

Kenneth E. Goodson

Winter 2023

Davies Family Provostial Professor at Stanford University

Senior Associate Dean for Faculty and Academic Affairs in the School of Engineering

Professor of Mechanical Engineering and, by courtesy, of Materials Science and Engineering

goodson@stanford.edu

<https://profiles.stanford.edu/kenneth-goodson>

<https://nanoheat.stanford.edu>

Overview

Ken Goodson specializes in heat transfer and electronics cooling with an emphasis on microfluidic heat sinks, nanoscale conduction, and basic transport physics. His lab pioneered phonon free path measurements and helped IC companies launch SOI, PCRAM, and other thermally-hard technologies. Current projects address power devices, vehicles, and data centers with ARPA-E, Google, Ford, Intel, & NSF. Goodson is a member of the National Academy of Engineering. PhD alums include 20+ Professors at MIT, UC Berkeley, & other schools.

Education

1993 Ph.D., Mechanical Engineering, MIT, ONR Fellowship
1991 M.S., Mechanical Engineering, MIT, ONR Fellowship
1989 B.S. Mechanical Engineering, MIT. Tau Beta Pi, Pi Tau Sigma
1989 B.S. Humanities (Music Performance), MIT. Phi Beta Kappa, Luis Sudler Prize for the Arts

Employment

1994- Mechanical Engineering Professor, Stanford University
2001-2003 Founder and CTO, Cooligy, Inc., built heat sinks for Apple G5, acquired by Emerson
1993-1994 Visiting Scientist, Materials Research Group, Daimler-Benz AG, Ulm Germany

Stanford Administration

2019- Senior Associate Dean for Faculty & Academic Affairs, Stanford School of Engineering
2013-2019 Department Chair, Mechanical Engineering
2008-2013 Department Vice Chair, Mechanical Engineering
2015-2016 Presidential Search Committee

As ME Chair and Vice Chair, Goodson led two strategic plans and directed or launched many hiring actions, yielding 15 new faculty who have transformed the department's scholarship and diversity.

Awards & Honors

2020 Member, National Academy of Engineering.
2020 SRC Aristotle Mentorship Award. SIA University Researcher Award.
2010-2019 Elected Fellow: AAAS, IEEE, APS, ASME, National Academy of Inventors
2018 Inaugural Richard Chu Achievement Award, IEEE
2017 InterPACK Achievement Award, ASME & IEEE
2016 Charles Russ Richards Memorial Award, Pi Tau Sigma & ASME
2015 Donald Q. Kern Heat Transfer Award, AIChE
2015 Warren Rohsenow Lectureship, MIT. Hawkins Lectureship, Purdue University
2015 Aisinjiro-Soo Lectureship, University of Illinois Urbana-Champaign
2014 Heat Transfer Memorial Award for Science, ASME. Technical Excellence Award, SRC
2013 THERMI Award, IEEE
2010 Allan Kraus Thermal Management Medal, ASME. Dusenberre Lectureship, Penn State.
1996 ONR Young Investigator Award. NSF CAREER Award
1990 & 1991 Voice Fellowships, Tanglewood Music Center



Kenneth E. Goodson Bio Sketch

Ken Goodson is the Senior Associate Dean for Faculty and Academic Affairs in the School of Engineering. As Mechanical Engineering Chair & Vice Chair (2008-2019), he led two strategic plans and recruited 15 faculty who transformed the department's scholarship and diversity.

Goodson specializes in heat transfer and electronics cooling. His lab pioneered phonon free path measurements, helped IC firms launch SOI and PCRAM, and has a long track record of translating breakthrough cooling science to companies. He's a member of the National Academy of Engineering and a Fellow with ASME, IEEE, APS, AAAS, and the National Academy of Inventors. He received the ASME Kraus Medal, the inaugural IEEE Richard Chu Award, the AIChE Kern Award, the SRC Aristotle Award, and the Heat Transfer Memorial Award. His PhD alums include dozens at IC firms and 20+ Professors at MIT, UC Berkeley, and other schools. Goodson has 35 patents and co-founded Cooligy, which built heat sinks for Apple and was acquired by Emerson.

Goodson moonlights as a baritone oratorio soloist with appearances at Davies Symphony Hall and Bing Concert Hall. His wife, Laura Dahl, is a concert pianist with the Stanford music faculty.

Email: goodson@stanford.edu
Stanford Profile: <https://profiles.stanford.edu/kenneth-goodson>
Research Group: <https://nanoheat.stanford.edu>
Web of Science: <https://publons.com/researcher/2803489/kenneth-e-goodson/>
Google Scholar: <https://scholar.google.com/citations?user=oUhOkhUAAAAJ&hl=en>

OVERVIEW OF PUBLICATIONS & PATENTS

Kenneth E. Goodson has co-authored 250 archival journal articles, 330 refereed conference papers, 13 book chapters, two books, and 35 US patents. In Web of Knowledge, his articles received 23000 citations with an h-index of 70. In Google Scholar, his articles received 42000 citations with an h-index of 97.

Highlighted Archival Papers (from 225 total). PhD Students in Bold

Sood, Xiong, Chen, Wang, Selli, Zhang, McClellan, Sun, Donadio, Cui, Pop, Goodson, 2018, "An Electrochemical Thermal Transistor," *Nature Communications*, Vol. 9, 4510.

Kodama, Ohnishi, Park, Shiga, Park, Shimada, Shinohara, Shiomi, Goodson, 2017, "Modulation of Thermal and Thermoelectric Transport in Individual Carbon Nanotubes by Fullerene Encapsulation," *Nature Materials*, Vol. 16, pp. 892-897.

Palko, Lee, Zhang, Dusseault, Maitra, Won, Agonafer, Moss, Houshmand, Rong, Wilbur, Rockosi, Mykyta, Resler, Altman, Asheghi, Santiago, Goodson, 2017, "Extreme Two-Phase Cooling from Laser-Etched Diamond and Conformal, Template-Fabricated Microporous Copper," *Advanced Functional Materials*, Vol. 27, 1703265.

Marconnet, Panzer, and Goodson, K.E., 2013, "Thermal Conduction Phenomena in Carbon Nanotubes and Related Nanostructured Materials," *Reviews of Modern Physics*, Vol. 85, pp. 1295-1326.

Marconnet, Asheghi, Goodson, 2013, "From the Casimir Limit to Phononic Crystals: Twenty Years of Phonon Transport Studies using Silicon-on-Insulator Technology," *ASME Journal of Heat Transfer*, HTD Anniversary Issue, Vol. 42, pp. 272-381.

David, Miler, Steinbrenner, Yang, Touzelbaev, Goodson, 2011, "Hydraulic and Thermal Characteristics of a Vapor Venting Two-phase Microchannel Heat Exchanger," *International Journal of Heat and Mass Transfer*, Vol. 54, pp. 5504-5516.

Rowlette, Kekatpure, Panzer, Brongersma, and Goodson, 2009, "Nonradiative Recombination in Strongly Interacting Silicon Nanocrystals Embedded in Amorphous Silicon-Oxide Films," *Physical Review B*, Vol. 80, 045314.

Pop, Sinha, Goodson, 2006, "Heat Generation and Transport in Nanometer Scale Transistors," *Proceedings of the IEEE*, Vol. 94, pp. 1587-1601.

Pop, Mann, Wang, Goodson, Dai, 2006, "Thermal Conductance of an Individual Single-Wall Carbon Nanotube Above Room Temperature," *Nano Letters*, Vol. 5, pp. 96-100.

Jiang, Mikkelsen, Koo, Huber, Yao, Zhang, Zhou, Maveety, Prasher, Santiago, Kenny, Goodson, 2002, "Closed-Loop Electroosmotic Cooling System for VLSI Circuits," *IEEE Proc. Components, Packaging, & Manufacturing Technology*, Vol. 25, pp. 347-355. SEMITHERM Best Paper, 2001. Basis of US patents 6942018, 6991024, 7131486, 7185697, 7334630.

Ju, and Goodson, 1999, "Phonon Scattering in Silicon Films of Thickness Below 100 nm," *Applied Physics Letters*, Vol. 74, pp. 3005-3007.

Goodson, Kading, Rosler, and Zachai, 1994, "Experimental Investigation of Thermal Conduction normal to Diamond-Silicon Boundaries," *Journal of Applied Physics*, Vol. 77, pp 1385-1392.