# Intraoperative surgery and tissue selection:

# What can be done with full field optical coherence tomography?

A. Claude BOCCARA *Institut Langevin. ESPCI ParisTech 1 rue Jussieu 75005 PARIS*

Mail: claude.boccara@espci.fr

**Abstract:** Optical Coherence Tomography (OCT) is an interferometric technique based on the use of a broad spectrum to virtually "slice" inside scattering materials with a typical resolution in the 10 micrometer range. Full Field Optical Coherence Microscopy provides an endogenous contrast, based on backscattering of ballistic photons, with submicron 3D resolution. We will show how it can be used for ex vivo and in vivo intra operative diagnosis and tissue selection.

A large number of imaging techniques are now available for studying biological tissues at different scales; they provide information about the nature (normal or pathologic), the structure (fat, collagen etc.), composition and evolution in time. Optical techniques could have played a major role in the diagnostic areas, nevertheless light is strongly scattered by tissues that makes the paths of the light rays very tortuous and images difficult to observe. Optical Coherence Tomography (OCT) is an interferometric technique based on the use of a broad spectrum to virtually "slice" inside scattering materials; OCT uses a broadband light source coupled to an interferometric detection. It has been widely used for biological tissues the main domain being the retinal observation. On the opposite the applications of OCT to dense highly scattering tissues such as brain, breast etc. is more reduced.

We have introduced a new approach called Full Field OCT using a Linnik imaging interferometer and a thermal source. The main difference with standard OCT is that we record 2D "en face images" (transverse slices, thickness of about 1 micron) on megapixel cameras without any transverse scanning. This configuration allows sharp focusing in the micrometer range (from 0.5 to 1.5 micron depending on the numerical aperture of the microscope). We will give few examples that of images taken with FF-OCT for intra operative diagnosis and tissue selection.

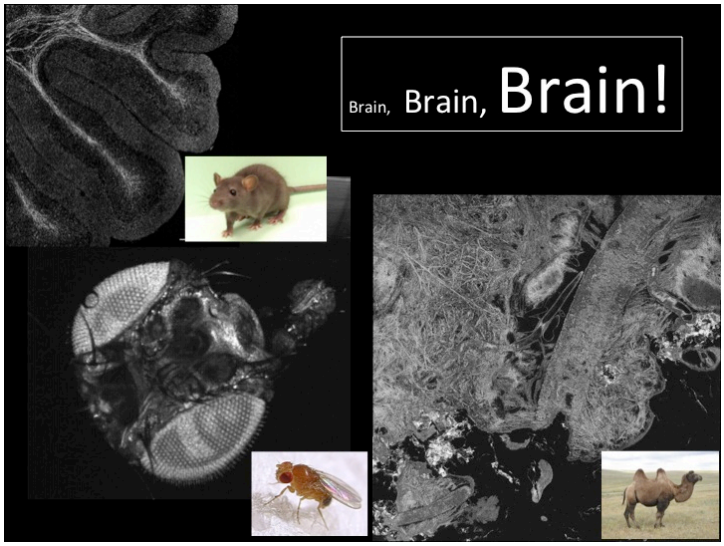


Figure: *images of virtual slices in the brain of a camel, a mouse and a drosophila*