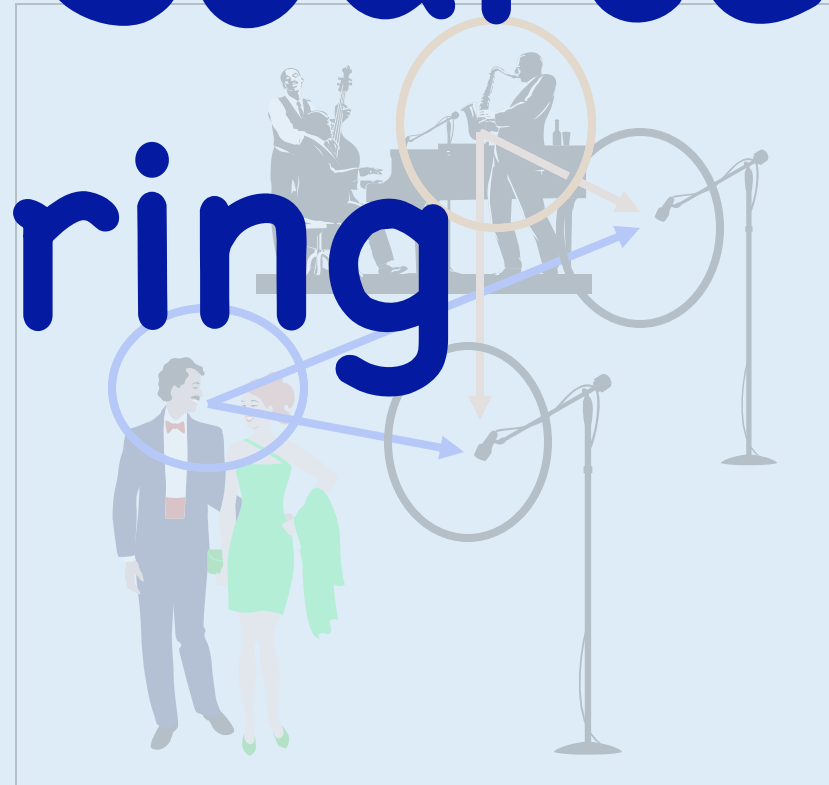
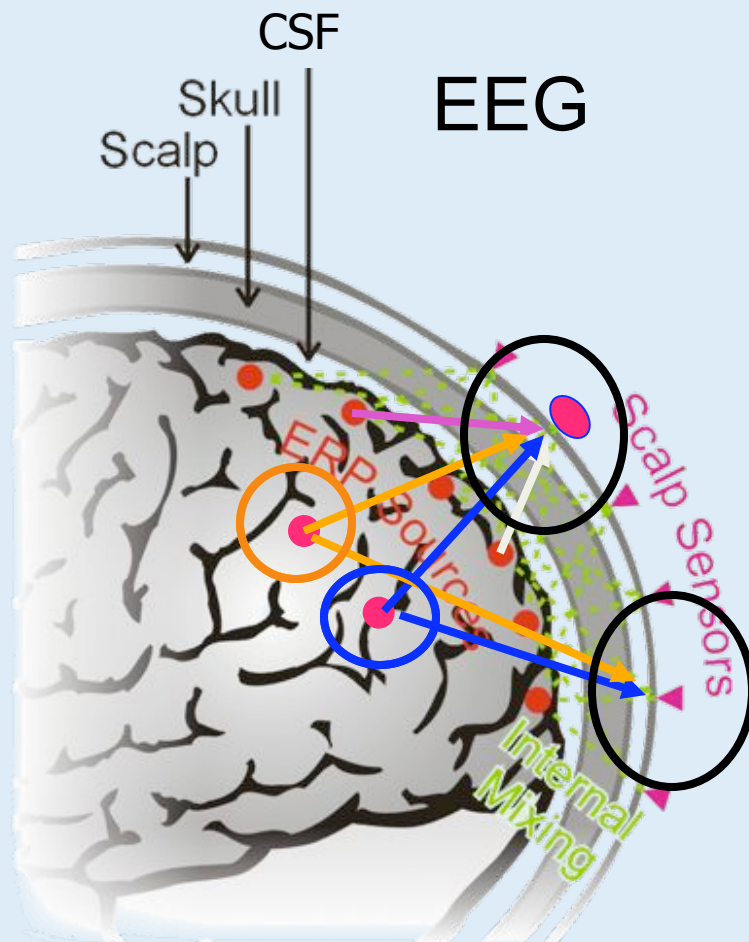


Blind EEG Source Separation by
Independent Component Analysis

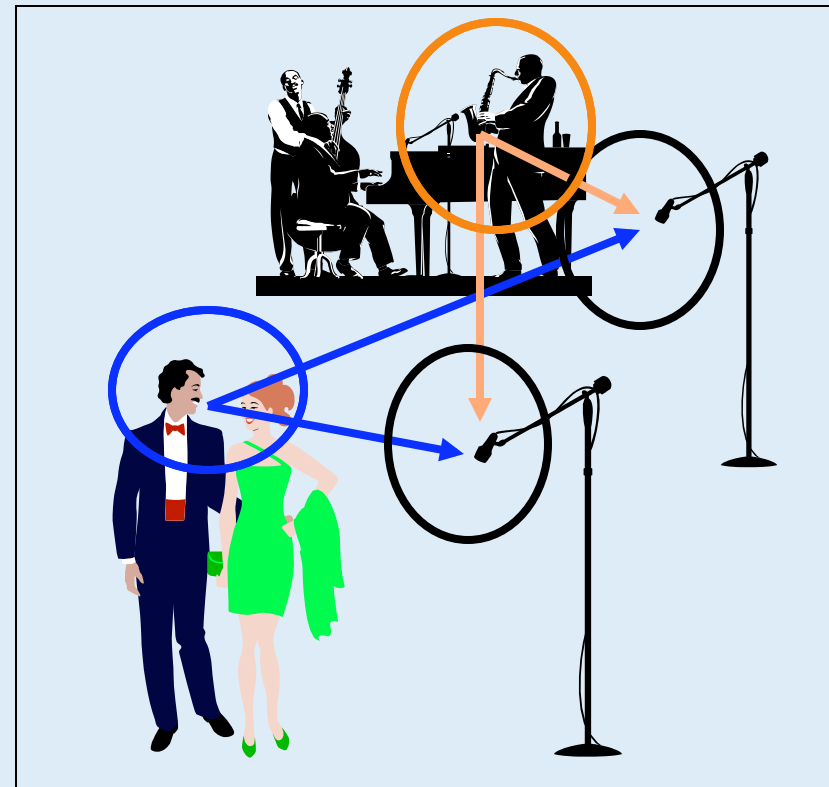
Spatial Source Filtering



Blind EEG Source Separation by Independent Component Analysis



Cocktail Party



Independent Component Analysis of Electroencephalographic Data



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Abstract

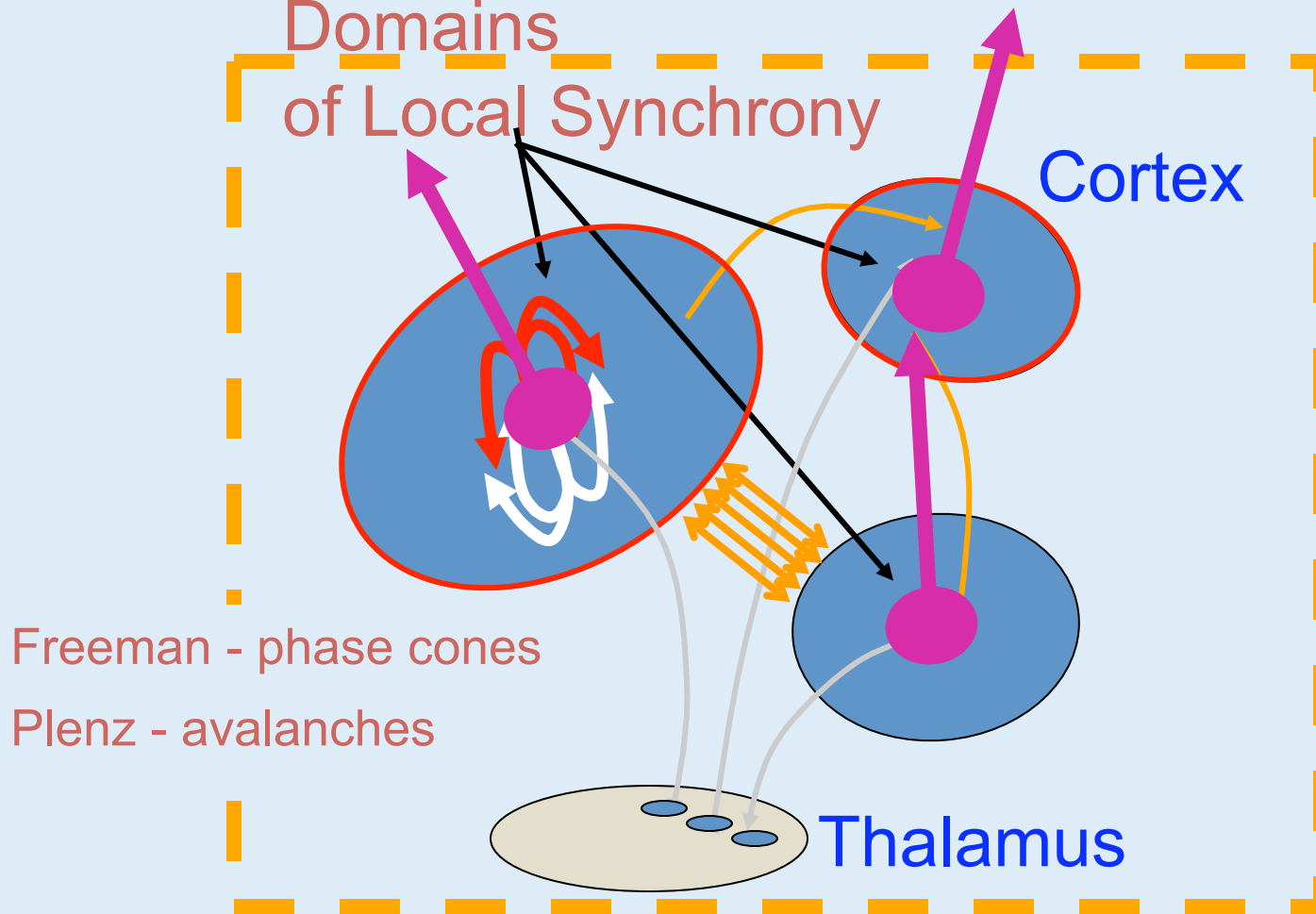
Because of the diverse origins of electrical fields and their effects on neurons, electroencephalographic (EEG) data collected from any point on the human scalp includes activity generated within a large brain area. This spatial smearing of EEG data by volume conduction does not readily distinguish distinct, spatially

separated sources. In this paper, we describe a new method for analyzing EEG data collected during a sustained voluntary attention task. (1) ICA, which is based on a mixture of different random fields, (2) ICA may be used to separate distinct underlying EEG components (the individual sources) from the recorded scalp signals. (3) ICA is capable of handling overlapping EEG phenomena, including all (the individual sources) and spatially-separated EEG components, to separate ICA channels. (4) Source localization for EEG and other neural data can be handled using ICA via changes in the amount of spatial activation across the head surface.

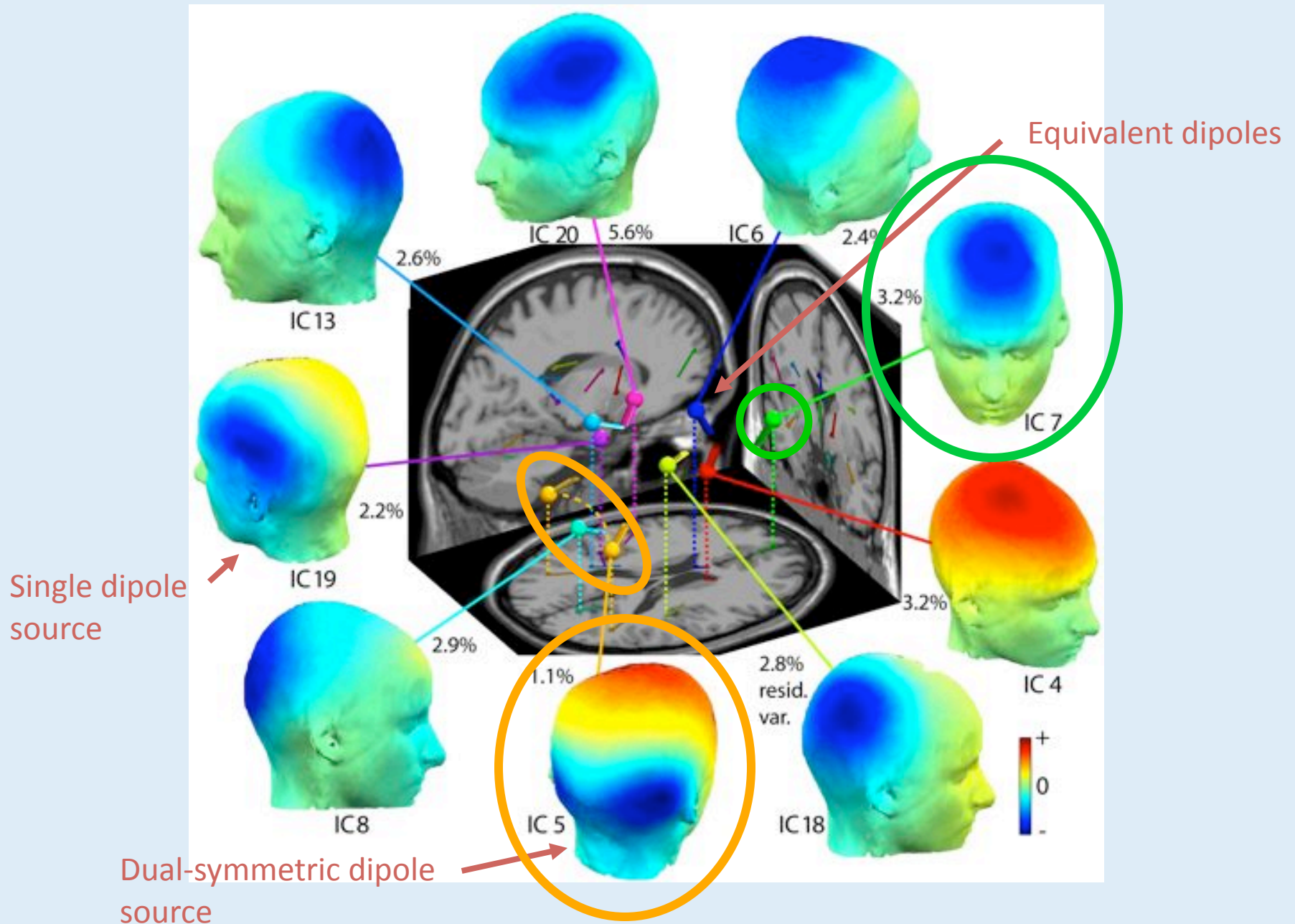
Infomax ICA

Are EEG source outputs (nearly) independent?

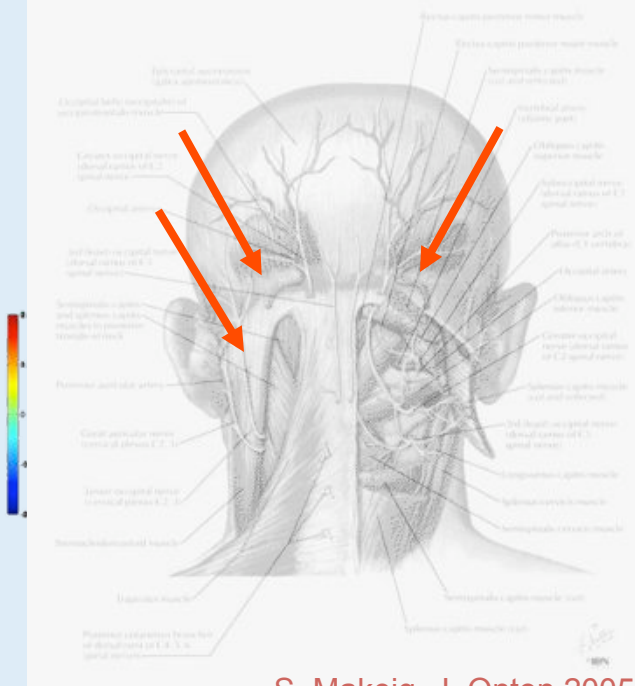
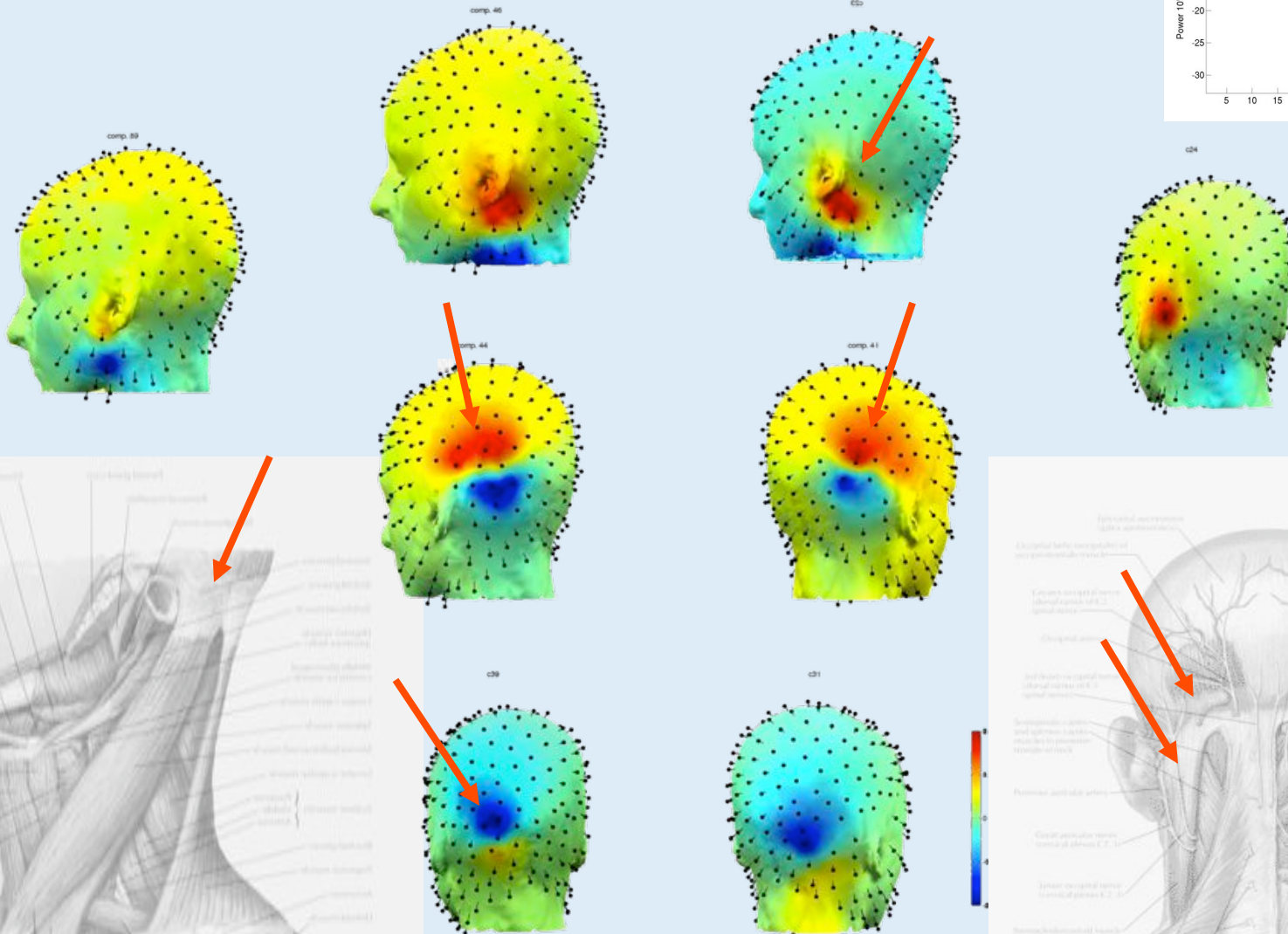
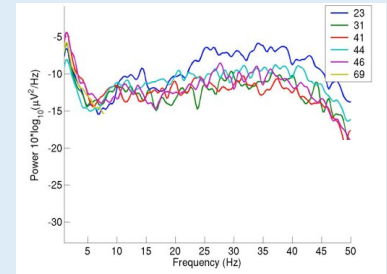
**Independent
Domains
of Local Synchrony**



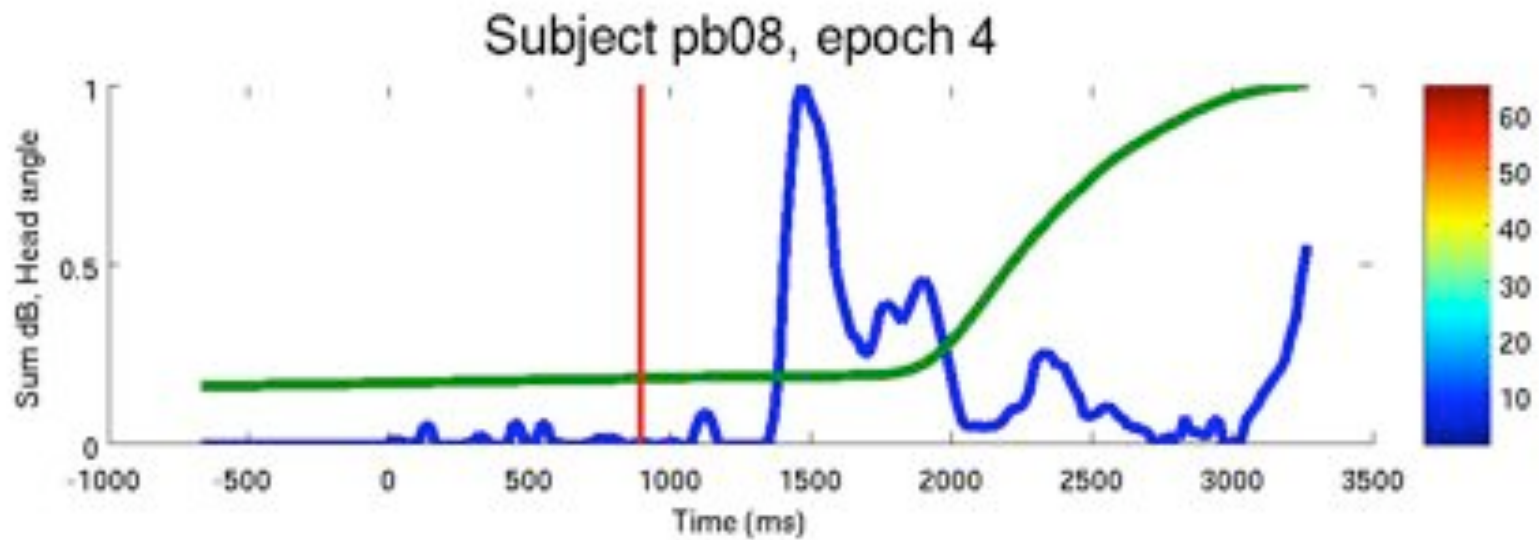
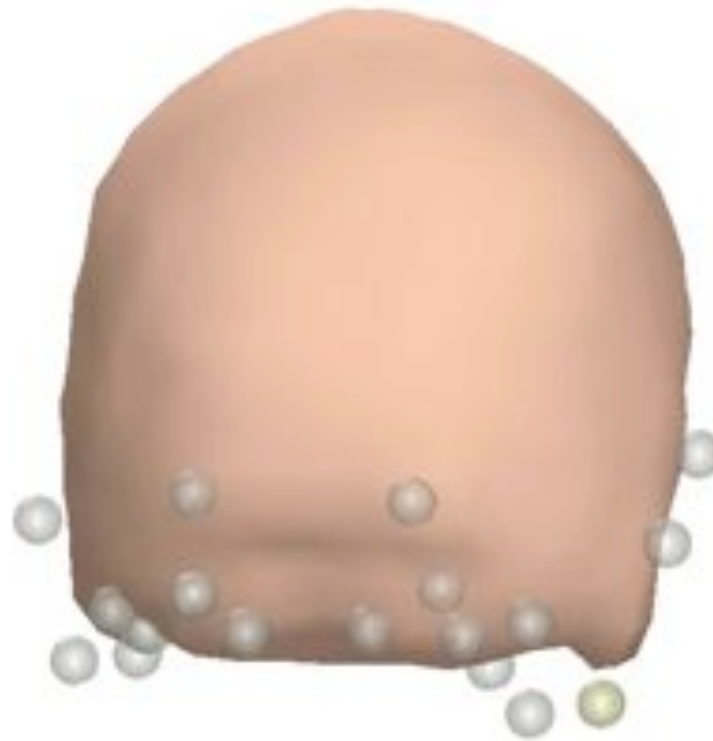
Independent brain EEG sources



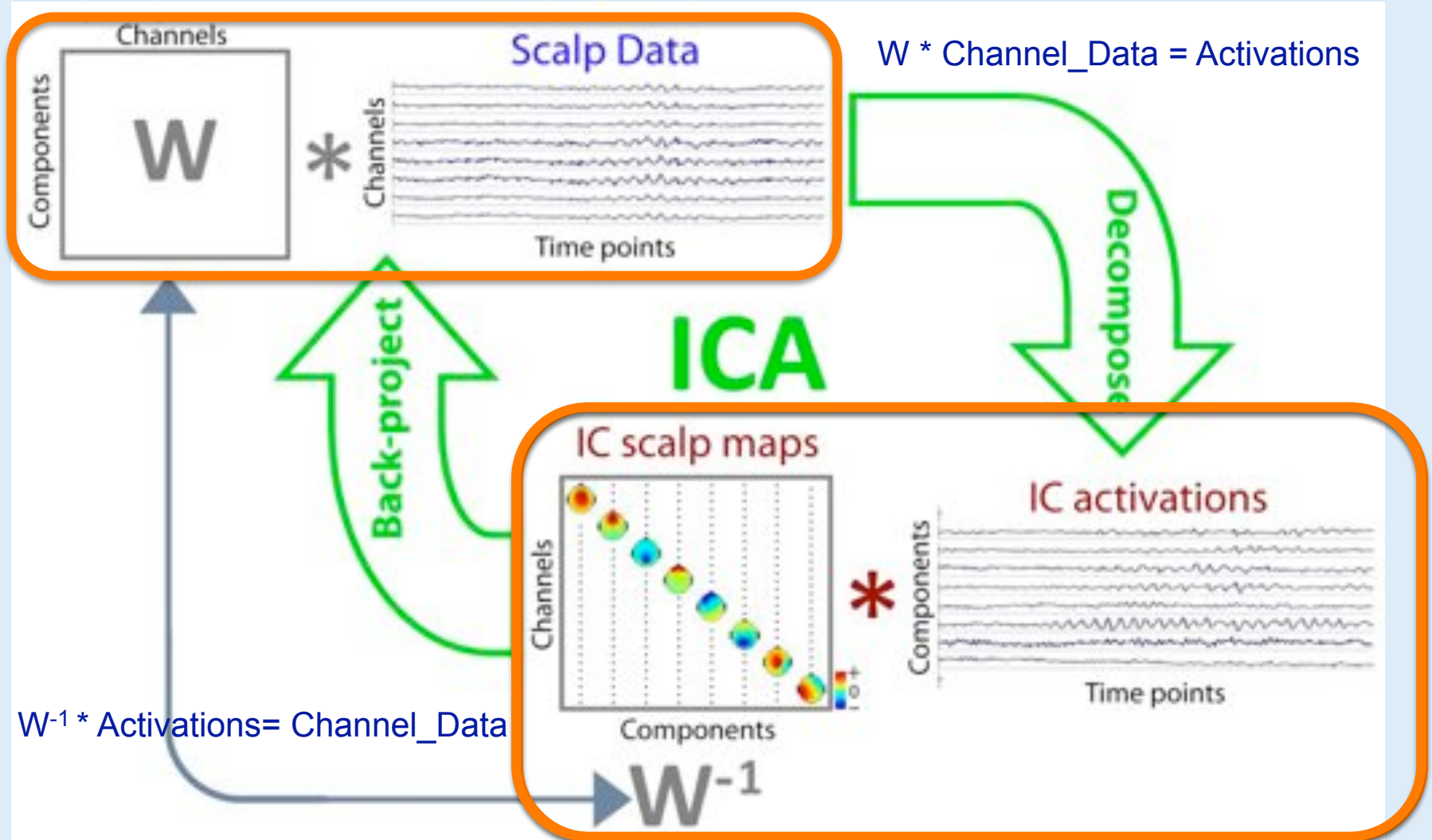
Independent muscle signals



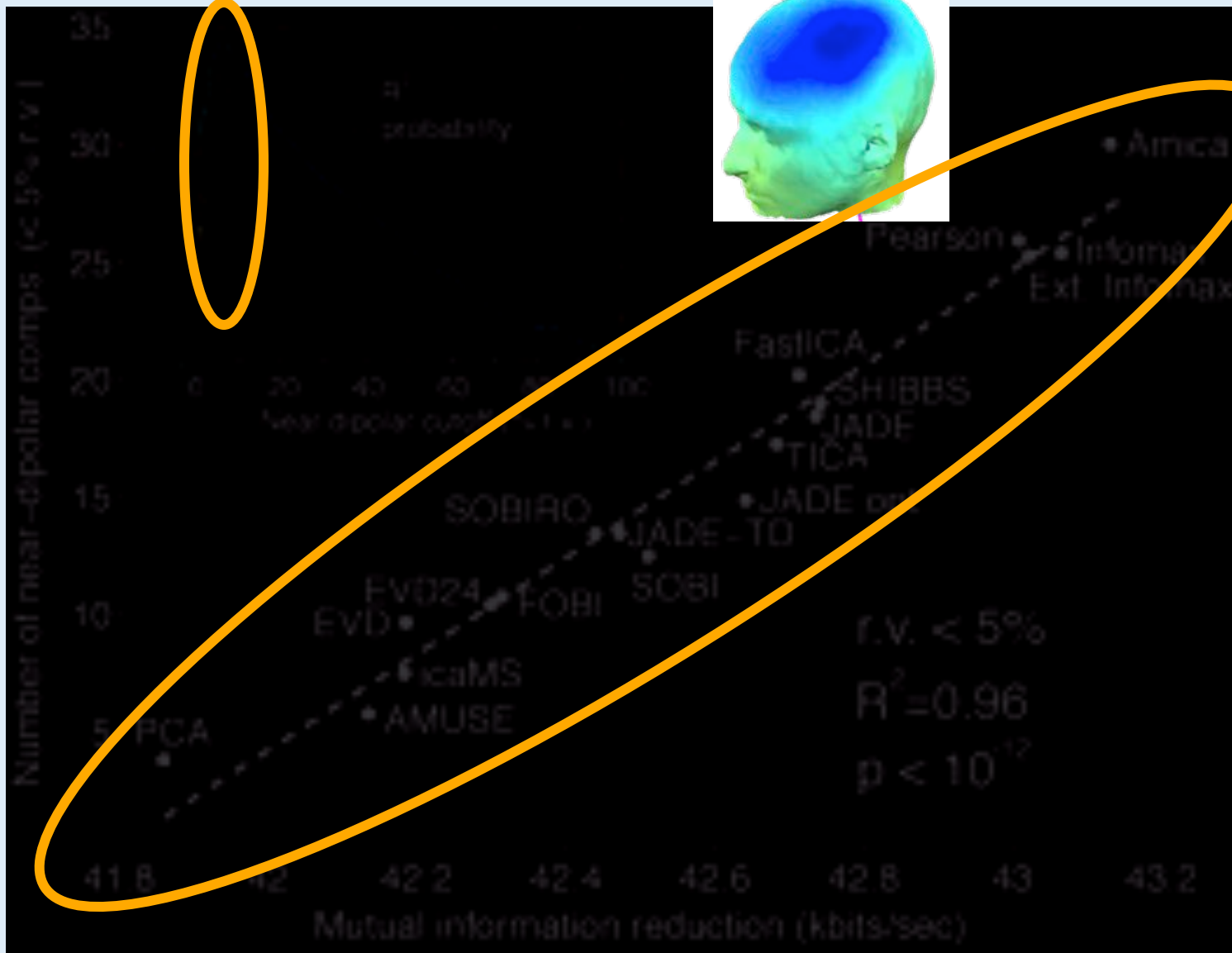
Distributed muscle / movement events



ICA is a linear data decomposition method

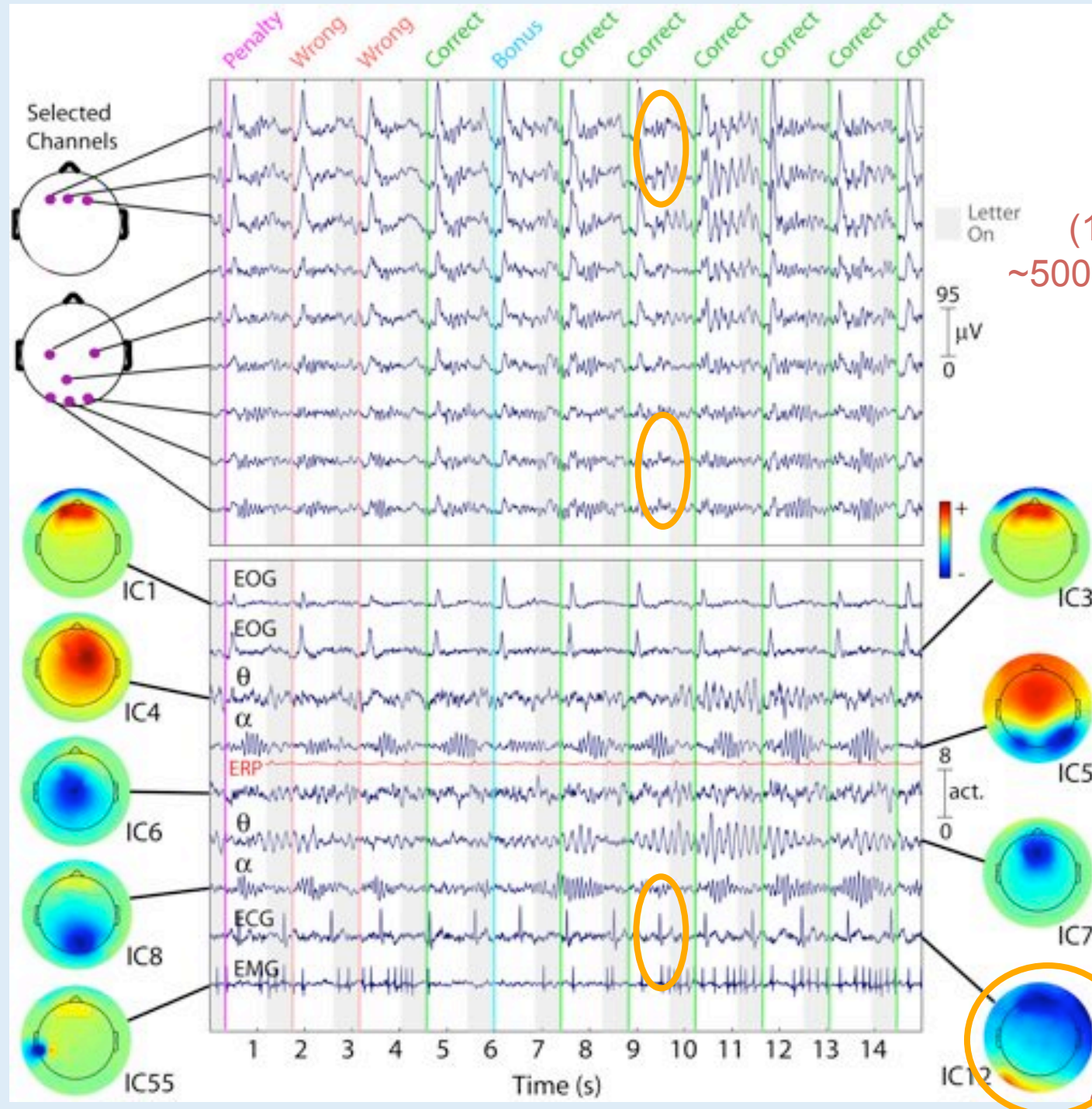


Independent Components of Human EEG are Dipolar



ICA in practice

(100 channels, ~500k time points)



24 Subjects –Frontal Midline Theta Sources

