

# ***Your Best Brain:***

---

## ***Ten Great Ways***

### ***To Change Your Brain for the Better***

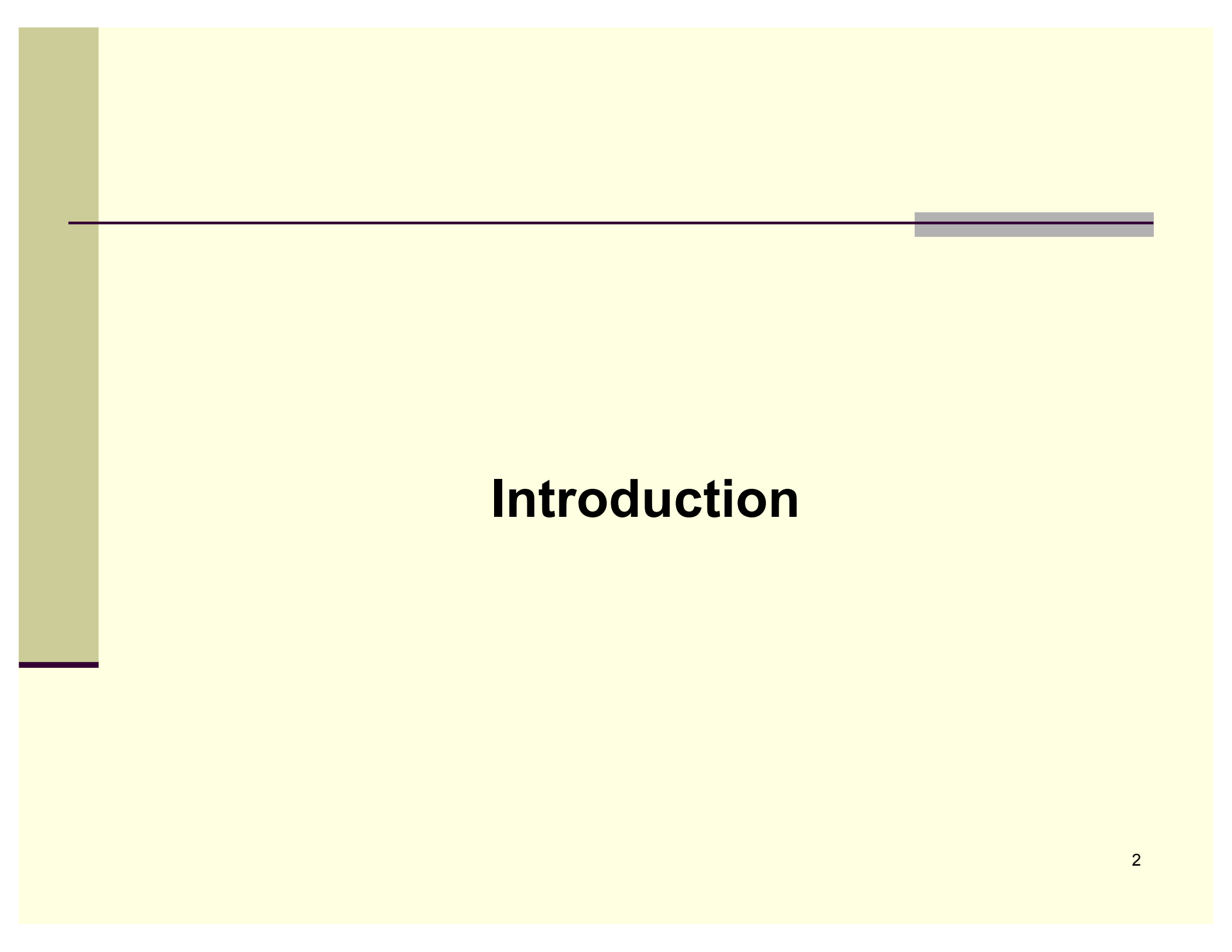
Jan Hanson, M.S., L.Ac. and Rick Hanson, Ph.D.  
April 14, 2013

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

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

[www.JanHealth.com](http://www.JanHealth.com)    [janhealth@comcast.net](mailto:janhealth@comcast.net)

[www.RickHanson.net](http://www.RickHanson.net)    [drh@comcast.net](mailto:drh@comcast.net)



# Introduction

---

*[People] ought to know that  
from nothing else but the brain  
come joys, delights, laughter and sports,  
and sorrows, griefs, despondency, and lamentations.*

Hippocrates



---

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

*What do you do?*

John Maynard Keynes

---

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

*We don't know,*

*yet we are thinking continually.*

Venerable Tenzin Palmo



# Physical Methods

# Key Physical Interventions for the Brain

---

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

**And exercise!**





**Provide a Complete Array of Nutrients**

# 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.
  - 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

---

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

---

Patient: “What do you think about the blood type diet?”

Jan: “I love it. But I don’t think it matters what type you pick.”

# Nutrients from Food - 1

---

- 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

---

- 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

---

- 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.

# Nutrients From Food - 4

---

- 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 dysregulates 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

---

- Start with a good multi-vitamin/mineral supplement, with high B-vitamins (10x DVs for B's and 800 mcg folic acid, ideally as 5-methyl-tetrahydrofolate)
- Folate, B-12, and B-6 cut brain shrinkage in half in older mildly cognitively impaired adults with high homocysteine. Take B-12 under the tongue.
- Low folate predisposes people to depression.
- Folic acid + SSRI almost doubles success rate over SSRI alone.

# Supplement Minerals

---

- 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

---

- 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

---

- 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

---

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). Or call me, at 415/472-3663.

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

---

- 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

---

- 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 - 1

---

- 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:
  - Eat a low sugar, low refined flour, high fiber diet.
    - Bad bugs like sugar; good bugs like fiber.
  - Supplement probiotics:
    - Lactobacillus GG (Culturelle)
    - Saccharomyces boulardii (Florastor)
    - Bifido-bifidus (particularly for kids)
    - Lactobacillus paracasei, casei, plantarum, rhamnosus, and salivarius

# Increase Beneficial Microflora - 2

---

- Dosing multi-strain probiotics
  - Must sustain treatment: probiotics bloom then leave within two weeks
  - 5 billion CFUs (colony forming units) per day for ongoing healthy GI support
  - 25-50 billion CFUs for GI repair
  - 450 billion - 3.6 trillion CFUs: ulcerative colitis (VSL #3)
- Make your own yogurt or kefir
  - Dairy-free recipes using coconut milk are on-line.
  - Add your own probiotics.
  - Most supermarket brands have no active probiotics.

# Decrease Pathogenic Microbes

---

- 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

---

- 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

---

- 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

---

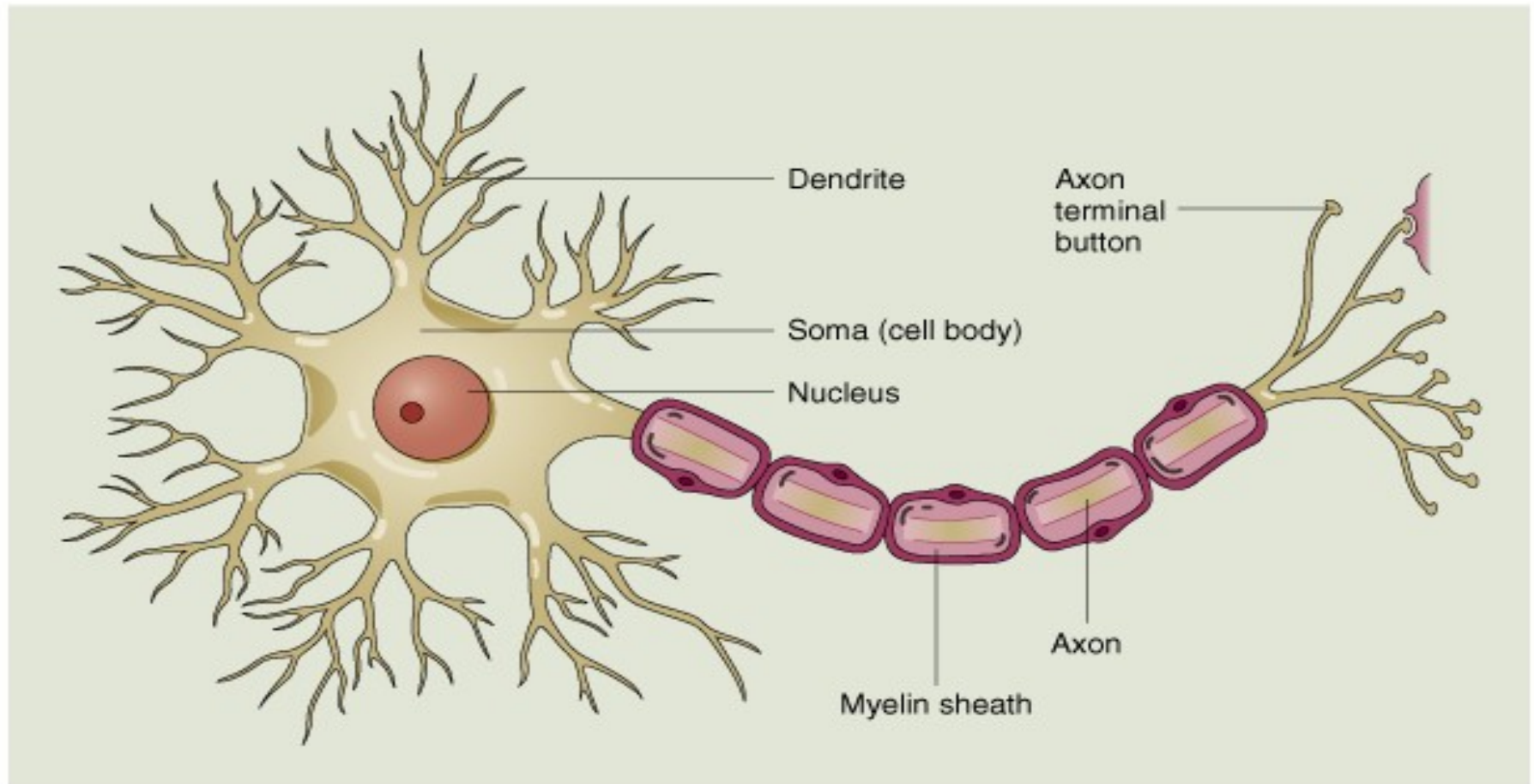
- Inhibitory:

- Serotonin
- GABA

- Excitatory:

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

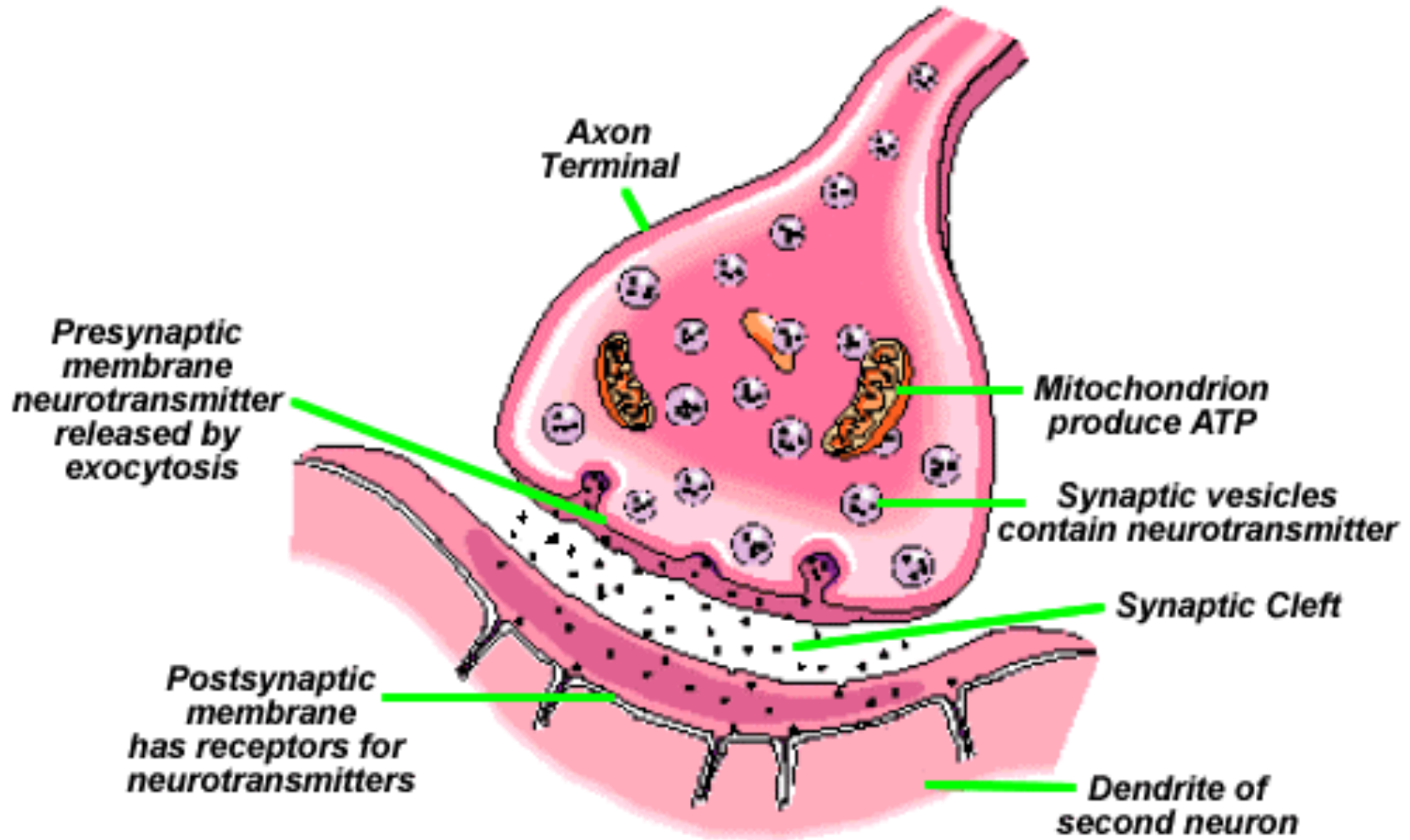
# A Neuron



© 2000 John Wiley & Sons, Inc.



# A SYNAPSE



# Serotonin Effects

---

- 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

---

- Tryptophan (with iron) -> 5-hydroxytryptophan (5-HTP) (with B-6 [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”

---

- 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

---

- **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

---

- 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

---

- Supplementing magnesium increases GABA.
- Studies on migraines, seizures, and preeclampsia 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

---

- 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

---

- 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

---

- 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

---

- 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

---

- 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

---

- 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

---

- 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>47</sup>



# **Enhance Excitatory Neurotransmitters**



# Enhance Dopamine, Norepinephrine

---

- 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-Phenylalanine 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

---

- 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

# Enhance Acetylcholine - 2

---

- 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

---

- 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.

# Broad Neurotransmitter Increase

---

- When fatigue is an issue, even chronic fatigue, a complete amino acid blend can be very useful.
  - Taken on an empty stomach, it temporarily but strongly boosts amino acids levels.
  - The theory is that it primes the pump and gets the body and brain going.
- Use a free amino acid balanced blend.
  - Take on an empty stomach, 30 minutes before food in the morning.
  - 3 - 10 grams
  - Can modify with amino acid testing (from integrative practitioners).
  - Make sure vitamin and mineral co-factors are present.<sup>53</sup>

# Bonus #6 Increase Glutathione

---

- Increase glutathione, perhaps the most important anti-oxidant in the brain.
  - Lipoic acid: 100 - 600 mg. per day.
    - Consider R-Lipoic form.
    - Consider time-release lipoic acid.
  - NAC (N-Acetyl-Cysteine)
    - Most important building block of glutathione
    - May benefit the GABA/Glutamic Acid ratio
    - May be hard to tolerate on the digestive system
    - Try 500 - 2000 mg. per day on an empty stomach.
- Oral glutathione is not well absorbed.

# Bonus #7: Hormones

---

- 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



# **Mental Methods**



# Three Facts about Brain and Mind

---

- As the brain changes, the mind changes.
  - Mental activity depends upon neural activity.
- As the mind changes, the brain changes.
  - Transient: brainwaves, local activation
  - Lasting: epigenetics, neural pruning, “neurons that fire together, wire together”
  - Experience-dependent neuroplasticity
- You can use the mind to change the brain to change the mind for the better: self-directed neuroplasticity.

---

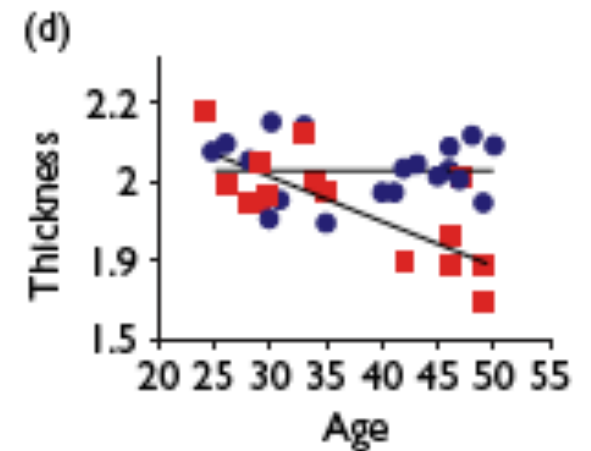
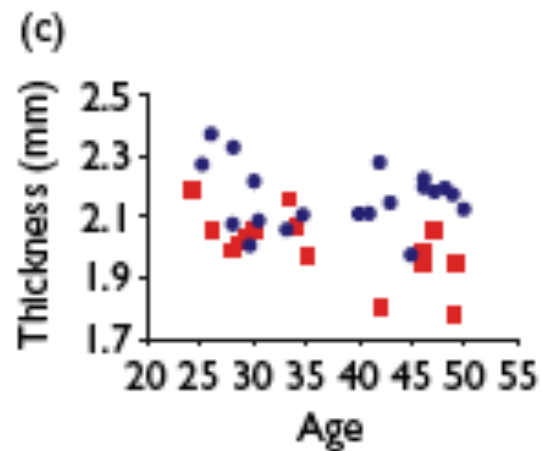
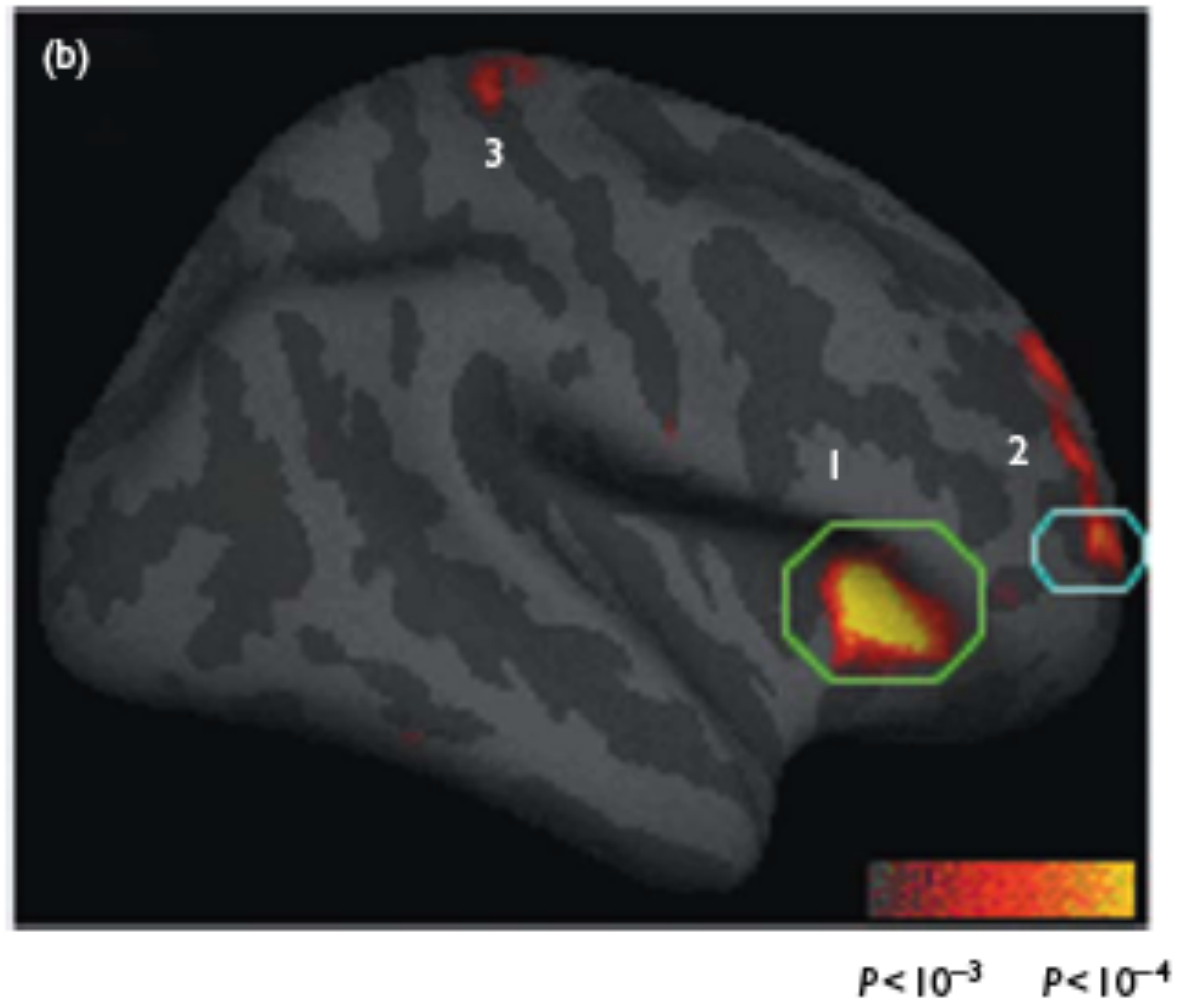
*The principal activities of brains  
are making changes in themselves.*

Marvin L. Minsky

# Tibetan Monk, Boundless Compassion



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



# Honoring Experience

---

**Your experience *matters*.**

**Both for how it feels in the moment  
and for the lasting residues it leaves behind,  
woven into the fabric of your brain and being.**

---

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

# Key Mental Interventions for the Brain

---

- **Be on your own side.**
- **Be mindful.**
- **Take in the good.**
- **Rest in love.**
- **Come home to happiness.**



**Be on Your Own Side**



---

*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

---

*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

---

- 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



**Be Mindful**

# 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

# The Joy of Tech™

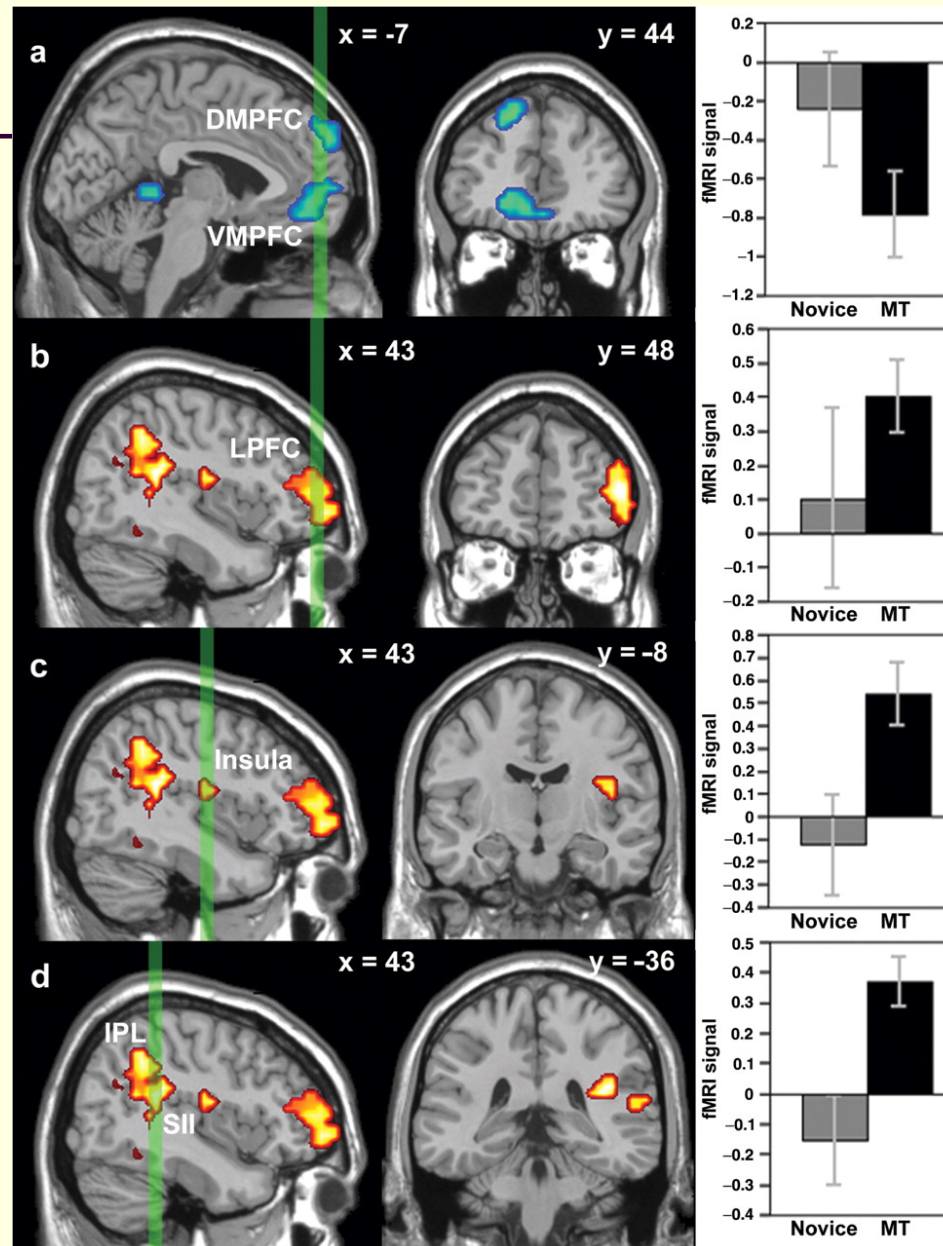
by Nitrozac & Snaggy



©2007 Geek Culture

joyoftech.com

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





# Ways to Activate “Being” Mode

---

- Relax
- Focus on bare sensations and perceptions
- Sense the body as a whole
- Take a panoramic, “bird’s-eye” view
- Engage “don’t-know mind”; release judgments
- Don’t try to connect mental contents together
- Let experience flow, staying here now
- Relax the sense of “I, me, and mine”

# Whole Body Awareness

---

- Sense the breath in one area (e.g., chest, upper lip)
- Sense the breath as a whole: one gestalt, percept
- Sense the body as a whole, a whole body breathing
- Sense experience as a whole: sensations, sounds, thoughts . . . all arising together as one unified thing
- It's natural for this sense of the whole to be present for a second or two, then crumble; just open up to it again and again.



# Take in the Good

# Negativity Bias

---

- As our ancestors evolved, not getting hit by “sticks” was more important for survival than getting “carrots.”
- Negative stimuli get more attention and processing. Loss aversion.
- Preferential encoding in implicit memory:
  - Easy to create learned helplessness, hard to undo
  - Negative interactions: more powerful than positive
  - Good at learning from bad, bad at learning from good
  - Most good experiences are wasted on the brain: lowers both the results of practice and motivation

# Cultivation in Context

---

- Three ways to engage the mind:
  - Be with it. Decrease negative. Increase positive.
  - The garden: Observe. Pull weeds. Plant flowers.
  - Let be. Let go. Let in.
  - Mindfulness present in all three ways to engage mind
- While “being with” is primary, it’s often isolated in Buddhist, nondual, and mindfulness-based practice.
- Skillful means for decreasing the negative and increasing the positive have developed over 2500 years. Why not use them?

# HEAL by Taking in the Good

---

1. Have a positive experience. Notice or create it.
2. Enrich the experience through duration, intensity, multimodality, novelty, personal relevance
3. Absorb the experience by intending and sensing that it is sinking into you as you sink into it.
4. Link positive and negative material.

Benefits: Specific contents internalized. Implicit value of being active and treating yourself like you matter. Gradual sensitization of the brain to the positive.

# Some Key Resource Experiences

---

## Avoiding Harms

- Feeling basically alright right now
- Feeling protected, strong, safe, at peace
- The sense that awareness itself is untroubled

## Approaching Rewards

- Feeling basically full, the enoughness in this moment as it is
- Feeling pleased, glad, grateful, satisfied
- Therapeutic, spiritual, or existential realizations

## Attaching to Others

- Feeling basically connected
- Feeling included, seen, liked, appreciated, loved
- Feeling compassionate, kind, generous, loving

---

*Think not lightly of good, saying,  
"It will not come to me."*

*Drop by drop is the water pot filled.*

*Likewise, the wise one,  
gathering it little by little,  
fills oneself with good.*





# Rest in Love



© Kalyan Varma





---

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

Henry Wadsworth Longfellow

# Compassion and Kindness

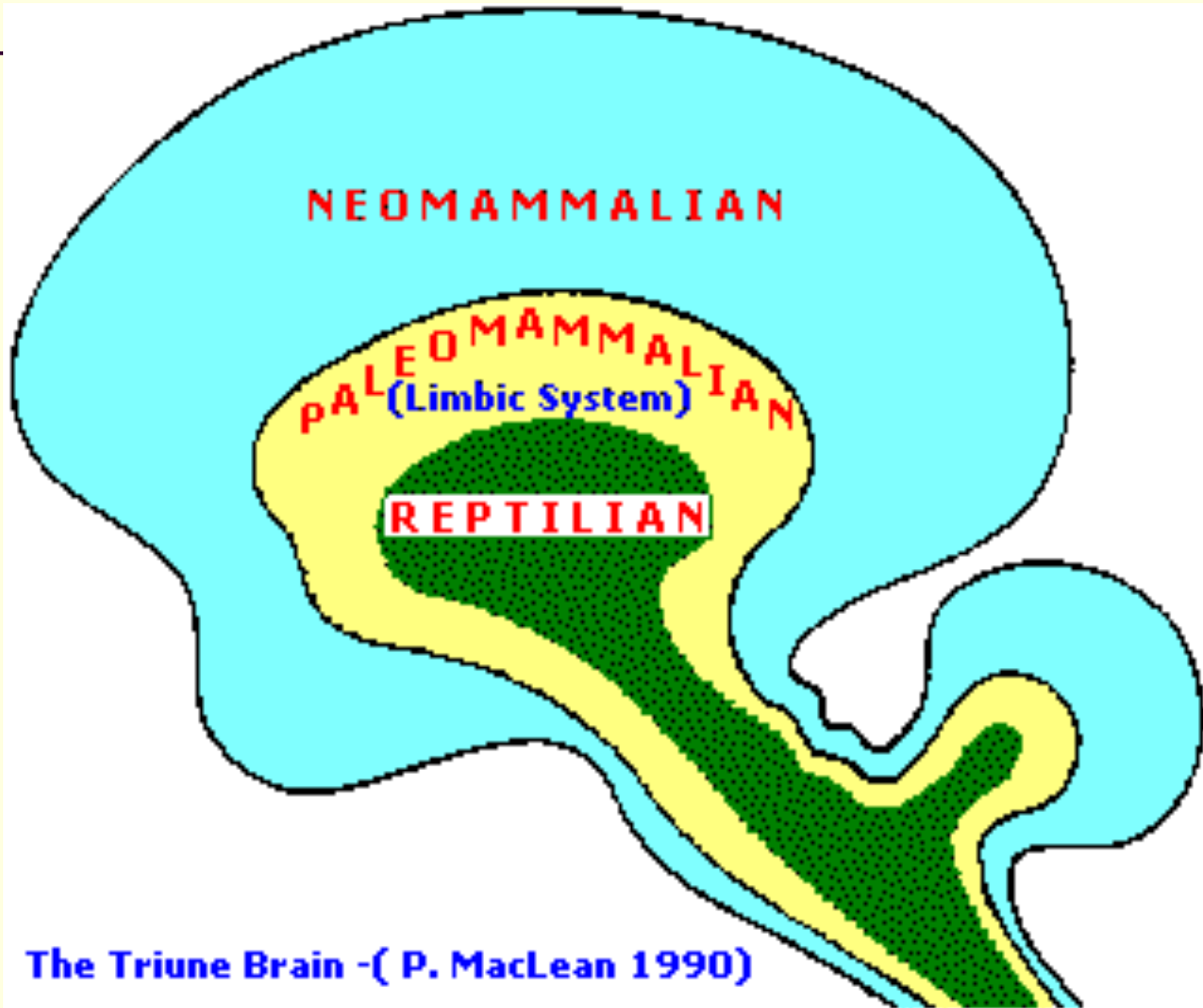
---

- Good heart
  - Feeling cared about and caring
  - Warming the heart itself
  - Heartmath
  
- Good wishes: safety, health, happiness, ease
  
- All beings, “omitting none”
  - Self
  - Benefactor
  - Friend
  - Neutral person
  - Difficult person



**Come Home to Happiness**

# Evolutionary History



The Triune Brain - ( P. MacLean 1990)

# Three Fundamental Motivational and Self-Regulatory Systems

---

- **Avoid Harms:**
  - Primary need, tends to trump all others
- **Approach Rewards:**
  - Elaborated via sub-cortex in mammals for emotional valence, sustained pursuit
- **Attach to Others:**
  - Very elaborated via cortex in humans for pair bonding, language, empathy, cooperative planning, compassion, altruism, etc.



# The Homeostatic Home Base

---

*When not disturbed by threat, loss, or rejection [no felt deficit of safety, satisfaction, and connection]*

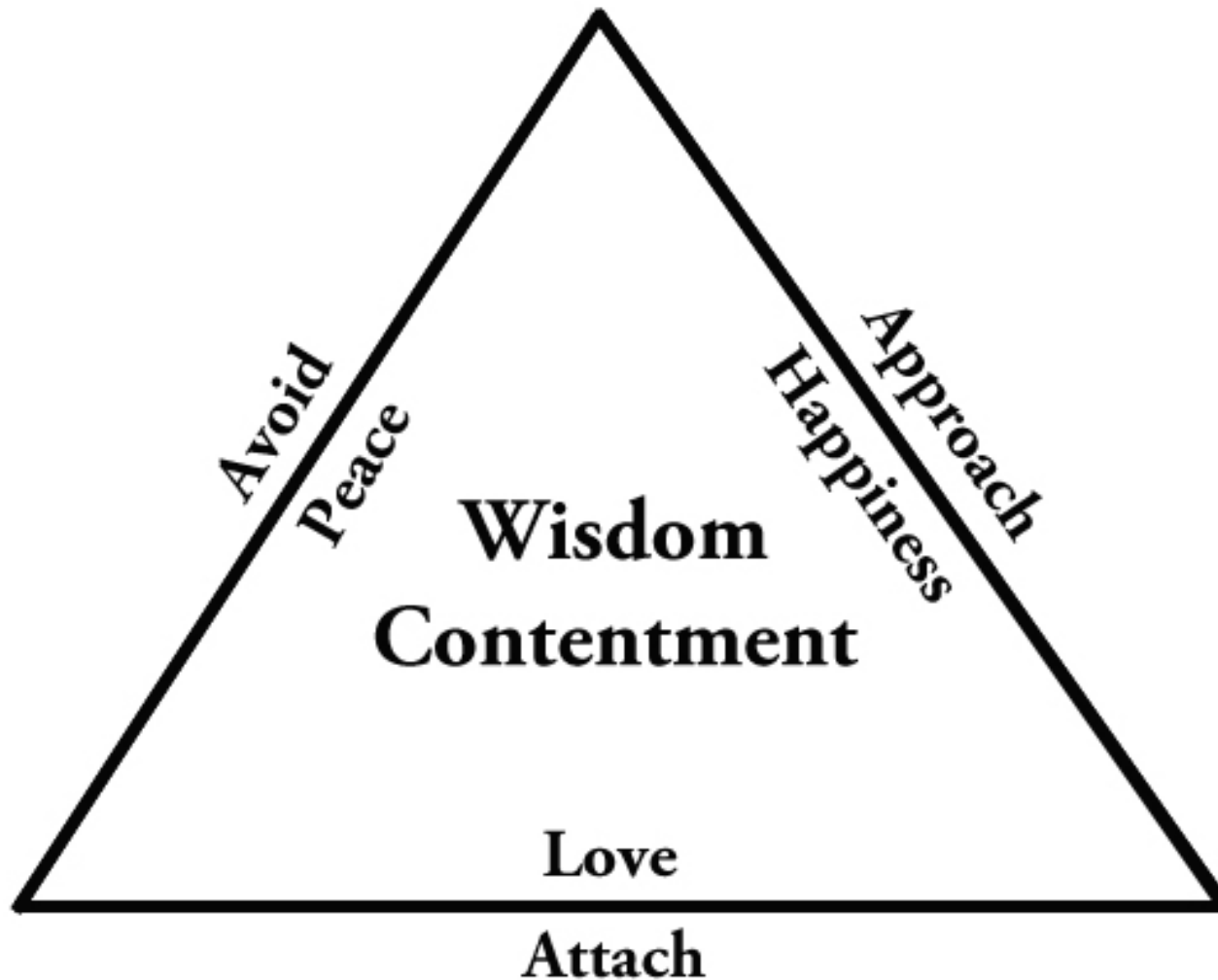
The body defaults to a sustainable equilibrium of refueling, repairing, and pleasant abiding.

The mind defaults to a sustainable equilibrium of:

- **Peace** (the Avoiding system)
- **Contentment** (the Approaching system)
- **Love** (the Attaching system)

This is the brain in its homeostatic ***Responsive,***  
*minimal craving* mode.

# The Responsive Mode



# Neurobiological Basis of Craving

---

*When disturbed by threat, loss, or rejection [felt deficit of safety, satisfaction, or connection]:*

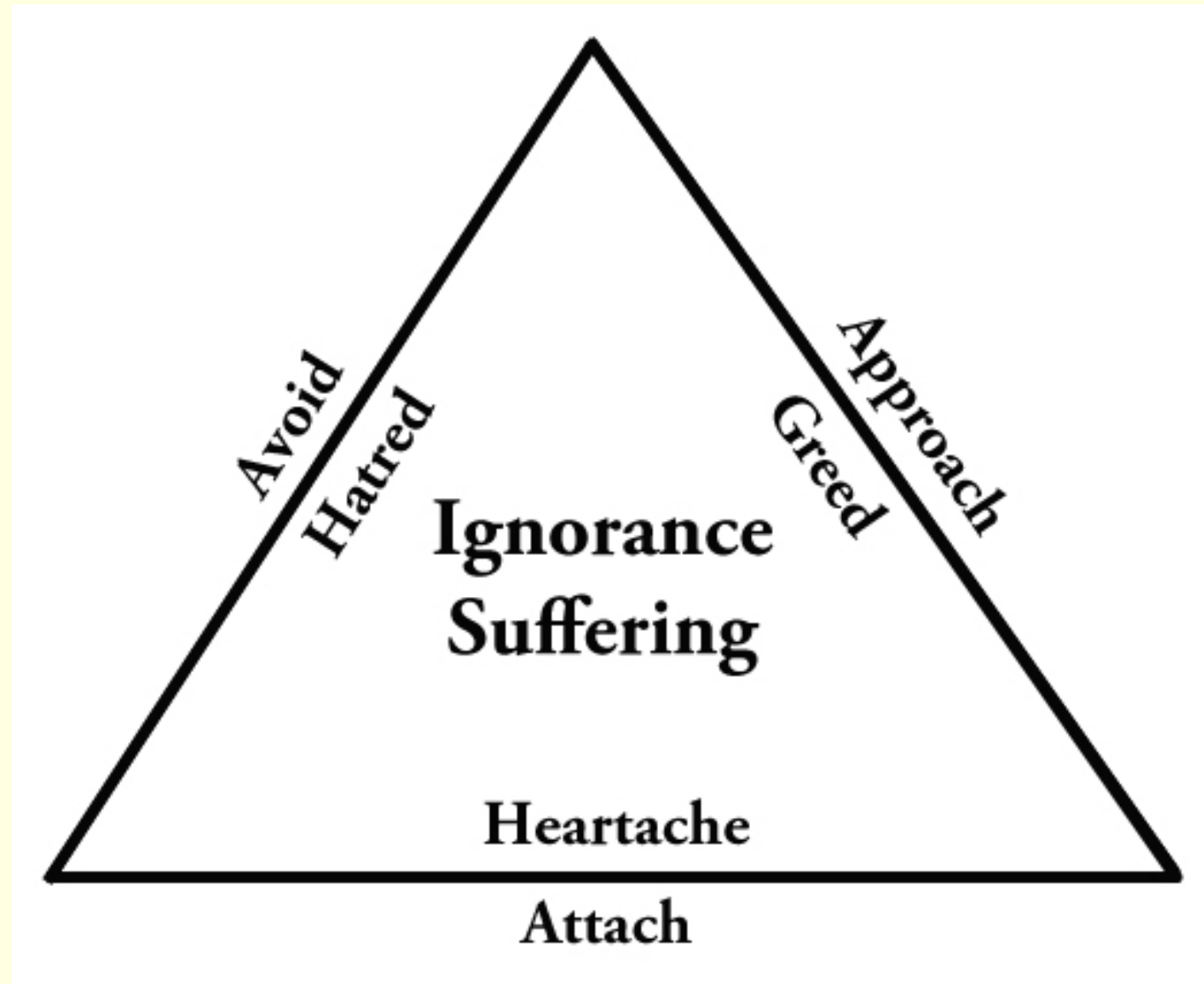
The body fires up into the stress response; outputs exceed inputs; long-term building is deferred.

The mind fires up into:

- **Hatred** (the Avoiding system)
- **Greed** (the Approaching system)
- **Heartache** (the Attaching system)

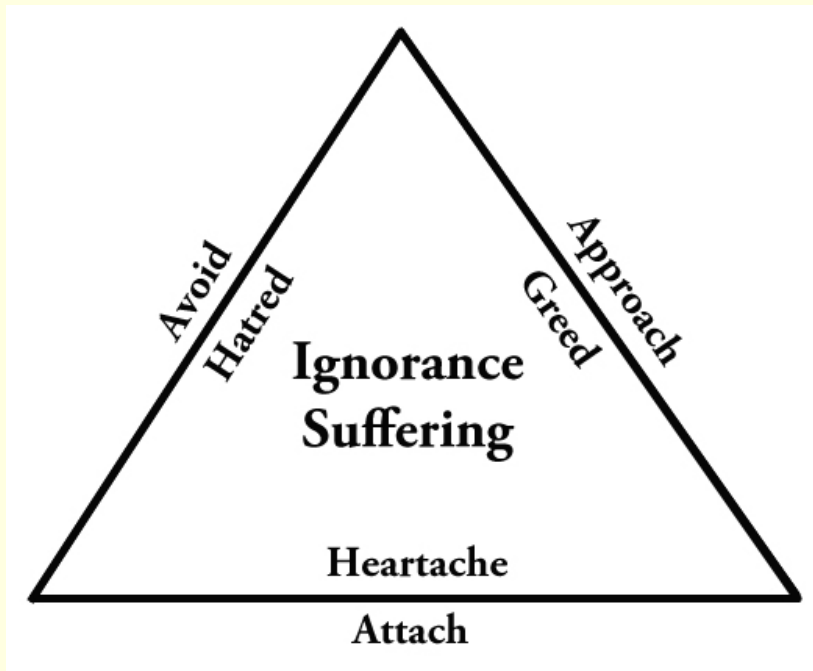
This is the brain in allostatic, **Reactive**, *craving* mode.<sup>91</sup>

# The Reactive Mode



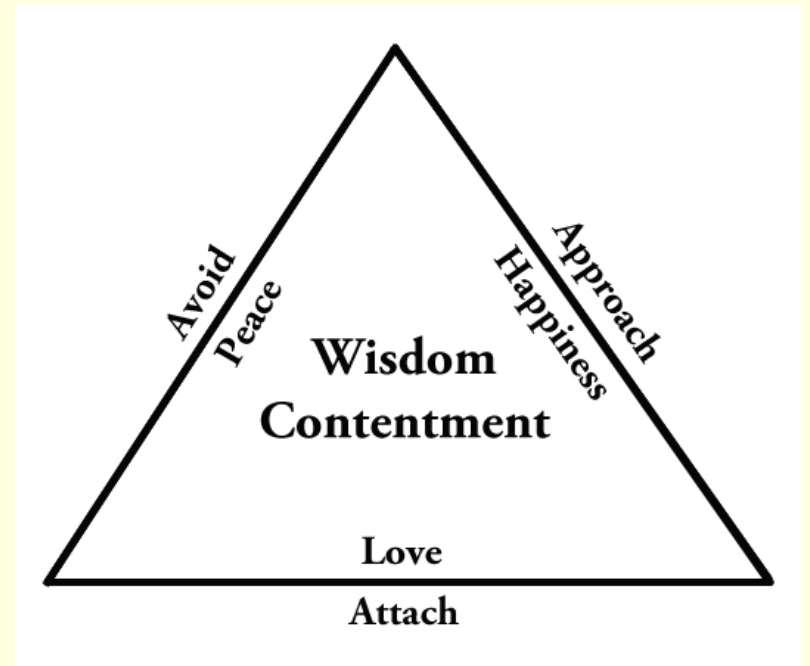
# Choices . . .

---



**Reactive Mode**

Or?



**Responsive Mode**

# Cultivation Undoes Craving

---

- All life has goals. The brain continually seeks to avoid harms, approach rewards, and attach to others - even that of a Buddha.
- It is wholesome to wish for the happiness, welfare, and awakening of all beings - including the one with your nametag.
- We rest the mind upon positive states so that the brain may gradually take their shape. This disentangles us from craving as we increasingly rest in a peace, happiness, and love that is independent of external conditions.
- With time, even the practice of cultivation falls away - like a raft that is no longer needed once we reach the farther shore.

# Coming Home . . .

---

**Peace**

**Contentment**

**Love**

# Great Books

---

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

---

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. 98

# 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.