Public Lecture:
7:30 PM - Thursday, February 23rd
Virginia Tech, Quillen Auditorium
190 Goodwin Hall

TITLE: Solar Steam Generation and Applications

We recently discovered that illuminating a solution of broadly absorbing nanoparticles dispersed in water results in vapour generation without the requirement of heating the fluid volume. [1] Using sunlight, approximately 80% of the energy absorbed by the nanoparticle solution is directly converted to steam generation, with only 20% resulting in heating of the liquid. To understand this unusual property we need to examine the intimate connection between the optical properties and the heat transfer properties of nanoparticle-laden liquids, a regime not previously investigated. Comparing single nanoparticle light-induced heating measurements with studies of light-induced steam generation in solutions of nanoparticles, we observe the importance of collective optical effects-multiple light scattering by absorber-scatterer nanoparticles-in this phenomenon. [2] In addition to steam generation, when nanoparticles are dispersed within a mixture of liquids and then illuminated, the properties of the distillate can diverge dramatically from those observed for standard distillation with thermal sources. These light-generated steam processes have direct applications in solar energy harvesting, where the goal is to produce steam directly for a variety of off-grid applications, well-suited to needs in both the developed and the developing world. [3-5]

References: