



**STEVENS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

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Carnegie Room 315, Time 1:00pm**

***Recent Progress in Nanoscale Thermal Radiative Transfer
and Properties for Energy Harvesting***

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Wave interference and photon tunneling can result in significant enhancement of the radiative transfer for closely spaced objects. Nanoscale thermal radiation holds promise in near-field thermophotovoltaic devices. Furthermore, spectral and directional control of thermal radiation has a number of applications, including solar energy utilization, space thermal management, and high-efficiency incandescent lamps. A number of structures have been proposed as coherent emission sources, with spectral emission peaks in well-defined directions. The grating structure has been commonly used in which coherent emission is achieved by the excitation of surface polaritons or surface waves. Along with the development of metamaterials, magnetic polaritons have received much attention lately. Furthermore, planar structures can also support surface waves or optical resonance for thermal emission control. An overview will be given on our recent developments in nanoscale thermal radiation and in controlling the spectral and directional thermal radiative properties using subwavelength gratings, photonic crystals, optical cavities, vertically aligned carbon-nanotube arrays, and metamaterials.

Professor Zhuomin Zhang is an ASME Fellow and a Professor of Mechanical Engineering at Georgia Tech. He received B.S. and M.S. degrees in Engineering Thermophysics from the University of Science and Technology of China (USTC), and a Ph.D. degree in Mechanical Engineering from MIT. He worked at NIST and the University of Florida prior to joining Georgia Tech. Professor Zhang's research interests are in the areas of micro/nanoscale heat transfer, with applications to energy conversion, optoelectronic devices, and semiconductor manufacturing. He has written a textbook on *Nano/Microscale Heat Transfer* (McGraw-Hill, 2007) and authored/co-authored over 100 journal papers and 6 book chapters, received 2 patents, and given over 110 invited and 120 contributed presentations. Professor Zhang was a recipient of the Pi Tau Sigma Outstanding Teacher Award for 1997, the Sigma Xi Junior Faculty Research Award for 1999, the Presidential Early Career Award for Scientists and Engineers (PECASE) for 1999, the Heat Transfer Division Best Paper Award for 2000, and the AIAA Thermophysics Best Paper Award for 2005. He is an associate editor of the *Journal of Thermophysics and Heat Transfer* and the *Journal of Quantitative Spectroscopy & Radiative Transfer*. He also serves on the Editorial Board of the *International Journal of Thermophysics* and *Frontiers of Energy and Power Engineering in China*.