Fakultät für Mathematik und Physik
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Physikalisches Institut

PHYSIKALISCHES KOLLOQUIUM

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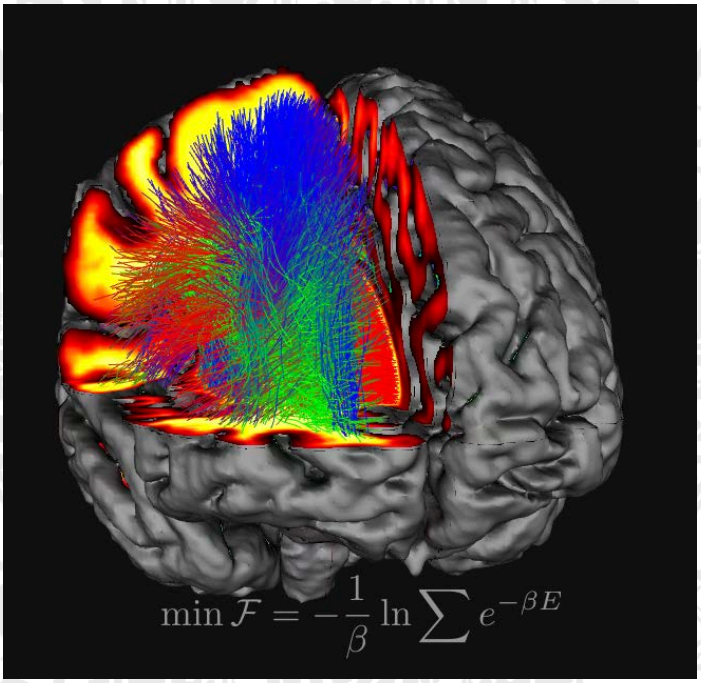
IM GROßEN HÖRSAAL



MICROSTRUCTURAL MRI: IN-VIVO HISTOLOGY?

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While magnetic resonance imaging (MRI) is indispensable in the modern medicine, its spatial resolution of the order of a millimeter is about three orders of magnitude coarser than the dimensions of biological cells that define the fundamental scale of biology. Cells are the object of microscopy-supported histology and histopathology, which are the ultimate diagnostic methods of medicine, unfortunately principally ex-vivo and often post-mortem. It is a great challenge to access at least some of cell properties in vivo and non-invasively. This goal inspires the currently booming activities within the MRI community. Accessing statistically averaged cell properties such as their size, spatial arrangement, membrane permeability etc. appears possible using MRI measurements of diffusion and signal attenuation. The engine of this approach is theory of the MRI signal formation in biological tissues. Theory rules the measurement design and provides data interpretation in terms of the microscopic tissue structure. It also reveals fundamental links to other domains of physics such as transport (diffusion and current) in disordered media. In this talk, the physical concepts behind this new development will be presented with examples of application to living human subjects.