

# SEMİNER

Elektrik-Elektronik Mühendisliği Bölümü

Tarih:12.5. 2014

Saat:15:00

Yer: EE Bolumu Yorgo Istefanopulos Seminer Salonu

## Dr. M. Fatih Toy

### Digital holographic microscopy at its limits: From space biology to nanoscopy

Digital Holographic Microscopy (DHM) is a novel interferometric technique enabling real-time quantitative phase measurement of coherent wavefront. Retrieval of the complex light wavefront permits digital focusing and numerical optical aberrations corrections a-posteriori, while the phase information can be quantitatively directly related to both sample's morphology and refractive index distribution. In this talk, I will present three DHM based systems we have developed each bringing unique capabilities to its own application.

A dual mode DHM - epifluorescence microscopy system is specially developed for space biology studies (simulated microgravity conditions -Random Positioning Machine- and European Space Agency –ESA- parabolic flight campaigns). Exploiting the intrinsic capabilities of DHM enables this system for the first time to observe the minute response of living cells under microgravity.

A complementary DHM technique, total internal reflection holographic microscopy (TIRHM), is developed to shed light on the cell substrate interactions that take crucial role in the cytoskeletal remodeling. This marker free near field imaging technique does not suffer from inferior resolution thanks to its objective type incidence and collection.

$2\pi$  Phase Nanoscopy takes the capabilities of DHM to one step forward by enabling optical superresolution with a practical resolution of  $\sim 70\text{nm}$ . 3D refractive index distribution of a sample is imaged by benefiting from synthetic aperture imaging and 3D complex deconvolution. A start-up company, Nanolive SA ([www.nanolive.ch](http://www.nanolive.ch)), is founded to commercialize the technology for various applications.

**Short Bio:** M. Fatih Toy received his B.Sc. and M.Sc. both in Electrical and Electronics Engineering from Koç University in 2006 and 2008. He received his Dr. Sci. in Photonics degree from École Polytechnique Fédérale de Lausanne (EPFL) in 2013. For the rest of the year, he served as a post-doctoral researcher in the same institution. Currently, he is a co-founder and the technical advisor to the Swiss start-up company, Nanolive SA. His research interests include coherent imaging, biomicroscopy, and optical microsystems. He has co-authored over 20 publications in peer-reviewed journals and international conferences.