

Neurodharma:

Exploring Buddhist Themes in the Brain

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Topics

- **Perspectives**
- **Grounding the mind in nature**
- **Strengthening conviction**
- **Deepening insight:**
 - **The evolution of dukkha**
 - **Natural happiness**
 - **The negativity bias**
- **Right Mindfulness and Right Effort**



Perspectives

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.

*Great questioning, great enlightenment;
little questioning, little enlightenment;
no questioning, no enlightenment.*

Dogen

We ask, "What is a thought?"

We don't know,

yet we are thinking continually.

Venerable Tenzin Palmo

Why Keep the Brain in Mind?

- **Grounds the mind in nature, in life**
- **Supports conviction and thus motivation**
- **Deepens insight**
- **Highlights Right Mindfulness and Right Effort**
- **Can enhance practice**



Grounding the Mind in Nature

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







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

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

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

The Mind/Brain System

- “Mind” = flow of information within the nervous system:
 - Information is represented by the nervous system.
 - Most mind is unconscious; awareness is an aspect of mind.
 - The headquarters of the nervous system is the brain.
- In essence then, apart from hypothetical transcendental factors, the mind *is* what the brain *does*.
- Brain = necessary, *proximally* sufficient condition for mind:
 - The brain depends on the nervous system, other bodily systems, nature, and culture.
 - As we’ll see, the brain also depends on the mind.
- Therefore, the brain and mind are two aspects of one system, interdependently arising.

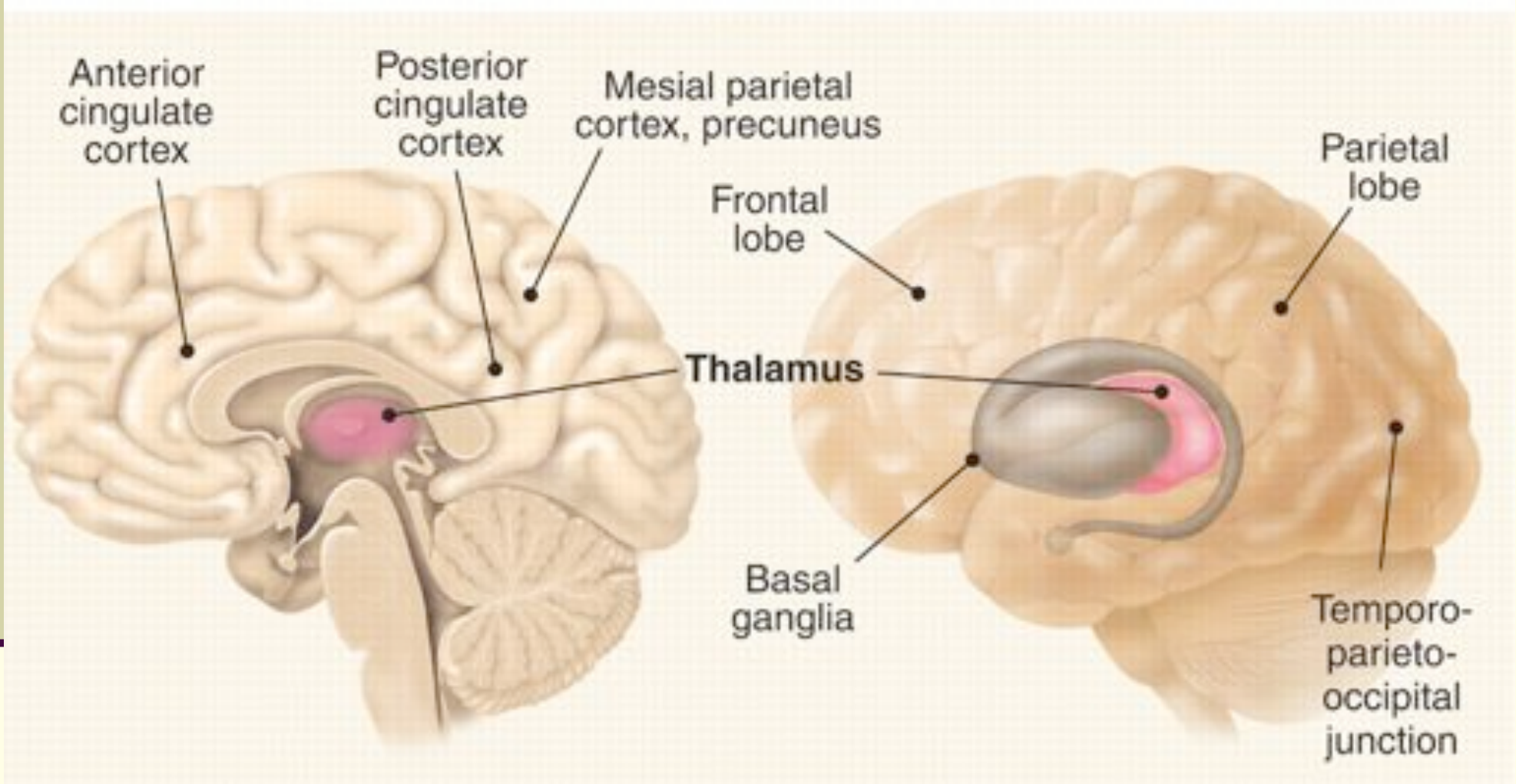
Evolution is a tinkerer. In living organisms, new capabilities are achieved by modifying existing molecules slightly and adjusting their interaction with other existing molecules.

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.

Eric R. Kandel

Key Brain Areas for Consciousness



(adapted from) M. T. Alkire et al., *Science* 322, 876-880 (2008)





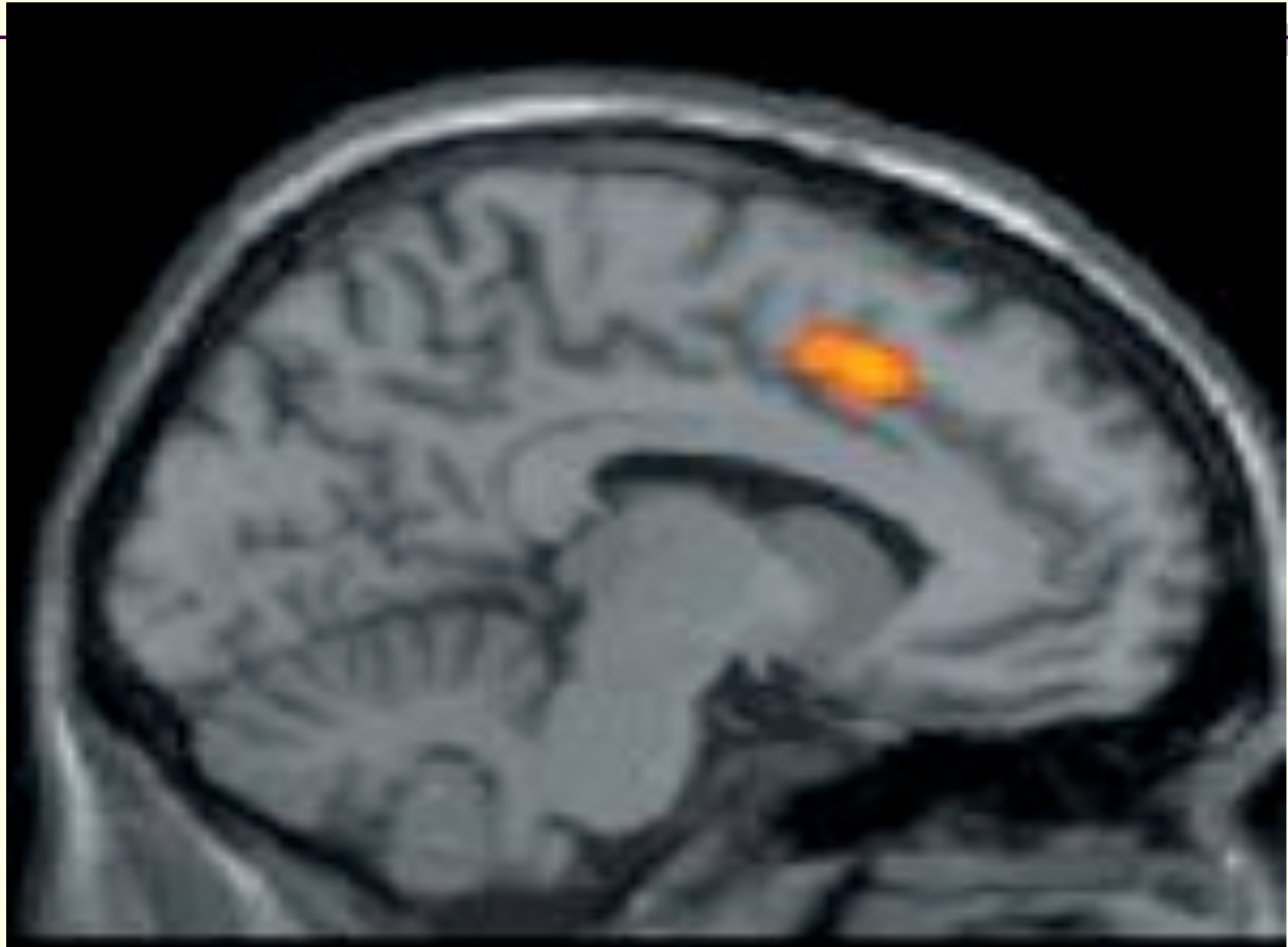
Strengthening Conviction



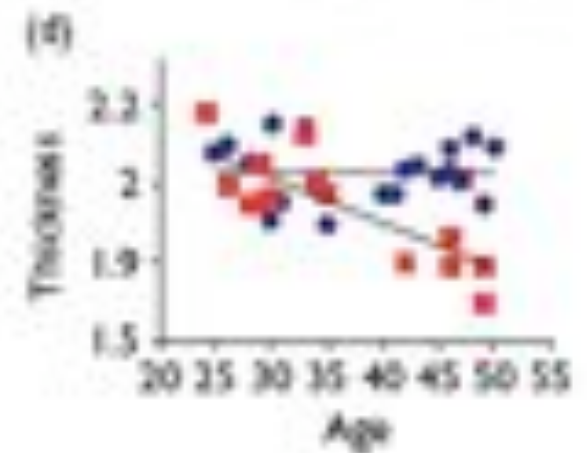
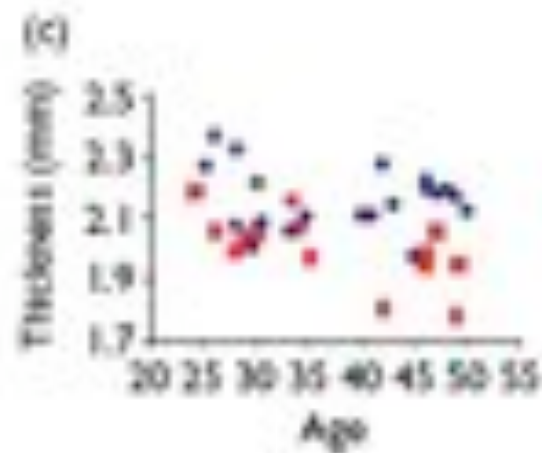
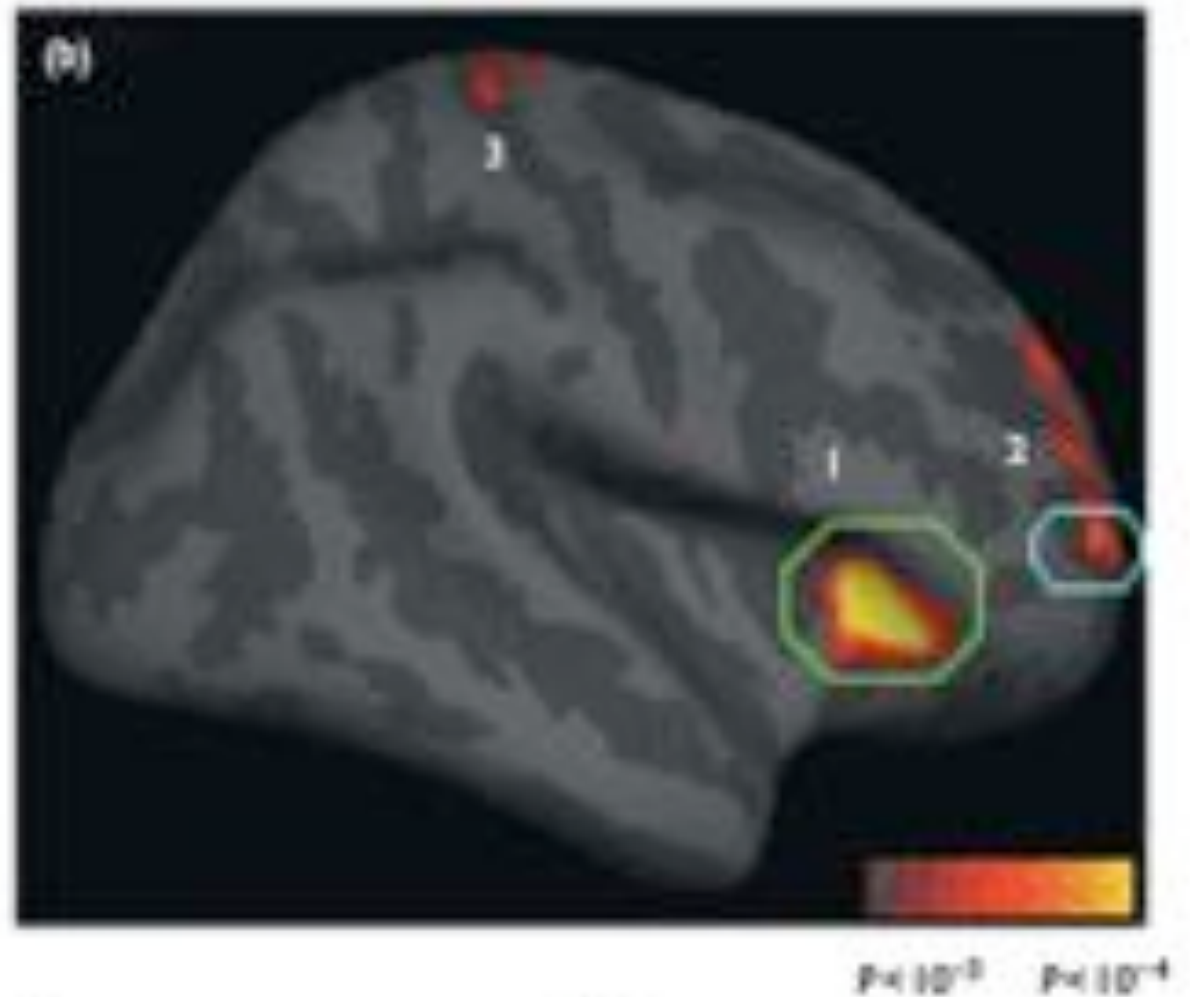
*The principal activities of brains
are making changes in themselves.*

Marvin L. Minsky

Tibetan Monk, Boundless Compassion



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



Meditation: Neural Benefits

- Thickens prefrontal (PFC) regions that help control attention
- Thickens insula (interoception, self-awareness, empathy)
- Less cortical thinning with aging in the PFC and insula above
- Increases gray matter density in hippocampus (creating context for memory, inhibiting the amygdala)
- Increases activation of left frontal regions, which lifts mood
- Increases gamma-range brainwaves (integration)
- Increases overall brain connectivity

Meditation: Physiological Benefits

- Decreases stress-related cortisol
- Stronger immune system
- Helps many medical conditions, including cardiovascular disease, asthma, type II diabetes, PMS, and chronic pain
- Aids wound healing and post-surgical recovery

Meditation: Psychological Benefits

- Improves attention (including for ADHD)
- Increases compassion
- Increases empathy
- Reduces insomnia, anxiety, phobias, eating disorders
- MBCT for depression decreases relapse



Deepening Insight: The Evolution of Dukkha

Three Requirements of Survival

- To survive, living organisms *must* try to:
 - Separate themselves from the world (e.g., membrane of microbe, skin of primate, personal identity of human)
 - Stabilize equilibria inside the body and mind, and within systems (e.g., “optimal distance” in relationship)
 - Attain rewards and avoid harms
- Alarms sound whenever these strategies run into trouble.
- For life with a nervous system: alarms below awareness create a background of unease; those entering awareness are unpleasant, even painful.


The Three Marks of Existence

These survival requirements fly in the face of three characteristics of existence, noted by the Buddha:

- Everything is connected to everything else, so nothing has an absolute, independent self-nature
- Everything is impermanent, constantly changing
- Suffering arises when we crave the lasting of pleasure and the ending of pain.

The Noble Truth of Suffering

- The contradictions between what animals need to do to survive, and the nature of existence, create ongoing alarm signals: physical and emotional discomfort, ranging from mild to intense.
- In Pali - the language of early Buddhism - the word used for this discomfort is *dukkha*, typically translated as “suffering.” Its roots are “du,” meaning not-good or not-right, and “kha,” which is where the hub of a wheel meets an axle: a “wobbly grinding.”
- To live, we must bear inevitable, continual wobbly grinding in the body, mind, relationships, and world.



Deepening Insight: Natural Happiness

Three Stages of Brain Evolution

■ Reptilian:

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

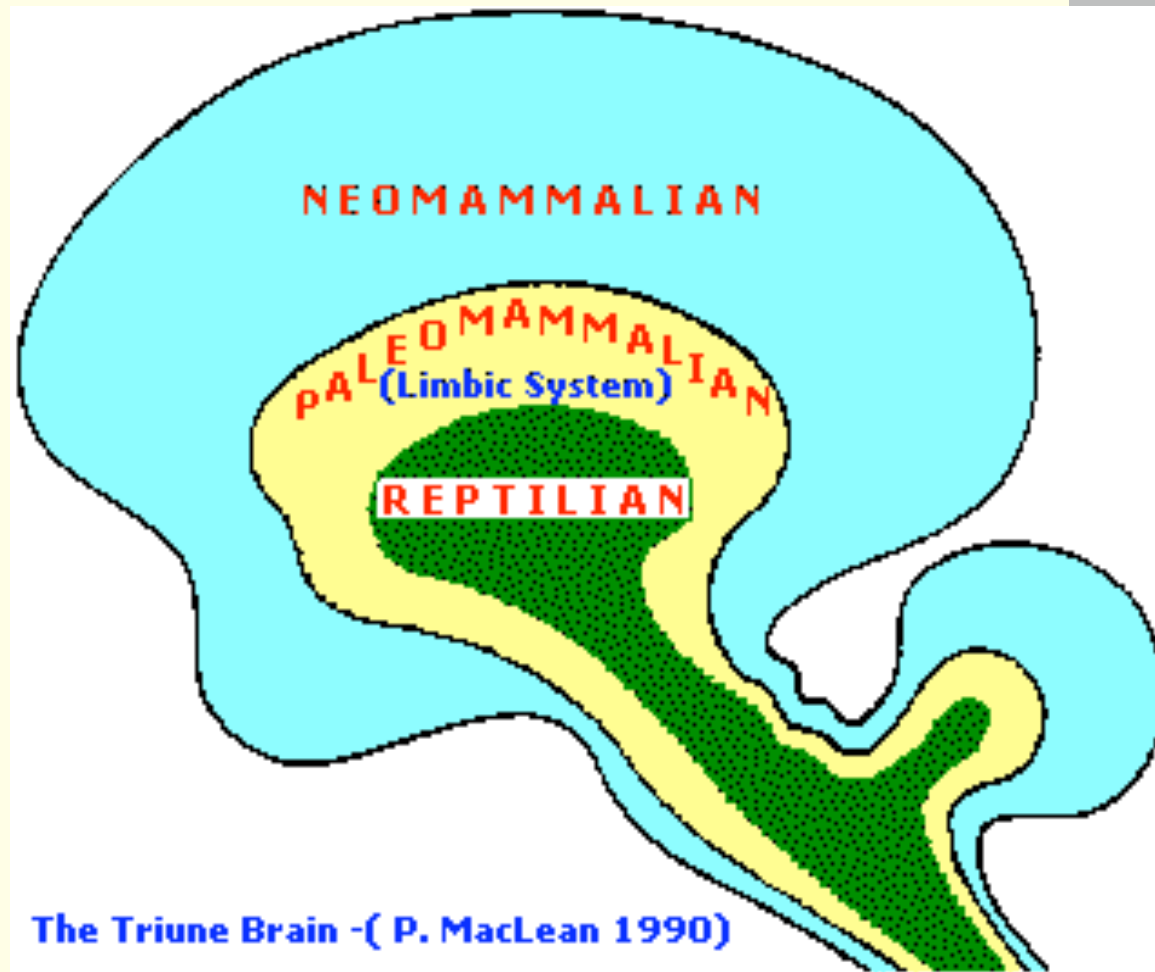
■ Mammalian:

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

■ Human:

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

Evolutionary History



The Triune Brain

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



Responsive Mode

	<u>View</u>	<u>Action</u>	<u>Experience</u>
Avoid	Resources, challenges-in- context	Govern/restrain, truth-to-power, forgive	Strength, safety, peace
Approach	Sufficiency, abundance, disenchantment	Aspire, give, let go	Glad, grateful, fulfilled, satisfied
Attach	Connection, belonging, social supplies	Open to others; join; be empathic, compassionate, kind, caring; love	Membership, closeness, friend- ship, bonding loved and loving

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*

Key Benefits of Responsive Mode

- Fueling for Reactive mobilizations; recovery after
- Positive emotions, cognitions, and behaviors
- Positive cycles
- Promotes virtue and benevolence

*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



Deepening Insight: 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 impact 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!³⁹
- 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

Negative Experiences Are Stressful

- Sympathetic nervous system (SNS) and hypothalamic-pituitary-adrenal axis (HPAA)
- Surges of cortisol, norepinephrine, other hormones
- Fight, flight, or freezing behaviors
- Abandoning long-term needs for a short-term crisis

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)

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."

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 Mode

	<u>View</u>	<u>Action</u>	<u>Experience</u>
Avoid	Harms present or lurking	Fight, flight, freeze	Fear, anger, weakness
Approach	Scarcity, loss, unreliability, not expected rewards	Grasp, acquire	Greed, longing, frustration, disappointment
Attach	Separated, being “beta,” devalued	Cling, seek approval, reproach	Loneliness, heart-break, envy, jealousy, shame

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”

Choices . . .



Reactive Mode

Or?



Responsive Mode



Right Mindfulness and Right Effort

The Power of Mindfulness

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

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

William James

Mindfulness, Virtue, Wisdom

- **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”

- **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.

How to come home?

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

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.”

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

Pema Chodren

Coming Home . . .

Calm

Contentment

Caring

Penetrative insight

joined with calm abiding

utterly eradicates

afflicted states.

Shantideva

Great Books

See www.RickHanson.net for other great books.

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See www.RickHanson.net for other scientific papers.

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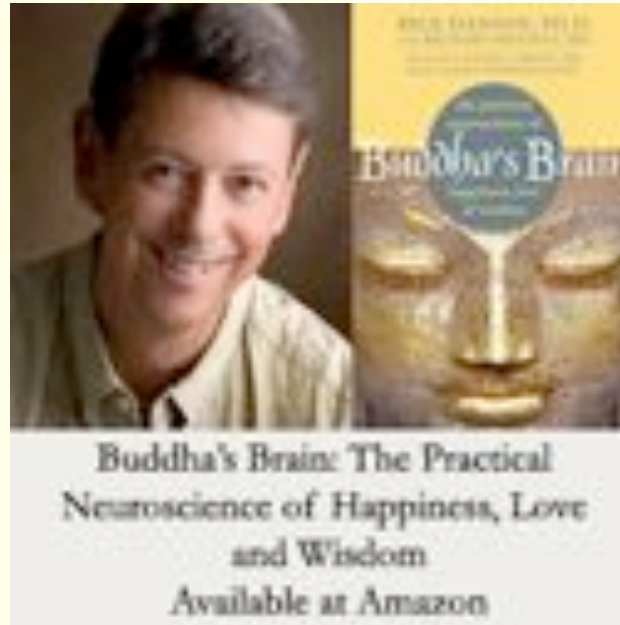
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