Some like it hot: on the use of thermographic phosphor particles for temperature and velocity measurements in fluids
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Time: 9:00 – 10:00 AM
Location: 362 Willard Building
Coffee and donuts will be provided

Abstract: Flows involving heat transfer or chemical reactions show a strong coupling between flow field and heat transfer or heat release from chemical reactions, which makes the simultaneous measurement of velocity and temperature highly desirable. The velocity can readily be measured using, e.g. a particle image velocimetry approach, which requires the seeding of micrometer-sized particles to the flow. However, the strong Mie scattering from these particles make the use of most thermometry techniques very difficult. A relatively new approach is to use the same particles needed for velocimetry to also perform fluid phase thermometry [1]. This can be achieved by seeding thermographic phosphor particles, which are composed of a ceramic host doped with transition metals or rare-earth elements. These materials emit strong luminescence after UV excitation, which changes spectrally with temperature, allowing a two-color ratiometric thermometry approach. Particles with a diameter of a few micrometers are small enough to follow both the flow and the fluid phase temperature. Fundamentals of the approach as well as some application examples will be discussed.

Biography: Dr. Frank Beyrau is the director of the Institute of Fluid Dynamics and Thermodynamics, and a chaired professor at Otto-von Guericke University in Magdeburg, Germany. He was previously a Reader in combustion diagnostics in the mechanical engineering department at Imperial College of London. He received the Gaydon Prize in 2014 for significant contributions to combustion, and was a visiting faculty at NASA Langley in 2006, among many other accolades. He has significant expertise in combustion and temperature diagnostics.