

Talk at the 3rd International Mobile Brain/Body Imaging (MoBI) Conference
Berlin, Germany July, 2018

Scott Makeig
Research Scientist & Director,
Swartz Center for Computational Neuroscience
Institute for Neural Computation
University of California San Diego
La Jolla CA 92093
smakeig@ucsd.edu
smakeig@{google,skype}

Mobile Brain/Body Imaging: A Decade of Emergence

A decade ago, when my colleague Howard Poizner approached me with the idea to record EEG during a behavioral reaching experiment, the wider possibilities for performing functional EEG imaging during nearly any motor behavior dawned on me only slowly. I knew that the independent component analysis (ICA) data decomposition method I and my colleagues were pioneering, originally at Terry Sejnowski's lab at the Salk Institute and then at our UCSD Swartz Center for Computational Neuroscience, could separate out the profuse contributions to scalp EEG from eye movements and neck muscle activities during natural movements. Thus, the technical means were at hand to separate, for the first time, potentials generated in the brain from non-brain processes that are summed in high-density scalp EEG. Non-trivial results from our first pilot experiment began to appear when we extended our ICA method to include in the analysis not only the nature of the movement the participant was making, but their immediately previous movement history. ICA-based EEG imaging revealed dynamics of cortical networks involved in motor planning and evaluation, processes that are near-continually active during what Klaus Gramann later dubbed our *natural cognition*. It struck me that previous brain imaging, whether of participants lying rigidly still in an fMRI, PET, or MEG scanner or staring at an EEG experiment screen fixation point, may not have seen or revealed the brain's repertoire or cortical dynamics that supports human *agency*, a root aspect of human consciousness. Indeed, the human brain has evolved to support our ability to move *intelligently*, meaning so as to optimize the *results* of our behavior. These ideas seemed so scientifically important to me that I felt the new research direction deserved a name – and, optimally, its own four-letter acronym (i.e., *not* 'f-m-r-l') that might inspire and focus research interest on this new field of brain research studying how cortical network dynamics support our everyday living. I decided to venture a new term, *mobile brain/body imaging*, and for it a new acronym, MoBI. In my talk I will explore these thoughts and will comment (from my limited viewpoint) on the now everywhere emerging brain studies of our natural embodied cognition, and on how the high-resolution EEG methods we and others are now developing can fulfill the promise of those first pilot experiments, a decade ago, which involved participants seated in darkness and attempting to reach out to touch briefly illuminated points of light.