

The Neurology of Awakening:

Using the New Brain Research to Steady Your Mind

**Spirit Rock Meditation Center
March 25, 2012**

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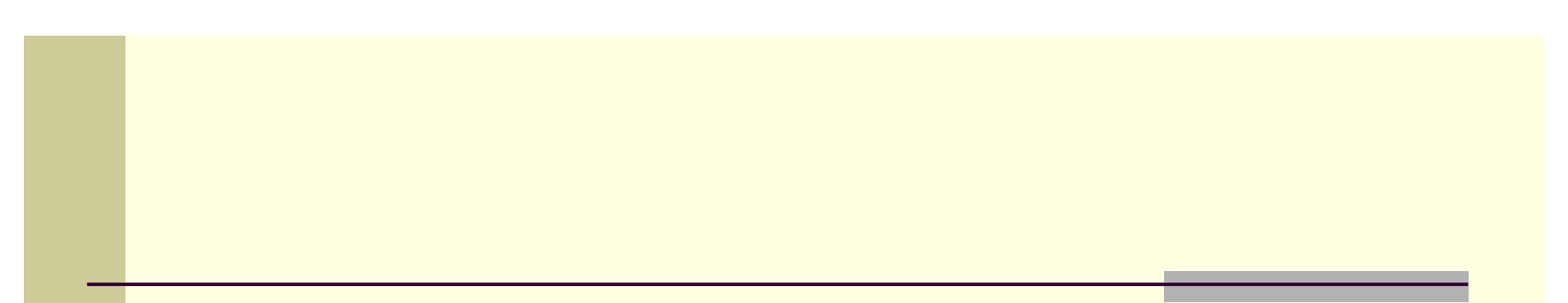
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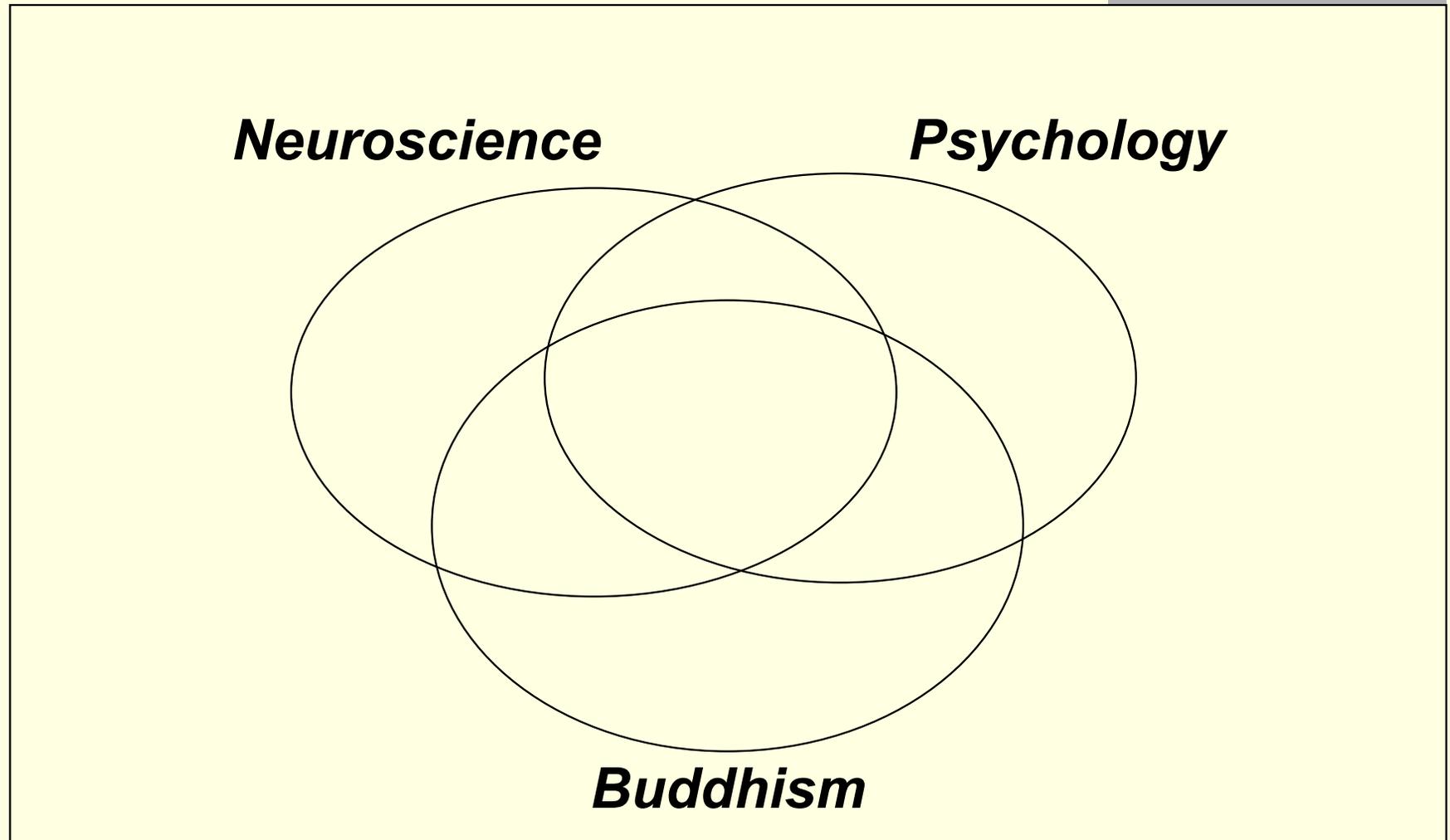
Topics

- **Perspectives**
- **Concentration in contemplative practice**
- **Foundations of mindfulness**
- **Grounding the mind in nature**
- **Self-directed neuroplasticity**
- **Lateral networks of spacious awareness**
- **Neurological diversity**
- **Resources for concentration**
- **Steady, quiet, and brought to singleness**
- **The Jhana factors**



Perspectives

Common - and Fertile - Ground

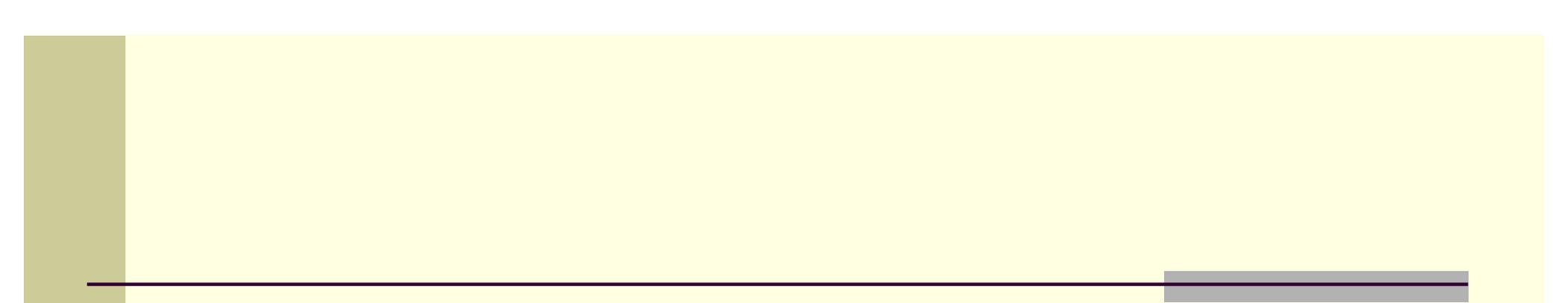


"We ask, 'What is a thought?'

We don't know,

yet we are thinking continually."

- Ven. Tenzin Palmo



Concentration in Contemplative Practice

The Three Pillars of Practice

- 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.

The Importance of Concentration

- 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

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.

*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

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

Distinctions . . .

- **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.

Cultivating Vipassana

- 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.*

Heartwood

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.

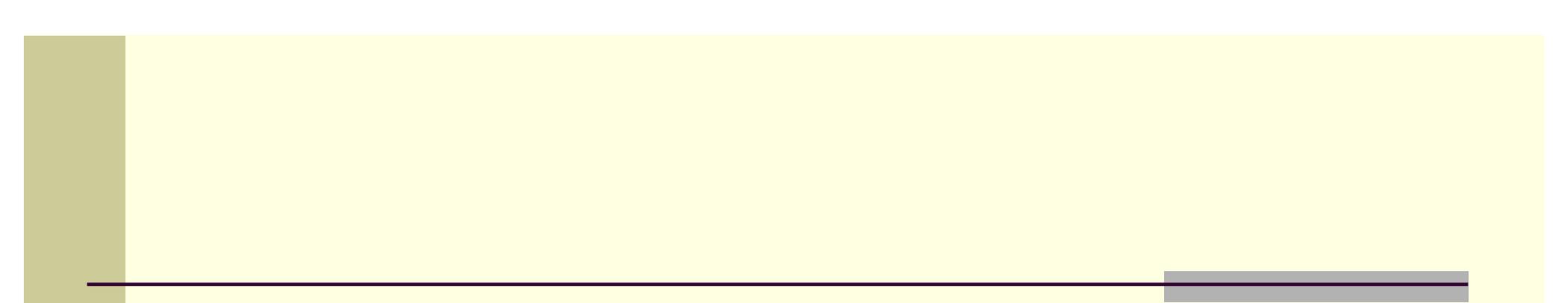
Penetrative insight

joined with calm abiding

utterly eradicates

afflicted states.

Shantideva



Foundations of Mindfulness

Basics of Meditation

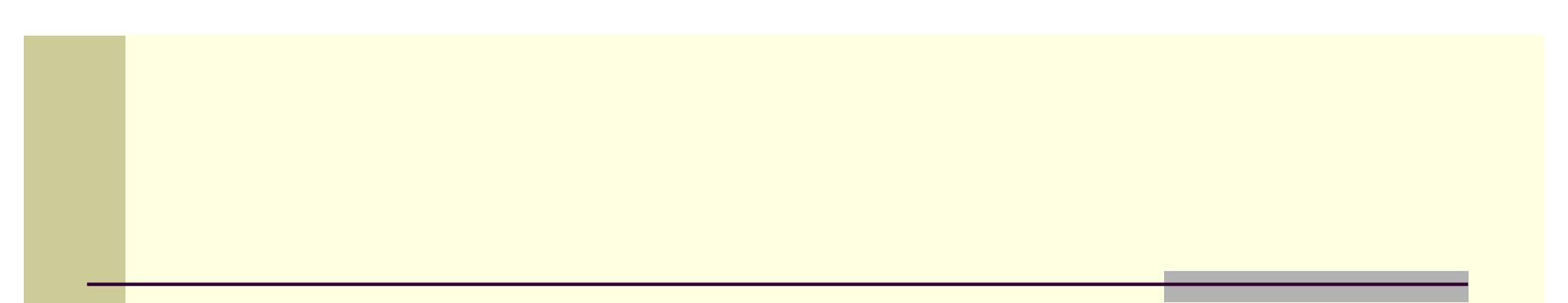
- Relax
- Posture that is comfortable and alert
- Simple good will toward yourself
- Awareness of your body
- Focus on something to steady your attention
- Accepting whatever passes through awareness, not resisting it or chasing it
- Gently settling into peaceful well-being

Mindfulness Factors

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

Neural Basis of Mindfulness Factors

- **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



Grounding the Mind in Nature

Evolution is a tinkerer. In living organisms, new capabilities are achieved by modifying existing molecules slightly and adjusting their interaction with other existing molecules.

Science has found surprisingly few proteins that are truly unique to the human brain and no signaling systems that are unique to it.

All life, including the substrate of our thoughts and memories, is composed of the same building blocks.







All cells have specialized functions. Brain cells have particular ways of processing information and communicating with each other. Nerve cells form complete circuits that carry and transform information.

Electrical signaling represents the language of mind, the means whereby nerve cells, the building blocks of the brain, communicate with one another over great distances. Nerve cells generate electricity as a means of producing messages.

All animals have some form of mental life that reflects the architecture of their nervous system.

The Mind/Brain System

- “Mind” = flow of information within the nervous system:
 - Information is represented by the nervous system.
 - Most mind is unconscious; awareness is an aspect of mind.
 - The headquarters of the nervous system is the brain.

- In essence then, apart from hypothetical transcendental factors, the mind *is* what the brain *does*.

- Brain = necessary, *proximally* sufficient condition for mind:
 - The brain depends on the nervous system, which intertwines with and depends on other bodily systems.
 - These systems in turn intertwine with and depend upon nature and culture, both presently and over time.
 - And as we’ll see, the brain also depends on the mind.

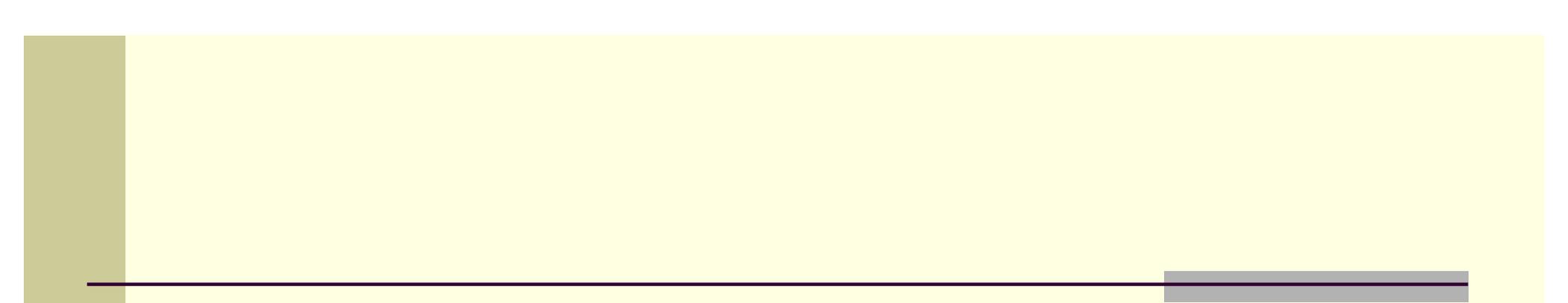
Within the Frame of Western Science

This workshop focuses on how to use the mind to change the brain to benefit the mind.

There could be Transcendental factors at work in the brain and the mind.

Since this cannot be proven either way, a truly scientific attitude is to accept it as a possibility.

Bowing to the possibility of the Transcendental, I'll stay within the frame of Western science in this course.



Self-Directed Neuroplasticity



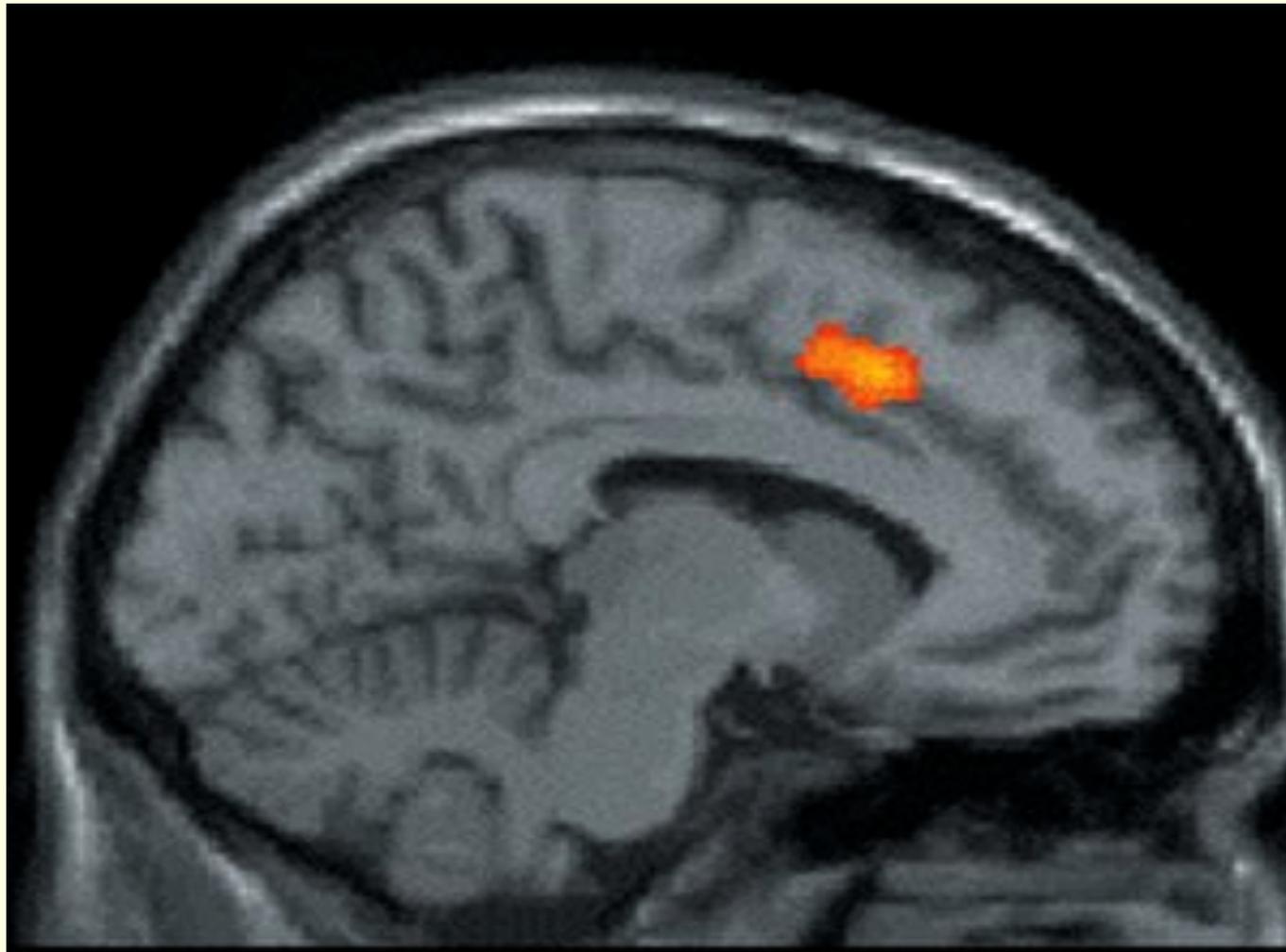
Mental Activity Sculpts Neural Structure

- What flows through your mind sculpts your brain. Immaterial experience leaves material traces behind.

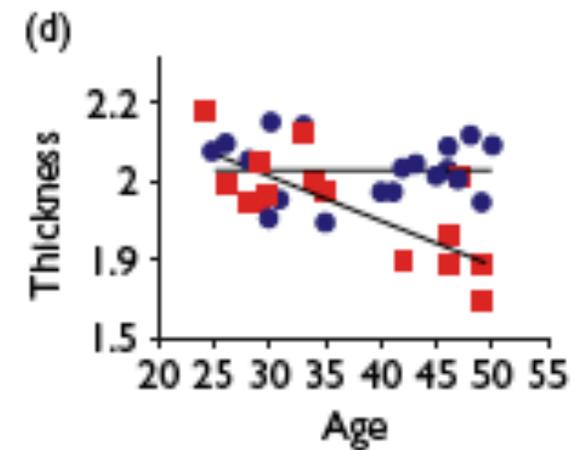
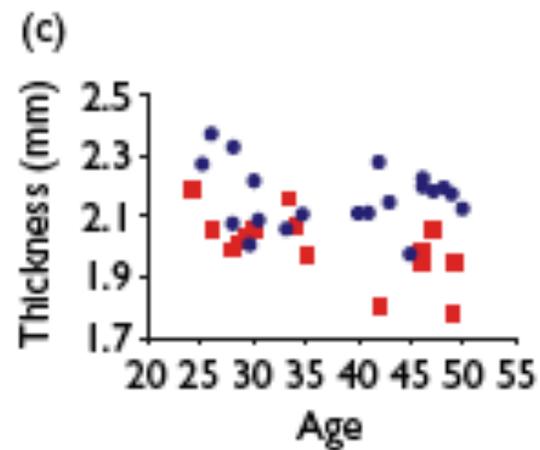
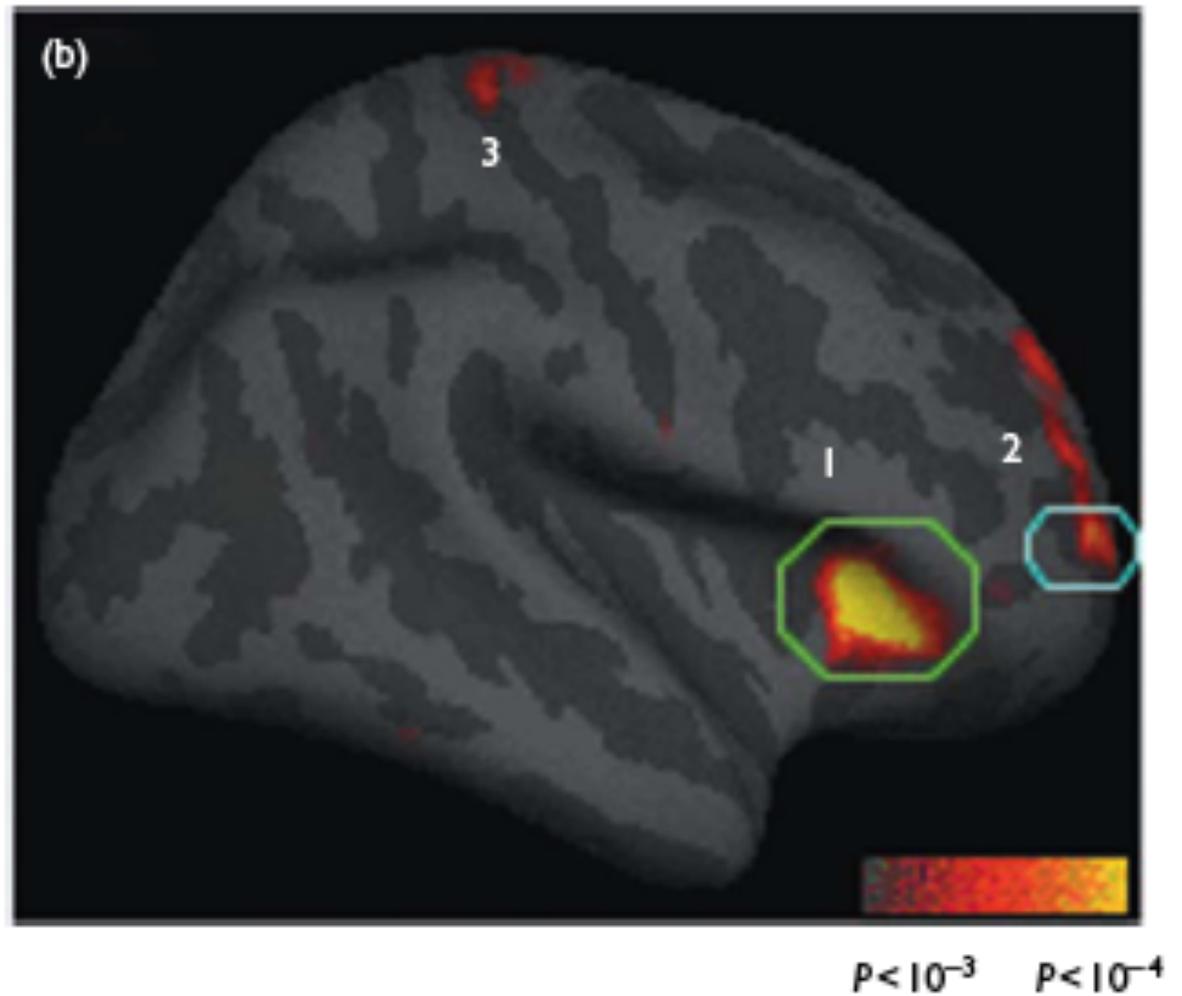
- “Neurons that fire together wire together.”
 - Neuronal “pruning” - Natural selection in the brain
 - Changes in excitability of individual neurons due to activity
 - Increased blood flow
 - Strengthen existing synapses
 - Building new synapses; from *in utero* to your deathbed
 - Observable thickening 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.

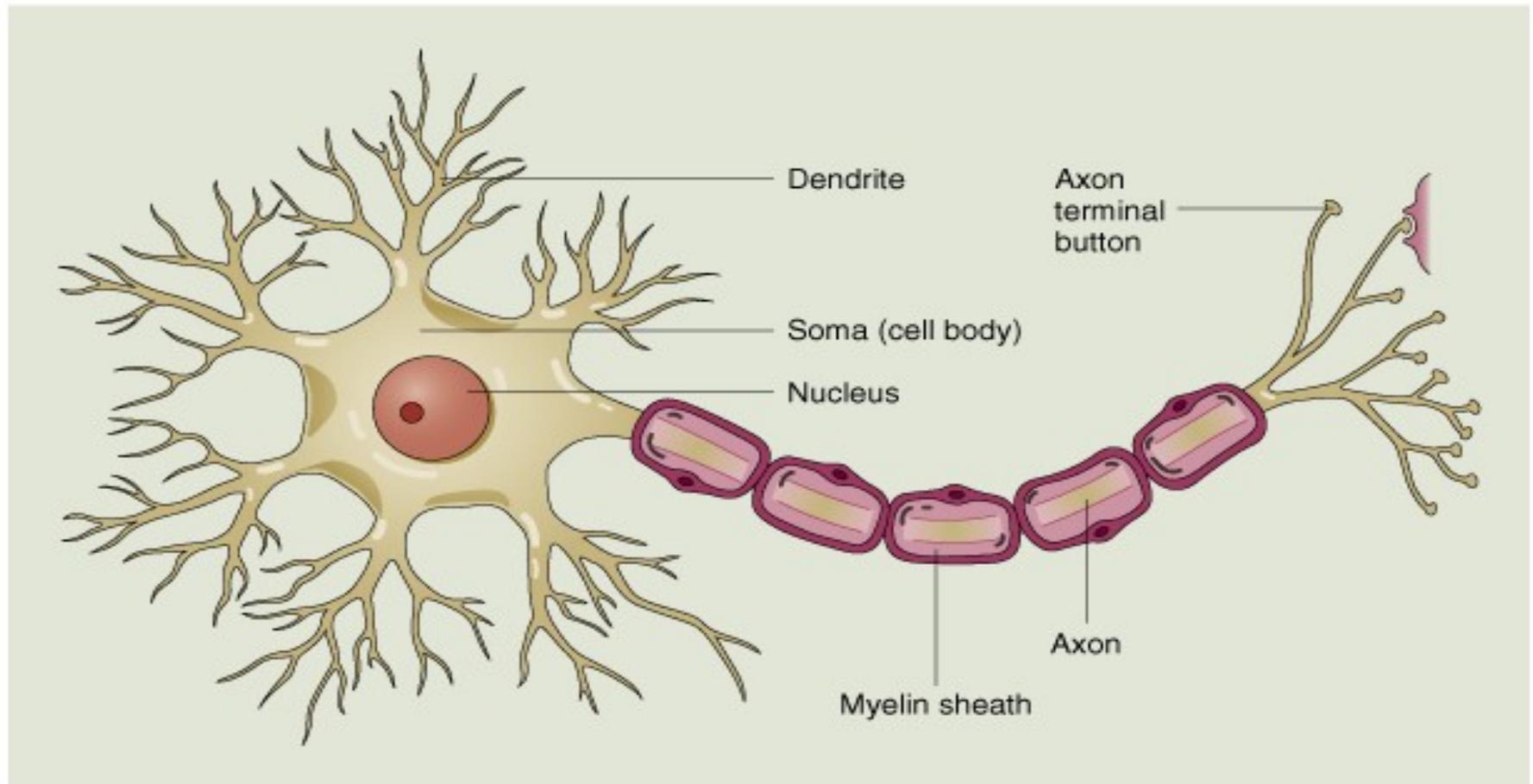
“Ardent, Resolute, Diligent, and Mindful”



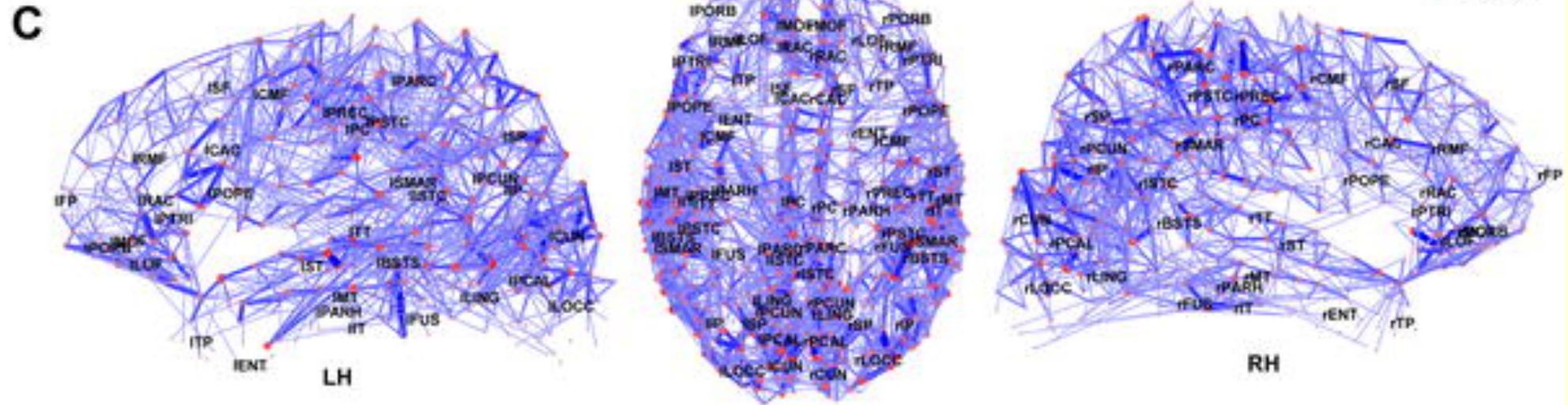
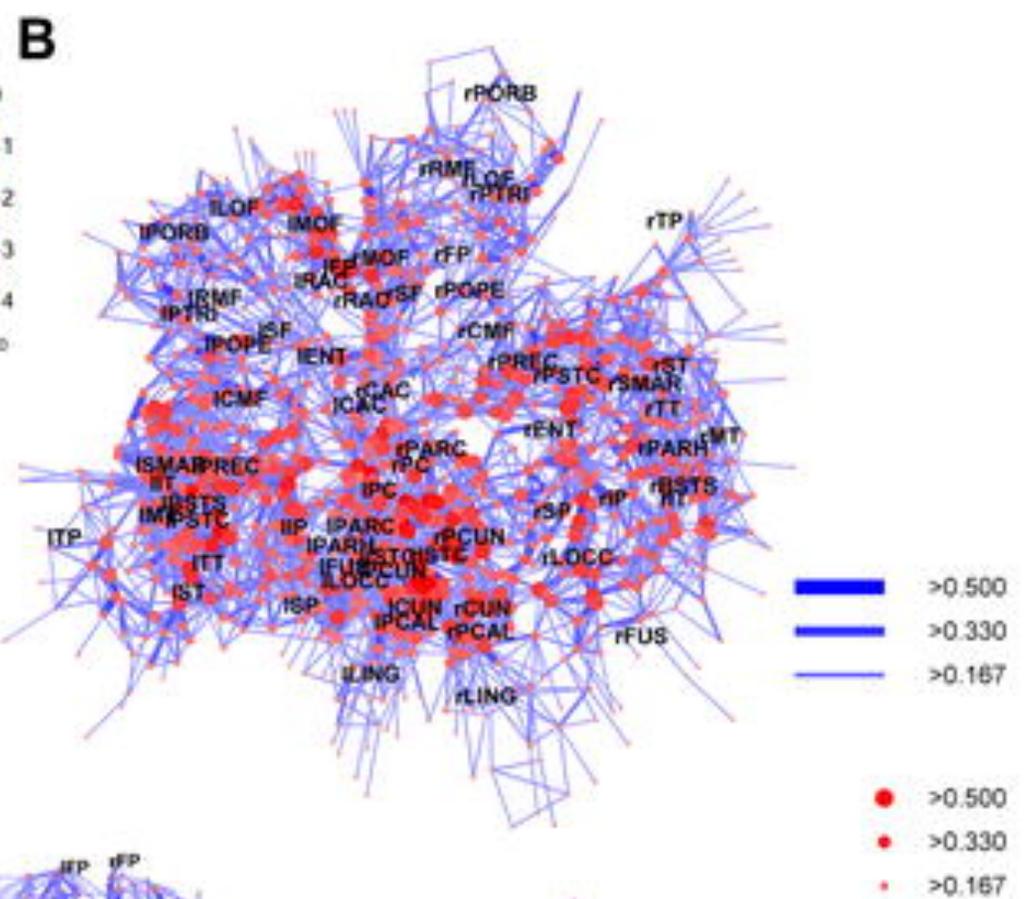
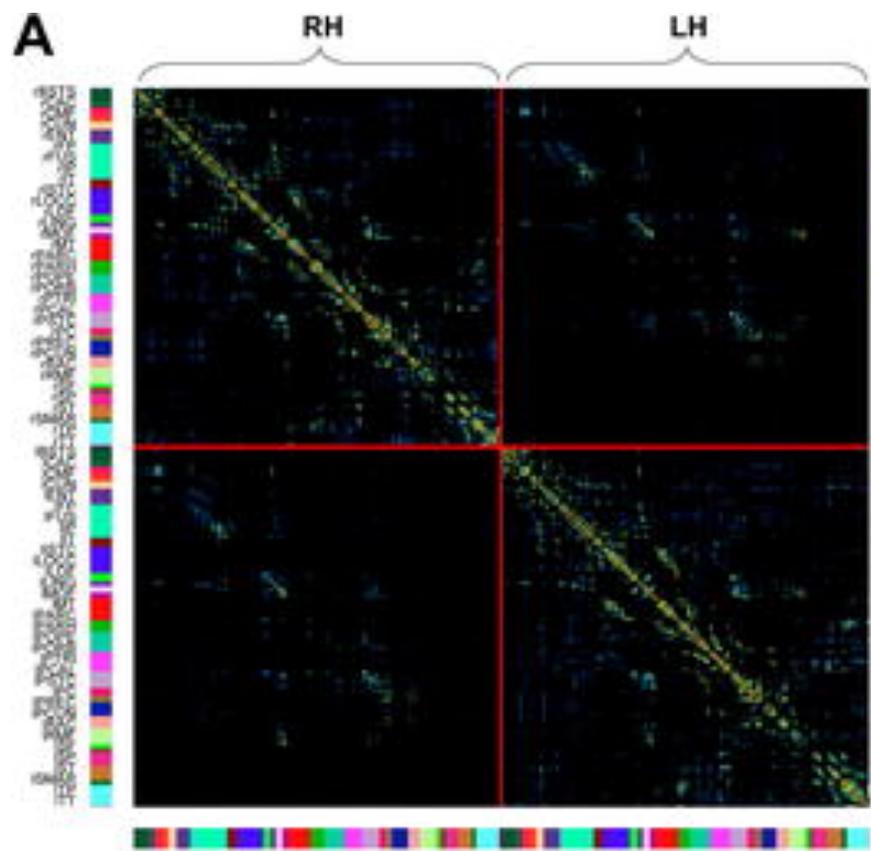
Lazar, et al. 2005.
Meditation
experience is
associated
with increased
cortical thickness.
Neuroreport, 16,
1893-1897.



A Neuron



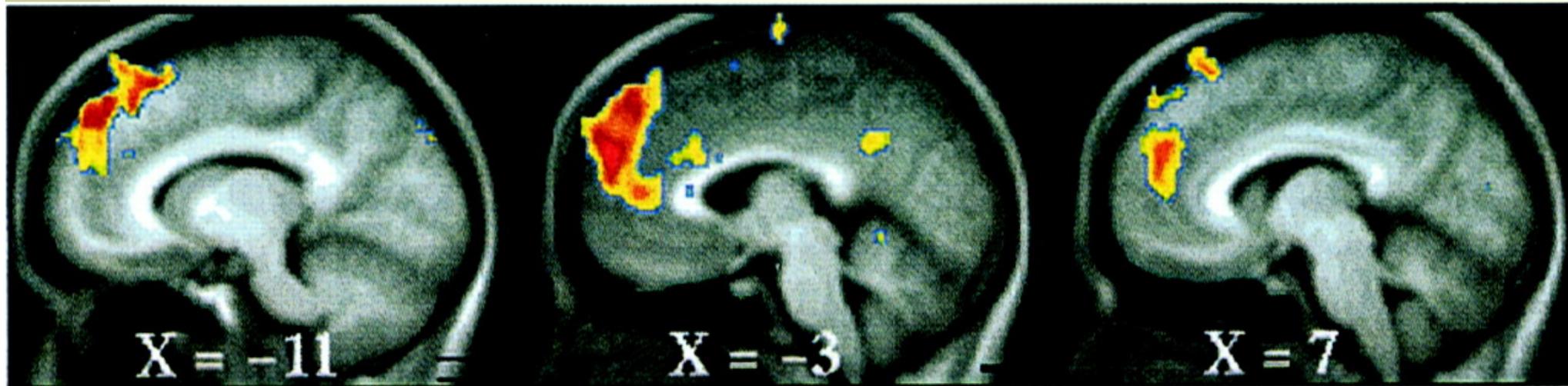
© 2000 John Wiley & Sons, Inc.





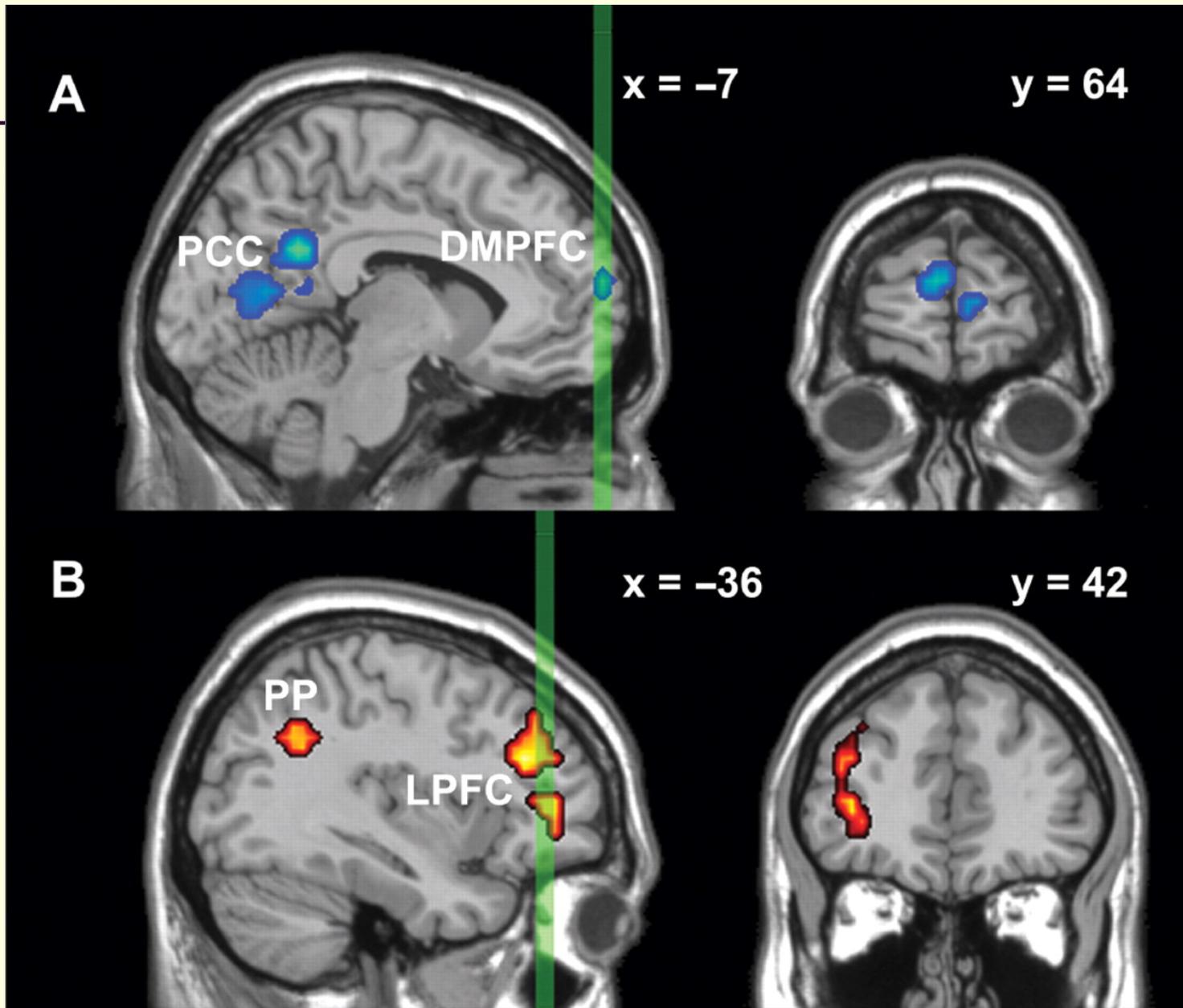
Lateral Networks of Spacious Awareness

Increased Medial PFC Activation Related to Self-Referencing Thought

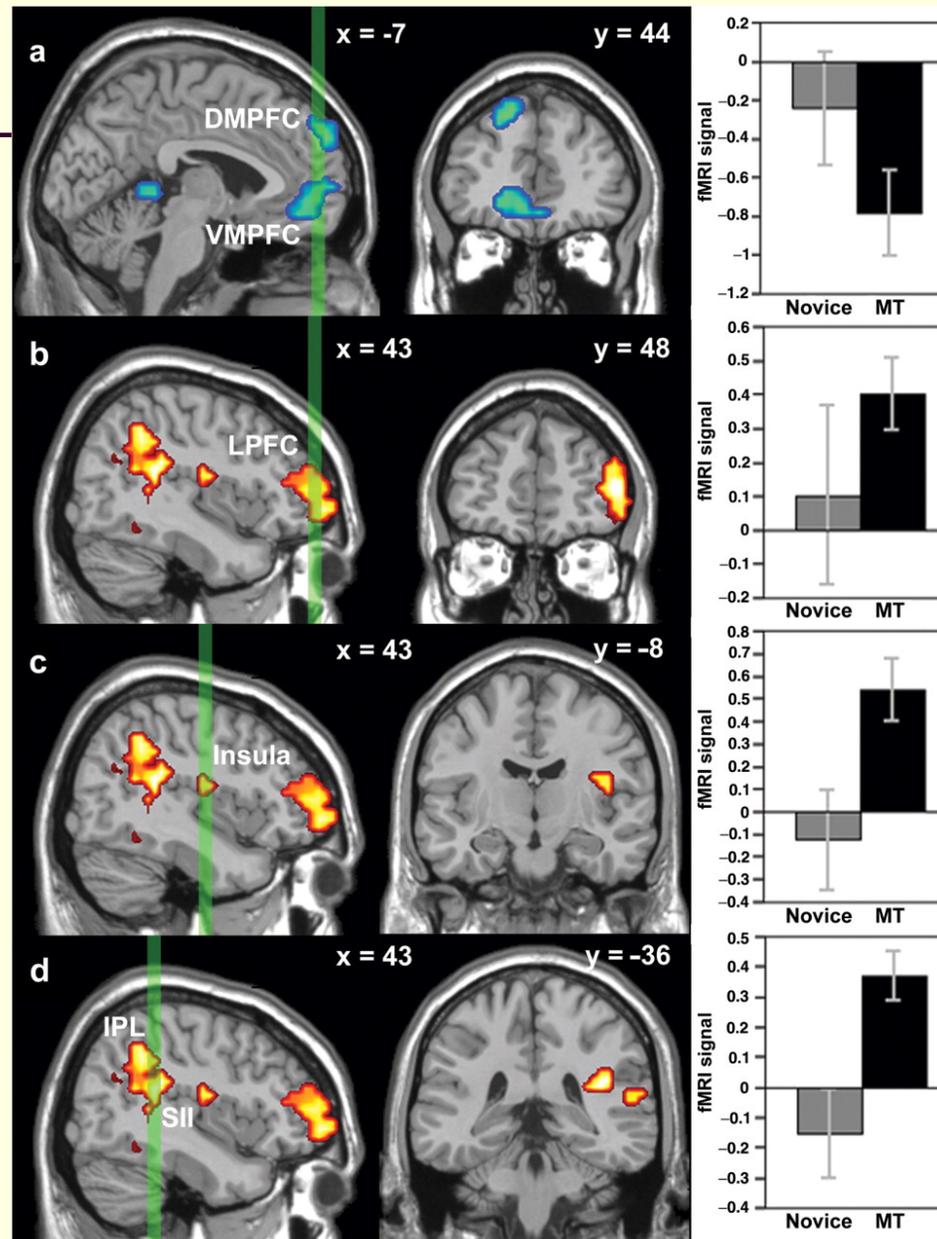


Gusnard D. A., et.al. 2001. *PNAS*, 98:4259-4264

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

- 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

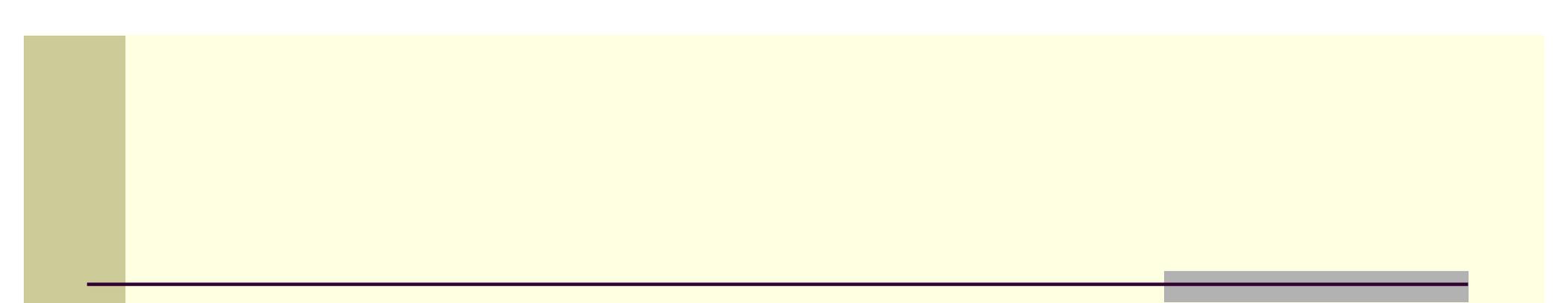
- Involves insula and middle parietal lobes, which integrate sensory maps of the body, plus right hemisphere, for holistic (gestalt) perception
- Practice
 - Sense the breath in one area (e.g., chest, upper lip)
 - Sense the breath as a whole: one gestalt, percept
 - Sense the body as a whole, a whole 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

- 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

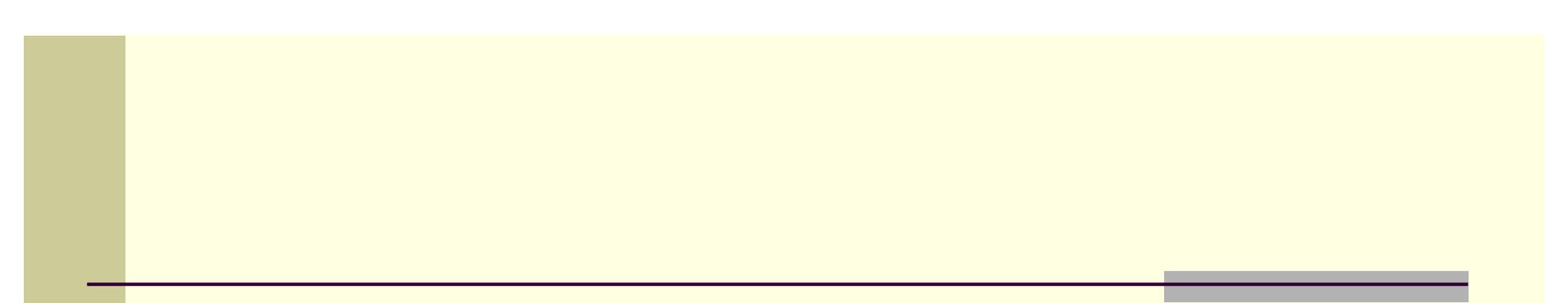
- Holding onto information
- Updating awareness
- Seeking stimulation
- Dopamine and the gate to awareness
- The basal ganglia stimostat

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

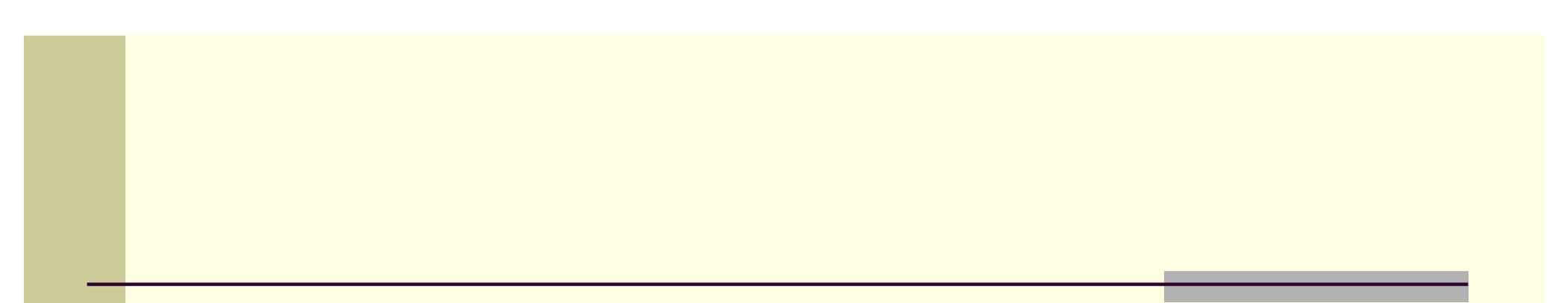
William James

Individual Differences in Attention

	Holding <u>Information</u>	Updating <u>Awareness</u>	Seeking <u>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



What is your own profile of attentional capabilities?



Resources for Concentration

General: Regenerate Intention

- Centrality of intention in psychology and contemplative practice: “*Ardent, diligent, and resolute. . .*” (the Buddha)
- Instructions from frontal lobes; executive oversight via anterior cingulate
- How to:
 - Evoke a sense of the desired state
 - Establish intentions at start of meditating
 - “Channel” a teacher/mentor/guru
 - Re-intend at short intervals

Hold the Object of Attention

- Enlist language centers for more resources
 - Count breaths, steps, etc.
 - "Soft noting"
- Set up overseer function to watch the watcher
 - Probably centered in the anterior cingulate (AC)
 - Warm up the AC with compassion
- Evoke warmth, fondness, devotion for the breath
 - Increases positive emotion and energy
 - Deepens engagement

Filter out Distractions

- Sate on stimuli: Recurring, safe to ignore.
- Use frontal lobe intentionality to set "high filtering."
- Bat away other stimuli before they take root.
- Postpone planning, worrying, thinking, getting upset, etc., to later.
- If necessary, focus on the intrusive stimulus.

Increase General Stimulation

- Enjoy “the beautiful breath.”
- Evoke feelings of sufficiency, contentment, fullness.
- Activate oxytocin, giving yourself a mental hug.
- Savor the pleasant sense of absorption itself.

Increase the Stimulation of the Object of Attention

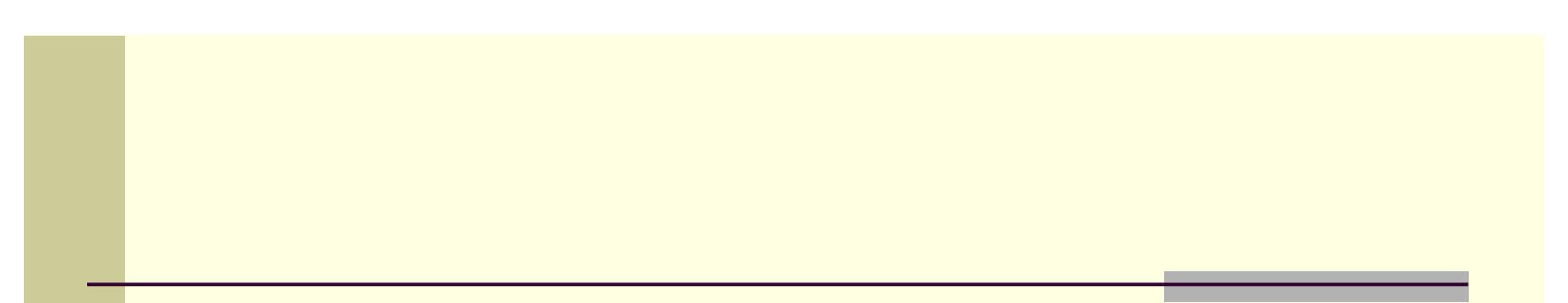
- Re-orient to each breath as a fresh stimulus
 - Beginner's mind, "don't-know mind"
- Intensify contact (= more stim): details, subtleties
- Attend to breath as a whole
- Move attention among its parts
- Walking meditation

Be Satisfied with Less

- 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

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

Steadied Internally

A stable

stability of attention . . .

Quiet

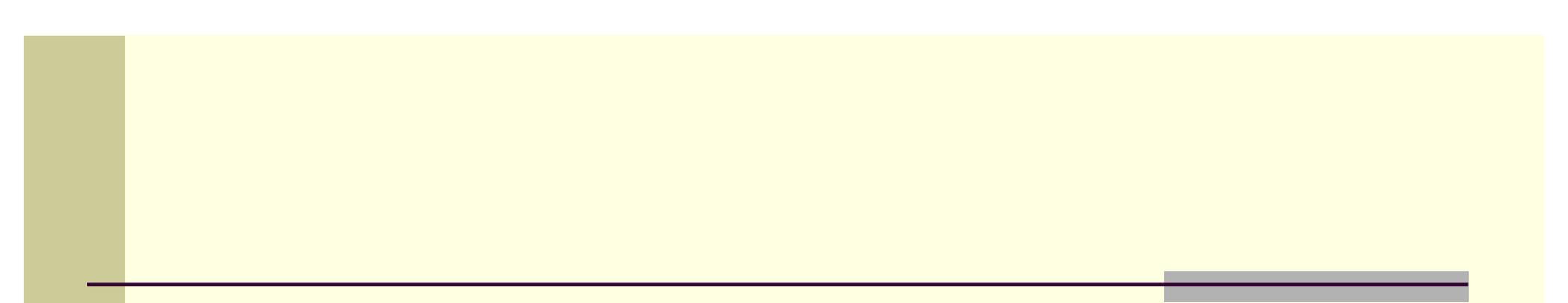
- Little verbal activity
- Minimal sensorimotor stimuli
- Little goal-directedness
- A still pond with few waves

Singleness of Mind

- Great collectedness: integrated, inclusive awareness: all one percept
- Largely absorbed in the object of attention; withdrawn from most everything else
- Only wispy, peripheral thoughts
- Growing equanimity: impartiality toward experience
- Little sense of self: breathing without a breather

Concentrated

- 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



The Jhana Factors

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

Rapture

- 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.

Joy

■ 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.

Cultivating Singleness

■ 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

Know the mind.

Shape the mind.

Free the mind.

Great Books

See www.RickHanson.net for other great books.

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Key Papers - 1

See www.RickHanson.net for other scientific papers.

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Key Papers - 4

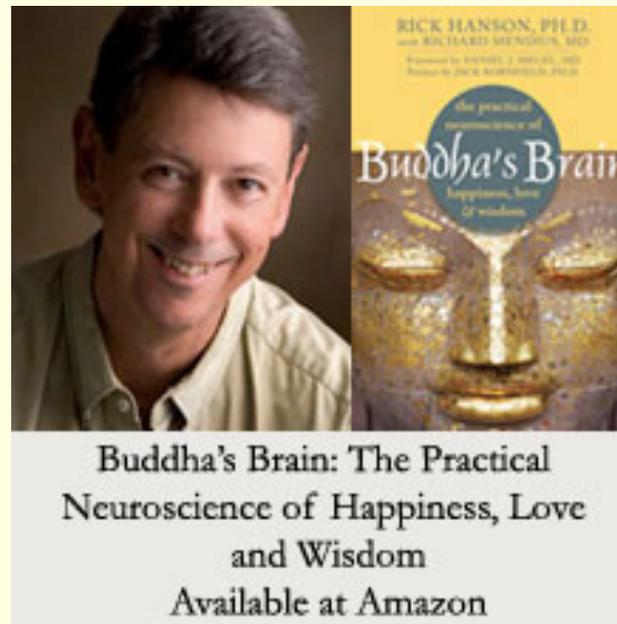
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Where to Find Rick Hanson Online



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