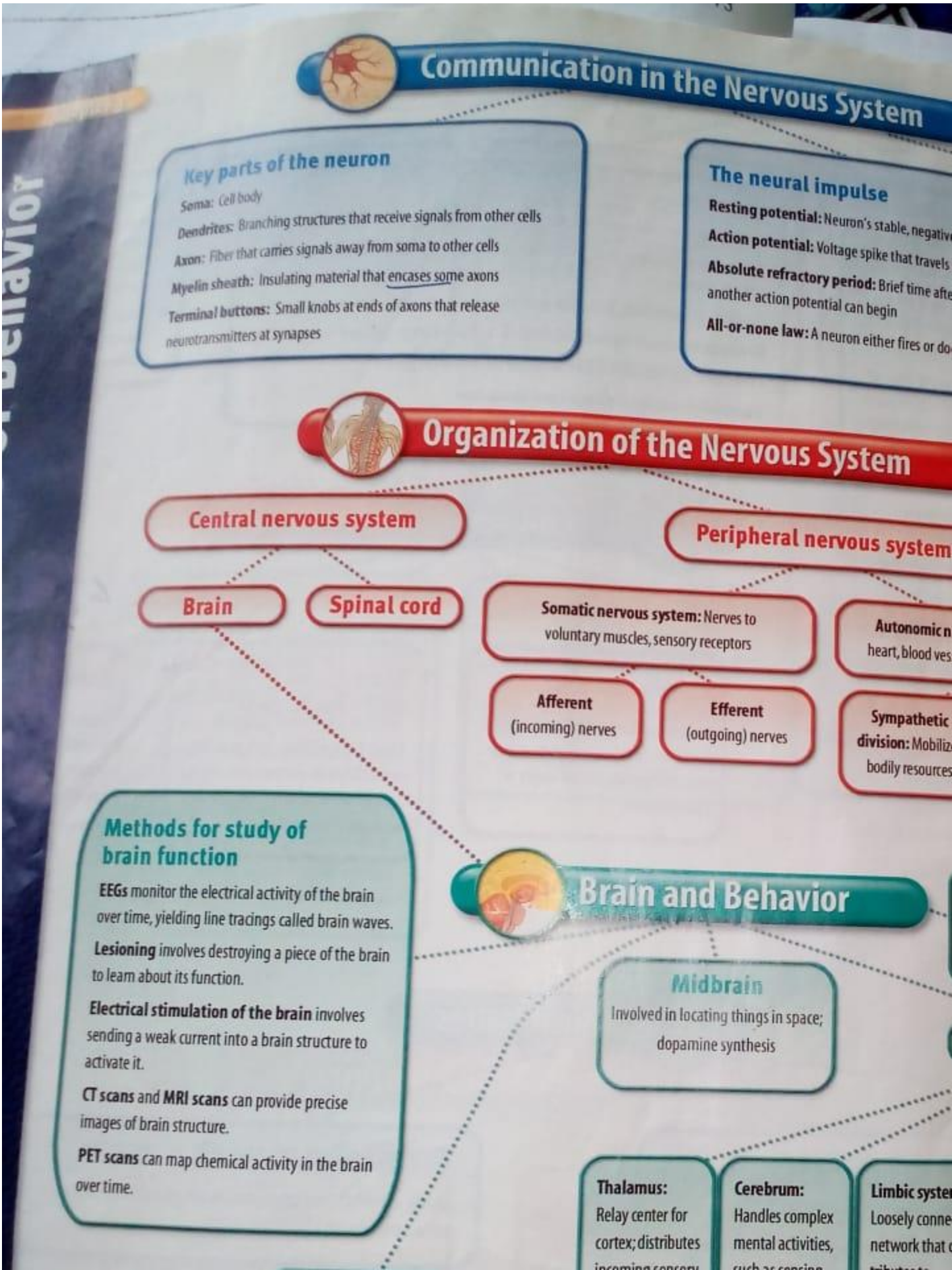
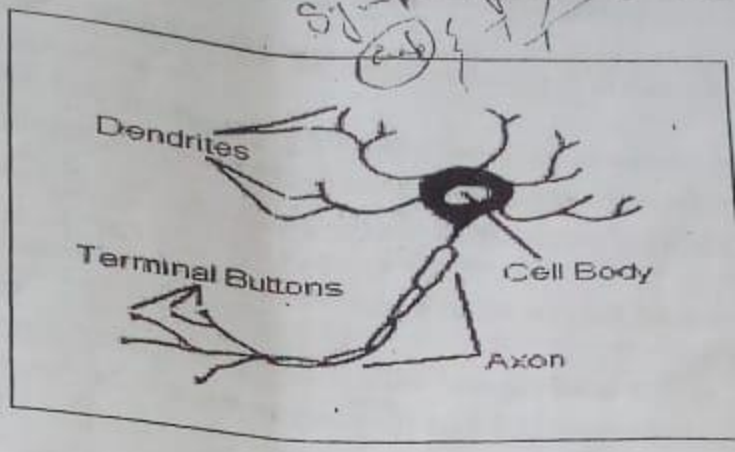

Communication in the Nervous System
Key parts of the neuron
Soma: Cell body
Dendrites: Branching structures that receive signals from other cells
Axon: Fiber that carries signals away from soma to other cells
Myelin sheath: Insulating material that encases some axons
Terminal buttons: Small knobs at ends of axons that release neurotransmitters at synapses
The neural impulse
Resting potential: Neuron's stable, negativ
Action potential: Voltage spike that travels
Absolute refractory period: Brief time afte
another action potential can begin
All-or-none law: A neuron either fires or do
Organization of the Nervous System
Central nervous system
Peripheral nervous system
Brain
Spinal cord
Somatic nervous system: Nerves to voluntary muscles, sensory receptors
Autonomic n
heart, blood ves
Afferent (incoming) nerves
Efferent (outgoing) nerves
Sympathetic division: Mobiliz
bodily resources
Methods for study of brain function
EEGs monitor the electrical activity of the brain over time, yielding line tracings called brain waves.
Lesioning involves destroying a piece of the brain to learn about its function.
Electrical stimulation of the brain involves sending a weak current into a brain structure to activate it.
CT scans and MRI scans can provide precise images of brain structure.
PET scans can map chemical activity in the brain over time.
Brain and Behavior
Midbrain
Involved in locating things in space; dopamine synthesis
Thalamus:
Relay center for cortex; distributes
Cerebrum:
Handles complex mental activities,
Limbic syste
Loosely conne
network that



Neurotransmitters

Information is carried by biochemical substances called neurotransmi
will talk about in more detail shortly. The terminal buttons and the den
neurons do not touch, but instead pass the information containing neu
through a Synapse. Once the neurotransmitter leaves the axon, and pass
synapse, it is caught on the dendrite by what are termed Receptor Sites.

Neurotransmitters have been studied quite a bit in relation to
human behavior. What we have found is that several neurotransmitters pl
way we behave, learn, the way we feel, and sleep. And, some play a role in
The following are those neurotransmitters which play a significant role
health.

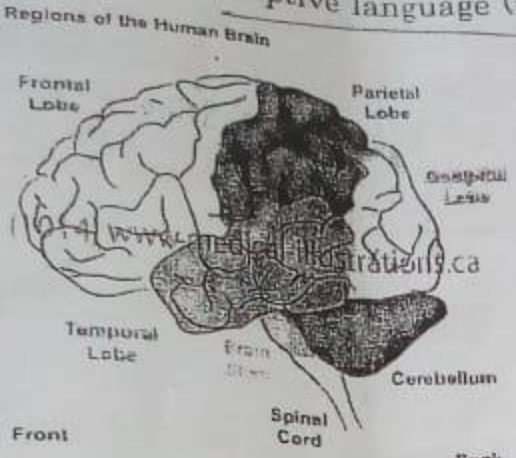
Acetylcholine – involved in *voluntary* movement, learning, memory, and sle

- Too much acetylcholine is associated with depression, and t
  hippocampus has been associated with dementia.

Dopamine – correlated with movement, attention, and learning

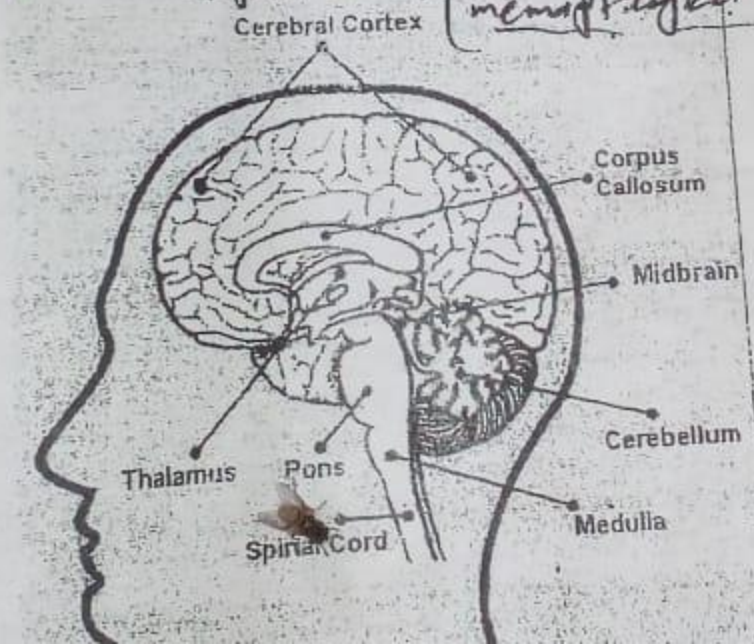
- Too much dopamine has been associated with schizophrenia,
  associated with some forms of depression as well as the musc
  tremors found in Parkinson's disease.

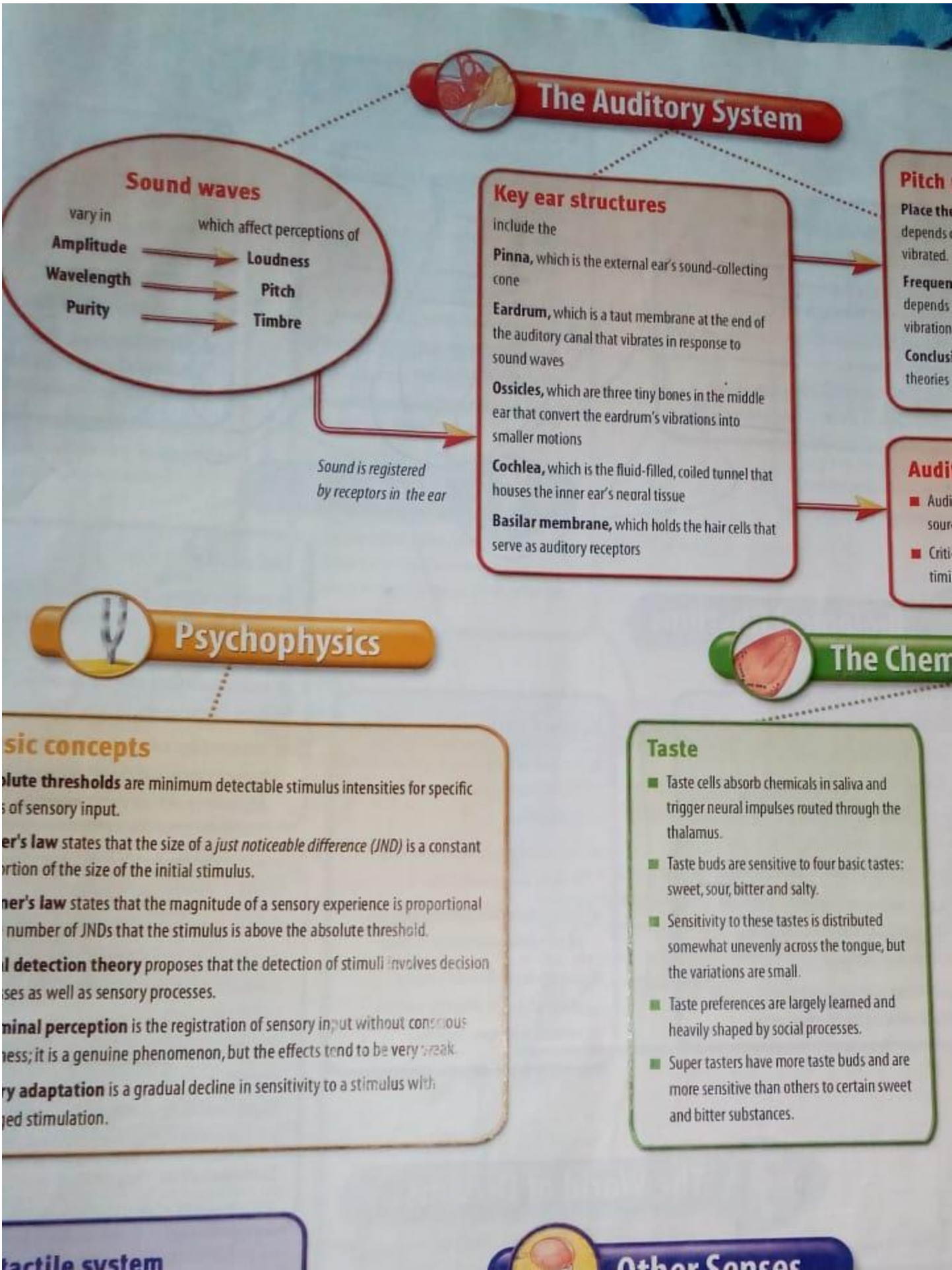
Temporal Lobe – (auditory cortex) receptive language (understanding language), as well a



memory and emotion

Typically the brain and spinal cord act together, but there are some actions, suc those associated with pain, where the spinal cord acts even before the information en the brain for processing. The spinal cord consists of the (1) Brainstem which is involved i sustaining functions. Damage to the brainstem is very often fatal. Other parts o brainstem include the (2) Medulla Oblongata, which controls heartbeat, breathing, pressure, digestion (3) Reticular Activating System (Reticular Formation) involved in a and attention, sleep and wakefulness, and control of reflexes, (4) Pons – regulates sta arousal, including sleep and dreaming.




The Auditory System
Sound waves
vary in
which affect perceptions of
Amplitude
Loudness
Wavelength
Pitch
Purity
Timbre
Sound is registered by receptors in the ear
Key ear structures
include the
Pinna, which is the external ear's sound-collecting cone
Eardrum, which is a taut membrane at the end of the auditory canal that vibrates in response to sound waves
Ossicles, which are three tiny bones in the middle ear that convert the eardrum's vibrations into smaller motions
Cochlea, which is the fluid-filled, coiled tunnel that houses the inner ear's neural tissue
Basilar membrane, which holds the hair cells that serve as auditory receptors
Pitch
Place the
depends
vibrated.
Frequen
depends
vibration
Conclusi
theories
Audi
Audi
sour
Criti
timi
Psychophysics
The Chem
sic concepts
olute thresholds are minimum detectable stimulus intensities for specific
of sensory input.
er's law states that the size of a just noticeable difference (JND) is a constant
rtion of the size of the initial stimulus.
ner's law states that the magnitude of a sensory experience is proportional
number of JNDs that the stimulus is above the absolute threshold.
l detection theory proposes that the detection of stimuli involves decision
ses as well as sensory processes.
ninal perception is the registration of sensory input without conscious
ness; it is a genuine phenomenon, but the effects tend to be very weak.
y adaptation is a gradual decline in sensitivity to a stimulus with
ed stimulation.
Taste
Taste cells absorb chemicals in saliva and trigger neural impulses routed through the thalamus.
Taste buds are sensitive to four basic tastes: sweet, sour, bitter and salty.
Sensitivity to these tastes is distributed somewhat unevenly across the tongue, but the variations are small.
Taste preferences are largely learned and heavily shaped by social processes.
Super tasters have more taste buds and are more sensitive than others to certain sweet and bitter substances.
tactile system
Other Senses

These two subsystems are at work constantly shifting your body to more prepa
states and more relaxed states. Every time a potentially threatening experience occ
(e.g., someone slams on their breaks in front of you, you hear a noise in your house at ni
you hear a loud bang, a stranger taps you on the shoulder unexpectedly), your body rea
The constant shifting of control between these two systems keeps your body ready for
current situation.

Nervous system

Sensation and Perception

Light waves

vary in → which affect perceptions of

- Amplitude → Brightness
- Wavelength → Color (hue)
- Purity → Saturation

Light is registered by receptors in the eye

Key eye structures

include the

Lens, which focuses light rays falling on the retina

Pupil, which regulates the amount of light passing to the rear of the eye

Retina, which is the neural tissue lining the inside back surface of the eye

Optic disk, which is a hole in the retina that corresponds to the *blind spot*

Fovea, which is a tiny spot in the center of the retina where visual acuity is greatest

In the retina

Visual receptors

consist of *rods* and *cones,* which are organized into *receptive fields.*

Rods play a key role in night and peripheral vision and greatly outnumber cones.

Cones play a key role in day and color vision and provide greater acuity than rods.

Receptive fields are collections of rods and cones that funnel signals to specific visual cells in the retina or the brain.

Lateral antagonism makes the visual system sensitive to *contrast* rather than absolute levels of light.

Visual signals are sent onward to the brain

Optical illusions

- An *optical illusion* is a discrepancy between the appearance of a visual stimulus and its physical reality.
- Optical illusions, such as the *Muller-Lyer illusion,* the *Ponzo illusion,* and the *moon illusion,* show that perceptual hypotheses can be wrong and that perception is not a simple reflection of objective reality.

Color perception

Subtractive color mixing works by removing some wavelengths of light, leaving less light.

Additive color mixing works by putting more

Form perception

- The same visual input can result in very different perceptions.
- Form perception is selective, as the phenomenon of *inattentional blindness* demonstrates.

Neurotransmitters and behavior

Acetylcholine: Released by neurons that control skeletal muscles

Serotonin: Involved in regulation of sleep; abnormal levels linked to depression and obsessive-compulsive disorder

Dopamine: Abnormal levels linked to schizophrenia; dopamine circuits activated by cocaine and amphetamines

Norepinephrine: Abnormal levels linked to depression; contributes to modulation of mood and arousal

GABA: Inhibitory transmitter that contributes to regulation of anxiety

Synaptic transmission

Synthesis and storage of neurotransmitters in synaptic vesicles → **Release** of neuro-transmitters into synaptic cleft → **Bindi** transm recept to exci inhibit

Right Brain/Left Brain

Methods for study of lateralization

Split brain surgery: Bundle of fibers (corpus callosum) that connects two hemispheres is severed.

Perceptual asymmetries: Left-right imbalances in speed of processing are studied in normal subjects.

Left hemisphere
usually handles verbal processing, including language, speech, reading, writing

Right hemisphere
Usually handles nonverbal processing, including spatial, musical, and visual recognition tasks

He

Basic concepts

- *Chromosomes* are threadlike strands of DNA that carry genetic information.
- *Genes* are DNA segments that are the key functional units in hereditary transmission.
- Two genes in a specific pair may be *homozygous* (the same) or *heterozygous* (different).
- When paired genes are different, one may be *dominant* (expressed) and the other *recessive* (masked).
- *Genotype* refers to a person's genetic makeup, whereas *phenotype* refers to a person's observable characteristics.
- Most behavioral traits appear to involve *polygenic inheritance*.

Endocrine System

- Consists of glands that secrete chemicals called hormones into the bloodstream
- Among other things, hormones regulate responses to stress, sexual development, insulin production, metabolic rate

Evolutionary Bases of Behavior

Chapter 2

Biopsychology

Most experts in the field of psychology and biology agree that the m
are connected in more complex ways than we can even comprehend. Res
shows us that the way we think affects the way we behave, the way we f
our body's respond. The opposite is also true, physical illness, physic
exercising, insomnia all affect the way we feel and behave, but also the way
ourselves and the world.

Since most of this online text is devoted to the way our mind work
our brain), this chapter will focus on the brain, the nervous system,
physiological components of our being interact, respond to, and influence o
health.

Neurons

A Neuron is a specialized nerve cell that receives, processes,
information to other cells in the body. We have a fixed number of neurons
they do not regenerate. About 10,000 neurons die everyday, but since we
between ten and 100 billion (Hooper & Teresi, 1987), we only lose abou
lifetime.

Information comes into the neuron through the Dendrites from oth
then continues to the Cell Body – (soma) which is the main part of the
contains the nucleus and maintains the life sustaining functions of the neu
processes information and then passes it along the Axon. At the end of the
like structures called Terminal Buttons that pass the information on to gland
other neurons.

- Too little epinephrine has been associated with depression.

Serotonin plays a role in mood, sleep, appetite, and impulsive and aggress

- Too little serotonin is associated with depression and some a especially obsessive-compulsive disorder. Some antidepressant med the availability of serotonin at the receptor sites.

GABA (Gamma-Amino Butyric Acid) inhibits excitation and anxiety

- Too little GABA is associated with anxiety and anxiety disorders. medication increases GABA at the receptor sites.

Please note that these associations are merely correlations, and d demonstrate any cause and effect relationship. We don't know what other affecting both the neurotransmitter and the mental illness, and we don't k in the neurotransmitter causes the illness, or the illness causes th neurotransmitter.

The Brain and Nervous System

The nervous system is broken down into two major systems: System and Peripheral Nervous System. We'll discuss the Central Nervou

The Central Nervous System consists of the brain and the spinal Cortex, which is involved in a variety of higher cognitive, emotional, s functions is more developed in humans than any other animal. It is wh picture a human brain, the gray matter with a multitude of folds cove The brain is divided into two symmetrical hemispheres: left (language, t the brain, associated with analytical thinking and logical abilities) and ri with musical and artistic abilities). The brain is also divided into four lob

Hypothalamus – controls the autonomic nervous system, and therefore body's homeostasis, which we will discuss later (controls body temperatu and appetite. Translates extreme emotions into physical responses

Limbic System – emotional expression, particularly the emotional compon memory, and motivation

Amygdala – attaches emotional significance to information and mediates and aggressive behavior

Hippocampus – involved more in memory, and the transfer of information fr to long-term memory

The Peripheral Nervous System is divided into two sub-systems. Nervous System – primary function is to regulate the actions of the skeletal m thought of as mediating voluntary activity. The other sub-system, called t Nervous System, regulates primarily involuntary activity such as heart ra blood pressure, and digestion. Although these activities are considered invo can be altered either through specific events or through changing our percep specific experience. This system is further broken down into two compliment Sympathetic and Parasympathetic Nervous Systems.

The Sympathetic Nervous System controls what has been called th Flight" phenomenon because of its control over the necessary bodily changes we are faced with a situation where we may need to defend ourselves or esca walking down a dark street at night by yourself. Suddenly you hear what you footsteps approaching you rapidly. What happens?

Your Sympathetic Nervous System kicks in to prepare your body: you quickens to get more blood to the muscles, your breathing becomes faster (an increase your oxygen, blood flow is diverted from the organs so digestion is redu skin gets cold and clammy and rerouted so to speak to the muscles, and your for better vision. In an instant, your body is prepared to either defend or escape

Now imagine that the footsteps belong to a good friend who catches up offers to walk you home. You feel relief instantly, but your body takes longer t