

***Your Best Brain:***  
***Ten Great Ways***  
***To Change Your Brain for the Better***

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**The Wellspring Institute**  
**For Neuroscience and Contemplative Wisdom**

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# Introduction

# 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

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

Dogen



# Your Brain: The Technical Specs

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## ■ **Size:**

- 3 pounds of tofu-like tissue
- 1.1 trillion brain cells
- 100 billion "gray matter" neurons

## ■ **Activity:**

- Always on 24/7/365 - Instant access to information on demand
- 20-25% of blood flow, oxygen, and glucose

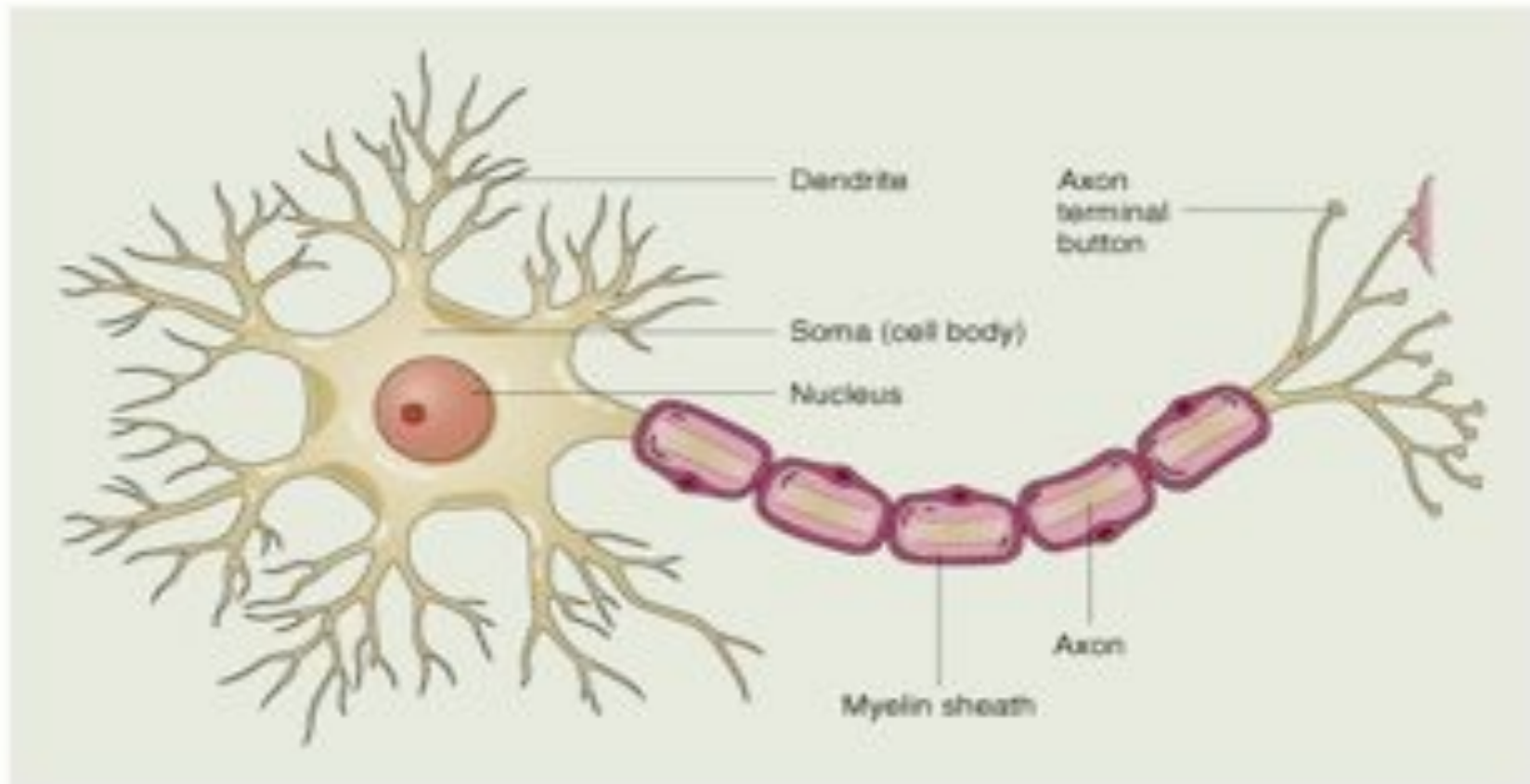
## ■ **Speed:**

- Neurons firing around 5 to 50 times a second (or faster)
- Signals crossing your brain in a tenth of a second

## ■ **Connectivity:**

- Typical neuron makes ~ 5000 connections with other neurons:  
~ 500 trillion synapses

# A Neuron



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# Your Brain: The Technical Specs

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# Key Physical Interventions for the Brain

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- **Provide a complete array of nutrients.**
- **Get the gut right.**
- **Optimize serotonin.**
- **Increase GABA/glutamic acid ratio.**
- **Enhance excitatory neurotransmitters.**



**Provide a Complete Array of Nutrients**

# Perspectives on Natural Methods

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- Potential benefits:
  - Often highly effective
  - Minimal side effects (pure molecules that the body knows how to metabolize)
  - Readily available
  
- But use wisely:
  - Gather information.
  - Don't do on your own with psychotropic meds.
  - Start with low doses.
  - If something does not feel good, stop.
  - Make sure other co-factors are adequate (e.g., B-6, iron).
  - Consider further testing (e.g., amino acids).

# Key Functions of Nutrients

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- Build tissue
- Act as substrate for metabolic processes
- Act as co-factors for enzymes that facilitate metabolic steps
- Act as anti-oxidants

# Nutrients from Food - 1

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## ■ Protein:

- 3 servings a day, the size of the palm of your hand
- Animal protein: well absorbed, hypoallergenic
- Nuts and seeds
- Protein powder
- Vegetarians: consider an amino acid supplement

## ■ Vegetables and fruits:

- Vegetables: at least several cups a day
- Primary source of carbohydrates
- Fruit: eat whole fruit; be mindful of sugar content<sup>13</sup>

# Nutrients from Food - 2

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- Grains:
  - Not so much
  - Whole grains, not made into flour
  - Gluten-free (gluten = wheat, oats, rye, barley, spelt, kamut)
  
- Oils:
  - Primary oil is olive
  - No trans-fats
  - Be mindful of saturated fats

# Nutrients from Food - 3

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- Dairy:
  - Try to eliminate cow dairy -- a major allergen
  - Goat and sheep products are best
  - Substitute with almond milk, coconut milk, etc.
- Go paleolithic!
  - Eat like the hunter-gatherers did -- that is your evolutionary heritage.
  - Animal protein, vegetables, fruit, eggs, nuts, healthy oils.

# Nutrition From Food - 4

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- Eat No Sugar and little refined flour . . .
- If you must, eat as little sugar as possible.
  - The average American eats 158 lbs per year.
  - Sugar raises and disregulates blood sugar.
  - Sugar raises insulin and puts you on the road to diabetes.
  - High insulin is inflammatory.
  - Increased risk of Alzheimer's disease and depression with diabetes
  - Decreases cognitive performance



# Supplement B-Vitamins

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- Start with a good multi-vitamin/mineral supplement, with high B-vitamins (10x d.v.; 800 mcg folic acid)
- Folate, B-12, and B-6 cut brain shrinkage in half in older mildly cognitively impaired adults with high homocysteine. (Smith, D., et al., 2010)
- Low folate predisposes people to depression.
- Folic acid + SSRI almost doubles success rate over SSRI alone.

# Supplement Minerals

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- The multi should have the DV or more of zinc, copper, selenium, manganese, molybdenum, chromium, iodine.
  
- Typically add calcium and magnesium:
  - At least 400 mg. magnesium.
  - Women should consume at least 1000 mg. calcium.
  
- Iron:
  - A critical brain nutrient, but toxic if you get too much
  - Carnivorous men usually shouldn't add iron.
  - Menstruating women usually do need iron.
  - It's best to test for iron with an iron panel or serum ferritin. A blood count helps, but can miss low iron.
  - If you have fatigue and/or depression, test.

# Supplement Essential Fatty Acids

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- Much DHA (docosahexaenoic acid) in the brain
- DHA & EPA (eicosapentaenoic acid) are important regulators of inflammation.
- EPA & DHA negatively correlate with depression (DHA has more data)
- EPA: anti-inflammatory; DHA: brain structure.
- May be preventive for Parkinson's and Alzheimer's.
- Fish oil: 500 mg. each of EPA and DHA

# Supplement Vitamin D

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- Co-factor in synthesis of serotonin, dopamine, and norepinephrine
- Low levels of D are implicated in depression.
- Major support for the immune system
- May be helpful in preventing dementia and Parkinson's disease
- Made in the skin from unprotected sunlight
- Get 10 - 15 minutes sun mid-day; do not burn.
- Goal for D: 50 - 60 ng./ml. The correct test is "25-OH-vitamin D."
- If you cannot test, try 2000 I.U./day.

# About Supplements

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Most supplements are available at health food stores.

Some products might be hard to find. If so, you can get them at my website, [www.JanHealth.com](http://www.JanHealth.com).

If you want to check the formulas of vitamin, mineral, or amino acid products at health food stores, etc., you can compare them to products on my website.

For comparisons, look on my site at the Twice Daily Multi, and BAM or All Basic Plus amino acid mixes.



# **Get the Gut Right**

# The GI Tract and the Brain

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- The road to health is paved with good intestines.
  - Our gastrointestinal (GI) tract has a huge effect on our brain.
  - We can have a huge effect on our GI tract.
  - Key issues: cytokines, malabsorption, dysbiosis
- GI tract effects on the brain via the immune system:
  - 60 - 70% of the immune system is in the GI tract.
  - When the GI tract is inflamed, it sends messengers called ***cytokines*** throughout the body - including the brain - causing inflammation and trouble.
  - By activating a particular enzyme, cytokines deplete the brain of serotonin.
  - Cytokines stimulate hypothalamic-pituitary stress pathway, resulting in higher stress hormones, including cortisol.

# GI Malabsorption

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- When the intestines are inflamed, malabsorption of nutrients occurs.
- Malabsorption decreases amino acids, iron, folic acid, and fats. (And probably all nutrients).
- We need these nutrients for brain health.



# Increase Beneficial Microflora

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- There are trillions of bacteria in the intestines.
  - Beneficial bacteria protect intestinal walls, help build vitamins, and decrease inflammation and bad microbes.
  - Pathogenic bacteria cause inflammation.
  
- Increase beneficial bacteria:
  - Supplement probiotics:
    - Lactobacillus GG (Culturelle)
    - Saccharomyces boulardii (Florastor)
    - Bifido-bifidus (particularly for kids)
    - Lactobacillus paracasei, casei, plantarum, rhamnosus, and salivarius
  
  - Eat a low sugar, low refined flour, high fiber diet.
    - Bad bugs like sugar; good bugs like fiber.

# Decrease Pathogenic Microbes

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- Get rid of bad bugs: parasites, yeast overgrowth, and bacterial overgrowth.
- You may need to test to identify pathogens. A comprehensive stool test is offered by integrative practitioners.
  - My favorite test is one that uses DNA to identify and quantify microbes -- it is very accurate.
- Treat microbes as appropriate. If possible use natural products. Parasites usually require prescription medication, and perhaps a long treatment.

# Eliminate Food Allergens

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- Food allergens cause inflammation and reactivity all over the body.
  - No down side, except giving up your favorite foods
  - Dramatic effects on mood and energy
  - Particularly noticeable in children
- The worst offenders are gluten and dairy, then soy.
  - Gluten: wheat, oats, rye, barley, spelt, kamut
  - Dairy: cow is usually worse than goat and sheep.
- Test:
  - Try a couple weeks off.
  - Or you can do an IgG antibody test (through integrative practitioners).



# Optimize Serotonin

# Working with Neurotransmitters

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- Two core functions of neurotransmitters:
  - Calming down - Inhibitory
  - Energizing up - Excitatory
- You can supplement neurotransmitters or their co-factors - in a context of overall health.
- Individual differences:
  - More benefit from inhibitory neurotransmitters

# Inhibitory and Excitatory Neurotransmitters

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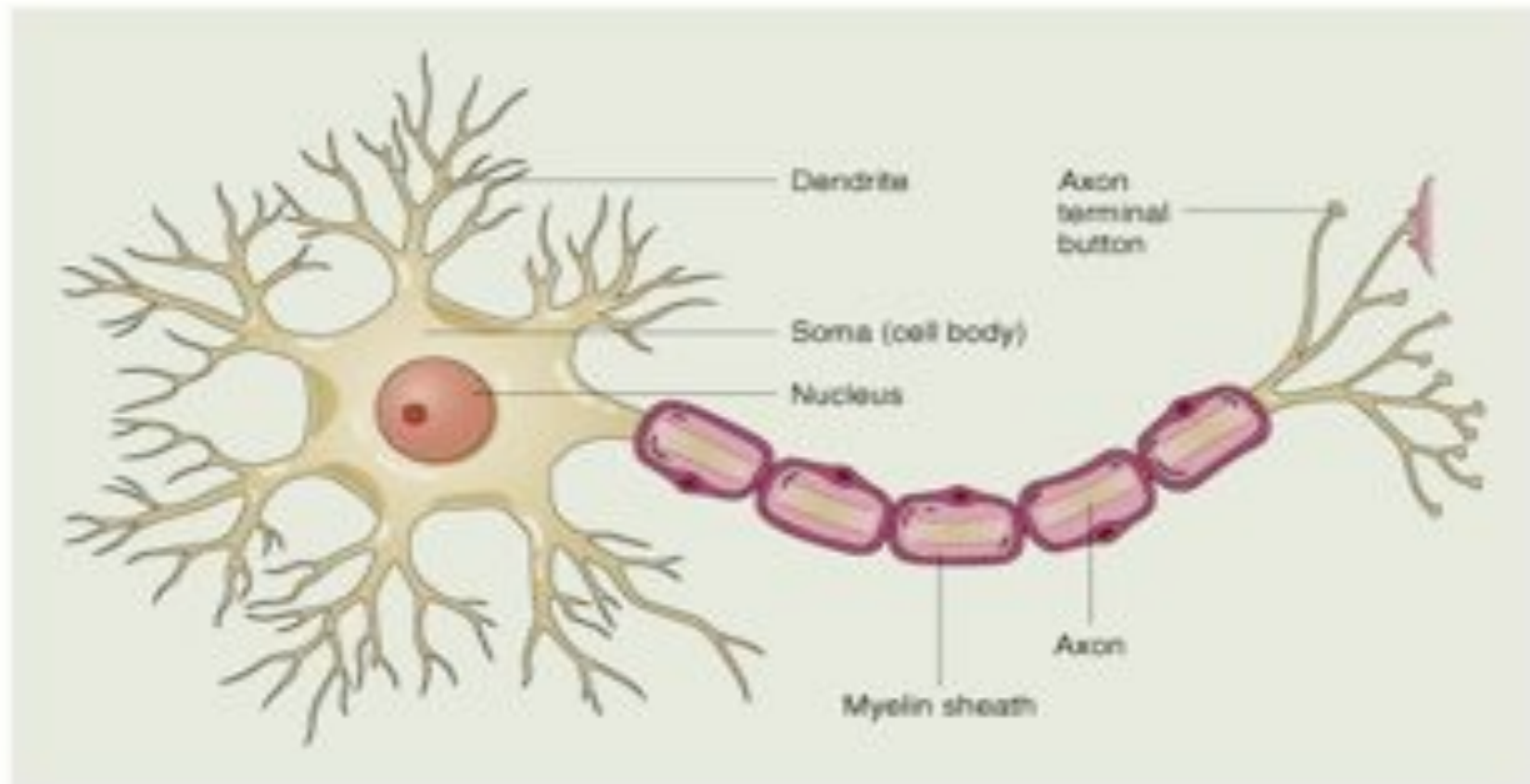
- Inhibitory:

- Serotonin
- GABA

- Excitatory:

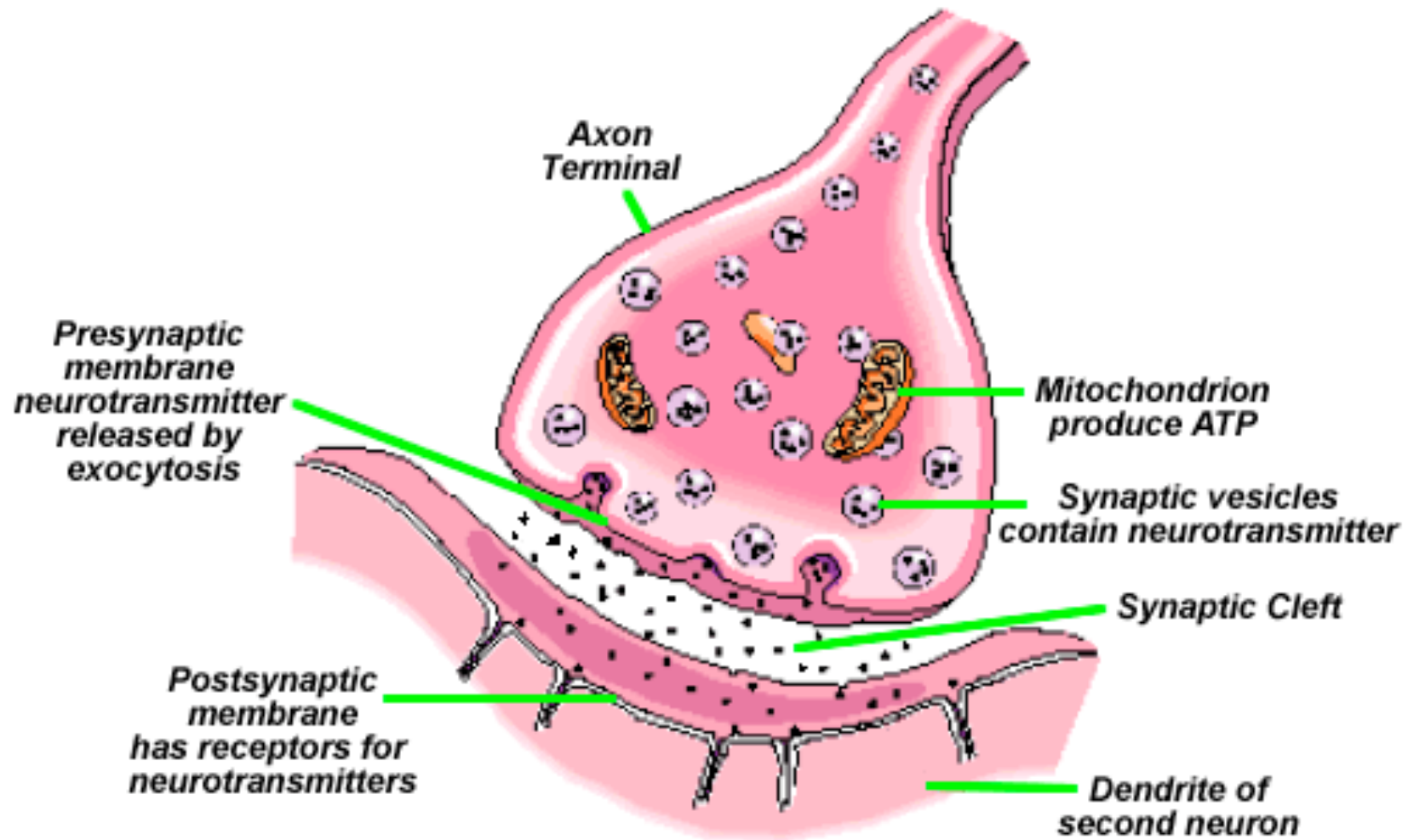
- Norepinephrine
- Dopamine
- Acetylcholine
- Glutamic acid (glutamate)

# A Neuron



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# A SYNAPSE





# Serotonin Effects

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- Serotonin is the key neurotransmitter for “happy and relaxed.”
- Serotonin is a neuro-modulator of GABA that increases its effects, and also helps decrease overactive norepinephrine, dopamine, adrenaline, and cortisol.
- Major effect on depression and anxiety

# Serotonin Production and Supplementation

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- Tryptophan (with iron) -> 5-hydroxytryptophan (5-HTP) (with P-5-P) -> **serotonin**  
|----> melatonin
- Options for increasing serotonin:
  - 5-HTP, 50 - 200 mg./day; empty morning stomach
  - Tryptophan: 500 - 1500 mg./day; before bed (great for sleep)
- Stop if it doesn't feel good.

# Serotonin and “Prozac Poop-Out”

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- Serotonin is eliminated from the synapse through re-uptake, which SSRI's prevent, or through degradation by monoamine oxidase (MAO).
- A theory: when the uptake of serotonin is inhibited, it leaves more serotonin available for breakdown by MAO. This could increase MAO action over time, thus depleting available serotonin.
- Possibly: add a little (50 mg.) 5-HTP. Be very careful -- if it feels at all wrong, stop.

# St. John's Wort

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- Neurochemistry:
  - Many pathways of action due to molecular complexity
  - Uptake inhibitor of serotonin and probably dopamine and norepinephrine; mild MAO inhibitor
  - If the drug companies could make this, they would!
- Dosing: 300 mg. 3 times per day
- Concerns about decreasing the effectiveness of other medications:
  - Do not use with protease inhibitors for HIV.
  - Unproven concern with birth control pills, but be mindful

**Increase GABA/Glutamic Acid Ratio**

# GABA and Glutamic Acid: Overview

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- GABA and glutamic acid (GA) have a dance in the brain. GABA is Yin (inhibitory) and Glutamic Acid is Yang (excitatory).
- Too much GA feels like a monosodium glutamate (MSG) overdose.
- High GA and/or low GABA are associated with:
  - Anxiety, depression, bipolar disorder
  - Migraines, seizures
  - Parkinson's disease
  - Schizophrenia

# Supplement Magnesium

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- Supplementing magnesium increases GABA.
- Studies on migraines, seizures, pre-eclampsia found magnesium to be effective.
- Take 400 - 1000 mg. magnesium.
  - Magnesium citrate will likely be a laxative.
  - Magnesium glycinate is not usually a laxative.

# Supplement Vitamin B-6

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- 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.
- Many don't make P-5-P from pyridoxine effectively.
- Often deficient in women on birth control pills.



# Supplement Taurine

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- Taurine binds to GABA receptors, thus stimulating GABA-like activity.
- It stimulates enzymes that make GABA, and inhibits enzymes that break it down.
- It's typically a benign amino acid, also depleted during breastfeeding.
- Consider 1000 mg./day (maybe more).

# Supplement Melatonin

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- Melatonin blocks the main glutamate receptor.
- Get good sleep. Take the time. Sleep is perhaps the most restorative activity for the brain.
- For sleep, use 1 - 3 mg. melatonin before bed, or a smaller amount for middle-of-the-night waking. Try sublingual preparations.

# Supplement Theanine

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- 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.

# Supplement GABA

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- 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.
- Several studies show efficacy of GABA with anxiety.
- Consider 250 - 750 mg./day on an empty stomach.

# Supplement Progesterone

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- 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.

# Possible Daily Supplements for Enhancing GABA/Glutamic Acid Ratio

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- Magnesium: 400 - 1000 mg. citrate (lax.) or glycinate (non-lax.)
- Vitamin B6 as P-5-P: 50 mg. on an empty stomach
- Taurine: 1000 mg. (or more) on an empty stomach (in a.m.)
- Melatonin 1-3 mg.
- Theanine: 100 – 200 mg.
- GABA: 250 - 750 mg.
- Progesterone cream (women only)
- Tryptophan or 5-HTP to enhance serotonin --> modulates GABA<sup>46</sup>



# **Enhance Excitatory Neurotransmitters**

# Increasing Amino Acids in General

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- When fatigue is an issue, even chronic fatigue, a complete amino acid blend can be very useful.
  - Taken on an empty stomach, it strongly (albeit temporarily) boosts amino acids levels.
  - The theory is, it primes the pump and gets the body and brain going.
- Use a free amino acid balanced blend:
  - Take 30 minutes before food in the morning.
  - 3 - 10 grams
  - Can modify with amino acid testing
  - Make sure vitamin and mineral co-factors are present.



# Enhance Dopamine, Norepinephrine

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- Increase dopamine and norepinephrine, which support attention, energy, and mood.
- Phenylalanine (with iron) -> tyrosine (with P-5-P) -> dopamine -> norepinephrine.
- Tyrosine also builds thyroid hormone.
- On a foundation of good serotonin, supplement:
  - 500-1000 mg./day of L-Phenylalaine or L-Tyrosine (empty stomach in the morning)
  - 50 mg./day of P-5-P (empty stomach in the morning)
  - Supplement iron as indicated by testing.

# Enhance Acetylcholine -1

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## ■ Phosphatidylserine:

- A structural component of a neuron's membrane
- Enhances acetylcholine release
- Calms stress pathways in the brain, reducing cortisol
- Many studies show decreased cognitive decline with aging
- 100 - 300 mg./day

## ■ Acetyl-L-Carnitine:

- Enhances acetylcholine
- Studies show decreased cognitive decline with aging and decreased progression of Alzheimer's disease.
- 500 - 1000 mg./day

# Enhance Acetylcholine - 2

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- Alpha GPC (glycerylphosphorylcholine) stimulates manufacture of new acetylcholine by providing a supply of choline for neurons.
- Stimulates release of GABA
- Benefits shown for memory, stroke, Alzheimer's, and vascular dementia.
- Try 300 - 600 mg. (By prescription in Europe)

## Enhance Acetylcholine -3

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- Huperzine A. is extracted from Chinese club moss. It helps prevent breakdown of acetylcholine.
- Some studies have shown effectiveness with Alzheimer's disease; one study showed improved memory in adolescents.
- 50 - 200 mg./day. Start slow. Although studies say no side effects, I have seen them.

# Bonus #6: Hormones

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- Check thyroid if fatigue is a factor.
  - TSH should ideally be under 2.00, but certainly under 3.00.
  
- Estrogen does many good things for the brain:
  - Improves mood
  - Supports memory
  - Helps prevent dementia
  
- Menopausal women should test estrogen levels and consider supplementation.
  - Always bioidentical
  - Always transdermal -- patch, cream, or spray

# Key Mental Interventions for the Brain

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- **Spacious awareness**
- **Taking in the good**
- **Loved and loving**
- **Restorative relaxation**
- **Natural happiness**



# **Self-Directed Neuroplasticity**

# Fact #1

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

# Tibetan Monk, Boundless Compassion

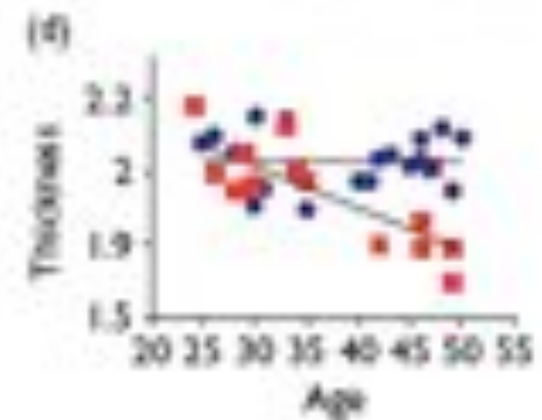
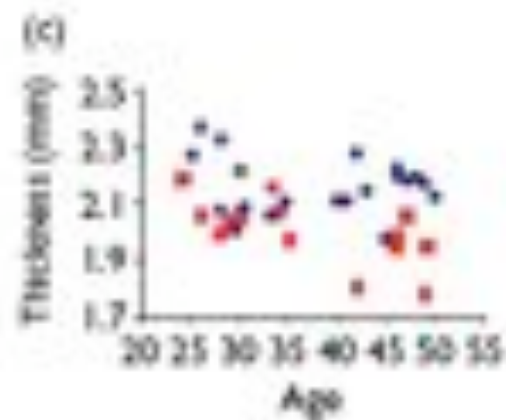
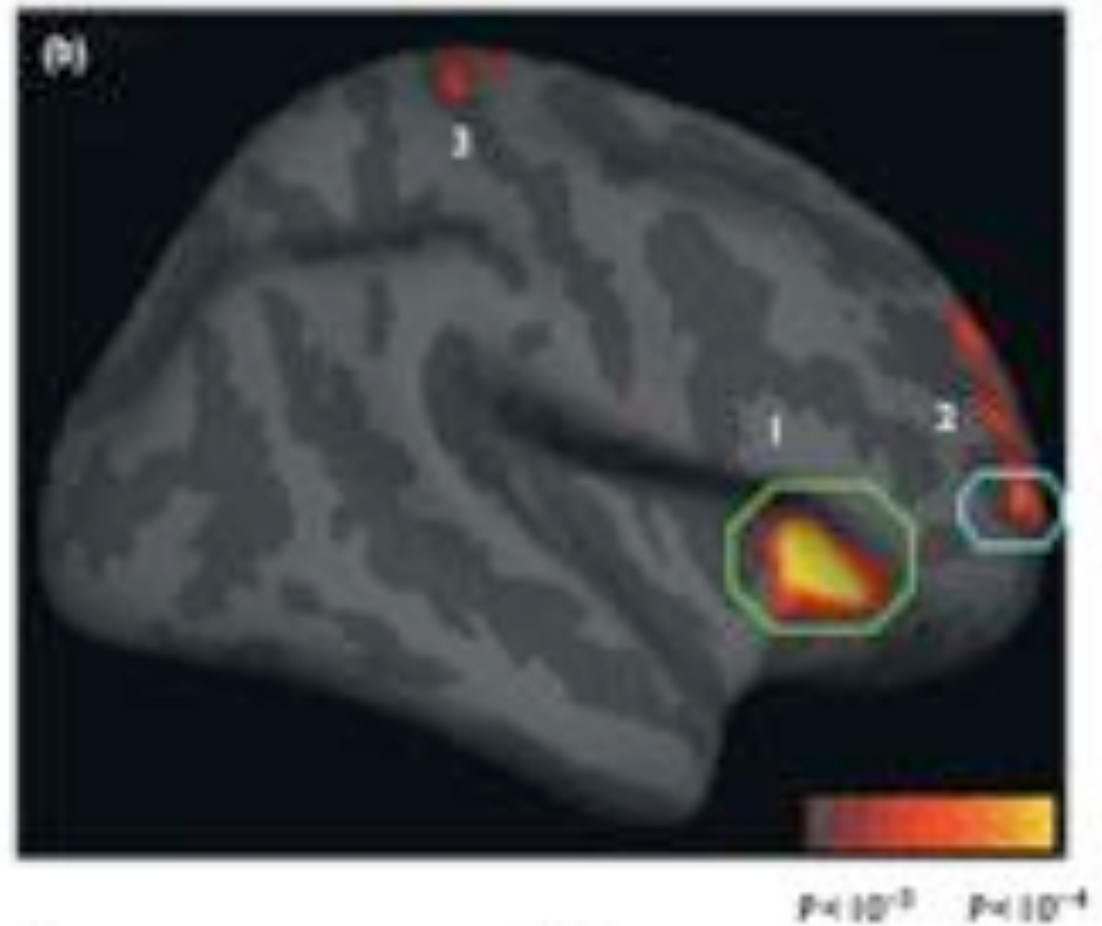


# Mind Changes Brain in Lasting Ways

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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.



## 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?***



# **Spacious Awareness**

# 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

# Dual Modes

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## “Doing”

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

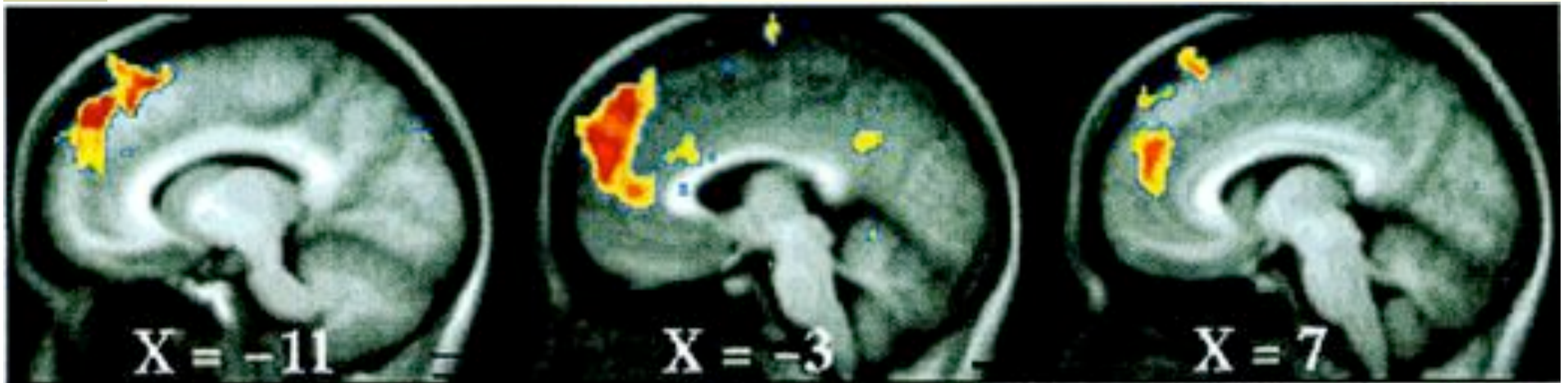
## “Being”

Mainly sensory  
Little verbal activity  
Concrete  
Now-focused  
Transient contents of mind  
Nothing to do, nowhere to go  
Sense of peace  
Impersonal, 3<sup>rd</sup> person perspective  
Uncertainty, not-knowing  
Nonjudgmental  
Mindful presence  
Loosely connected experiences  
Panoramic view  
Minimal or no self-as-object  
Minimal or no self-as-subject



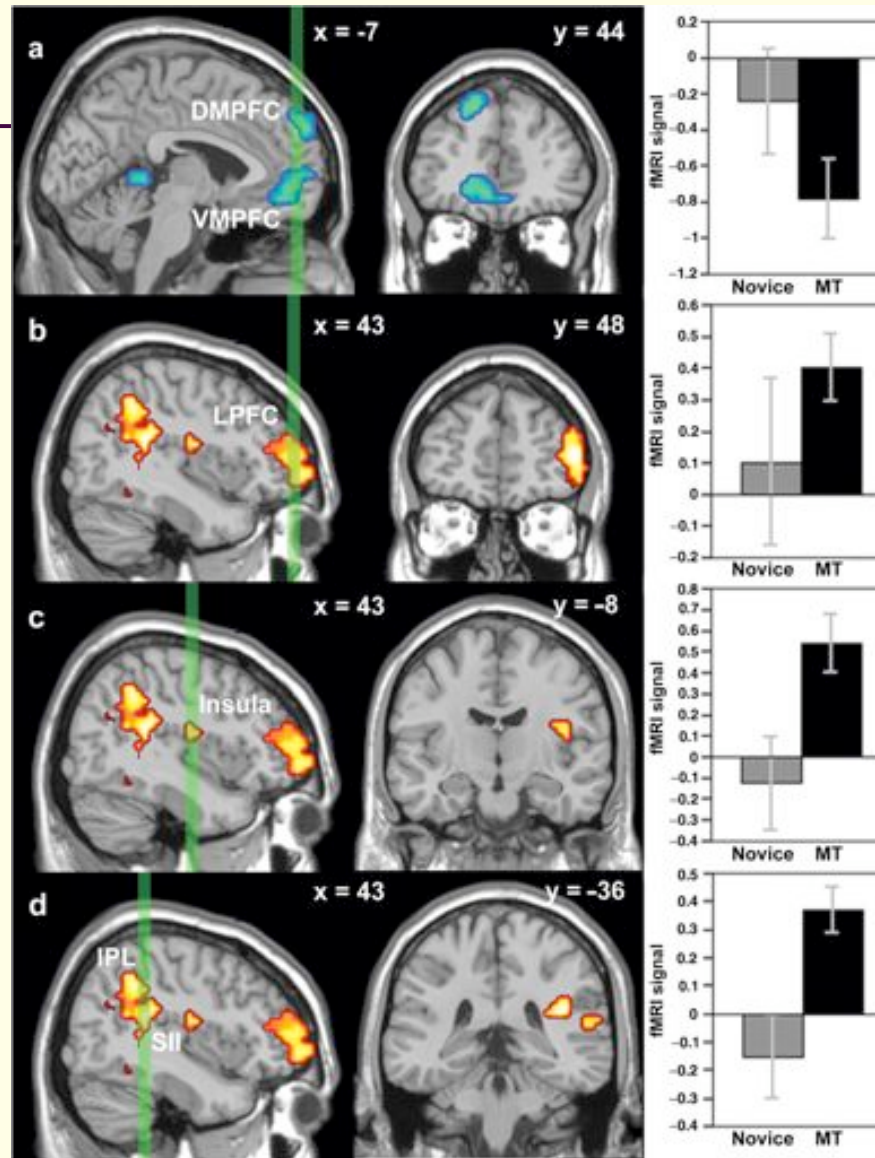
## Increased Medial PFC Activation Related to Self-Referencing Thought

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

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



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Minimal or no self-as-object  
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# Ways to Activate “Doing” Mode

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- Enter the “default mode” of the brain; run mini-movies in the mental simulator
- Sense a threat or opportunity; “crave” or “cling”
- Focus on a task; solve a problem; plan
- Think with language
- Reflect about future or past
- Take life personally

# Ways to Activate “Being” Mode

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- 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

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- 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

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- 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.

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

Ajahn Sumedho

# Taking in the Good



# Mindfulness, Virtue, Wisdom

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- **Mindfulness, virtue, and wisdom** are identified in both Western psychology and the contemplative traditions as key pillars of mental health.
- These map to three core functions of the nervous system: receiving/learning, regulating, and prioritizing. And map to the three phases of psychological healing and personal growth:
  - Be mindful of, release, replace.
  - Let be, let go, let in.
- Mindfulness is vital, but not enough by itself.

# “What a long strange trip it’s been”

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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
- ~ 80 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

# Three Stages of Brain Evolution

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## ■ Reptilian:

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

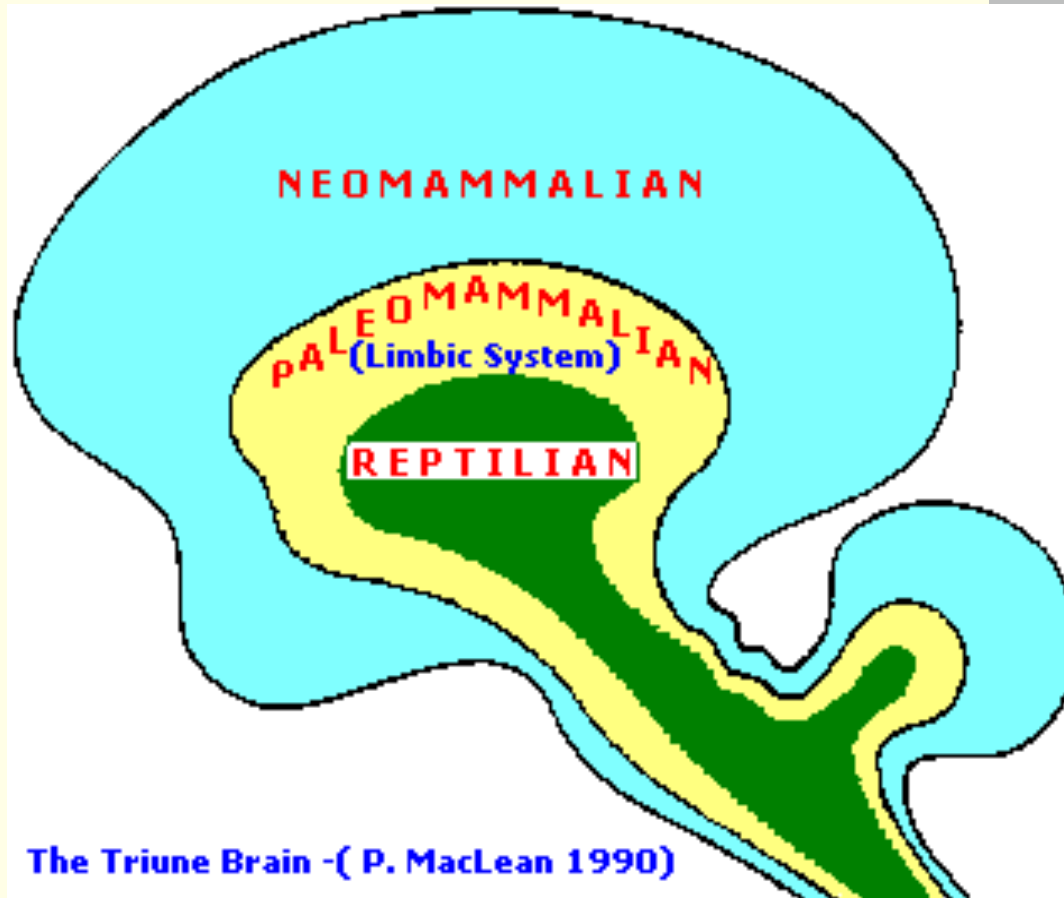
## ■ Mammalian:

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

## ■ Human:

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

# Evolutionary History



## The Triune Brain

# Three Goal-Directed Systems Evolved in the Brain

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- **Avoid** “sticks,” threats, penalties, pain
- **Approach** “carrots,” opportunities, rewards, pleasure
- **Attach** to “us,” 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 the other two for its ends.

# 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 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!<sup>78</sup> no more carrots forever.

# 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

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- 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)

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- 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

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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?*

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

# How to Take in the Good

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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.

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**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.**

# Targets of TIG

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

# Kinds of “Good” to Take in

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- The small pleasures of ordinary life
- The satisfaction of attaining goals or recognizing accomplishments - especially small, everyday ones
- Feeling grateful, contented, and fulfilled
  
- Things are alright; nothing is wrong; there is no threat
- Feeling safe and strong
- The peace and relief of forgiveness
  
- 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



# The Fourth Step of TIG

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

# Psychological Antidotes

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## Approaching Opportunities

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

## Affiliating with “Us”

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

## Avoiding Threats

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

# Resources for Taking in the Good

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- Intention; willing to feel good
- Identified target experience
- Openness to the experience; embodiment
- Mindfulness of the steps of TIG to sustain them
- Working through obstructions (e.g., distractibility, counter experiences, painful associations when accessing an embodied experience)

# Why It's Good to Take in the Good - 1

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- In general, adds positive contents to implicit memory
- Internalizes psychological growth (e.g., it usually feels good and goes well to speak from my heart)
- Associates rewards to good steps; boosts motivation
- Brings in missing “supplies” (e.g., love, worth) to help remedy deficits and heal painful experiences
- Encourages prosocial experiences and actions

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*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

# Why It's Good to Take in the Good - 2

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- Reduces threat reactivity (by taking in resources, opportunities fulfilled, and reasonable safety)
- Counteracts “learned helplessness” (by taking in assertiveness, efficacy, internal locus of control)
- Reduces suffering due to alarm signals from endlessly disturbed equilibria by taking in their also endless re-balancing
- Implicitly: Rights the internal injustice of the negativity bias; embodies self-attunement, -nurturance, and -advocacy (vital if a person hasn't received these)

# Benefits of Positive Emotions

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- 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, including:
  - Promote exploratory, “approach” behaviors
  - Lift mood; increase optimism, resilience
  - Counteract trauma
  - Strengthen immune and protect cardiovascular systems
  - Overall: “broaden and build”
  - Create positive cycles



# Loved and Loving



# 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 *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.

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*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

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*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

# 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

# Neural Substrates of Empathy

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

# Empathy Skills

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- Show up
  - Pay attention.
  - Be open.
  - Drop aversion (judgments, distaste, fear, anger, withdrawal).
  
- Track actions
  - What would it feel like in your own body?
  - Perhaps mirror appropriately
  
- Track emotions
  - Tune into face and eyes.
  - What would you be feeling? In your own body?
  
- Track thoughts
  - Sense beneath the surface.
  - Investigate actively.

---

*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



---

*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.*

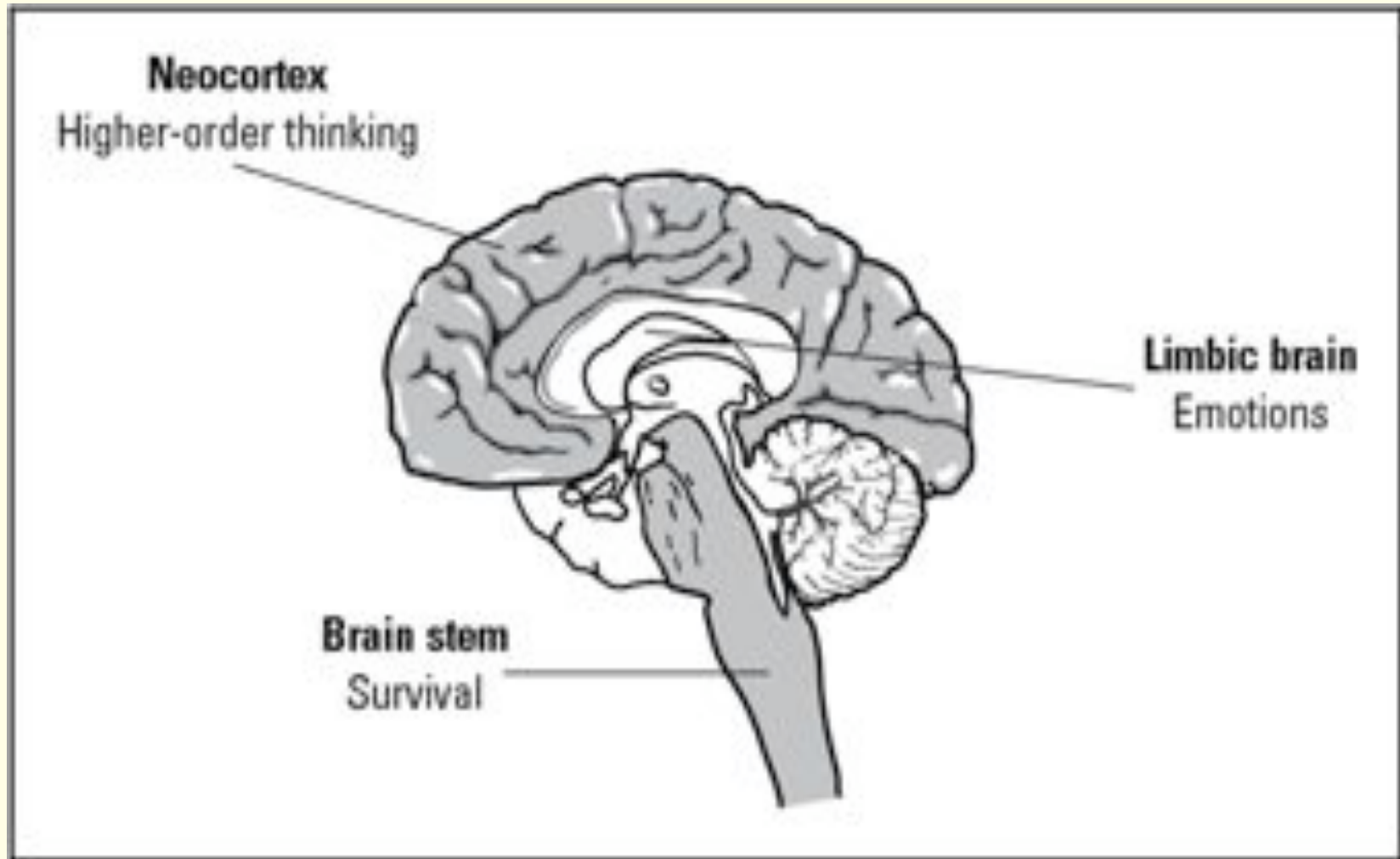
*(Hu)mankind is waiting and longing for those who can accomplish the task of untying what is knotted, and bringing these underground waters to the surface.*

Albert Schweitzer



# Restorative Relaxation

# Circuits of Reactive Responses



# Negative Experiences Can Have Benefits

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

*But is there really any shortage of negative experiences?*

# 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

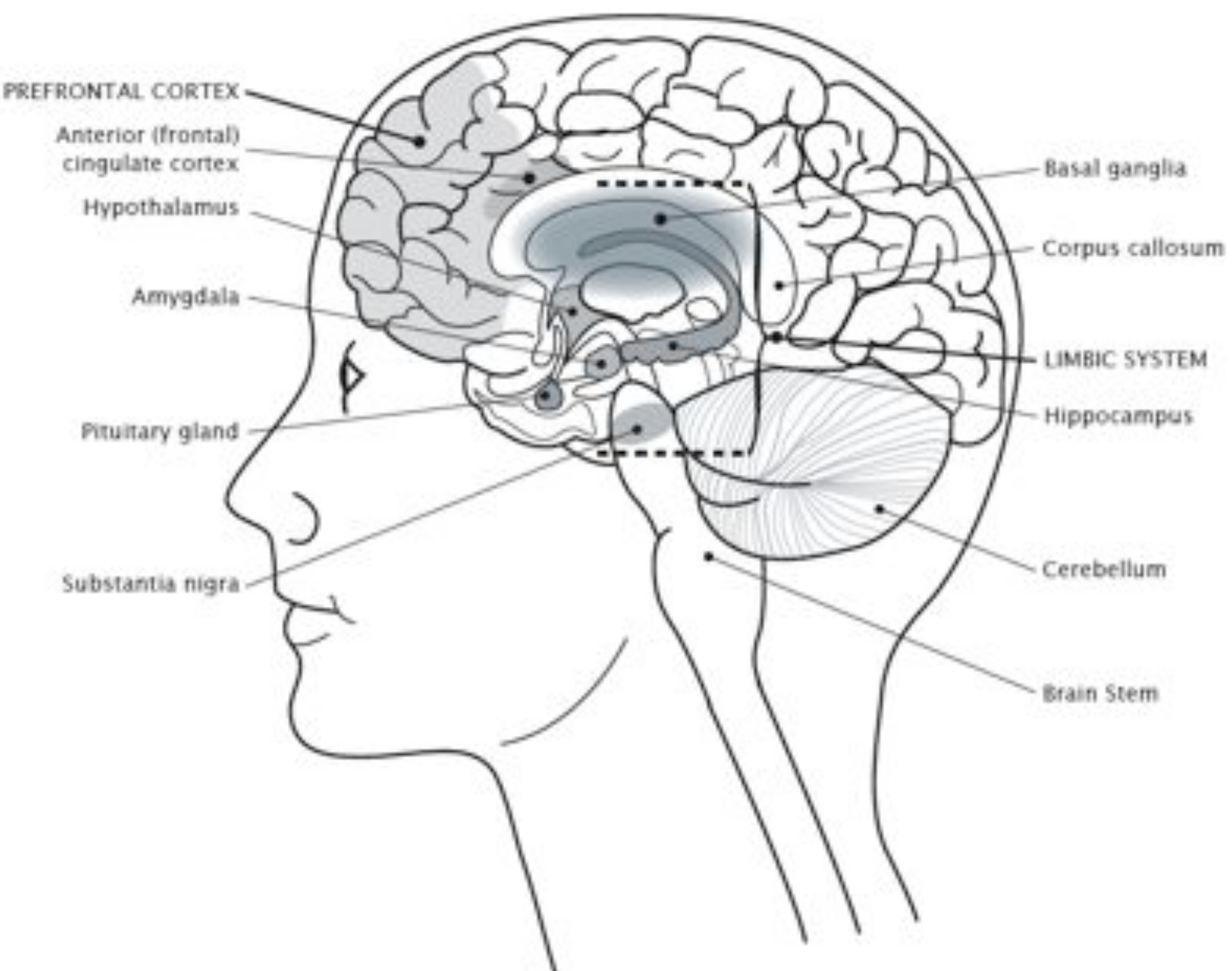
## ■ Mental:

- 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)

# One Neural Consequence of Negative Experiences

---

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





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# Feeling as Safe as You Reasonably Can

---

- Connecting with others; finding allies; internalizing self-encouraging, -nurturing, -soothing, -coaching 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

# 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)

# Cooling the Fires

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- 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.

---

*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



# 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)?

# Three Motivational Systems

---

- **Avoid** “sticks,” threats, penalties, pain
  - **Approach** “carrots,” opportunities, rewards, pleasure
  - **Attach** to “us,” for proximity, bonds, feeling close
- Reptiles and fish avoid and approach. Mammals and birds also *attach* - especially primates and humans. Attaching is a breakthrough, co-evolving with emotion.
- 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.



# Home Base of the Human Brain

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*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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# 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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# 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”

# Choices . . .

---



Or?

Respo



# Coming Home . . .

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**Gladness**

**Love**

**Peace**

# Ways to “Take the Fruit as the Path”

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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.



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*Penetrative insight  
joined with calm abiding  
utterly eradicates  
afflicted states.*

Shantideva

# Great Books

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

- Austin, J. 2009. *Selfless Insight: Zen and the Meditative Transformations of Consciousness*. MIT Press.
- Begley, S. 2007. *Train Your Mind, Change Your Brain: How a New Science Reveals Our Extraordinary Potential to Transform Ourselves*. Ballantine.
- Hanson, R. 2009 (with R. Mendius). *Buddha's Brain: The Practical Neuroscience of Happiness, Love, and Wisdom*. New Harbinger.
- Johnson, S. 2005. *Mind Wide Open: Your Brain and the Neuroscience of Everyday Life*. Scribner.
- Kornfield, J. 2009. *The Wise Heart: A Guide to the Universal Teachings of Buddhist Psychology*. Bantam.
- LeDoux, J. 2003. *Synaptic Self: How Our Brains Become Who We Are*. Penguin
- Sapolsky, R. 2004. *Why Zebras Don't Get Ulcers*. Holt.
- Siegel, D. 2007. *The Mindful Brain: Reflection and Attunement in the Cultivation of Well-Being*. W. W. Norton & Co.
- Thompson, E. 2007. *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Belknap Press.

# Key Papers - 1

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See [www.RickHanson.net](http://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. 132

# 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.