

# **The Neurology of Awakening:**

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## ***Using the New Brain Research to Steady Your Mind***

**Spirit Rock Meditation Center**

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# Topics

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- **Concentration in contemplative practice**
- **Foundations of mindfulness**
- **Self-directed neuroplasticity**
- **Lateral networks of spacious awareness**
- **Neurological diversity**
- **Resources for concentration**
- **Steady, quiet, and brought to singleness**



# **Concentration in Contemplative Practice**

# The Three Pillars of Practice

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- Virtue (sila) - expressing natural goodness, restraining what's harmful to oneself and others
- Concentration (samadhi) - mindfulness, steadiness of mind, meditative absorption
- Wisdom (panna) - insight, understanding the Four Noble Truths
- A path of practice in which one both uncovers the true nature that is already present, and purifies and transforms the mind and heart
- The path itself is its own reward. And it ultimately culminates in enlightenment and complete freedom from suffering.

# Distinctions . . .

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- **Awareness** is the field in which neural activity (mysteriously) becomes conscious experience.
- **Attention** is a heightened focus - a spotlight - on a particular content of awareness.
- **Mindfulness** is sustained attentiveness, typically with a metacognitive awareness of being aware.
- **Concentration** is deep absorption in an object of attention - sometimes to the point of non-ordinary states of consciousness.

# The Importance of Concentration

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- We'll focus on one aspect of one pillar: meditative depth.
- That aspect has often been under-emphasized as Buddhism came to the West.
- But strong concentration is recommended by the Buddha and traditional teachers. It brings heft to insight, strengthens the will, and purifies the mind.
- The Noble Eightfold Path includes Wise Concentration, which is the four jhanas: profound states of meditative absorption.
- We're not teaching the jhanas, but how to nourish the brain states that support their five mental factors.

# Right Concentration

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*And what, friends, is right concentration? Here, quite secluded from sensual pleasures, secluded from unwholesome states, a person enters upon and abides in the first jhana, which is accompanied by applied and sustained thought, with rapture and pleasure born of seclusion.*

*With the stilling of applied and sustained thought, the person enters upon and abides in the second jhana, which has self-confidence and singleness of mind without applied and sustained thought, with rapture and pleasure born of concentration.*

*With the fading away as well of rapture, the person abides in equanimity, and mindful and fully aware, still feeling pleasure with the body, enters upon and abides in the third jhana, on account of which noble ones announce: 'He or she has a pleasant abiding who has equanimity and is mindful.'*


*With the abandoning of pleasure and pain, and with the previous disappearance of joy and grief, he or she enters upon and abides in the fourth jhana, which has neither-pain-nor-pleasure and purity of mindfulness due to equanimity. This is called right concentration.*

# The Jhana Factors

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- Applied attention - bringing it to bear
- Sustained attention - staying with the target
- Rapture - great interest in the target, bliss
- Joy - happiness, contentment, and tranquility
- Singleness - unification of awareness





*Concentration is  
the proximate cause of wisdom.*

*Without concentration, one cannot even secure  
one's own welfare, much less the lofty goal of  
providing for the welfare of others.*

Acariya Dhammapala

# Cultivating Vipassana

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- Insight is the ultimate aim.
- Insight is nourished by stable, quiet, collected, and concentrated states . . . of the brain.
- Liberating insight - and Nibbana itself - is the fruit of virtue, wisdom, and contemplative practice.

*Even if the ripe apple falls ultimately by grace,  
its ripening was caused  
by the watering, feeding, protecting, and shaping of its tree.*



*Penetrative insight*

*joined with calm abiding*

*utterly eradicates*

*afflicted states.*

Shantideva

# Heartwood

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*This spiritual life does not have gain, honor, and renown for its benefit, or the attainment of moral discipline for its benefit, or the attainment of concentration for its benefit, or knowledge and vision for its benefit.*

*But it is this unshakable liberation of mind that is the goal of this spiritual life, its heartwood, and its end.*

The Buddha



# **Foundations of Mindfulness**

# Basics of Meditation

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- Relax
- Posture that is comfortable and alert
- Simple good will toward yourself
- Awareness of your body
- Focus on something to steady your attention
- Accepting whatever passes through awareness, not resisting it or chasing it
- Gently settling into peaceful well-being

# Mindfulness Factors

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- Setting an intention
- Relaxing the body
- Feeling cared about
- Feeling safer
- Encouraging positive emotion
- Absorbing the benefits

# Neural Basis of Mindfulness Factors

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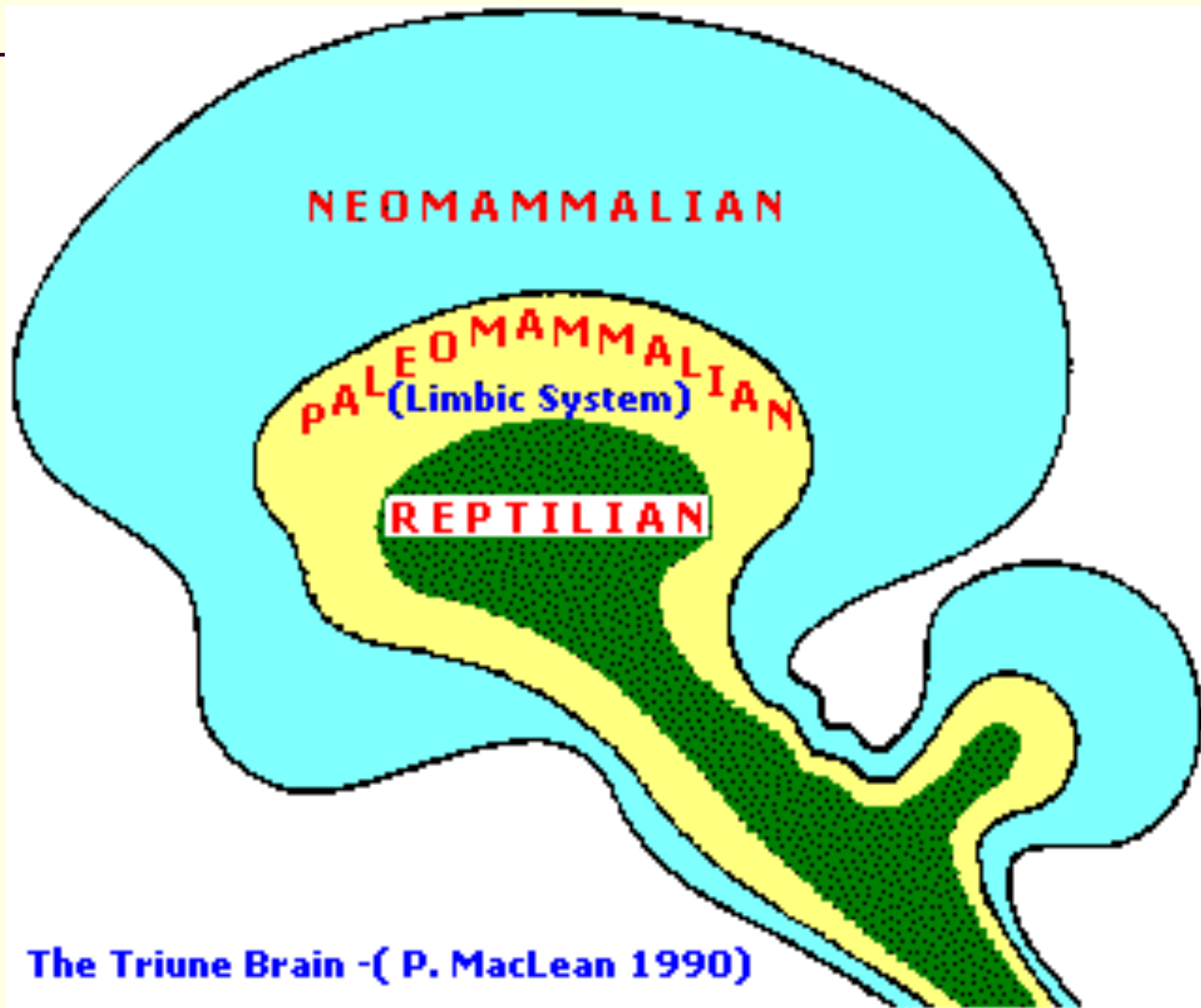
- **Setting an intention** - “top-down” frontal, “bottom-up” limbic
- **Relaxing the body** - parasympathetic nervous system
- **Feeling cared about** - social engagement system
- **Feeling safer** - inhibits amygdala/ hippocampus alarms
- **Encouraging positive emotion** - dopamine, norepinephrine
- **Absorbing the benefits** - positive implicit memories





# **Self-Directed Neuroplasticity**

# Evolutionary History



# Three Stages of Brain Evolution

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## ■ Reptilian:

- Brainstem, cerebellum, hypothalamus, basal ganglia
- Reactive and reflexive
- **Avoid** hazards

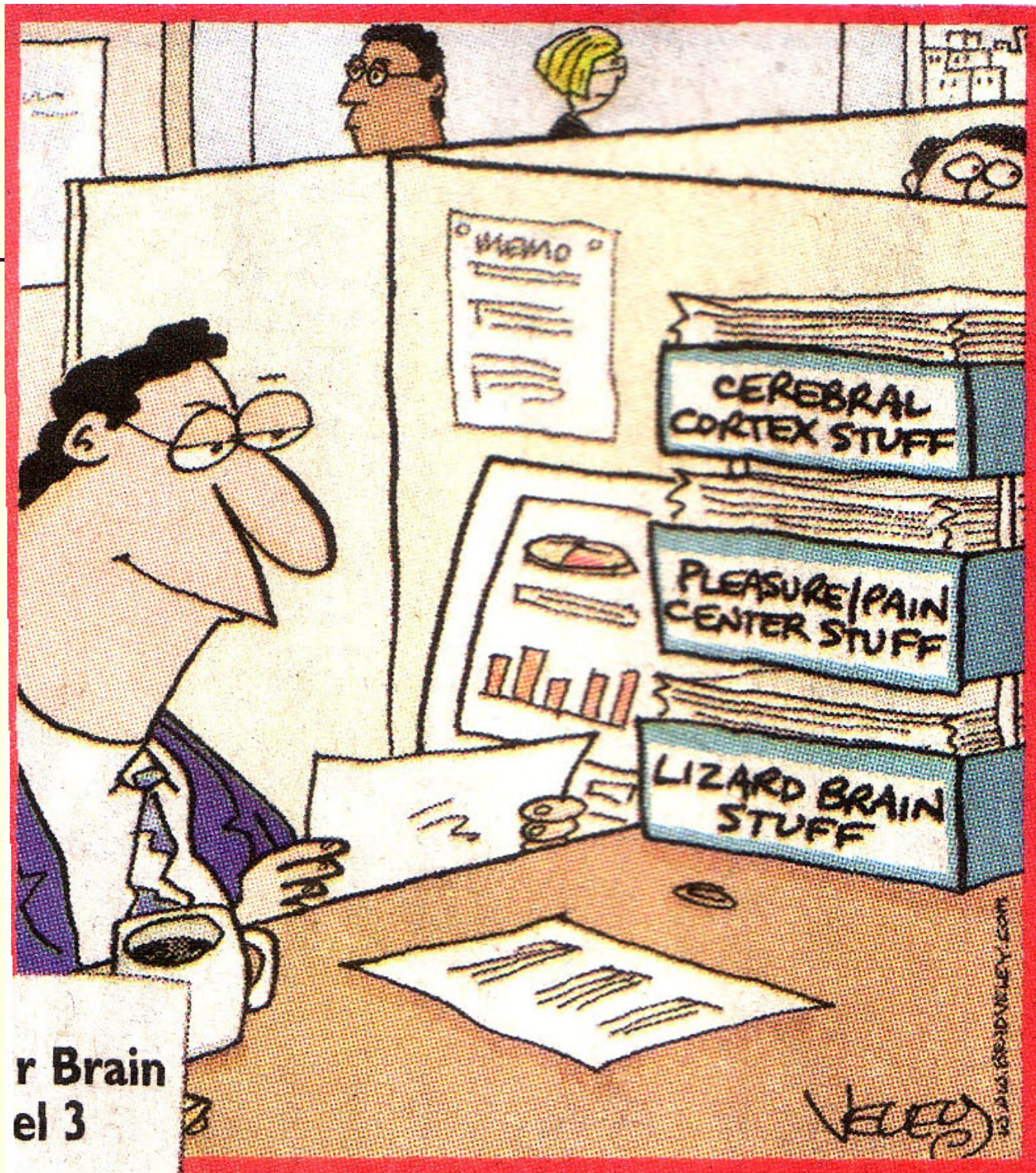
## ■ Mammalian:

- Amygdala, hippocampus, cingulate, early cortex
- Memory, emotion, social behavior
- **Attain** rewards

## ■ Human:

- Massive cerebral cortex
- Abstract thought, language, cooperative planning, empathy
- **Attach** to “us”





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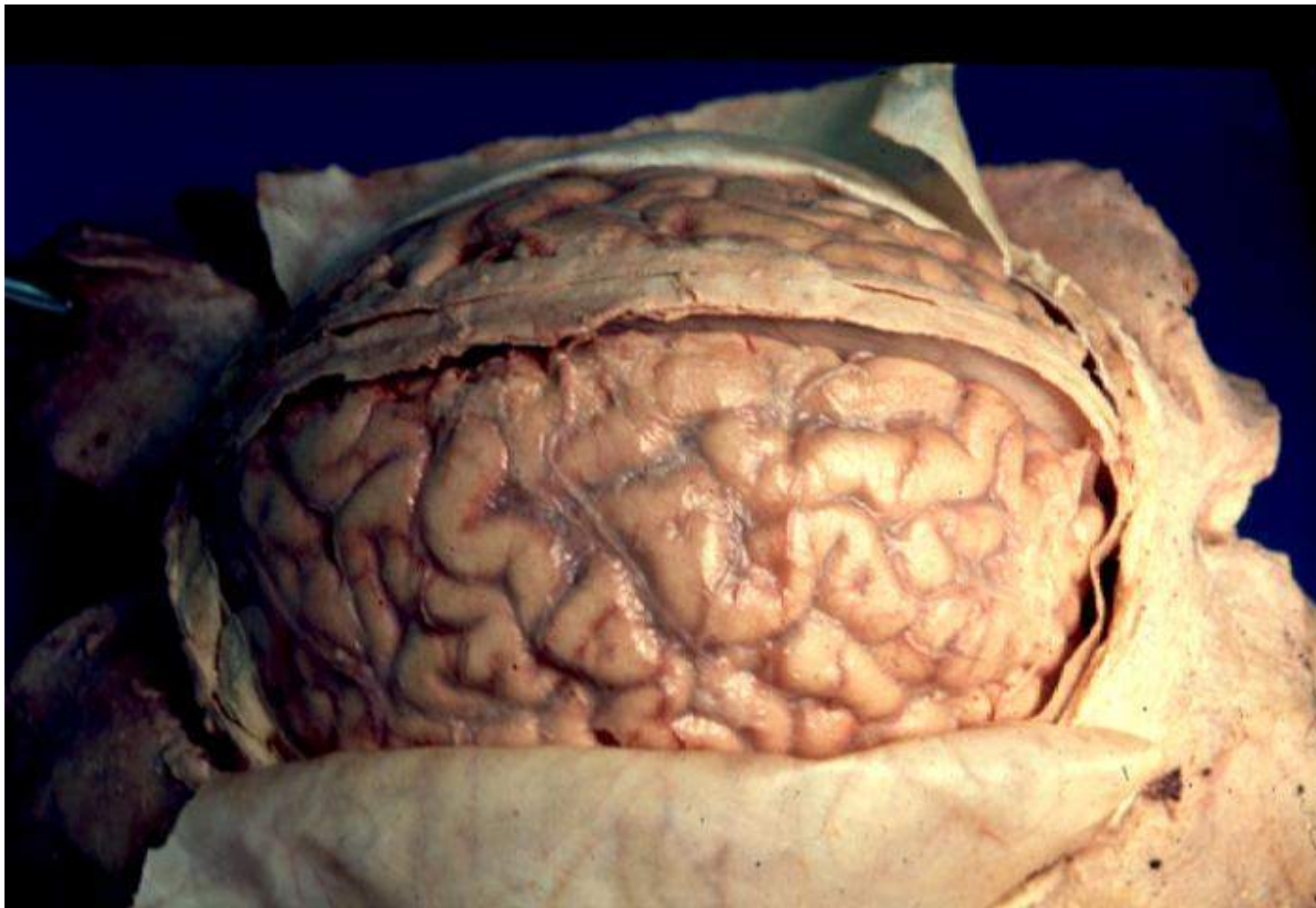




**"With all due respects, I find your disparaging remarks about the 'reptilian brain' unnecessary"**







# Mental Activity Sculpts Neural Structure

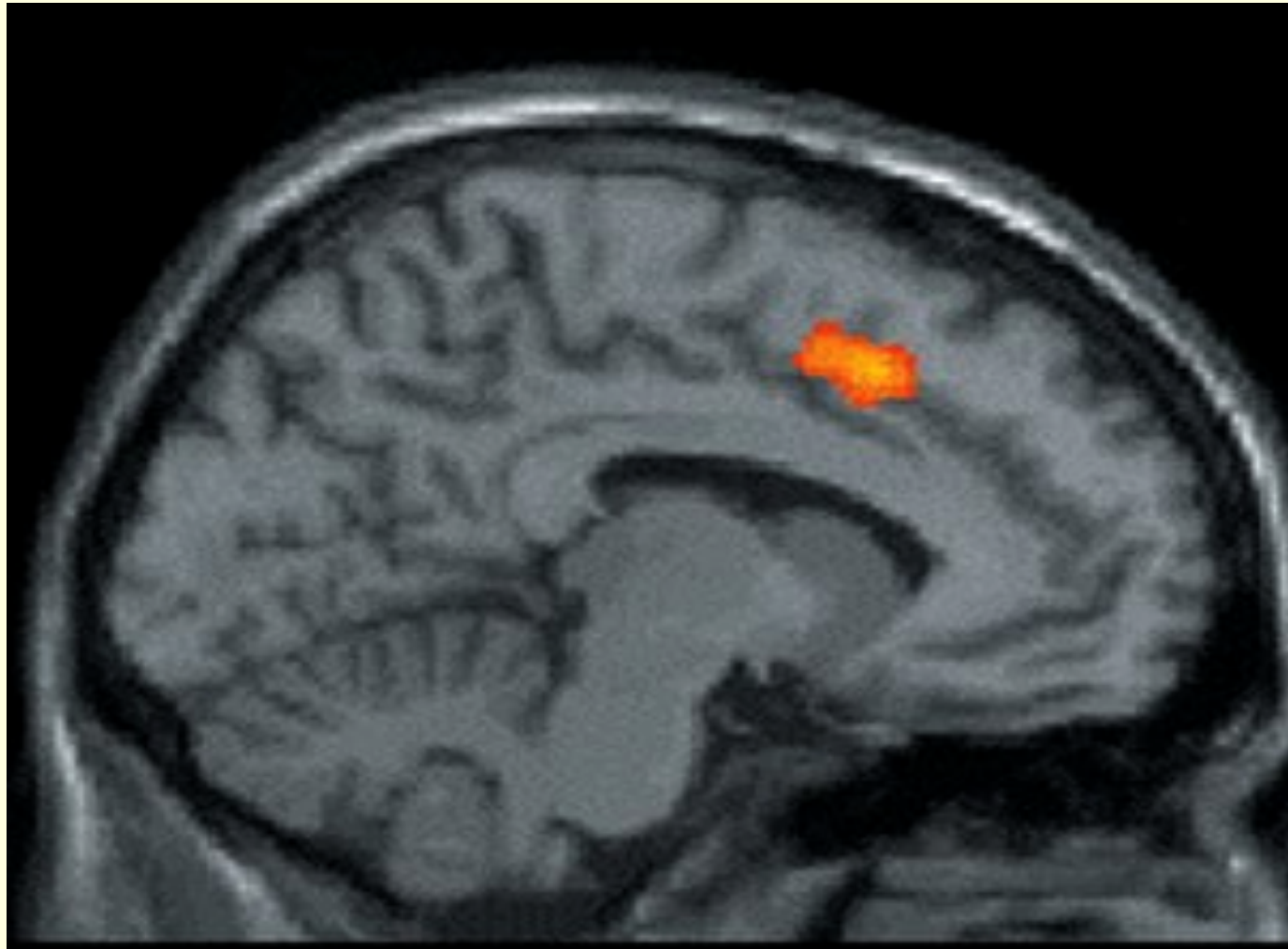
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- What flows through your mind sculpts your brain. Immaterial experience leaves material traces behind.
- “Neurons that fire together wire together.”
  - Neuronal “pruning” - Natural selection in the brain
  - Changes in excitability of individual neurons due to activity
  - Increased blood flow
  - Strengthen existing synapses
  - Building new synapses; from *in utero* to your deathbed
  - Observable thickening of cortical layers
- 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.

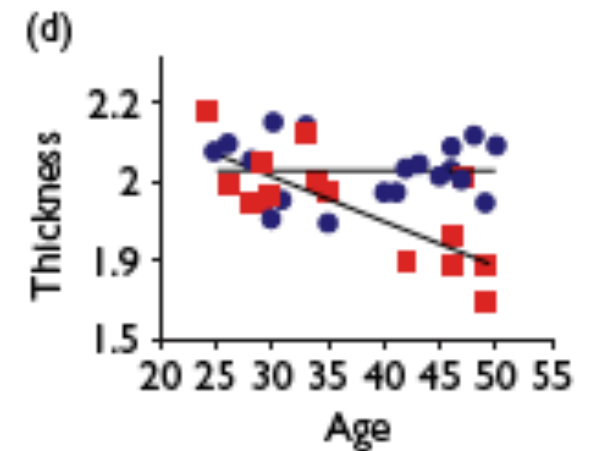
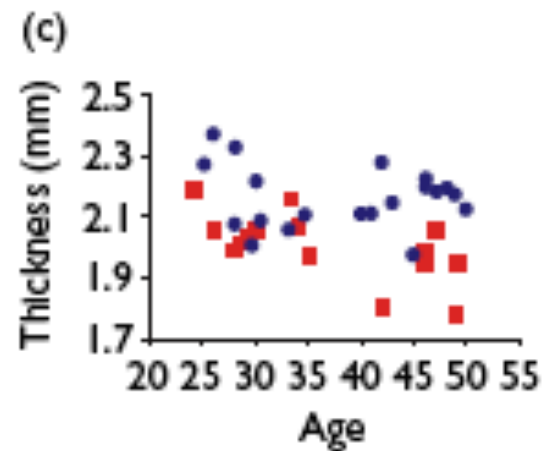
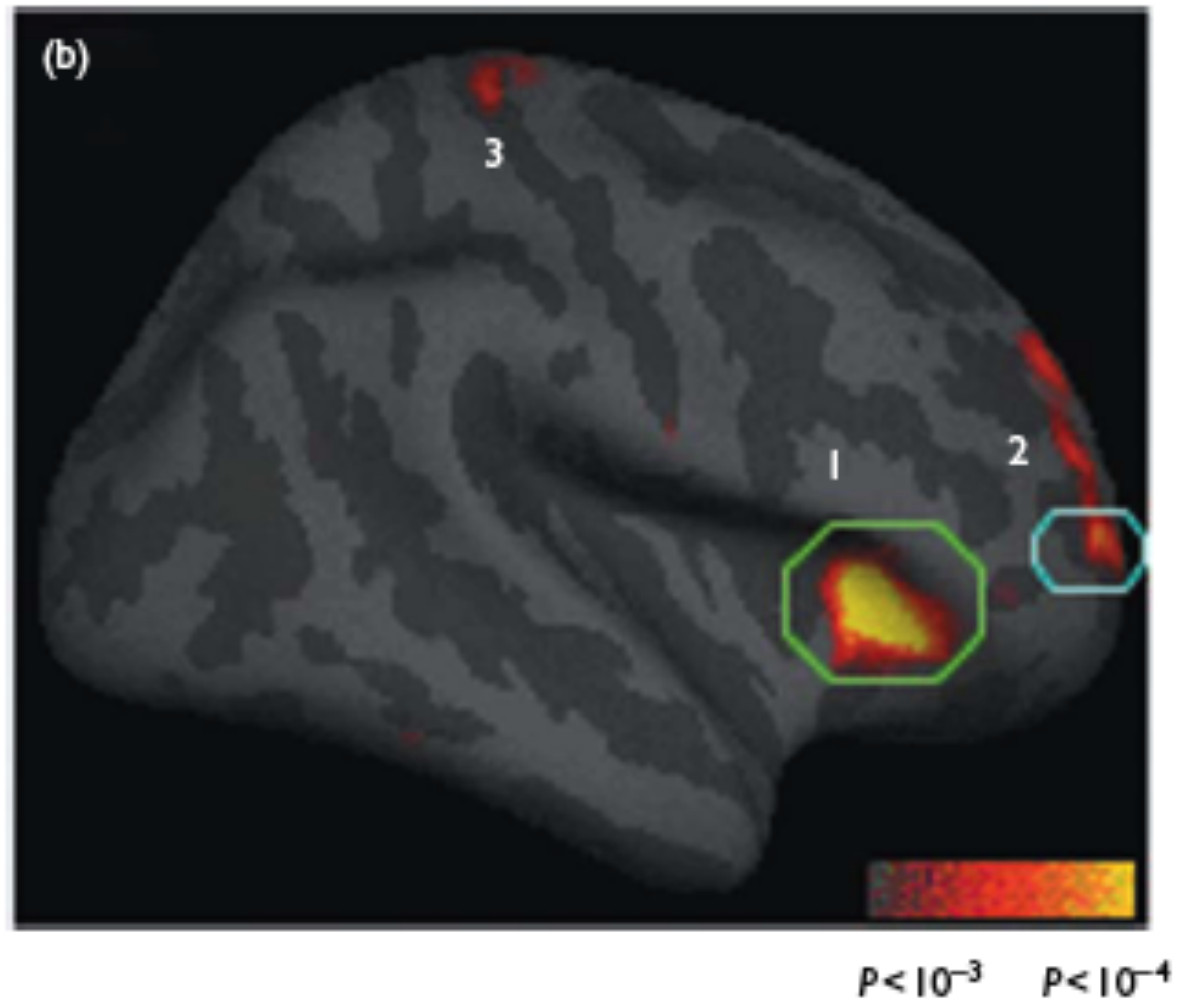


# “Ardent, Resolute, Diligent, and Mindful”

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



# Why Mindfulness Matters

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- Attention is like a spotlight, illuminating what it rests upon.
- Because neuroplasticity is heightened for what pay attention to, attention is also like a vacuum cleaner, sucking its contents into the brain.
- Directing attention skillfully - the essence of mindfulness - is therefore a fundamental way to shape the brain - and one's life - over time.

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

William James

## The Joy of Tech™

by Nitrozac & Snaggy



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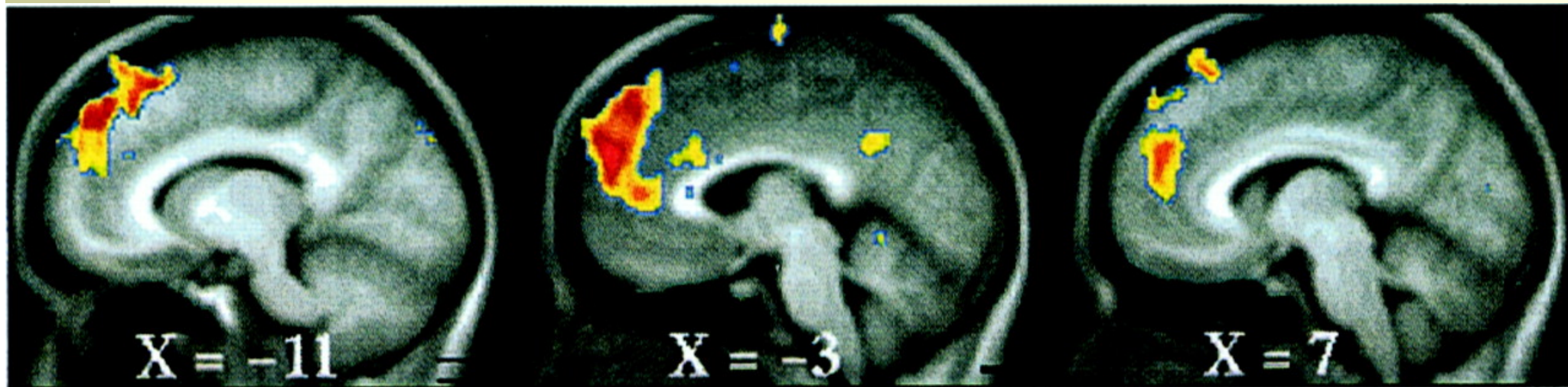


# **Lateral Networks of Spacious Awareness**



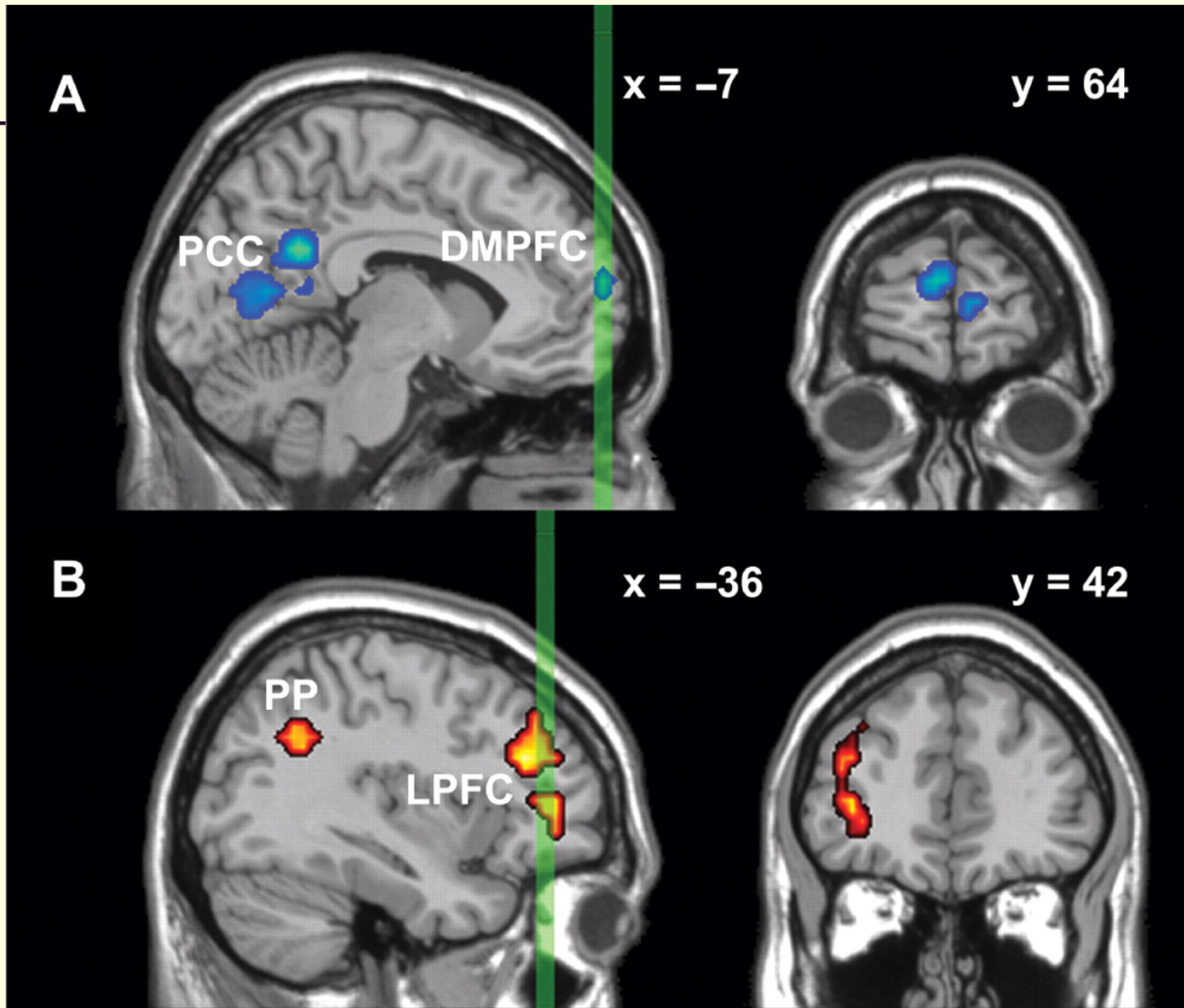
# Increased Medial PFC Activation Related to Self-Referencing Thought

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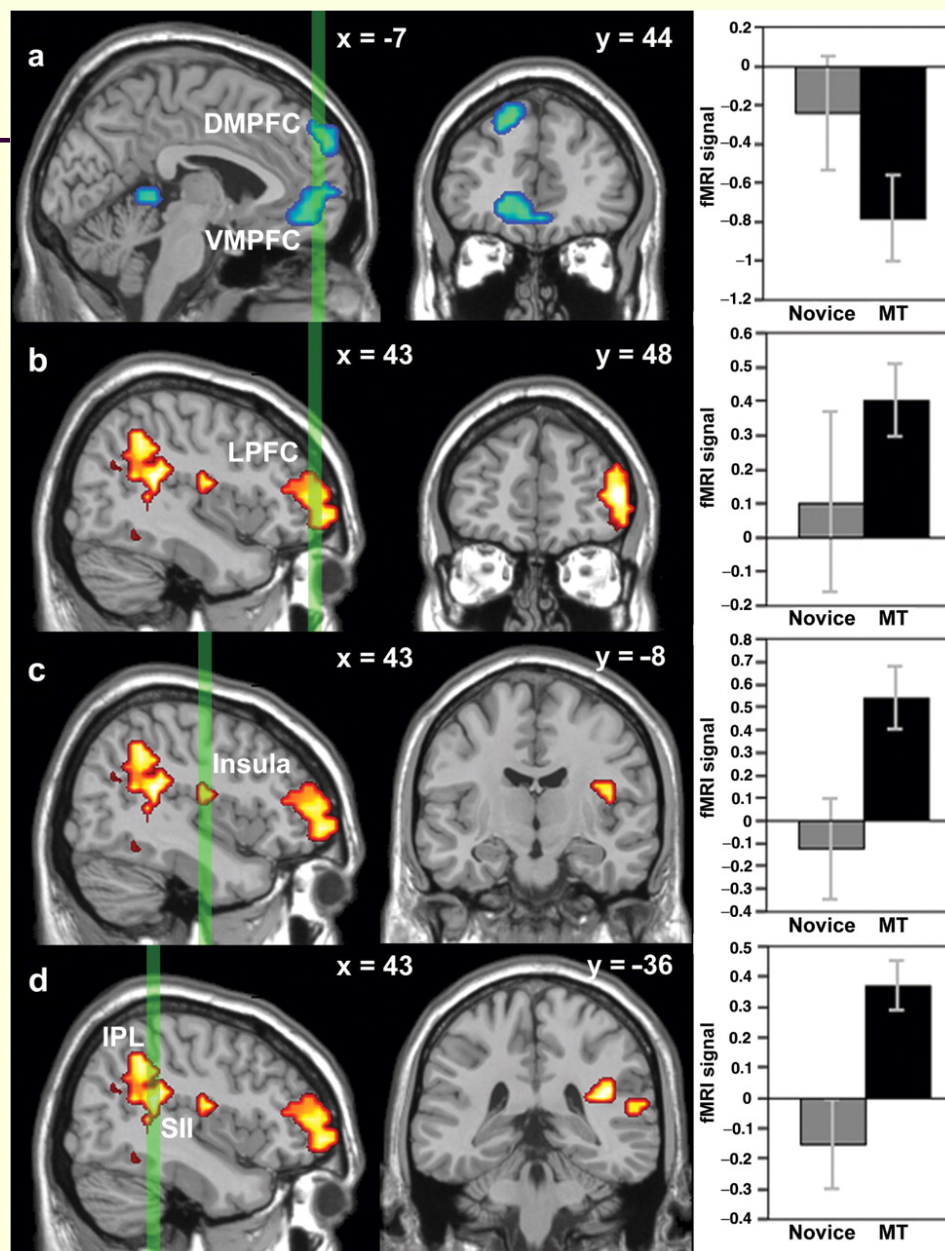


Gusnard D. A., et.al. 2001. *PNAS*, 98:4259-4264

## Self-Focused (blue) and Open Awareness (red) Conditions (in the novice, pre MT group)



# Self-Focused (blue) and Open Awareness (red) Conditions (following 8 weeks of MT)





# Ways to Activate Lateral Networks

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- Relax.
- Focus on bare sensations and perceptions.
- Sense the body as a whole.
- Take a panoramic, “bird’s-eye” view.
- Engage “don’t-know mind”; release judgments.
- Don’t try to connect mental contents together.
- Let experience flow, staying here now.
- Relax the sense of “I, me, and mine.”

# Whole Body Awareness

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- Involves insula and middle parietal lobes, which integrate sensory maps of the body, plus right hemisphere, for holistic (gestalt) perception
- Practice
  - Sense the breath in one area (e.g., chest, upper lip)
  - Sense the breath as a whole: one gestalt, percept
  - Sense the body as a whole, a whole body breathing
  - Sense experience as a whole: sensations, sounds, thoughts . . . all arising together as one unified thing
- This sense of the whole may be present for a second or two, then crumble; just open up to it again.

# Panoramic Awareness

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- Recall a bird's-eye view (e.g., mountain, airplane).
- Be aware of sounds coming and going in an open space of awareness, without any edges: boundless.
- Open to other contents of mind, coming and going like clouds moving across the sky.
- Pleasant or unpleasant, no matter: just more clouds
- No cloud ever harms or taints the sky.

*Trust in awareness, in being awake,  
rather than in transient and unstable conditions.*

Ajahn Sumedho




# Neurological Diversity

# How the Brain Pays Attention

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- Holding onto information
- Updating awareness
- Seeking stimulation



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

William James


# Individual Differences in Attention

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



**What is your own profile of attentional capabilities?**





*The root of Buddhism is compassion,  
and the root of compassion is compassion for oneself.*

Pema Chodron



© Kalyan Varma

# Self-Compassion

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- Compassion is the wish that a being not suffer, combined with sympathetic concern. Self-compassion simply applies that to oneself. It is not self-pity, complaining, or wallowing in pain.
- Studies show that self-compassion buffers stress and increases resilience and self-worth.
- But self-compassion is hard for many people, due to feelings of unworthiness, self-criticism, or “internalized oppression.” To encourage the neural substrates of self-compassion:
  - Get the sense of being cared about by someone else.
  - Bring to mind someone you naturally feel compassion for
  - Sink into the experience of compassion in your body
  - Then shift the compassion to yourself, perhaps with phrases like: “May I not suffer. May the pain of this moment pass.”



## **Resources for Concentration**

# Increase the Stimulation of the Object of Attention


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- Re-orient to each breath as a fresh stimulus
  - Beginner's mind, "don't-know mind"
- Intensify contact (= more stim): details, subtleties
- Attend to breath as a whole
- Move attention among its parts
- Walking meditation

# Be Satisfied with Less

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- Mindfulness thickens cortical layers, so less stimuli are still rewarding.
- Practice focusing on neutral - neither pleasant nor unpleasant - experiences. (*"The neutral is actually very close to peace and ease. It's a real doorway to resting in the eventless."* Christina Feldman)
- Recall the truth that all stimuli are fundamentally impermanent, empty, and ultimately unsatisfying.
- Call up a sense of disenchantment with the inner and outer worlds.



*In the deepest forms of insight,  
we see that things change so quickly  
that we can't hold onto anything,  
and eventually the mind lets go of clinging.*

*Letting go brings equanimity.  
The greater the letting go, the deeper the equanimity.  
In Buddhist practice, we work to expand  
the range of life experiences in which we are free.*



# **Steady, Quiet, and Brought to Singleness**



# A Road Map from the Buddha

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The Buddha described a progressive process in which:

*...the mind is steadied internally, quieted, brought to singleness, and concentrated* - Anguttara Nikaya 3:100 - leading to liberating insight.

- *Steady* - attention is stable
- *Quiet* - tranquility, little verbal or emotional activity
- *Single* - integrative awareness, minimal thought, deep and nearly effortless engagement with the target of attention
- *Concentrated* - the jhanas or related non-ordinary states of consciousness; great absorption; often powerful feelings of rapture, bliss, happiness, contentment, and equanimity

# The Jhana Factors

---

- Applied attention - bringing it to bear
- Sustained attention - staying with the target
- Rapture - great interest in the target, bliss
- Joy - happiness, contentment, and tranquility
- Singleness - unification of awareness

# Steadied Internally

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A stable

stability of attention . . .

# Joy

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## ■ Experience

- Spectrum of happiness, contentment, and tranquility
- Happiness - Gratitude, gladness, delight
- Contentment - Well-being plus no wish at all that the moment be any different (hint of equanimity)
- Tranquility - Deep peace; a still pond
- Feelings can be subtle, and still pervade the mind.

## ■ Neurology

- Stable dopamine, lessening norepinephrine and opioids
- Internal stimulation reduces basal ganglia need for external stim.

## ■ Practice

- Settle down from rapture.
- Softly think: “May joy (*sukha*) arise.”
- OK to think of cues to joy.
- Explore the spectrum of joy; know each state.

# Rapture

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## ■ Experience

- Feelings of pleasure, even bliss, in the body; pulses, waves of energy; rising quality
- Range of capacity for rapture
- Can come to feel a little overwhelming

## ■ Neurology

- Intensifies dopamine, closing the gate to working memory
- Intensifies norepinephrine and alertness (“brightening the mind”)
- Both neurotransmitters promote synaptic formation, thus learning.
- Intensifies natural opioids

## ■ Practice

- Softly think: “May rapture (*piti*) arise.”
- Perhaps gently arouse the body: strong inhale; pulse muscles at base of spine.
- If rapture doesn’t come, return to the breath.

# Quiet

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- Little verbal activity
- Minimal sensorimotor stimuli
- Little goal-directedness
- A still pond with few waves

# Cultivating Singleness

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## ■ Experience

- A sense of all contents of experience appearing as a unified whole, as a single gestalt, moment by moment
- Great collectedness; minimal thought; deep, nearly effortless engagement with the object of attention; non-reactivity; little sense of self

## ■ Neurology

- Fast gamma wave entrainment
- Less “effortful control” by the ACC

## ■ Practice

- Relax into whole body awareness
- Softly think: “May singleness (*ekaggata* ) arise.”
- Open up to the “ka-woosh” of it all coming together

# Concentrated

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- Profound absorption in non-ordinary state of consciousness: e.g., the “form” and “formless” jhanas; samadhi; mystical transport
- Pervading sense of rapture, bliss, happiness, contentment, tranquillity, equanimity
- Penetrating clarity into fine-grained details of experience, e.g., transience, interdependence, selflessness





*Know the mind.*

*Shape the mind.*

*Free the mind.*

# Great Books

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See [www.RickHanson.net](http://www.RickHanson.net) for other great books.

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- Begley, S. 2007. *Train Your Mind, Change Your Brain*. Ballantine.
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# Key Papers - 1

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See [www.RickHanson.net](http://www.RickHanson.net) for other scientific papers.

- Atmanspacher, H. & Graben, P. 2007. Contextual emergence of mental states from neurodynamics. *Chaos & Complexity Letters*, 2:151-168.
- Baumeister, R., Bratlavsky, E., Finkenauer, C. & Vohs, K. 2001. Bad is stronger than good. *Review of General Psychology*, 5:323-370.
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- Lazar, S., Kerr, C., Wasserman, R., Gray, J., Greve, D., Treadway, M., McGarvey, M., Quinn, B., Dusek, J., Benson, H., Rauch, S., Moore, C., & Fischl, B. 2005. Meditation experience is associated with increased cortical thickness. *Neuroreport*. 16:1893-1897.
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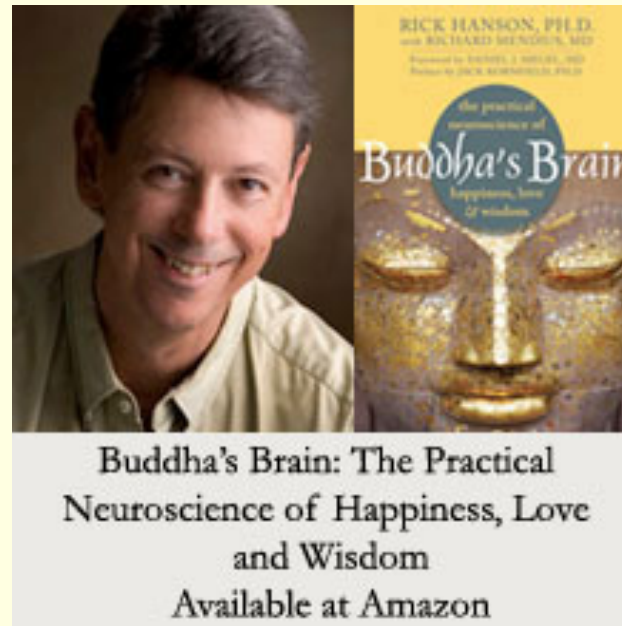
## ***Where to Find Rick Hanson Online***

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<http://www.youtube.com/BuddhasBrain>

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