Sensory-Motor integration
- Sensory pathway transform & move signal towards CNS
  - First-order neurons—involved with sensory receptor
  - Second-order neurons—usually located in spinal cord or brainstem
    - Typically cross the mid-line (contralateral)
    - Transmit to thalamus
  - Third-order neurons—generally in sensory nucleus of thalamus
  - Fourth-order neurons—in cerebral cortex where through interactions with higher order neurons may --> PERCEPTION

Somatic sensory pathways
- See Fig 15.6
- What are tracts?
- What are columns?
- What is practical consequence of crossing-over (decussation)?
- Role of thalamus?
- Collaterals to many other areas of brain

Somatic sensory and motor “maps” in cerebral cortex
- See Fig 15.5
- Homunculus
- What determines size of area?
  - Sensitivity and control
- Size can change

Sensory input helps coordinate movement
- See Figs 15.7 and 15.8
- Note: lower motor neurons (final common pathway) to skeletal muscles are always excitatory
- Basal ganglia and cerebellum also provide input to motor neurons

Special senses of olfaction and taste (gustation)
- Chemoreceptors
- Chemicals in food, water and air
- Olfactory bulbs receive input from primary olfactory neurons—one of oldest parts of cerebrum
- Oldest “special sense”
- Not filtered by thalamus.
  - Smells can evoke complex memories

Olfactory epithelium—see Fig 16.1
- In nasal cavity
- Receptors are primary neurons
- Processes extend through epithelium to olfactory bulb
- Olfactory receptors replaced in about 1-2 months
- How do processes find their way into brain?
Olfactory reception

- Cilia on surface with protein receptor molecules
- Odorant molecule (dissolved in mucus) combine with receptors
- Second messenger cascade to open cation channels and depolarize cell
- Hundreds of receptor types used in combination to distinguish thousands of odors.

Gee Whiz facts

- Collaterals to limbic system means smells evoke emotions and memory
- Damage ==> anosmia
- Gender differences
  - Females sense of smell >> males (unless menstrual cycles are irregular
  - Human pheromones?
- Primary odors: camphor, musk, floral, peppermint, ether, pungent, putrid

Sense of Taste (see Fig 16.2)

- 5 primary tastes (sweet, sour, bitter, salt, umami)
- Primary sensory neuron axons in glossopharyngeal nerve, facial and vagus nerves to brain stem and thalamus (does not cross-over)

Taste bud

- About 50 receptor cells/taste bud
- Replaced from basal cells (live about 10 days)
- Gustatory hairs (microvilli) with receptor molecules to bind specific chemicals dissolved in saliva
- Receptor potential/neurotransmitter release to sensory neuron

Taste recognition

- One primary sensory taste neuron can respond to >1 receptor
- Different sensitivities
- Pattern of response ==> taste recognition (see Fig 16.3)