

The Neurology of Awakening:

The Nondual Brain

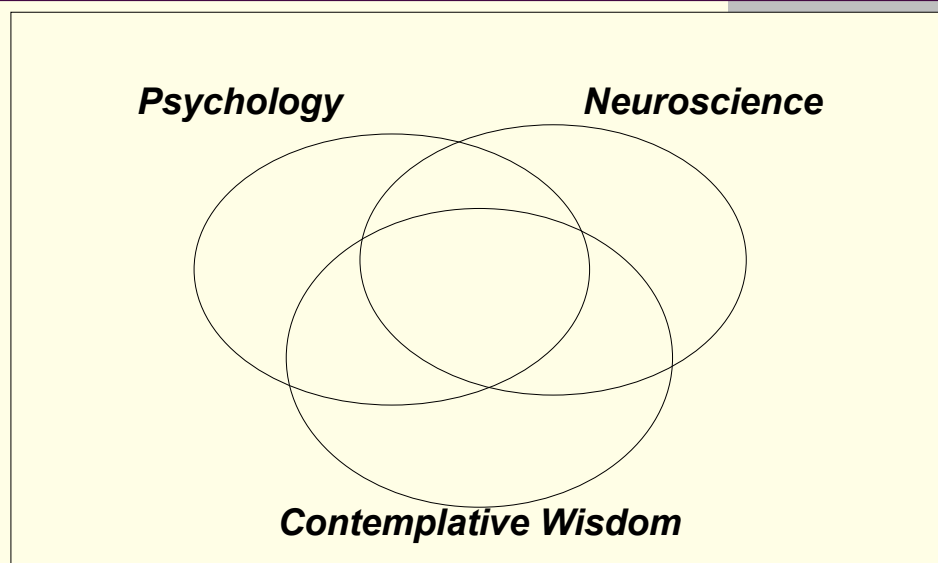
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Common - and Fertile - Ground



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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

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Plan for the Morning

- Setting the Stage
- The Integration of Mind and Brain
- Your Amazing Brain
- Evolution and Neurology of Awareness
- General Factors for Stable Awareness
- Neurology of Jhana Factors
- Interoception and Whole Body Awareness
- Experiencing Spacious Awareness

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Plan for the Afternoon

- Duality and Oneness in the Brain
- Taking the Body for a Walk
- The Neurology of “Self”
- Evolutionary Origins of “Self”
- Conditions Supporting Release of “Self”

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A Few Disclaimers

- On the frontiers of science

*"We ask, 'What is a thought?'
We don't know, yet we are thinking continually."
- Venerable Ani Tenzin Palmo*

- Neuroscience is no replacement for contemplative wisdom.
- Adapt this to your own needs and interests.
- Our limited background in nondual wisdom

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The Integration of Mind and Brain

- “Mind” = flows of information within the brain.
- Most mental activity is forever outside awareness.
- The standard neuropsychological view:

Most, if not all, subjective, immaterial states of mind have a 1:1 correspondence with objective, material states of brain. The mind *is* what the brain *does*.

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Mind Does Not Reduce to Brain

- Patterns of information are represented by patterns of matter.
- The mind (information) is represented by the brain (matter).
- When information can be represented by any suitable matter, it is functionally independent of its physical substrate.
- Much mental information can be represented by any suitable neural circuit (e.g., association cortices). Therefore:
Much mental activity is functionally independent of the brain.
- This independence enables thoughts to cause other thoughts; the brain *carries* thoughts but does not necessarily *cause* them.
- Mind can change matter (brain) through its embedding in the matter that represents it (e.g., thoughts of gratitude lower stress hormones).

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Three Implications of the Integration of Mind and Brain

1. As your mind changes, your brain changes, both temporarily and permanently.

“Neurons that fire together, wire together.”

2. As your brain changes, your mind changes.

3. You can use your mind to change your brain to benefit your whole being.

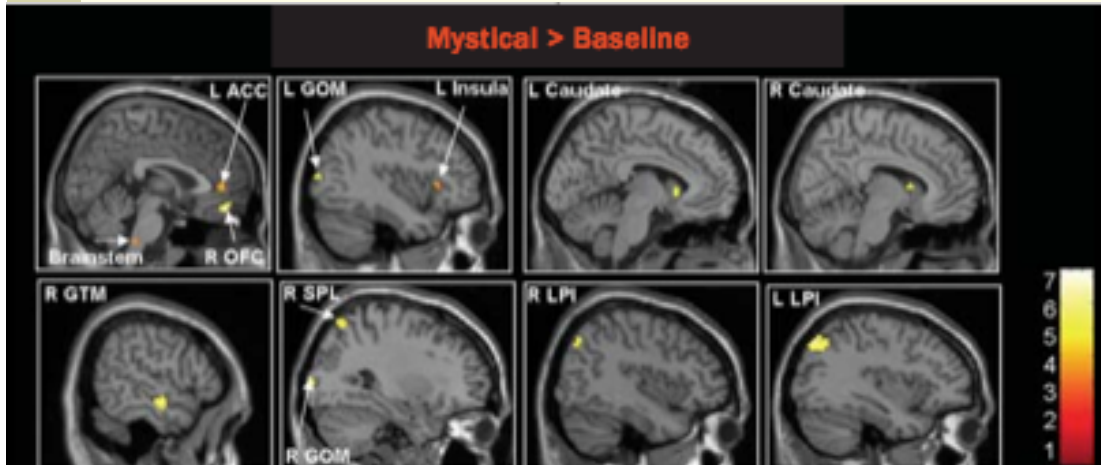
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“Ardent, Resolute, Diligent, and Mindful”



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Nuns in Prayer



Beauregard, et al., *Neuroscience Letters*, 9/25/06

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Your Amazing Brain

Major Features

- **Size:**
 - 3 pounds of cottage cheese
 - 1.1 trillion total cells
 - 100 billion "gray matter" neurons
- **Activity:**
 - Always on 24/7/365 - Instant access to information on demand
 - 2% weight - But 20% of blood flow, oxygen, and glucose
- **Speed:**
 - Neurons firing 10 to 100 times a second
 - Signals crossing your brain in a tenth or hundredth of a second
- **Connectivity:**
 - On average, a neuron gets inputs from about 1000 neurons
... and sends its outputs to 1000 more
... giving you about one hundred trillion synapses.

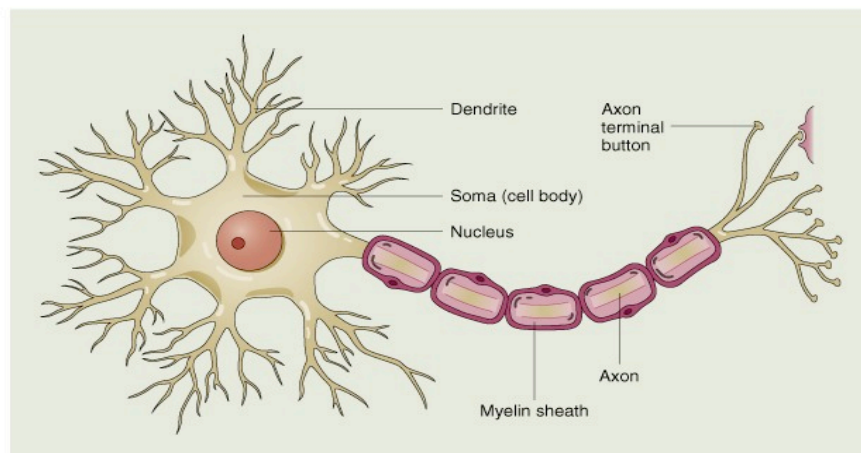
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Stability and Instability

- Stasis followed by updating followed by stasis
- Cycles a few milliseconds long. . . or decades
- Forever pulsing: Impermanence
- Fertile openness to creation: Emptiness

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One Simple Neuron . . .



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... Multiplied by Billions of Neurons

- A giant network with 100 trillion nodes (synapses) chattering away at each other 5 - 50 times a second
- Possible brain states: 1 followed by a million zeros
- Circular loops:
 - Recursion and self-observation
 - Dynamic, “chaotic” effects: determined, but unpredictable
 - Shared circuitry triggers wandering stream of consciousness

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... A Profoundly Complex System

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

*MORE COMPLEX THAN THE CLIMATE,
OR A SUPERNOVA*

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Evolution Grinding Away

- 3.5 billion years of life on this planet
- 650 million years of multi-celled animals
- 80 million years of mammals
- 10 million years of ape-like ancestors
- 2.5 million years of stone tool-using relatives
- 100,000+ years of our own species

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The 2% Difference

- Chimpanzee DNA is 98% identical to our own.
- Most of that crucial 2% difference codes genes for the brain - especially the relationship functions.
- Human evolution is about mainly one thing: Brain. Brain. Brain.
- Which means relationships, empathy, and cooperation.

All for what purpose?

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Grandchildren!



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Natural Resting State of Your Brain

- Brain waves:
 - Emphasize delta (1 - 3 Hz) and theta (4 - 7 Hz), with some beta (14 - 30 Hz) mixed in
 - Increased integration and coherence
- Parasympathetic nervous system activation
- Pleasant, rewarding hormones and neurotransmitters: Norepinephrine, oxytocin, dopamine, endorphins

Awake, even-keeled, interested, benign, contented

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Friendly Attention to the Brain

Nurturing the causes of:

- The arising, increase, and continuance of the wholesome
- The prevention, decrease, and fading away of the unwholesome

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Know the mind.

Shape the mind.

Free the mind.

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Does a Dog Have “Awareness Nature?”

Does an amoeba?

Does a worm?

Does a spider?

Does a frog?

Does a shark?

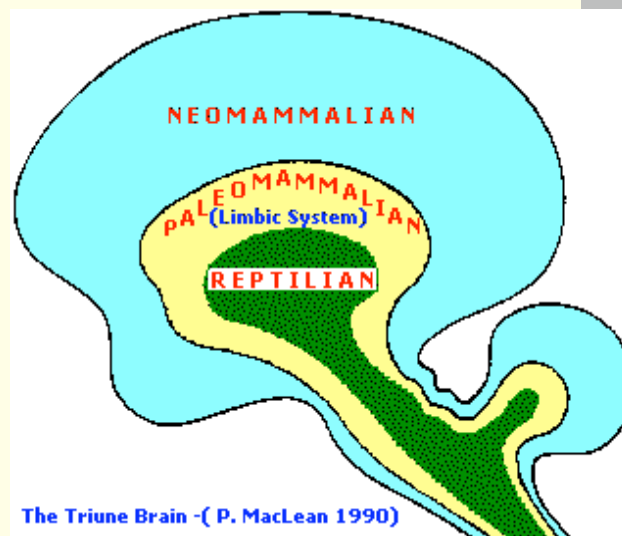
Does a squirrel?

Does a hawk?

Does a chimpanzee?

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Evolutionary History



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Evolutionary Architecture of Awareness

- “Aware” = “Aware of” = “Perceives”
- Evidence of perception = response to stimulus
- Some animals seem to respond even to internal stimuli in other animals.
- The neurology enabling our six senses is not categorically different from other vertebrates.
- Humans differ in: The contents, awareness of, and control of awareness, and the experiencing subject.

In sum, humans appear to be aware in many of the same fundamental ways that other, “higher” animals are aware.

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Neurology of “Core Consciousness”

- Most basic awareness of stimuli depends on structures of brain stem and limbic system
- Level 1 sensors receive stimuli.
- Level 2 sensors register changes in Level 1.
- Level 3 represents signals from Level 2: the first awareness of the equilibrium of the body.
- Rooted in regions handling interoception
- Core consciousness is simple, in the present, with little sense of self or personal history.
- Core consciousness alone may feel peaceful, but without the capacity for “autobiographical consciousness,” a person is seriously impaired.

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“Autobiographical Consciousness”

- “Autobiographical consciousness” is more textured, personalized, and inclusive of past and present.
- Its neurological circuits build on those of core consciousness and reach into the cingulate gyrus and the frontal lobes.
- Many people have experienced a quiet, deep sense of a more chattery and superficial awareness - what Jung referred to as, “the Subject to which the ego is an object.”
- There are likely several systems supporting awareness, not just those of “core” and “autobiographical” consciousness.
- The “hard problem” of consciousness - how the experience of “red,” etc. is created - is far from solved.

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*“To determine by what modes or actions
light produceth in our minds the phantasm
of colour is not so easie.”*

Isaac Newton

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Nondual Perspectives on Awareness

- Ordinary awareness co-arises with the underlying neurological activities it depends upon.
- There is no sharp, dualistic division between human awareness and awareness of other members of the animal kingdom.
- The brain as a whole creates awareness.
- Awareness and its objects co-arise.

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General Supporting Conditions

- Wise intentions
- Parasympathetic activation
- Feeling safe
- Positive emotions
- Taking in the good

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Wise Intentions

- The enduring influence of the frontal lobes
- Methods:
 - Wise understanding
 - Reflect on motivating reasons
 - Be on your own side
 - Evoke a sense of the desired state of mind
 - “Channel” a mentor, role model, teacher, etc.
 - Formally establish intentions
 - Re-establish intentions frequently

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Parasympathetic Activation

- Full breaths, especially exhalation
- Deep relaxation
- Balancing heart-rate variability; HeartMath
- Mindfulness of the body
- Yawning
- Meditation

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Feeling Safe

- PNS activation
- Being in a protected place
- Spaciousness
- Taking refuge
- Cognitive methods
- Social support (both material and evoked)
- Taking reasonable action

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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.

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Taking in the Good

- Cultivating wholesome qualities in oneself is central to psychological growth and spiritual practice.
- It's important to defeat the hard-wired "negativity bias" of the brain that is the result of evolution.
- With clients, taking in the good helps lift mood, heal trauma, and nourish motivation.
- Four key steps:
 - Register positive events as positive experiences.
 - Savor and extend the experience.
 - Sense the experience sinking into oneself.
 - Imagine the current experience is replacing and healing old pain.

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Key Neurology of Jhana Factors

- Applied attention - Prefrontal cortex giving instructions
- Sustained attention - Anterior cingulate cortex monitoring conflicts in focus; dopamine levels block out norepinephrine triggers to shift focus
- Rapture - Lots of dopamine from ventral tegmentum to nucleus accumbens and prefrontal lobes; bodily bliss
- Joy - Norepinephrine from locus ceruleus to cingulate, brightening the mind; plus dopamine and other pleasure circuits.
- One-Pointedness - Left temporal verbal centers are quiet, so only wispy thoughts; equanimity via quiet amygdala and sympathetic system; high-frequency gamma waves creating brain-wide coherence; maybe oxytocin for cozy alrightness

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Whole Body Awareness

- The insulae:
 - Interoceptive awareness
 - Emotions of internal states (e.g., disgust, fear of pain)
 - Activate with pain of others: empathy
 - Integrate whole body awareness
- Right hemisphere:
 - Specialized processing of bodily sensations
 - Gestalt awareness
 - Pulls activation away from verbal chatter of left brain
- Track breath as a whole, then body as a whole, then settle into spacious choiceless awareness

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*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

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Duality - and Three Kinds of Oneness

- Ordinary Duality
 - Wholesome
 - Unwholesome
- Objective Oneness
- Subjective Oneness
- Transcendental Oneness

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Ordinary Duality

- Physical dualism of organism and world:
 - Defined by a boundary
 - Necessary for survival

"That spoon is not me."
- Neurological dualisms:
 - Distinction between inhibitory and excitatory
 - Different brain regions have different functions
 - Signals extracted from a background of noise

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Wholesome Dualities

Many examples, including:

- Agency
- Theory of mind and empathy
- Unilateral virtue

"This hand holds a spoon."

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Unwholesome Dualities

For example:

- Setting self against world
- Setting self against other selves
- Setting self against self
- Greed, hatred, and delusion

"I don't like the spoon."

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Objective Oneness

- The physical, and physically-based, aspects of the universe, from the “Materialist” view: *“There really is a spoon.”*
- Everything is connected to everything else, and arises dependent upon conditions.
- Therefore, nothing has inherent self-nature, and all apparent dualities are “empty.” No “them” - only “us.”
- The body is one with the world, and the brain is one with the body, so the brain is one with the world.
- The mind and brain are one, so the mind is one with the world.

*“The hand and spoon and world
- and perception of all that - are one.”*

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Subjective Oneness

- The strong version: *“There is no spoon.”*
- The subtle version:
 - We can know only the incomplete version of the world our brain constructs.
 - Consistent with brain functioning
 - Offers skillful means:
 - Encourages “don’t know mind”
 - Coming to peace with the (phenomenal) world
 - Taking responsibility for the (phenomenal) world
 - More open to the influence of mental phenomena

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Transcendental Oneness

- “Thou art That.”
- All forms of oneness and duality are expressions of the transcendental Ground.

“There are no others.” - Ramana Maharshi

- Commonly, the union of conventional reality and transcendental Ground is most immediately sensed in the meeting of personal, psychoneurologically rooted awareness and universal Awareness.
- Much nondual psychotherapy is the facilitation of that meeting.

“The spoon is God.”

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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

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Penetrative insight

joined with calm abiding

utterly eradicates

afflicted states.

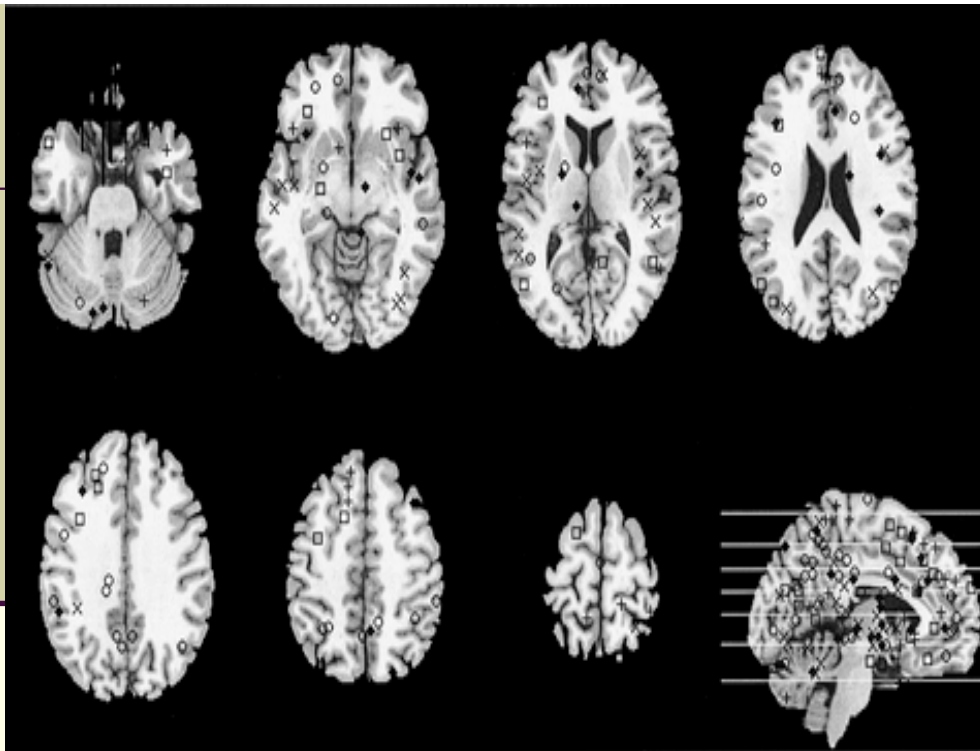
Shantideva

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Properties of “Self” as Experienced

- Object of awareness, not awareness itself
- Associated with a particular body and its history
- Activates and deactivates to help organism survive - a process
- Especially triggered by greed and hatred - by clinging
- Variable, inconstant - impermanent
- Made up of parts - compounded and “empty”
- Carries a sense of tension and contraction - suffering

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Brain activations of “selfing” - Gillihan, et al., Psych Bulletin, 1/2005 49

Properties of Self in the Brain

- Self functions are distributed; no homunculus
- Self is information represented in matter; in that sense, self is as real as a memory, love, values, and the smell of a rose.
- Self is built up from many sub-systems: compounded.
- Self-in-brain is thus dependent upon conditions; it's not separate from the neural circuits that constitute it.
- Selfing activates fluidly and transiently: impermanent.
- Selfing is i, in response to feeling tone:
 - Pleasant -> Approach -> Greed
 - Unpleasant -> Avoid -> Hatred

*No self,
no problem*

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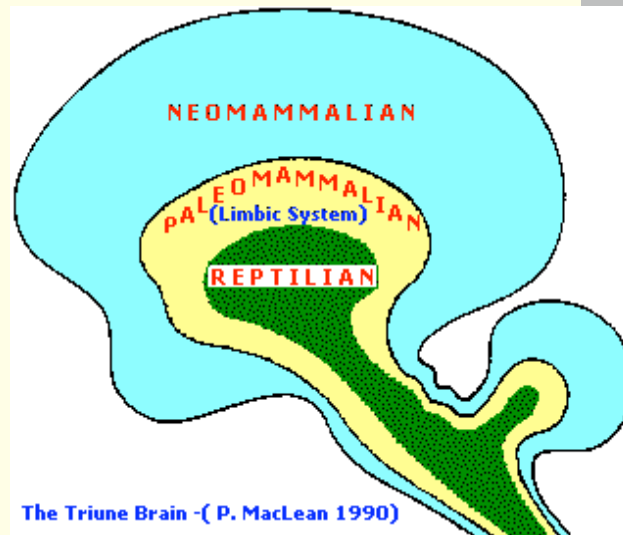
Evolution of Rudimentary Self

1. Representation of state of body: experience
2. Representation of repeated experiences: history
3. Implicit associated reference to a particular body
4. Representation of repeated bodily references: existence
5. Architecture of representations: thus, a specific physical identity
6. Identity aids intentions: avoid pain, seek pleasure: agency
7. States of mind get represented, also intentions
8. Physical, mental states are linked: mental-physical identity
9. Steady awareness of variable states: awareness identity
10. Awareness linked to physical, mental states; an architecture of representations: physical-mental-awareness identity, with intentions and agency

And thus the self is born . . .

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Evolutionary History



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Evolution of Complex Self

- Based on layers of new neural structures
- New capabilities: Territory, possession, etc.
- Beginnings of identification
- Mammalian and primate brain: empathy, self in relation to others, basic personal identity
- Human brain: past and future self, predicting reactions of oneself, constructing narratives, act to change oneself, etc.

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The dualistic ego-mind is essentially a survival mechanism, on a par with the fangs, claws, stingers, scales, shells, and quills that other animals use to protect themselves. By maintaining a separate self-sense, it attempts to provide a haven of security . . . Yet the very boundaries that create a sense of safety also leave us feeling cut off and disconnected.

John Welwood

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Supports for Self-Release

- Understanding, insight, and conviction
- Activate parasympathetic system
- Minimal desire
- Blurred self boundaries
- Surrender agency
- Actively undermine sense of self
- Taking refuge
- Joining with others

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Selflessness is not a case of something that existed in the past becoming nonexistent.

Rather, this sort of “self” is something that never did exist.

What is needed is to identify as nonexistent something that always was nonexistent.

The Dalai Lama

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Activating the Parasympathetic

- Full breaths, especially exhalation
- Deep relaxation
- Balancing heart-rate variability; HeartMath
- Mindfulness of the body
- Yawning
- Meditation

Initial access to the unconditioned mind can be greatly enhanced by slowing our thinking down so that we feel peaceful and serene.

Peter Fenner

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Fading of Desire

- Equanimity:
 - Not reacting to one's reactions - especially the "feeling tone" of pleasant/unpleasant/neutral: breaks chain of "contact-feeling-craving-clinging-suffering"
 - Frontal lobe influence over limbic system
 - Desensitization and calming of limbic system (e.g., attention to the neutral feeling tone)
- Fulfillment of core needs
- Reasonable goals and no addictions
- Profound acceptance

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When we experience ourselves . . . and the moment as it is, without division, we experience healing into our essential wholeness, into the truth of our being.

Dorothy Hunt

We stop making problems out of having problems! We accept . . . our experience - our life circumstances, not in a defeatist way, but with dignity and grace.

We welcome what is as a gateway to the unconditioned mind.

Peter Fenner

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Surrendering Agency

- Receiving the breath
- Giving oneself over to precepts and practices
- Surrender to “the better angels of one’s nature” or to wholesome purposes
- Devotional practices
- Devotion to a teacher or guru

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*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

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Undermining the Sense of Self

- Treating self as unimportant
 - Dedication of merit; karma yoga
 - Tonglen practices in Tibetan Buddhism
 - Vows of poverty; other renunciation
- Embrace narcissistic injuries for practice
- Orient to experience as “not-me”
- Meditations that deconstruct “self”
 - Vipassana, contemplations of aggregates
 - Charnel ground
 - “A year to live”

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

Basho

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Taking Refuge

- Identify with God, True Self, Bodhicitta, True Self . . . Or simply with the beingness that is a fundamental property of the nervous system: aware, peaceful, benign, and content.
- Find those refuges, register them in memory, and learn how to evoke or enter them again.
- Conviction and community help.

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Sam sees *“peeping among the cloud-wrack . . . a white star twinkle for a while. The beauty of it smote his heart, as he looked up out of the forsaken land, and hope returned to him. For like a shaft, clear and cold, the thought pierced him that in the end the Shadow was only a small and passing thing: there was light and high beauty for ever beyond its reach.”*

Tolkein, *The Lord of the Rings*

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Joining with Others

- Empathy, cooperation are deep in our nature
- Human intimacy; presence; sangha
- True nature in others is a mirror to that in ourselves: *“What is intrinsic within me is by nature intrinsic within you.”* (Adyashanti)
- Virtue; sila

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

This is a blessing supreme.

The Buddha

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Wisdom and Virtue

Wisdom is . . . all about understanding the underlying spacious and empty quality of the person and of all experienced phenomena.

To attain this quality of deep insight, we must have a mind that is quiet and malleable.

Achieving such a state of mind requires that we first develop the ability to regulate our body and speech so as to cause no conflict.

Venerable Tenzin Palmo

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

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

The Buddha

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Thank you

Be still

Listen to the stones of the wall

Be silent, they try

To speak your

Name.

Listen to the living walls.

Who are you?

Who

Are you? Whose

Silence are you?

Thomas Merton