**Amygdala:** Part of the centrally located limbic regions of the brain. This almond-shaped cluster of neurons is involved in the appraisal of meaning, the processing of social signals, and the activation of emotion. Along with the orbitofrontal cortex and anterior cingulate, it plays a crucial role in coordinating perceptions of memory and behavior.

**Axon:** The long length of a neuron that extends from the cell body out to make synaptic connections with other neurons.

**Basal ganglia:** Beneath the outer cortex, this is a set or cluster of neurons that is thought to mediate rule-guided behavior.

**Brainstem:** A lower brain structure, deep within the skull. It mediates states of arousal and alertness and regulates the physiologic state of the body (temperature, respiration, heart rate). It also houses the clusters of neurons that activate the fight/flight/freeze survival reactions, which are part of the brainstem reflexes.

**Catecholamines:** A form of molecule (adrenaline and noradrenaline) that serves as a neurotransmitter and neuromodulator as well as a hormone carried through the bloodstream.

**Cell membrane:** The protein/lipid layer surrounding the cell. For the nervous system, the cell membrane functions to transfer electrochemical energy flow in the form of an action potential (ions flowing in and out of the membrane) and a chemical release via neurotransmitters at the far end of the axon.

**Cerebellum:** A portion of the brain at the back of the skull that plays an important role in integrating bodily information along with emotional and cognitive processing.

**Central nervous system (CNS):** The components of the nervous system, such as the skull part of the brain, that interconnect with the peripheral nervous system that is spread throughout the body.

**Corpus callosum:** The connecting fibers that link the left and the right hemispheres of the brain, permitting energy and information to flow back and forth and enabling both activation and inhibition of the corresponding regions of each hemisphere.

**Cortex:** Also known as the neocortex, cerebral cortex, or neomammalian cortex, this is the outer region of the cerebral hemispheres. It consists of highly folded layers, usually about six cells deep, filled with “cortical columns” of highly linked neuronal clusters. The clusters’ communications with other columnar areas allow for more and more complex functions to emerge. The neocortex mediates information-processing functions such as perceiving, thinking, and reasoning.

**Cortisol:** Sometimes known as the “stress hormone,” this corticosteroid is released during stress

to alter metabolism in an adaptive manner. Prolonged stress may disrupt the functioning of the HPA axis, which regulates cortisol secretion, by way of direct neural impairment and alteration of the regulation of genes that control this important way

**Dendrites:** The receiving ends of neurons.

**DNA:** Deoxyribonucleic acid, the basic form of molecule that makes up our genetic material. DNA makes up our chromosomes and is twisted into a double helix spiral within the nucleus of the cells of the body.

**Dorsal branch of the vagal nerve:** The unmyelinated branch of the vagal nerve that is part of the parasympathetic system with major functions of regulating organs below our diaphragm (e.g., the intestines for digestion). Also involved in the primitive “shut-down” response and fainting.

**Epigenesis:** The process in which experience alters the regulation of gene expression by way of changing the various molecules (histones and methyl groups) on the chromosome.

**Fight-flight-freeze:** The basic survival set of reactions mediated by the brainstem in response to threats and associated with increased sympathetic tone. A complex defense system, it integrates motor actions with increases in sympathetic activation to generate the necessary energy to respond to a threat, including the tensing of muscles in the freeze reaction (often a preparation for subsequent fleeing).

**Frontal lobes:** The front of the cerebral cortex, sometimes called the “associational cortex” in that it makes linkages among widely interconnected processes fundamental to higher thinking and planning.

**Glial cells:** As fundamental cells of the nervous system, including oligodendrocytes and astrocytes, these cells number in the trillions, are generally smaller than neurons, and carry out a number of functions. Though we say that they “support” neurons through myelin production and regulating blood flow, science is just beginning to discover the many ways glial cells may influence energy and information flow through the nervous system.

**Hemispheres:** Refers to the left and right sides, or “half-spheres,” of the brain, especially the neocortex. The left hemisphere develops later, and it specializes in ways of being and perceiving that involve linear, linguistic, logical (cause-effect relationship seeking, syllogistic reasoning), literal, and list-making characteristics (notice all the “l”-based words!). In contrast, the ways of being and perceiving that the right hemisphere dominates in are early development, holisticness, nonverbal reactions, visuospatial imagery, metaphoric meaning, context sensing, stress-response mediation, autobiographical memory and reflection, and an integrated map of the whole body. Both hemispheres tend to work together, but these differentiated dominances help the whole, when linked, to achieve more complex functions.

**Hypothalamic-pituitary-adrenocortical (HPA) axis:** This system responds to stress and its function over time and can be adversely affected by trauma.

**Hypothalamus:** Located in the lower region of the brain, near the pituitary, it is responsible for physiological homeostasis as a master hormone regulator.

**Insula:** A structure in the middle prefrontal cortex that links bodily processes to higher cortical areas. Information from the body moves up the spinal cord’s Lamina I and the vagal nerve and reaches the brainstem and then the insula. First the dorsal, then the anterior insula seem to be involved in the process of interoception (awareness of internal bodily sensations). Its direct link to other middle prefrontal areas, such as the anterior cingulate, by way of spindle cells has been associated with forms of self-awareness.

**Intergenerational transfer:** The passage of something from one generation to the next. This transfer can occur by means of experiential learning from patterns of behavior, and it can also occur by means of epigenetic factors that are passed through the gametes to regulate gene expression.

**Interoception:** The perception of the interior of the body, our “sixth sense,” including signals emerging from Lamina I of the spinal cord that derive from muscles, bones, and viscera (heart, lungs, intestines) of the torso of the body. May precede the ability to know what we are feeling, to become aware of shifts in internal bodily states that influence our affective arousal. This awareness seems to involve action of the right anterior insula in the prefrontal cortex and is correlated with the capacity for empathy for the feelings of others.

**Interpersonal neurobiology (IPNB):** A consilient field that embraces all branches of science as it seeks the common, universal findings across independent ways of knowing in order to expand our understanding of the mind and well-being. Sometimes abbreviated as IPNB, this field explores the ways in which relationships and the brain interact to shape our mental lives. IPNB is meant to convey the embracing of everything in life from society (interpersonal) to synapses (neurobiology).

**Lamina I:** A layer of the spinal cord that carries data from the body upward to the skull-encased brain.

**Limbic regions:** Located in the central part of the brain called the medial temporal lobe, these areas include the amygdala and hippocampus, which coordinate input from the higher cortical regions, with streams of input from the lower brainstem and the body proper. Limbic structures integrate a wide range of mental processes such as appraisal of meaning, processing of social signals, and the activation of emotion. The limbic area evolved during our mammalian evolution and is thought to be essential for attachment.

**Middle prefrontal cortex:** Consists of medial and ventral prefrontal, orbitofrontal, and anterior

cingulate cortices. The neural circuits in this interconnected set of regions function to integrate the processing of social information, autobiographical consciousness, the evaluation of meaning, the activation of arousal, bodily response, and higher cognitive processing. Nine middle prefrontal functions include body regulation, attuned communication, emotional balance, fear modulation, flexibility of response, insight, empathy, morality, and intuition. These are the outcome of mindfulness meditation practice. Also, the first eight are outcomes of secure attachment relationships.

**Mirror neurons:** A set of neurons that is distributed in various regions of the brain and that has both motor and perceptual functions. Mirror neurons become activated at the perception of behaviors of others with predictable sequences that enable related areas (the superior temporal sulcus) to create maps of another’s intentional state. Mirror neurons then enable both behavioral imitation and internal simulation of the other. The proposed mechanism of mirror neurons is supported by a number of investigations, but some scientists feel it is not substantiated yet.

**Myelin:** The fatty sheath created by glial cells that insulates the long axonal lengths of neurons such that the speed of neuronal firing is increased by 100 and the resting or refractory period is decreased by 30 times. The result of practice, myelin thus increases the effective communication among interconnected neurons by 3,000 times, creating the enhanced functioning necessary for skill building.

**Myelinogenesis:** The creation by glial cells of the myelin sheath around interconnected neurons.

**Nervous system:** The entire set of interconnected neural cells, including neurons and glia, that extends throughout the whole body and that function, in part, by the electrochemical energy flow across the distributed system. Immune, cardiovascular, gastrointestinal, and endocrine systems as well as social interactions directly influence its functions. Includes the skull-based brain as part of the central nervous system as well as the peripheral and autonomic nervous systems.

**Neural firing:** The activation of neurons involves the flow of energy in the form of electrical movement of ions in and out of the neural membrane and chemical transformations as neurotransmitter release and receptor engagement at the synapse. Neural firing can lead to subsequent activation or inhibition of the downstream neurons.

**Neural integration:** Linkage of differentiated neurons within the brain. It results in optimal self-regulation with balance and coordination of disparate regions into a functional whole.

**Neurogenesis:** The production of new neurons from neural stem cells that can occur in certain regions such as the hippocampus of the brain across the life span.

**Neuron:** A basic type of cell in the nervous system. It is composed of a cell body, receiving ends called dendrites, and a long axon that reaches out to other neurons at a synaptic linkage.

**Neuroplasticity:** The overall process with which brain connections are changed by experience, including the way we pay attention.

**Neurotransmitters:** Chemicals released at the ends of neurons that diffuse across the synapse and activate the downstream neurons’ receptors.

**Orbitofrontal cortex:** A part of the prefrontal cortex just behind the eyes, this important region is molded by relational experience and interacts with other aspects of the middle prefrontal cortex in shaping attachment and self-awareness.

**Parasympathetic nervous system:** One of two branches of the autonomic nervous system. The parasympathetic branch is inhibitory and de-arousing, producing, for example, decreases in heart rate, respiration, and alertness. Involves aspects of the vagal nerve. See also Sympathetic nervous system.

**Prefrontal cortex:** Central to the process of creating meaning and emotion and enabling a flexibility of response, it sits at the interface between lower regions (brainstem and limbic areas) receiving input from the body and higher regions (the cortex) involved in integrating information. It includes the dorsolateral prefrontal cortex, ventral areas such as the insula, and medial structures such as the orbitofrontal cortex, the ventromedial prefrontal cortex, and, in some views, the anterior cingulate cortex.

**Presynaptic / Postsynaptic:** Refers to the position of neurons in their synaptic linkage either before or after the synapse.

**Receptor:** The area of the postsynaptic neuronal membrane that receives the neurotransmitter released by the presynaptic cell, leading to the activation or deactivation of the ensuring potential.

**Regulate / Regulation:** To monitor and modify the change of something across time. Monitoring involves the capacity to sense a process; modifying involves the modulation and shaping of that process over time. This process can include affect and emotion, physiology and motor movement, or communication and interactions with others.

**Resilience:** The quality of being able to effectively adapt to stressors.

**Reticular Activating System (RAS):** A traditional neuroscience term signifying a collection of brainstem nuclei (clusters of neurons) that has input into the cortex and influences “states of arousal” or wakefulness and that in contemporary ways is considered as influencing degrees of activation in regions of the brain involved in attention and cognition.

**Sensorimotor:** The integration of the sensory and motor systems of the body.

**SNAG:** Stands for “stimulate neuronal activation and growth.” An acronym for how focused attention can intentionally alter synaptic connections in the brain.

**Stress:** The internal or external conditions that push the state of an individual away from equilibrium. Some stress is “eustress” and promotes optimal functioning, such as mild anxiety before an exam that can elevate performance. Other stress is harmful because it creates a negative impact on the individual’s well-being. Cortisol is the hormone released in response to stress.

**Subcortical:** Refers to neural regions below the cortex, including the limbic areas and the brainstem in the skull portion of the nervous system, and sometimes also the neural processing of regions in the body proper.

**Sympathetic nervous system:** One of two major branches of the autonomic nervous system. The sympathetic system excites and arouses, producing, for example, increases in heart rate, respiration, sweating, and states of alertness. See also Parasympathetic nervous system.

**Synapse:** The linkage between two neurons. The synapse is often a small space between the end of a neuron’s axons or dendrites through which neurons communicate with each other by way of the release of neurotransmitters from the presynaptic neuron and their reception by the receptors embedded in the membrane of the postsynaptic neuron.

**Synaptic shadows:** The effects of prior learning on present experience. This is the way the past, embedded in our learning-induced synaptic connections, casts shadows or influences shaped by our earlier experiences and that directly impact how we perceive, feel, and think in the present and even how we anticipate, plan, and create the future. These shadows are neither bad nor good; they are simply the “top-down” way that the past shapes present and future.

**Synaptogenesis:** The process by which new synapses are formed. Also, may refer to the strengthening of previously existing synapses as a part of synaptic molding.

**Thalamocortical circuit:** The interconnections between the thalamus and the neocortex.

**Thalamus:** Sits atop the brainstem. It serves as a gateway for incoming sensory information and has extensive connections to other brain regions including the neocortex. Activity of the thalamocortical circuit may be a central process for the mediation of conscious experience.

**Vagus / Vagal Nerve:** The tenth cranial nerve that includes an ancient unmyelinated dorsal branch involved in the shut-down response to life threats or unavoidable harm and a more modern ventral vagus involved in the social engagement system. The two branches of the vagal nerve originate in two brainstem nuclei: the ancient dorsal from the dorsal motor nucleus and the more modern ventral branch from the nucleus ambiguus.

**Reference:**

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