
Whose Brain Is It, Anyway?

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For Neuroscience and Contemplative Wisdom**

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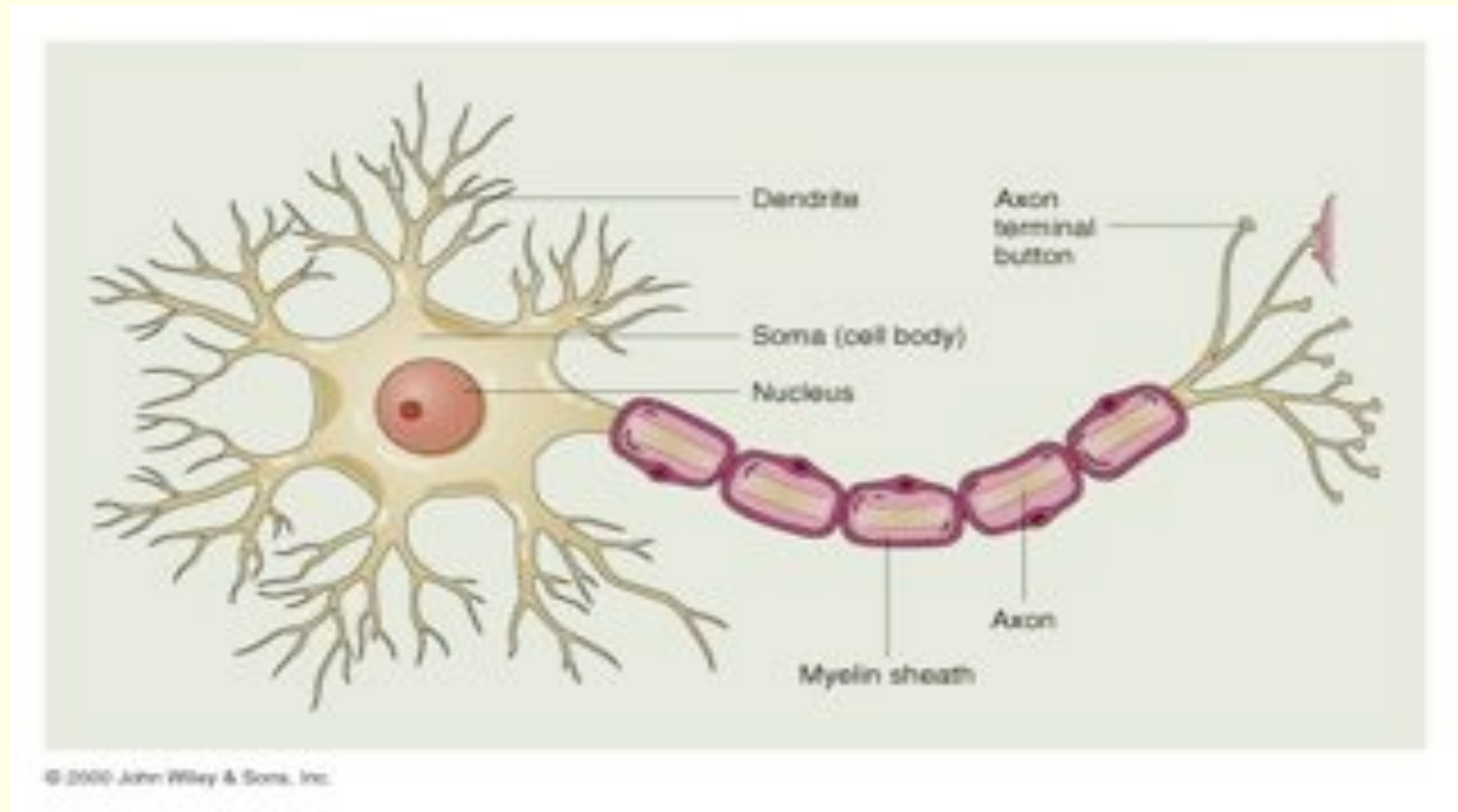
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About This Talk

- How your brain works
- Why that matters
- What you can do about it

A Schematic Neuron



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 connects with about 5000 neurons, giving you five hundred trillion synapses.
- During one breath, a quadrillion-plus signals coursed through your head.

First Fact about Your Brain

As your brain changes, your mind changes.



Second Fact about Your Brain

As your mind changes, your brain changes.

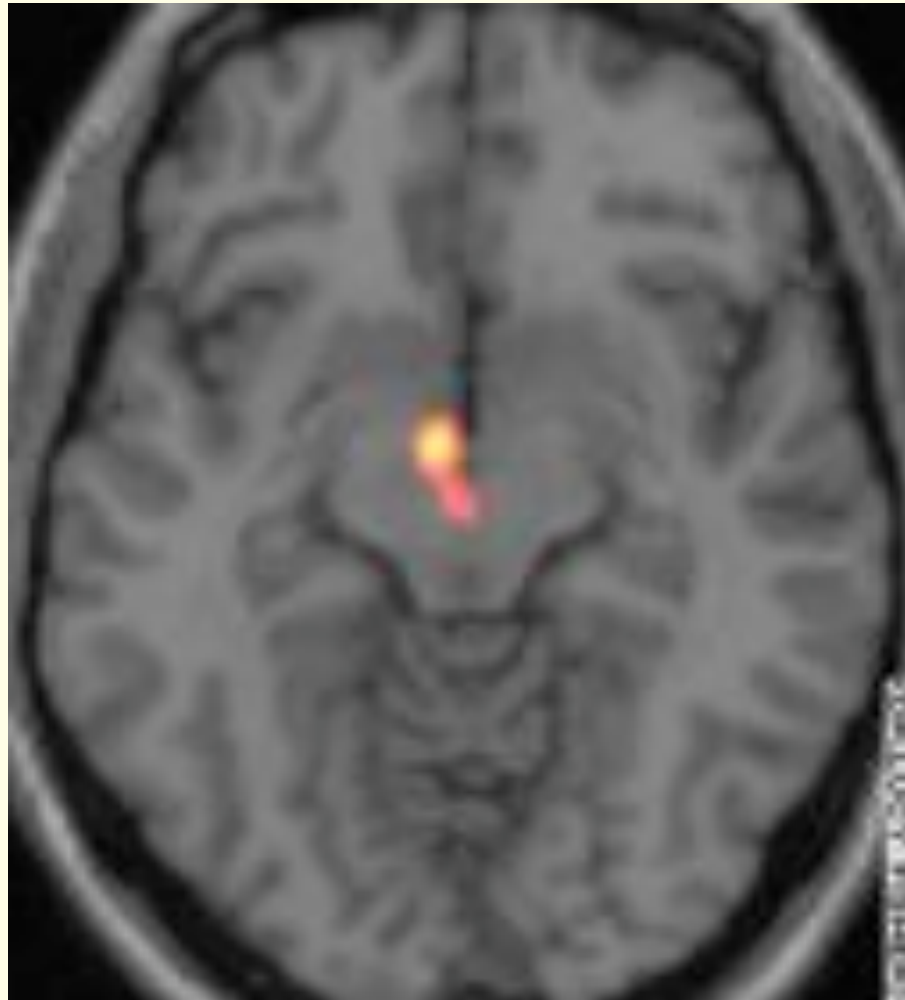
Immaterial mental activity maps to material neural activity.

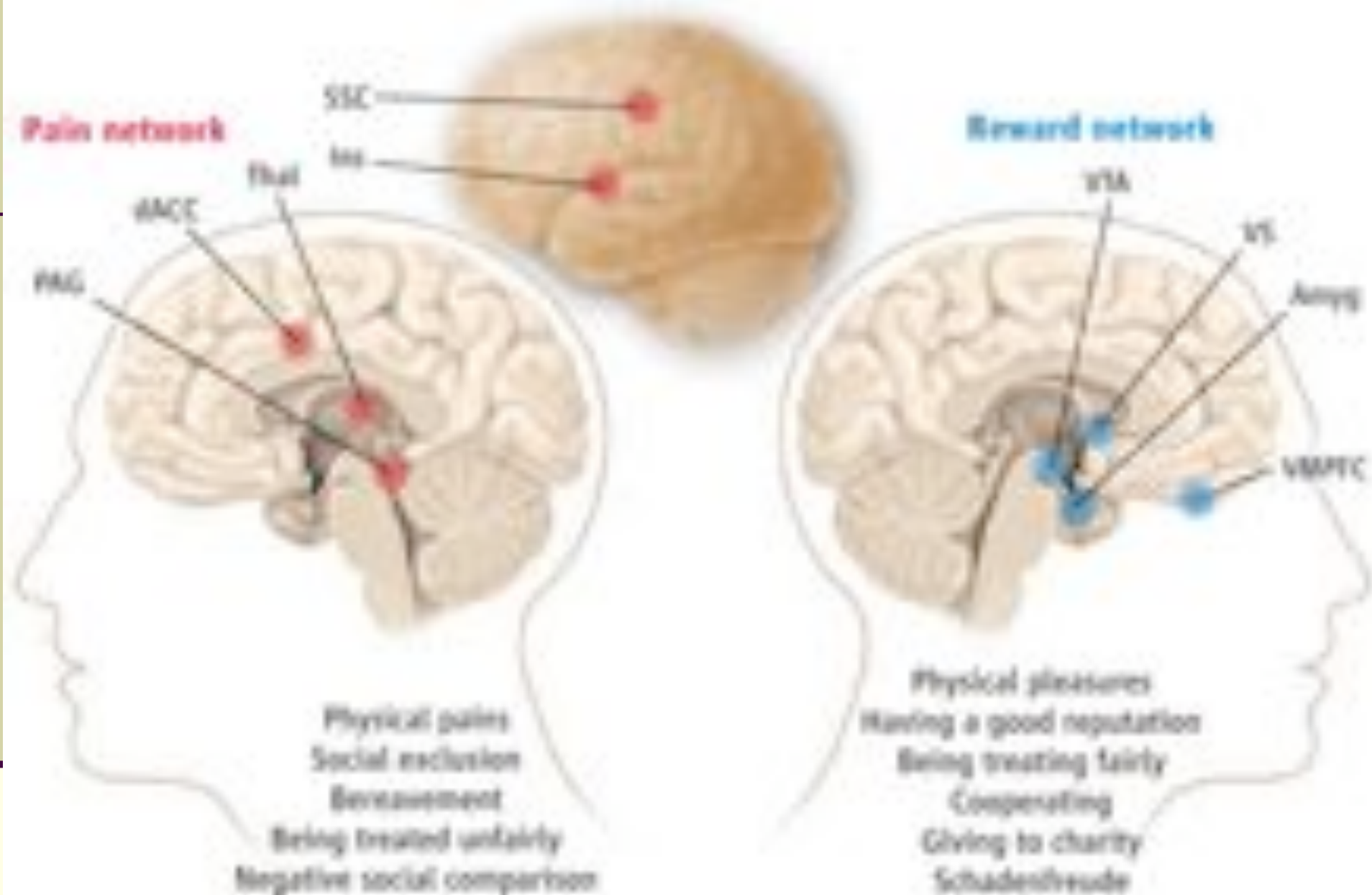
This produces temporary changes in your brain and lasting ones.

Temporary changes include:

- Alterations in brainwaves (= changes in the firing patterns of synchronized neurons)
- Increased or decreased use of oxygen and glucose
- Ebbs and flows of neurochemicals

The Rewards of Love

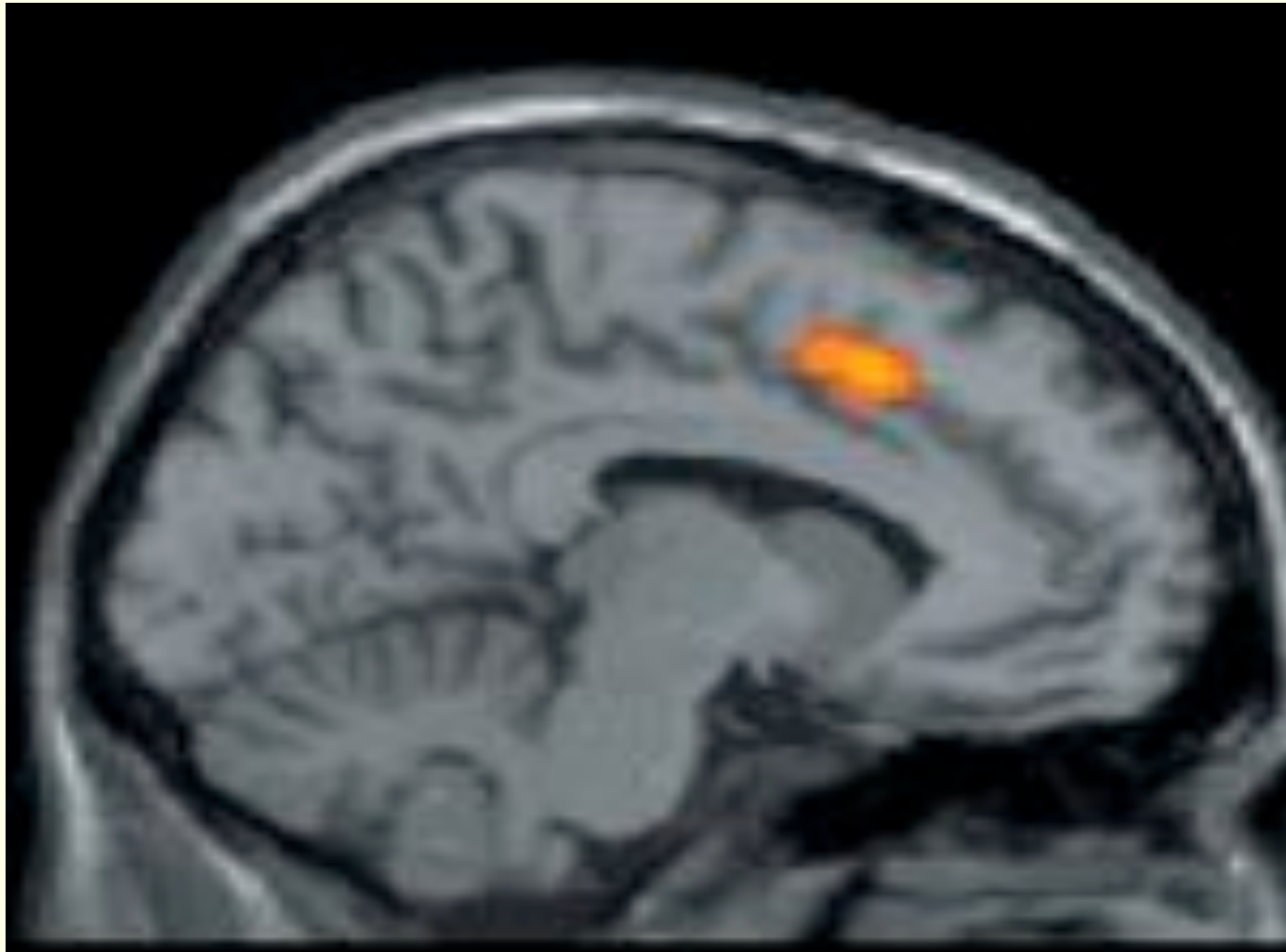


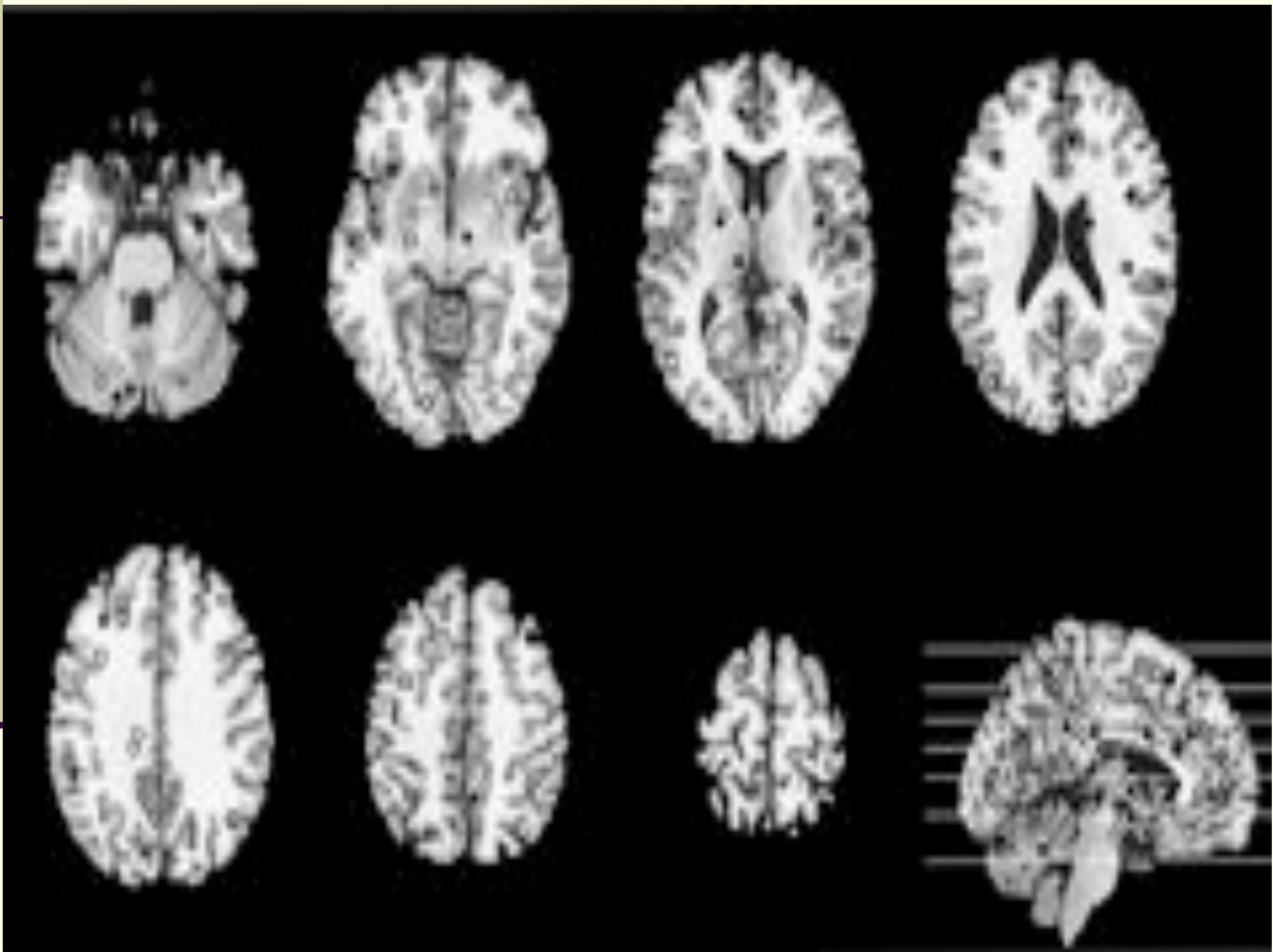


Pain network: Dorsal anterior cingulate cortex (dACC), insula (Ins), somatosensory cortex (SSC), thalamus (Thal), and periaqueductal gray (PAG).

Reward network: Ventral tegmental area (VTA), ventral striatum (VS), ventromedial prefrontal cortex (VMPFC), and amygdala (Amyg).

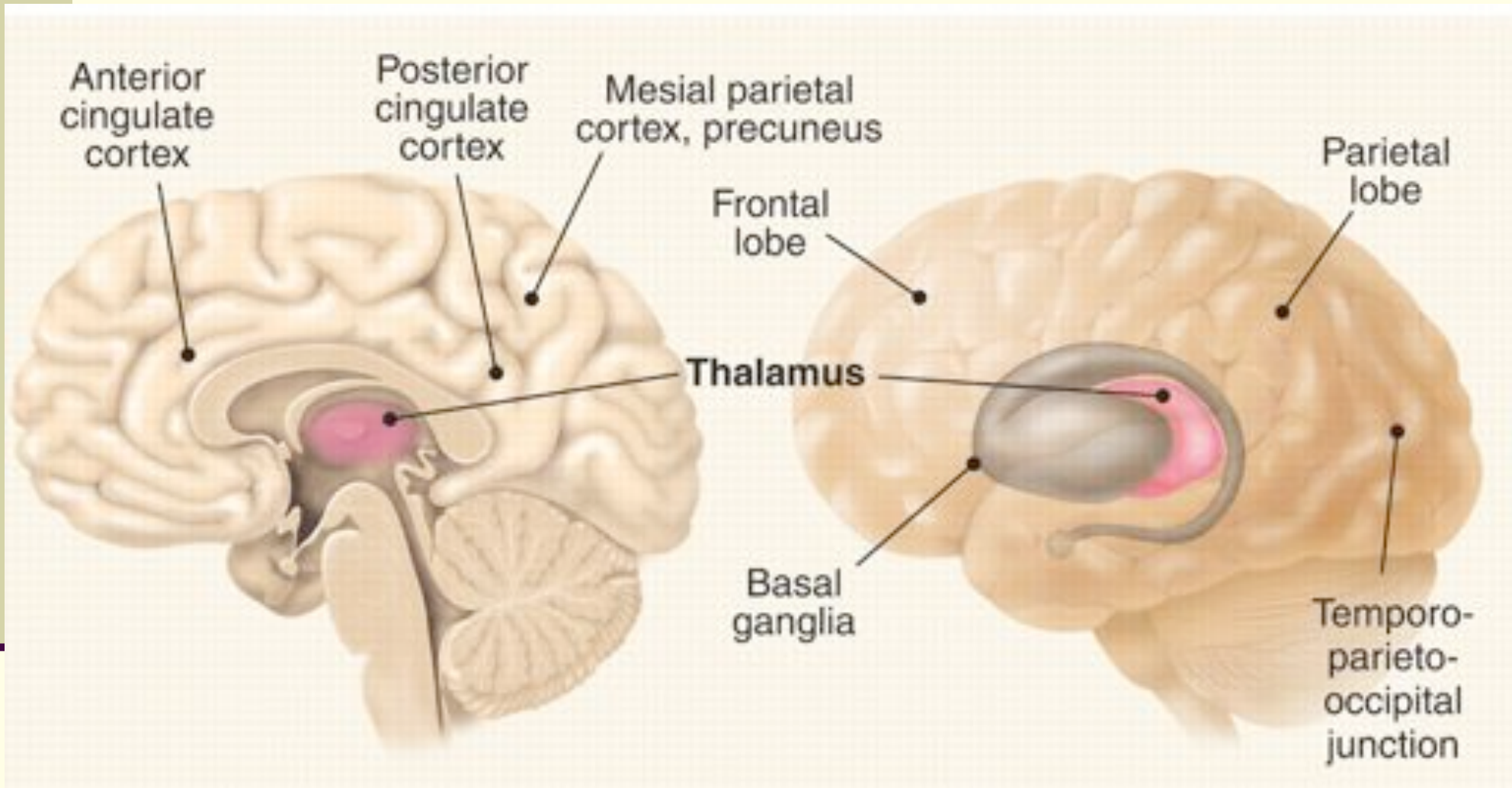
Paying Attention





Brain activations of “selfing” - Gillihan, et al., Psych Bulletin, 1/2005

Key Brain Areas for Consciousness

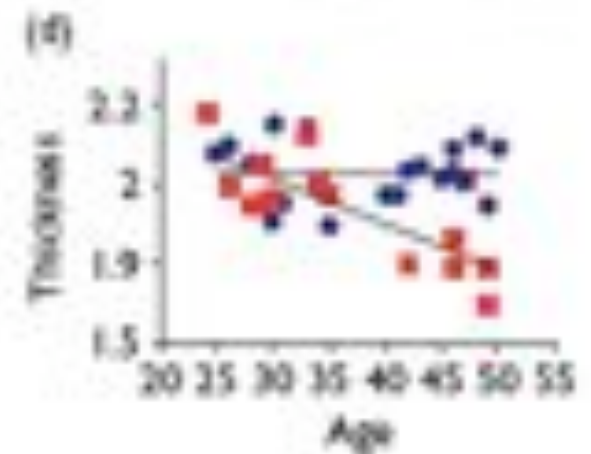
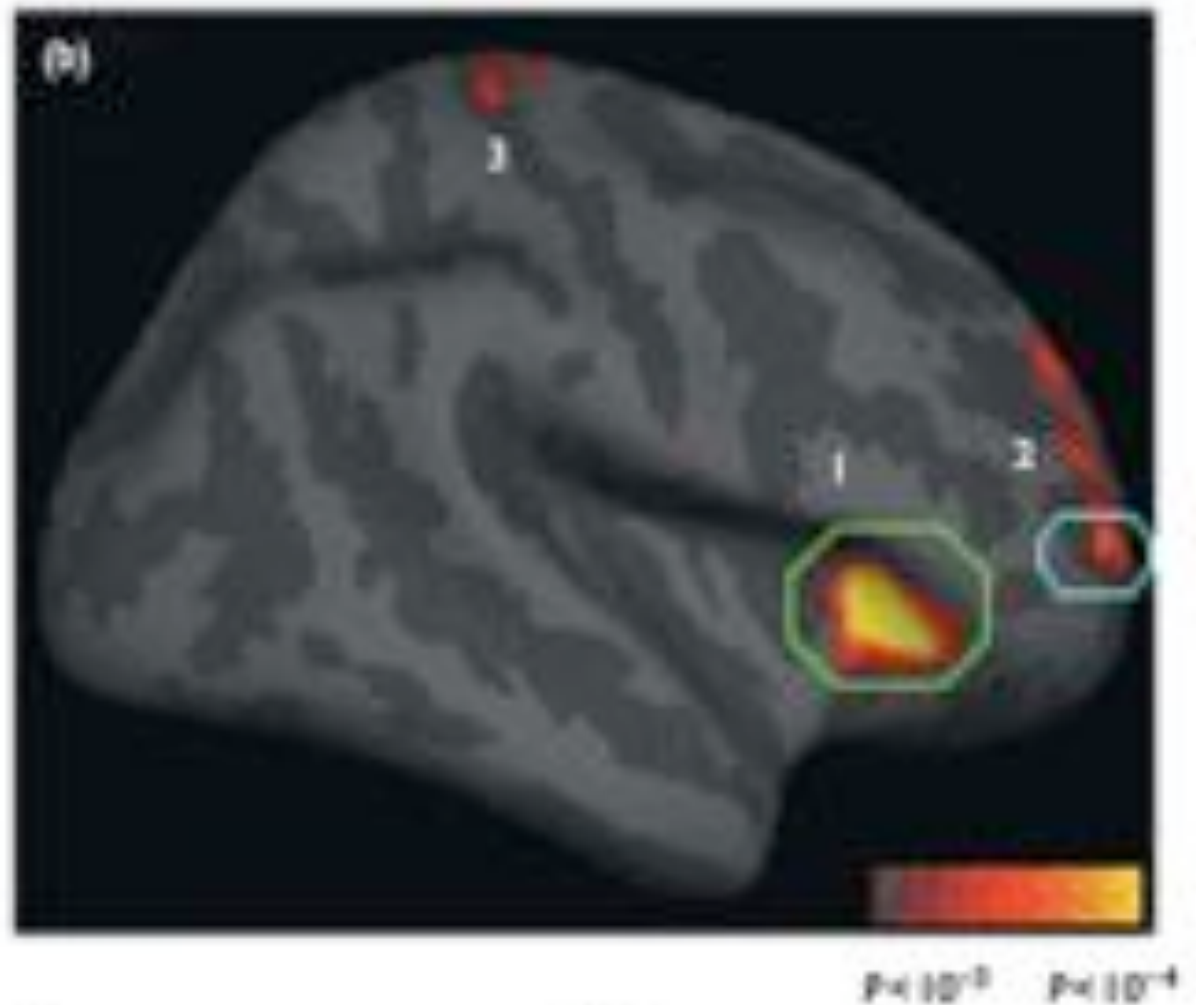


(adapted from) M. T. Alkire et al., *Science* 322, 876-880 (2008)

Mental Activity Shapes Neural Structure

- *What you think and feel changes your brain* in numerous ways:
 - Increased blood/nutrient flow to active regions
 - “Neurons that fire together wire together.”
 - Increasing excitability of active neurons
 - Strengthening existing synapses
 - Building new synapses; thickening your cortex
 - Neuronal “pruning” - “use it or lose it”
- What flows through your mind sculpts your brain.

Lazar, et al. 2005.
Meditation
experience is
associated
with increased
cortical thickness.
Neuroreport, 16,
1893-1897.



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

William James

“A Spotlight on Speed”

- Attention:
 - Like a spotlight: Illuminates what it shows.
 - Like a vacuum cleaner: Sucks its contents into your brain.
 - Controlling attention is a fundamental way to shape your brain - and therefore your life over time.
- Most people have poor control of their “spotlight.”
- Meditation is the preeminent training of attention.
- Benefits of attention training:
 - Academic performance
 - Sports and music
 - Emotional well-being

Physical Effects of Chronic Stress

- Elevated stress hormones, including cortisol and adrenaline
- Weakened immune function
- Impaired digestion
- Lowered reproductive hormones

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 brain and your self.

Third Fact about Your Brain

**You can use your mind
to change your brain
to change your mind
for the better.**

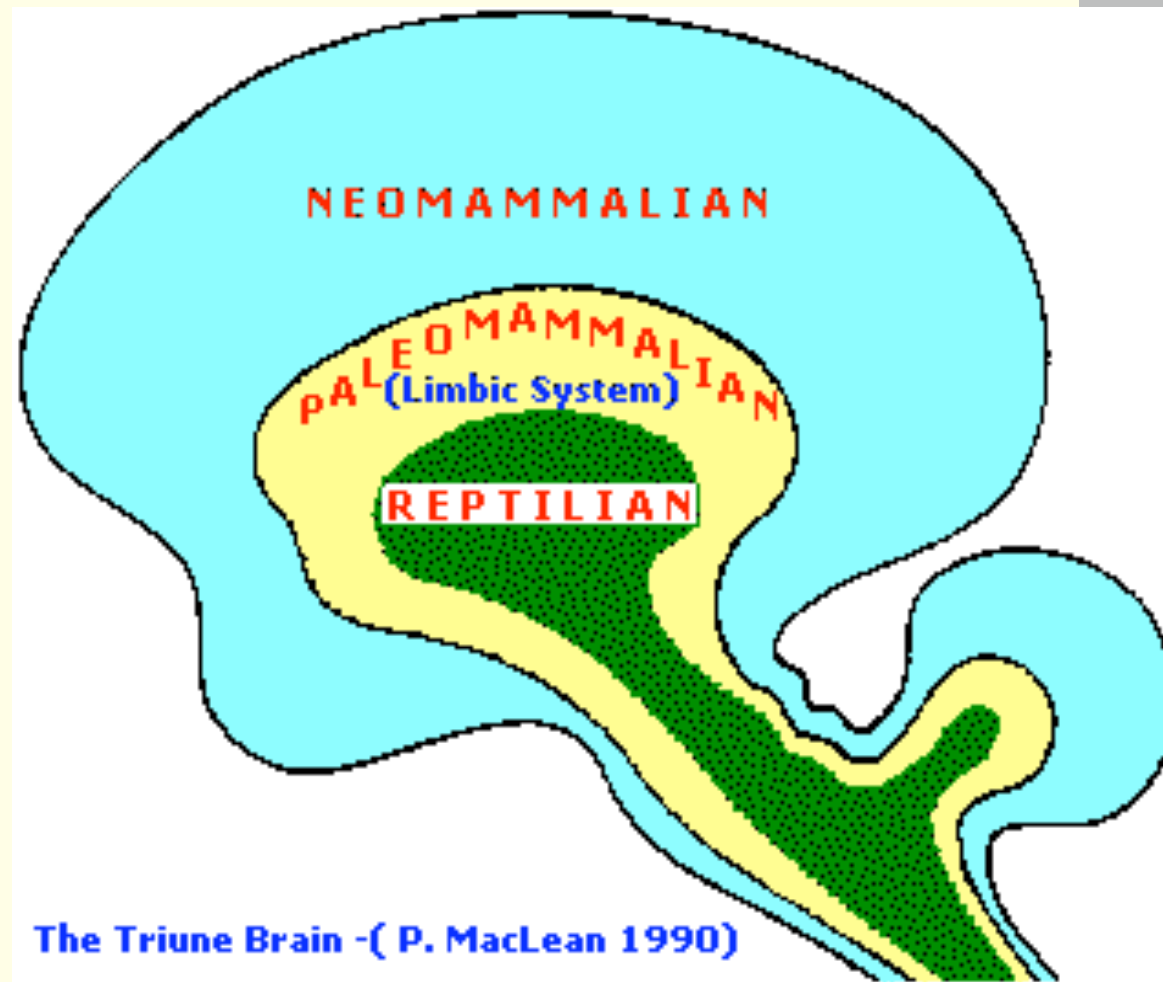
What about the Caveman Brain?



Evolution Grinding Away

- 3.5 billion years of life on this planet
- 600 million years of multi-celled animals
- 80 million years of mammals
- 10 million years of ape-like ancestors
- 2.5 million years of stone tool-using relatives
- 100,000+ years of our own species

Evolutionary History



The Triune Brain

The Negativity Bias

- In evolution, threats had more impact on survival than opportunities.
 - > Sticks count more than carrots.
- The brain is like Velcro for negative experiences and Teflon for positive ones.
- Consequently, negative trumps positive:
 - People will do more to avoid a loss than get a gain.
 - Takes five positive interactions to undo a negative one

How to Take in the Good

1. Look for positive **facts** and let them become positive experiences.
2. Extend the experience in *time* and *space*:
 - Savor it.
 - Encourage it to expand in your body.
3. Sense that the positive experience is soaking into your brain and body - registering deeply in emotional memory.

Kinds of “Good” to Take in

- Things are alright; nothing is wrong; there is no threat
- The good feelings that come from being kind, fair, generous
- Small pleasures of ordinary life
- Accomplishments - especially small, everyday ones
- Feeling strong
- Being included, valued, liked, respected, loved by others
- Recognizing your positive character traits

*The good life, as I conceive it, is a happy life.
I do not mean that if you are good you will be happy;
I mean that if you are happy you will be good.*

Bertrand Russell

Being for Yourself

Who is the one person in the world you have the greatest power over?

It's your future self.

What it will be depends on how you care for it - in lots of little ways every day.

So take good care of your brain.

How to Take Good Care of Your Brain

- Take in good experiences as the day goes on.
- Count your blessings at the end of every day.
- Remember: one drink kills 10,000 brain cells.
- Take regular exercise; it builds brain cells.
- Liquidate your brain: it needs lots of water.
- Practice kindness and generosity: kind people live longer.
- Learn to meditate.
- If you're having a hard time, talk to someone.

Great Books

- Begley, S. 2007. *Train Your Mind, Change Your Brain: How a New Science Reveals Our Extraordinary Potential to Transform Ourselves*. Ballantine.
- Hanson, R. 2009. *Buddha's Brain: The Practical Neuroscience of Happiness, Love, and Wisdom*. New Harbinger.
- Johnson, S. 2005. *Mind Wide Open: Your Brain and the Neuroscience of Everyday Life*. Scribner.
- Kornfield, J. 2009. *The Wise Heart: A Guide to the Universal Teachings of Buddhist Psychology*. Bantam.
- LeDoux, J. 2003. *Synaptic Self: How Our Brains Become Who We Are*. Penguin
- Sapolsky, R. 2004. *Why Zebras Don't Get Ulcers*. Holt.
- Siegel, D. 2007. *The Mindful Brain: Reflection and Attunement in the Cultivation of Well-Being*. W. W. Norton & Co.
- Thompson, E. 2007. *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Belknap Press.