

Foreword

Optical coherence tomography (OCT) is one of the most successful applications of modern optics in clinical diagnostics. By using the spectral information of broad bandwidth radiation, scattering tissue is imaged with micrometer depth resolution. By OCT *in vivo* imaging of the layered structure of the retina was enabled for the first time and 20 years after its first publication OCT has become an essential technique for retinal imaging. Parallel detection of light backscattered from different depths and single photon sensitivity are key features for the success of OCT.

This book introduces lateral parallelization of OCT in order to address two current shortcomings of this technology. 1. Imaging speed is limited by the maximal permissible exposure of the focused beam which scans the tissue. 2. The depth of focus in which the image is recorded is coupled to the lateral resolution. The center of attention of this book is the introduction of holoscopy, the combination of OCT with digital holography, which overcomes both limitations. By experimentally implementing ideas of Emil Wolf from the end of the 60s and Adolf Fercher ten years later, the whole scattered light field from a tissue volume is holographically recorded at discrete wavelengths over a certain spectral range. Images of biological objects and first *in vivo* images of human tissue are presented for the first time.

The description of theory and background of holoscopy includes a rigorous and comprehensive depiction of OCT itself. In two further chapters new approaches for data reconstruction by Fourier transforms on non-equispaced data and for correction of group velocity dispersion or sample motion are discussed. These techniques are equally important for both, OCT and holoscopy.

This book links optical coherence tomography to digital holography and shows that both have more in common than up to now was anticipated. The unifying view of this book paves the way for improved biomedical imaging with scattered ballistic photons.

I can highly recommend this book to all scientists and graduate students interested in coherence based imaging of biological tissue.

Lübeck, April 2014

PD Dr. Gereon Hüttmann

Holoscopy

Hillmann, D.

2014, XXXVI, 206 p. 58 illus., 1 illus. in color., Softcover

ISBN: 978-3-658-06478-5