## Selective Plane Illumination Microscopy

The field of optical microscopy emerged in late 17th century, when famous Dutch draper and scientist Anton van Leeuwenhoek pioneered the techniques of microscopy. Since then the field has expanded and has greatly influenced the development of biology, chemistry, physics and medical research areas. Recently optical microscopy reached the realms of super resolution and nano scale, therefore allowing to see even single molecules. For this invention in 2014 three scientists were awarded with Nobel prize in chemistry. Overall, four Nobel prizes have been awarded for discoveries and inventions in microscopy. Most of the research in optical microscopy is done to increase the spatial resolution, neglecting the resolution in time. But obviously there are fast biological processes and understanding them would give significant contribution to medicine and biology.

In the last decade a new field of microscopy emerged, called selective plane illumination microscopy (SPIM). What distinguishes SPIM from conventional microscopes is that the sample is illuminated with a thin laser sheet. Therefore fluorescent light will be emitted only from the plane where the light sheet lies. And the light sheet can be made as thin as one hundredth of a human hair width. Therefore the SPIM method allows to image large samples with high temporal resolution and high spatial resolution in all 3 dimensions. With this new technique it is possible to reach up to few thousand frames per second, and it is possible to follow neuron signal propagation in real time. It is a great step forwards for research in neurology. Not only for studying cellular interactions, but also neuronal network interactions throughout the body of small animals. Furthermore bigger and older sample imaging could give better understanding of the neurological diseases that come with age, for instance Alzheimer's disease.

Besides significant increase in temporal resolution, with the SPIM technique it is possible to follow biological processes for much longer time periods compared to conventional microscopes. One can follow the evolution from larvae to fully grown organisms with single cell resolution or biological processes in cells for several days. Therefore it is now possible to follow how diseases evolve in tissue and how well the drugs can affect a disease. Thus it is possible to monitor the disease and the treatment in all stages. This is a significant improvement compared to conventional microscopes: now it is possible to study diseases and drug efficacy like never before.