

# A13: Confocal spectroscopy on small objects

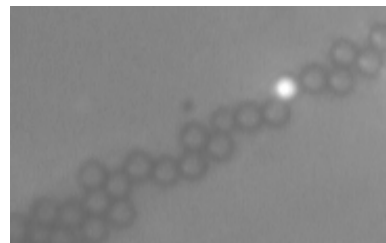
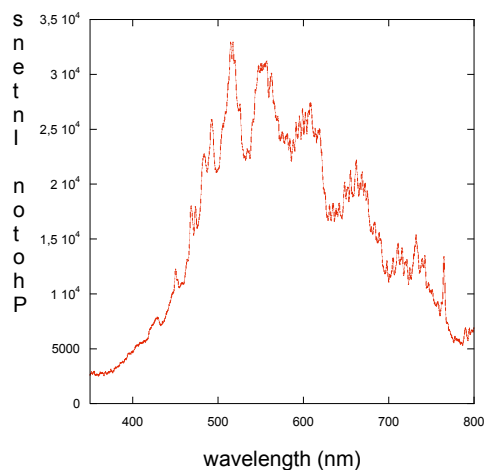
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Confocal optical microscopy is a technique for increasing the contrast of microscope images by selecting, via pin-holes, the light emitted from a desired point and rejecting the light from all other points. By this technique, overlying or nearby scatterers are kept from contributing to the detected signal which returns to restricting the observation volume. Observation of objects of sub-micrometric scale is thus accessible.

In this practical we will see how, on the basis of a confocal experimental set-up, one can perform optical spectroscopy on micro-objects, roughly of the scale of the observation wavelength. In particular the optical absorption and scattering of small objects will be measured as a function of the wavelength.

After presenting the principle of our experimental set-up, we will see different local optical measurements which can be performed using a model-sample in the name of latex spheres. A first step will be to measure the spectra of light scattered by a unique sphere. We will see how the incident white light may excite the Mie resonances of the sphere and how the diameter of the sphere can be deduced.



White-light illumination of a unique latex sphere of 2  $\mu\text{m}$  of diameter and associated excited Mie resonances.

In the second part of the practical, we will see how time-dependant optical measurements enable to measure the mean diameter of nano-objects, such as colloids, that can not be resolved by the microscope. To do so we measure the time dependant fluctuatiuos of the scattered light in order to determine the correlation function of the photon intensity. If some time is left, w will see that the same information and additional ones can also be obtained placing the colloids in the confocal experimental set-up. This technique, still under development, is close to the technique of Fluorescent Correlated Spectroscopy frequently used in Biology.