

# Biography

**Valentina Emiliani** (DR1, CNRS) is the head of the Neurophotonics department and leader of the *Wave front engineering microscopy group*, at the University Paris Descartes (France).

She obtained her PhD in Physics at the University “La Sapienza” in Rome working on the investigation of tunneling effect in quantum wells by ultrafast spectroscopy. As a post doc (Max Born Institut, Berlin), she investigated carrier transport in quantum wires by low temperature scanning near field optical microscopy (SNOM). In 2000 she formed a research team ‘High resolution microscopy’ at the European laboratory for nonlinear spectroscopy (Florence, Italy), focused on the investigation of light propagation in disordered structure by SNOM. In 2002 she moved to Paris where she start working in interdisciplinary projects at the interface between physics and biology at the Institute Jacques Monod (Paris, France). Here she studied the role of mechanical forces on the establishment of cell polarity by holographic optical tweezers.

In 2004 she has been recruited as researcher at the CNRS and promoted to research director in 2011. In 2005 she formed the *Wavefront engineering microscopy group*.

The group comprises today more than 20 people with complementary skills and knowledge comprising, nonlinear optics, ultra-fast spectroscopy, *in vivo* imaging, super resolution imaging, spatial light modulator technology, thermal imaging, electrophysiology and neurophysiology. The team has pioneered the use of phase modulation based techniques for the optical control of brain signalling. In particular, the group has demonstrated a number of new techniques for efficient photoactivation of caged compounds and optogenetics molecules, techniques based on computer generated holography, generalized phase contrast and temporal focusing. These new approaches are currently used in a series of collaborative projects, including the analysis of zebrafish swim circuit, the investigation of the retinal circuit, the study of calcium dynamics in respiratory-related neurons, the investigation of *hub* neuronal function *in vivo*, the mapping of functional circuits in visual cortex and the optical detection of neuronal membrane voltage. The team has also developed an optical microscope for super-resolution based on the principle of STimulated Emission Depletion (STED), and very recently has demonstrated a new optical scheme for super resolution wide field speckle imaging.

VE obtained the European Young Investigator price in 2005 and the Bettencourt-Shueller foundation price in 2014.