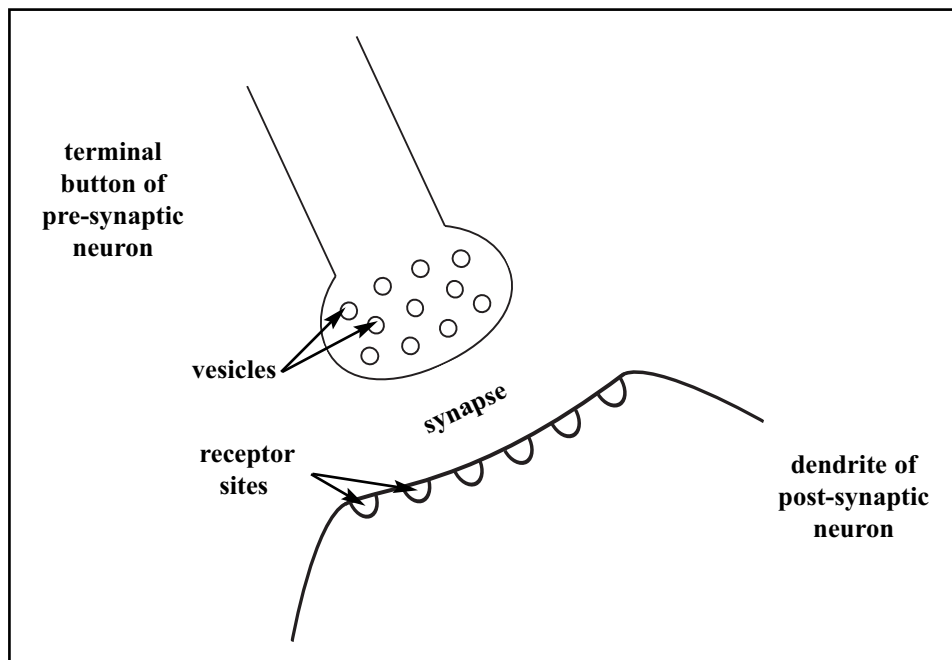


Some students find it useful to think of these inhibitory mechanisms as the safety catch on a gun, and the “**gun analogy**” also holds up in terms of other operations in the firing of a neuron. When there is sufficient input, the cell is **depolarized** (briefly, more positively charged inside the cell), and the neuron reaches its **firing threshold**. Once it does so, it fires in an “**all or none**” fashion. In pulling the trigger of a gun, there is a point at which the gun will fire, no matter how slowly or gently you have pulled the trigger. Pulling the trigger slowly will not make the bullet fly more slowly. After the neuron fires its electrical signal, there is a very brief **refractory period** in which the cell cannot fire again. This is analogous to the time after firing a pistol that one has to re-cock the gun in order to shoot again. It’s easy to confuse the concepts of refractory period and resting state. When a neuron is in its **resting state**, it is more negatively charged inside the cell, and it *could* fire, it just isn’t firing at the moment! During the absolute refractory period, the cell temporarily cannot fire at all, and during the relative refractory period that follows, it is much more difficult for the cell to fire than when in its resting state. It’s not likely that you’ll run into this distinction on the AP Exam, but if it comes up you’ll be ahead of the competition.

When the electrical signal reaches the end of the axon it causes the release of the neurotransmitter housed in **the vesicles** of the terminal buttons. The chemical enters the synapse, where it locks into the receptor sites of the receiving neuron (**the post-synaptic neuron**; the neuron that sends the message is considered **pre-synaptic**). Any excess neurotransmitter left in the synapse is re-collected by the transmitting neuron. This is called **re-uptake**. Some neurotransmitters are “cleaned up” from the synapse not by re-uptake but by enzymes which break the chemical down.

Many textbooks use the “**lock and key**” analogy to help students understand how cells communicate, and also how drugs can act to block or stimulate neurotransmitter activity. For example, some drugs designed to control schizophrenia work like a piece of tape covering a keyhole. The presence of schizophrenia is correlated with higher than normal levels of **dopamine** activity, and several medications used to treat the disease basically do not allow that neurotransmitter (the key) to bind to the receptor site (the keyhole or lock) of the post synaptic neuron. Such a drug, one that blocks the action of a neurotransmitter, is

called an **antagonist**; drugs that simulate the action of a certain neurotransmitter are called **agonists**. In a sense cocaine is a kind of agonist, although it does not so much mimic the action of dopamine as it stimulates a higher than normal level of dopamine activity by blocking the re-uptake of that chemical. Dopamine molecules are thus left out in the synapse and continue to bind to receptors, elevating the level of dopamine activity.



In later units on Sensation and Perception, Memory, Motivation and Emotion, Abnormal Psychology and others you will learn more about the action of specific neurotransmitters. For example, low levels of **acetylcholine** are correlated with the presence of Alzheimer's Disease. But it also clearly sends messages regarding muscular contraction as well. Some snake venoms block acetylcholine receptors, leading to paralysis and suffocation. Arousal of the **fight of flight mechanism** when an organism is under stress stimulates the release of **norepinephrine** and the natural pain killers called **endorphins**. The aptly named **Substance P** is the neurotransmitter responsible for the sending of pain messages. **Serotonin** seems connected to mood regulation and eating drives, among other things. The aforementioned **dopamine** is often linked to pleasure; several recreational drugs seem to operate on dopamine neurons. Some estimate that as many of one third of all neurons are **G.A.B.A. (gamma-aminobutyric acid)** neurons. G.A.B.A. is the leading inhibitory neurotransmitter in the brain. Many seizure disorders are correlated with lower than normal levels of G.A.B.A. activity, resulting in lower than normal levels of inhibition – simplistically stated, it's as if the brakes are failing in the car.

Finally, you might see reference on the AP Exam to the basic process by which **afferent, or sensory neurons**, carry messages to **interneurons** in the brain and spinal cord (the central nervous system) which then transmit the message out to the muscles and glands (the effectors) via **efferent, or motor neurons**. In a reflex arc, sensory input of a foreign object flying toward your eye is carried by afferent neurons directly to the spinal cord and then

Finally, in this unit you might be exposed to **reversible figures** like the well known “old lady/young lady” image, **figure-ground images** like the equally well known “vase or faces?” example and other perceptual illusions and phenomena. The Test Preparation graphic organizer at the end of this chapter contains examples of some of these. It is highly unlikely, however, that you would have to specifically recall the name of an illusion or supply an example of one with the name only as a cue on the AP Exam.

Name Hall of Fame

Just as many colleges and universities have their own sports halls of fame, populated by standouts from that particular school who might or might not be part of an all-inclusive, national hall of fame, so too with names from this unit. Specialists in sensation and perception might consider recognition of them indispensable, but, for an introductory college psychology course and for the authors of the Advanced Placement Exam, they are not. While there could possibly be a multiple choice item on the history of psychology which may refer to names like **Wilhelm Wundt, Gustav Fechner, Edward Titchener or Ernst Weber**, you would not have to pull any of those names out of a hat. Each of them, you may recall, was an early researcher in psychophysics, but their names would likely be used simply as another cue for you in responding to a question of greater breadth.

David Hubel and **Thorsten Wiesel** won a Nobel Prize for identification of feature detector cells in the brain, so that makes them pretty important, but, again, no AP Exam question would be completely dependent on simply recalling their names. The concept of *feature analysis* would be the more likely focus.

Essay Themes

The concepts of **set, expectancy** and **schemas** are very important. They overlap with other units (you will encounter them for sure in the Memory unit in the context of eyewitness recall, in Thought and Language in terms of *mental sets* in problem solving and in Social Psychology under the umbrella of prejudice and stereotyping) and they form the foundation of the entire ‘perception’ portion of this unit. If you don’t understand them, go back and review!

The omnipresent “nature, nurture or both?” debate in psychology is relevant in this unit. Do we *learn* about size and shape constancy, or are we in some way hard wired, perhaps for some evolutionary reasons, to “get” such things? You could ask the same question about our mastery of depth and distance cues, and probably most anything else in this unit!

Test Preparation: Cognition Part II: Thought and Language

