



ICFO Colloquium JOHN PENDRY 'Transformation Optics: A Universal Design Tool'

JOHN PENDRY

December 11, 2015

Friday, December 11th, 12:00, ICFO's Auditorium

JOHN PENDRY

Imperial College London **John Pendry** has made seminal contributions to surface science, disordered systems and photonics. His most recent work has introduced a new class of materials, metamaterials, whose electromagnetic properties depend on their internal structure rather than their chemical constitution. Pendry discovered that a 'perfect lens' manufactured from negatively refracting material would circumvent Abbe's diffraction limit to spatial resolution, which has stood for more than a century. His most recent innovation of 'transformation optics' gives the metamaterial specifications required to rearrange electromagnetic field configurations at will, by representing the field distortions as a warping of the space in which they exist. In its simplest form the theory shows how we can direct field lines around a given obstacle and thus provide a 'cloak of invisibility', which was first

realised at Duke in 2006

Our intuitive understanding of light has its foundation in the ray approximation and is intimately connected with our vision: as far as our eyes are concerned light behaves like a stream of particles. Here we look inside the wavelength and show how the new concept of transformation optics that manipulates electric and magnetic field lines rather than rays can provide an equally intuitive understanding of sub wavelength phenomena and at the same time be an exact description at the level of Maxwell's equations. Examples will be given of applications to plasmonic structures with dimensions of just a few nanometres: a tenth or even a hundredth of the wavelength of visible light, and at the other extreme to cloaking of static magnetic fields. In both instances the ray picture fails utterly.

Friday, December 11th, 12:00, ICFO's Auditorium