
*Indeed, the sage who's fully quenched
Rests at ease in every way;
No sense desire adheres to him or her
Whose fires have cooled, deprived of fuel.*

*All attachments have been severed,
The heart's been led away from pain;
Tranquil, he or she rests with utmost ease.
The mind has found its way to peace.*

The Buddha

Deepening Equanimity: The Neuropsychology of Inner Peace

Openground, Australia

May, 2011

Rick Hanson, Ph.D.

The Wellspring Institute for Neuroscience and Contemplative Wisdom

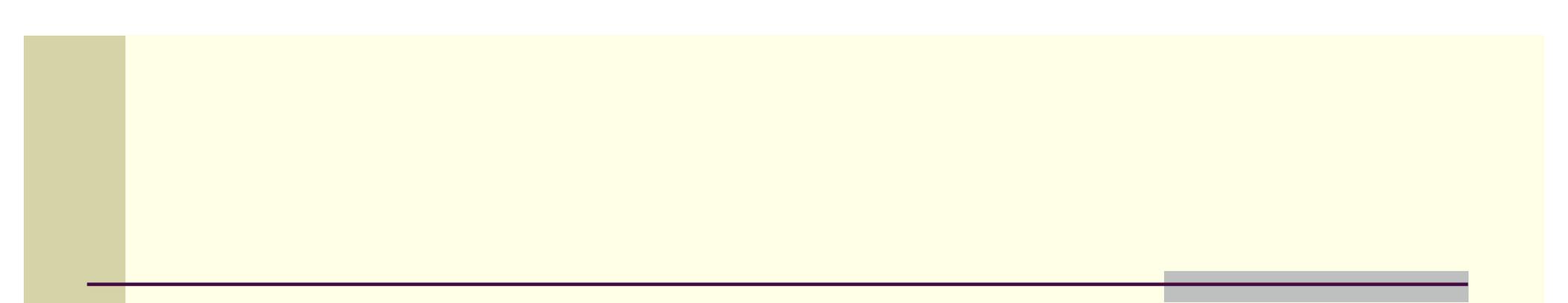
www.WiseBrain.org

www.RickHanson.net

drh@comcast.net

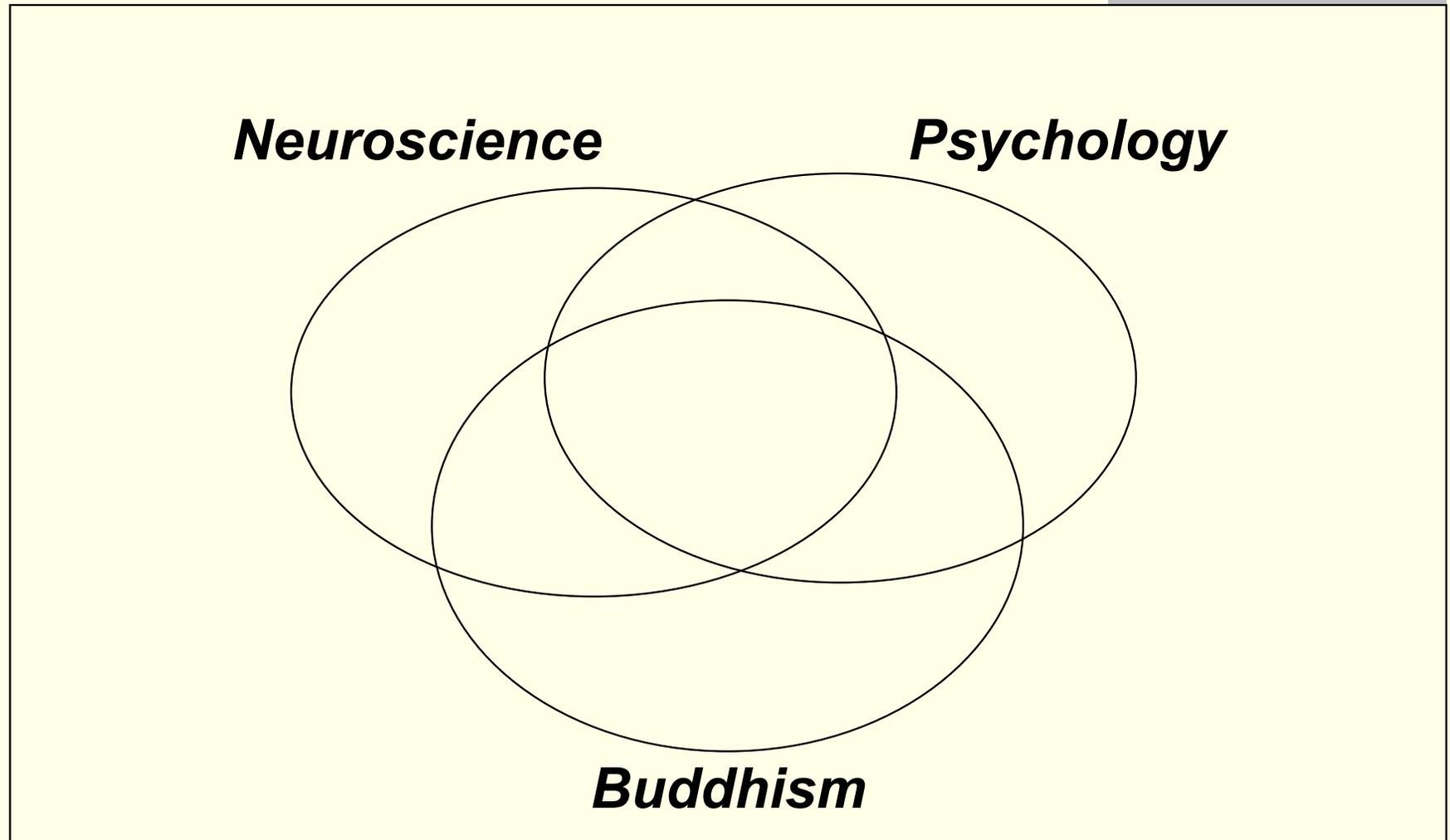
Topics

- **Self-directed neuroplasticity**
- **What is equanimity?**
- **Steadiness of mind**
- **Insight into the evolution of suffering**
- **Cooling the fires**
- **Healing old pain**



Perspectives

Common - and Fertile - Ground



*The history of science is rich in the example
of the fruitfulness of bringing
two sets of techniques, two sets of ideas,
developed in separate contexts
for the pursuit of new truth,
into touch with one another.*

J. Robert Oppenheimer

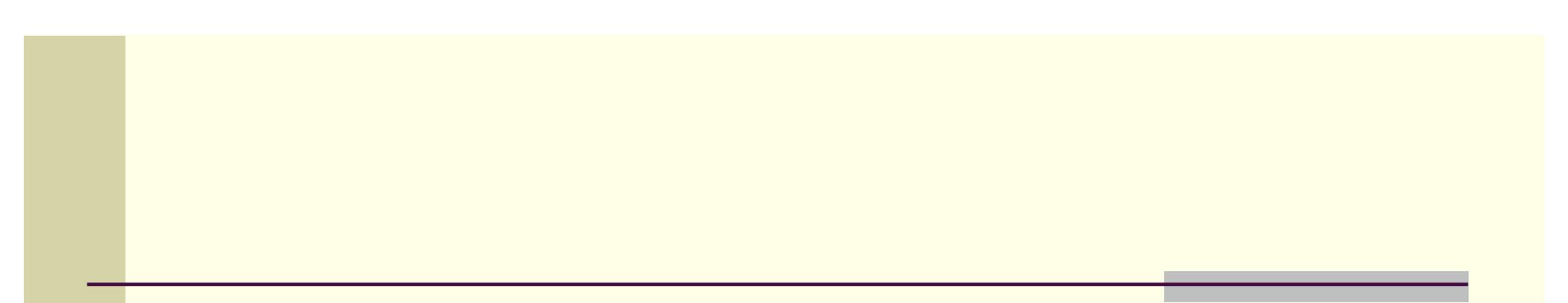
*When the facts change,
I change my mind, sir.*

What do you do?

John Maynard Keynes

Domains of Intervention

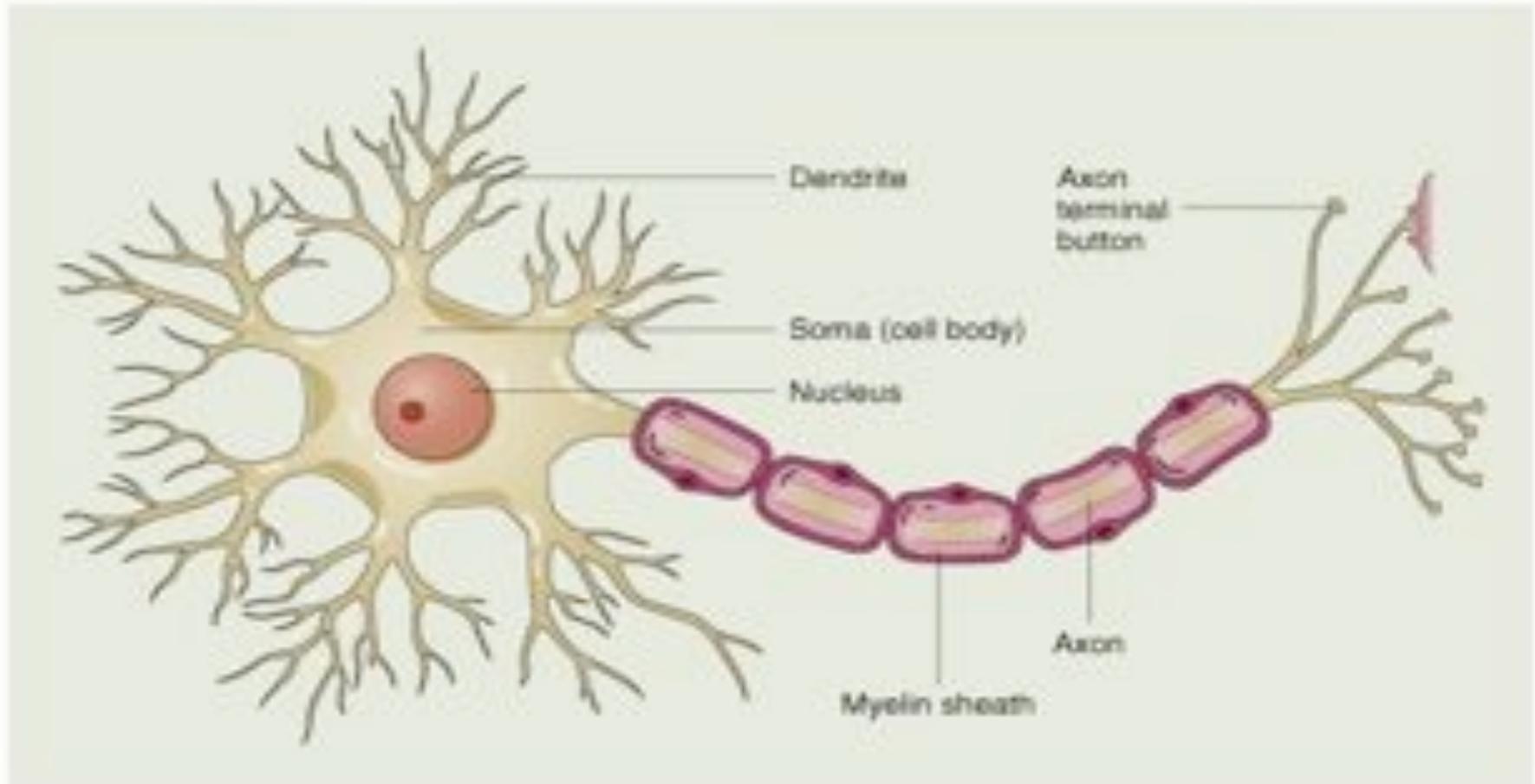
- We can intervene in three domains:
 - World (including relationships)
 - Body
 - Mind
- All three are important. And they work together.
- We have limited influence over world and body.
- In the mind:
 - Much more influence
 - Changes are with us wherever we go



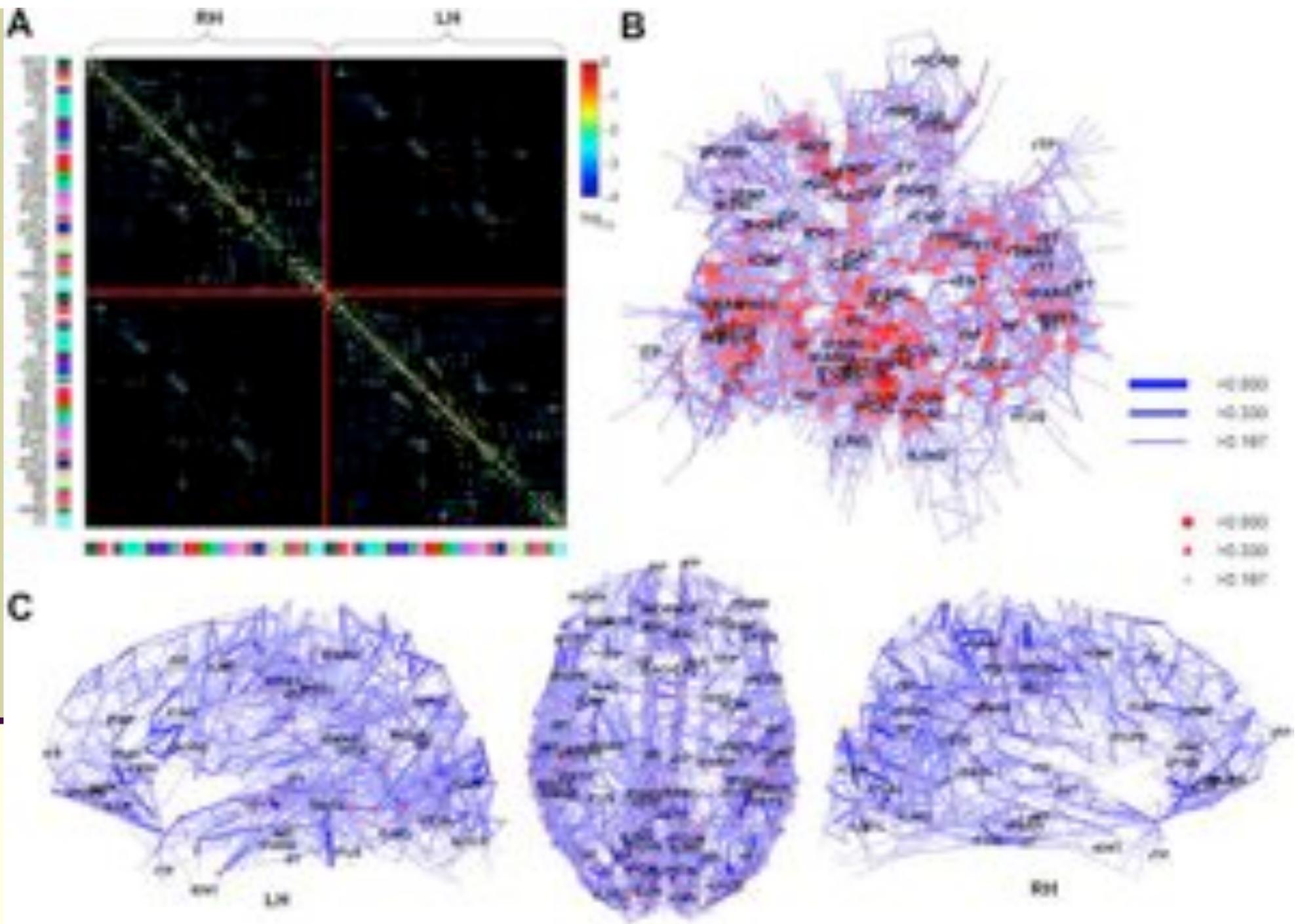
Self-Directed Neuroplasticity



A Neuron



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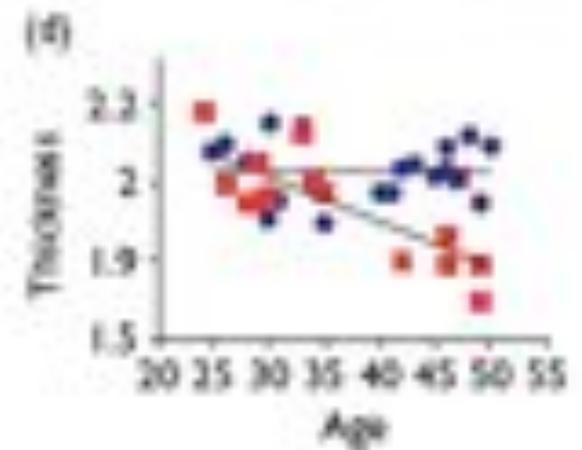
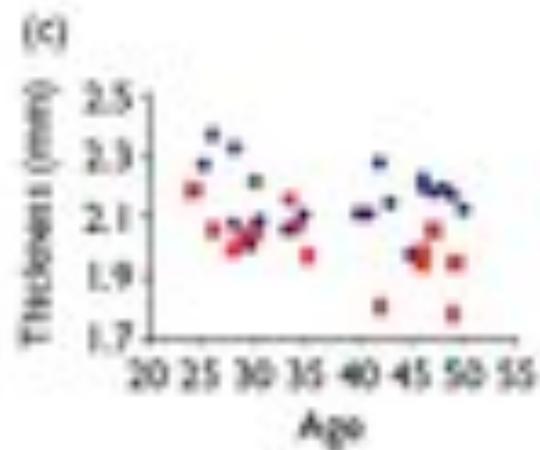
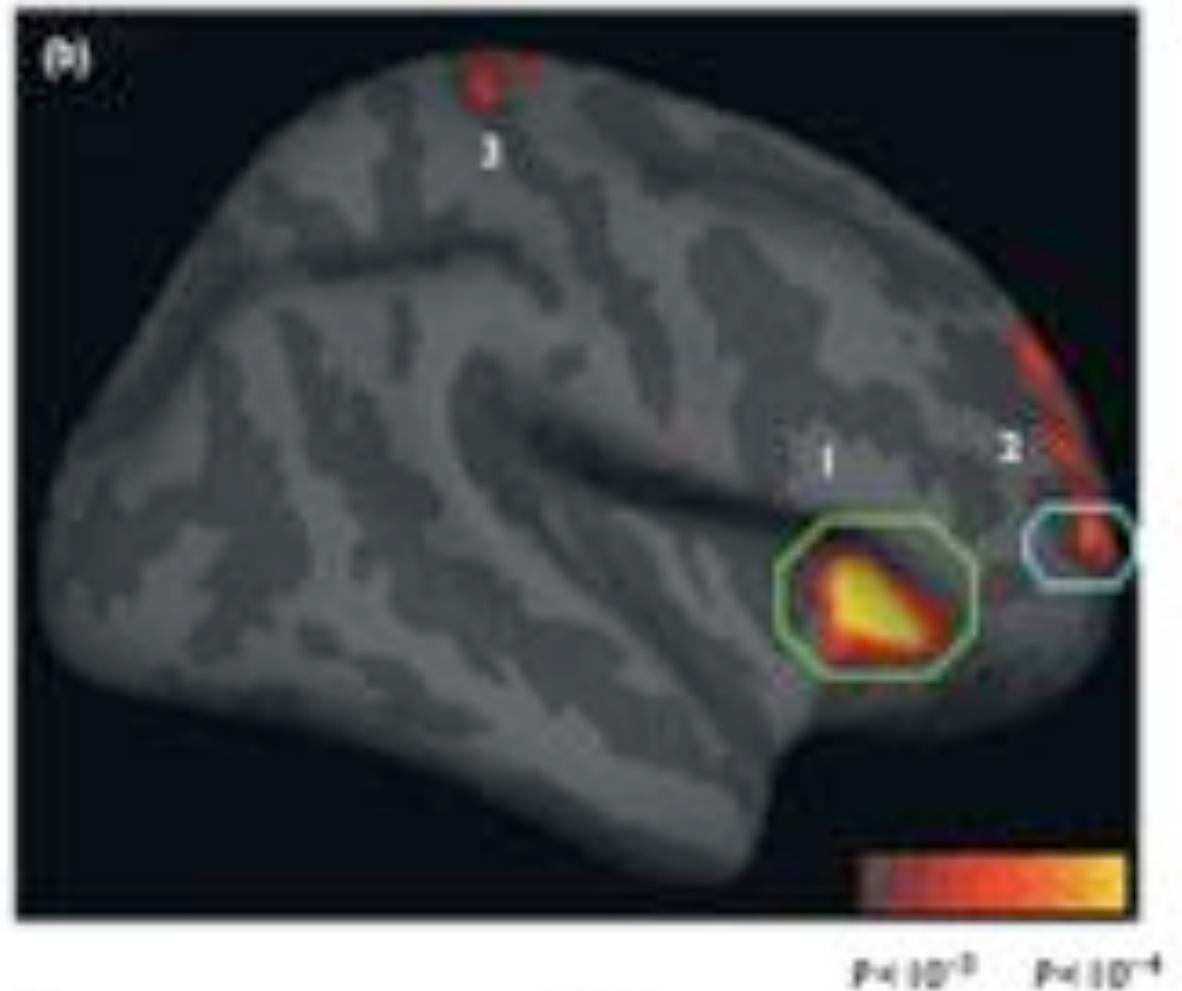
The Mind/Brain System

- “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, other bodily systems, nature, and culture.
 - As we’ll see, the brain also depends on the mind.
- Therefore, the brain and mind are two aspects of one system, interdependently arising.

Three Facts about Brain and Mind

- As the brain changes, the mind changes.
- As the mind changes, the brain changes.
 - Transient: brainwaves, local activation
 - Lasting: epigenetics, neural pruning, “neurons that fire together, wire together”
- One can use the mind to change the brain to change the mind for the better: self-directed neuroplasticity.

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



Honoring Experience

One's experience *matters*.

Both for how it feels in the moment and for the lasting residues it leaves behind, woven into the fabric of a person's brain and being.

“Anthem”

*Ring the bells that still can ring
Forget your perfect offering
There is a crack in everything
That's how the light gets in
That's how the light gets in*

Leonard Cohen

The Power of Mindfulness

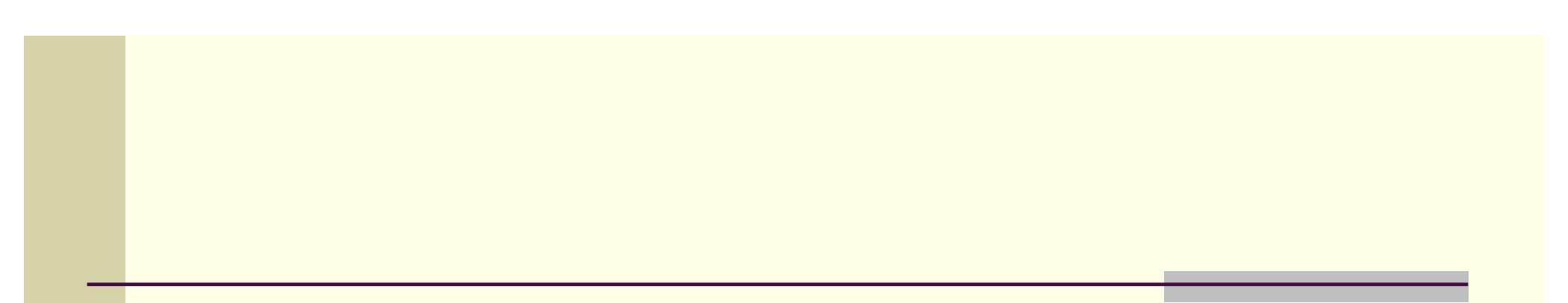
- Attention is like a spotlight, illuminating what it rests upon.
- Because neuroplasticity is heightened for what's in the field of focused awareness, attention is also like a vacuum cleaner, sucking its contents into the brain.
- Directing attention skillfully is therefore a fundamental way to shape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

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

William James

Being with, Releasing, Replacing

- There are three phases of psychological healing and personal growth (and spiritual practice):
 - Be mindful of, release, replace.
 - Let be, let go, let in.
- Mindfulness is key to the second and third phase, sometimes curative on its own, and always beneficial in strengthening its neural substrates. But often it is not enough by itself.
- And sometimes you need to skip to the third phase to build resources for mindfulness.



What Is Equanimity?

Balanced, Steady, Present

- **Balance** - not reacting to fleeting experiences
- **Steadiness** - sustained through all circumstances
- **Presence** - engaged with the world but not troubled by it; guided by values and virtues, not reactions

The ancient circuitry of the brain continually triggers reactions. Equanimity is the circuit breaker that prevents the craving that leads to suffering.

Equanimity is a perfect, unshakeable balance of mind.

Nyanaponika Thera

With equanimity, you can deal with situations with calm and reason while keeping your inner happiness.

The Dalai Lama

Eight Worldly Winds

- Pleasure and pain
- Praise and blame
- Gain and loss
- Fame and ill repute

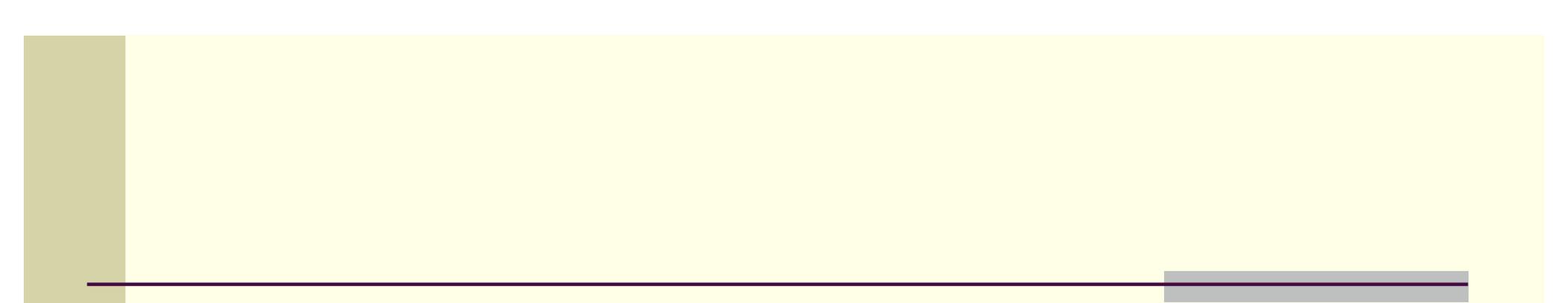
*Whose mind is like rock, steady, unmoved,
dispassionate for things that spark passion,
unangered by things that spark anger:*

*When one's mind is developed like this,
from where can there come suffering & stress?*

The Buddha, Udāna 4.34

Equanimity in the Brain

- **Steadiness of mind** - Sustained by oversight from the anterior cingulate cortex (ACC); over time, probably becomes a whole-brain stability of attention
- **Understanding and Intention** - Conceptual in prefrontal cortex; embodied in prefrontal cortex (action tendencies), parietal cortex (perspective), limbic system (emotion), and brainstem (arousal)
- **Global coherence** - So as not to be caught by anything, experience presents itself as a coherent whole, probably enabled by large-scale gamma wave synchronization.
- **Calm and contentment** - Much parasympathetic activation, inhibiting fight-flight stress reactions; underlying well-being in the core motivational systems (Avoid, Approach, Attach)



Steadiness of Mind

Basics of Meditation

- Relax, in a posture that is comfortable and alert.
- Have simple good will toward yourself.
- Be aware of your body.
- Focus on something to steady your attention.
- Accept whatever passes through awareness.
- Gently settle into peaceful well-being.

Foundations of Meditation

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

Neural Basis of Meditation Foundations

- **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

Promoting Steadiness of Mind

- Daily meditation
- Concentration practices
- Attention to the neutral
- Disenchantment with the show in the mind

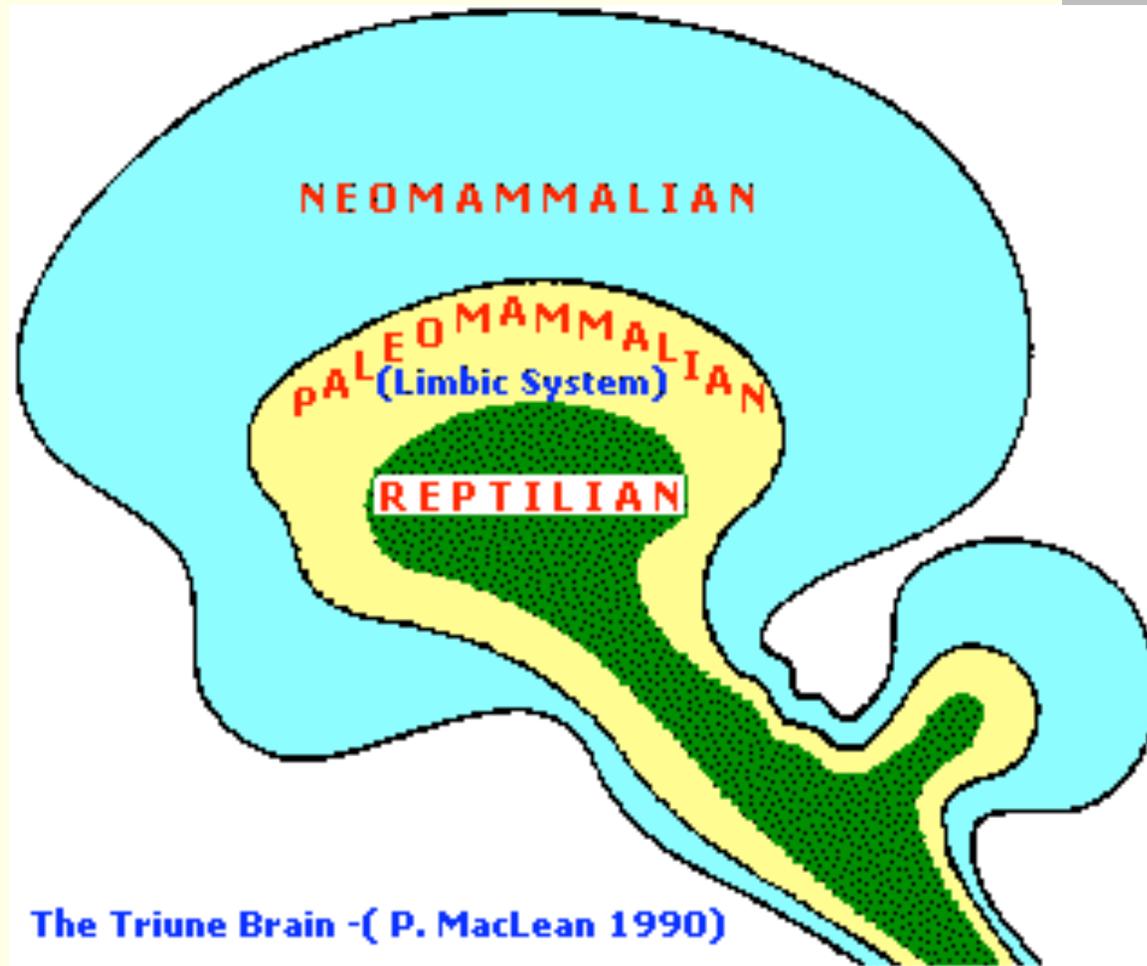


Insight into the Evolution of Suffering

Evolution

- ~ 4+ billion years of earth
- 3.5 billion years of life
- 650 million years of multi-celled organisms
- 600 million years of nervous system
- ~ 200 million years of mammals
- ~ 60 million years of primates
- ~ 6 million years ago: last common ancestor with chimpanzees, our closest relative among the “great apes” (gorillas, orangutans, chimpanzees, bonobos, humans)
- 2.5 million years of tool-making (starting with brains 1/3 our size)
- ~ 150,000 years of *homo sapiens*
- ~ 50,000 years of modern humans
- ~ 5000 years of blue, green, hazel eyes

Evolutionary History



The Triune Brain

Three Stages of Brain Evolution

■ Reptilian:

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

■ Mammalian:

- Limbic system, cingulate, early cortex
- Memory, emotion, social behavior
- **Approach** rewards

■ Human:

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

Reverse Engineering the Brain

What is the nature of the brain when a person is:

- **Experiencing inner peace?**
- **Self-actualizing?**
- **Enlightened (or close to it)?**

Home Base of the Human Brain

When not threatened, ill, in pain, hungry, upset, or chemically disturbed, most people settle into being:

- **Calm** (the Avoid system)
- **Contented** (the Approach system)
- **Caring** (the Attach system)
- **Creative** - synergy of all three systems

This is the brain in its *responsive* mode.

Responsive Mode



Behind the Obscurations

Sam sees “peeping among the cloud-wrack . . . a white star
twinkle for a while.

*The beauty of it smote his heart, as he looked up out of the
forsaken land, and hope returned to him.*

*For like a shaft, clear and cold, the thought pierced him that
in the end the Shadow was only a small and passing thing:
there was light and high beauty forever beyond its reach.”*

Tolkein, *The Lord of the Rings*

Some Benefits of Responsive Mode

- Recovery from “mobilizations” for survival:
 - Refueling after depleting outpourings
 - Restoring equilibrium to perturbed systems
 - Reinterpreting negative events in a positive frame
 - Reconciling after separations and conflicts
- Promotes prosocial behaviors:
 - Experiencing safety decreases aggression.
 - Experiencing sufficiency decreases envy.
 - Experiencing connection decreases jealousy.
 - We’re more generous when our own cup runneth over.

But To Cope with Urgent Needs, We Leave Home . . .

With activations of the three systems:

- **Avoid:** When we are threatened or harmed
- **Approach:** When we can't attain important goals
- **Attach:** When we feel isolated, disconnected, unseen, unappreciated, unloved

This is the brain in its *reactive* mode of functioning
- a kind of inner homelessness.

Unavoidable Disturbances

- Animals survive through three fundamental strategies. When these run into trouble, unpleasant alarm signals pulse through the nervous system.
- But trouble comes constantly: each strategy contains inherent contradictions, as the animal keeps trying:
 - To ***separate what is actually connected*** – in order to create a boundary between itself and the world
 - To ***stabilize what keeps changing*** – in order to maintain its internal systems within tight ranges
 - To ***hold onto fleeting pleasures and escape inevitable pains*** – in order to approach opportunities and avoid threats

The First and Second Dart

- The Buddha referred to unavoidable discomfort - including disease, old age, death, and sorrow at harms befalling others - as the “first dart.”
- Then we add our reactions to that first dart. For example, one could react to a physical pain with anxiety, then anger at oneself for feeling anxious, then sadness linked to not being comforted as a child.
- Sometimes we react with suffering when there is no first dart at all, simply a condition that there is no need to get upset about.
- And sometimes we react with suffering to positive events, such as a compliment or an opportunity.
- The Buddha called these reactions “second darts” - the ones we throw ourselves.

The Chain of Suffering

- Contact: An external or internal stimulus
- Feeling: The “hedonic tone” of pleasant, unpleasant, or neutral; likes and dislikes
- Craving: Wanting what you like to continue and what you dislike to end; *tanha* - thirst - in Pali
- Clinging: The elaboration of craving
- Suffering: Discomfort related to wanting (e.g., tension, anxiety, pressure, frustration, disappointment, longing, sadness, remorse, anger)

The Reactive Triangle



The urgency of survival needs have made the *reactive* mode very powerful in the rapidity, intensity, and inflexibility of its activations.

A Major Result of the Negativity Bias: Threat Reactivity

- Two mistakes:
 - Thinking there is a tiger in the bushes when there isn't one.
 - Thinking there is no tiger in the bushes when there is one.
- We evolved to make the first mistake a hundred times to avoid making the second mistake even once.
- This evolutionary tendency is intensified by temperament, personal history, culture, and politics.
- Threat reactivity affects individuals, couples, families, organizations, nations, and the world as a whole.

Results of Threat Reactivity (Personal, Organizational, National)

- Our initial appraisals are mistaken:
 - Overestimating threats
 - Underestimating opportunities
 - Underestimating inner and outer resources
- We update these appraisals with information that confirms them; we ignore, devalue, or alter information that doesn't.
- Thus we end up with views of ourselves, others, and the world that are ignorant, selective, and distorted. 47

Costs of Threat Reactivity

(Personal, Organizational, National)

- Feeling threatened feels bad, and triggers stress consequences.
- We over-invest in threat protection.
- The boy who cried tiger: flooding with paper tigers makes it harder to see the real ones.
- Acting while feeling threatened leads to over-reactions, makes others feel threatened, and creates vicious cycles.
- The Approach system is inhibited, so we don't pursue opportunities, play small, or give up too soon.
- In the Attach system, we bond tighter to "us," with more fear and anger toward "them."

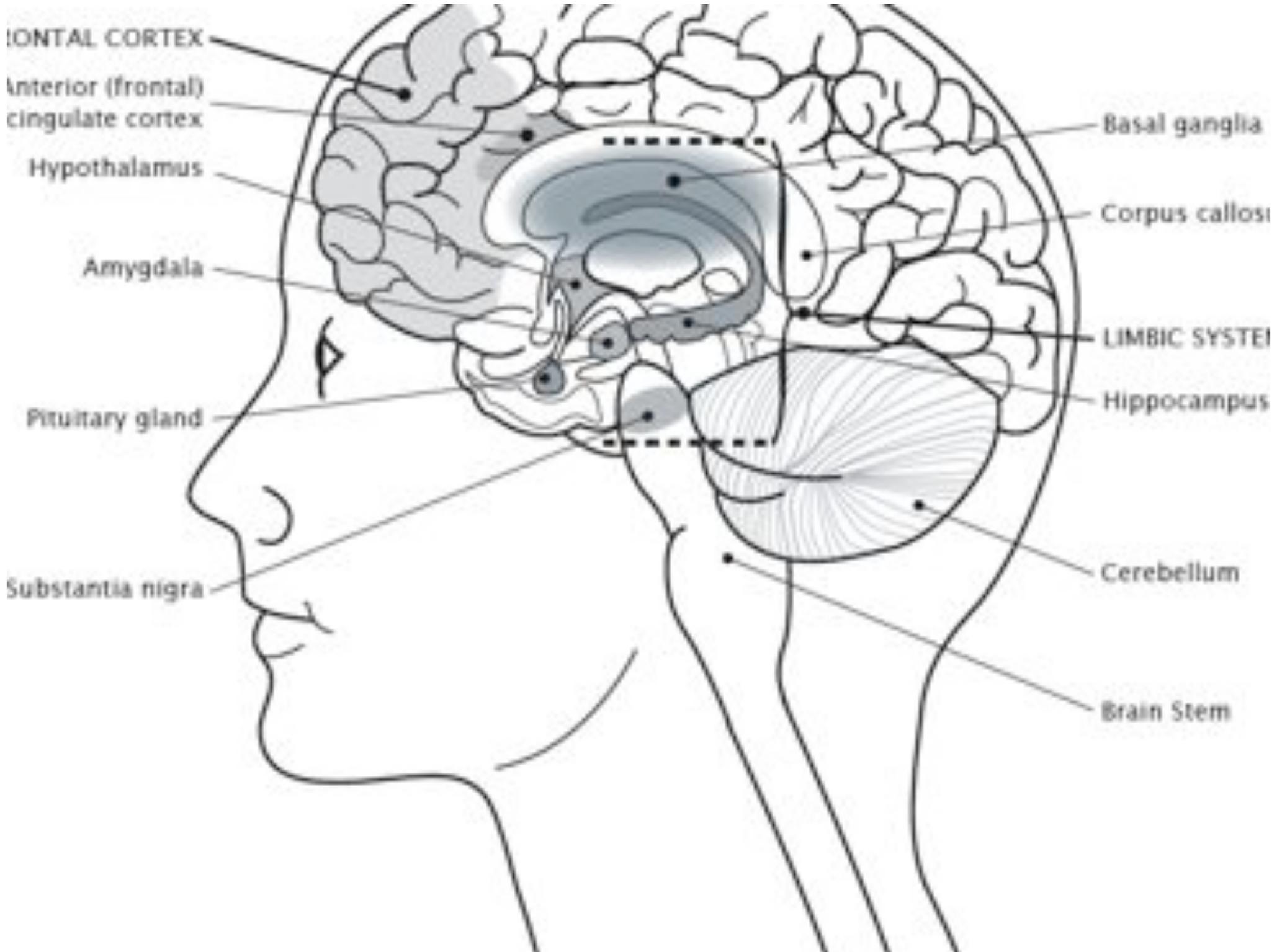
Negative Experiences Can Have Benefits

- There's a place for negative emotions:
 - Anxiety alerts us to inner and outer threats
 - Sorrow opens the heart
 - Remorse helps us steer a virtuous course
 - Anger highlights mistreatment; energizes to handle it
- Negative experiences can:
 - Increase tolerance for stress, emotional pain
 - Build grit, resilience, confidence
 - Increase compassion and tolerance for others

But is there really any shortage of negative experiences?

One Neural Consequence of Negative Experiences

- Amygdala (“alarm bell”) initiates stress response
- Hippocampus:
 - Forms and retrieves contextual memories
 - Inhibits the amygdala
 - Inhibits cortisol production
- Cortisol:
 - Stimulates and sensitizes the amygdala
 - Inhibits and can shrink the hippocampus
- Consequently, chronic negative experiences:
 - Sensitize the amygdala alarm bell
 - Weaken the hippocampus: this reduces memory capacities and the inhibition of amygdala and cortisol production.
 - Thus creating vicious cycles in the NS, behavior, and mind



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Reactive Dysfunctions in Each System

- **Approach** - Addiction; over-drinking, -eating, -gambling; compulsion; hoarding; driving for goals at great cost; spiritual materialism
- **Avoid** - Anxiety disorders; PTSD; panic, terror; rage; violence
- **Affiliate** - Borderline, narcissistic, antisocial PD; symbiosis; *folie a deux*; “looking for love in all the wrong places”

Choices . . .



Reactive Mode

Or?



Responsive Mode

Disenchantment

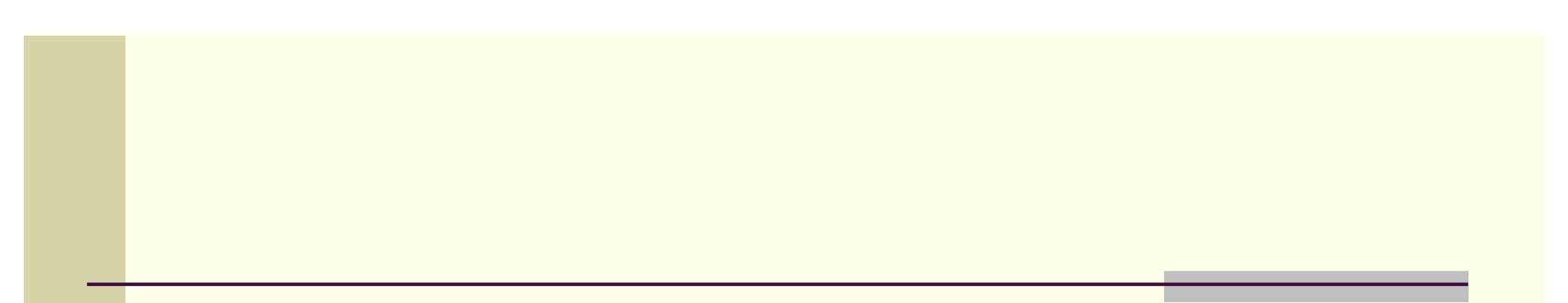
- The brain routinely simulates possible events and the experiences you could have if they occur. This was a major evolutionary accomplishment that promoted planning and learning.
- But this also makes you suffer: it “enchants” you with exaggerated anticipated pleasures and pains, and makes you invest in strategies to deal with these.
- Instead, recognize the truth of your experience: pleasures are usually not that great and pains are usually not that bad. Intend to wake up from the spell.

“Taking the Fruit as the Path”

Gladness

Love

Peace



Global Coherence

Dual Modes

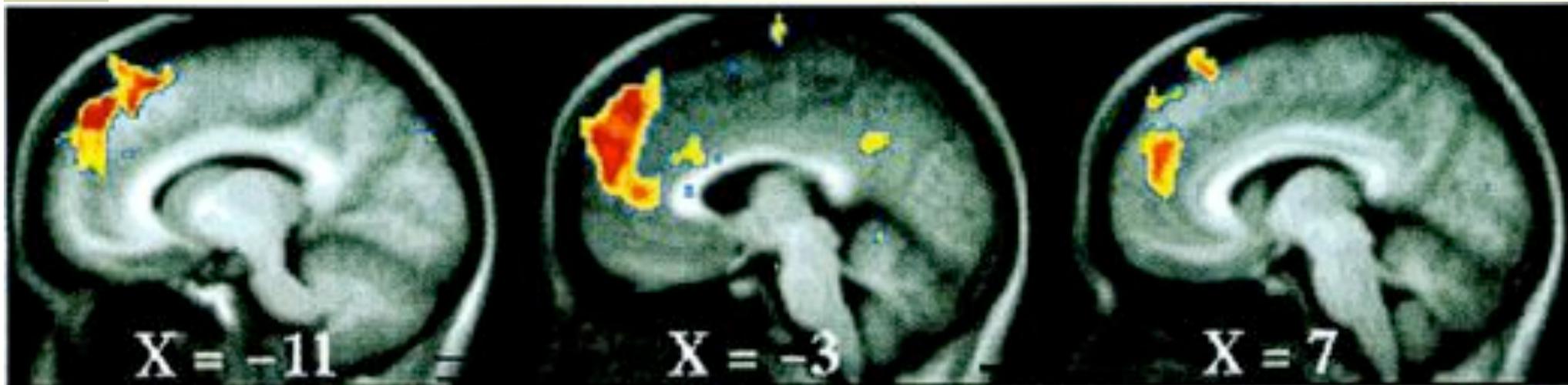
“Doing”

Mainly representational
Much verbal activity
Abstract
Future- or past-focused
Goal-directed
Sense of craving
Personal, self-oriented perspective
Focal view
Firm beliefs
Evaluative
Lost in thought, mind wandering
Reverberation and recursion
Tightly connected experiences
Prominent self-as-object
Prominent self-as-subject

“Being”

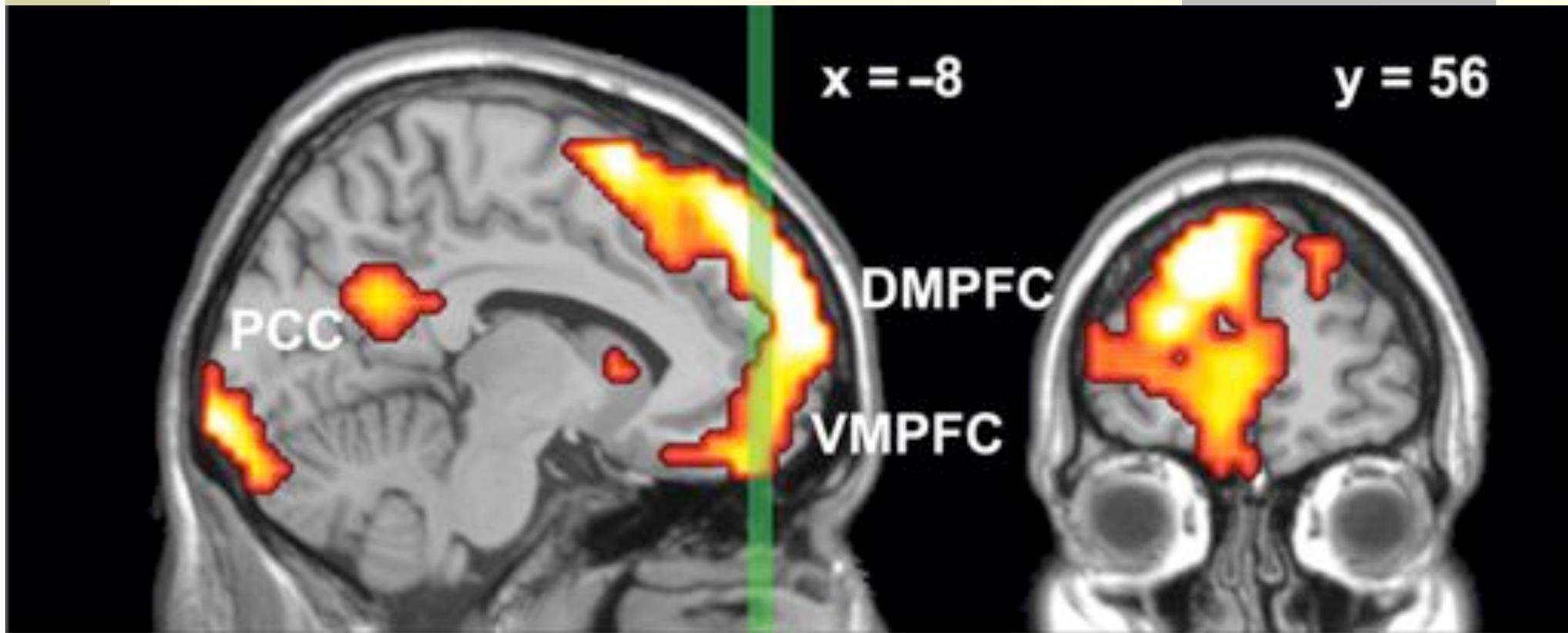
Mainly sensory
Little verbal activity
Concrete
Now-focused
Nothing to do, nowhere to go
Sense of peace
Impersonal, 3rd person perspective
Panoramic view
Uncertainty, not-knowing
Nonjudgmental
Mindful presence
Immediate and transient;
Loosely connected experiences
Minimal or no self-as-object
Minimal or no self-as-subject

Increased Medial PFC Activation Related to Self-Referencing Thought



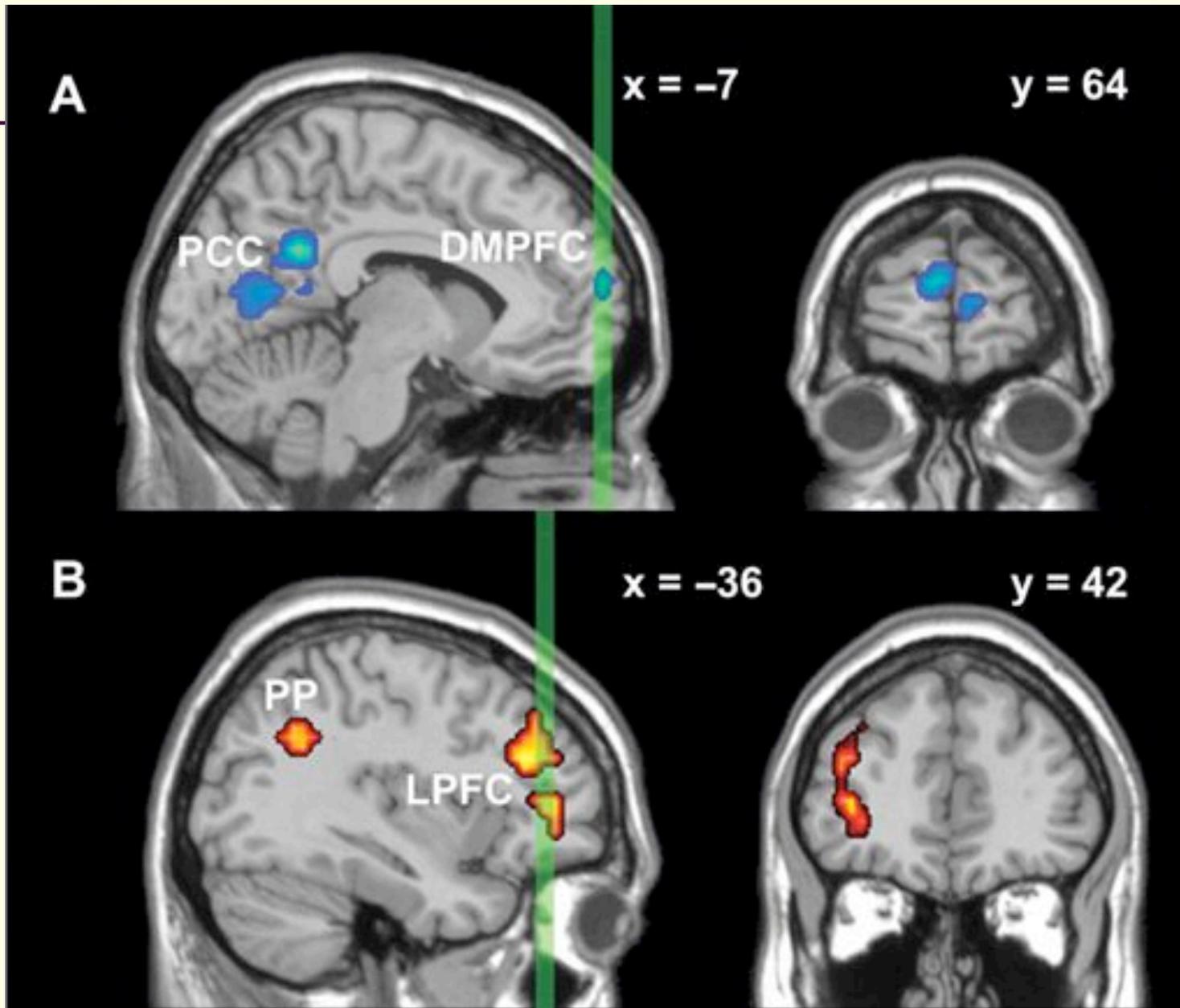
Gusnard D. A., et.al. 2001. *PNAS*, 98:4259-4264

Cortical Midline Areas for Self-Referencing Thought



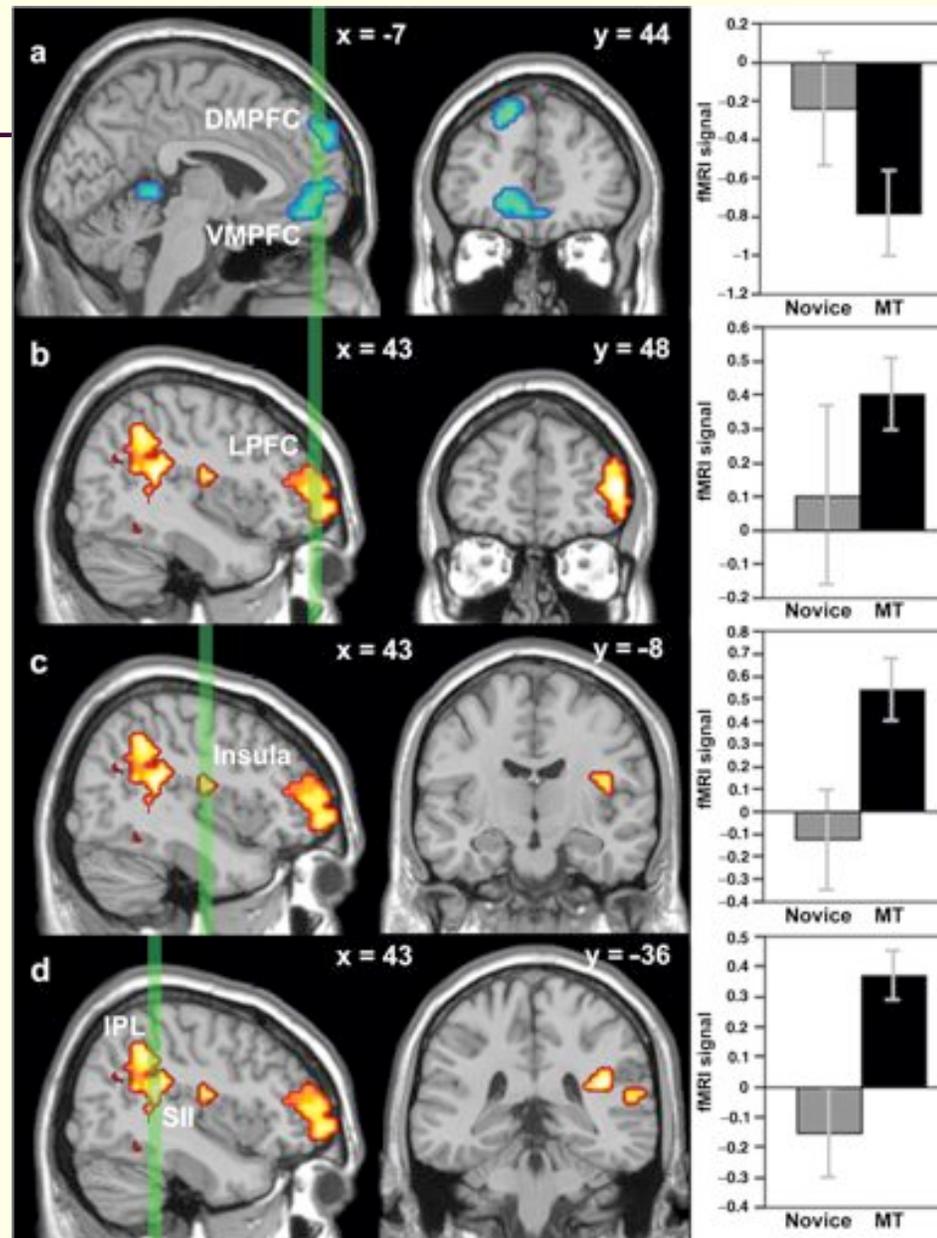
Farb, et al. 2007. *Social Cognitive Affective Neuroscience*, 2:313-322

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



Farb, et al. 2007. *Social Cognitive Affective Neuroscience*, 2:313-322

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



Dual Modes

“Doing”

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Much verbal activity
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“Bahiya, you should train yourself thus.”

In reference to the seen, there will be only the seen. To the heard, only the heard. To the sensed, only the sensed. To the cognized, only the cognized.

When for you there will be only the seen in reference to the seen, only the heard in the heard, only the sensed in the sensed, only the cognized in the cognized, then, Bahiya, there's no you in that.

When there's no you in that, there's no you there. When there's no you there, you are neither here nor yonder nor between the two.

This, just this, is the end of all suffering.

Ways to Activate “Being” Mode

- 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

- 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
- It's natural for this sense of the whole to be present for a second or two, then crumble; just open up to it again and 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.

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



Cooling the Fires

Mindfulness of Threats and Fear

- Mindfulness of the negativity bias itself:
 - Primes recognition of threat reactivity in general
 - Fuels correcting of cognitive errors
- Mindfulness alerts us to specific assumptions or exaggerations of threat.
- Through mindfulness, we disidentify from threat appraisals and the reactive cascade.
- Mindfulness draws us into a centered place that feels relatively strong and safe.

Parasympathetic Activation

- Parasympathetic inhibits sympathetic and hormonal arousal.
- Attitude: Regard stressful activation as an affliction.
- Methods for stimulating the parasympathetic nervous system:
 - Multiple, long exhalations
 - Relaxing the tongue
 - Pleasant tastes
 - Relaxing the body
- Get in the habit of rapidly activating a damping cascade when the body gets aroused.
- Regard bodily activation as just another compounded, “meaningless,” and impermanent phenomenon; don’t react to it.

Feeling Cared About

- As we evolved, we increasingly turned to and relied on others to feel safer and less threatened.
 - Exile from the band was a death sentence in the Serengeti.
 - Attachment behaviors: relying on the secure base
 - The well-documented power of social support to buffer stress and aid recovery from painful experiences
- Methods:
 - Recognize it's kind to others to feel cared about yourself.
 - Look for occasions to feel cared about and take them in.
 - Deliberately bring to mind the experience of being cared about in challenging situations.
 - Be caring yourself.

Feeling Stronger and Safer

- Be mindful of an experience of strength (e.g., physical challenge, standing up for someone).
- Staying grounded in strength, let things come to you without shaking your roots, like a mighty tree in a storm.
- Be mindful of:
 - Protections (e.g., being in a safe place, imagining a shield)
 - People who care about you
 - Resources inside and outside you
- Let yourself feel as safe as you reasonably can:
 - Noticing any anxiety about feeling safer
 - Feeling more relaxed, tranquil, peaceful
 - Releasing bracing, guardedness, vigilance

Benefits of Unilateral Virtue

- It simplifies things: all you have to do is just live by your own code, and others will do whatever they do.
- It feels good in its own right.
- It minimizes inflammatory triggers, evokes good treatment, empowers you to ask for it.
- It stands you on the moral high ground.

Remaining virtuous in the face of provocation is a profound expression of non-harming and benevolence.

Wisdom is . . . all about understanding the underlying spacious and empty quality of the person and of all experienced phenomena.

To attain this quality of deep insight, we must have a mind that is quiet and malleable.

Achieving such a state of mind requires that we first develop the ability to regulate our body and speech so as to cause no conflict.

Venerable Ani Tenzin Palmo

*There are those who do not realize that
one day we all must die.
But those who do realize this
settle their quarrels.*

The Buddha

Liking and Wanting

- Distinct neural systems for liking and wanting
- In the brain: feeling tone --> enjoying (liking) --> wanting --> pursuing
 - Wanting without liking is hell.
 - Liking without wanting is heaven.
- The distinction between *chandha* (wholesome wishes and aspirations) and *tanha* (craving)
- But beware: the brain usually wants (craves) and pursues (clings) to what it likes.

I make myself rich by making my wants few.

Henry David Thoreau

Practicing with Wanting

- *Chandha* crowds out *tanha*: energize wholesome wants (e.g., practice, sobriety, love, aspirations).
- 2nd Foundation of Mindfulness: Surround strongly pleasant or unpleasant feeling tones with spacious awareness - the “shock absorber” - without tipping into craving.
- Regard wants as just more mental content. Investigate them. Watch them come and go. No compulsion, no “must.”
- Be skeptical of the predicted rewards of acting on the feeling tone. They’re usually simplistic and inflated, based on the primitive subcortical regions that produce them. Disenchanted.
- Pick a key want and just don’t do it.

The Great Way is easy.

For one with no preferences.

Third Zen Patriarch

If you let go a little, you will have a little happiness.

If you let go a lot, you will have a lot of happiness.

If you let go completely, you will be completely happy.

Ajahn Chah



Healing Old Pain

How to Take in the Good

1. Look for positive **facts**, and let them become positive experiences.
2. Savor the positive experience:
 - Sustain it for 10-20-30 seconds.
 - Feel it in your body and emotions.
 - Intensify it.
3. Sense and intend that the positive experience is soaking into your brain and body - registering deeply in emotional memory.

Using Memory Mechanisms to Help Heal Painful Experiences

- The machinery of memory:
 - When explicit or implicit memory is re-activated, it is re-built from schematic elements, not retrieved *in toto*.
 - When attention moves on, elements of the memory get re-consolidated.
- The open processes of memory activation and consolidation create a window of opportunity for shaping your internal world.
- Activated memory tends to associate with other things in awareness (e.g., thoughts, sensations), esp. if they are prominent and lasting.
- When memory goes back into storage, it takes associations with it.
- You can imbue implicit and explicit memory with positive associations.

The Fourth Step of TIG

- When you are having a positive experience:
 - Sense the current positive experience sinking down into old pain, and soothing and replacing it.
- When you are having a negative experience:
 - Bring to mind a positive experience that is its antidote.
- In both cases, have the positive experience be big and strong, in the forefront of awareness, while the negative experience is small and in the background.
- You are not resisting negative experiences or getting attached to positive ones. You are being kind to yourself and cultivating positive resources in your mind.

Psychological Antidotes

Approaching Opportunities

- Satisfaction, fulfillment --> Frustration, disappointment
- Gladness, gratitude --> Sadness, discontentment, “blues”

Affiliating with “Us”

- Attunement, inclusion --> Not seen, rejected, left out
- Recognition, acknowledgement --> Inadequacy, shame
- Friendship, love --> Abandonment, feeling unloved or unlovable

Avoiding Threats

- Strength, efficacy --> Weakness, helplessness, pessimism
- Safety, security --> Alarm, anxiety
- Compassion for oneself and others --> Resentment, anger

A Serenity Prayer

*May I find the serenity to accept the things that cannot be changed,
the courage to change the things which should be changed,
and the wisdom to distinguish the one from the other.*

*Living one day at a time,
Enjoying one moment at a time,
Accepting hardship as a pathway to peace,
Taking this imperfect world as it is,
Not as I would have it,
Trusting in my refuges,
May I be reasonably happy in this life,
And supremely happy forever some day.*

Great Books

See 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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- Siegel, D. 2007. *The Mindful Brain*. Norton.
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Key Papers - 1

See 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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Key Papers - 3

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- Lieberman, M.D. & Eisenberger, N.I. 2009. Pains and pleasures of social life. *Science*, 323:890-891.
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Key Papers - 4

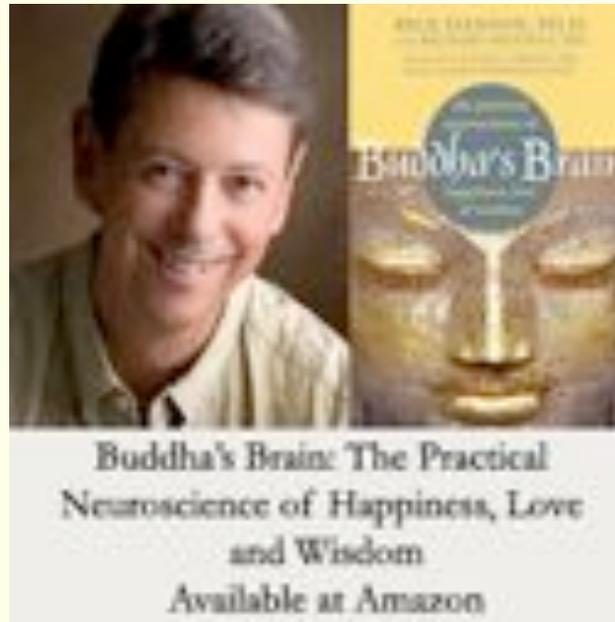
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Where to Find Rick Hanson Online



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

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



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www.WiseBrain.org