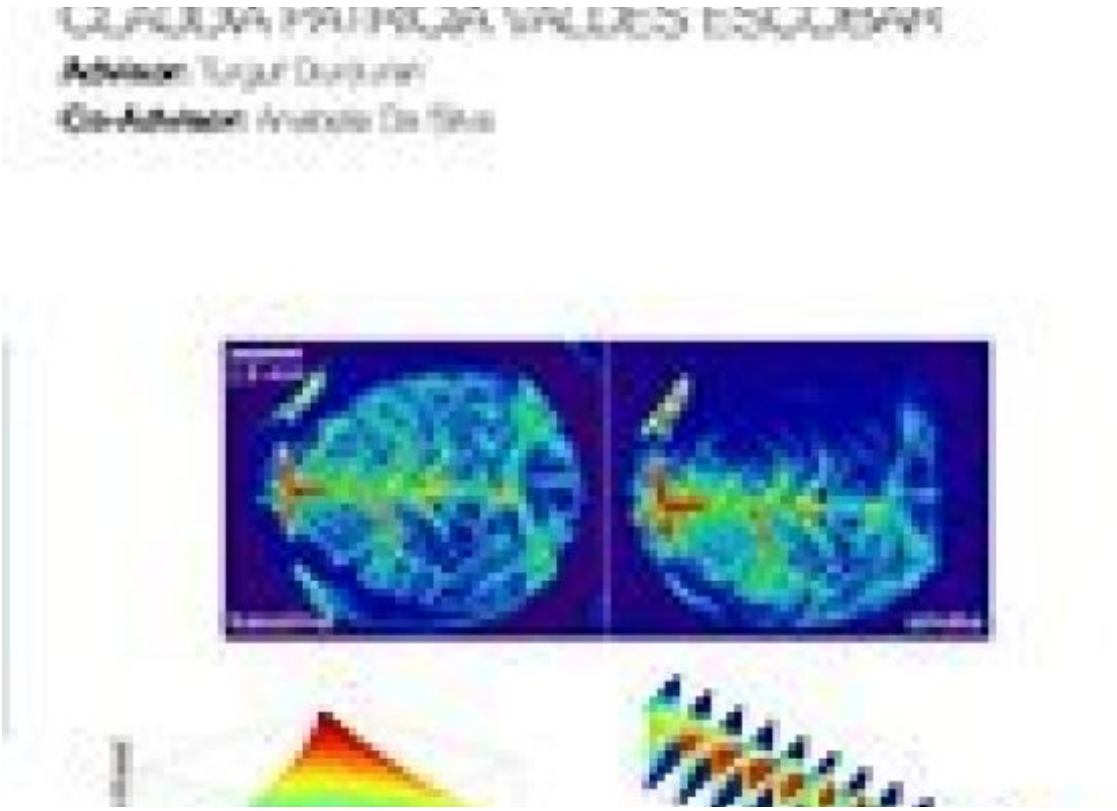

PhD Thesis Defense CLAUDIA VALDES ?New Laser Speckle Methods for in Vivo Blood Flow Imaging And Monitoring?

CLAUDIA VALDES

December 15, 2014

Monday December 15, 15:00. ICFO Auditorium

CLAUDIA VALDES

Medical Optics

ICFO-The Institute of Photonic Sciences

Blood flow and its regulation, as well as hemodynamics in general, are important for the health of tissues and hence the measurement of these quantities has many applications in research and clinical environments. Various optical techniques are attractive for the

measurement of blood flow since they are often non- or minimally-invasive, continuous and are relatively inexpensive. During my PhD I have contributed to the monitoring of blood flow in experimental animal models with the construction of a multimodal device, based on laser speckle flowmetry and optical intrinsic signals, capable of measuring superficial microvascular cerebral blood flow, blood oxygenation and blood volume for translational research. This device was applied in animal models of ischemic stroke and is flexible to be modified and used for other purposes. In doing so, I have developed new experimental methods and image processing protocols that allowed us to perform longitudinal studies where the animal can be removed from the device several times. Furthermore, this device has been used as a tool in a multi-disciplinary study to understand the role of the Mannose-binding lectin protein in reperfusion injury after an ischemic stroke in animal models. This then led to the main contribution of this work which is the development of the speckle contrast optical spectroscopy and tomography, a new non-invasive, optical technique for deep blood flow measurement that paves the way for deeper and three dimensional imaging of blood flow. This new method was first developed from a theoretical perspective. Then it was validated in tissue simulating phantoms and demonstrated to be feasible in measurements on the human arm muscle. Overall, these contributions will allow the development of cost-effective, non-invasive tomographic methods for the measurement of blood flow even in humans.

Monday December 15, 15:00. ICFO Auditorium

Thesis Advisor: Prof. Turgut Durduran