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CURSO DE INTRODUCCIÓN A LA
INVESTIGACIÓN EN
ÓPTICA

Invited talk IO-CSIC OSA student chapter

Friday, 25th April, 12:45 pm
Sala de Conferencias Instituto de Óptica (CSIC)
Serrano, 121 Madrid

Novel techniques in biomedical imaging: Ocular biomechanics with Brillouin microscopy

Dr. Giuliano Scarcelli

Wellman Center for Photomedicine, Harvard Medical School

Changes in the elasticity of crystalline lens and cornea are thought to be central in the development of ocular disorders such as cataracts, presbyopia and corneal ectasia. However, current technologies to measure mechanical properties are limited for in vivo and/or in situ applications. We have recently introduced a new approach, based on optical Brillouin scattering, toward developing non-invasive high-resolution tool for biomechanical measurement. Brillouin scattering involves a frequency shift, arising from the interaction between an incident optical wave and spontaneous acoustic waves within a sample. The elastic modulus of the sample can be calculated from the frequency shift of Brillouin spectrum.

In the crystalline lens, we found that the elastic modulus increases from the cortex to the nucleus; most importantly, in vivo we found that the overall stiffness of the lens increases with age. The age-related stiffening of lens has long been associated with presbyopia. In the cornea, we found a depth-dependent variation of stromal elasticity that varies with disease states (e.g. keratoconus) and ocular procedures (e.g. corneal collagen crosslinking). Given the demonstrated sensitivity to detect mechanical changes, both physiological, pathological and due to ocular procedures, Brillouin microscopy promises to be a useful clinical tool to reveal onset and progression of prominent ocular diseases as well as response to treatment and drugs.

Dr. Giuliano Scarcelli is a physicist specialized in optical sciences and technology development. He obtained his PhD in quantum optics from the University of Maryland, Baltimore County. He then joined the Wellman Center for Photomedicine and Harvard Medical School as a postdoc in 2006 where he has become a faculty member in 2009. Giuliano has >25 peer-reviewed publications with over a 1000 citations, is inventor of four patents, all licensed to industry. Giuliano has been the recipient of several awards such as the EU international graduate student fellowship, the "Exceptional by example" award for outstanding PhD studies, the Tosteson Award for Harvard postdocs, the Human Frontier Science program Young Investigator, the NIH Quantitative Career Award as well as the Harvard University "Teaching excellence" award.

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