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# **Whose Brain Is It, Anyway?**

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[www.WiseBrain.org](http://www.WiseBrain.org)

[www.RickHanson.net](http://www.RickHanson.net)

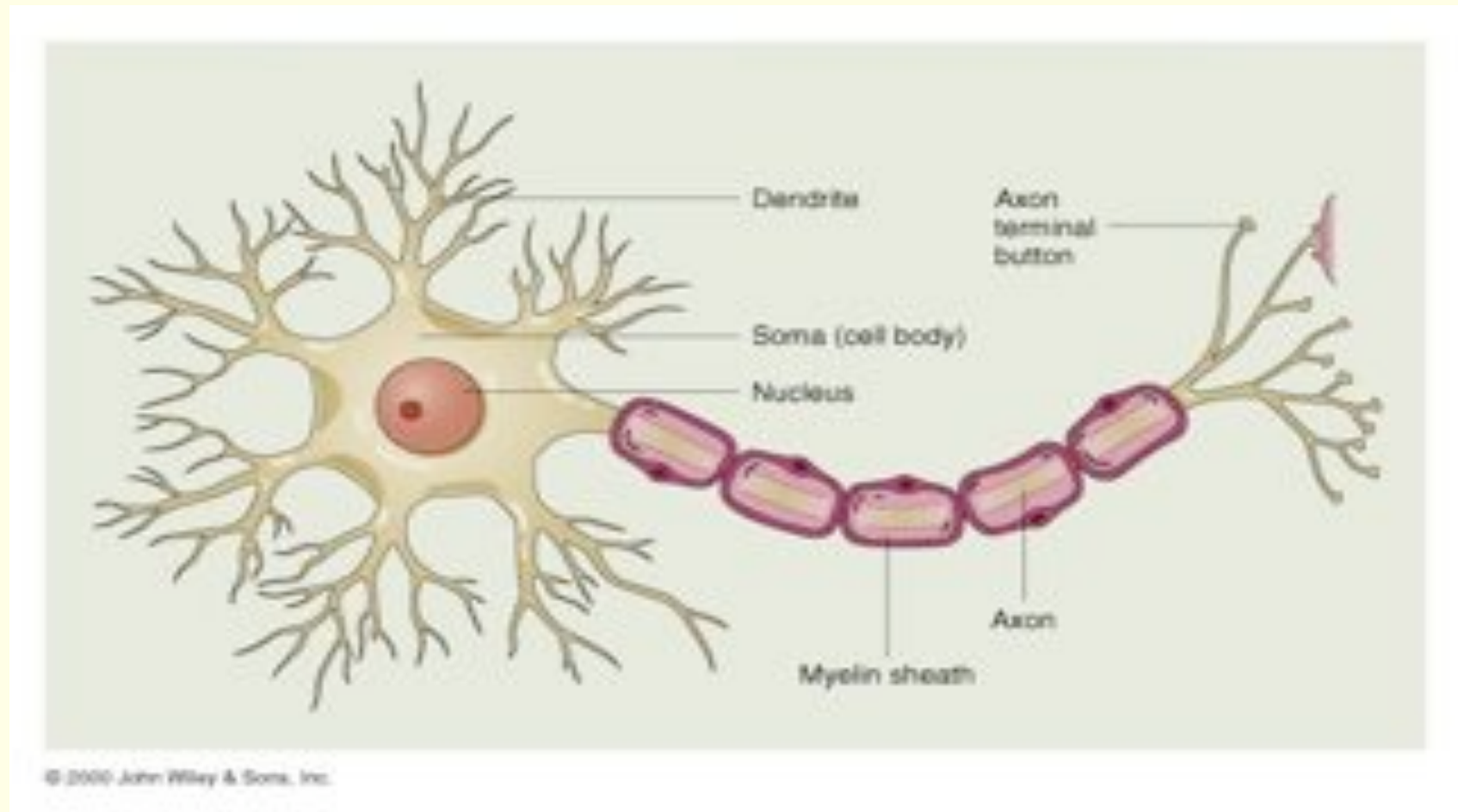
[drh@comcast.net](mailto:drh@comcast.net)

# About This Talk

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

# A Schematic Neuron



# Your Amazing Brain

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## 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

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**As your mind changes, your brain changes.**

Immaterial mental activity maps to material neural activity.

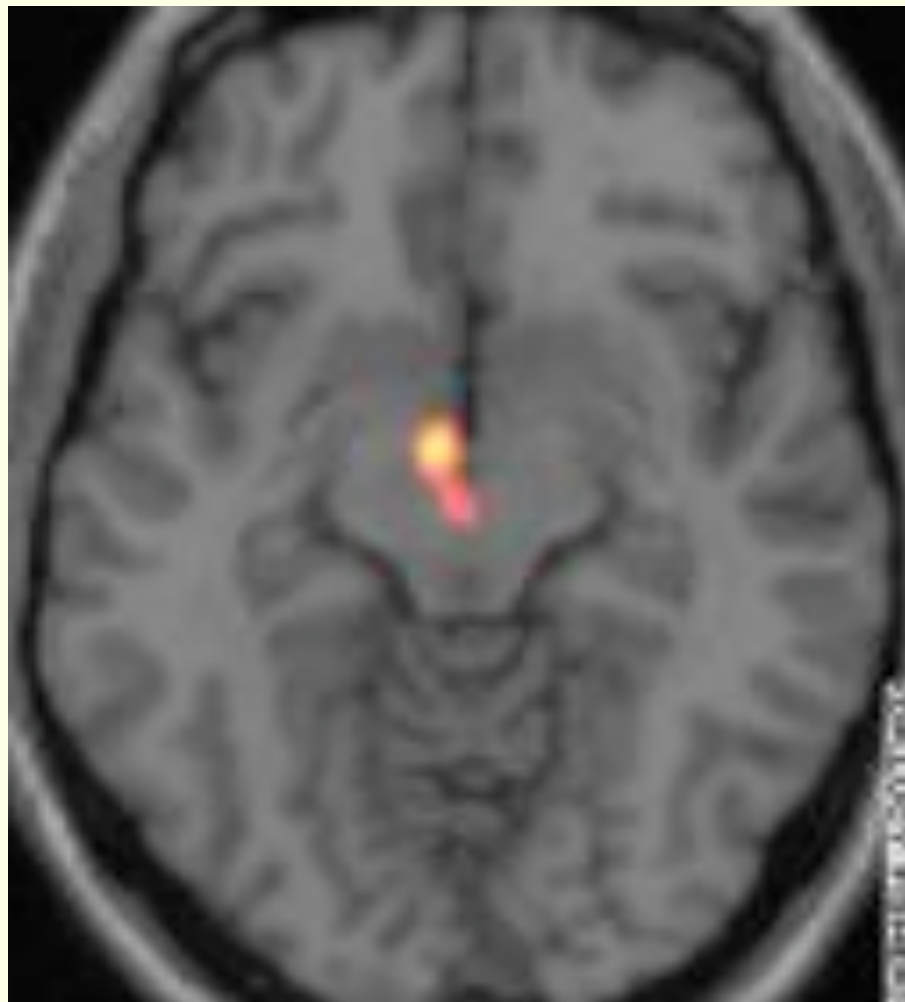
This produces temporary changes in your brain and lasting ones.

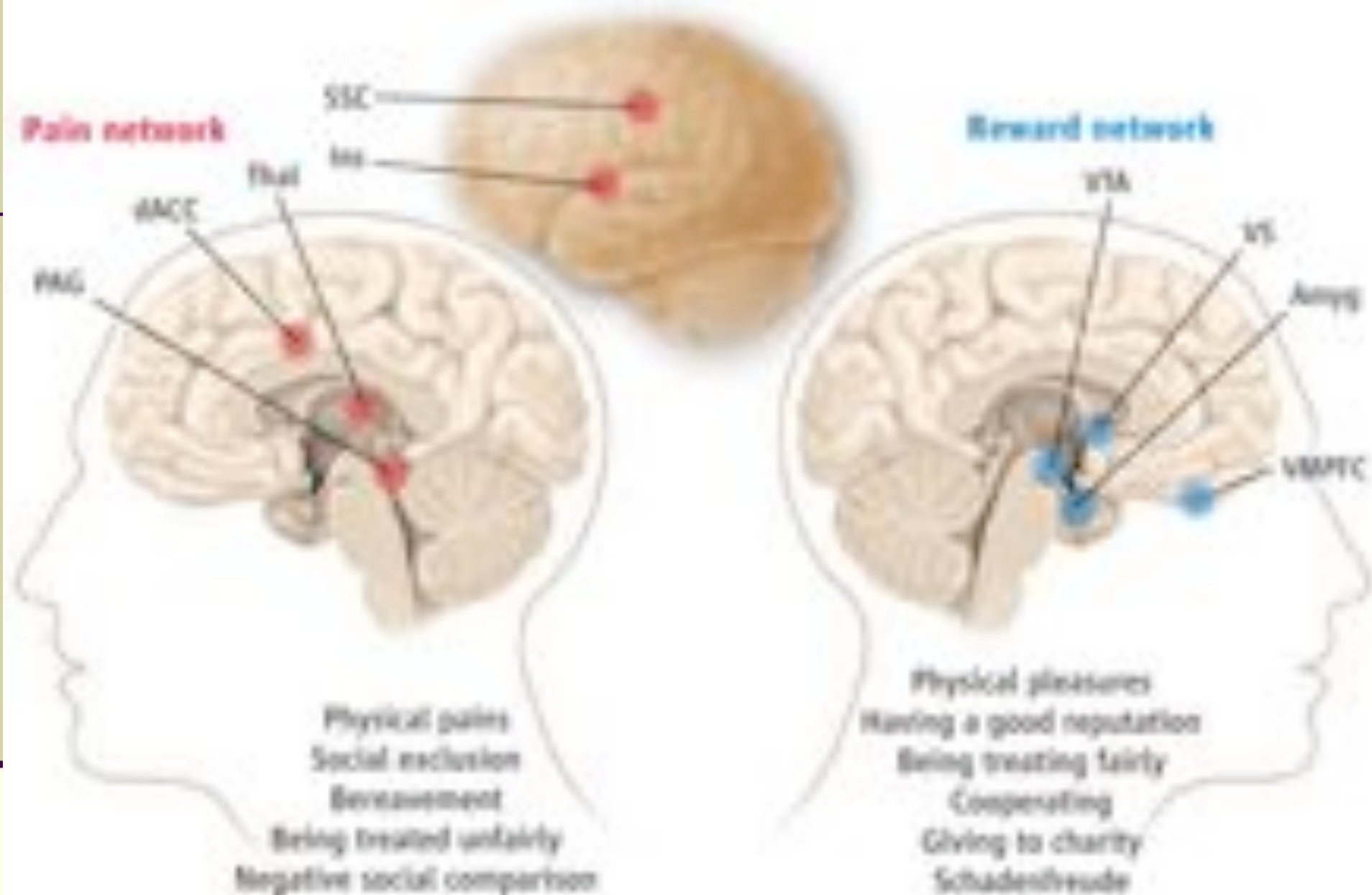
*Temporary* changes include:

- 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

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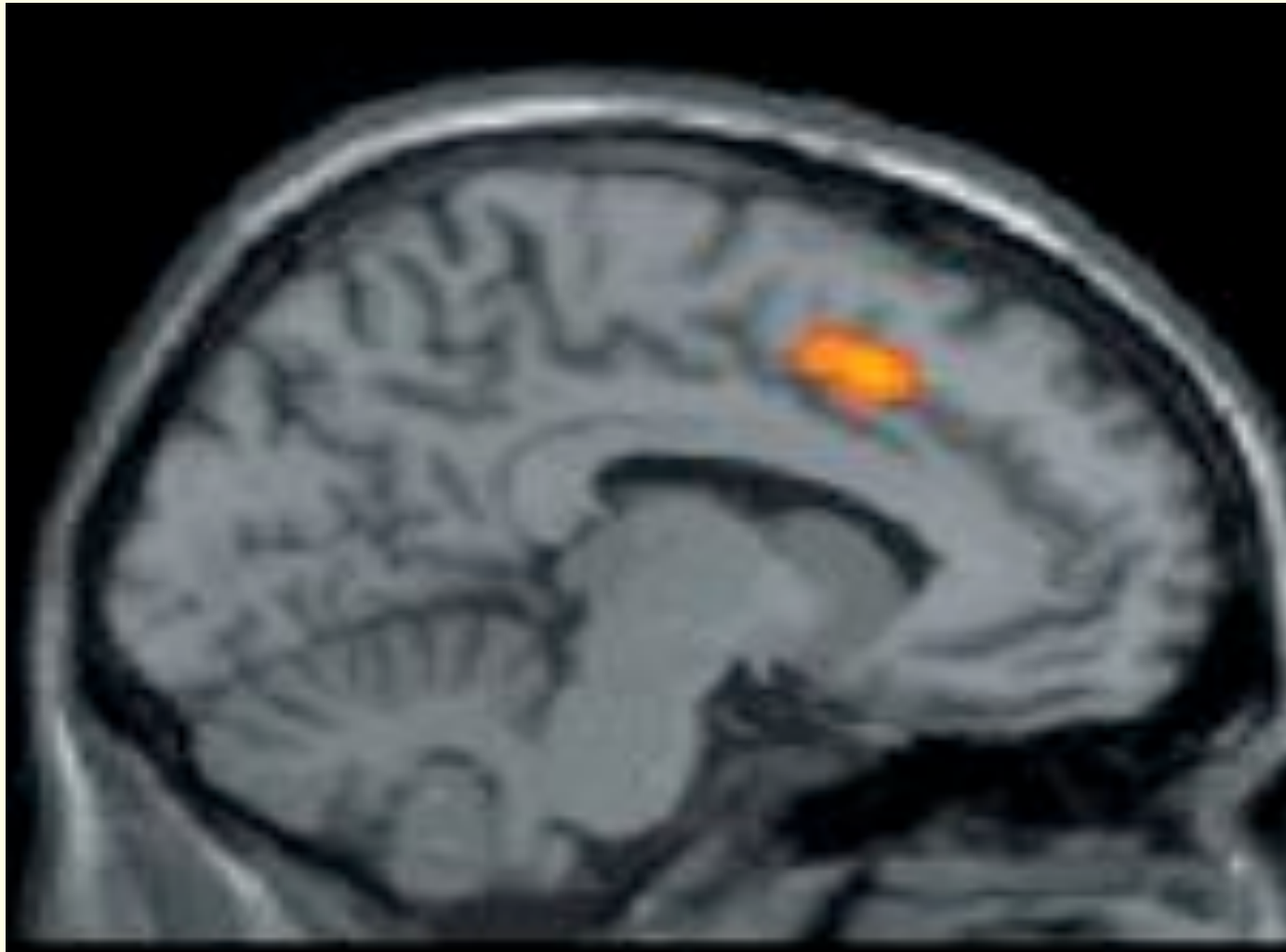
Pain network: Dorsal anterior cingulate cortex (dACC), insula (Ins), somatosensory cortex (SSC), thalamus (Thal), and periaqueductal gray (PAG).

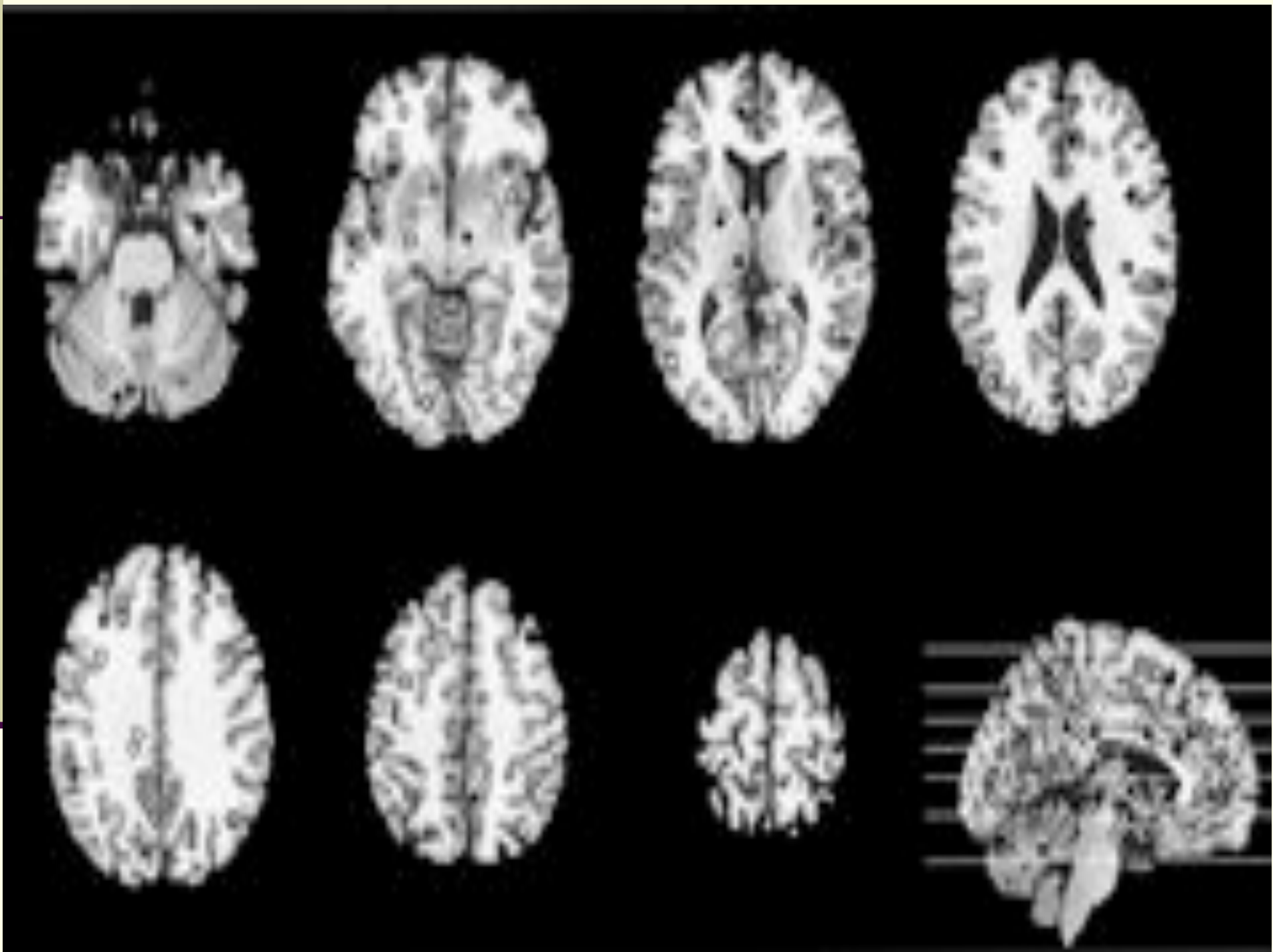
Reward network: Ventral tegmental area (VTA), ventral striatum (VS), ventromedial prefrontal cortex (VMPFC), and amygdala (Amyg).



# Paying Attention

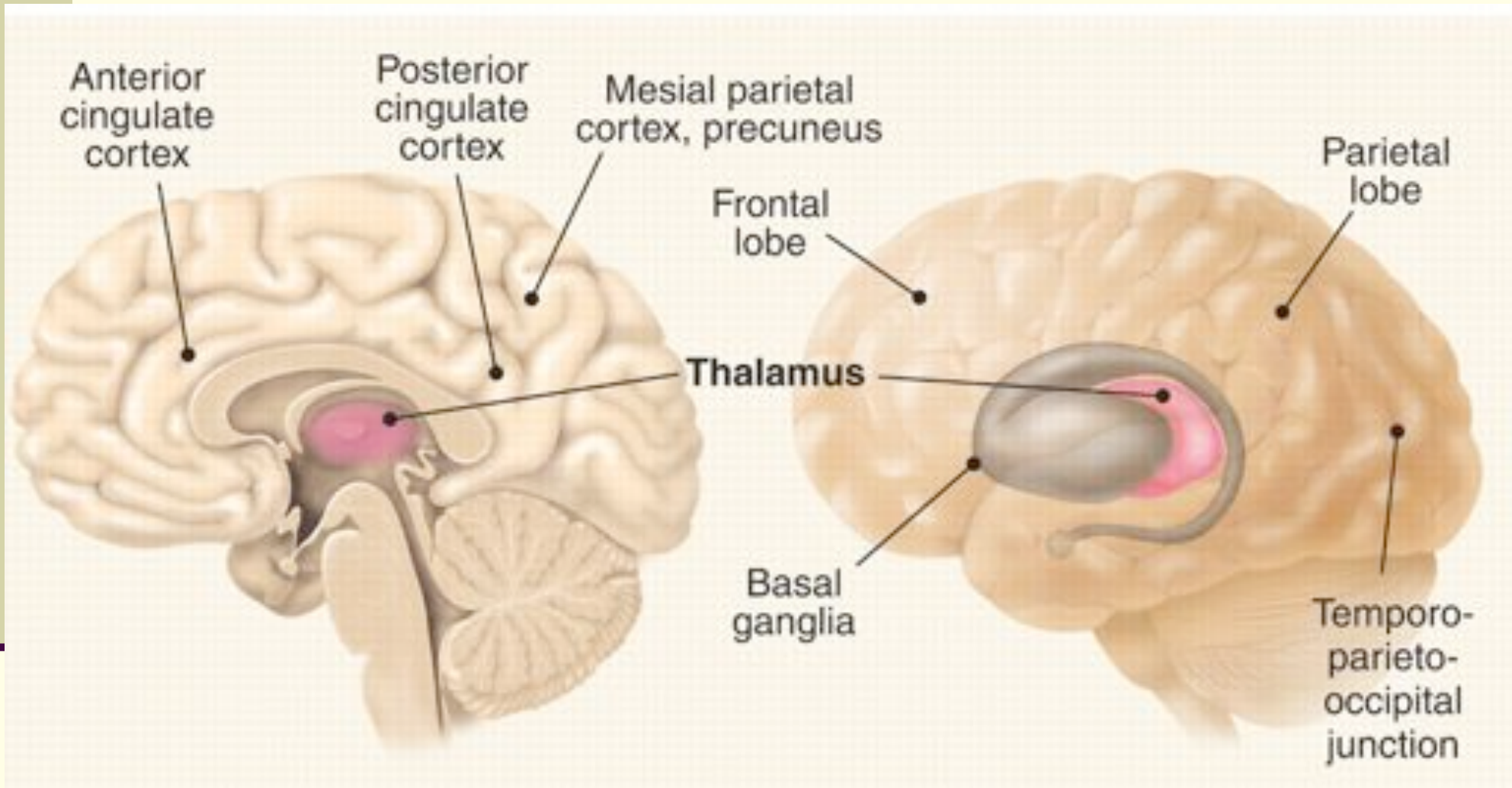
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Brain activations of “selfing” - Gillihan, et al., Psych Bulletin, 1/2005

# Key Brain Areas for Consciousness



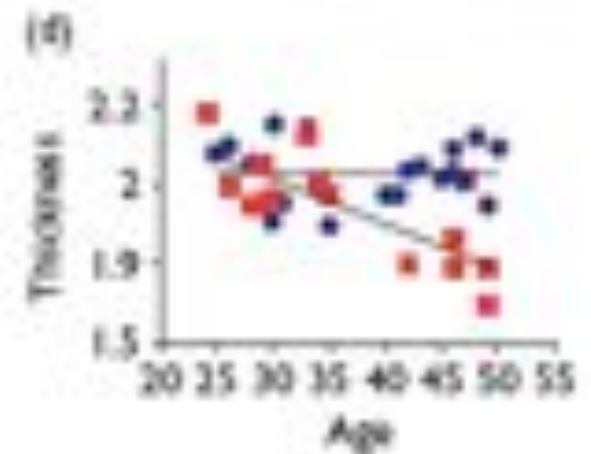
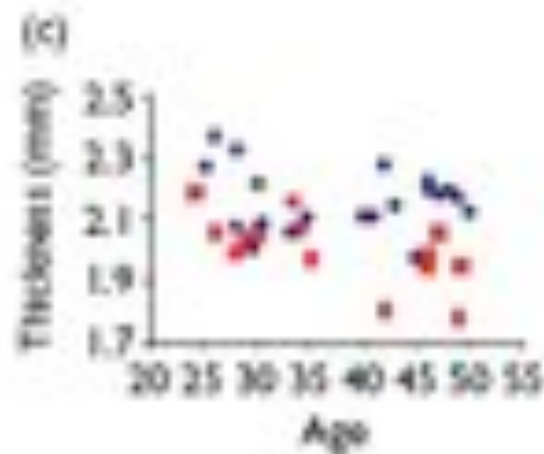
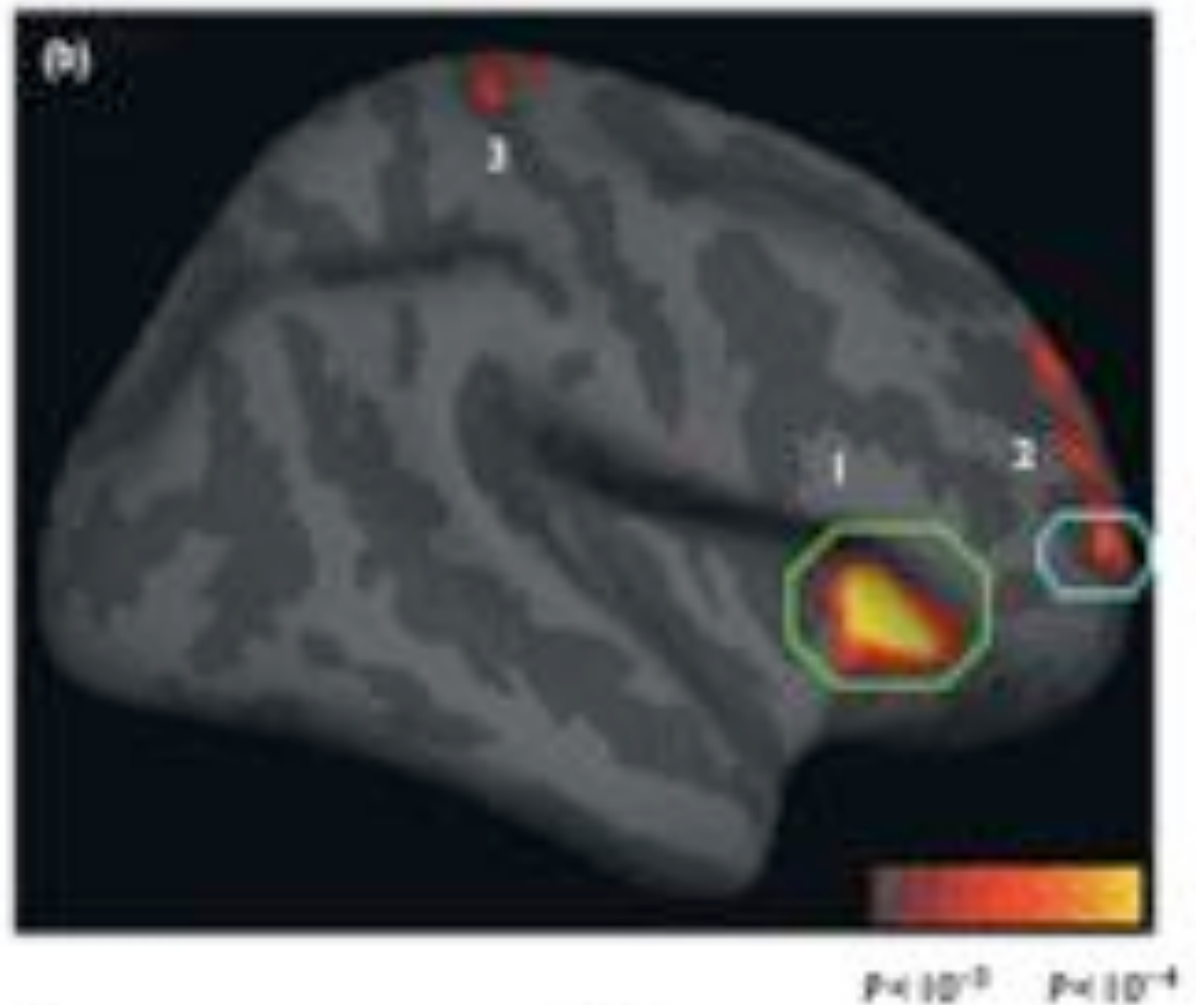
(adapted from) M. T. Alkire et al., *Science* 322, 876-880 (2008)

# Mental Activity Shapes Neural Structure

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- *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.



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

William James

# “A Spotlight on Speed”

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- 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

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



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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**

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

# What about the Caveman Brain?

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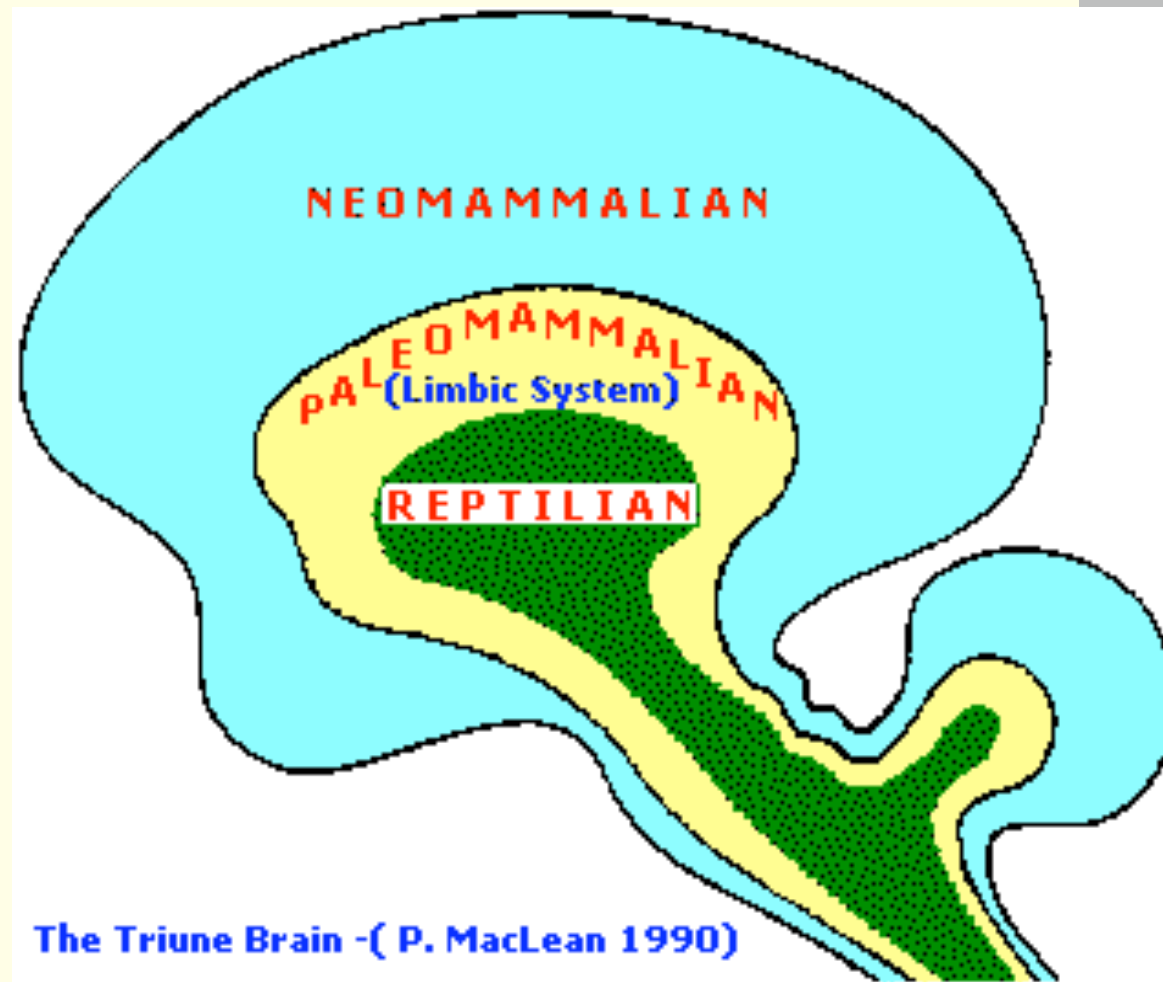


# Evolution Grinding Away

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- 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

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- 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

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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

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- 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



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*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

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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

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- 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

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- 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.