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*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

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# ***Natural Contentment And Brain Evolution***

**Barre Center for Buddhist Studies**

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# Topics

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- **Self-directed neuroplasticity**
- **The evolving brain**
- **Responsive and reactive modes**
- **Taking the fruit as the path**

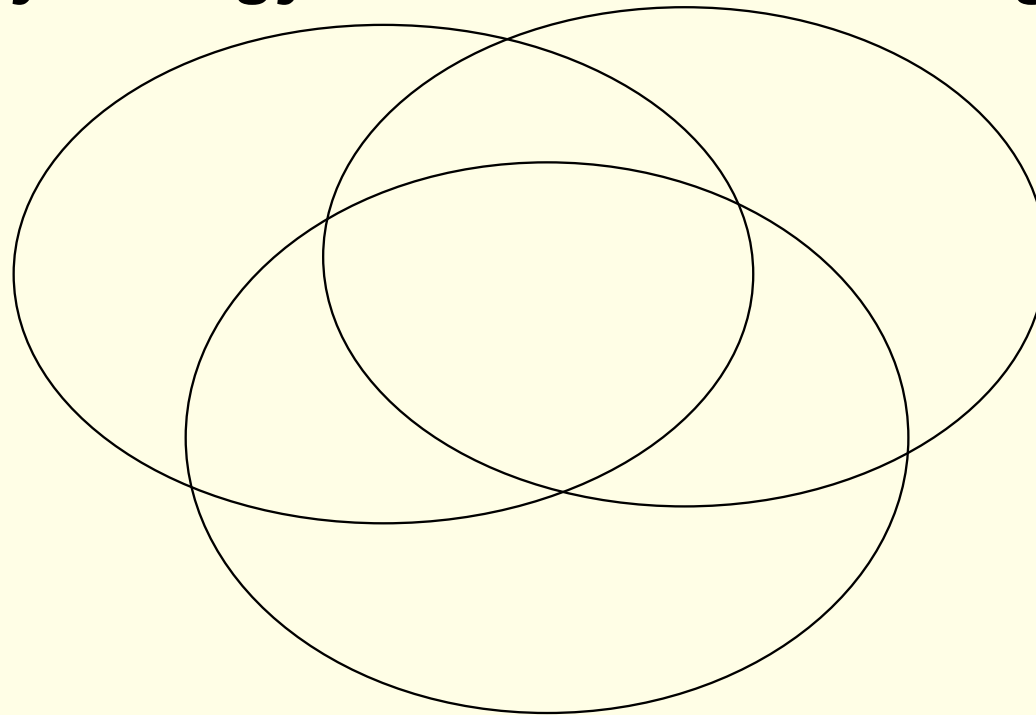


# Perspectives

# Common - and Fertile - Ground

***Psychology***

***Neurology***



***Buddhism***

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*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

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*Do not go by oral tradition, by lineage of teaching, by hearsay, by a collection of texts, by logic, by inferential reasoning, by reasoned cognition, by the acceptance of a view after pondering it, by the seeming competence of a speaker, or because you think, "this . . . is our teacher."*

*But when you know for yourselves, "these things are wholesome, these things are blameless; these things are praised by the wise; these things, if undertaken and practiced, lead to welfare and happiness," then you should engage in them.*

The Buddha

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

*What do you do?*

John Maynard Keynes



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***"We ask, 'What is a thought?'"***

***We don't know,***

***yet we are thinking continually."***

- Ven. Tenzin Palmo

# Domains of Intervention

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- 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

# Mindfulness, Virtue, Wisdom

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- **Mindfulness** (or “concentration”), **virtue**, and **wisdom** are identified in Buddhism and other contemplative traditions as the pillars of practice.
- In Western psychology, these are the foundations of mental health and well-being.
- These three pillars map to three core functions of the nervous system:
  - Receiving/learning
  - Regulating
  - Prioritizing/selecting

# “Know the Mind, Shape the Mind, Free the Mind”

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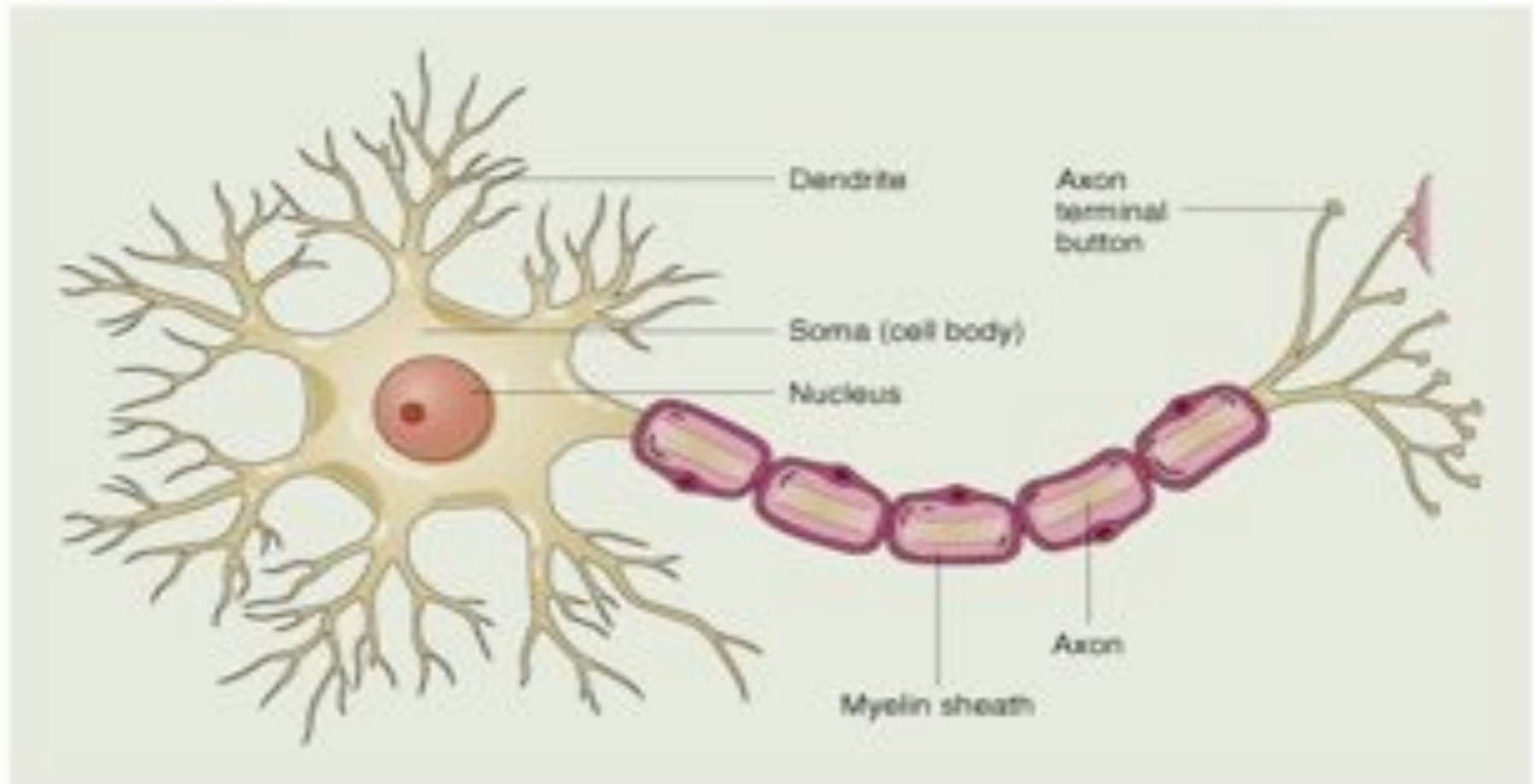
- **Mindfulness, virtue, and wisdom** - and their neural correlates - also map to three phases of practice:
  - Be aware of the garden, pull weeds, plant flowers.
  - Be mindful of, release, replace.
  - Let be, let go, let in.
- People vary in their inclinations and strengths with the phases.
- Sometimes we need to take in resources in the third phase in order to bear our own experience.
- 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.



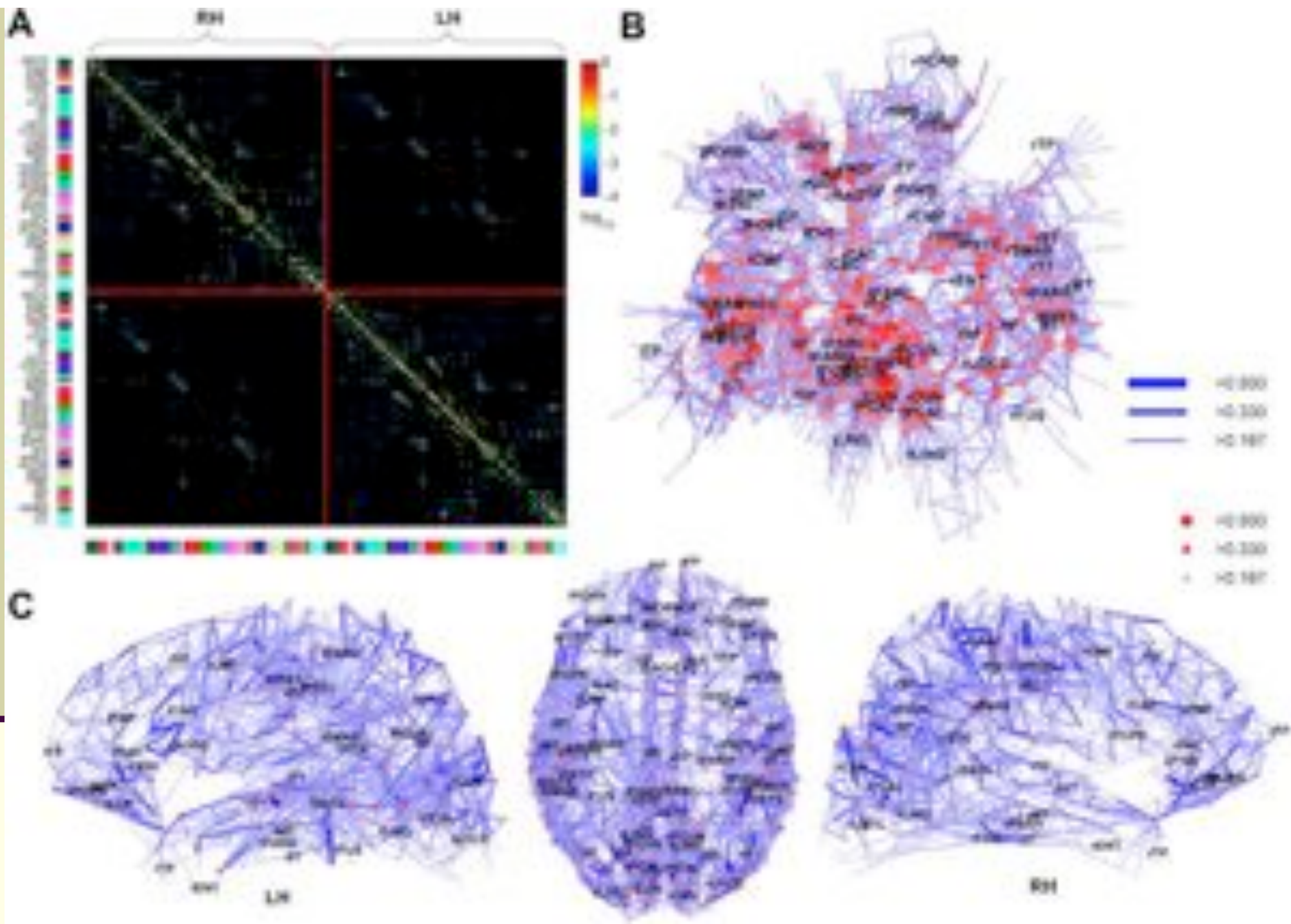
# **Self-Directed Neuroplasticity**



# A Neuron









# The Mind/Brain System

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- “Mind” = flow of information within the nervous system
  - Information is represented by the nervous system.
  - Most mind is unconscious; awareness is part of mind.
  - The headquarters of the nervous system is the brain.
- In essence then, apart from hypothetical transcendental factors, your mind *is* what your 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.

# Fact #1

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As your brain changes, your mind changes.



# Fact #2

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## As your mind changes, your brain changes.

Immaterial mental activity maps to material neural activity.

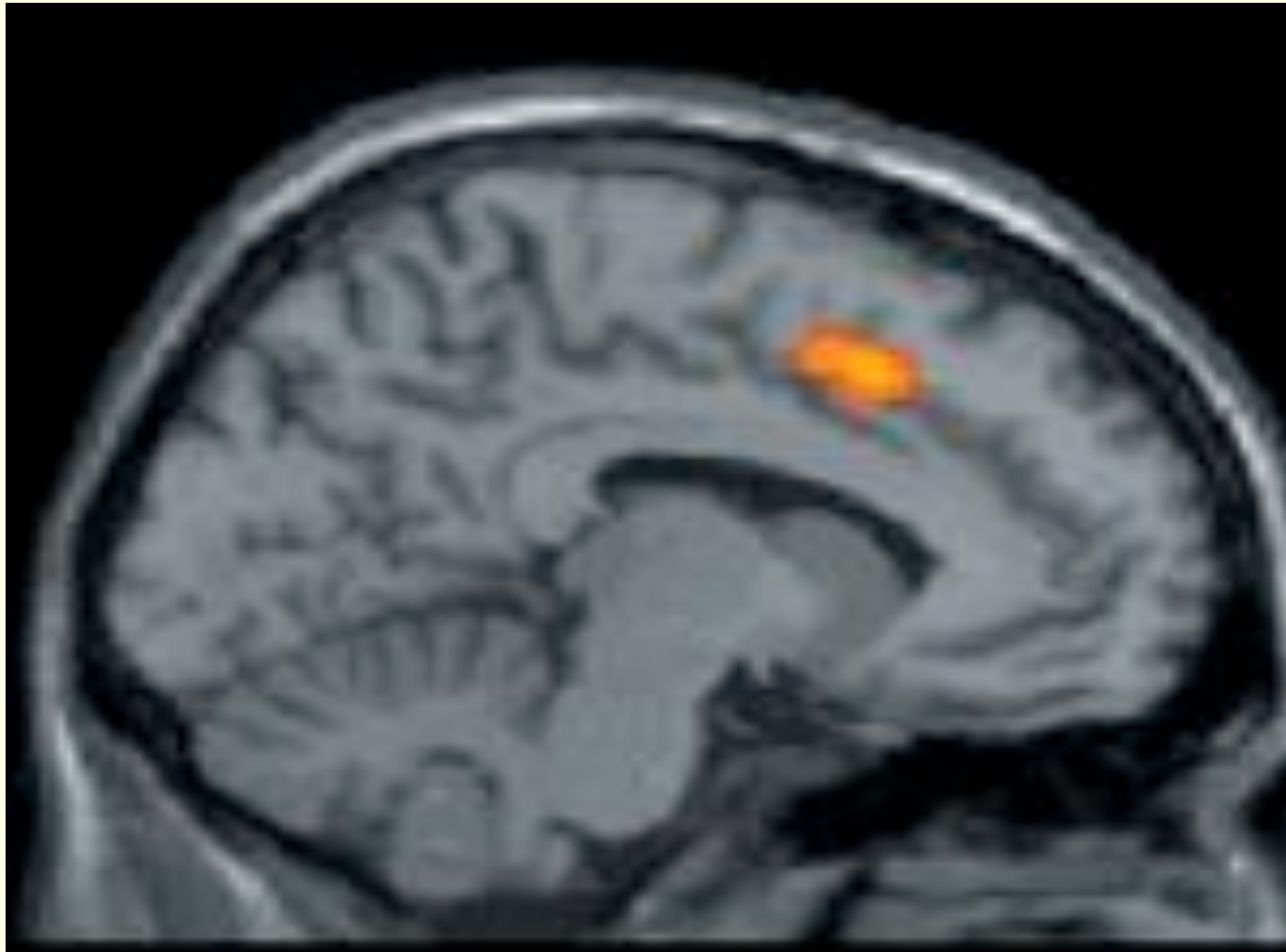
This produces temporary changes in your brain and lasting ones.

*Temporary* changes include:

- Alterations in brainwaves (= changes in the firing patterns of synchronized neurons)
- Increased or decreased use of oxygen and glucose
- Ebbs and flows of neurochemicals

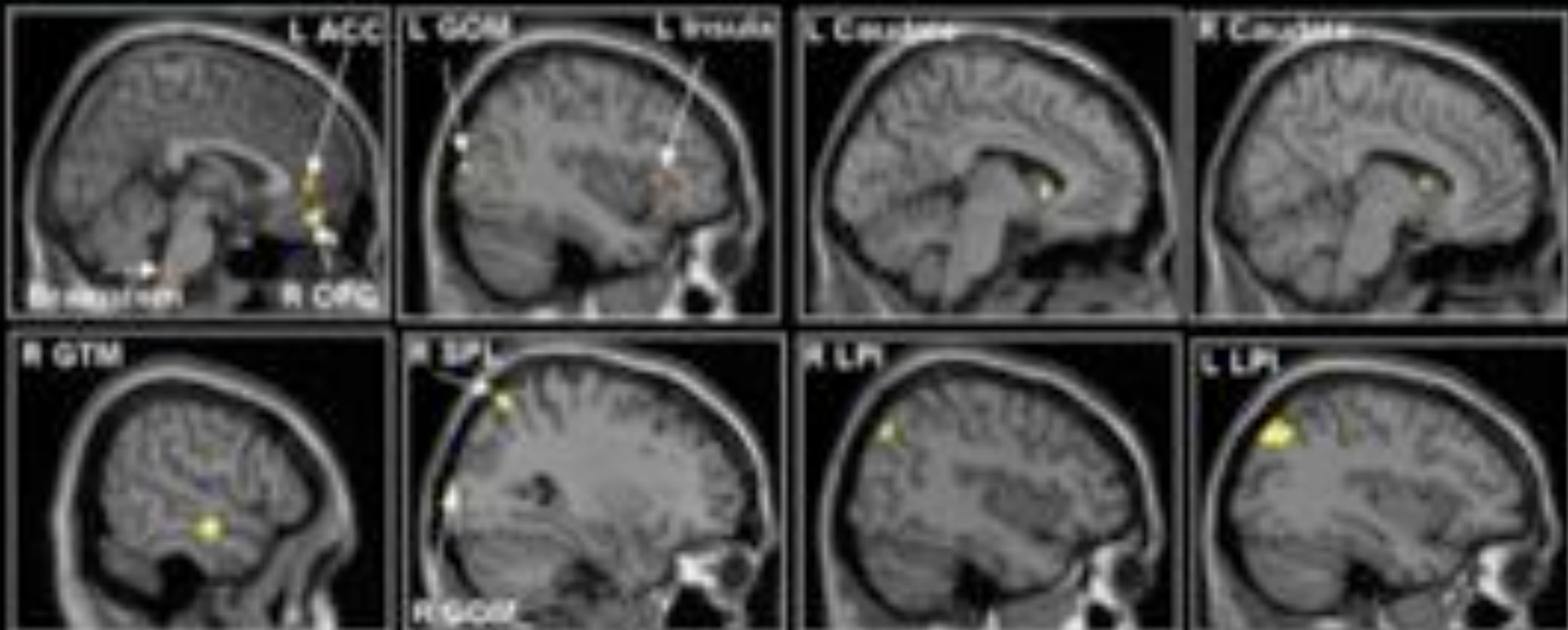
# “Ardent, Diligent, Resolute, and Mindful”

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# Christian Nuns, Recalling Profound Spiritual Experiences

Mystical > Baseline



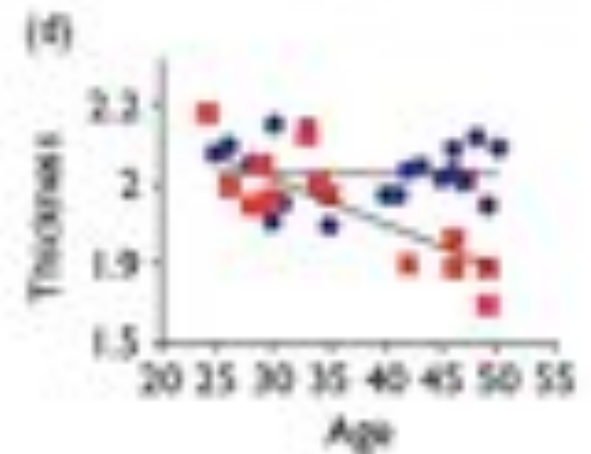
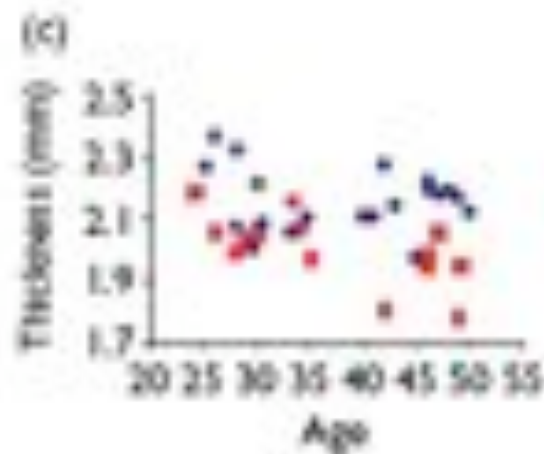
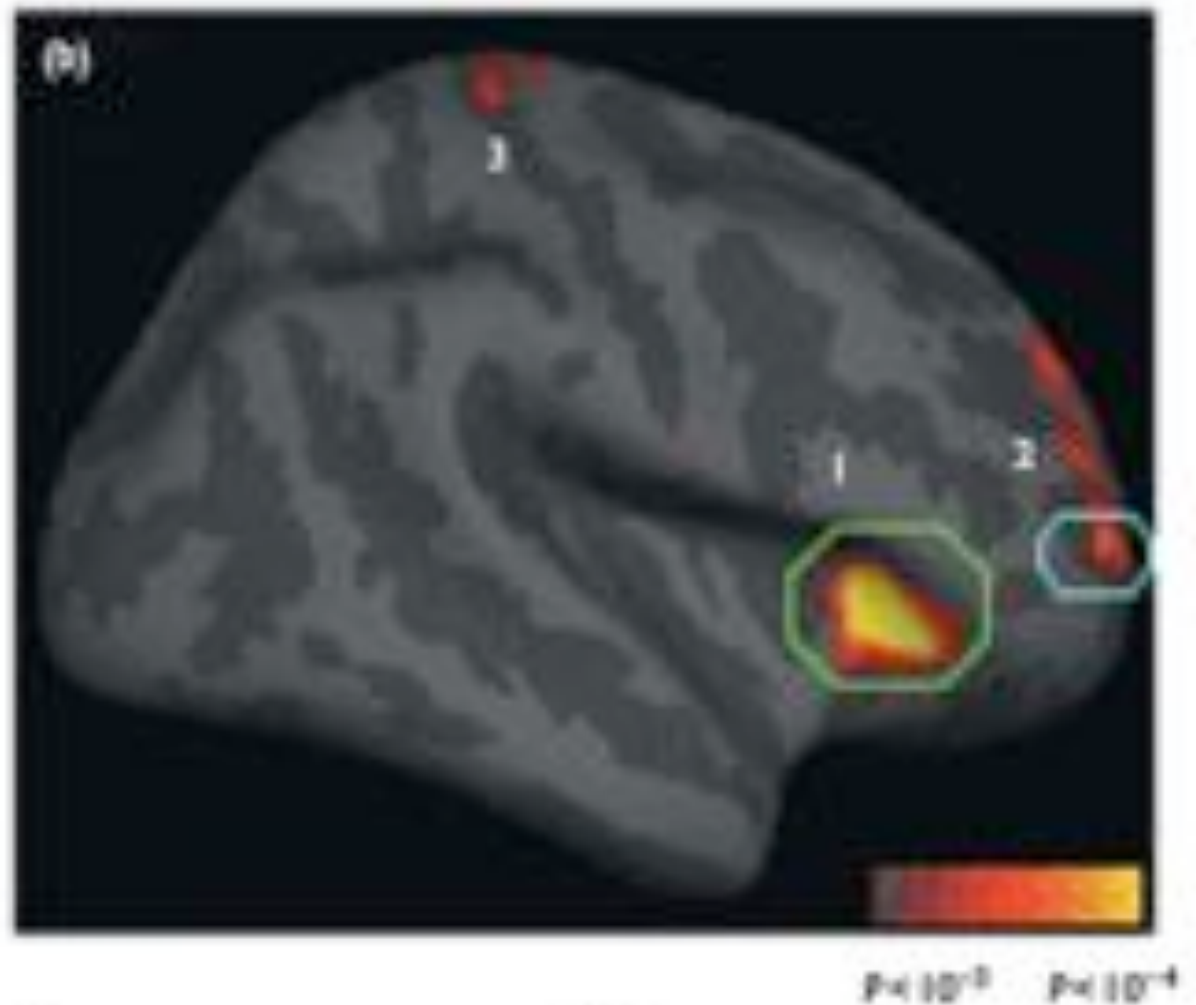
# Mind Changes Brain in Lasting Ways

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- 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.



# Physical Effects of Meditation

---

- Thickens and strengthens anterior (frontal) cingulate cortex and insula. Results include improved attention, empathy, and compassion.
- Less cortical thinning with aging
- Increases activation of left frontal regions, which lifts mood
- Increases power and reach of gamma-range brainwaves
- Decreases stress-related cortisol
- Stronger immune system



# Honoring Experience

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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

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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?***

# The Power of Mindfulness

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- 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

# Compassion

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

Pema Chodren

# Self-Compassion

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

# “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



# **Foundations of Meditation**

# Basics of Meditation

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



# Foundations of Meditation

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- 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



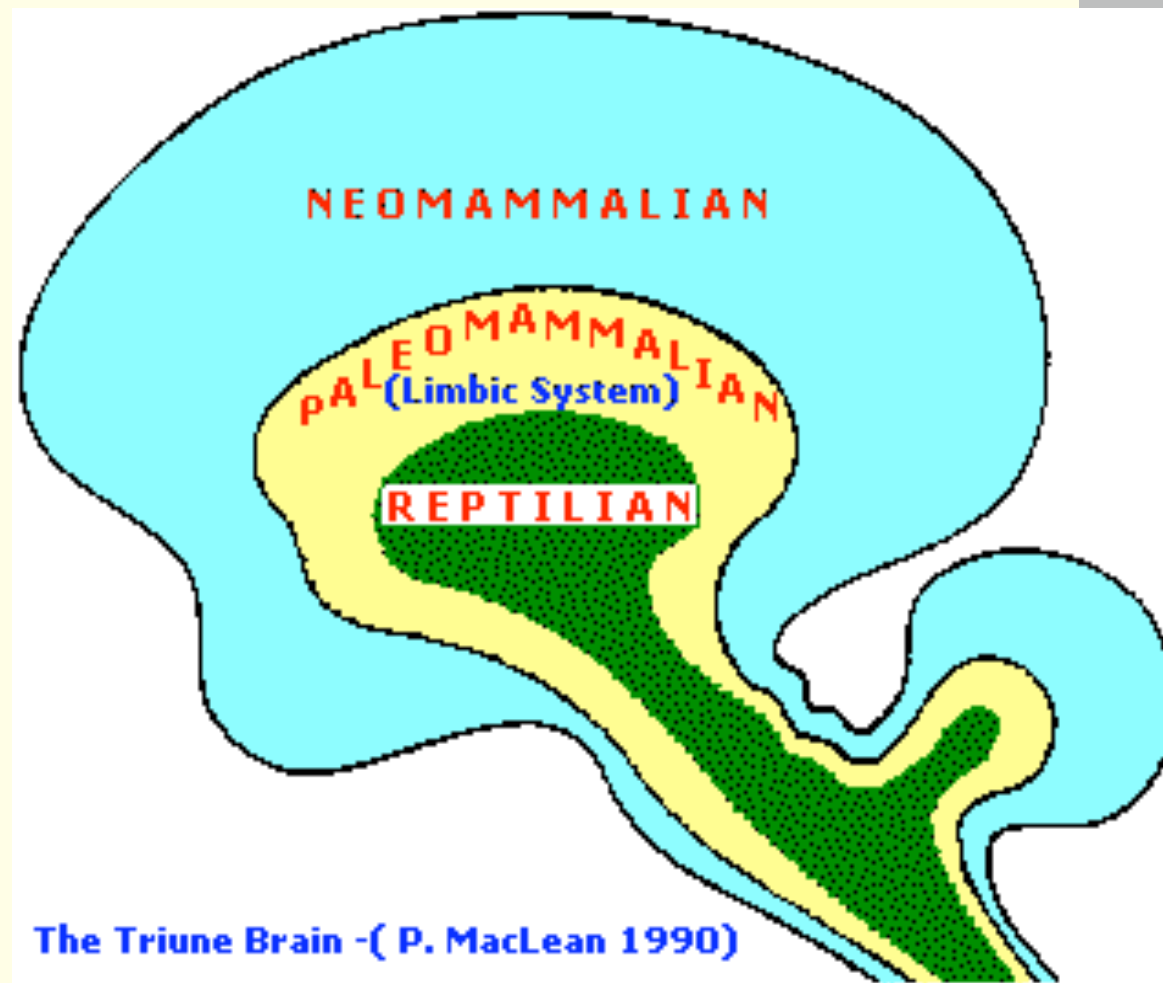
# **The Evolving Brain**

# Evolution

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- ~ 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

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## ■ 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”

# Three Motivational Systems

---

- **Avoid** “sticks,” threats, penalties, pain
  - **Approach** “carrots,” opportunities, rewards, pleasure
  - **Attach** to “us,” for proximity, bonds, feeling close
- 
- Although the three branches of the vagus nerve loosely map to the three systems, the essence of each is its aim, not its neuropsychology. Each system can draw on another system for its ends.

# Love and the Brain

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- Social capabilities have been a primary driver of brain evolution.
- Reptiles and fish avoid and approach. Mammals and birds also *attach* - especially primates and humans. Attaching is a breakthrough, co-evolving with emotion.
- 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







# **Natural Happiness**

# Reverse Engineering the Brain

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*What is 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

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# Some Benefits of Responsive Mode

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- 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.



---

*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

# Benefits of Positive Emotions

---

- Emotions organize the brain as a whole, so positive ones have far-reaching benefits.
- These include:
  - Promote exploratory, “approach” behaviors
  - Lift mood; increase optimism, resilience
  - Counteract trauma
  - Strengthen immune and protect cardiovascular systems
  - Overall: “broaden and build”
  - Create positive cycles

# But to Survive, We Leave Home . . .

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- **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

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# The Evolution of Suffering

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- 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

# Negativity Bias: Causes in Evolution

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- “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.

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**With the negativity bias, the Avoid system hijacks the Approach and Attach systems, inhibiting them or using them for its ends.**

# Negativity Bias: Physiology and Neuropsychology

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- Physiology:
  - Greater bodily arousal to negative stimuli
  - Pain is produced anywhere; pleasure is circumscribed.
- Neuropsychology:
  - Separate, low-level systems for negative and positive stimuli
  - Right hemisphere specialized for negative stimuli
  - Greater brainwave responses to negative stimuli
  - ~ 65% of amygdala sifts for negative stimuli
  - The amygdala-hippocampus system flags negative experiences prominently in memory: *like Velcro for negative experiences but Teflon for positive ones.*
  - More negative “basic” emotions than positive ones



# 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)

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- 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."

# Health Consequences of Chronic Stress

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## ■ 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 for women)
- Primes aversion (SNS-HPAA negativity bias)

# Reactive Dysfunctions in Each System

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

# A Poignant Truth

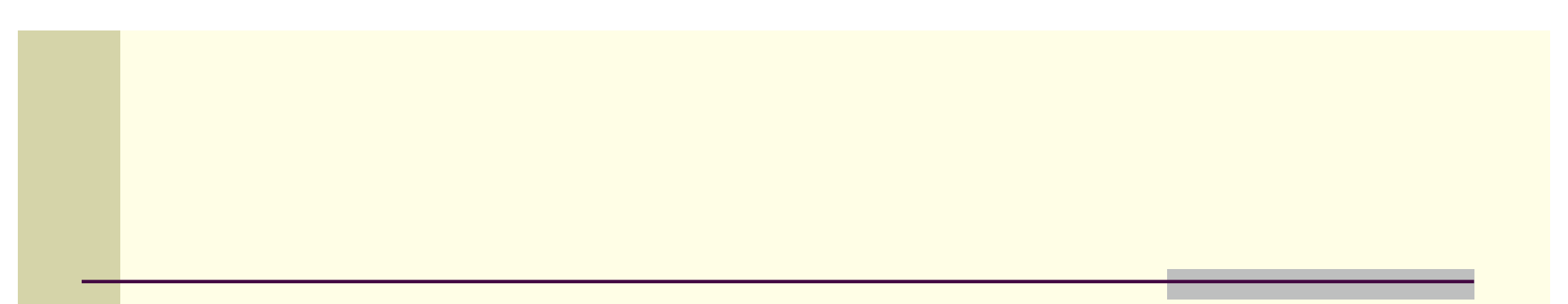
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Mother Nature is tilted toward producing gene copies.

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**



---

**How to come home?**

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

# Coming Home . . .

---

**Gladness**

**Love**

**Peace**

# Ways to “Take the Fruit as the Path”

---

General factors: See clearly. Have compassion for yourself. Take life less personally. Take in the good. Deepen equanimity.

## Approach system

- Be glad.
- Appreciate your resources.
- Give over to your best purposes.

## Attach system

- Sense the suffering in others.
- Be kind.
- Act with unilateral virtue.

## Avoid system

- Cool the fires.
- Recognize paper tigers.
- Tolerate risking the dreaded experience.



# Foundations

# Liking and Wanting

---

- Distinct neural systems for liking and wanting
- In the brain: feeling tone --> enjoying --> wanting --> pursuing
  - Wanting without enjoying is a hell.
  - Enjoying without wanting is a middle way.
- 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. Consider the frequent, blunt admonitions in the dharma against indulging in sensual pleasure.

---

*I make myself rich by making my wants few.*

Henry David Thoreau

---

*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



---

*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

# “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.

---

*For one who clings motion exists, but for one who does not  
cling there is no motion.*

*Where no motion is, there is stillness.*

*Where stillness is, there is no craving.*

*Where no craving is, there is neither coming nor going.*

*Where no coming or going is there is neither arising nor  
passing away.*

*Where neither arising nor passing away is, there is neither  
this world, nor a world beyond nor a state between.*

*This verily, is the end of suffering.*

The Buddha, Udana 8:3

---

*Blissful is passionlessness in the world,  
The overcoming of sensual desires;  
But the abolition of the conceit I am --  
That is truly the supreme bliss.*

The Buddha, Udāna 2.11

# Heartwood

---

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

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

The Buddha



**Gladness**

---

**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 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.



# Kinds of “Good” to Take in

---

- 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
  
- Things are alright; nothing is wrong; there is no threat
- Feeling safe and strong
- The peace and relief of forgiveness
  
- Recognizing your positive character traits
- Spiritual or existential realizations



**Love**

---

*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]



# 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.

# 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.*

# Benefits of Unilateral Virtue

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- 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.*



**Peace**



# Cooling the Fires

---

- Regard stressful activation as an affliction.
- Lots of methods for stimulating the parasympathetic nervous system to down-regulate the SNS:
  - Big exhalation
  - Relaxing the body
  - Yawning
  - Fiddling the lips
- Get in the habit of rapidly activating a damping cascade when the body activates.
- Regard bodily activation as just another compounded, “meaningless,” and impermanent phenomenon; don’t react to it.

# Not Harming

---

- The fundamental tenet of morality in Buddhism and other traditions
- Applies to oneself as well as others
- Precepts; Right Speech, Action, Livelihood
- The emphasis on abandoning ill will
- The distinction between moral action in the world and succumbing to anger and ill will
- The reframing of not-doing in active, doing terms

---

*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

# Feeling as Safe as You Reasonably Can

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- Connecting with others; finding allies; internalizing self-encouraging, -nurturing, -soothing resources
- Feeling strong
- Waking up from Threat Level Orange:
  - Recognizing real threats
  - Not getting alarmed at paper tigers
  - Seeing opportunities clearly
  - Recognizing all your inner and outer resources for dealing with threats and fulfilling opportunities

---

*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

---

*Penetrative insight*

*joined with calm abiding*

*utterly eradicates*

*afflicted states.*

Shantideva

# Great Books

---

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

- Austin, J. 2009. *Selfless Insight*. MIT Press.
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See [www.RickHanson.net](http://www.RickHanson.net) for other scientific papers.

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## *Where to Find Rick Hanson Online*

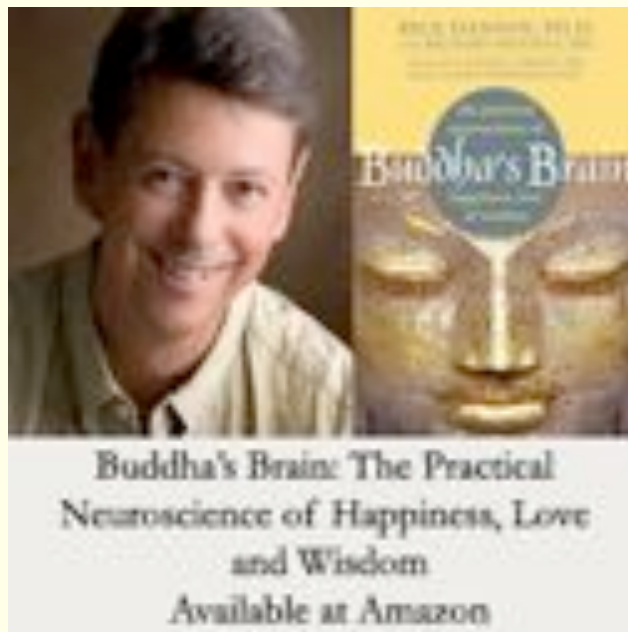
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<http://www.youtube.com/BuddhasBrain>



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

# Feeding the Wolf of Love

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- 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.
- Sila/restraint about over-identifying with “us”
- Reflect on the suffering of so many people in the world.
- Self-generate feelings of kindness and love.