYSIS OF BATTERY THERMAL MANAGEMENT CONTROL STRATEGIES**
  Singh, S., Olyaei, M., Jiang, K., Gurumukhi, Y., Goodson, K., Asheghi, M., Miljkovic, N., AMER SOC MECHANICAL ENGINEERS
  AMER SOC MECHANICAL ENGINEERS.2023

- **DEVELOPMENT OF THERMAL INTERFACE MATERIALS TAPE USING VERTICALLY ALIGNED COPPER NANOWIRE-PDMS COMPOSITES**
  Qiao, H., Jiang, K., Wei, T., Lin, Y., Perez, C., Asheghi, M., Goodson, K., AMER SOC MECHANICAL ENGINEERS
  AMER SOC MECHANICAL ENGINEERS.2023

- **Parametric design analysis of a multi-level 3D manifolded microchannel cooler via re duce d order numerical modeling** *INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER*
  Hazra, S., Wei, T., Lin, Y., Asheghi, M., Goodson, K., Gupta, M., Degner, M.
  2022; 197

- **Understanding Interface-Controlled Resistance Drift in Superlattice Phase Change Memory** *IEEE ELECTRON DEVICE LETTERS*
  Wu, X., Khan, A., Ramesh, P., Perez, C., Kim, K., Lee, Z., Saraswat, K., Goodson, K. E., Wong, H., Pop, E.
  2022; 43 (10): 1669-1672

- **A machine learning approach for predicting heat transfer characteristics in micro-pin fin heat sinks** *INTERNATIONAL JOURNAL OF HEAT AND MASS TRANSFER*
  Kim, K., Lee, H., Kang, M., Lee, G., Jung, K., Kharangate, C. R., Asheghi, M., Goodson, K. E., Lee, H.
  2022; 194

- **Unveiling the Effect of Superlattice Interfaces and Intermixing on Phase Change Memory Performance.** *Nano letters*
  Khan, A. I., Wu, X., Perez, C., Won, B., Kim, K., Ramesh, P., Kwon, H., Tung, M. C., Lee, Z., Oh, I., Saraswat, K., Asheghi, M., Goodson, et al
  2022

- **A novel hardmask-to-substrate pattern transfer method for creating 3D, multi-level, hierarchical, high aspect-ratio structures for applications in microfluidics and cooling technologies.** *Scientific reports*
  Hazra, S., Zhang, C., Wu, Q., Asheghi, M., Goodson, K., Dede, E. M., Palko, J., Narumanchi, S.
  2022; 12 (1): 12180

- **Heat Conductor-Insulator Transition in Electrochemically Controlled Hybrid Superlattices.** *Nano letters*
  Zhou, J., Wu, Y., Kwon, H., Li, Y., Xiao, X., Ye, Y., Ma, Y., Goodson, K. E., Hwang, H. Y., Cui, Y.
  2022

- **Electro-Thermal Confinement Enables Improved Superlattice Phase Change Memory** *IEEE ELECTRON DEVICE LETTERS*
  Khan, A., Kwon, H., Chen, M. E., Asheghi, M., Wong, H., Goodson, K. E., Pop, E.
  2022; 43 (2): 204-207

- **Nanoscale Phase Change Memory Arrays Patterned by Block Copolymer Directed Self-Assembly**
  Tung, M. C., Khan, A., Kwon, H., Asheghi, M., Goodson, K. E., Pop, E., Wong, H.
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  SPIE-INT SOC OPTICAL ENGINEERING.2022

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PRESENTATIONS

- Hawkins Lectureship, Purdue University (2015) - Purdue University
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