

SENSORY BIOPHYSICS

STIMULUS represents a change in the environment.

A SENSORY MODALITY is a quality of sensation. The various modalities are encoded by the receptors and interpreted by the brain. RECEPTORS are structures responding to specific stimuli by producing generator potentials. They act as TRANSDUCERS (i.e. they convert energy in various forms into the energy of nerve impulses) and may be simply the ending of an AFFERENT neuron or it may be a specialized cell or organ.

Receptors or senses can be classified as either special or general: • Special senses: e.g. vision, hearing, equilibrium
• General senses: e.g. touch, heat, pain, pressure

Receptors can be classified functionally: 1. Chemo-receptors: Taste, smell, pain, blood carbon dioxide receptors, etc. 2. Photo-receptors 3. Thermo-receptors 4. Mechano-receptors: Touch, pressure, vibration, proprioception, equilibrium, etc.

Tonic receptors adapt slowly to prolonged stimulation. Phasic receptors, in contrast, adapt rapidly to prolonged stimulation. This response is called SENSORY ADAPTATION.

Note that the RECEPTOR POTENTIALS are graded and localized. These, to some degree, reflect the properties of the STIMULUS. The resulting ACTION POTENTIALS, in contrast, are ALL OR NONE (non-graded and propagated).

Information about the INTENSITY of a stimulus is coded by the FREQUENCY of the action potentials in the afferent neuron, this is called FM coding. There is no AMPLITUDE coding, because the amplitude of an action potential is invariant (i.e. ALL or NONE).

Information about the LOCATION of a stimulus is also very important. Several factors combine to provide this information, including: a. The location of the stimulated receptor and the size of its RECEPTIVE FIELD (neuron with smaller receptive field provides more precise information about the location of a point stimulus). b. The point within the receptive field where the stimulus is applied. c. The comparative responses of overlapping receptive fields. d. The phenomenon of LATERAL INHIBITION (helps to localize a stimulus site by markedly sharpening the contrast at the edges of the affected area, this can occur at any of several levels within a sensory pathway).

SOUND AND HEARING Speed of propagation (speed of sound) Acoustic impedance Sound intensity and acoustic pressure Human auditory system Pathology Hearing tests and audiometry

LIGHT, EYE AND VISION Frequency, wavelength, energy and colour Photometry and brightness Ultraviolet and infrared light Eye Vision defects Astigmatism Cataract Glaucoma Colour-blindness

1. SOUND AND HEARING

1. *Speed of propagation (speed of sound)* (http://www.wikilectures.eu/index.php/SOUND_AND_HEARING#SPEED_OF_PROPAGATION .28SPEED_OF_SOUND.29)
2. *Acoustic impedance* (http://www.wikilectures.eu/index.php/SOUND_AND_HEARING#ACOUSTIC_IMPEDANCE)
3. *Sound intensity and acoustic pressure* (http://www.wikilectures.eu/index.php/SOUND_AND_HEARING#SOUND_INTENSITY_AND_ACOUSTIC_PRESSURE)
4. *Human auditory system* (http://www.wikilectures.eu/index.php/SOUND_AND_HEARING#HUMAN_AUDITORY_SYSTEM)
5. *Pathology* (http://www.wikilectures.eu/index.php/SOUND_AND_HEARING#PATHOLOGY)
6. *Hearing tests and audiometry* (http://www.wikilectures.eu/index.php/SOUND_AND_HEARING#HEARING_TESTS_AND_AUDIOMETRY)

2. LIGHT, EYE AND VISION (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION)

1. *Frequency, wavelength, energy and colour* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.1..C2.A0_Frequency.2C_wavelength.2C_energy_and_colour)
2. *Photometry and brightness* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.2._Photo_metry_and_brightness)
3. *Ultraviolet and infrared light* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.3..C2.A0_Ultraviolet_and_infrared_light)
4. *Eye* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.4..C2.A0Eye)
5. *Vision defects* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.5..C2.A0Vision_defects)
6. *Astigmatism* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.6..C2.A0_Astigmatism)
7. *Cataract* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.7..C2.A0Cataract)
8. *Glaucoma* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.8..C2.A0.C2.A0Glaucoma)
9. *Colour-blindness* (http://www.wikilectures.eu/index.php/LIGHT,_EYE_AND_VISION#1.1.9..C2.A0_Colour-blindness)

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