



**Buildings and Human Habitation, Department of
Environmental Health September 2015, 4th Year**

Buildings and Human Senses

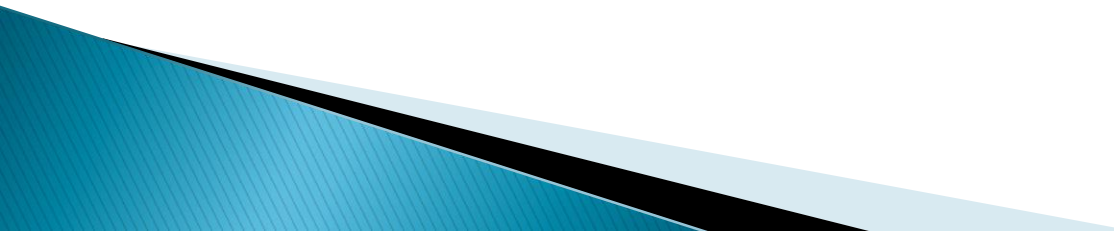
Structure

- 1) Buildings and human senses
- 2) Human body and the environment

Buildings and human senses

The well being of the population is largely affected by health, comfort and safety conditions during the main activities of living and working in an enclosed space in which people spend most of their time.

The human senses are essentially the instruments that give indication whether the person is feeling healthy and/or comfortable. Through sensory receptors, via nerves (the spinal cord and cranial), these senses can provide information to the brain, which is processes and used to send messages with prescribed actions to the relevant parts of the human body.



The Characteristics and mechanisms of each of the components of the human body that relate to the reception and perception of the indoor environment such as skin, eye, ear and respiratory tract, and the human systems (nervous, endocrine and immune).

All of these sense organs have the same basic features namely


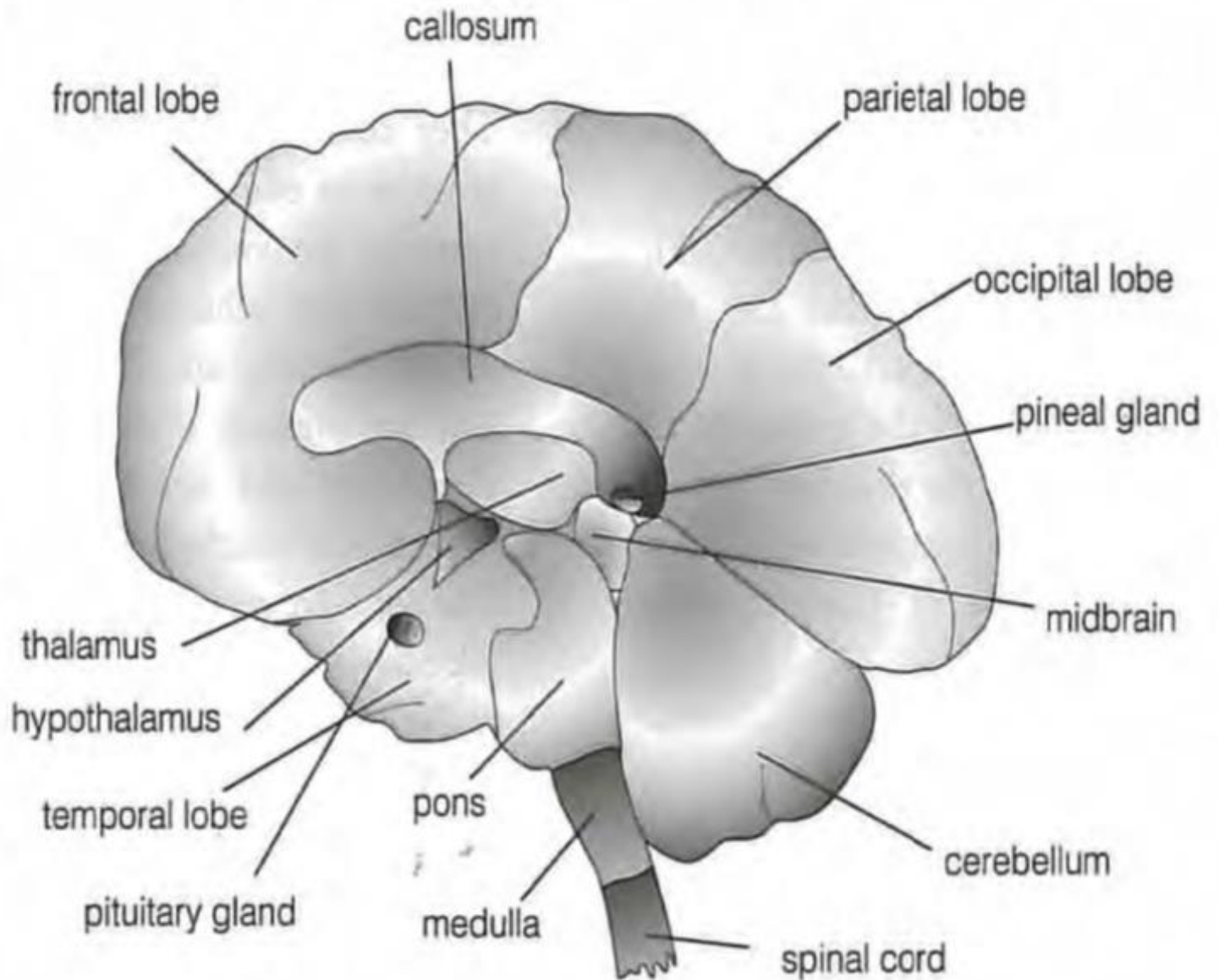
- 1) They contain receptor cells that are specifically sensitives to one class of stimulus (e.g. light is the stimulus for visual experience). As shown in Table (1).
 - 2) The sensitive receptor cells are often localised in the body at a receiving membrane or surface (such as the retina of the eye). Sensory inputs (stimuli) enter through the eyes (vision), ears (audition), mouth (taste), nose (olfaction) and body sensors (touch and internal organ configurations).
 - 3) The sensory cells connect with secondary ingoing nerve cells that carry the nerve impulse (action potential) along (some are very short, such as in the eye, and some are very long, such as in the skin).
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Table 1 *Types of sensory receptors found in or on the human body and senses (besides these sensory receptors, the human body also has motor and integration receptors)*

Receptor	Where	Sensitive to/detect stimuli	Function
Mechano-receptor	Skin, muscles, joints and visceral organs	Mechanical deformation by indentation, stretch and hair movement	Touch, muscle length, tendon and limb position Hearing and balance Blood pressure
Chemo-receptor	Olfactory bulb (nose) Taste buds in mouth Internally (e.g. blood)	Chemicals	Smell (odour) and taste Blood levels (oxygen, carbon dioxide, glucose, osmolarity)
Thermo-receptor	Free nerve endings in skin	Warmth and cold	Internal temperature (hypothalamus)
Noiceptor	Free nerve endings in skin	Noxious stimuli	Pain
Photoreceptor	Retina in eye	Light energy	Vision

Source: Kapit et al (2000)

4- From such nerves, higher - order neurons make complex connections with pathways of the brainstem and deeper parts of the brain (e.g. the thalamus) that eventually end in specific areas in the cerebral cortex of the brain (see Figures-1 and 2). Vision goes to the occipital lobe in the back, smell to the frontal lobe (visual cortex for early vision), audition to the temporal lobes on the sides, and touch (tactual function) to the parietal lobes towards the top of the brain. Associations between stimuli are developed by memory in various cortical sites.



Source: adapted from several sources

Figure –1 *Lobes of the cerebral cortex and other components of the brain*

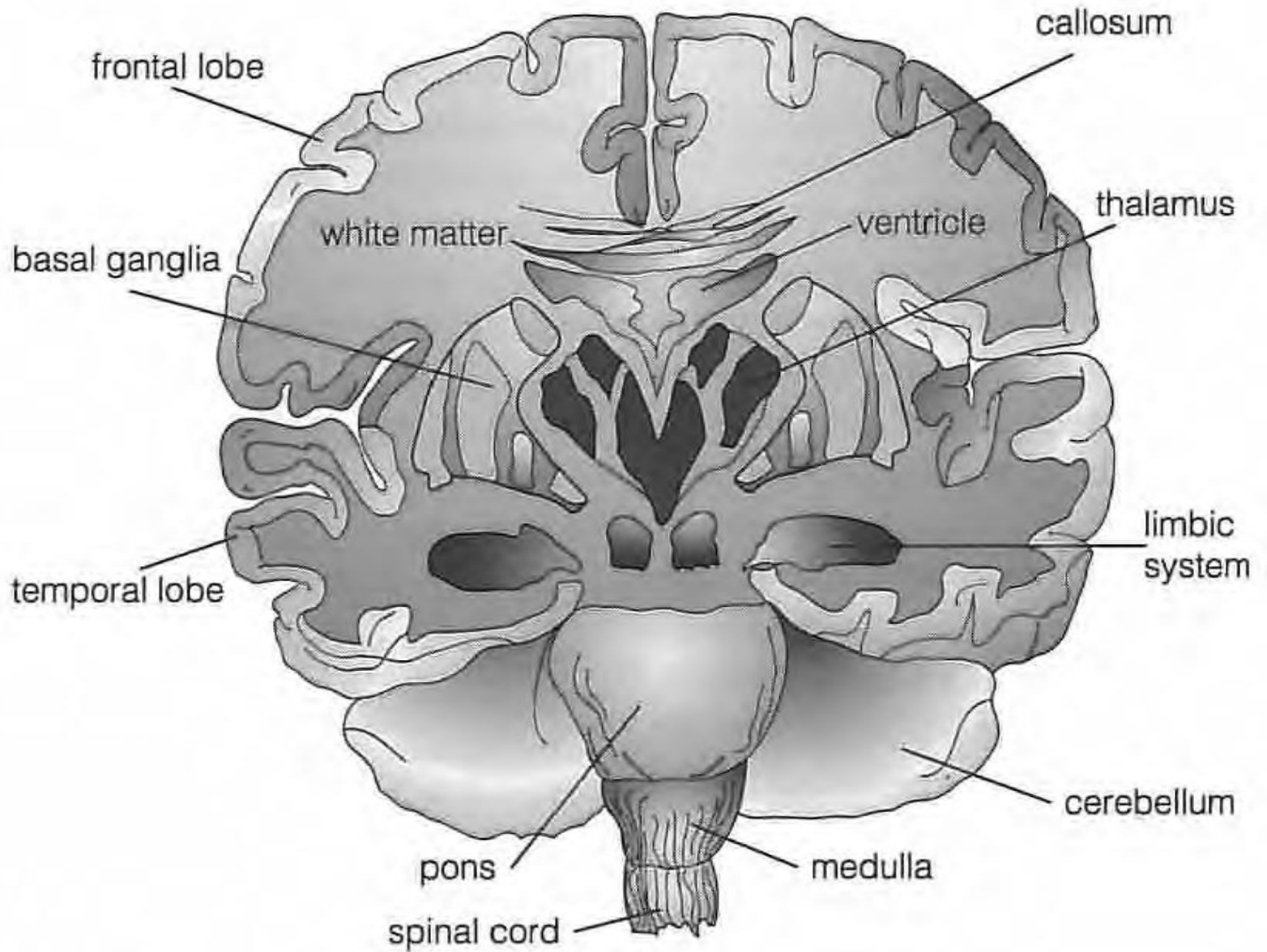


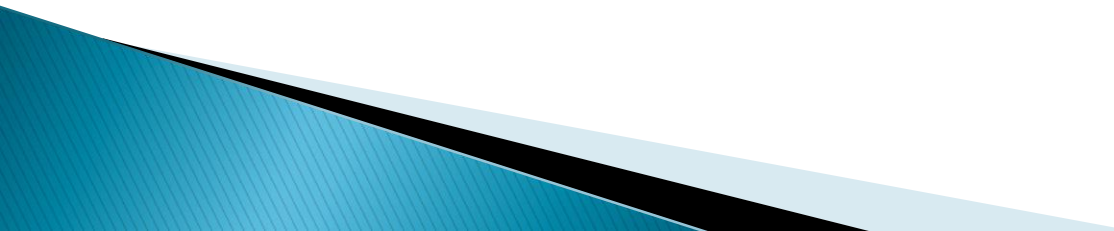
Figure 2 *Cross-section of the human brain*

5- Conscious and unconscious action are then coded and sent back to the relevant parts of the human body, where they are executed.

As we can see the sensory receptors are all start by transforming the information to the nerves that carry the nerve impulse (action potential) along the nervous system to the brain. Depending upon the type of receptor, the type of nerve fibres carrying the signal and the location in the cortex to which the signal is sent, the brain knows which kind of information it receives (pain, cold, smell, touch, etc.)

Human body and the environment

- ▶ Our body's health in relation to environmental stimuli is controlled (fought against) by the immune system; our emotions and perceptions are controlled by our limbic system and other parts of the brain (central nervous system), and our instincts (such as hunger, the need for sleep, thirst and breathing) are controlled by the brainstem and the cerebellum. Additionally, the endocrine system provide boundary conditions for control of environmental stimuli by our immune as well as our limbic system.

- ▶ Human body allergy is the reaction of the body to un-harmful substance, while with an infectious disease, it is the reaction of the body to a substance that can cause harm. In both, inflammation like reactions (swelling, pain, redness and or heat) occur and both are hypersensitivity reactions of the immune system.
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References

- ▶ Bluysen P. M., 2009, The Indoor Environmental Handbook, how to make buildings healthy and comfortable, UK, The Cromwell Press Group.