

Where is the Origin of Human Consciousness?

Brain Mapping in Health and Disease

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317-503-1296

Indiana Brain Mapping
www.IndianaBrainMapping.com

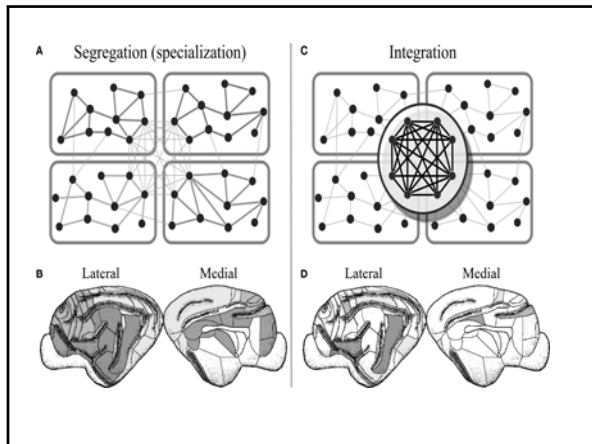
Autism Parent Care
www.autismparentcare.com

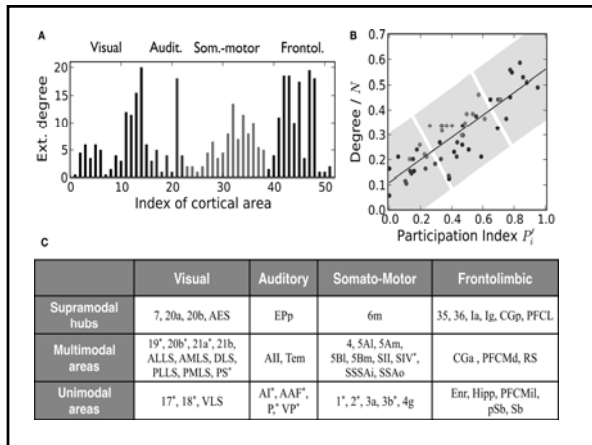
Abstract

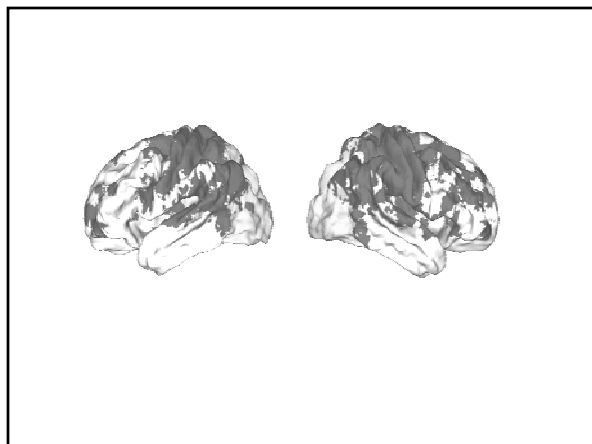
(1) Title: Brain mapping in health and disease

With the advent of neuroimaging in the last two decades, we have witnessed a quantum leap in the understanding of the brain. What was thought as idiosyncrasies of behavior is not only being taken more seriously but is being linked to certain loci in the brain. Just like discoveries of the microscope and telescope expanded our understanding, brain imaging has and will continue to challenge us into the question of consciousness and ultimately behavior. Technologies of neuroimaging has long been inaccessible for private clinicians as the MRI requires high cost for purchasing and maintenance. In the past 15 years, thanks to the help of computational science, brain imaging methods has been miniaturized into portable versions allowing much easier access and provide literally a map of the brain. The implication of such a trend will be discussed in this presentation along with its applications. Some results from case studies from individuals with brain conditions such as autism, ADHD, depression, addiction, learning disabilities, dyslexia and early onset Alzheimer's will be discussed along with strategies for intervention based on their brain mapping results.









What makes the human brain unique?

Expansion of frontal lobe?

Emotion?
Empathy

Language?

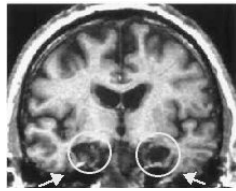
Chimp language
Bee language
Birdsong

Consciousness?
Blindsight
NCC
Binocular rivalry
Self-awareness?
Mirror test

How do we study the human brain?



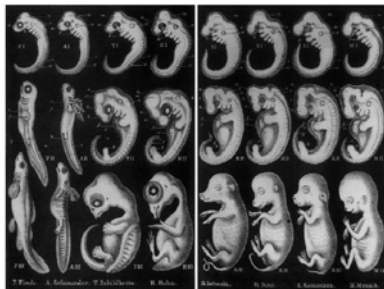
1848 Cavendish, VT



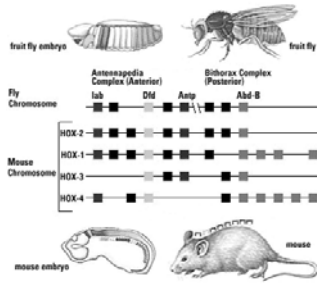
1953 William Scoville

How is a brain put together?

"Ontogeny recapitulates phylogeny"
- Ernst Haeckel 1866



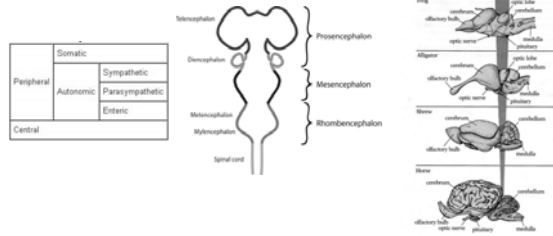
Homeobox genes



HHMI

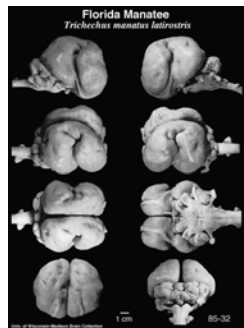
The simplest nervous systems

Vertebrates (fish, amphibians, reptiles, birds, mammals) increasing reliance on centralized brain

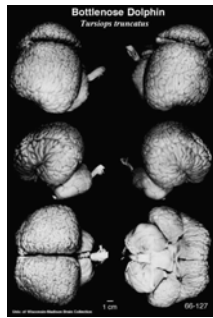


Decerebrate frog

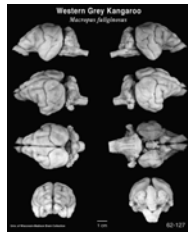
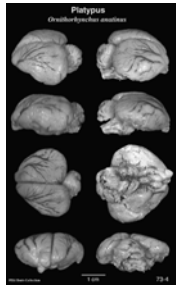
Anatomy: cortical architecture



Anatomy: cortex



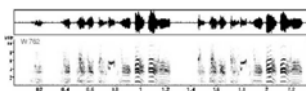
Anatomy: cortex



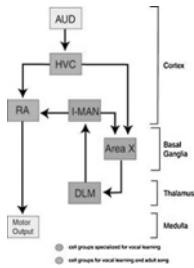
Animal models of cognition: bird song



Zebra finch (male)



Teaching, practice, error-correction



The New Era of Brain Imaging (1973 -)

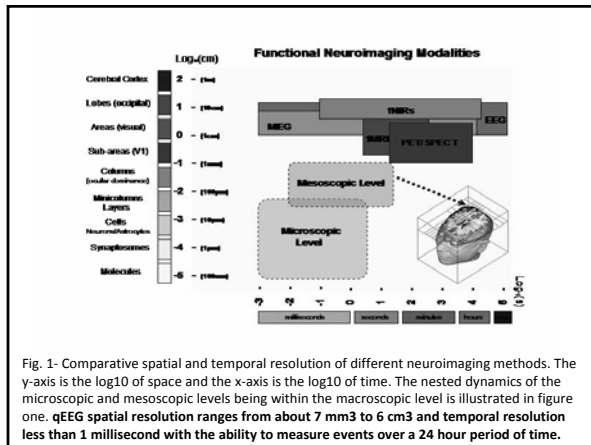
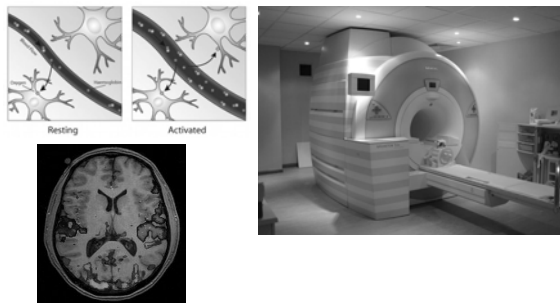


Fig. 1- Comparative spatial and temporal resolution of different neuroimaging methods. The y-axis is the log₁₀ of space and the x-axis is the log₁₀ of time. The nested dynamics of the microscopic and mesoscopic levels being within the macroscopic level is illustrated in figure one. qEEG spatial resolution ranges from about 7 mm³ to 6 cm³ and temporal resolution less than 1 millisecond with the ability to measure events over a 24 hour period of time.

fMRI (1990 -)

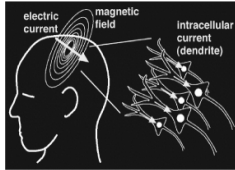
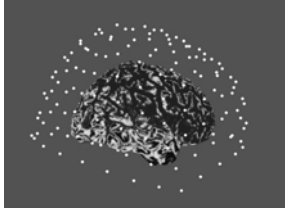
Functional magnetic resonance imaging, or fMRI, is a technique for measuring brain activity. It works by detecting the changes in blood oxygenation and flow that occur in response to neural activity



Magnetoencephalography (MEG)

(2000 -)

Mapping brain activity by recording magnetic fields produced by electrical currents occurring naturally in the brain, using very sensitive magnetometers.



MEG is a record of magnetic fields, measured outside the head, produced by electrical activity within the brain.

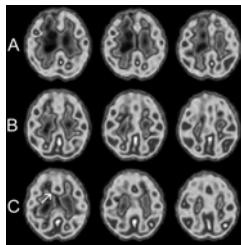
Single-Photon Emission Computed Tomography (SPECT)

(2000-)

A gamma-emitting radioisotope (called radionuclide) is injected into the subject's bloodstream. This allows the radioisotope to be carried and bound to a place of interest in the body, which then (due to the gamma-emission of the isotope) allows the ligand concentration to be seen by a gamma-camera.



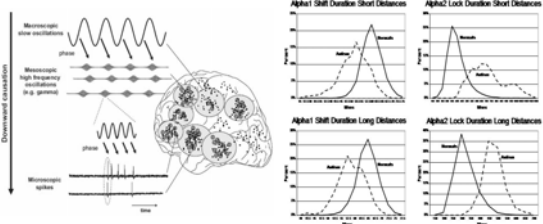
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Alzheimer's disease

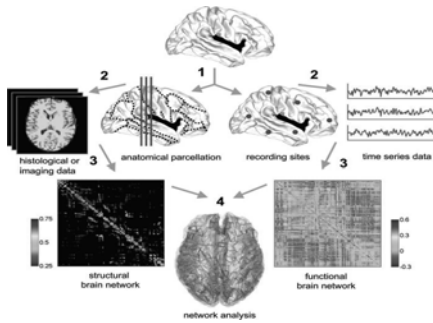
Electroencephalography (EGG) (1950 -)

Multi-frequency oscillations for scaling up or down in brain dynamics: The macro-, meso- and



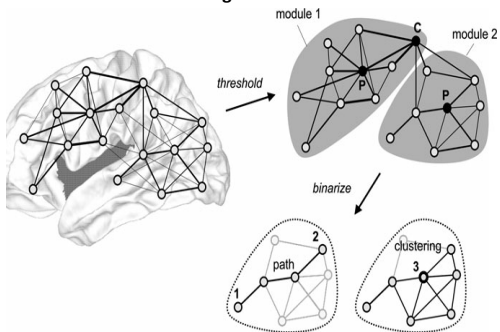
Taken together, what have we learnt from brain imaging technology?

First, the techniquelots of mathematics

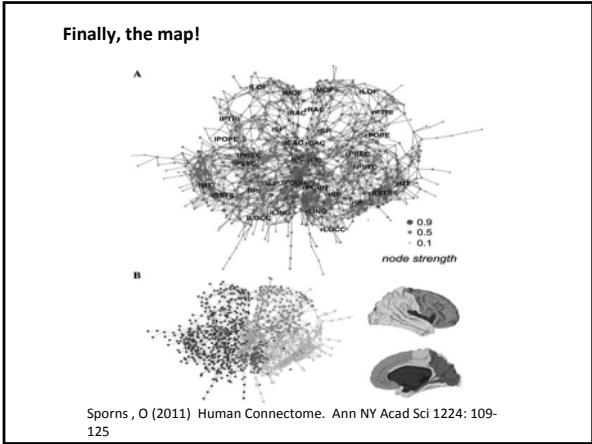


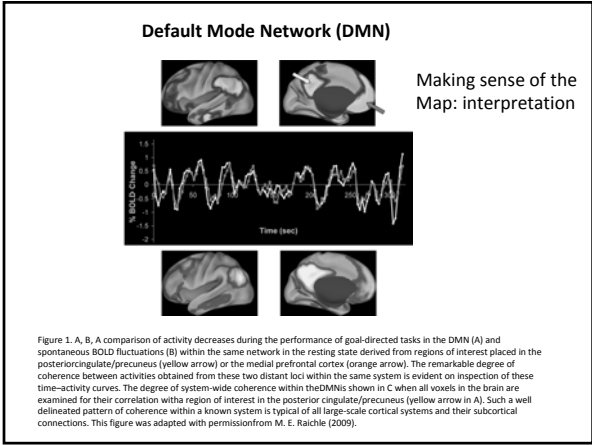
Sporns, O (2011) Human Connectome. Ann NY Acad Sci 1224: 109-125

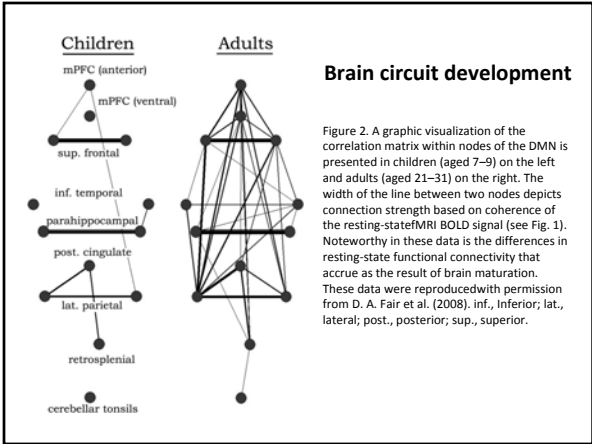
More mathematical modeling....



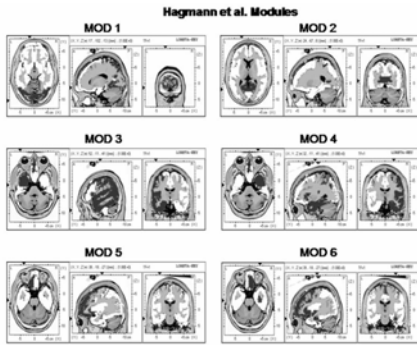
Sporns, O (2011) Human Connectome. Ann NY Acad Sci 1224: 109-125



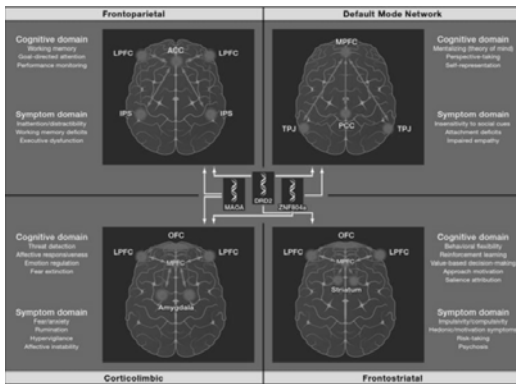




Multi-modal network in the brain subserving various functions in health and disease

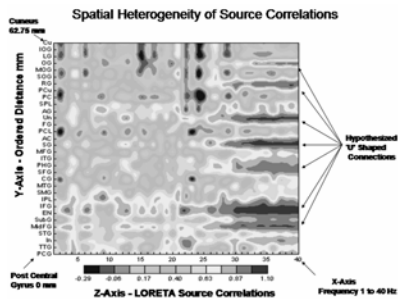


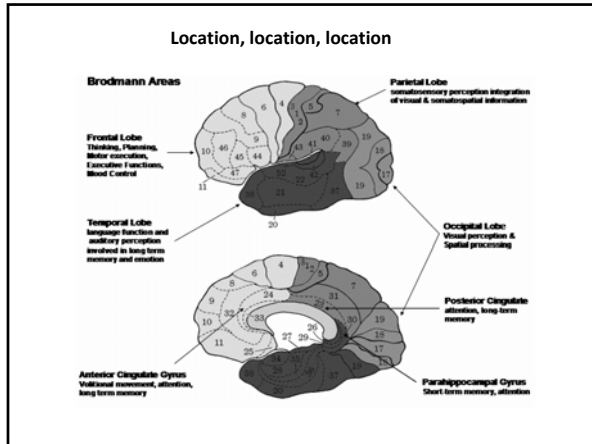
Connectivity: the basis of perception in health and disease



Buckholz and Lindenberg (2012) Neuron 74

Strength of connection predict function





As a man thinketh, so he is

Click Symptoms **Double Click & Enter Severity** **List of Matching Brodmann Areas**

List of Symptoms

Symptom / Complaint	Severity	Z Score
Anagnosia - Denial of a Problem	4	0.00
Anxiety	6	
Attention Deficits - Easily Distracted	5	0
Auditory Sequencing Problems	0	
Balance Problems	0	
Blurred Vision	0	
Chronic Pain	0	
Compulsive Behaviors and/or Thoughts	0	
Concentration Difficulties	0	

Anatomical Hypotheses

Hypothesis	Match	Mismatch
13 Right	13 Right	2 Right
10 Left	10 Left	3 Right
20 Right	20 Right	4 Left
30 Left	Amygdala Left	4 Right
30 Right	Amygdala Right	5 Left
Amygdala Left		6 Right
Amygdala Right		6 Left

Live brain recording, a demo

Calling for a brave volunteer to demonstrate his/her thoughts live
