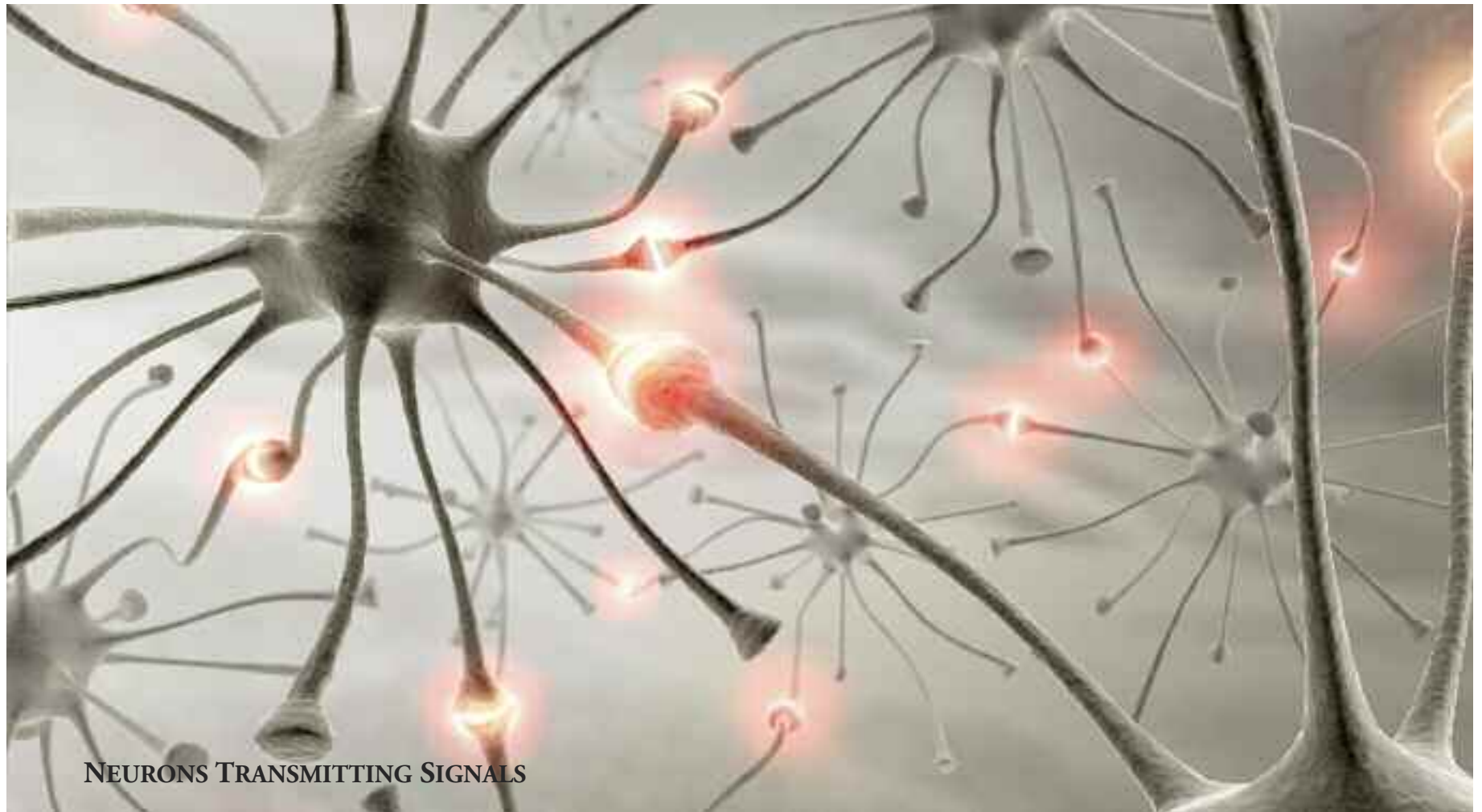




NEURONS TRANSMITTING SIGNALS

The Nervous System

NERVOUS SYSTEM

Overview

The nervous system is an organ system containing a network of specialized cells called neurons that coordinate the actions of a human and transmit signals between different parts of its body. The nervous system consists of two parts, central and peripheral. The central nervous system contains the brain, spinal cord, and retina. The peripheral nervous system consists of sensory neurons, clusters of neurons called ganglia, and nerves connecting them to each other and to the central nervous system. These regions are all interconnected by means of complex neural pathways. The enteric nervous system, a subsystem of the peripheral nervous system, has the capacity, even when severed from the rest of the nervous system through its primary connection by the vagus nerve, to function independently in controlling the gastrointestinal system.

Neurons send signals to other cells as electrochemical waves travelling along thin fibers called axons, which cause chemicals called neurotransmitters to be released at junctions called synapses. A cell that receives a synaptic signal may be excited, inhibited, or otherwise modulated. Sensory neurons are activated by physical stimuli impinging on them, and send signals that inform the central nervous system of the state of the body and external environment. Motor neurons, situated either in the central nervous system or in peripheral ganglia, connect the nervous system to muscles or other effector organs.

Central neurons make all of their input and output connections with other neurons. The interactions of all these types of neurons form neural circuits that generate our perception of the world and determine our behavior. Along with neurons, the nervous system contains other specialized cells called glial cells (or simply glia), which provide structural and metabolic support.

Structure

At the most basic level, the function of the nervous system is to send signals from one cell to others, or from one part of the body to others. There are multiple ways that a cell can send signals to other cells. One is by releasing chemicals called hormones into the internal circulation, so that they can diffuse to distant sites. In contrast to this “broadcast” mode of signaling, the nervous system provides “point-to-point” signals – neurons project their axons to specific target areas and make synaptic connections with specific target cells. Thus, neural signaling is capable of a much higher level of specificity than hormonal signaling. It is also much faster: the fastest nerve signals travel at speeds that exceed 100 meters per second.

At a more integrative level, the primary function of the nervous system is to control the body. It does this by extracting information from the environment using sensory receptors, sending signals that encode this information into the central nervous system, processing the information to determine an appropriate response, and sending output signals to muscles or glands to activate the response.

The evolution of a complex nervous system has made it possible for various animal species to have advanced perception abilities such as vision, complex social interactions, rapid coordination of organ systems, and integrated processing of concurrent signals. In humans, the sophistication of the nervous system makes it possible to have language, abstract representation of concepts, transmission of culture, and many other features of human society that would not exist without the human brain.



NERVES OVERVIEW

#	Name of Nerves	Type	Sensory Function	Motor Function
I	Olfactory	Sensory	Sense of smell	None
II	Optic	Sensory	Sight	None
III	Oculomotor	Motor	None	Movement of eyeball
IV	Trochlear	Motor	None	Movement of eyeball
V	Trigeminal	Mixed	Sensation from face	Chewing movements
VI	Abducent	Motor	None	Movement of eyeball
VII	Facial	Mixed	Sense of taste	Movement of facial muscles
VIII	Auditory	Sensory	Sense of hearing	None
IX	Glossopharyngeal	Mixed	Sense of taste	Secretion of saliva
X	Vagus	Mixed	Sensation from multiple organs	Stimulates secretory glands and smooth muscles
XI	Accessory	Motor	Movement of head, shoulders, pharynx, and larynx	
XII	Hypoglossal	Motor	None	Movement of tongue



AUTONOMIC NERVOUS SYSTEM

Function	Sympathetic Effect	Benefit in Fight/Flight	Parasympathetic
Heart rate and force	Increase	Better circulation	Decrease
Coronary blood vessels	Dilate	Aids heart function	Constrict
Blood vessels to limbs	Dilate	Able to run faster	Constrict
Sphincters of bladder/ digestive tract	Constrict		Dilate
Glycogen metabolism	Glycogen mobilized from liver	Provides more energy to muscles	Glycogen stored in liver
Iris of eye	Dilated pupil	Better distance vision	Constricted pupil
Sweating	Increased	Cope with increased heat production	Decreased
Saliva production	Decreased	Blood diverted for essential functions	Increased
Digestive System	Decreased activity		Increased activity



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