

## Gary L. Solbrekken

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### Research Interests

I have an interest in: general thermal management issues: solid state energy conversion (thermoelectric, thermionic, Nernst, etc. in refrigeration and generation modes) used for thermal design: cooling of electronic equipment: integrating solid state technology with other cooling/generation strategies at different geometric scales (macro to nano): thermal metrology development: thermal interface characterization: and heat transfer in biological systems.

### Education

- Ph.D. University of Minnesota, Mechanical Engineering, 2003, Thesis Project – *Design and Optimization of Solid State Energy Conversion Devices for Electronic Equipment.*  
MS University of Minnesota, Mechanical Engineering, 1995, Thesis Project – *Modeling and Analysis of Gas-Assisted Evaporative Cooling.*  
BS Rose-Hulman Institute of Technology, Mechanical Engineering, 1993.

### Scientific Employment

- Assistant Professor University of Missouri – Columbia, Mechanical Engineering, Columbia, MO, 2003 – present.  
Research Faculty University of Maryland, Mechanical Engineering, College Park, MD, 2003 – present.  
Teaching Fellow University of Minnesota, Mechanical Engineering, Minneapolis, MN, 2002 – 2003.  
Thermal Lab Manager Intel Corporation, Chandler, AZ, 1996 – 2000.

### Professional Awards and Affiliations

- U. of MN, Dept. of Mech. Eng., Teaching Fellowship, 2002 - 2003  
Best Paper of Conference at 2000 Sony SRF conference  
Best Paper of Session at 1999 ISPS conference  
University of Minnesota Graduate School Fellowship, 1993 – 1994  
ASME, Tau Beta Pi, Blue Key, Rose-Hulman Class Agent

### Patents

- Thermal Interface Material on a Mesh Carrier, US Pat. #6,523,608, Feb. 25, 2003, Solbrekken, G.L., Simmons, C., Chiu, C. P.
- Method for an Integrated Circuit Thermal Grease Mesh Structure, US Pat. # 6,150,195, Nov. 21, 2000, Chiu, C. P., Sharaf, N., Solbrekken, G., Cooks, C.
- Mesh Structure to Avoid Thermal Grease Pump-out in Integrated Circuit Heat Sink Attachments, US Pat. # 6,121,680, Sept. 19, 2000, Chiu, C. P., Sharaf, N., Solbrekken, G., Cooks, C.
- Thermal Bus Bar Design for an Electronic Cartridge, US Pat. # 5,990,549, Nov. 23, 1999, Chiu, C. P., Yusuf, I., Banerjee, K., Young, T., Solbrekken, G.

## **Selected Publications**

### Thesis

- Solbrekken, G. L., "Design and Optimization of Solid State Energy Conversion Devices for Electronic Equipment," PhD Thesis, Department of Mechanical Engineering, University of Minnesota, August 2003.
- Solbrekken, G. L., "Modeling And Analysis Of Gas-Assisted Evaporative Cooling," M.S. Thesis, Department of Mechanical Engineering, University of Minnesota, December 1995.

### Refereed Journals

- Yazawa, K., G. L. Solbrekken, and A. Bar-Cohen, 2003, "Modeling and Analysis of Heat Driven Forced Convection Cooling," *Trans. of the HTSJ: Thermal Science and Engineering*, Vol. 10, No. 5, pp. 29-35.
- Solbrekken, G. L., and C. P. Chiu, 2000, "Calibration of Resistance Type Die Level Temperature Sensors Using a Single Temperature Technique," *IEEE Trans. On Components and Packaging Tech.*, Vol. 23, No. 1, pp. 40 – 46.
- Bar-Cohen, A., G. Sherwood, M. Hodes, and G. Solbrekken, 1995, "Gas-Assisted Evaporative Cooling of High Density Electronic Modules," *IEEE Trans. On Components and Packaging Tech.*, Vol. 18, No. 3, pp. 502 – 509.

### Refereed Proceedings

- Solbrekken, G. L., K. Yazawa, and A. Bar-Cohen, 2003, "Chip Level Refrigeration Of Portable Electronic Equipment Using Thermoelectric Devices," Proceedings of InterPack 2003, Maui, HA, Jul 6-11, Paper IPACK2003-35305.
- Yazawa, K., G. L. Solbrekken, and A. Bar-Cohen, 2003, "Thermofluid Design of Energy Efficient and Compact Heat Sinks," Proceedings of InterPack 2003, Maui, HA, Jul 6-11, Paper IPACK2003-35242.
- Solbrekken, G. L., W. K. Coxe, K. Yazawa, and A. Bar-Cohen, 2002, "Passive Cooling Limits for Ventilated Notebook Computers," Proceedings of 12<sup>th</sup> International Heat Transfer Conference, Grenoble, France, August 18 – 23, Vol. 4, pp. 87 - 92.
- Coxe, W. K., G. L. Solbrekken, K. Yazawa, and A. Bar-Cohen, 2002, "Experimental Modeling of the Passive Cooling Limit of Notebook Computers," Proceedings of Itherm 2002, San Diego, CA, May 30 – June 1, pp 15 – 21.
- Solbrekken, G. L., K. Yazawa, K. C., Coxe, and A. Bar-Cohen, 2001, "Passive Cooling Limits for Unventilated Notebook Computers," Proceedings of InterPack 2001, Kauai, HA, Jul 8-13, Paper IPACK2001-15785.
- Prasher, R., C. Simmons, and G. Solbrekken, 2000, "Thermal Contact Resistance of Phase Change and Grease Type Polymeric Materials," Proceedings of IMECE, Orlando, FL, Nov. 5 – 10, MED-Vol. 11, pp. 461 – 466.
- Solbrekken, G. L., C. P. Chiu, B. Byers, and D. Reichenbacher, 2000, "The Development of a Tool to Predict Package Level Thermal Interface Material Performance," Proceedings of Itherm 2000, Las Vegas, NV, May 24-26, Vol. 1, pp. 48-54.
- Chiu, C. P., G. L. Solbrekken, and T. Young, 2000, "Thermal Modeling and Experimental Validation of Thermal Interface Performance Between Non-Flat Surfaces," Proceedings of Itherm 2000, Las Vegas, NV, May 24-26, pp. 55-62.
- Chiu, C. P., R. Viswanath, and G. L. Solbrekken, 1999, "Pentium ® II Processor Cartridge Design for Desktop," Proceedings of InterPACK '99, Hawaii, June 14 - 18.
- Solbrekken, G. L., and C. P. Chiu, 1998, "Single Temperature Calibration Method for Die Level Temperature Sensors," Proceedings of Itherm '98, Seattle, WA, May 27 – 30, pp 88-95.
- Solbrekken, G. L., and A. Bar-Cohen, 1995, "Gas-Assisted Water Cooling of High Heat Flux Surfaces," 1995 National Heat Transfer Conference Proceedings, Vol. 2, Portland, OR, August 6 – 8, pp 91 – 100.