Sensory receptors

• Sensory receptors – dendrites specialized to detect certain types of stimuli

  – (Exteroceptors): detect stimuli from outside the body (e.g. taste, hearing, vision)
  – (Interoceptors): receive stimuli from inside the body (e.g. change in blood pressure)

Types of sensory receptors

• Chemoreceptors – respond to nearby chemicals
  – Pain receptors – a type of chemoreceptors that respond to chemicals released by damaged tissue

• Photoreceptors – respond to light energy

• Mechanoreceptors – respond to mechanical forces such as pressure

• Thermoreceptors – stimulated by temperature changes

Senses and the receptors involved

<table>
<thead>
<tr>
<th>Sensory feature</th>
<th>Stimulus</th>
<th>Category</th>
<th>Sense</th>
<th>Sensory Organ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taste buds</td>
<td>Chemicals</td>
<td>Chemoreceptor</td>
<td>Taste</td>
<td>Taste buds</td>
</tr>
<tr>
<td>Olfactory cells</td>
<td>Chemicals</td>
<td>Chemoreceptor</td>
<td>Smell</td>
<td>Olfactory epithelium</td>
</tr>
<tr>
<td>Retinal rods and cones in retina</td>
<td>Light</td>
<td>Photoreceptor</td>
<td>Vision</td>
<td>Eye</td>
</tr>
<tr>
<td>Hair cells and hair follicles</td>
<td>Hair</td>
<td>Mechanoreceptor</td>
<td>Hearing</td>
<td>Ear</td>
</tr>
<tr>
<td>Hair cells and hair follicles</td>
<td>Hair</td>
<td>Mechanoreceptor</td>
<td>Tactile sensibility</td>
<td>Tongue</td>
</tr>
<tr>
<td>Muscular spindle</td>
<td>Gravity</td>
<td>Mechanoreceptor</td>
<td>Sensation</td>
<td>Cerebral cortex</td>
</tr>
</tbody>
</table>
14.1 Sensory receptors and sensations

How does sensation occur?

- Sensory receptors respond to environmental stimuli
- Nerve impulses travel to the cerebral cortex
- Sensation (conscious perception) of stimuli occurs
- Sensory adaptation, decrease in stimulus response, can occur with repetitive stimuli (i.e. odor)

14.1 Proprioceptors and cutaneous receptors

Proprioceptors

- Mechanoreceptors involved in reflex actions that maintain muscle tone

14.2 Proprioceptors and cutaneous receptors

Cutaneous receptors

- Receptors in the dermis that make the skin sensitive to touch, pressure, pain and temperature
14.3 Senses of taste and smell

**Taste receptors**
- Sensitive to sweet, sour, salty and bitter tastes in food
- ~3,000 taste buds mostly on the tongue
- 80-90% of what we perceive as taste is actually due to the sense of smell

14.3 Senses of taste and smell

**Smell receptors**
- Depends on 10-20 million olfactory cells (modified neurons) in the roof of the nasal cavity

14.4 Sense of vision

**Anatomy of the eye**
14.4 Sense of vision

C. The eye: Photoreceptors of the retina

- **Rods:**
  - Contain a visual pigment called rhodopsin
  - Important for peripheral and night vision
  - Vitamin A is important for proper functioning

- **Cones:**
  - Located mostly in the fovea
  - Allow us to detect fine detail and color
  - 3 different kinds of cones containing red, green and blue pigments

### Summary of eye structures

<table>
<thead>
<tr>
<th>Part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sclera</td>
<td>Connects and supports eyeball</td>
</tr>
<tr>
<td>Cornea</td>
<td>Refracts light rays</td>
</tr>
<tr>
<td>Pupil</td>
<td>Avert the light</td>
</tr>
<tr>
<td>Chromatoid</td>
<td>Absorbs blue light</td>
</tr>
<tr>
<td>Glial body</td>
<td>Helps lens shape to accommodate vision</td>
</tr>
<tr>
<td>Iris</td>
<td>Regulates light entrance</td>
</tr>
<tr>
<td>Retina</td>
<td>Contains sensory receptors for light</td>
</tr>
<tr>
<td>Rod cells</td>
<td>Main black and white vision possible</td>
</tr>
<tr>
<td>Cone cells</td>
<td>Main color vision possible</td>
</tr>
<tr>
<td>Fovea central</td>
<td>Maine acute vision possible</td>
</tr>
<tr>
<td>Choroid</td>
<td>Mirror reflect lens</td>
</tr>
<tr>
<td>Lens</td>
<td>Reflects and focuses light rays</td>
</tr>
<tr>
<td>Humen</td>
<td>Sees most light rays and supports eyeball</td>
</tr>
<tr>
<td>Optic nerve</td>
<td>Transmits impulses to brain</td>
</tr>
</tbody>
</table>

[Diagram of the Retina]
C. The ear: Cochlea

- Converts vibrations into nerve impulses
- Mechanoreceptors?
- Contains the organ of Corti (spiral organ) sense organ containing hairs for hearing
  - Bending of embedded hairs cause vibrations that send nerve impulses to the cochlear nerve and then to the brain
  - Pitch is determined by varying wave frequencies that are detected by different parts of the organ of Corti
  - Volume is determined by the amplitude of sound waves
The inner ear: Semicircular canals and vestibule

- Detects movement of the head in the vertical and horizontal planes (gravitational equilibrium)
  - Depends on hair cells in the utricle and saccule
  - Mechanoreceptors?
- Detects angular movement (rotational equilibrium)
  - Depends on hair cells at the base of each semicircular canal (ampulla)