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 transcendent 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 Sculpt 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

- 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


The Connectome - 2


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 . . .

- 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”

. . . Multiplied by Billions of Neurons

- 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

<table>
<thead>
<tr>
<th>Holding Information</th>
<th>Updating Awareness</th>
<th>Seeking Stimulation</th>
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</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
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<tr>
<td>Obsession</td>
<td>Porous filters</td>
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<td><strong>Low</strong></td>
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<td>Fatigues w/Conc.</td>
<td>Fixed views</td>
<td>Stuck in a rut</td>
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<tr>
<td>Small WM</td>
<td>Oblivious</td>
<td>Apathetic</td>
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<td></td>
<td>Low learning</td>
<td>Lethargic</td>
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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