



PIERRE BON 'Quantitative Phase for Biological Imaging and Temperature Measurements at Microscopic Scale'

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February 23, 2012

Seminar, February 23, 2012, 15:00. Blue Lecture Room

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Most of the microscopic samples (cells, bacteria?) are semi-transparent and classical white-light imaging doesn't give much information as light is not absorbed by the sample. But, as the refractive index within the sample is inhomogeneous, light accumulates a phase-shift during the propagation through the sample. We propose here to measure the wavefront in the exit plane of a conventional microscope with a high-resolution wavefront sensor used as a simple CCD camera. This allows us to measure both the intensity and the phase-shift introduced by the sample in a quantitative way.

I will show that a lot of information can be obtained on living cells. For example, it is possible to determine the quantity of matter within a single cell, and then to deduce the state of this cell into its cell cycle (G1, S, G2 or Mitosis). It is also possible to make diffraction tomography in order to reconstruct in 3D the sample.

I will finally present our last development to measure the temperature increase introduced by gold nanoparticles heating with the wavefront sensor. This technique uses the fact that the refractive index of the medium surrounding the particles is changing with the temperature and so is the wavefront. It allows us to measure a 1°C temperature variation in water (which is the worst candidate) with a simple measurement and without any modification of the sample (no fluorescence probe, no dedicated substrate?).

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Hosted by Prof. Romain Quidant