*The **CREA**tion of the Department of Physical Chemistry of Biological Sys**TE**ms [CREATE]*

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Visit Dawid Borycki in Neurophotonics Lab, Department of Biomedical Engineering, University of California, Davis report

[WP2]

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Noninvasive optical imaging

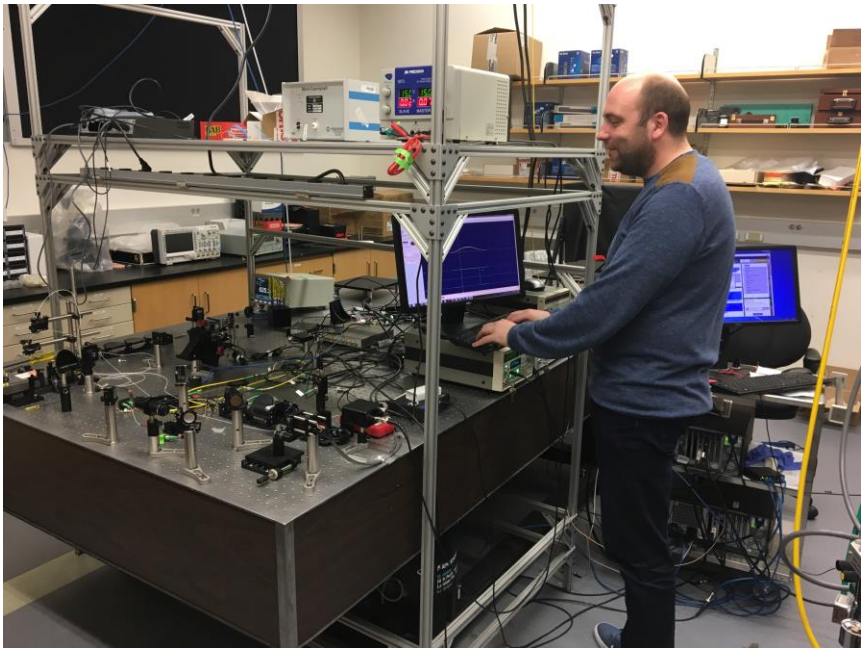
1. Visit summary

Noninvasive optical imaging in turbid media with microscopic resolution has multiple promising applications. For instance, such imaging can be used to visualize breast tumors to early detect and characterize any disorders and thus significantly increase the cure rate (because X-ray mammography cannot identify tumors at their early stage of development). The brain tractography (visualization of the axon maps) may help in characterizing demyelination in diseases of the central nervous system and complex neuropsychiatric disorders. However, as light penetrates deeper regions of the sample it is scattered multiple times. So, the resulting image instead of the pure sample structure, is confounded with noise from a diffusive photons.

There were multiple approaches developed among the past to tackle this problem. All of them isolate the ballistic component (which carries an information about the sample structure) from multiply scattered light (which introduces noise). To this end various properties of the scattered light are used to construct the so called gates. For instance, multiply scattered light travels longer than ballistic photons (time gate), is depolarized (polarization gate), propagates off-axis (spatial gate), and under specific conditions has the greater chance of being absorbed than ballistic light (absorption gate).

In our previous works on interferometric near-infrared spectroscopy (iNIRS) we identified yet another way to distinguish ballistic light and this visit was to validate this idea. To this end I developed software components and we performed a series of ex vivo experiments. Acquired signals were processed digitally to determine a scattered field autocorrelations from which diffusive and ballistic components were extracted. Results of this research are being prepared as a manuscript.

2. Photos

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