# Aarhus MEG Special 2014

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*The Quest for the Philosopher's Stone of Human Brain Imaging*

Abstract:

Neuroscientists and clinicians use several noninvasive imaging methods to gain insight into the anatomy of the human brain and the distribution and temporal orchestration of its activity. It is regularly emphasized that one should strive for the best possible temporal and spatial resolution. However, this quest for the philosopher's stone of brain imaging often ignores the fact that, especially for the functional imaging methods, the phenomena probed have inherent time scales and the temporal resolution cannot be improved by oversampling the signals. Even more importantly, different functional imaging methods provide information about distinct aspects of brain function. For example, electroencephalography (EEG) and magnetoencephalography (MEG) record the electric and magnetic field produced by neural currents while functional magnetic resonance imaging (fMRI) and optical imaging (NIRS) are sensitive to slow hemodynamic changes associated with the actual brain activity. Positron-emission tomography (PET) complements this picture by providing information about the distribution and concentration of specific chemical compounds in the brain. Therefore, to extract all available information about human brain function, all data should be preferably acquired simultaneously and analyzed jointly. This talk will discuss the characteristics of the electrophysiological and hemodynamic methods, the technology we have developed to analyze the imaging data separately and jointly, and will finally show examples of how these methods have been used to resolve intriguing questions in basic and clinical neuroscience.