Diffuse Modulatory Systems

Cholinergic

- basal forebrain colinergic nuclei
  - some of the first neurons to degenerate and die in alsheimer's
- targets
  - hippocampus
  - neocortex
- general functions
  - attention
  - arousal
  - sleep-wake cycles

Serotonergic

- Raphe (seam, as in sewing) nuclei located in midline of brainstem
- Targets
  - everything
- general function
  - most active when aroused, active
  - control of sleep-wake cycles
- dysfunction
  - depression
  - possibly schitzophrenia
  - possibly OCD

Properties

- small nuclei
- mostly in brainstem
- synapse with > 100,000 neurons throughout CNS
- **En passant** synapses - transmitter diffuses from synapses on the middle of the axons ("synaptic zones", Wellman) to many postsynaptic cells
- Receptors on postsynaptic cells are typically G-protein-coupled

Noradrenergic

- Located in coeruleus in pons
- targets
  - spinal cord
  - cerebellum
  - thalamus
  - cortex
- general function
  - activated by novel stimuli
  - may increase arousal and responsiveness in response to salient stimuli
  - regulates sleep-wake cycles
  - modulatory role in learning and memory
- dysfunction
  - panic disorder

Dopamanergic

- located in substantia nigra and ventra tegmental area in midbrain
- targets
  - basal ganglia
  - nucleus accumbens
  - frontal lobe
- general function
  - initiating voluntary movements
  - part of "reward system"