Selected student project descriptions in the optics group (2010-2011).

1. Optical spectroscopy of Intermediate band gap and quantum dot nanostructures :application to 3rd generation solar cell structures.

This project is to perform Photoreflectance (PR) and Spectroscopic Ellipsometry of Intermediate band gap materials and quantum dot materials. The student should perform a systematic study of a series of samples containing QD layers, and work on the datasets collected from PhotoLuminescence (PL), Spectroscopic Ellipsometry (SE), AFM, SEM and possibly TEM. The student should become the expert on the interpretation of the data from optical spectroscopy, and we are looking for someone also interested in semiconductor optics and optical spectroscopy. In particular, the photo-reflectance technique should be studied in detail, and the student may participate in performing small improvements to the PR-instrument. The student is expected to have a key contribution in the understanding of the manufacture processes needed in order to develop materials of sufficient quality in order to produce the final solar cell structure.

Supervisors:
Prof. Morten Kildemo
Lars Martin Sandvik Aas
Ass. Prof. Turid Worren.

2. Light Scattering theory related to Mueller Matrix Ellipsometric image and light scattering measurements of bio-tissue.

In this project, the student is proposed to work on light scattering models related to anisotropic shaped objects such as collagen fiber and nerve fibers. These fibers are typically long cylinders and make up important parts such as cartilage (brusk), retina (nerve fibre layer). The overall target of this project is to relate the complete outgoing *Stokes-vector* to the incoming *Stokes vector*, i.e. the so-called *Mueller matrix*, and hence relate to the recent experimentally observed *Mueller matrix images*. The modeling will also relate to experimental scattering Mueller matrices. It is proposed to start from the existing single scattering theories, in order to relate to the polarization properties of scattering. Then we envisage to slowly look at more complex models in the second part of the project (e.g. Master thesis). The student may also upon interest choose to be involved in the measurement formalism and experimental Mueller matrix ellipsometry in collaboration with the biophysics group.

Supervisors:
Prof. Morten Kildemo
Prof. Ingve Simonsen
(P. G. Antonsen)