

Buddha's Brain:

Lighting up the Neural Circuits of Happiness, Love, and Wisdom

Esalen

September, 2011

Rick Hanson, Ph.D.

The Wellspring Institute for Neuroscience and Contemplative Wisdom

www.WiseBrain.org

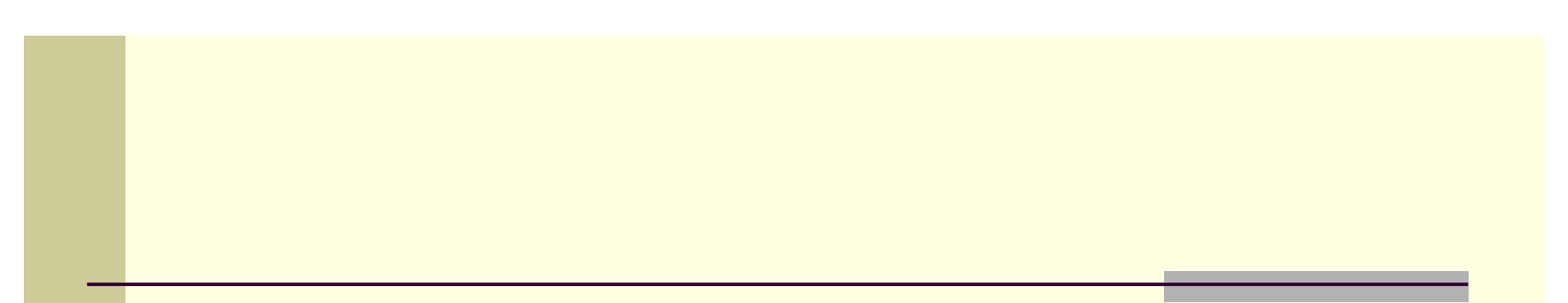
www.RickHanson.net

drh@comcast.net

© 2011

Topics

- **Self-directed neuroplasticity**
- **The power of mindfulness**
- **Being on your own side**
- **The evolving brain**
- **Coming home to happiness**
- **The negativity bias**
- **Threat reactivity**
- **Taking in the good**
- **Clearing old pain**
- **Your loving nature**
- **Two wolves in the heart**
- **Empathy**
- **Compassion and lovingkindness**
- **Relationship virtues**
- **Assertiveness**



Perspectives

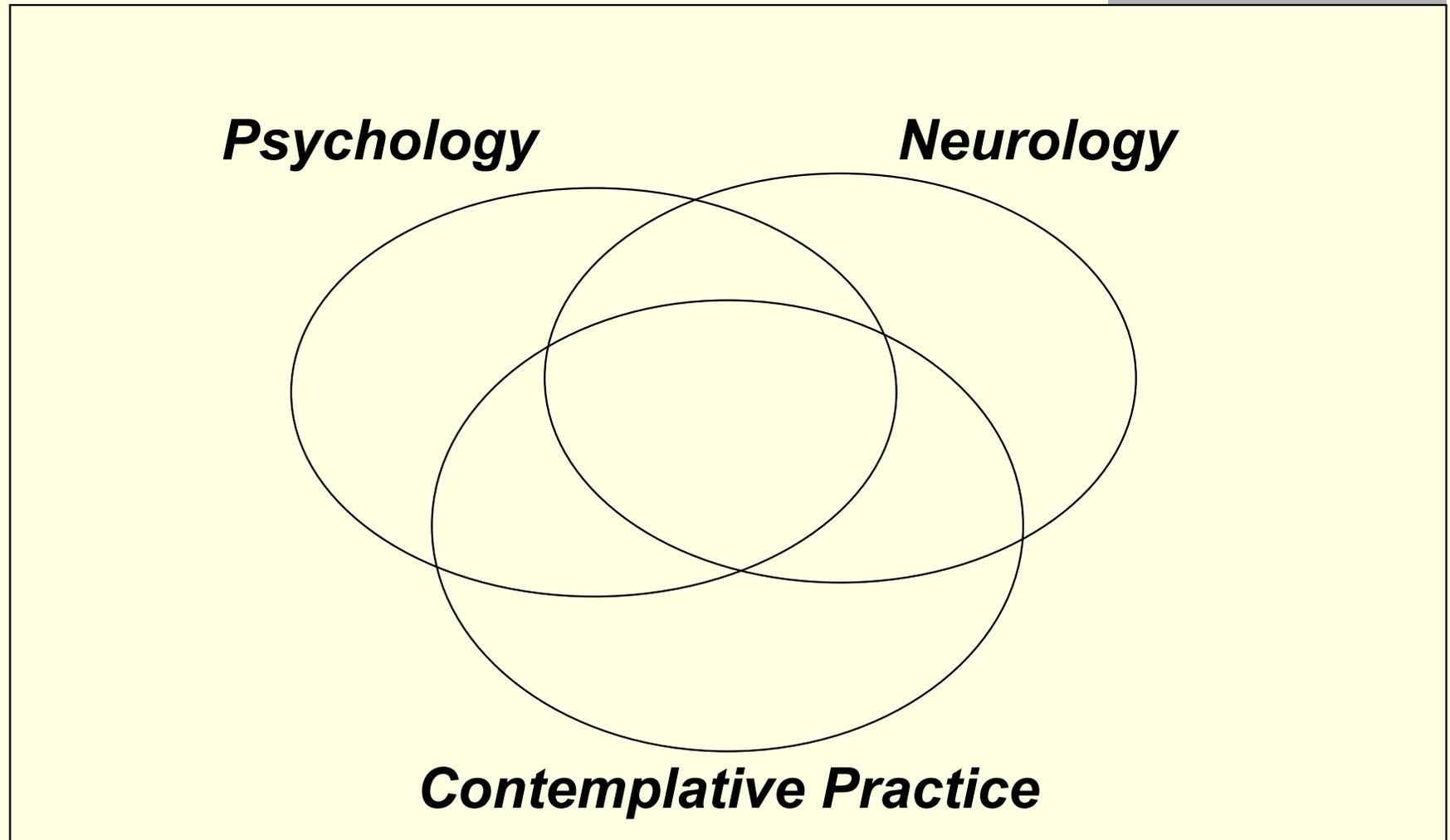
Domains of Intervention

- 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

*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

Common - and Fertile - Ground



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

What do you do?

John Maynard Keynes

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.

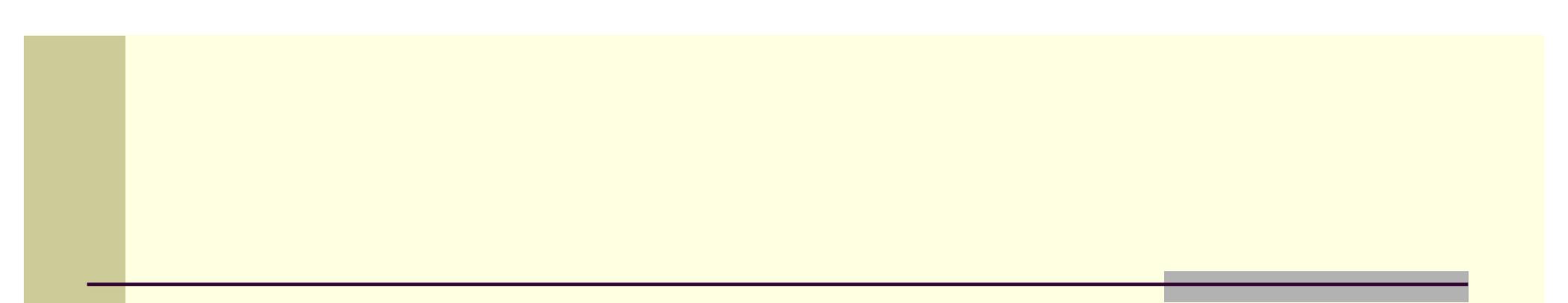


Know the mind.

Shape the mind.

Free the mind.

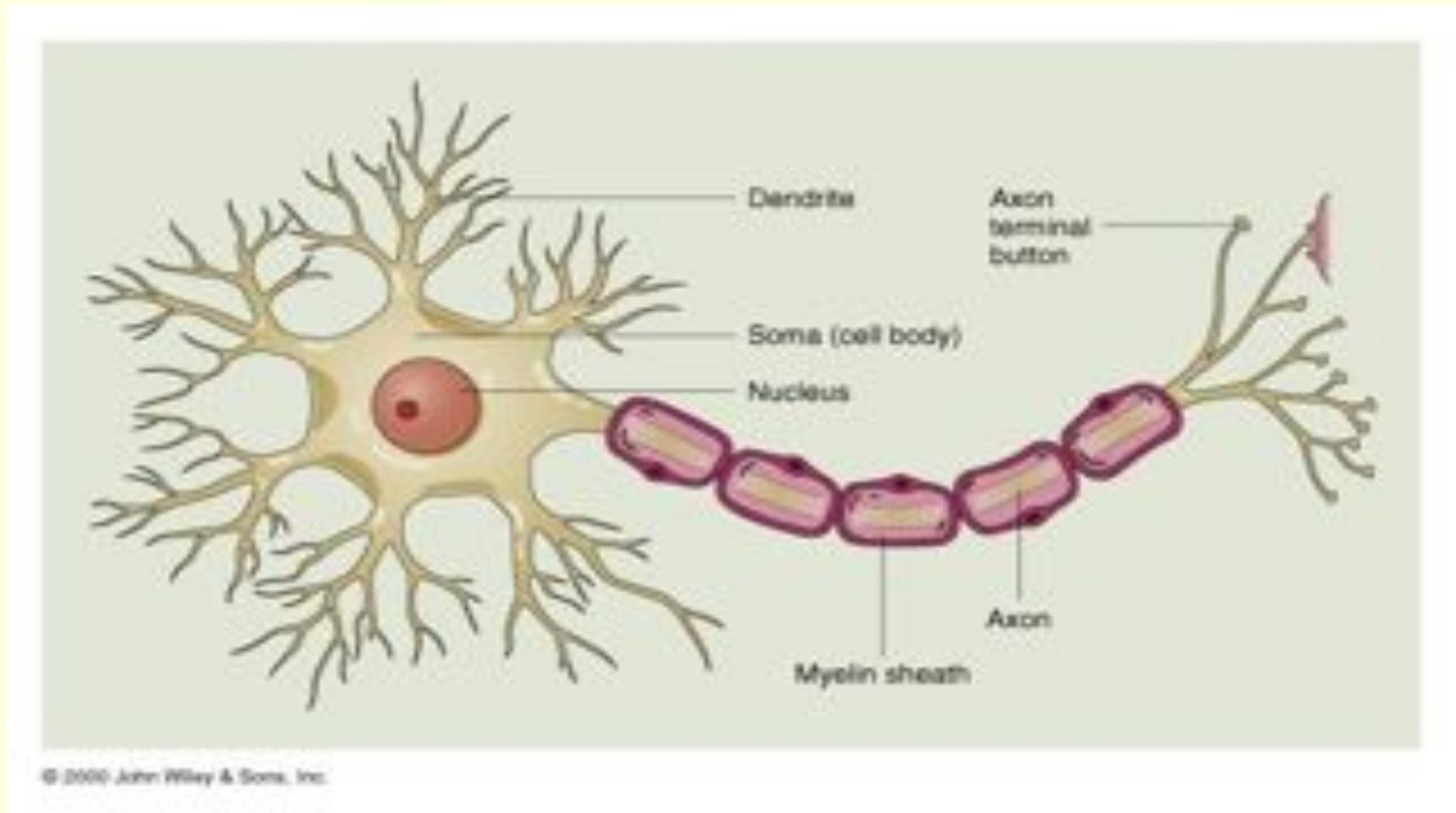




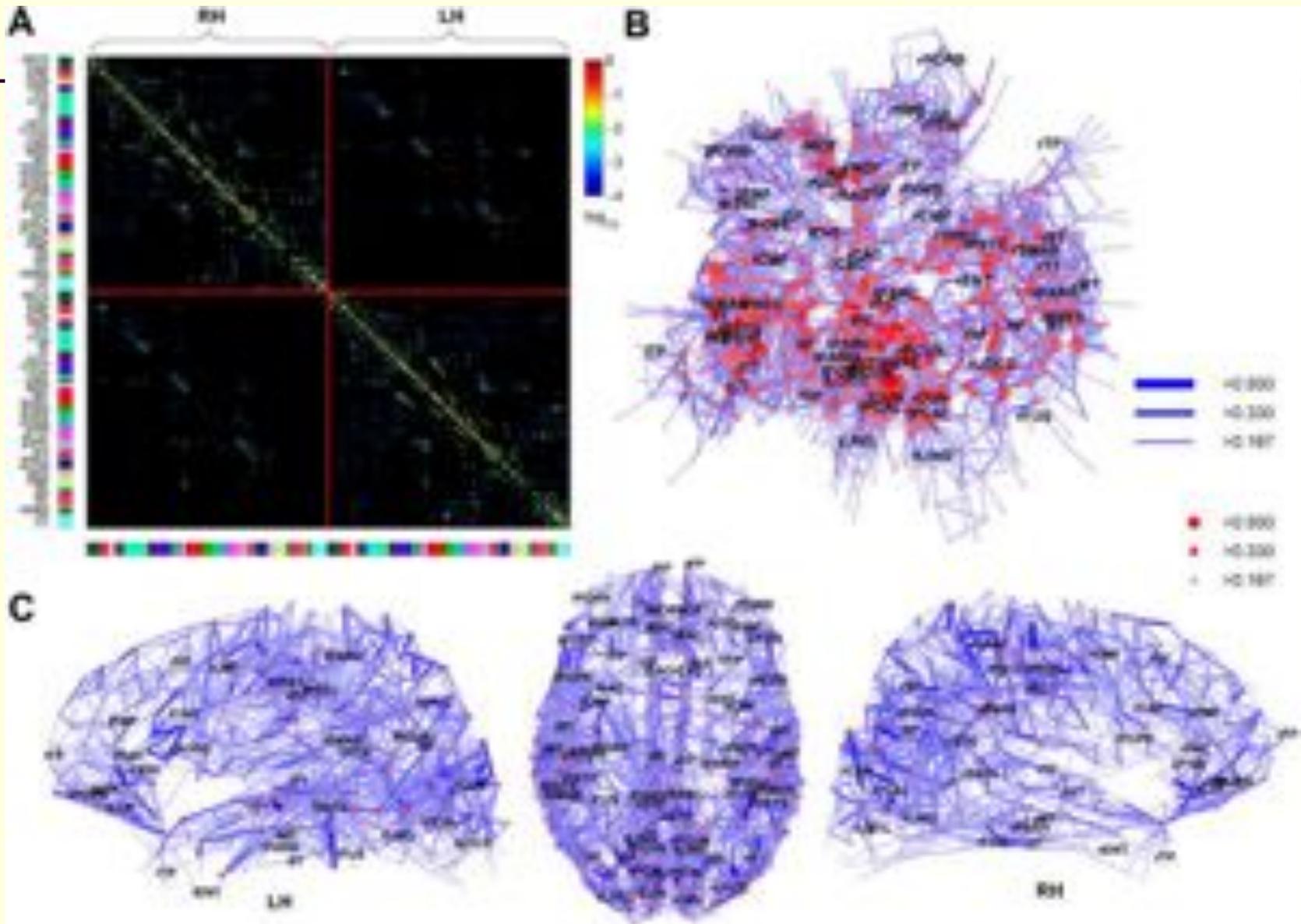
Self-Directed Neuroplasticity



One Simple Neuron . . .



The Connectome - 2



Hagmann, et al., 2008, *PLoS Biology*, 6:1479-1493.





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.

Eric R. Kandel, 2006

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.

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.

We ask, "What is a thought?"

We don't know,

yet we are thinking continually.

Venerable Tenzin Palmo

Fact #1

As your brain changes, your mind changes.



Ways That Brain Can Change Mind

- For better:

- A little caffeine: more alertness
- Thicker insula: more self-awareness, empathy
- More left prefrontal activation: more happiness

- For worse:

- Intoxication; imbalances in neurotransmitters
- Concussion, stroke, tumor, Alzheimer's
- Cortisol-based shrinkage of hippocampus: less capacity for contextual memory

Fact #2

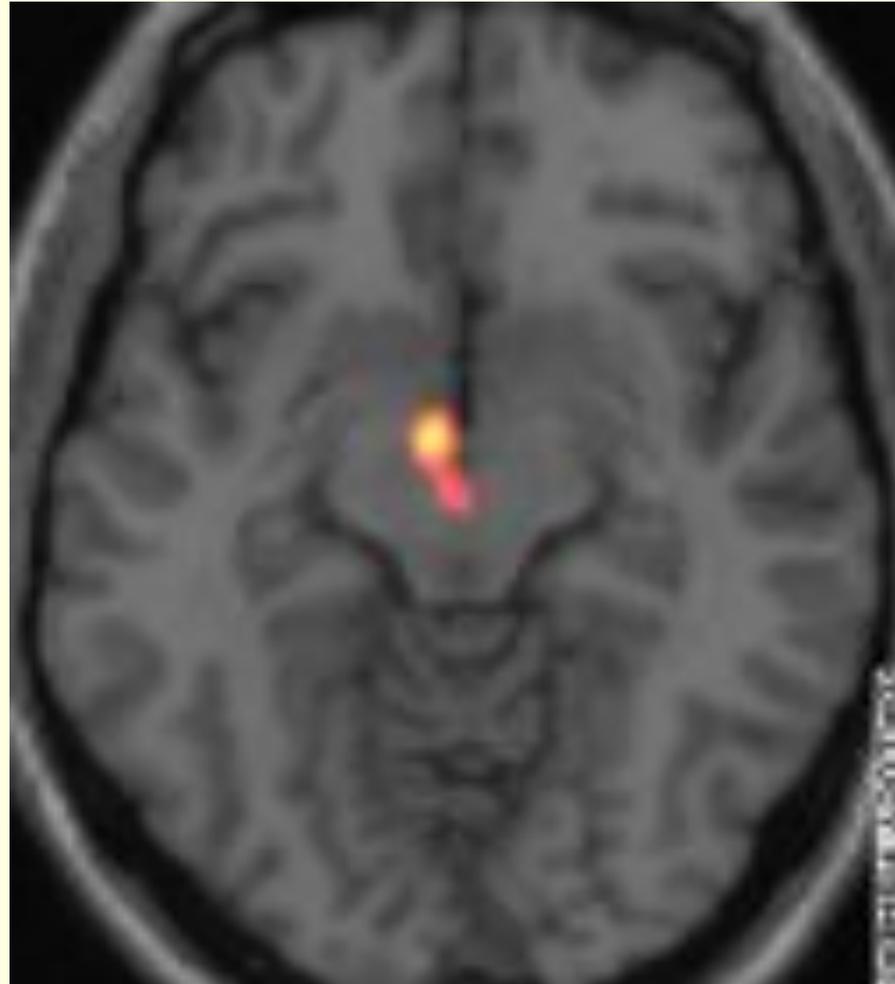
As your mind changes, your brain changes.

Immaterial mental activity co-occurs with, correlates with material neural activity.

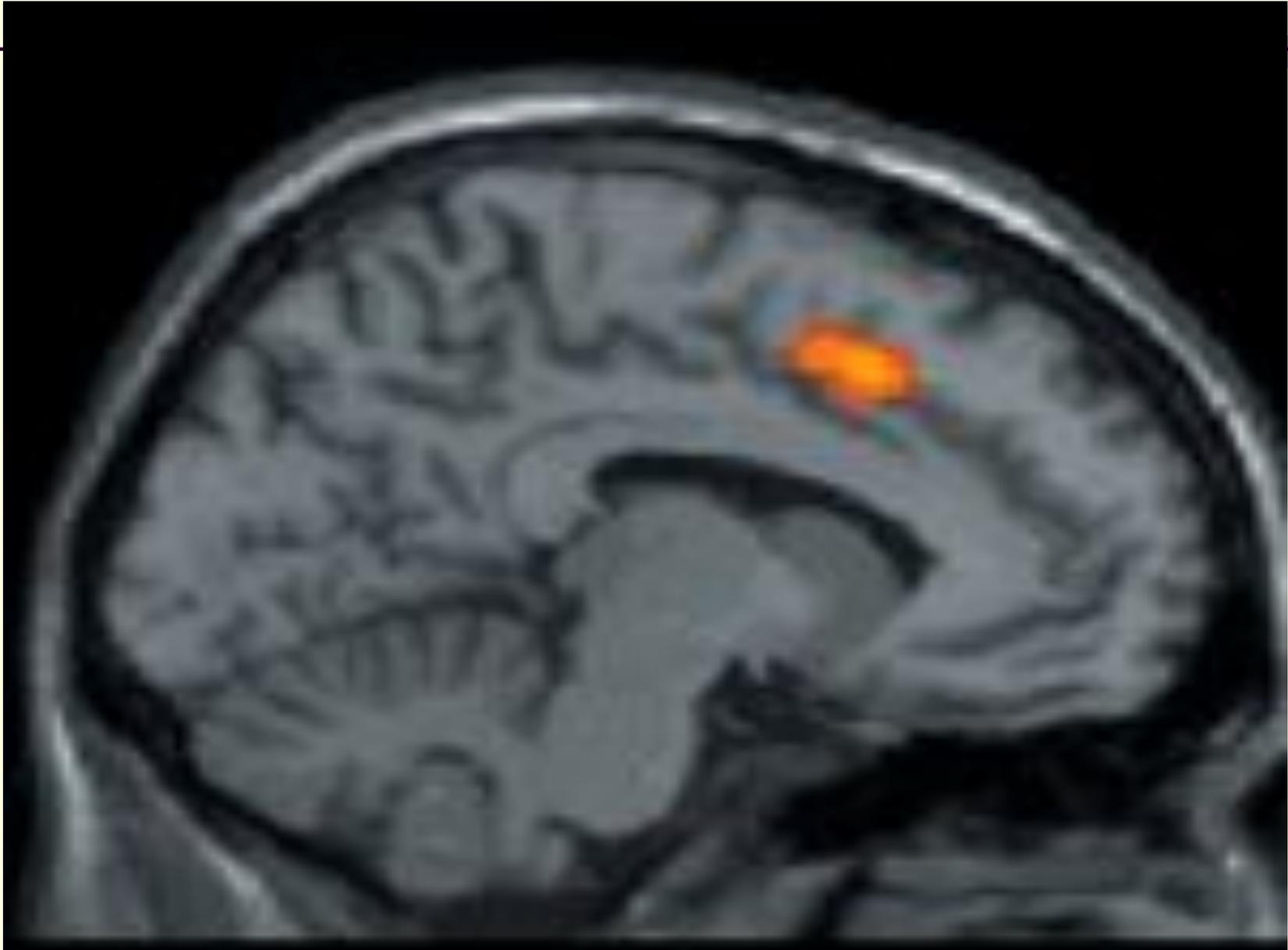
This produces temporary changes in your brain and lasting ones. *Temporary* changes include:

- Alterations in brainwaves (= changes in the firing patterns of synchronized neurons)
- Changing consumption of oxygen and glucose
- Ebbs and flows of neurochemicals

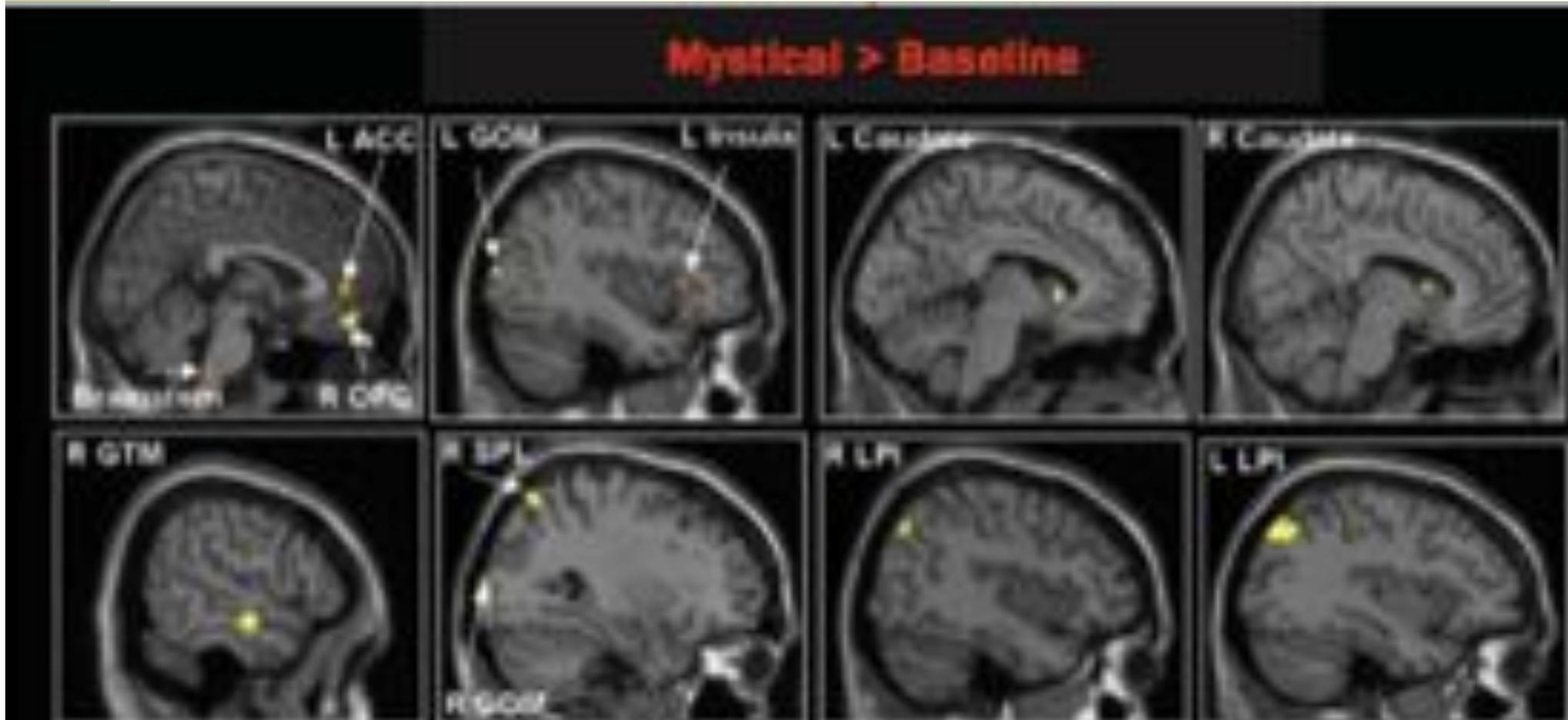
The Rewards of Love

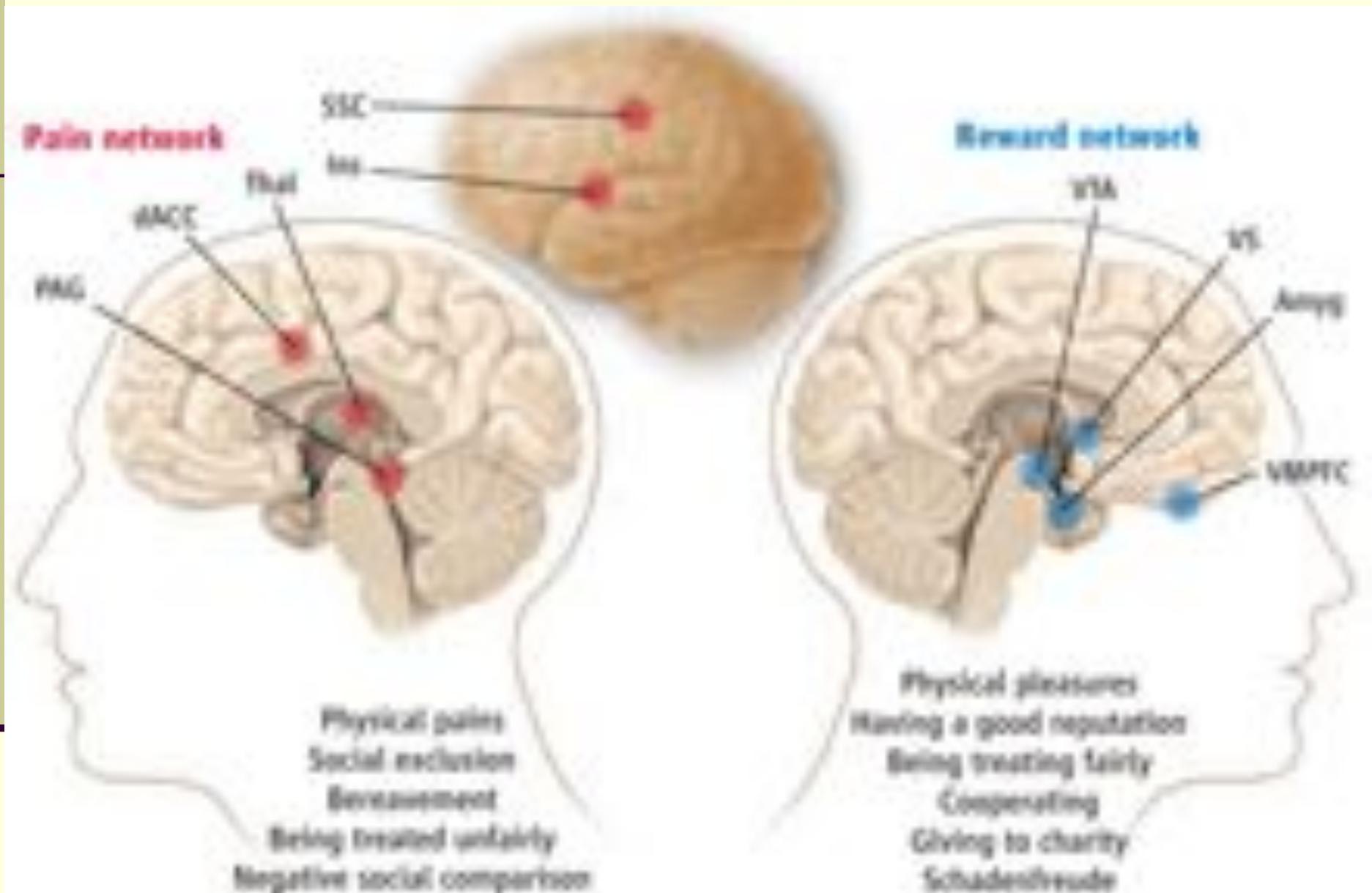


Tibetan Monk, Boundless Compassion



Christian Nuns, Recalling a Profound Spiritual Experience



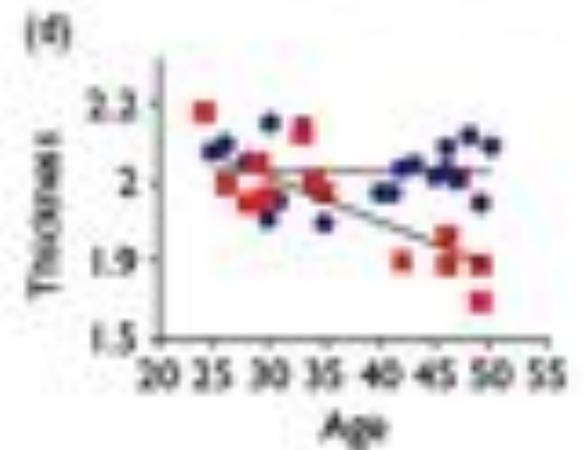
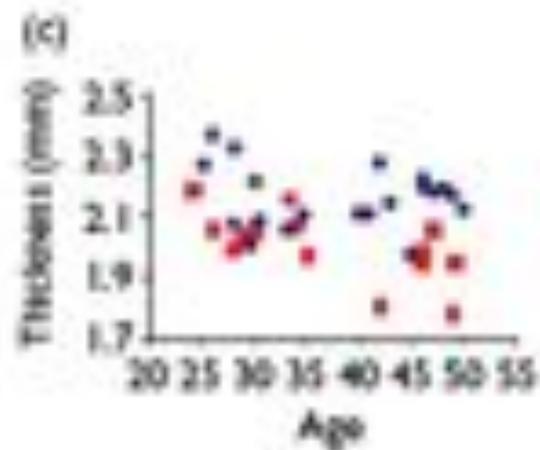
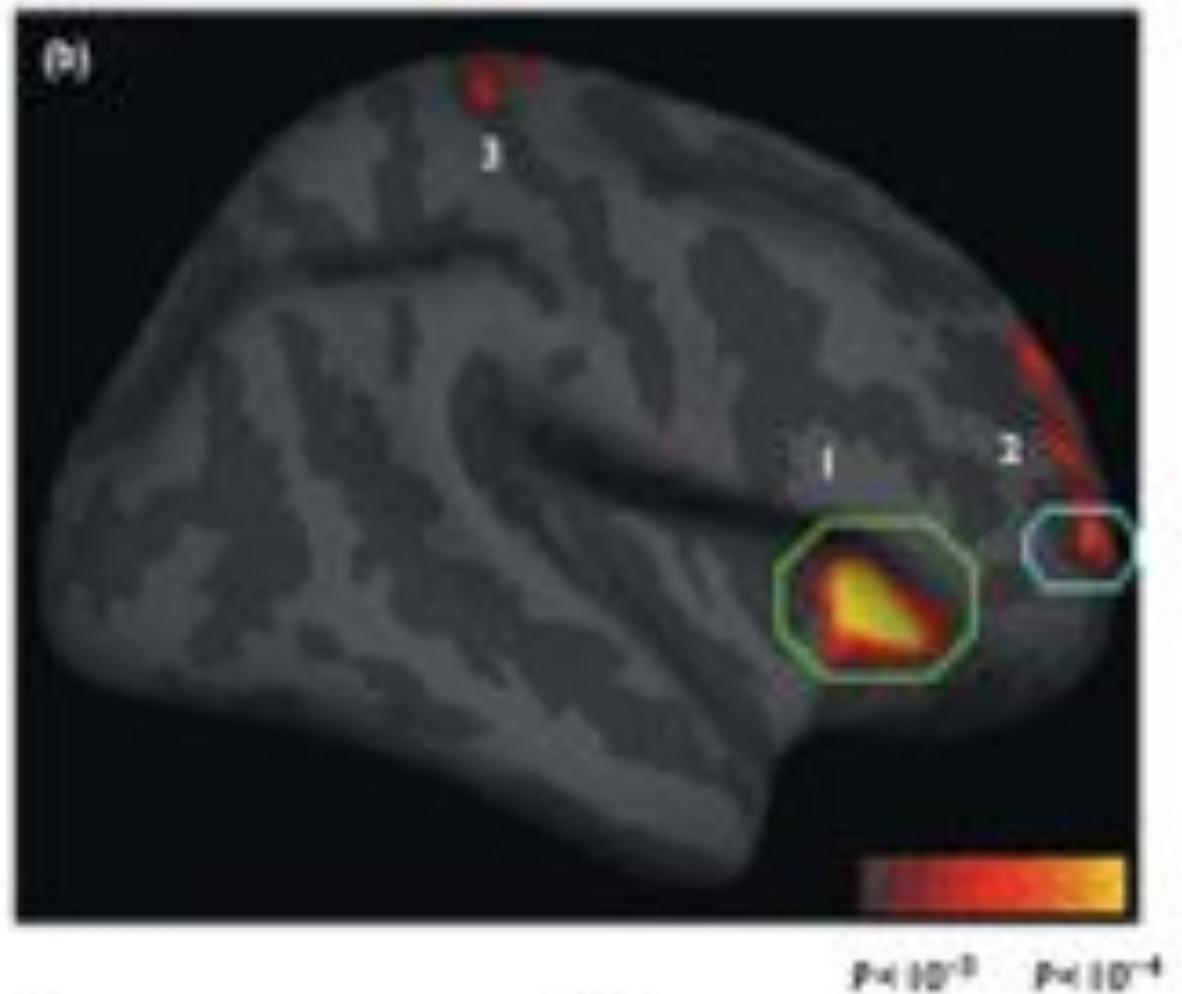


Pain network: Dorsal anterior cingulate cortex (dACC), insula (Ins), somatosensory cortex (SSC), thalamus (Thal), and periaqueductal gray (PAG). Reward network: Ventral tegmental area (VTA), ventral striatum (VS), ventromedial prefrontal cortex (VMPFC), and amygdala (Amyg). K. Sutliff, in Lieberman & Eisenberger, 2009, *Science*, 323:890-891

Mind Changes Brain in Lasting Ways

- What flows through the mind sculpts your brain. Immaterial experience leaves material traces behind.
- Increased blood/nutrient flow to active regions
- Altered epigenetics (gene expression)
- “Neurons that fire together wire together.”
 - Increasing excitability of active neurons
 - Strengthening existing synapses
 - Building new synapses; thickening cortex
 - Neuronal “pruning” - “use it or lose it”

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



Some Physical Effects of Meditation

- Thickens and strengthens the anterior (frontal) cingulate cortex and the insula. Those regions are involved with controlled attention, empathy, and compassion – and meditation improves those functions.
- Less cortical thinning with aging
- Increases activation of the left frontal regions, which lifts mood
- Increases the power and reach of fast, gamma brainwaves
- Decreases stress-related cortisol
- Stronger immune system

Honoring Experience

One's experience *matters*.

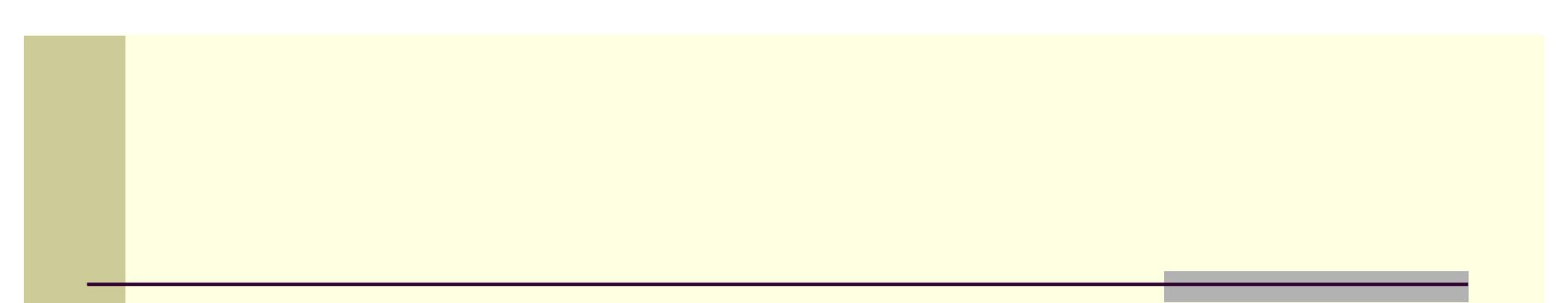
Both for how it feels in the moment and for the lasting residues it leaves behind, woven into the fabric of a person's brain and being.

Fact #3

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

This is self-directed neuroplasticity.

How to do this, in skillful ways?



Being on Your Own Side

Self-Goodwill

- All the great teachers have told us to be compassionate and kind toward all beings. And that whatever we do to the world affects us, and whatever we do to ourselves affects the world.
- You are one of the “all beings!” And kindness to yourself benefits the world, while hurting yourself harms the world.
- It’s a general moral principle that the more power you have over someone, the greater your duty is to use that power wisely. Well, who is the one person in the world you have the greatest power over? It’s your future self. You hold that life in your hands, and what it will be depends on how you care for it.
- Consider yourself as an innocent child, as deserving of care and happiness as any other.

*If one going down into a river,
swollen and swiftly flowing,
is carried away by the current --
how can one help others across?*

The Buddha

*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

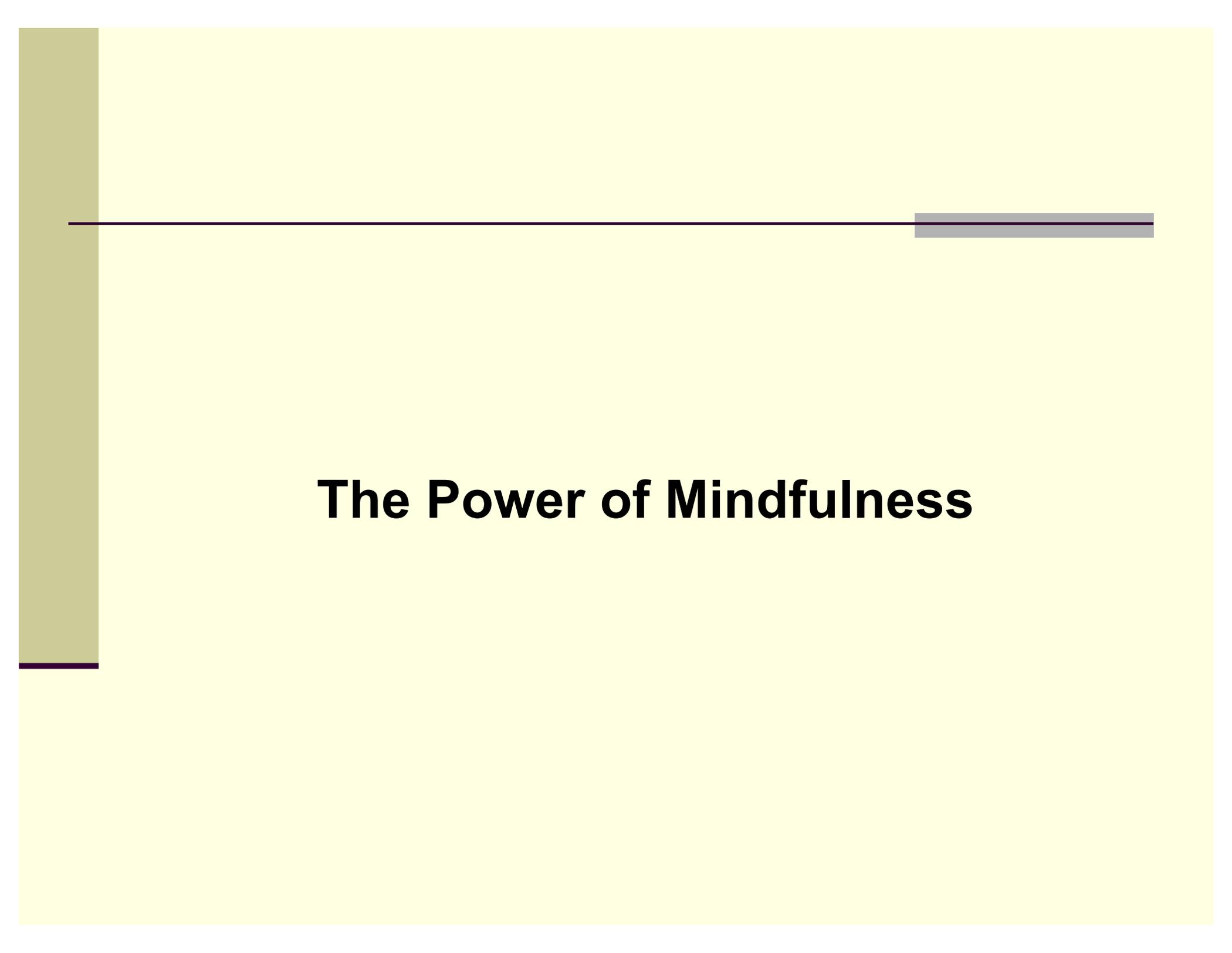
Self-Compassion

- 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.”

“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

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 the education par excellence.*

William James

How the Brain Pays Attention

- Key functions:

- Holding onto information
- Updating awareness
- Seeking stimulation

- Key mechanisms:

- Dopamine and the gate to awareness
- The basal ganglia stimostat

Challenges to Mindfulness and Concentration

- We evolved continually scanning, shifting, wide focus attention in order to survive: “monkey mind.”
- This generic, hard-wired tendency varies in the normal range of temperament, extending from “turtles” to “jackrabbits.”
- Life experiences - in particular, painful or traumatic ones - can heighten scanning and distractibility.
- Modern culture - with its fire hose of information and routine multi-tasking - leads to stimulation-hunger and divided attention.

Individual Differences in Attention

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

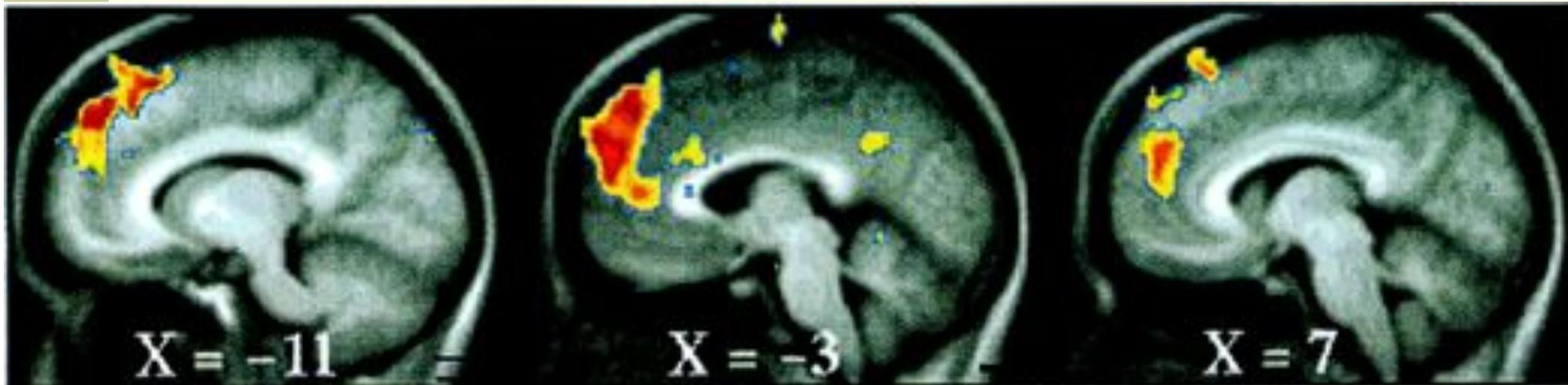
Basics of Meditation

- 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

7 Neural Factors of Mindfulness

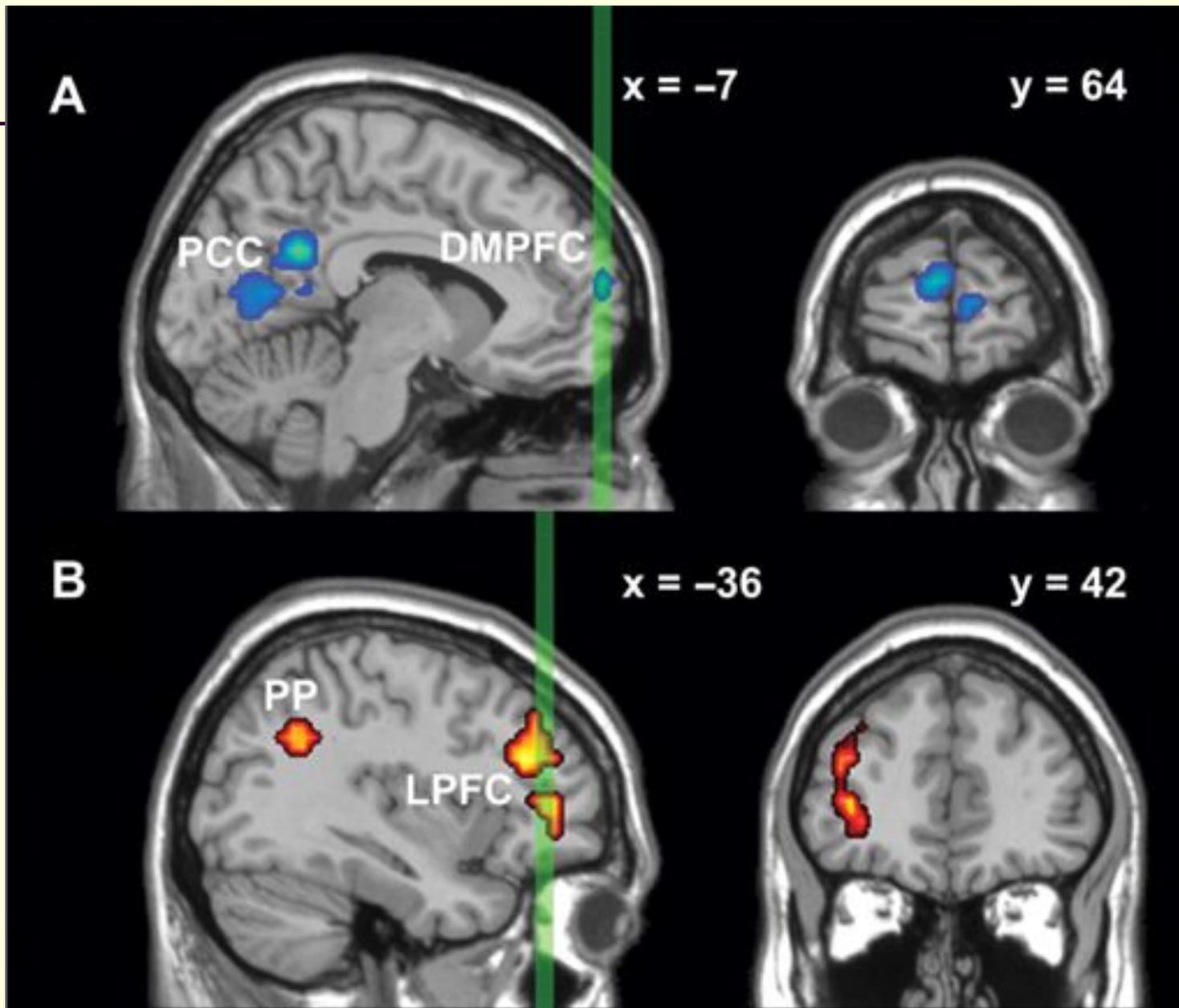
- **Setting an intention** - “top-down” frontal, “bottom-up” limbic
- **Relaxing the body** - parasympathetic nervous system
- **Feeling cared about** - social engagement system
- **Feeling safer** - inhibits amygdala/ hippocampus alarms
- **Encouraging positive emotion** - dopamine, norepinephrine
-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

Increased Medial PFC Activation Related to Self-Referencing Thought

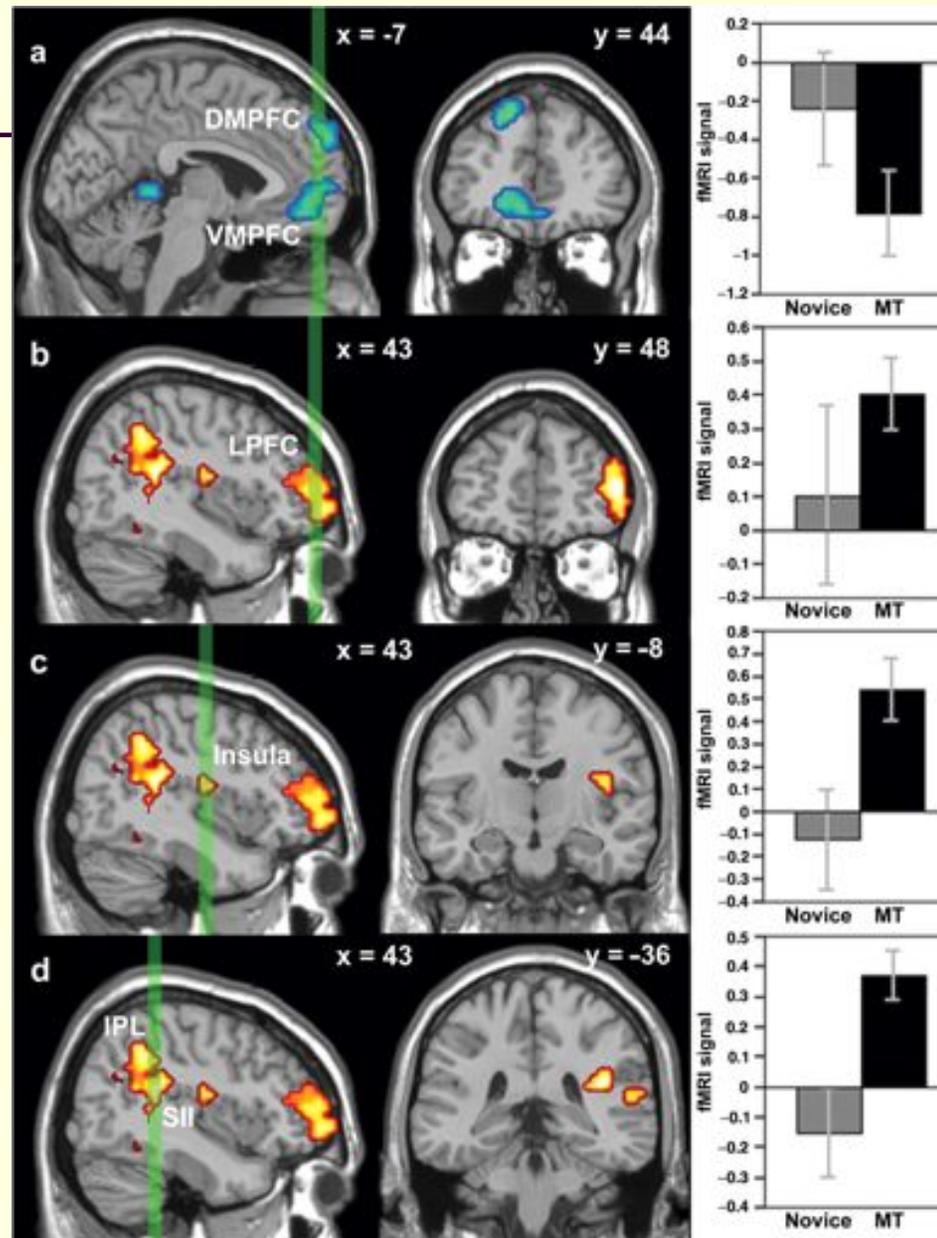


Gusnard D. A., et.al. 2001. *PNAS*, 98:4259-4264

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



Self-Focused (blue) vs 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

- 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.

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

“Bahiya, you should train yourself thus.”

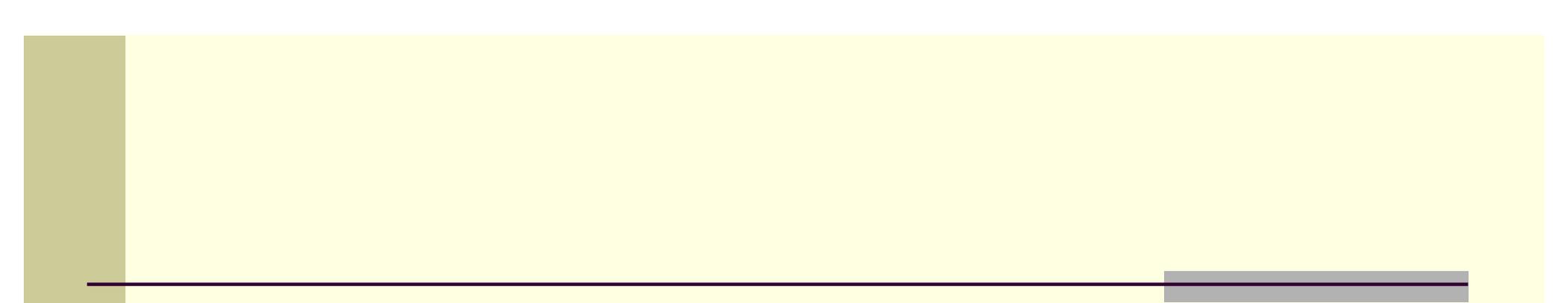
In reference to the seen, there will be only the seen. To the heard, only the heard. To the sensed, only the sensed. To the cognized, only the cognized.

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.

The Buddha

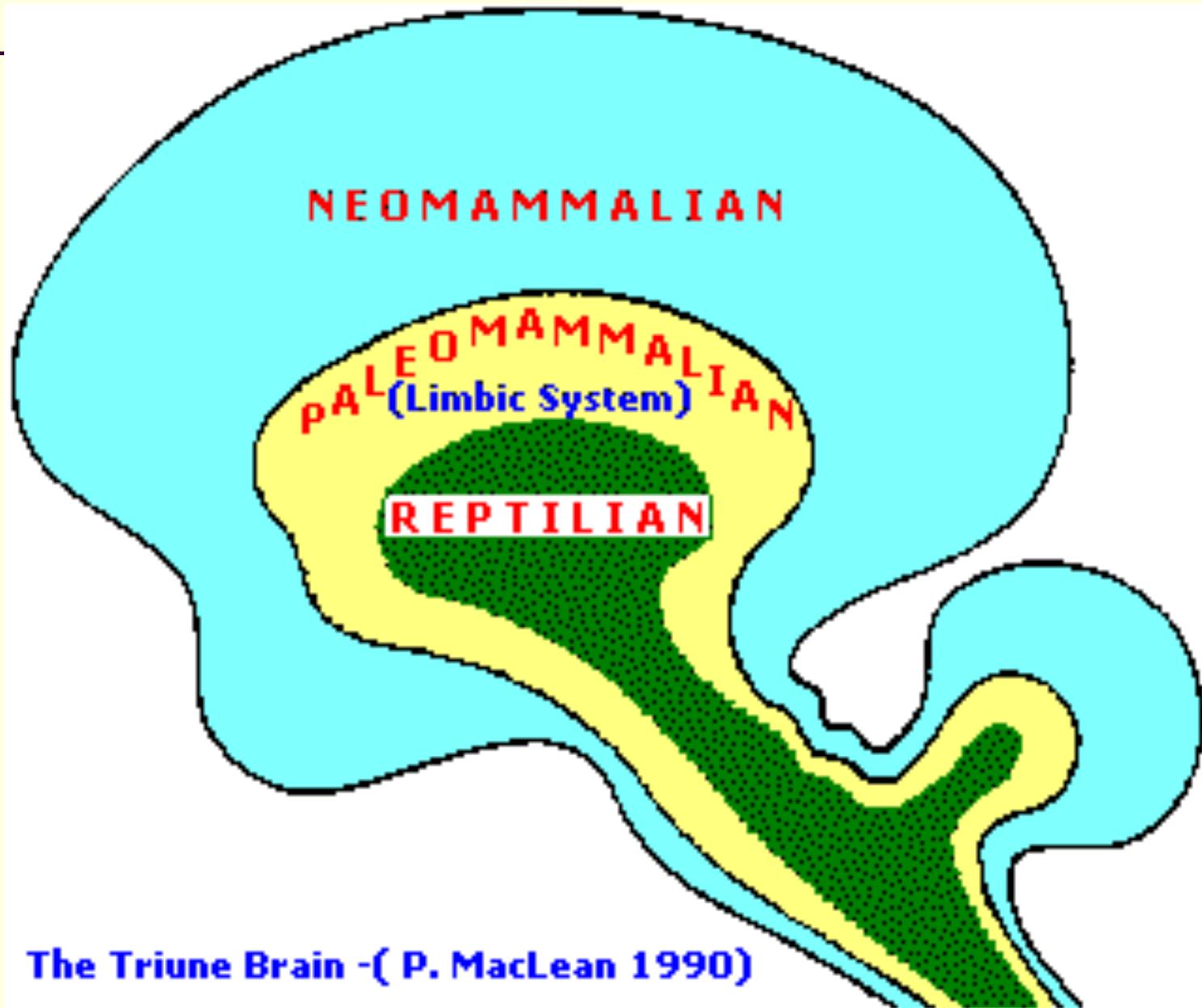


The Evolving Brain

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



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

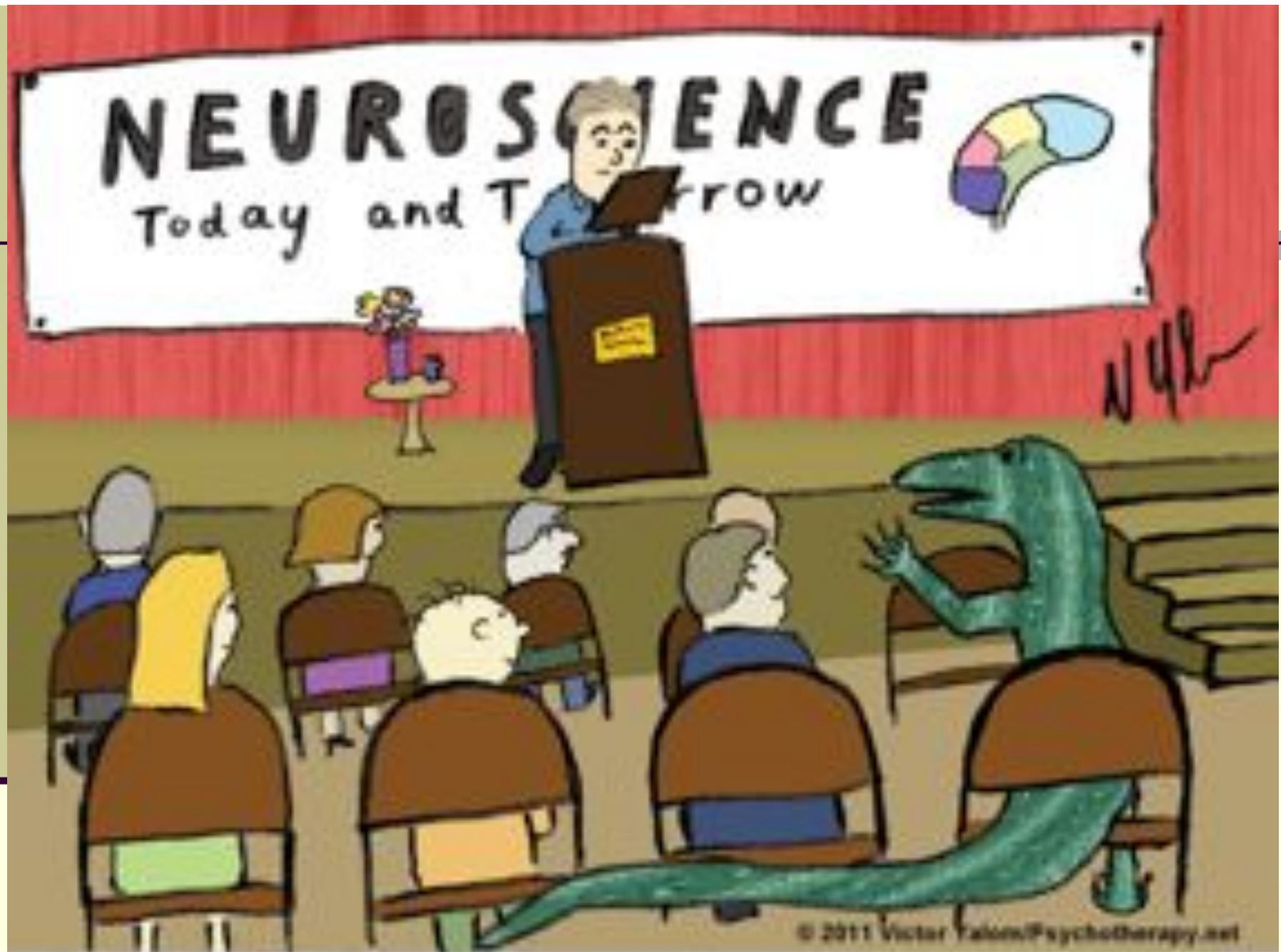
■ Human:

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

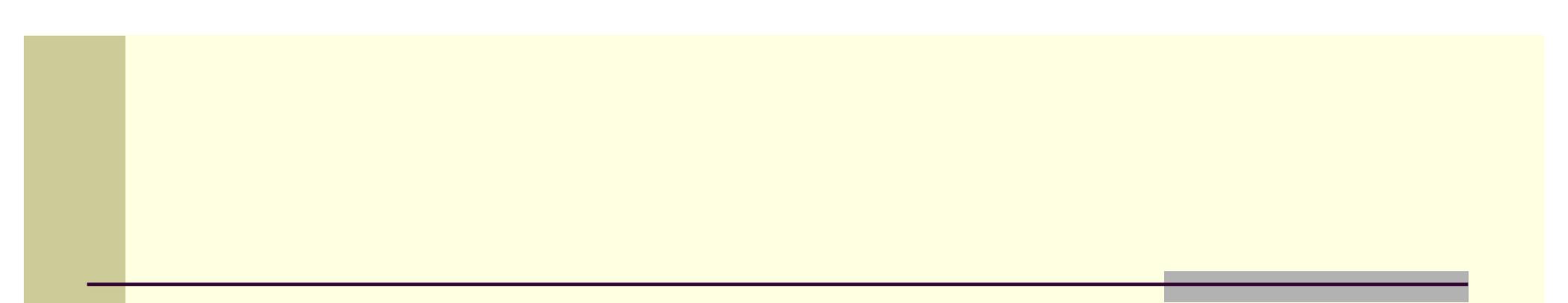


r Brain
el 3

www.veley.com



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



Coming Home to Happiness

Reverse Engineering the Brain

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

- In peak states of productivity or “flow?”
- 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 natural, ***responsive*** mode.

The 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 . . .

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

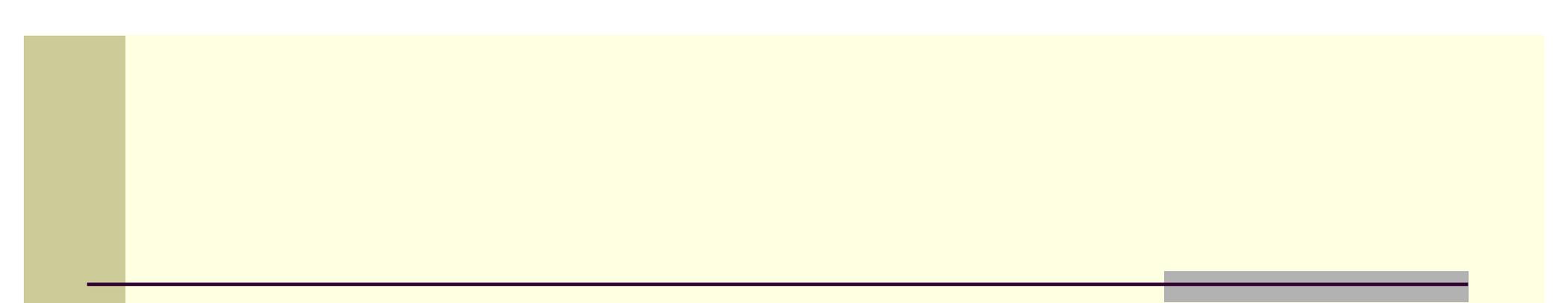
This is the brain in its *reactive* mode of functioning
- a kind of inner homelessness.

The Reactive Mode



Reactive Dysfunctions in Each System

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



The Negativity Bias

Negativity Bias: Causes in Evolution

- “Sticks” - Predators, natural hazards, social aggression, pain (physical and psychological)
- “Carrots” - Food, sex, shelter, social support, pleasure (physical and psychological)
- During evolution, avoiding “sticks” usually had more effects on survival than approaching “carrots.”
 - Urgency - Usually, sticks must be dealt with immediately, while carrots allow a longer approach.
 - Impact - Sticks usually determine mortality, carrots not; if you fail to get a carrot today, you’ll likely have a chance at a carrot tomorrow; but if you fail to avoid a stick today - whap! - no more carrots forever.

Negativity Bias: Some Consequences

- Negative stimuli get more attention and processing.
- We generally learn faster from pain than pleasure.
- People work harder to avoid a loss than attain an equal gain (“endowment effect”)
- Easy to create learned helplessness, hard to undo
- Negative interactions: more powerful than positive
- Negative experiences sift into implicit memory.

Negative Experiences Can Have Benefits

- 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

Health Consequences of Chronic Stress

■ Physical:

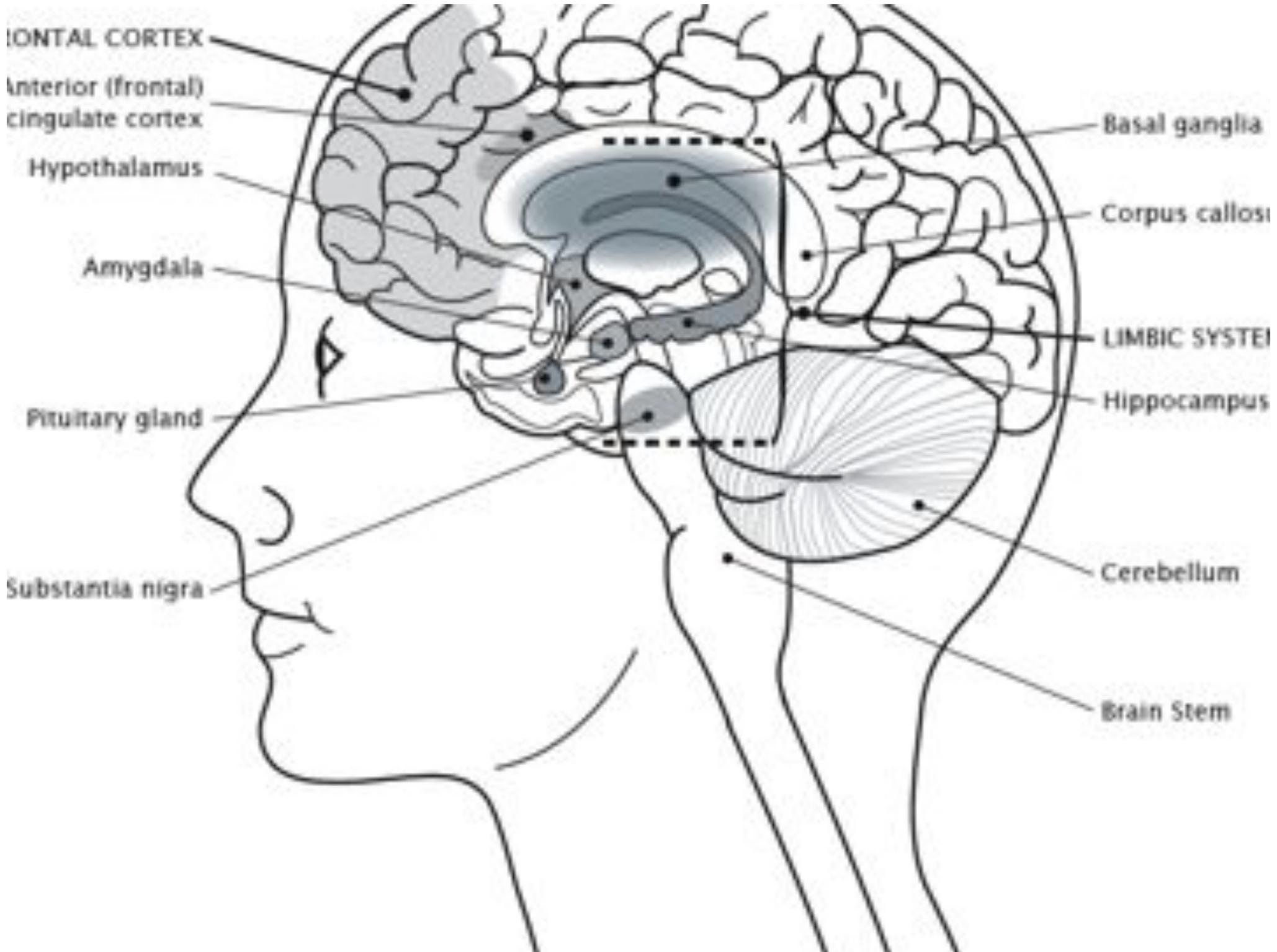
- Weakened immune system
- Inhibits GI system; reduced nutrient absorption
- Reduced, dysregulated reproductive hormones
- Increased vulnerabilities in cardiovascular system
- Disturbed nervous system

■ Mental:

- Lowers mood; increases pessimism
- Increases anxiety and irritability
- Increases learned helplessness (especially if no escape)
- Often reduces approach behaviors (less so for women)
- Primes aversion (due to SNS-HPAA negativity bias)

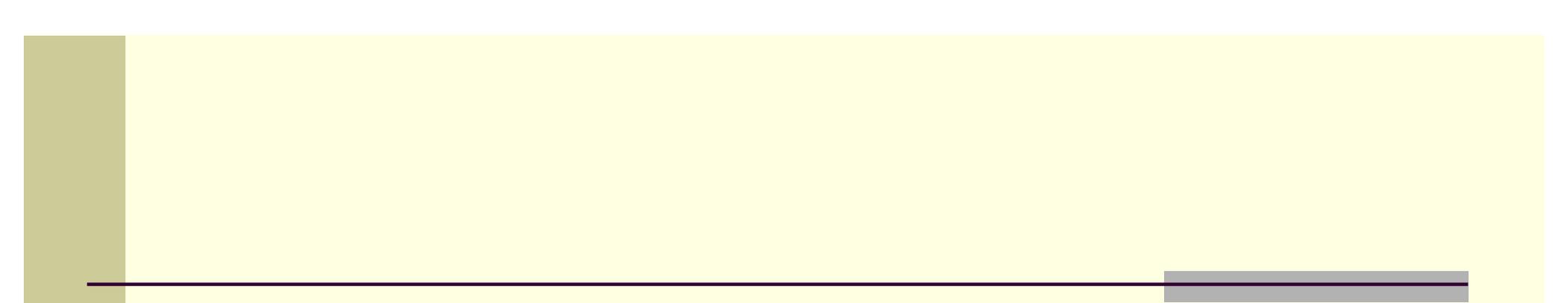
Neural Consequences of Negative Experiences

- Amygdala initiates stress response (“alarm bell”)
- 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



Neural Consequences of Negative Experiences

- Amygdala initiates stress response (“alarm bell”)
- 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



Threat Reactivity

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.

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."

A Poignant Truth

Mother Nature is tilted toward producing gene copies.

But tilted against personal quality of life.

And at the societal level, we have caveman/cavewoman brains armed with nuclear weapons.

What shall we do?

*We can deliberately use the mind
to change the brain for the better.*

Choices . . .



Reactive Mode

Or?



Responsive Mode

Coming Home . . .

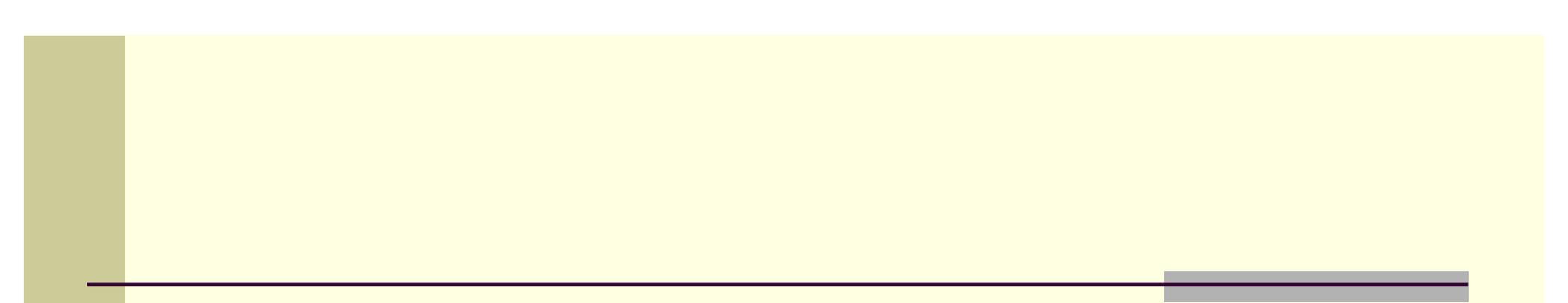
Calm

Contentment

Caring

How to come home?

**How to recover the natural, responsive mode
of the brain?**



Taking in the Good

Just having positive experiences is not enough.

They pass through the brain like water through a sieve, while negative experiences are caught.

We need to engage positive experiences actively to weave them into the brain.

How to Take in the Good

1. Look for positive **facts** and let them become positive experiences.
2. Savor the experience:
 - Sustain it.
 - Have it be emotional and sensate.
 - Intensify it.
3. Sense that the positive experience is soaking into your brain and body - registering deeply in emotional memory.

Targets of TIG

- Bodily states - healthy arousal; PNS; vitality
- Emotions
- Views - expectations; object relations; perspectives on self, world, past and future
- Behaviors - repertoire; inclinations

Kinds of “Good” to Take in

- Things are alright; nothing is wrong; there is no threat
- Feeling safe and strong
- The peace and relief of forgiveness

- The small pleasures of ordinary life
- The satisfaction of attaining goals or recognizing accomplishments - especially small, everyday ones
- Feeling grateful, contented, and fulfilled

- Being included, valued, liked, respected, loved by others
- The good feelings that come from being kind, fair, generous
- Feeling loving

- Recognizing your positive character traits
- Spiritual or existential realizations

Psychological Antidotes

Avoiding Harms

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

Approaching Rewards

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

Attaching to “Us”

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

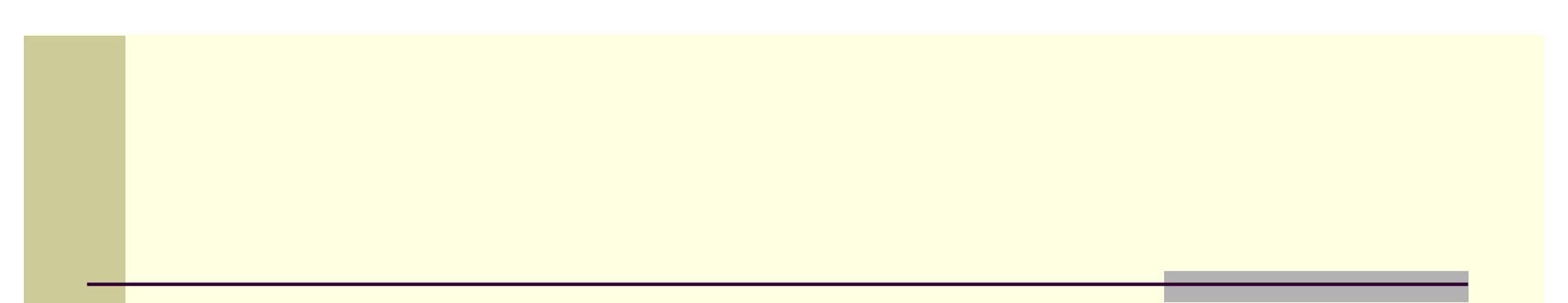
Why It's Good to Take in the Good

- Rights an unfair imbalance, given the negativity bias
- Gives oneself today the caring and support one should have received as a child, but perhaps didn't get in full measure; an inherent, implicit benefit
- Increases positive resources, such as:
 - Positive emotions
 - Capacity to manage stress and negative experiences
- Can help bring in missing "supplies" (e.g., love, strength, worth)
- Can help painful, even traumatic experiences

Benefits of Positive Emotions

- The benefits of positive emotions are a proxy for many of the benefits of TIG.
- Emotions organize the brain as a whole, so positive ones have far-reaching benefits
- These include:
 - Stronger immune system; less stress-reactive cardiovascular
 - Lift mood; increase optimism, resilience
 - Counteract trauma
 - Promote exploratory, “approach” behaviors
 - Create positive cycles

*How to use taking in the good
for healing painful, even traumatic experiences?*



Equanimity

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

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.

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

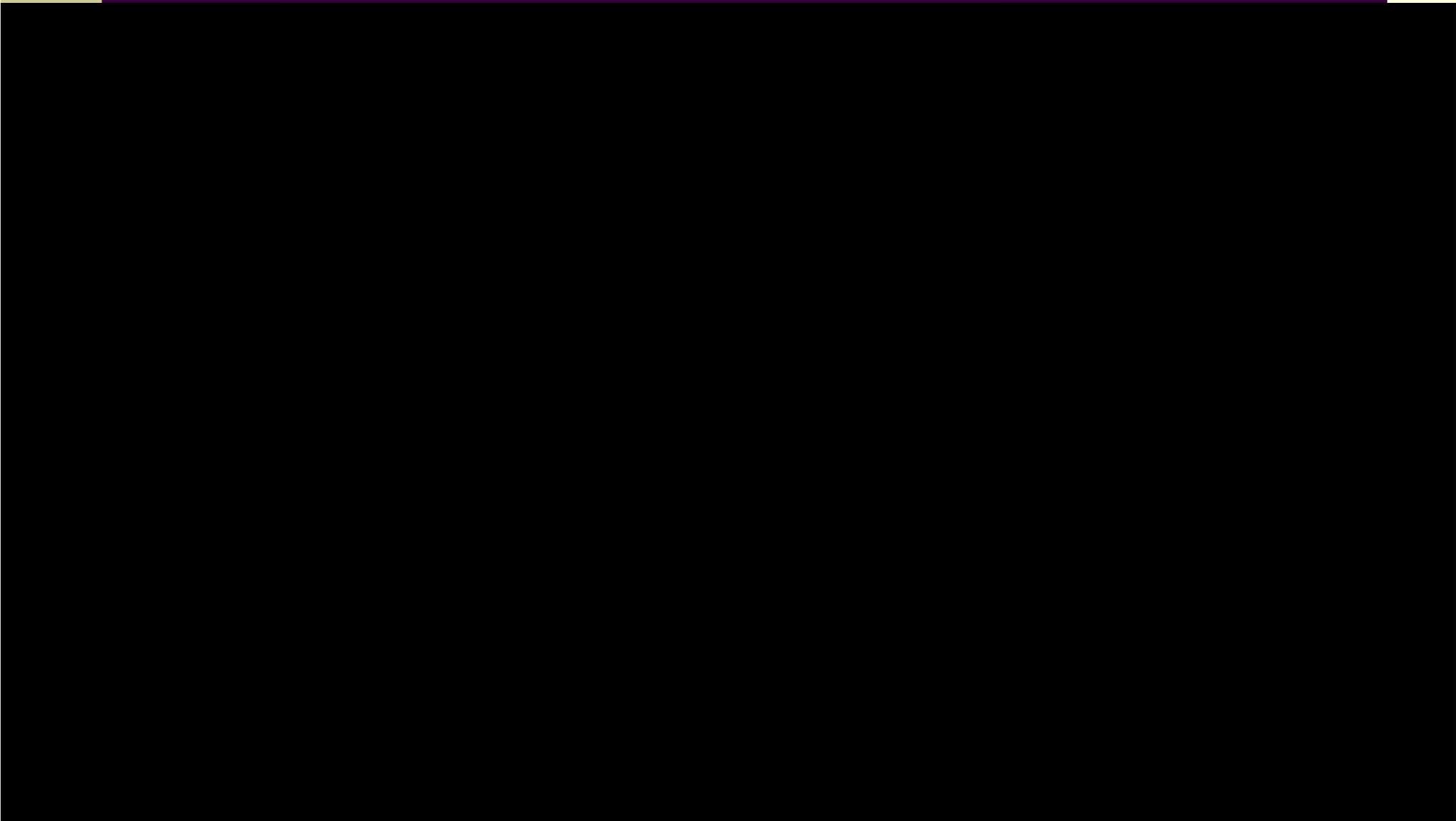
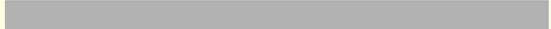
*When one's mind is developed like this,
from where can there come suffering & stress?*

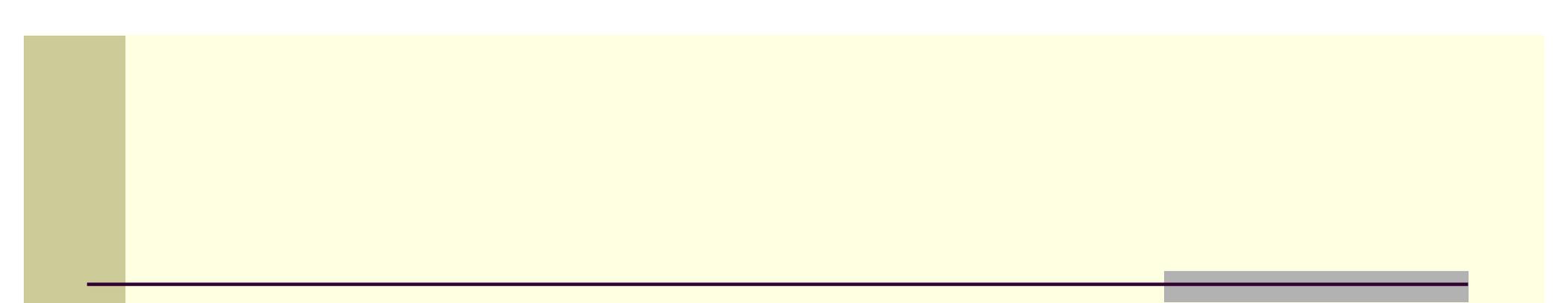
The Buddha, Udāna 4.34

*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.*

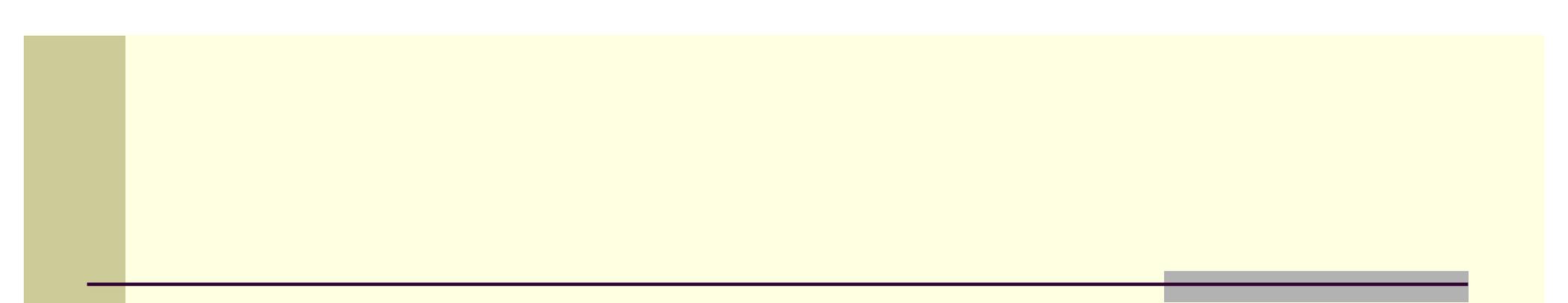
*All attachments have been severed,
The heart's been led away from pain;
Tranquil, he or she rests with utmost ease.
The mind has found its way to peace.*

The Buddha





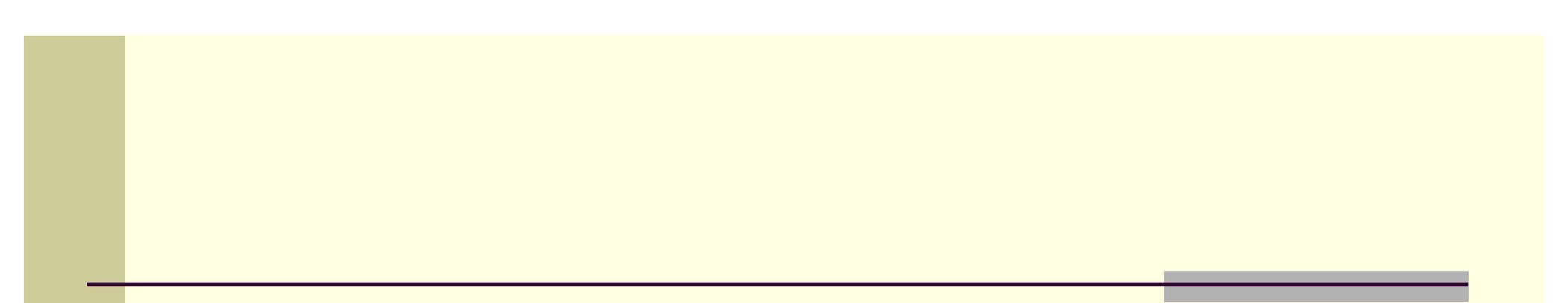
The First and Second Dart



Equanimity in the Brain

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)



Understanding and Intention

Ceaseless Change

- Everything changes:
 - Big Bang, galaxies, sun, earth, mountains, rivers, wind
 - Molecules, atoms, photons, quantum particles
 - Life: microbes, sponges, mammals, primates, humans
 - Societies, traffic, politics
 - The body: breath, digestion, hormones, cells, synapses
 - The mind: thought, feeling, hopes, fears, consciousness
 - Relationships: closeness and distance, friends and rivals

- We live at the edge of a waterfall, everything changing as it rushes past in this razor-thin instant of Now - already gone as soon as we recognize it.

That which arises must pass away.

The Buddha

Interdependence

- Everything arises and passes away dependent on conditions. As the Buddha put it: “When this is, that is; when this is not, that is not.”
- This means that:
 - Things happen in a vast network of causes.
 - Everything is related to everything else.
 - Nothing has absolute self-existence, including “I.”
 - Boundaries are relative, not absolute. The body continually exchanges molecules with the world, people influence each other, thoughts blur into each other inside the mind.

Eight Worldly Winds

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

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 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.

When the uninstructed worldling experiences a painful feeling, he or she sorrows, grieves, and laments; he or she weeps beating the breast and becomes distraught. He or she feels two feelings - a bodily one and a mental one.

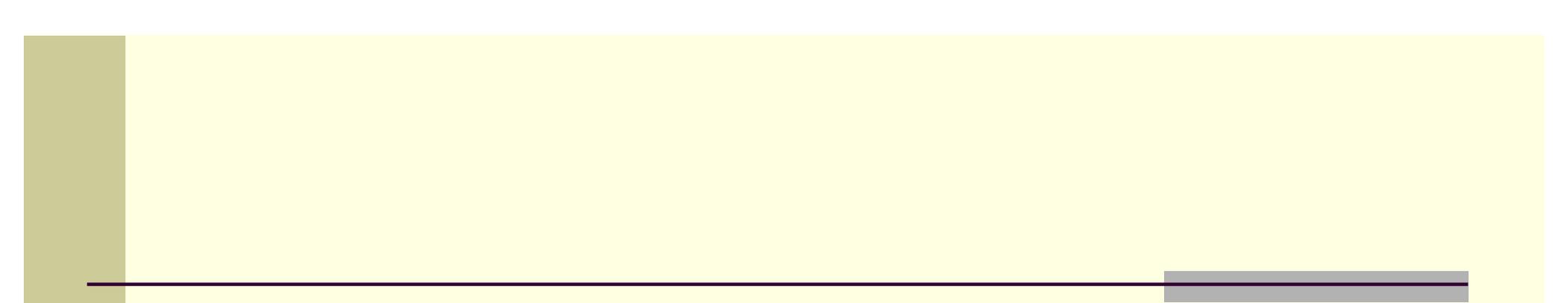
Suppose they were to strike a person with a dart, and then strike him immediately afterward with a second dart, so that the person would feel a feeling caused by two darts.

So too, when the uninstructed worldling experiences a painful feeling, the person feels two feelings - a bodily one and a mental one.

The Buddha, SN 36:6

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.



Cooling the Fires

First Aid for Upsets

- Pause
- Self-compassion
- Get on your own side
- Make a plan
- Take action - thought, word, and deed

Parasympathetic Nervous System

- The “rest-and-digest” parasympathetic nervous system (PNS) balances and dials down the “fight-or-flight” sympathetic nervous system.
- It soothes, resets, renews the body-mind. Though the SNS gets more press, the PNS is more primary.

Cooling the Fires

- Recognize that stress is not good for you. Get on your own side to prevent and minimize it.
- Cultivate relaxation and calm in your resting state.
- When you get stressed, activating a PNS, “cooling” cascade:
 - Inhale super-fully; hold it; l-o-n-g exhalation; repeat
 - Relax the tongue
 - Touch the lips
 - Relax the body

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

Elemental Safety

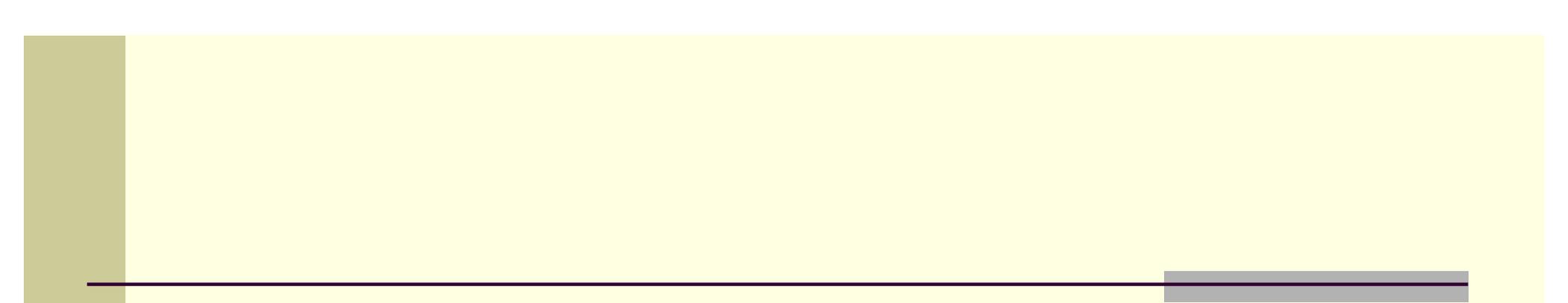
- Fear learning associates an inherently unpleasant stimulus - the “unconditioned stimulus” (US) - with a “conditioned stimulus” (CS) that is not inherently aversive - e.g., rats trained to expect an awful noise (US) following a puff of air (CS).
- Living itself can become the conditioned stimulus for anxious people.
- What’s needed are many small moments of associating basic parasympathetic alrightness to life: this breath is alright; this interaction is alright; I’m actually alright even if there is anxiety.
- Repeatedly practice feeling safe while engaged in basic, simple, brief bodily activities, such as touching, breathing, chewing, walking, hearing, seeing, etc.

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.*

Adapted from the Serenity Prayer, by Reinhold Niebuhr (1892-1971)



Liking and Wanting

Liking and Wanting

- Distinct neural systems for liking and wanting
- In the brain: feeling/hedonic 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.

The Great Way is easy.

For one with no preferences.

Third Zen Patriarch

I make myself rich by making my wants few.

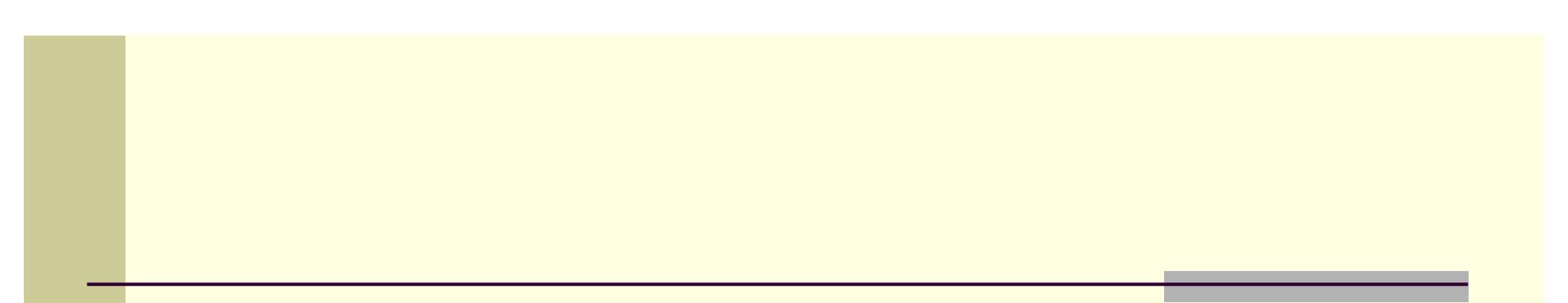
Henry David Thoreau

Practicing with Wanting

- Positive wants (e.g., practice, sobriety, love, aspirations) crowd out negative ones.
- Surround pleasant or unpleasant hedonic 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 predicted rewards - simplistic and inflated, from primitive subcortical regions. Explore healthy disenchantment.
- Pick a key want and just don't do it.

Feeling Rewarded

- What is already going alright in your life?
- What goals have you recently attained? What things have you recently accomplished?
- What are you glad about?
- What are you grateful for?



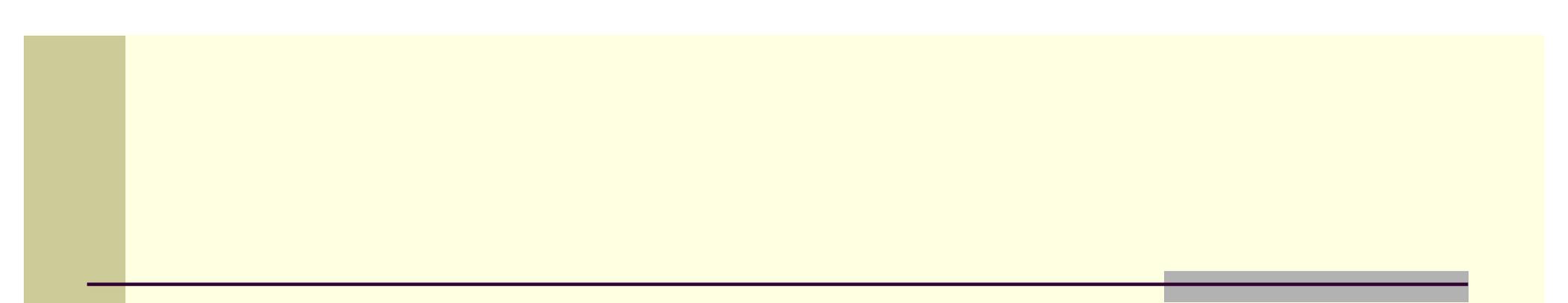
Clearing Old Pain

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 wholesomeness of mind.

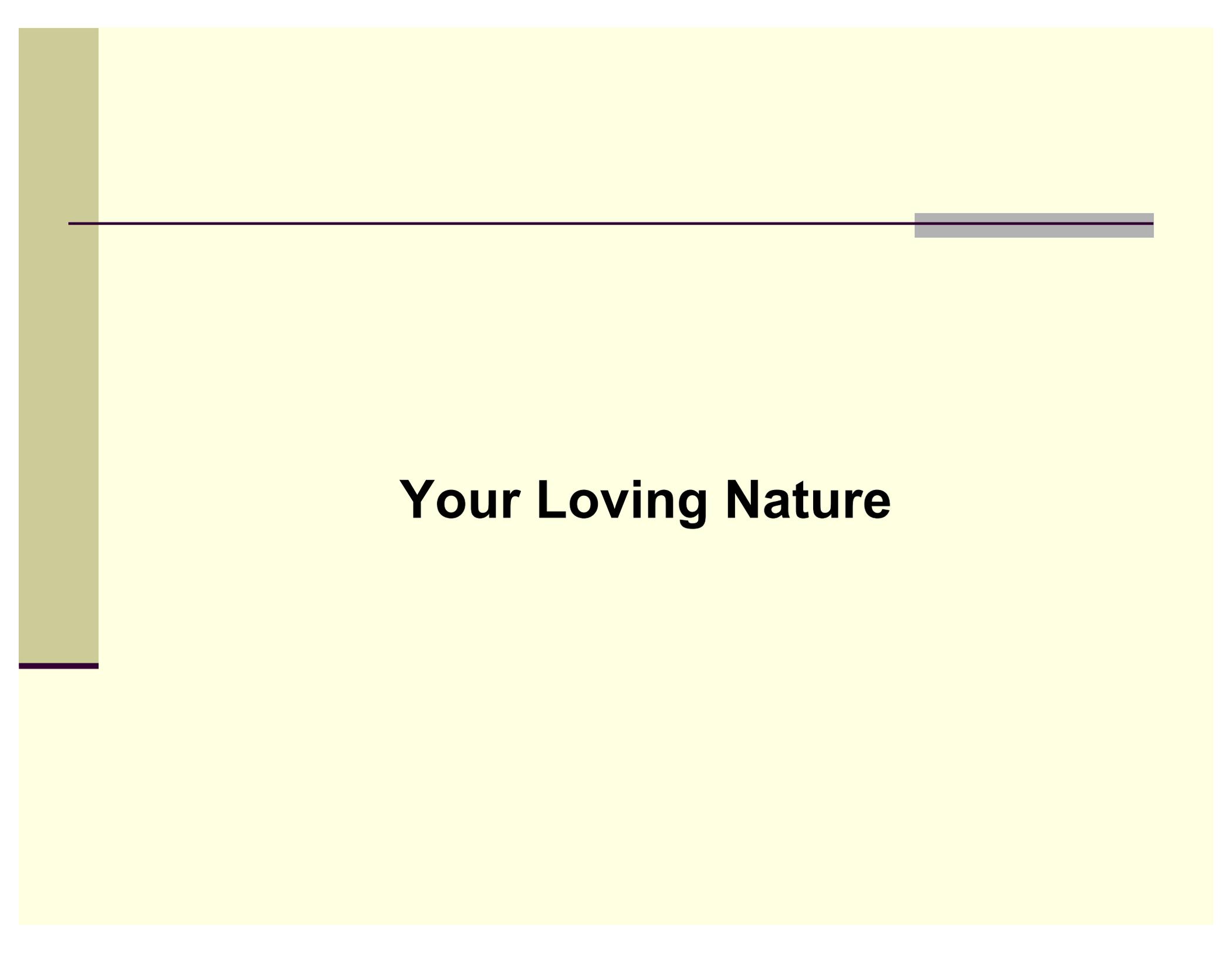


Working through an Upset

Practicing with Rejection and Hurt

RAINBOW:

- **Recognize** the experience
- **Acept** that it is what it is
- **Iinvestigate** it: textures and layers
- **Not-self** it: observe it without identifying with it; see its compounded nature; see the vast stream of causes of it
- **Breathe** and let go; activate PNS; release “wrong views”
- **Open** to new perspectives, feelings, and plans; find refuge
- **Welcome** that new wisdom into your being: take in the good so it becomes part of you



Your Loving Nature

The Social Brain

- Social capabilities have been a primary driver of brain evolution.
- Reptiles and fish avoid and approach. Mammals and birds *attach* as well - especially primates and humans.
- Mammals and birds have bigger brains than reptiles and fish.
- The more social the primate species, the bigger the cortex.
- Since the first hominids began making tools ~ 2.5 million years ago, the brain has roughly tripled in size, much of its build-out devoted to social functions (e.g., cooperative planning, empathy, language). The growing brain needed a longer childhood, which required greater pair bonding and band cohesion.

All sentient beings developed through natural selection in such a way that pleasant sensations serve as their guide, and especially the pleasure derived from sociability and from loving our families.

Charles Darwin

















PTP Art - Copyright - P.T. Blue Moon























*Ananda approached the Buddha and said,
“Venerable sir, this is half of the spiritual life:
good friendship, good companionship, good
comradeship.”*

*“Not so, Ananda! Not so Ananda!” the Buddha
replied. “This is the entire spiritual life. When you
have a good friend, a good companion, a good
comrade, it is to be expected that you will develop
and cultivate the Noble Eightfold Path.”*

[adapted from *In the Buddha's Words*, Bhikkhu Bodhi]

*In the cherry blossom's shade
there is no thing
as a stranger*

Issa



If there is anything I have learned about [people], it is that there is a deeper spirit of altruism than is ever evident.

Just as the rivers we see are minor compared to the underground streams, so, too, the idealism that is visible is minor compared to what people carry in their hearts unreleased or scarcely released.

(Hu)mankind is waiting and longing for those who can accomplish the task of untying what is knotted, and bringing these underground waters to the surface.

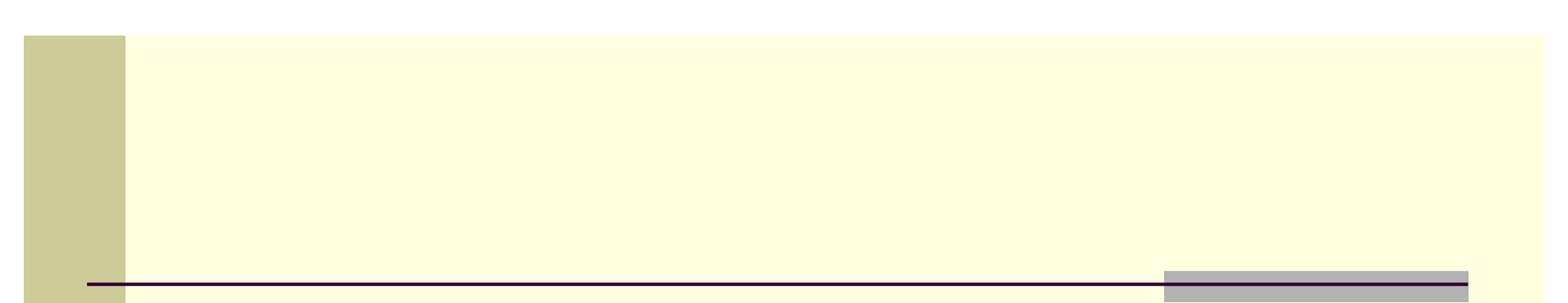
Albert Schweitzer











Two Wolves in the Heart

Us and Them

- Core evolutionary strategy: within-group cooperation, and between-group aggression.
- Both capacities and tendencies are hard-wired into our brains, ready for activation. And there is individual variation.
- Our biological nature is much more inclined toward cooperative sociability than toward aggression and indifference or cruelty. We are just very reactive to social distinctions and threats.
- That reactivity is intensified and often exploited by economic, cultural, and religious factors.
- Two wolves in your heart:
 - Love sees a vast circle in which all beings are “us.”
 - Hate sees a small circle of “us,” even only the self.

Which one will you feed?

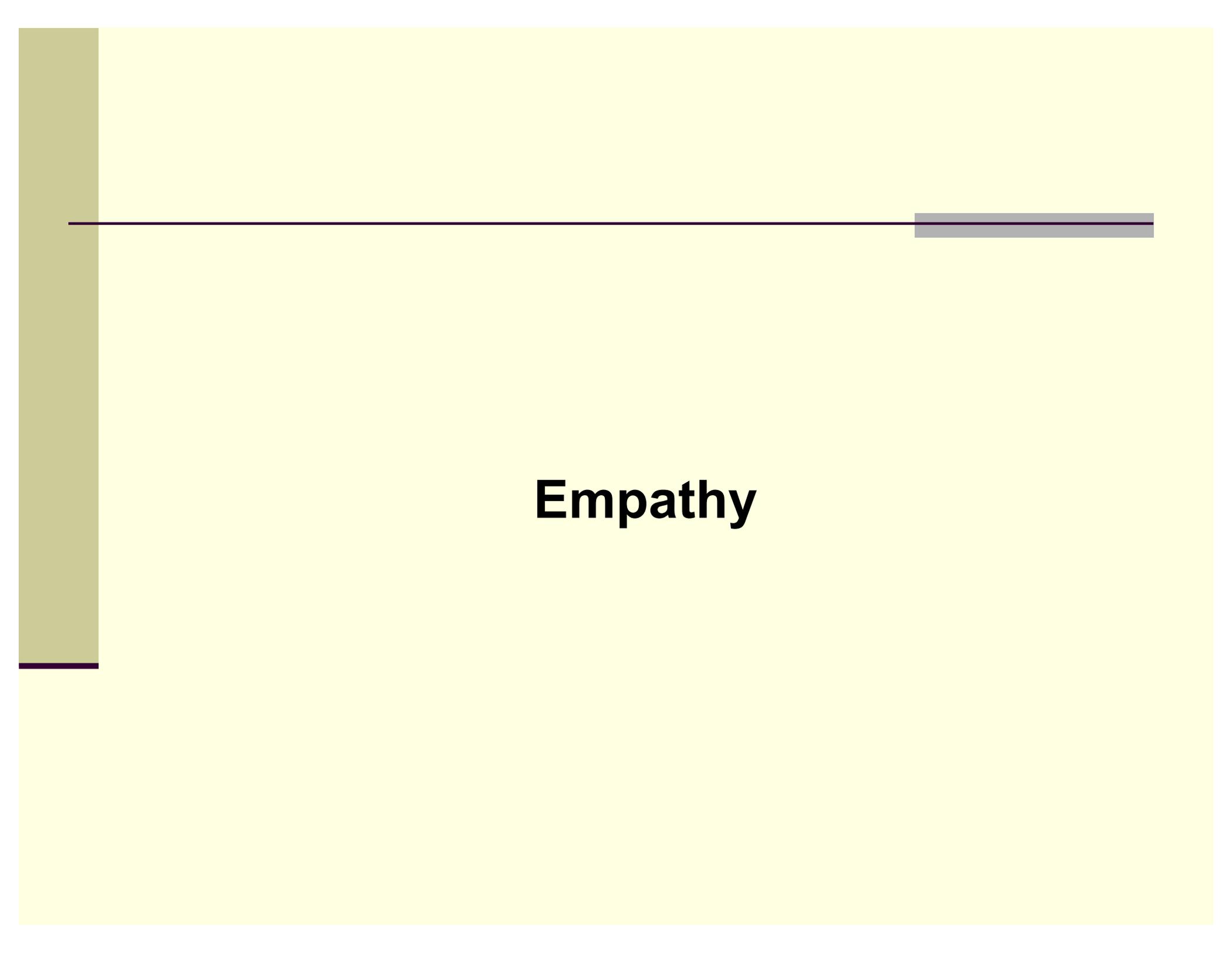
*In between-family fights, the baboon's 'I'
expands to include all of her close kin;
in within-family fights,
it contracts to include only herself.*

*This explanation serves for baboons
as much as for the Montagues and Capulets.*

Dorothy Cheney and Robert Seyfarth

Feeding the Wolf of Love

- Focus on similarities between “us” and “them.”
- Consider others as young children.
- Notice good things about neutral or unpleasant people.
- Bring to mind the sense of someone who cares about you.
- Keep extending out the sense of “us” to include everyone.
- Consider others as your mother or dear friend in a past life.
- Restraint about over-identifying with “us”
- Reflect on the suffering of so many people in the world.
- Self-generate feelings of kindness and love.



Empathy

What Is Empathy?

- It is sensing, feeling, and understanding how it is for the other person. In effect, you *simulate* his or her inner world.
- It involves (sometimes subtly) all of these elements:
 - Bodily resonance
 - Emotional attunement
 - Conceptual understanding
- Empathy is usually communicated, often tacitly.
- We can give empathy, we can receive it, and we can ask for it.

Neural Substrates of Empathy

- Three *simulating* systems:
 - Actions: “mirror” systems; temporal-parietal
 - Feelings: resonating emotionally; insula
 - Thoughts: “theory of mind”; prefrontal cortex
- These systems interact with each other through association and active inquiry.
- They produce an automatic, continual re-creation of aspects of others’ experience.

Empathy Skills

- Pay attention.
- Be open.
- Read emotion in face and eyes.
- Sense beneath the surface.
- Drop aversion (judgments, distaste, fear, anger, withdrawal).
- Investigate actively.
- Express empathic understanding:
 - Reflect the content
 - Resonate with the tone and implicit material
 - Questions are fine
 - Offer respect and wise speech throughout

**Can you attend to the postures, facial expressions,
and movements of another person?**

**Can you attune to and feel something of the
emotions of another person?**

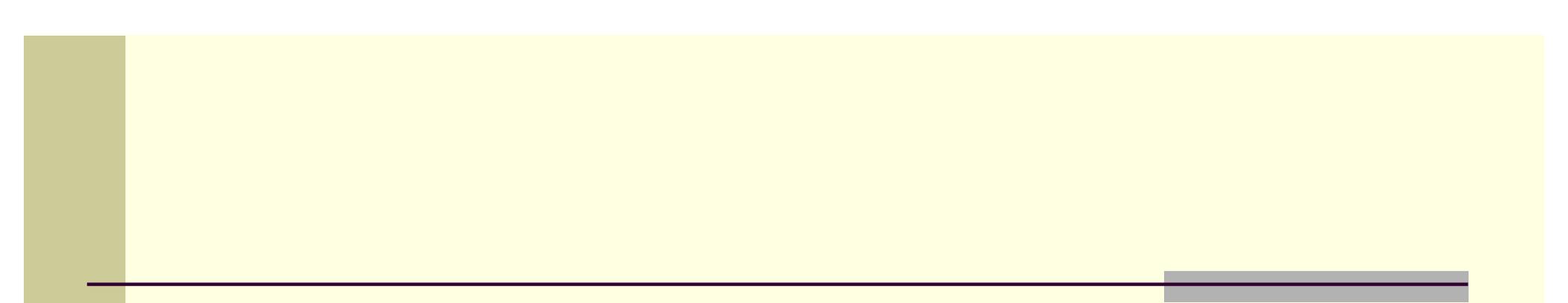
**Can you have some sense of the thoughts, hopes,
and concerns of another person?**

Reflections about Empathy

- You're more likely to get empathy if you're:
 - Open, present
 - Honest, real, authentic
 - Reasonably clear
 - Responsible for your own experience
 - Taking it in when you feel felt
- Empathy can be negotiated:
 - Name it as a topic in the relationship
 - Follow NVC format: "When X happens, I feel Y, because I need Z. So I request _____."
 - Stay with it.

*If we could read the secret history
of our enemies,
we should find in each [person's] life
sorrow and suffering enough
to disarm any hostility.*

Henry Wadsworth Longfellow



Compassion and Lovingkindness



The Wisdom of Connection

A human being is a part of a whole, called by us "universe," a part limited in time and space. He experiences himself, his thoughts and feelings as something separated from the rest... a kind of optical delusion of his consciousness.

This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us.

Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty.

Albert Einstein

The Buddha's Words on Lovingkindness

Wishing: In gladness and in safety, may all beings be at ease.

Omitting none, whether they are weak or strong, the great or the mighty, medium, short, or small, the seen and the unseen, those living near and far away, those born and to-be-born: May all beings be at ease.

Let none through anger or ill-will wish harm upon another. Even as a mother protects with her life her child, her only child, so with a boundless heart should one cherish all living beings; radiating kindness over the entire world: spreading upwards to the skies, and downwards to the depths, outwards and unbounded, freed from hatred and ill-will.

One should sustain this recollection.

This is said to be the sublime abiding.

When others address you, their speech may be timely or untimely, true or untrue, gentle or harsh, connected with good or harm, and connected with a mind of loving-kindness or inner hate.

You should train thus: My mind will remain unaffected, and I shall utter no evil words; I shall abide compassionate for their welfare, pervading them with a mind of loving-kindness, and pervading the all-encompassing world with a mind that is abundant, exalted, immeasurable, without hostility and without ill will.

Even if bandits were to sever you savagely limb by limb with a two-handed saw, anyone giving rise to a mind of hate would not be carrying out my teaching.

You should train thus: My mind will remain unaffected, and I shall utter no evil words; I shall abide compassionate for their welfare, pervading them with a mind of loving-kindness, and pervading the all-encompassing world with a mind that is abundant, exalted, immeasurable, without hostility and without ill will.

Lovingkindness Practice

- Types of wishes

- Safety
- Health
- Happiness
- Ease

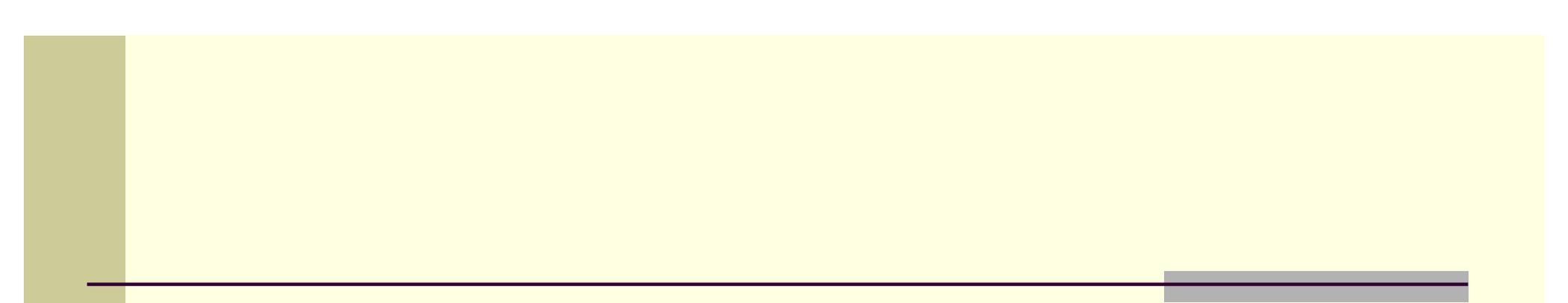
- Types of beings

- Self
- Benefactor
- Friend
- Neutral
- Difficult

- Continually “omitting none” in all directions

Feeding the Wolf of Love

- Focus on similarities between “us” and “them.”
- Consider others as young children.
- Notice good things about neutral or unpleasant people.
- Bring to mind the sense of someone who cares about you.
- Keep extending out the sense of “us” to include everyone.
- Consider others as your mother or dear friend in a past life.
- Restraint about over-identifying with “us”
- Reflect on the suffering of so many people in the world.
- Self-generate feelings of kindness and love.



Relationship Virtues

Wise Speech

- Well-intended
- True
- Beneficial
- Timely
- Expressed without harshness
- If possible: wanted

*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

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

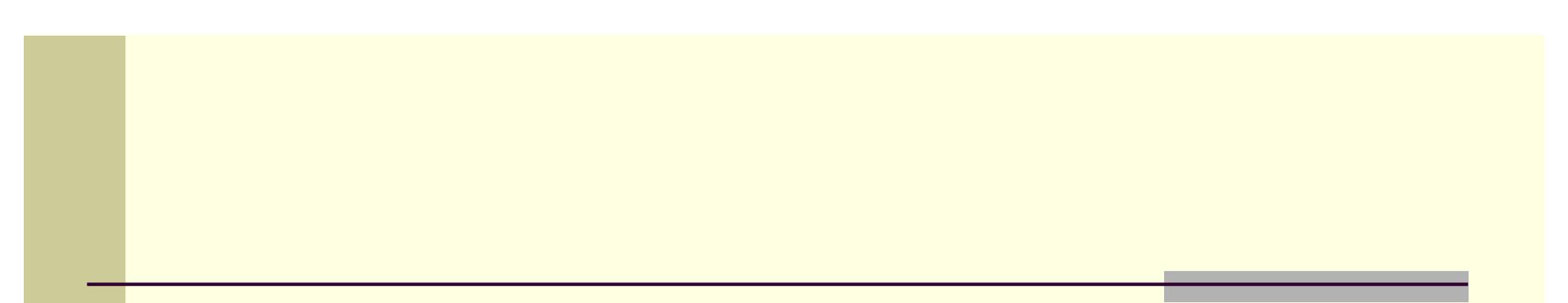
*If you let go a lot,
you will have a lot of happiness.*

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

Ajahn Chah

Benefits of Unilateral Virtue

- It simplifies things: all you have to do is live by your own code, and others will do whatever they do.
- It feels good in its own right; it brings peace of mind, “the bliss of blamelessness.”
- It minimizes inflammatory triggers, and encourages good behavior in others.
- It stands you on the moral high ground.
- It teaches you what you can ask for from others



Assertiveness

Healthy Assertiveness

What it is: Speaking your truth and pursuing your aims in the context of relationships

What supports it:

- Being on your own side
- Self-compassion
- Naming the truth to yourself
- Refuges: Three Jewels, reason, love, nature, God
- Taking care of the big things so you don't grumble about the little ones
- Health and vitality

Healthy Assertiveness: How to Do It - 1

- Know your aims; stay focused on the prize; lose battles to win wars
- Ground in empathy, compassion, and love
- Practice unilateral virtue

Healthy Assertiveness: How to Do It - 2

- Communicate for yourself, not to change others
 - Wise Speech; be especially mindful of tone
 - NVC: “When X happens, I feel Y because I need Z.”
 - Dignity and gravity
 - Distinguish empathy building (“Y”) from policy-making
- If appropriate, negotiate solutions
 - Establish facts as best you can (“X”)
 - Find the deepest wants (“Z”)
 - Focus mainly on “from now on”
 - Make clear plans, agreements
 - Scale relationships to their actual foundations

So that all cubs are our own . . .
So that all beings are our clan . . .
All life, our relatives . . .
The whole earth, our home . . .

*May you know love, joy, wonder, and wisdom,
in this life, just as it is.*

Thank you!

Penetrative insight

joined with calm abiding

utterly eradicates

afflicted states.

Shantideva

Great Books

See www.RickHanson.net for other great books.

- Austin, J. 2009. *Selfless Insight*. MIT Press.
- Begley, S. 2007. *Train Your Mind, Change Your Brain*. Ballantine.
- Carter, C. 2010. *Raising Happiness*. Ballantine.
- Hanson, R. (with R. Mendius). 2009. *Buddha's Brain: The Practical Neuroscience of Happiness, Love, and Wisdom*. New Harbinger.
- Johnson, S. 2005. *Mind Wide Open*. Scribner.
- Keltner, D. 2009. *Born to Be Good*. Norton.
- Kornfield, J. 2009. *The Wise Heart*. Bantam.
- LeDoux, J. 2003. *Synaptic Self*. Penguin.
- Linden, D. 2008. *The Accidental Mind*. Belknap.
- Sapolsky, R. 2004. *Why Zebras Don't Get Ulcers*. Holt.
- Siegel, D. 2007. *The Mindful Brain*. Norton.
- Thompson, E. 2007. *Mind in Life*. Belknap.

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.
- Braver, T. & Cohen, J. 2000. On the control of control: The role of dopamine in regulating prefrontal function and working memory; in *Control of Cognitive Processes: Attention and Performance XVIII*. Monsel, S. & Driver, J. (eds.). MIT Press.
- Carter, O.L., Callistemon, C., Ungerer, Y., Liu, G.B., & Pettigrew, J.D. 2005. Meditation skills of Buddhist monks yield clues to brain's regulation of attention. *Current Biology*. 15:412-413.

Key Papers - 2

- Davidson, R.J. 2004. Well-being and affective style: neural substrates and biobehavioural correlates. *Philosophical Transactions of the Royal Society*. 359:1395-1411.
- Farb, N.A.S., Segal, Z.V., Mayberg, H., Bean, J., McKeon, D., Fatima, Z., and Anderson, A.K. 2007. Attending to the present: Mindfulness meditation reveals distinct neural modes of self-reflection. *SCAN*, 2, 313-322.
- Gillihan, S.J. & Farah, M.J. 2005. Is self special? A critical review of evidence from experimental psychology and cognitive neuroscience. *Psychological Bulletin*, 131:76-97.
- Hagmann, P., Cammoun, L., Gigandet, X., Meuli, R., Honey, C.J., Wedeen, V.J., & Sporns, O. 2008. Mapping the structural core of human cerebral cortex. *PLoS Biology*. 6:1479-1493.
- Hanson, R. 2008. Seven facts about the brain that incline the mind to joy. In *Measuring the immeasurable: The scientific case for spirituality*. Sounds True.

Key Papers - 3

- 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.
- Lewis, M.D. & Todd, R.M. 2007. The self-regulating brain: Cortical-subcortical feedback and the development of intelligent action. *Cognitive Development*, 22:406-430.
- Lieberman, M.D. & Eisenberger, N.I. 2009. Pains and pleasures of social life. *Science*. 323:890-891.
- Lutz, A., Greischar, L., Rawlings, N., Ricard, M. and Davidson, R. 2004. Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *PNAS*. 101:16369-16373.
- Lutz, A., Slager, H.A., Dunne, J.D., & Davidson, R. J. 2008. Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences*. 12:163-169.

Key Papers - 4

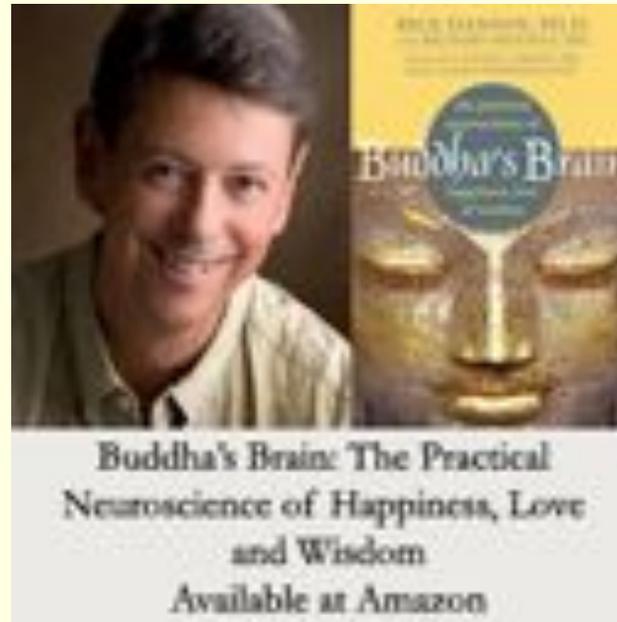
- Rozin, P. & Royzman, E.B. 2001. Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, 5:296-320.
- Takahashi, H., Kato, M., Matsuura, M., Mobbs, D., Suhara, T., & Okubo, Y. 2009. When your gain is my pain and your pain is my gain: Neural correlates of envy and schadenfreude. *Science*, 323:937-939.
- Tang, Y.-Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., Yu, Q., Sui, D., Rothbart, M.K., Fan, M., & Posner, M. 2007. Short-term meditation training improves attention and self-regulation. *PNAS*, 104:17152-17156.
- Thompson, E. & Varela F.J. 2001. Radical embodiment: Neural dynamics and consciousness. *Trends in Cognitive Sciences*, 5:418-425.
- Walsh, R. & Shapiro, S. L. 2006. The meeting of meditative disciplines and Western psychology: A mutually enriching dialogue. *American Psychologist*, 61:227-239.

Where to Find Rick Hanson Online



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

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



www.RickHanson.net

www.WiseBrain.org