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*Characterizing Brain Microstructure Using Magnetic Resonance Imaging: Towards In-Vivo Histology*

Understanding the normal and diseased human brain crucially depends on reliable knowledge of its microstructure. Until recently, the microstructure could only reliably be determined using invasive methods such as ex-vivo histology. I will discuss how an interdisciplinary approach developing novel magnetic resonance imaging (MRI) acquisition methods, image processing methods and integrated biophysical models aims to establish non-invasive quantitative histological measures of brain tissue. Example applications of this emerging field of in-vivo histology includes the mapping of cortical myelination, superficial white matter/U-fibers and iron in nigrosome 1 of the substantia nigra. I will also address major challenges to this ambitious goal including the validation of the in-vivo histology approaches.