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The Swiss Initiative in Systems Biology

PRESS RELEASE

Zurich, 27.04.2010

Scattered light fluorescence microscopy: imaging through turbid layers

The fluorescence microscope is a vital tool in virtually any biological, medical or biophysical laboratory. As with any microscope, a major limitation of the fluorescence microscope is its penetration depth into turbid tissue. This limitation is due to the fact that inside a turbid material small particles and imperfections scatter the light before it reaches the desired image plane. Researchers of the University of Zurich, from the SystemsX.ch project WingX, have taken an important step to solve this problem: they built a microscope that enables one to image fluorescent structures right through non-transparent 'walls' of turbid material [1]. The researchers used a recently developed technique to focus laser light through turbid layers [2]. However, instead of just focusing the light to a single point, their microscope moves the focus back and forth to scan a plane behind the non-transparent layer. By recording the amount of emitted fluorescent light for each position of the focus, the researchers were able to reconstruct the image of hidden fluorescent structures.

These images have a sub-micrometer resolution, which is comparable to that of a conventional microscope in a perfectly transparent medium. Areas of application include biological and biomedical imaging of processes that take place under skin, bone, cuticle, or other scattering tissue.

[1] I.M. Vellekoop and C. M. Aegerter, Optics Letters **35**, 1245 (2010)

[2] I.M. Vellekoop and A.P. Mosk, Optics Letters **32**, 2309 (2007)



WingX
Systems Biology
of the Drosophila Wing

Please visit **WingX** project on:

www.systemsX.ch