IMAGING WITH SCATTERED LIGHT

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Random scattering of light in complex samples such as biological tissue renders most objects opaque to optical imaging techniques. However, although random, scattering is a deterministic process, and it can be undone, and also exploited by controlling the incident optical wavefront. These insights form the basis for the emerging field of optical *wavefront-shaping* [1]. Opening the path to new possibilities, such as imaging through visually opaque samples and around corners [2].
However, two major challenges exist in the field today: the first is how to determine the required wavefront correction without accessing the far (target) side of the scattering sample. The second is how to do it faster than the dynamics of the sample.
I will present some of our recent efforts in addressing these challenges [3-11]. These include the guidance of wavefront-shaping using non-linear effects [3], the photoacoustic effect [4-6], and acousto-optics [7-8]. In addition I will show how one can exploit the dynamics of the samples instead of fighting them. I will also demonstrate how it is possible to image through scattering layers and 'around corners' using nothing but a smartphone camera [9], using correlations of scattered light.
If time permits, I will present the use of these principles for endoscopic imaging through optical fibers [10-11].

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