



Theology of Neurology: Facilitation: Changing the Path of Least Resistance: Synaptic Excitation, the Development of a Behavior Pattern

B. Synaptic Excitation:

- 1) (TXP: Chemical Synapse/Positive) When a neuron fires, it electronically sends its message down its axon to the presynaptic terminal.
- 2) When this action potential arrives at the synapse, it triggers the release of **calcium** ions, designated in chemistry by the symbol Ca^{2+} , which denotes it carrying **two positive charges**.
- 3) Channels containing calcium ions are normally closed and are **voltage gated** which means they open only when stimulated by electrical impulses received in the action potential.
- 4) The arrival of the calcium ions inside the axon triggers the release of neurotransmitters.
- 5) These neurotransmitters, carrying the chemical codes of memory, erupt across the synaptic cleft and attach to receptors on the postsynaptic membrane.
- 6) This causes the neighboring neuron to become slightly depolarized and thus more positively charged.
- 7) This means the neighboring neuron is more excitable, that is, more energized due to this stimulus.
- 8) This excitation causes the neighboring neuron to favor the reception of positive signals from the incoming neurotransmitters.
- 9) The receptor channels on the postsynaptic membrane are **chemically gated** and receptive to chemical neurotransmitters.
- 10) The number of gates that open, and how long they stay open, depends upon the amount of chemical neurotransmitters present.
- 11) Activation of one single synapse on a neighboring neuron will not cause it to develop its own action potential.
- 12) In other words, in order for the message to be passed on to a third neuron, the second neuron in the sequence must be excited at more than one of its synapses.
- 13) The originating neuron must send action potentials down its axon to several synapses—there are over 10,000 available to any one neuron.
- 14) As this process continues from one neuron to another, a positive memory trace is created.
- 15) I must alert you however that by *positive* I do not mean from the viewpoint of right and wrong but from the viewpoint of what the person who makes the decision *believes* is right or wrong. You do what you want to do and you generally do what you think is right.



- 16) As you continue to utilize this memory trace you cause it to become more and more efficient, a process called **facilitation**.
- 17) Facilitation means that repetition and practice enlarges the memory trace.
- 18) Each time you decide to rely upon a given memory trace, the branches of all the axons and dendrites involved elongate, more synapses are created, and synaptic connections become more efficiently arranged in the network.
- 19) Whenever certain stimuli arrive at the association cortex volition will consistently choose to utilize the memory trace which is the easiest to access. This is called the path of least resistance.
- 20) Such decision-making is what identifies a person's behavior patterns.
- 21) If alternate choices are never inculcated, then the person can always be expected to follow the same decision-making process.
- 22) How can established behavior be altered and changed? This occurs through synaptic inhibition.