IMAGING WITH SCATTERED LIGHT

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ABSTRACT: Scattering of light in complex samples such as biological tissue renders most samples opaque to conventional optical imaging techniques, limiting the penetration depth of microscopic imaging to a fraction of a millimeter in soft tissue. However, although random, scattering is a deterministic process, and it can be undone, controlled, and even exploited by carefully shaping the input wavefront, forming the basis for the emerging field of optical *wavefront-shaping* [1]. Opening the path to imaging through visually opaque samples [2] and to the control of scattered ultrashort pulses [3]. Unfortunately, many of these pioneering demonstrations [1-3] required invasive implantation of an optical probe at the target for determining the wavefront distortions.
I will present some of our recent efforts in addressing this challenge [4-10]. These include the use of the photoacoustic effect [4-6] or optical nonlinearities [7] to focus and control light non-invasively inside a scattering medium. I will also show how by exploiting the inherent correlations of scattered light it is possible to image through scattering layers and 'around corners' using nothing but a smartphone camera [8]. If time permits, I will present our efforts in exploiting these principles for endoscopic imaging [9-10].

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