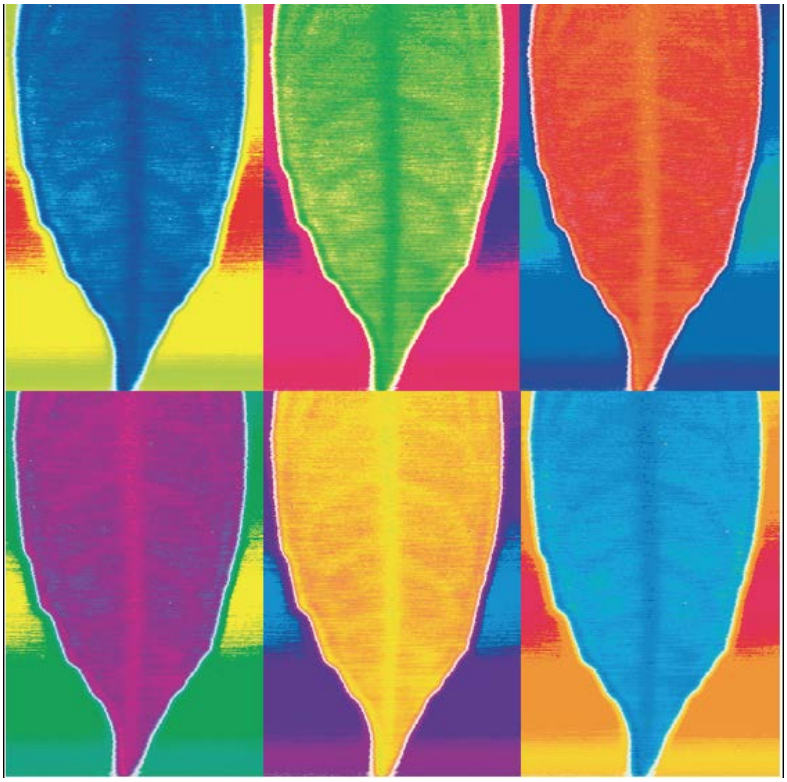

Between photonics and electronics: is THz the promised land of graphene technologies?

Alessandro Tredicucci, University of Pisa, Italy

Graphene is attracting considerable attention for a variety of photonic applications, including fast photodetectors, transparent electrodes in displays and photovoltaic modules, and saturable absorbers. Owing to its high carrier mobility, gapless spectrum, tunable chemical potential, and frequency-independent absorption coefficient, it has been recognized as a very promising element for the development of detectors and modulators operating in the Terahertz (THz) region of the electromagnetic spectrum, which is still severely lacking in terms of solid-state devices.
In the last few years, progress in the realization of graphene-based THz photonic devices has advanced very rapidly. In this talk I will focus in particular on the realization of THz detectors based on antenna-coupled graphene field-effect transistors (FETs), discuss the various mechanisms involved in their operation, and examine extension to other 2D materials and integration into future THz cameras. I will also address the development and applications of electrically switchable metamaterial devices as well as the prospects for the use of graphene in a new generation of THz sources, either directly as active element, or as waveguide optical component (for instance acting as saturable absorber in laser mode-locking). Finally, schemes to implement coherent control of absorption in graphene and the possible entailing device / diagnostic applications will be analysed.