

The Neurology of Awakening:

Using the New Brain Research to Deepen Your Practice

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Glossary

Neuroscience

Neuron - The nerve cell that processes information

Dendrite—the “antenna” of the neuron, receives signals from other neurons

Axon—the output wire of the neuron, sends signals to others

Synapse—the connection between one neuron and the next neuron or other cell

Transmitter—the chemical that crosses the synapse to signal the next cell

Brain

Gray matter—“skin” of the brain responsible for most advanced processing

Left hemisphere—emphasizes verbal skills and linear, sequential processing; linked to right hemisphere mainly via Corpus Callosum; controls right side of body

Right hemisphere—emphasizes awareness of the body, visual-spatial skills, holistic/gestalt/global processing; particularly activated in meditation; controls left side of body

Anterior = front; posterior = back; medial = middle; prefrontal = behind the frontal; dorsal = upper; ventral = lower

Frontal lobe—site of planning, “tuning” of behavior to the context, labeling of meaning, and attention; includes “prefrontal cortex”

Temporal lobe—site of auditory processing, memory, speech comprehension, and visual labeling (“what”)

Parietal lobe--site of body sensory processing, orientation in space, calculation, and visual movement perception ("where")

Occipital lobe—site of visual processing

Corpus Callosum—large white matter tract connecting left and right brains

Cingulate Cortex—Cortex immediately above the corpus callosum, involved in emotion, self, and behavior

Basal Ganglia—clumps of neurons in the center of the brain involved in motor control and sensory relay

Reticular Formation—collection of cells rising up from the brain stem into the mid-brain, involved in arousal and wakefulness

Sympathetic system—"fight-or-flight" wing of the of the autonomic nervous system; aroused by stress, threats, and upsetting emotions; triggers hormones like adrenaline and cortisol; chronic activation harms immune, gastrointestinal, nervous, and endocrine systems

Parasympathetic system—other wing of the autonomic nervous system; helps regulate the deep muscles and organs of the body; associated with feelings of relaxation and contentment; its activation dampens the sympathetic system and vice versa

Limbic System—Old mammalian brain—memory, emotion, and selection system for cortical sensory processing, basic drive state behaviors and hormonal controls

Thalamus—relay station for incoming sensory input, influences what gets paid attention to

Hippocampus—your RAM, sets up sensations and thoughts for memory storage

Amygdala—emotional tagging of memory for significance, especially fear, anger, and sadness

Caudate/Putamen—motor control circuitry, part of basal ganglia

Hypothalamus—overall regulation of hormonal balance, source of drive state behaviors-sexual, aggression, fear

Hormones, Neurotransmitters

Dopamine—a transmitter involved in reward systems mood, and motor function circuits

Norepinephrine—a transmitter involved in mood, arousal and concentration circuits

Epinephrine (adrenaline)—involved in sympathetic system and "fight-or-flight" responses or excitement

Serotonin—a neurotransmitter involved in sensory processing, sleep, mood

Oxytocin—a hormone involved in pair bonding, linked to endorphins, released during warm emotional experiences (e.g., breastfeeding, hugging)

Neuroimaging

CT scan—uses Xray beams to create a picture based on Xray absorption—not too detailed

MRI scan—magnetic resonance imaging -uses a strong magnetic field and radio waves to create a picture based on hydrogen content or content of other magnetic atoms (iron, gadolinium, etc). Can picture blood flow changes, water content, and changes in activity

PET scan-Positron Emission Tomography—uses a radioactive tracer to picture chemical anatomy (metabolism, transmitter location) SPECT is a single photon emitter CT, similar to PET, but less detailed

EEG—electroencephalogram—records the oscillations of electrical potentials over the cortex of the brain—usually from electrodes on the scalp—records the behavior of millions of neurons at any one electrode

SEEG—Spectral frequency analysis of the EEG data, which breaks down the EEG signal into different frequencies and maps them over the head. (even further removed from a single thought!)

Coherence—how the frequencies from different parts of the brain oscillate in synchrony

Psychology

Meta-attention - observing the application of one's attention; awareness of awareness

Observing ego - capacity to step back and observe and reflect upon one's thoughts, feelings, desires, actions, etc.; develops during childhood

Empathy - the sense of how it is for another person, especially emotions, desires, and other states of mind

Interoception - sensing of internal states of the body (e.g., sensations of the stomach moving with the breath)

Equanimity - not reacting to one's reactions; in Buddhist psychology, this means a pervasive, very strong disengagement from the initial feeling tone of all experience as pleasant, unpleasant, or neutral

ADHD - attention deficit/hyperactivity disorder; extreme end of the spirited range of the temperamental spectrum

Percept - unit of experience, especially as known to conscious awareness

Homunculus - Medieval term for "the little person in the head" that looks out through the eyes, observes thought, decides things, etc.

Buddhism

Three characteristics of experience

Anicca—impermanence, the arising and passing away of everything

Dukha—suffering, dissatisfaction, “stress” of experiencing life

Anatta—no-self, the lack of an essential nature to anything, interdependent co-arising due to many causes and conditions

Tanha - desire, clinging, "thirst"

Five Hindrances - states of mind, ranging from mild to intense, that obscure wisdom, create suffering for oneself and others, and impede growth in practice: "greed, hatred, sloth and torpor, restlessness and remorse, doubt"

Dependent Origination - fundamental dynamic in existence in which circular processes of causes and conditions give rise to new causes and conditions; a key sequence in this chain is how "contact" with a stimulus leads to a "feeling tone" (pleasant, unpleasant, or neutral), leading to "craving" (grasping at the pleasant, avoiding or resisting the unpleasant, or ignoring or departing from the neutral), leading to "clinging," which leads to suffering.

Karma - the results of past causes; at a minimum, in this life, and perhaps due to causes from previous lives; "like hitting golf balls in a tiled shower"

Sila - virtue, restraint, morality; one of the three pillars of Buddhist practice and domains of training and cultivation; the other two are "samadhi," meaning meditative capacity, and panna," meaning wisdom

Jhanas—non-ordinary states of mind, characterized by profound concentration and absorption, great clarity, and often intensely positive feelings

Samadhi - similar, non-ordinary states of mind

"Jhana factors"

Vitaka - applied attention ("planting the skate")

Vichara - sustained attention ("gliding")

Piti - rapture, bliss

Sukha - joy, happiness, contentment, tranquility

Ekaggata - singleness of mind, unification of awareness

Bodhicitta - innate quality of spacious mind and wholehearted kindness

Vipassana - insight into the ephemeral, constructed, interdependent qualities of existence, and into the causes of suffering and the end of suffering; particularly associated with Theravada Buddhism

Theravadan Buddhism - one of the four main lines or schools of Buddhism, distinct from Tibetan Buddhism, Zen, and Pure Land; most closely associated with the original teachings of the Buddha as contained in the Pali Canon

Pali - the language in which the discourse of the Buddha were first written down; etymologically close to Sanskrit, the ancient and formal language of India

Nibbana—“ -----“ the unconditioned, the deathless, the fourth kind of reality, the indescribable