# Diseases diagnosis using Raman spectroscopy

All student project at MCBP are part of on-going research. This leads to a choice of relevant topics and close supervision of all students as there is a group interest in the outcome of the project.

Project background

Raman micro-spectroscopy is a great analytical tool for label-free detection of various diseases. The method provides a huge amount data about chemical composition of the sample. This information can be obtained from both (sub)cellular and tissue samples. Special imaging enables the localization and following of abnormal changes in tissues/cells.
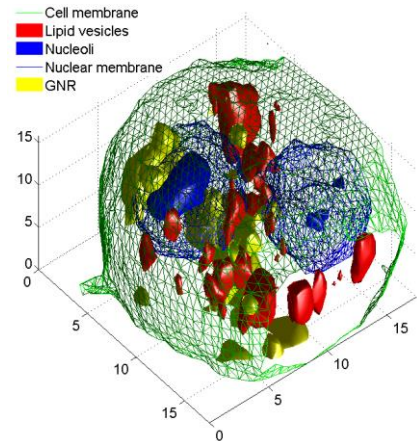
Developed Techniques

Raman signal in generated by exciting the specimen with an excitation laser. The scattered light is collected with a microscope system and the Raman spectrum is collected in a spectroscope. By moving the specimen under the microscope we can make a full 3D image of the cell, resulting in the image shown at the top of the page where different compounds in the cell are color coded.

Currently we are working on improving Raman analysis and diagnostics by combining this with other techniques:

- Integrating the Raman microscope with an electron microscope.
- Application of microfluidic device for Raman imaging samples in better controlled conditions.

Example Student Projects

1) The project concerns microbial carbonate mineralization in which the role of cyanobacteria for calcification process will be studied. Influence of those bacteria for mineralization process will be imaging by micro-Raman imaging and scanning electron microscopy.

2) When a cell is measured, its state can be determined when compared with a pre-made database of known signals. Currently there is a student project where this database of cells in the blood is being made and variations in the cell spectra are classified. It is expected that this can be used in the future to find abnormalities (like circulating tumor cells, leukemia cells or malaria) and develop detailed diagnosis methods.