Abstract: Thermal radiation represents a fundamental aspect of nature. Every object around us emits and absorbs thermal radiation. Radiative exchange therefore represents one of the most important pathways through which energy is transported. In recent years, the developments of nanophotonic structures opens new possibilities for controlling thermal radiation. These developments point to new opportunities in energy technology. As illustrations, in this talk will discuss radiative cooling, a passive cooling technology building upon the capability to control the spectral properties of thermal radiation. We will also discuss the development of non-reciprocal thermal radiation as a way towards achieving the harvesting of solar energy at the thermodynamic limit.

Bio: Dr. Shanhui Fan is the Joseph and Hon Mai Goodman Professor in the School of Engineering at Stanford University. He is a Professor of Electrical Engineering, a Professor of Applied Physics (by courtesy), and a Senior Fellow in the Precourt Institute for Energy. He is also a faculty member of the Edward L. Ginzton Laboratory, for which he was the Director from 2014 to 2021. His research interests are in fundamental studies of nanophotonic structures, especially photonic crystals and meta-materials, and applications of these structures in energy and information technology applications. He has published over 600 refereed journal articles, given more than 300 plenary/keynote/invited talks, and holds over 70 granted U. S. patents. For his research accomplishments he has received a number of awards, including the R. W. Wood Prize, the Simons Investigator in Physics, and the Vannevar Bush Faculty Fellowship. He is a member of the National Academy of Engineering (NAE), and a Fellow of IEEE, APS, Optica, and SPIE. Professor Fan did his undergraduate study in physics from 1988 to 1992 at the University of Science and Technology of China, and received his Ph. D. in 1997 in theoretical condensed matter physics from the Massachusetts Institute of Technology.