

11. PROGRAMMABLE OPTICS

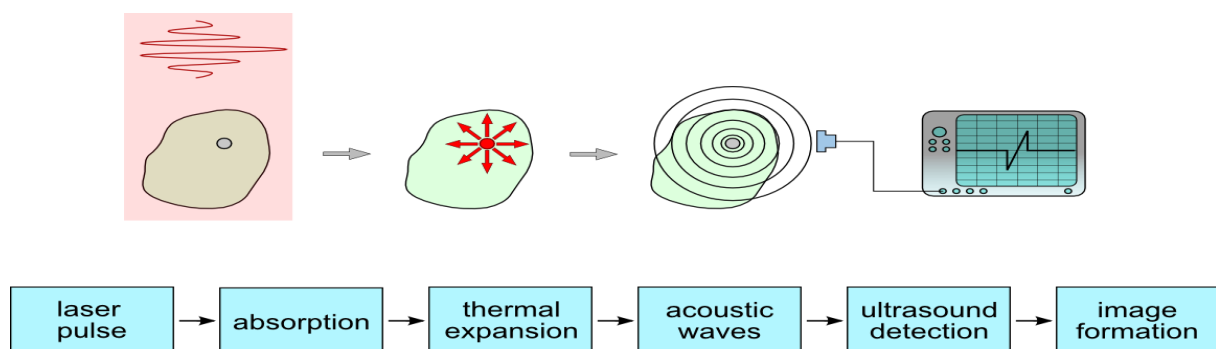
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Graduate students: ANDRÁS JÁNOSSY

We are working in several aspects of programmable optics combining different imaging modalities: Computational Optics, Optoacoustical Imaging, Digital Holographic Microscopy

- i. Our recent field of research is Photo- (or Opto-) Acoustical Microscopy. Its main advantage is that deep living tissues can be imaged for clinical diagnostic purposes. However, it usually requires multispectral optical exciting. Moreover surgeons can look under the surface before cutting into the tissue.
- ii. Our traditional and renewable field is building equipment to digitally capture complex wave-fields, which are holograms and reconstruct the wave-field and 3D objects by wave propagating algorithms. We use highly parallel GPUs to produce real-time 3D reconstructions. Its main applications are in biological digital holographic microscopy (DHM), especially in microfluidics. It is promising that infrared DHMs can look deeply inside human tissues.
- iii. Different optical, opto-acoustical, acoustical imaging modalities will be combined simultaneously to get deep tissue information that was not possible before.
- iv. It is possible to combine multiphoton microscopy with photoacoustic microscopy.

How we generate and capture optoacoustic signals:



ILLUSTRATIONS:

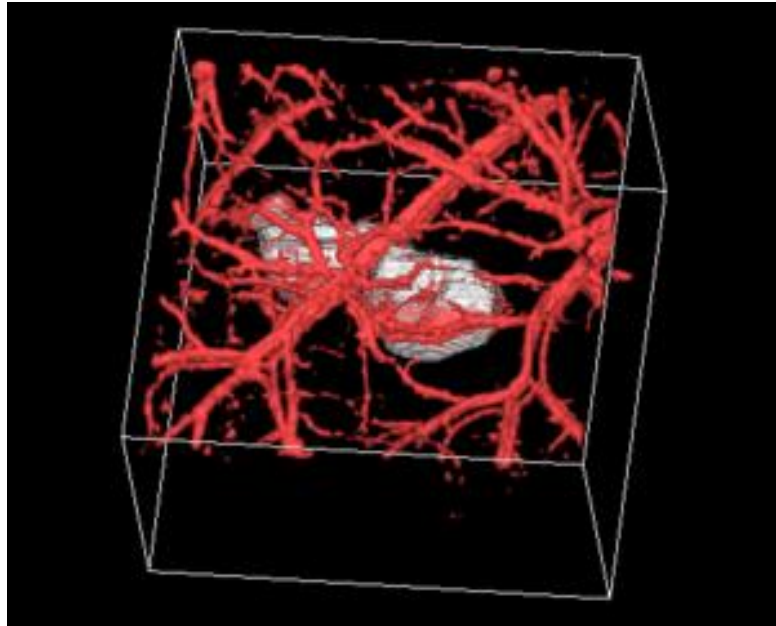


Fig. 1 Photoacoustic imaging of vasculature around tumor tissue (Lihong V. Wang)

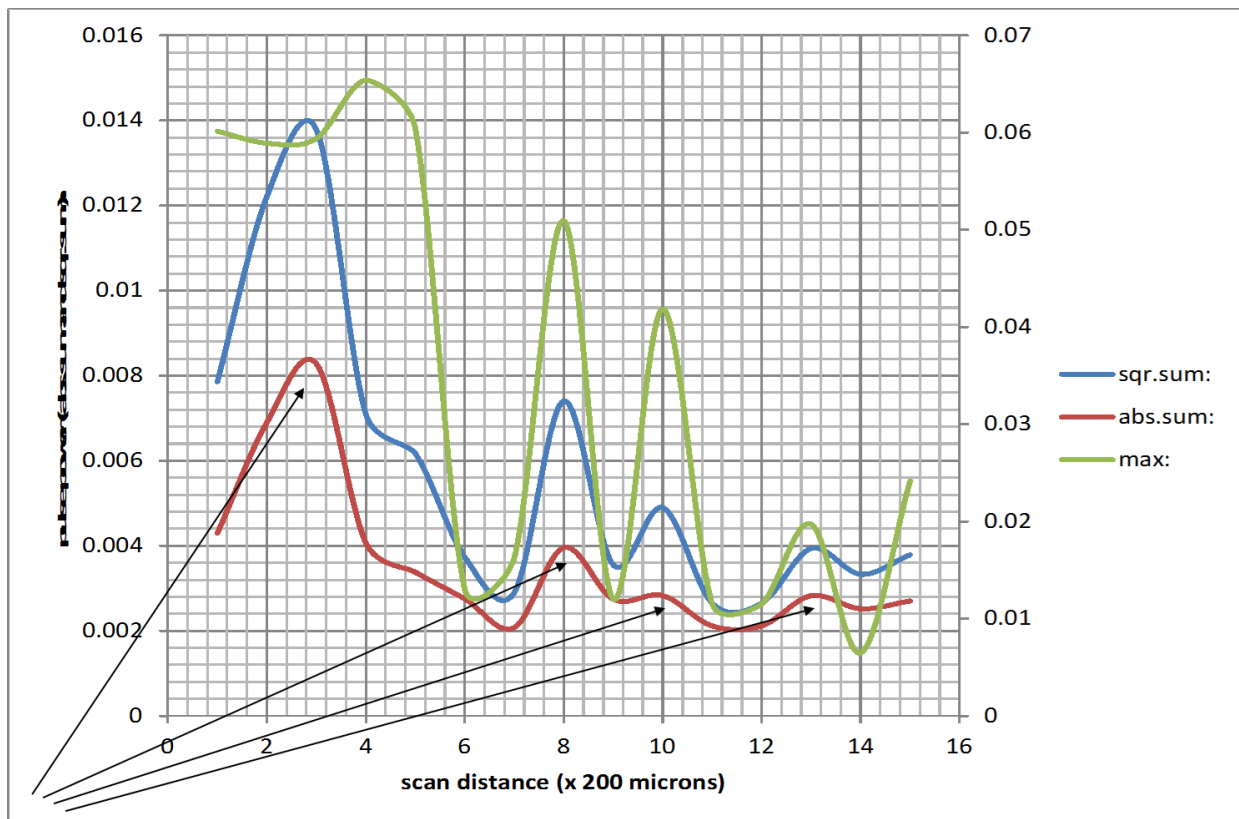


Fig. 2 Photoacoustic imaging of vasculature of mouse muscle (our result)

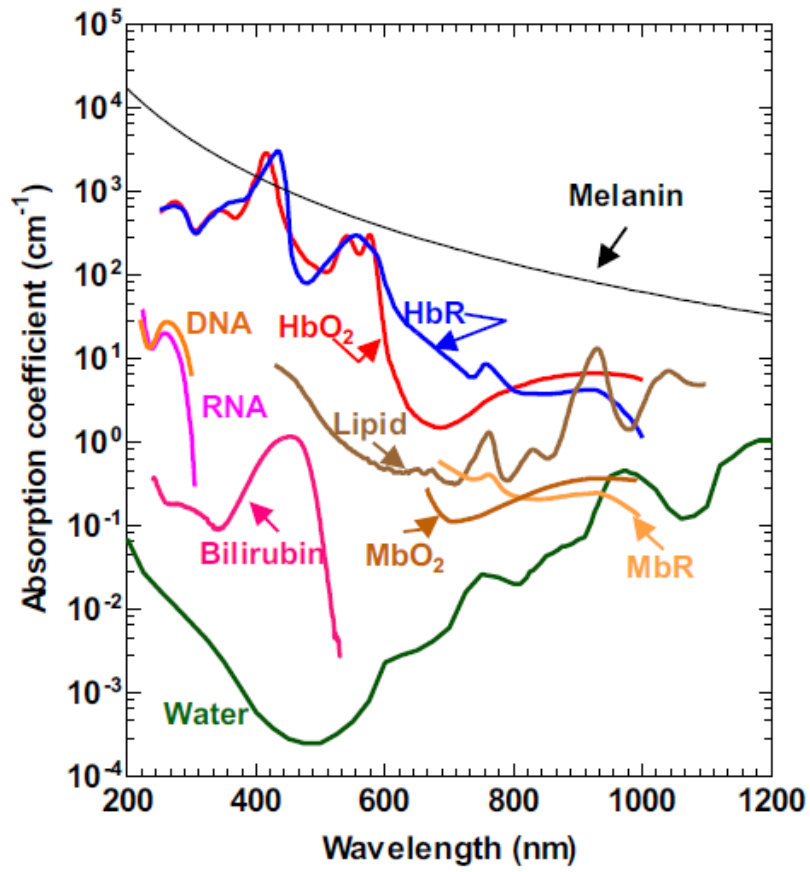


Fig. 3 Absorption coefficient of different endogen tissue elements

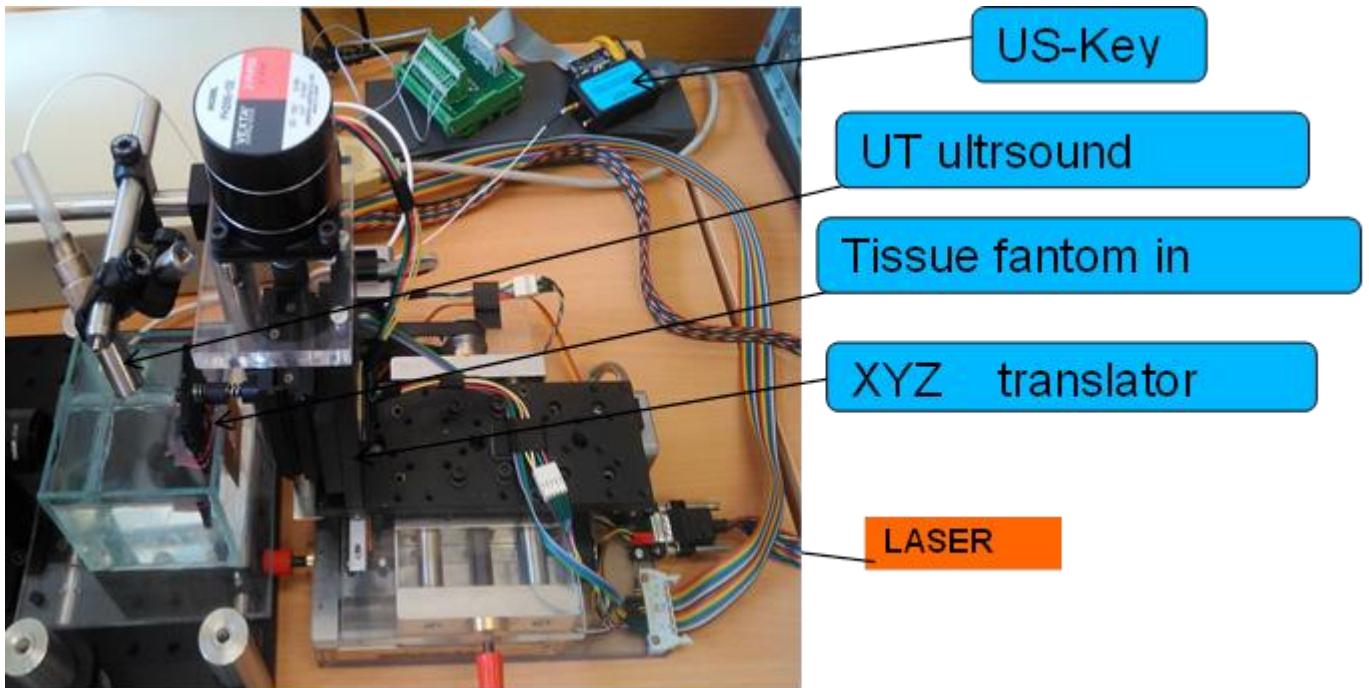


Fig. 4 Our photacoustic setup