

**THERMAL PHOTONICS: NEW CAPABILITIES IN SPECTRAL AND DIRECTIONAL CONTROL
AND RADIATIVE COOLING APPLICATIONS**
Aaswath Raman, Ph.D.

Assistant Professor, Department of Materials Science and Engineering
University of California Los Angeles



Abstract: Thermally generated light is a fundamental feature of nature. Its ubiquity makes its control and harnessing both of intrinsic scientific interest and of paramount importance for energy and heat transfer applications. In this talk, I will highlight some of our lab's recent results demonstrating metamaterial and nanophotonic approaches to controlling the spectral and directional nature of thermal emission, as well as new radiative cooling applications. As two examples, gradient epsilon-near-zero materials that exhibit anomalous directional control of thermal emission will be introduced, along with multi-scale metamaterials that support Mie-resonance-driven enhancement in infrared emissivity. I will also discuss new radiative cooling-driven energy and water applications we have developed in recent years that have been enabled by spectrally selective thermal emitters. This includes the development of a new passive approach to desalination, passive freezing desalination, as well as atmospheric water harvesting and the thermoregulation of building facades.

Bio: Aaswath Raman is an Assistant Professor in the Department of Materials Science and Engineering at UCLA. His research group's interests include nanophotonics, metamaterials and machine learning. He is also known for his works advancing radiative cooling, aspects of which he commercialized as co-founder and Chief Scientific Officer of SkyCool Systems. He received his Ph.D. in Applied Physics from Stanford University, and his A.B. cum laude in Physics and Astronomy from Harvard University. His work has been highlighted by The New York Times, The Washington Post, National Geographic, Popular Science and The Economist. He is a recipient of the MIT Technology Review Innovators Under 35 (TR35) Award (2015), Materials Research Society Nelson Buck Robinson Science and Technology Award for Renewable Energy (2018), Sloan Research Fellowship in Physics (2019), Hellman Fellows Award (2020), DARPA Young Faculty Award (2021), Senior Member, National Academy of Inventors (2022), NSF CAREER (2022) and the 3M Non-Tenured Faculty Award (2022)