

Awakening Your Brain:

Tools for Meditative Depth, Peacefulness, Happiness, and Equanimity

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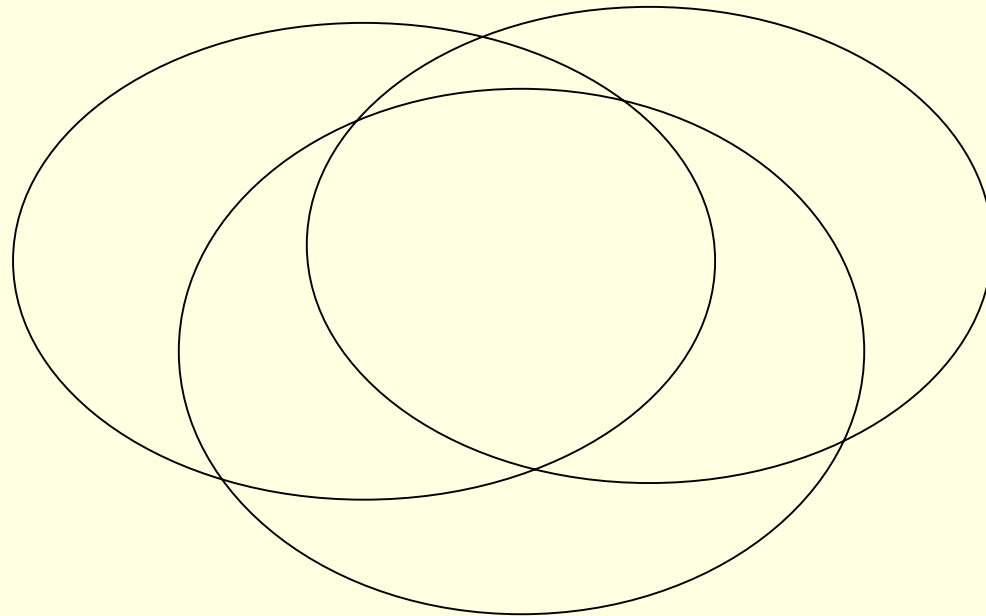
Plan for the Day

- Context
- Awareness and Equanimity
- Guided Meditation
- Neurodharma: The Executive Summary
- Lunch
- The Biochemistry of Inner Peace
- Cultivating Happiness through Taking in the Good
- Settling into Your Best Parts
- Equanimity: Neurobiology and Practice

Common - and Fertile - Ground

Neuroscience

Psychology



Buddhism

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

The Nature of Awareness

Consciousness ~ Awareness

“Core consciousness” is the sensing - by deep structures of the brain - of the sensors detecting change in the sensing of the body. [Any questions?]

Always in the present moment . . .

“Autobiographical consciousness” is more global, has past and present, and personal associations

Attention is controlled awareness. Steadiness of mind is the control of control.

Equanimity

- More than calm:
Equanimity means not reacting to your reactions
- Impartial about the “feeling tone:”
Positive, negative, or neutral
- Breaking the chain of "dependent origination:"
From contact to feeling to craving to clinging to suffering

Yes, the first dart lands. But not the second one.

Know the mind.

Shape the mind.

Free the mind.

Christina Feldman

Meditation

- Relaxation
- Intention
- Feeling safe
- Happiness
- Steadiness of mind
- Equanimity

Breathing in, be calm.
Breathing out, be useful.
Nun, Thailand

Don't try to bring meditation into daily life.
Bring daily life into meditation.
Ajahn Amaro

Framework of Western Science

- We respect the possibility of a mysterious transcendental Something.
- But that is not our focus today.
- We're exploring what an entirely materialistic perspective on the brain - informed by the Dharma - might offer for steadiness of mind, peacefulness, happiness, and wisdom.

A Few Disclaimers


- On the frontiers of science. Be skeptical.
- Neuroscience is no replacement for contemplative wisdom.
- Adapt this to your own needs and practices.
- Even science itself contains incredible mysteries.

The Union of Mind and Body

- Subjective experience correlates with brain activities.
- Change your experience - and you change your brain, temporarily and then permanently.
- Change your brain - and you change your experience.

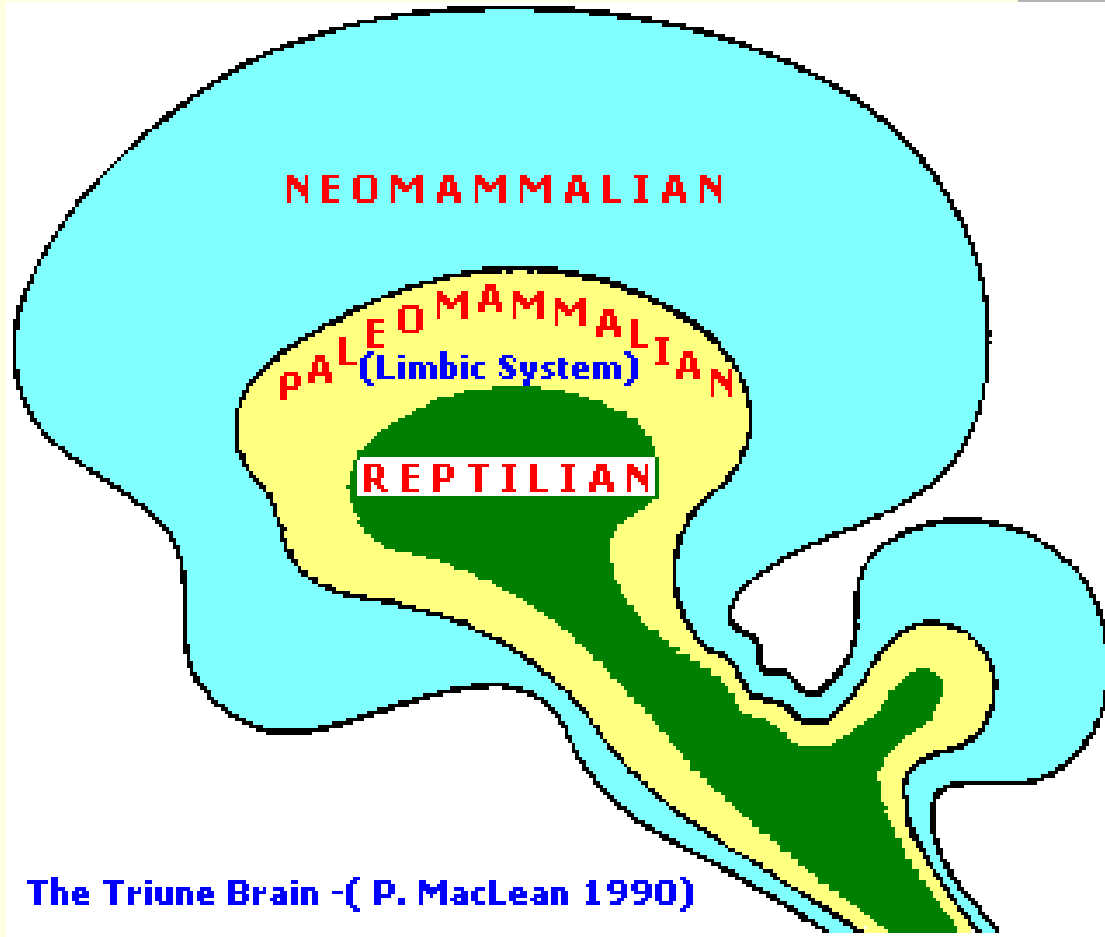
Fleeting Experiences Leave Structural Traces

- Neurons that fire together wire together.
- Brains get thicker in regions that are used.
- Your experience matters.
- This creates an incredible opportunity . . .
- . . . and a great responsibility.



Your Brain - The FAQs

Evolutionary History



The Triune Brain -(P. MacLean 1990)

Three Stages of Brain Evolution

■ Reptilian:

- Brainstem, cerebellum, hypothalamus
- Reactive and reflexive

■ Mammalian:

- Limbic system, hypothalamus, thalamus, hippocampus, amygdala
- Complex emotion, social behavior, enhanced memory

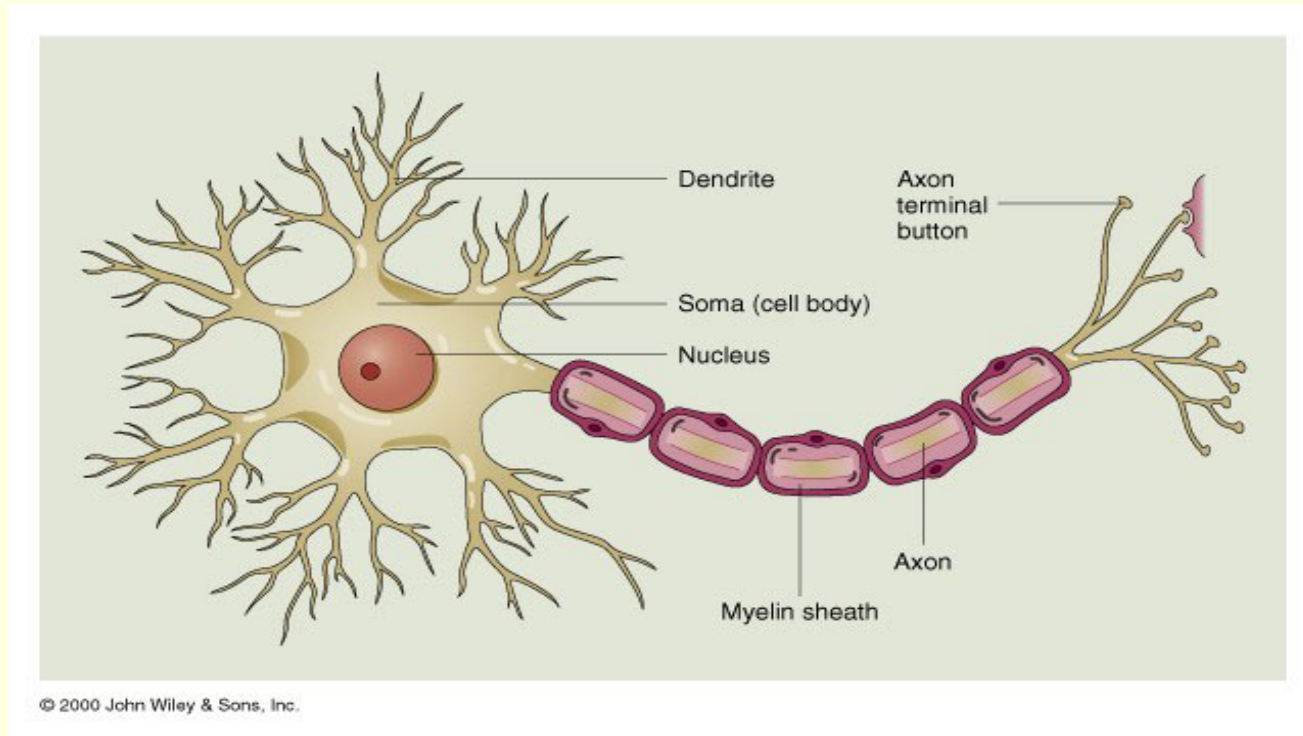
■ “Clever Ape” (*Homo sapiens*):

- Cerebral hemispheres
- Language, sophisticated planning, abstract thought, elaborate social behavior, self-reflection

Your Amazing Brain

- **Size:**
 - 3 pounds of “cottage cheese”
 - 1.1 trillion neurons, 100 billion in the "gray matter"
- **Activity:**
 - Always on 24/7/365 - instant access to info on demand
 - 2% of your body weight, 25% of your oxygen
- **Speed:**
 - Neurons firing 10 to 100 times a second
 - Signals crossing brain in a tenth or hundredth of a second
- **Connectivity:**
 - A neuron gets inputs from 10,000 neurons and sends outputs to 10,000.

One Simple Neuron . . .



One neuron: on or off. A simple switch, yes?

... Multiplied by Billions of Neurons

- Multiply the complexity of a single neuron by 100,000,000,000 neurons (and that's only gray matter)
- Each with 10,000 synapses:
 - One quadrillion - 1,000,000,000,000,000 - synapses total
 - Most synapses flickering 1 - 50 times a second
 - Neural nets rocked by bursts of 80/second waves
- Possible brain states: 1 followed by a million zeros
- Circular loops:
 - Recursion and self-observation
 - Dynamic, “chaotic” effects: determined, but unpredictable

A Profoundly Complex System

*YOUR BRAIN IS THE MOST COMPLEX OBJECT
KNOWN IN THE UNIVERSE.*

*MORE COMPLEX THAN THE CLIMATE,
OR A SUPERNOVA*

The Buddha on the Brain

- Basic conditions of existence:
 - Impermanent, changing, “mountain-ing”
 - Interdependent, non-dual, “empty”
- Beings suffer due to *clinging*. Clinging to what is changing and has no absolute existence in itself.

Impermanent Brain and Mind

- Constant change:
 - Brain waves, neurotransmitters, “arborization”
 - Fast speeds, tiny scales, gigantic quantities
- Brain change -> mind change: “Stream(s) of consciousness”
- No condition of mind - or environment - is a dependable source of enduring happiness.

Are you still looking for happiness in samsara?

Ani Tenzin Palmo

*With dewdrops dripping,
I wish somehow I could wash
this perishing world*

Basho

Interconnected, Interdependent Brain/Mind/World

- Brain: Most extraordinary network known
- Neurological loops -> associations in mind
- Brain and mind at one with the body
- Brain and body at one with the physical world
- Mind at one with the informational world

What me? Who, me?

- Self is a useful fiction.
- Self is variable, organized around clinging
- Self is compounded, with component parts distributed throughout the brain
- Self is intertwined with world

A mosaic with 10,000 pieces

To study the Way is to study the self.

To study the self is to forget the self.

*To forget the self is
To be enlightened by all things.*

Dogen

Who am I?

- A person:
 - With individual personality, temperament, history
 - Morally responsible
 - Deserving of humane treatment
- In what “grout” do the tiles of seeming self abide?
 - Background hum of neurological activity
 - Pure awareness
- A pulsing of consciousness . . . or a stable knowing?
Infused with a mysterious Brightness?



No self, no problem

The Construction of Suffering

The brain has five properties that help you survive, but also lead to your suffering:

- Separation of organism and world
- Identification with the body
- Anxiety of survival
- Seeking stability in a changing world
- Pursuing pleasure and avoiding pain

Ordinary Suffering

- In mind: uneasy, hurried, frazzled, uncomfortable, stressed
- In body: sympathetic nervous system arousal
- In brain/mind: intensified clinging and selfing
-> more stress -> more sympathetic arousal

Brain States in Relaxed Well-Being

- Autonomic nervous system:
 - Parasympathetic activation
 - Sympathetic quieting down
 - Breathing and heart rate slow, vascular walls relax (lowering blood pressure), digestion increases, immune system strengthens
- Pleasant, rewarding hormones, neuro-transmitters/modulators: Serotonin, norepinephrine, oxytocin, dopamine, endorphins
- Brain waves:
 - Emphasize delta (1 - 3 Hz) and theta (4 - 7 Hz), with some beta (14 - 30 Hz) mixed in
 - Increased coherence and resonance

The Intentional Brain

- Frontal lobes:
 - Manager of the capital city of the great land of you
 - Pitfalls: too much or too little control over the provinces
- Frontal lobe goals/instructions:
 - Increase responsiveness of circuits
 - Receive feedback and revise plans
 - Thus helping you adapt and succeed
- Forward focus and success foster sense of strength
- Evoked sense of good qualities/people activates emotional and bodily states

Feeling Safe

- Luscious cascades of GABA and serotonin neurotransmitters
- Adding to the effects of relaxation and parasympathetic arousal
- Neurological systems of vigilance - motivating you with a steady trickle of anxiety - quiet down.
- Making more neurological and thus mental resources available for inner awareness

Positive Emotions

- The brain on happiness:
 - Alert, energized: norepinephrine, etc.
 - Pleasant feelings: dopamine, etc.
 - Supports parasympathetic arousal
- A happy mind:
 - Increases resilience
 - Counteracts depression and anxiety
- *Happiness is skillful means:*
 - Joy is one of the seven factors of enlightenment.
 - Bliss and joy are factors of the jhanas.

Steady Mind, Coherent Brain

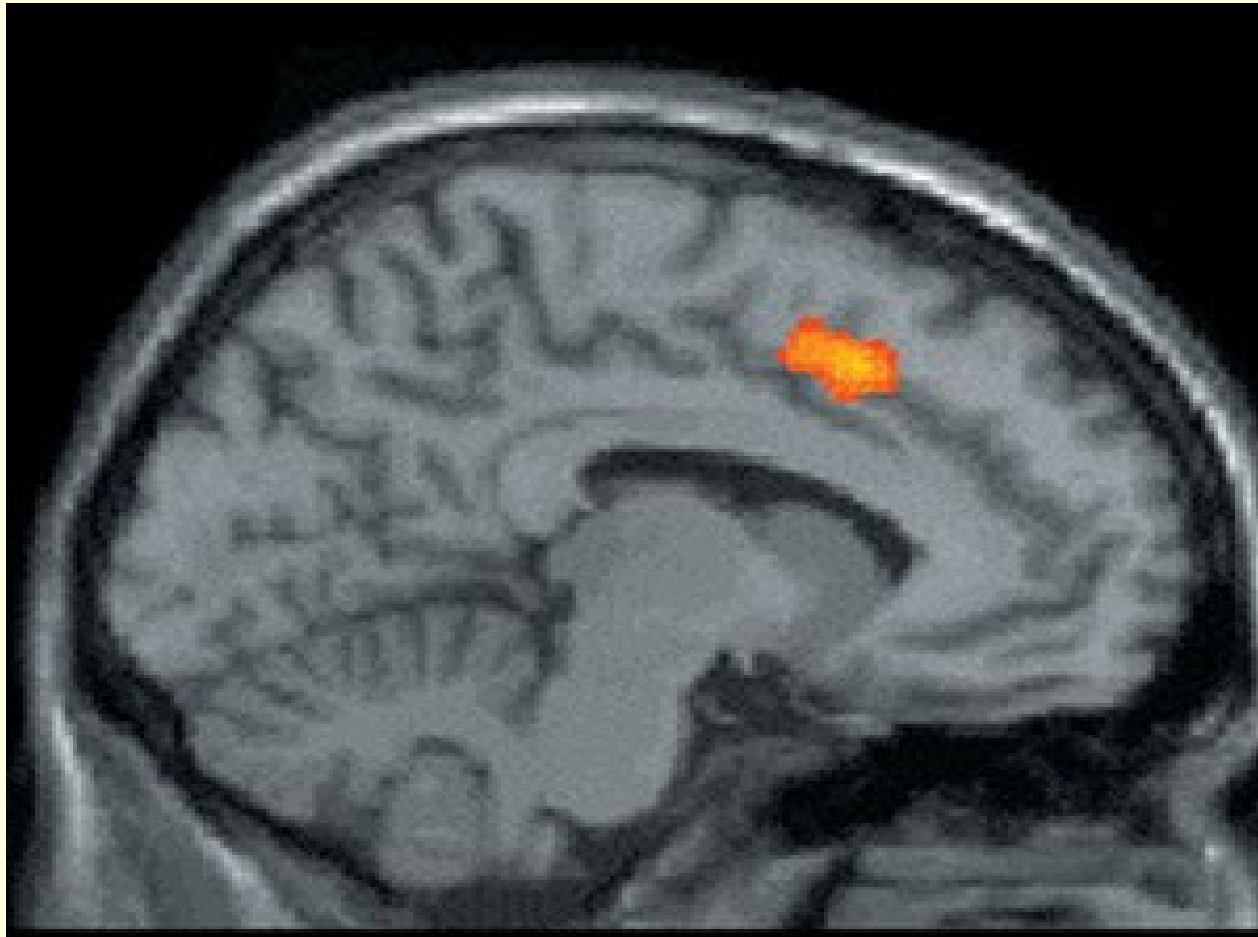
- Attention to an object increases the physical sensitivity of neural networks processing information about it.
- Cingulate gyrus monitors stability of attention (nourished by compassion), playing a leading role in the control of control
- Pleasure circuits reward success, and more dopamine flows with bliss and joy.
- High dopamine helps keep the gates of awareness closed to new and distracting information.
- Norepinephrine surges brightening the mind
- This internal stimulation puts the basal ganglia at ease.
- High frequency resonance synchronizing the whole brain

A Road Map from the Buddha

- *Milestones toward Awakening . . .*
- A gradual, progressive process in which:
 - “...the mind is steadied internally*
 - ... quieted*
 - ... brought to singleness*
 - ... and concentrated.”*

Anguttara Nikaya 3:100

What Does a Quiet Brain Look Like?



Cultivating Vipassana

- Insight is the ultimate aim.
- Insight is nourished by stable, quiet, collected, and concentrated states . . . of the brain.
- The Buddha: Liberating insight - and Nibbana itself - are the fruits of virtue, wisdom, and contemplative practice.

*Even if the ripe apple falls ultimately by grace,
its ripening was caused
by the watering, feeding, protecting, and shaping of its tree.*

Penetrative insight

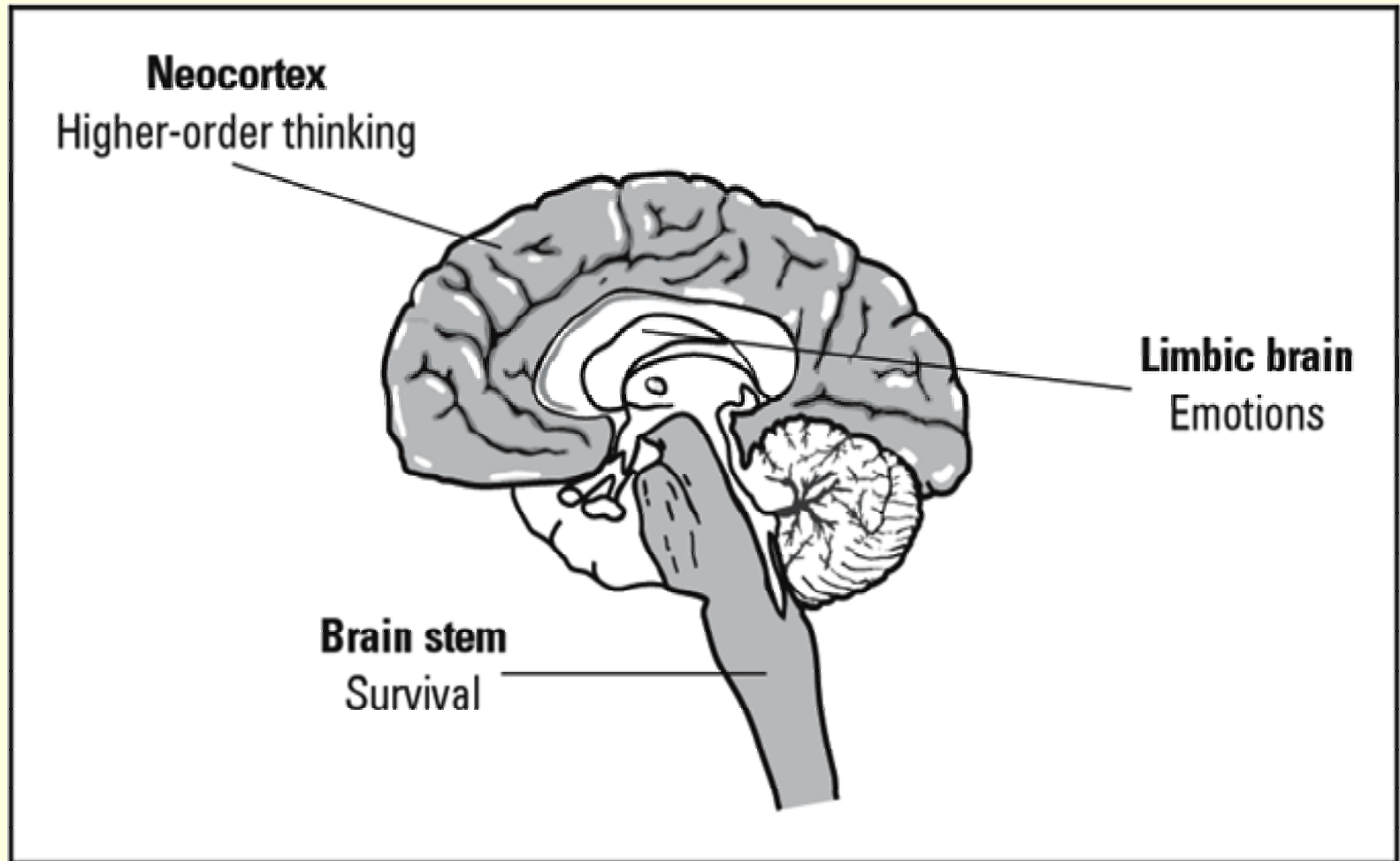
joined with calm abiding

utterly eradicates

afflicted states.

Shantideva

The Brain of Equanimity



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

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

The Buddha

Pathways to Inner Peace

- Using mind to change matter to benefit mind
 - Relaxation
 - Recognizing that there is no threat
 - Taking refuge in supportive settings and with supportive people
 - Accessing a sense of inner strength
 - Activating positive emotions
 - Equanimity toward reactions, including fearful ones
- Using matter to change matter to benefit mind

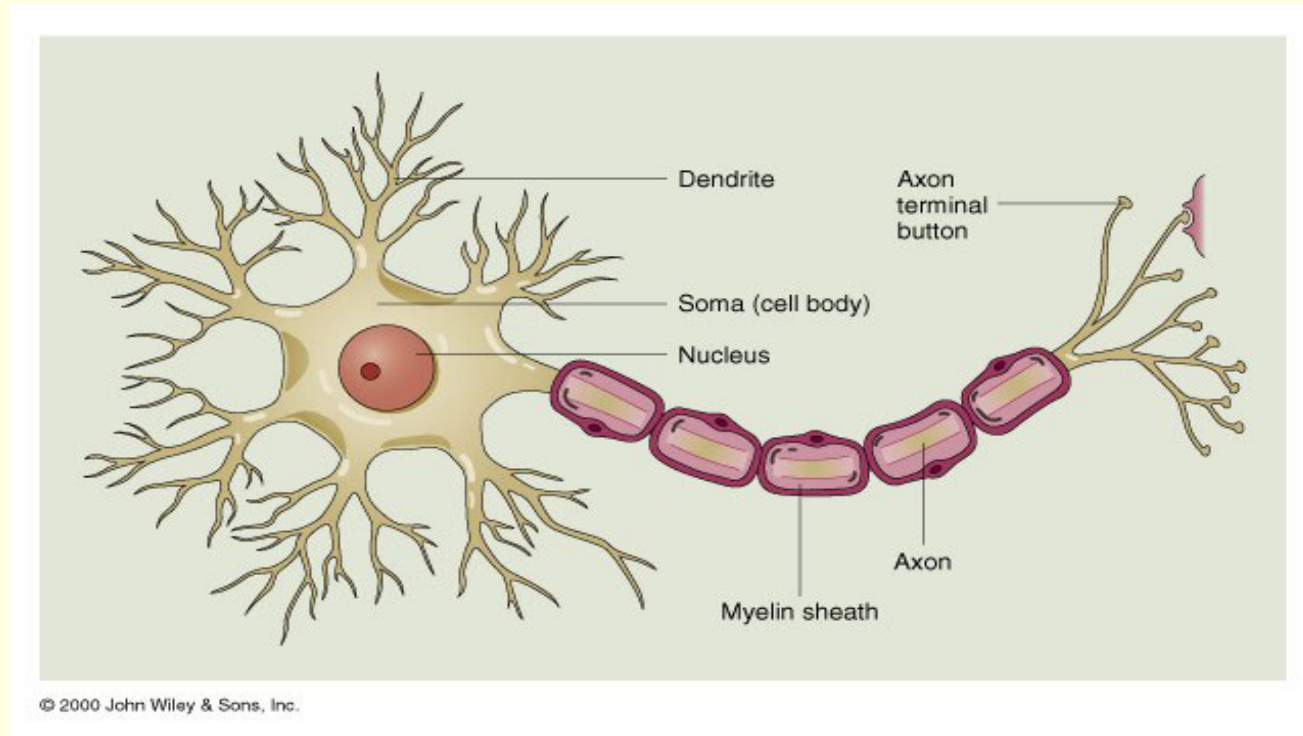
The Landscape of Anxiety

- Experiences of nervousness, apprehension, fear, “the jitters,” dread, on edge, keyed up, uptight, terror, alarm, panic
- Ranging in intensity and bodily involvement
- State anxiety vs. trait anxiety
- Necessary to survive; a drip-drip of fear
- But disproportionate state anxiety and chronic trait anxiety are excess suffering.

What biochemical processes create more or less anxiety?

What biochemical interventions can a person do on his or her own to feel less anxious – and feel more safe, secure, and peaceful?

The Neuron Returns



Neurotransmitter Functions

- Two core functions:
 - Calming down - “Inhibitory”
 - Energizing up - “Excitatory”
- Inhibitory neurotransmitters put the brakes on excitatory activity.
- Too much excitatory activity and too little inhibitory activity leads to anxiety, etc.

Inhibitory and Excitatory Neurotransmitters

■ Inhibitory:

- Serotonin
- Taurine
- GABA
- Glycine

■ Excitatory:

- Norepinephrine
- Dopamine
- Adrenaline
- Glutamic acid (glutamate)

The Glutamic Acid and GABA Dance

- GABA modulates glutamic acid (GA) effects.
- Too much GA feels like a monosodium glutamate overdose.

Perspectives on Natural Methods

- Potential benefits:
 - Often highly effective
 - Minimal side effects (pure molecules that the body knows how to metabolize)
 - Readily available
- But use wisely:
 - Gather information.
 - Do not take on your own if you're using psychotropic meds.
 - Start with low doses.
 - If something does not feel good, stop.

Increasing GABA

- Glutamic acid -> GABA
- Vitamin B-6 as Pyridoxal-5-Phosphate (P-5-P) is the key nutritional co-factor that shifts the balance in the direction of GABA.
- Take 50 mg./day of P-5-P on an empty stomach.

Increasing Serotonin

- Serotonin is a “neuromodulator” of GABA that increases its effects.
- Serotonin also helps decrease overactive norepinephrine, dopamine, adrenalin, and cortisol.
- Tryptophan (with iron) -> 5-hydroxytryptophan (5-HTP) (with P-5-P) -> serotonin
- Options for increasing serotonin:
 - Tryptophan, 500 – 1500 mg./day
 - 5-HTP, 50 – 200 mg./day

Increasing Taurine

- Taurine binds to GABA receptors, thus stimulating GABA-like activity.
- It's typically a benign amino acid, also depleted during breastfeeding.
- Consider 1000 mg./day.

Increasing Theanine

- Theanine is an amino acid found in green tea and added to soft drinks in Japan (!).
- It is “antagonistic” to glutamic acid.
- Consider 100 – 200 mg./day.

Taking GABA

- Theoretically, GABA does not cross the blood-brain barrier, but many people do report a calming effect.
 - Possibly there is a “leaky brain syndrome” allowing GABA to get through.
- Consider 250 - 750 mg./day on an empty stomach.

Taking Progesterone

- For women only . . .
- Progesterone stimulates GABA receptors, triggering a GABA-like effect.
- Approaching menopause, progesterone decreases before estrogen does, so supplementing progesterone may be helpful.
- Consider Pro-Gest cream, during the second half of your cycle.

Increasing Glycine

- Glycine is an inhibitory neurotransmitter. In the spine, it performs a GABA-like role, balancing the effect of glutamic acid.
- Consider:
 - Glycine, 500 – 1000 mg./day, or more
 - Magnesium glycinate, enough to get 400 mg. of magnesium

Summary of Possible Interventions

- P-5-P: 50 mg. on an empty stomach
- Tryptophan or 5-HTP to enhance serotonin
- Taurine: 1000 mg. on an empty stomach (in a.m.)
- Theanine: 100 – 200 mg.
- GABA: 250 - 750 mg.
- Progesterone cream (women only)
- Glycine: 500 - 1000 mg.

These three ways lead to the deathless realm:

living in the truth,

not yielding to anger,

and giving (even if you have only a little to share).

Dhammapada

You Are What You “Remember”

- Two kinds of memory:
 - Explicit
 - Implicit
- Negative experiences are more central to survival:
 - They register immediately, but positive ones need to be held in awareness longer.
 - Negative experiences trump positive ones.

Benefits of Taking in the Good

- Cultivating wholesome qualities
- Crowding out bad ones
- Highlighting key experiences so you can reactivate them again
- Building faith and confidence in the fruits of the path; conviction is one of the factors of enlightenment.
- Rewarding yourself for walking a hard but noble path, supporting motivation

How to Take in the Good

- Convert positive events to positive experiences.
 - Pay attention to the good.
 - Create positive experiences.
 - Allow yourself to have a good experience.

- Extend the experience in time and space
 - Sustain attention to it.
 - Let it fill your body and heart.
 - Savor it. It's delicious!

- Sense the experience sinking in
 - Feel it going into your body.
 - Maybe use imagery, e.g., treasure chest in your heart

Opening the Heart

- Natural variability of beat to beat interval
- Large, smooth changes in variability:
 - Activate parasympathetic nervous system, lower blood pressure, and support immune function
- A simple method:
 - Even breathing - inhalation equals exhalation
 - Imagine breathing through your heart
 - Evoke a heartfelt feeling (e.g., gratitude, love); perhaps combine lovingkindness practice

And for a Bonus . . .

- Sense that the positive experience is going down into old hollows and wounds within you, and filling them up and replacing them with new positive feelings and views.
- Have the new experience be prominent in awareness while the old experience is in the background.
- You're tapping into the way the brain reconstitutes memories.

A profound, far-reaching, and genuine way to help yourself

Attitudes for Taking in the Good

- You are just being in reality. Clear-eyed and fair-minded.
- You've earned the good times. The meal you paid for is set before you, and you're entitled to dig in.
- Recognize the value to yourself and others of taking in positive experiences. See how it is a good and virtuous thing to soak in positive experiences.

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

Pema Chodren

Settling into Your Best Parts

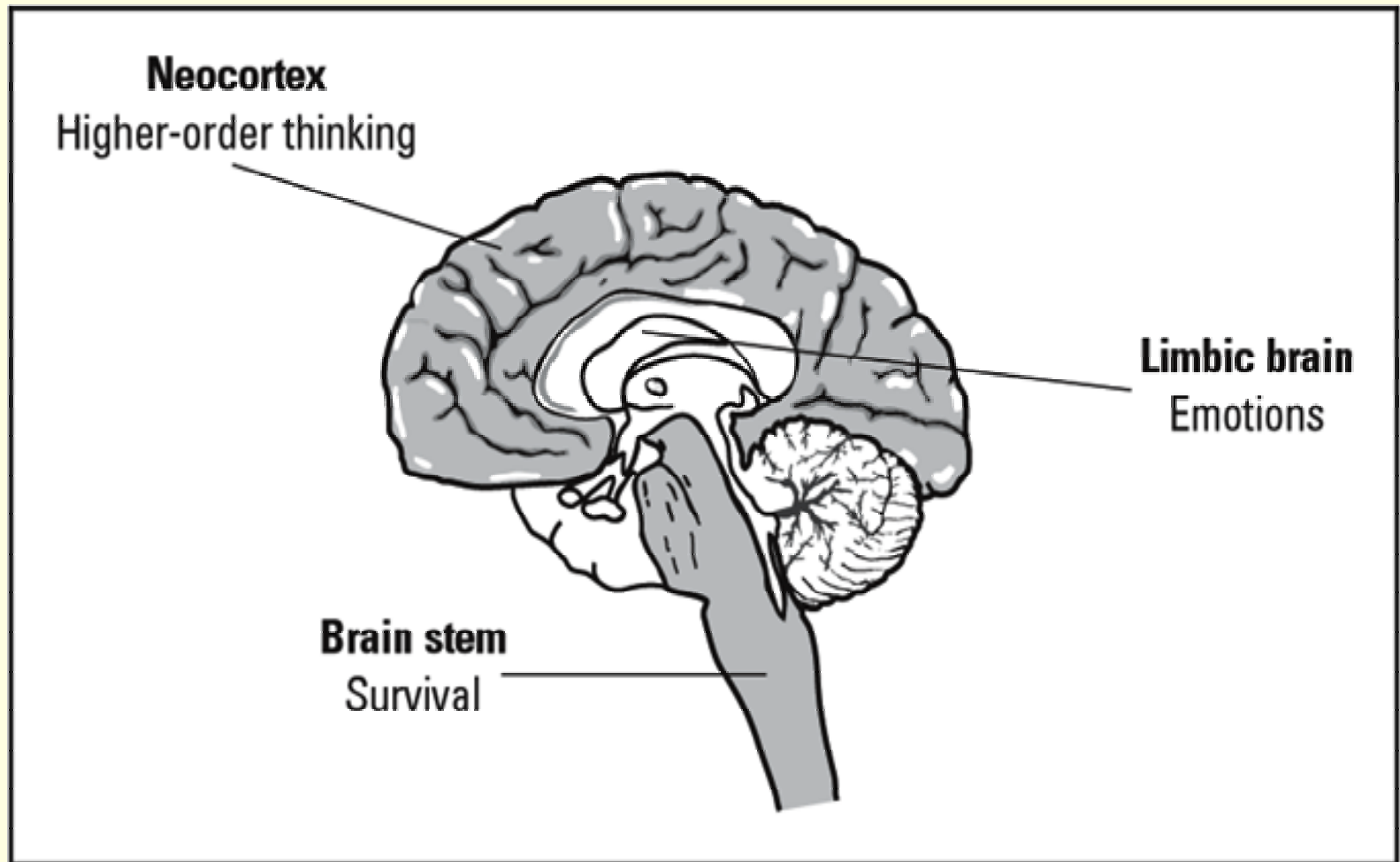
- Fitting the “key” of the new good experience to the “lock” of the hole in the heart
Like experiences of safety, strength, feeling loved or valued
- Buddhist perspectives on native goodness, “the stainless purity of mind”
- As an inherent property of the nervous system, there is an essence or core in each of us that is awake, present, interested, caring, and happy.
- Let a growing feeling of your innate goodness sink in like any other beautiful experience.

*Be wisdom itself,
rather than a person who isn't wise
trying to become wise.*

*Trust in awareness, in being awake,
rather than in transient and unstable conditions.*

Ajahn Sumedho

Circuits of Emotional Responses



The Neurology of Reactivity

- Incoming stimuli processed by amygdala
 - Labels: pleasant, unpleasant, neutral
 - the “feeling aggregate”
 - Directs a response: approach, avoid or fight, or ignore
 - Is it OK or not? What should I do?
- Reacts before frontal lobes can process signals
 - *“Jump first, ask questions later!”*
 - Why “feeling” comes before “perception”
- But leads reactions to hijack reasoning mind
 - (Especially with history of trauma)
 - Triggering secondary cascade of emotions, views, actions

Dampening Reactivity

- Train hippocampus - which influences the amygdala's labeling - to regard incoming information more positively; taking in the good really helps.
- Train amygdala to be less reactive and to label more experiences neutrally or positively
- Establish more frontal lobe control.
- Possible neurological processes in the Third and Fourth Jhanas (characterized by great equanimity)

Preparation for Equanimity Meditation

- Feel positive emotion to an intense degree:
 - Bliss (piti) and happiness (sukha)
 - Intensify dopamine, helping steady the mind
- Be aware of “feeling,” the Second Foundation of Mindfulness.
- Abide in an impartiality toward the ten thousand things that is deeper than tranquility.

“The Great Way is easy for one with no preferences.”

Third Zen Patriarch

*In the deepest forms of insight,
we see that things change so quickly
that we can't hold onto anything,
and eventually the mind lets go of clinging.*

*Letting go brings equanimity.
The greater the letting go, the deeper the equanimity.*

*In Buddhist practice, we work to expand
the range of life experiences in which we are free.*

U Pandita

Pleasant feeling is impermanent, conditioned, dependently arisen, having the nature of wasting, vanishing, fading, and ceasing.

The painful feeling and the neutral feeling, too, are impermanent, conditioned, dependently arisen, having the nature of wasting vanishing, fading and ceasing.

When a well-taught disciple perceives this, he becomes dispassionate toward pleasant feelings, dispassionate toward painful feelings and dispassionate toward neutral feelings.

*Being dispassionate, his lust fades away, and with the fading away of lust,
he is liberated.*

When liberated, there comes to him the knowledge that he is liberated. He now knows, "Birth is exhausted, the holy life has been lived, done is what was to be done, there is no more of this to come."

From Majjhima Nikaya 146

*Outstanding behavior,
blameless action,
open hands to all,
and selfless giving:*

This is a blessing supreme.

The Buddha