

Awakening to Mindfulness

The Self-Transforming Brain

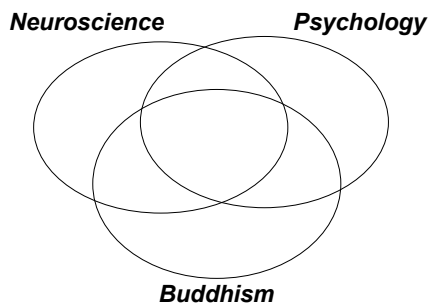
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Key Topics

- Framework
- The Mind/Brain System
- Your Amazing Brain
- How Your Brain Pays Attention
- Individual Profiles of Mindfulness
- Methods for Improving Mindfulness
- Closing Discussion

Common - and Fertile - Ground



We ask, "What is a thought?"

We don't know,

yet we are thinking continually.

Venerable Ani Tenzin Palmo

The Mind/Brain System

- "Mind" = flow of information within the nervous system; mainly unconscious
- Apart from hypothetical transcendental factors, your mind *is* what your brain *does*.
- As your brain changes, your mind changes. As your mind changes, your brain changes. Mental activity - the flow of information - maps to neural activity, the flow of matter and energy.
- Therefore, *you can use your mind to change your brain to change your mind* - to benefit your whole being and every other being you touch.

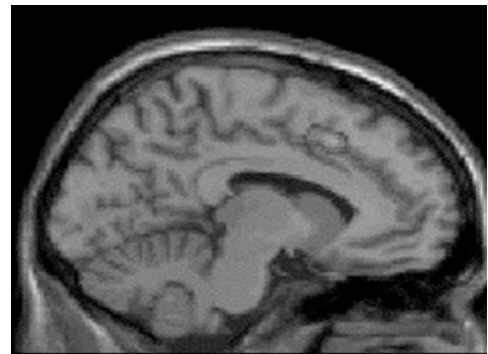
Mental Activity Sculpts Neural Structure

- What flows through your mind sculpts your brain. Immaterial experience leaves material traces behind:
 - Increased blood/nutrient flow to active regions
 - Epigenetics: experience affects gene expression
 - "Neurons that fire together wire together."
 - Increasing excitability of active neurons
 - Strengthening existing synapses
 - Building new synapses; thickening cortex; from womb to deathbed
 - Neuronal "pruning" - "use it or lose it"
- Your experience *matters*. Both for how it feels in the moment and for the lasting residues it leaves behind, woven into the fabric of your being.

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A Meditator



Physical Effects of Meditation

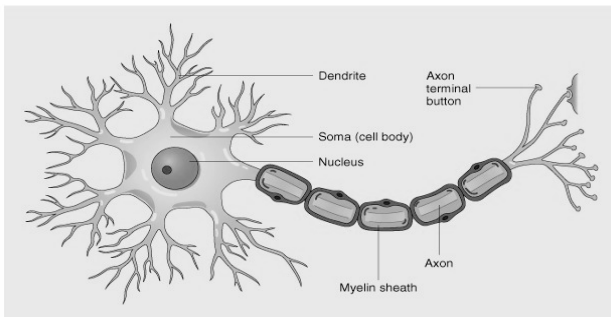
- Thickens and strengthens the anterior (frontal) cingulate cortex and the insula. Those regions are involved with controlled attention, empathy, and compassion – and meditation improves those functions.
- Less cortical thinning with aging
- Increases activation of the left frontal regions, which lifts mood
- Increases the power and reach of fast, gamma-range brainwaves
- Decreases stress-related cortisol
- Stronger immune system

Your Amazing Brain

Major Features

- **Size:**
 - 3 pounds of tofu-like tissue
 - 1.1 trillion brain cells
 - 100 billion "gray matter" neurons
- **Activity:**
 - Always on 24/7/365 - Instant access to information on demand
 - 20-25% of blood flow, oxygen, and glucose
- **Speed:**
 - Neurons firing around 5 to 50 times a second (or faster)
 - Signals crossing your brain in a tenth or hundredth of a second
- **Connectivity:**
 - A typical neuron gets inputs from 1000 neurons
 - and sends its outputs to 1000 more
 - giving you one hundred trillion synapses.

One Simple Neuron . . .



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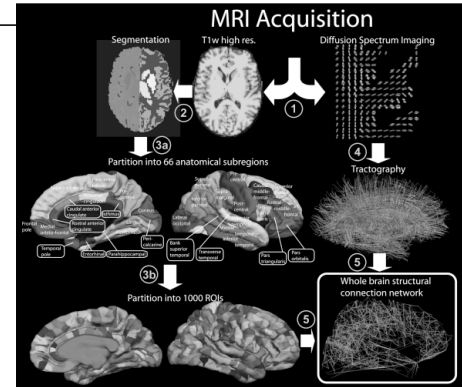
Specialization and Teamwork

- Specialized functions
 - Speech production differs from comprehension.
 - Face recognition

- Working in harmony as a network
 - Network “noise” facilitates individual signals.
 - “Specialization is for insects.” - Robert Heinlein
 - Distributed information - “Holographic”
 - One part can compensate for damage to another.

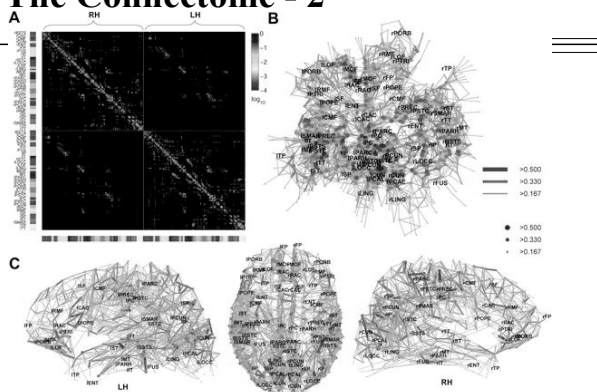
- No localized self -
 “Self” is in the system, not the cells.

The Connectome - 1

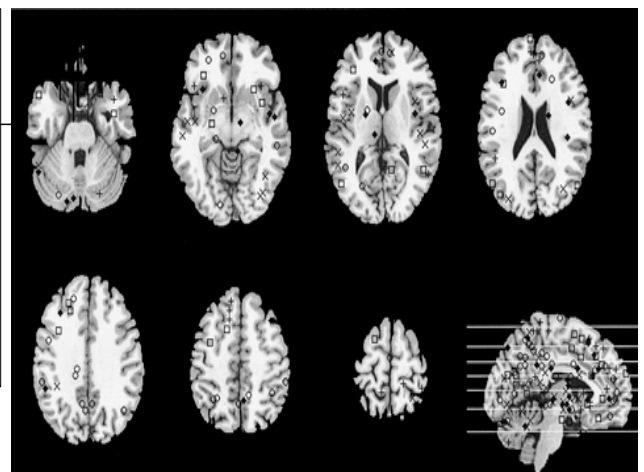


Hagmann, et al., 2008, *PLoS Biology*, 6:1479-1493.

The Connectome - 2



Hagmann, et al., 2008, *PLoS Biology*, 6:1479-1493.

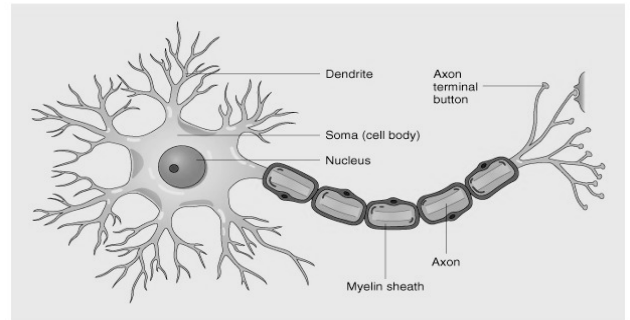


Brain activations of “selfing” - Gillihan, et al., 2005. *Psych Bulletin*, 131:76-97.

Stability and Instability

- Stasis followed by updating followed by stasis
- Cycles a few milliseconds long. . . or decades
- Forever pulsing: Impermanence
- Fertile openness to creation: Emptiness

One Simple Neuron . . .



. . . Multiplied by Billions of Neurons

- 100 billion neurons with 100 trillion synapses
- Possible brain states: 1 followed by a million zeros
- The most complex object known in the universe
- Circular loops:
 - Recursion and self-observation
 - Dynamic, "chaotic" effects: determined, but unpredictable
 - Shared circuitry triggers wandering stream of consciousness
- Overlapping, connected sub-networks: "stream of consciousness"

*The education of attention
would be an education par excellence.*

William James

How the Brain Pays Attention

- Holding onto information
- Updating awareness
- Seeking stimulation
- Dopamine and the gate to awareness
- The basal ganglia stimostat

Individual Differences in Attention

	<u>Holding Information</u>	<u>Updating Awareness</u>	<u>Seeking Stimulation</u>
High	Obsession Over-focusing	Porous filters Distractible Overload	Hyperactive Thrill-seeking
Mod	Concentrates Divides attention	Flexible Assimilation Accommodation	Enthusiastic Adaptive
Low	Fatigues w/Conc. Small WM	Fixed views Oblivious Low learning	Stuck in a rut Apathetic Lethargic

Supports for Mindfulness

- Have thoughts and feelings of compassion.
- Set intentions.
- Call up a greater sense of safety.
- Evoke positive emotions.
- Have whole body awareness.
- Deliberately look for rewards.
- Consciously “take in the good” of mindfulness.
- Adapt to individual needs.

Penetrative insight

joined with calm abiding

utterly eradicates

afflicted states.

Shantideva