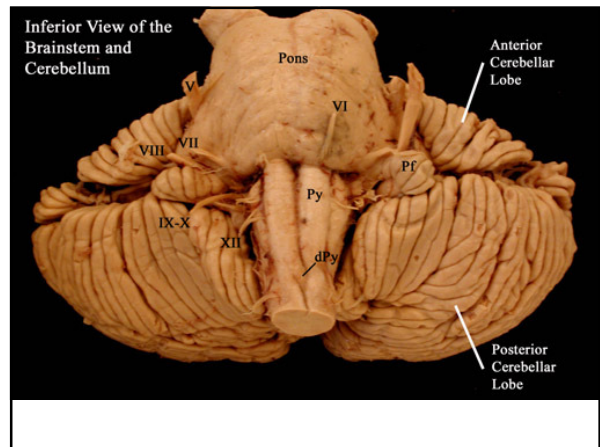
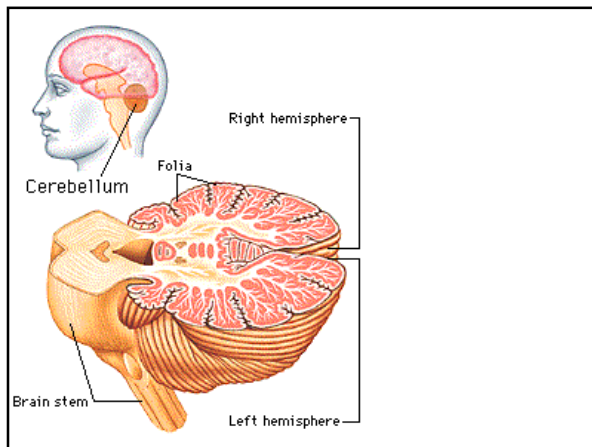
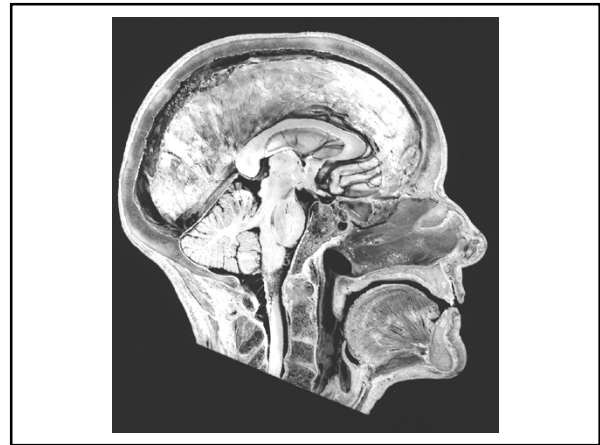
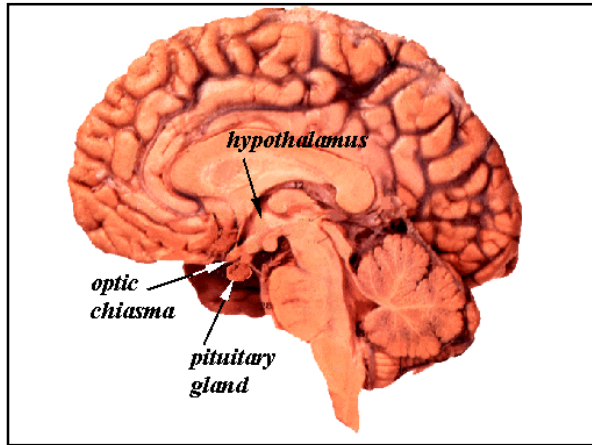
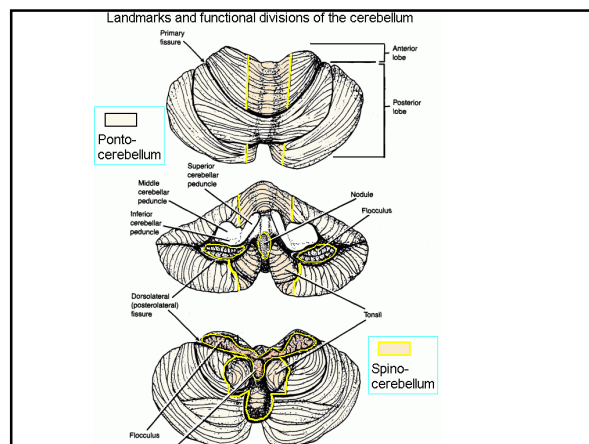
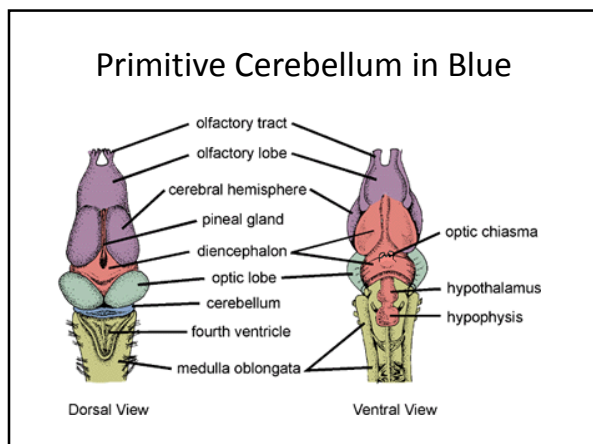


•Anatomy of the Cerebellum

- 2 hemispheres with vermis in between
- Very folded cerebellar cortex
- Underlying white matter & deep nuclei
- Deep nuclei are the output pathway
- Massive cerebellar peduncles (axon bundles to and from cerebellum) connecting to brainstem





• Evolution of Cerebellum

- Oldest part is the flocculonodular lobe - it gets input from the vestibular system (Vestibulocerebellar path)
- Next: the region around the vermis gets proprioceptive & cutaneous input via spinal cord (spinocerebellar tr.)
- Most recent region – the hemispheres- get input from cortex via the pons (corticopontocerebellar path)
- All input goes to cerebellar cortex; all output is from the deep cerebellar nuclei
- Loop-like feedback to each of those sources of input

• Mode of Functioning

- Totally unconscious
- Computer-like feedback loops
- Moment-to-moment adjustments
- Ipsilateral in its control (right side of cerebellum related to movements of right side of body)

• Cerebellum Is Needed For:

- Fluid coordination of movements
- Synergy/cooperation between muscles
- Precise timing & targeting of movements
- Appropriate force & muscle tone
- Cerebellum is storing these details during motor learning
- Automatic adjustments to changing conditions & to maintain balance

Symptoms of Cerebellar Damage

- Gait ataxia – wide-based, staggering walk, may shuffle, veer to side, may fall
- <http://www.youtube.com/watch?v=eBvzFkcv5cg&feature=related>
- Disturbed balance (can't balance on 1 foot; walk heel-to-toe) <http://www.youtube.com/watch?v=5DJ827uCP3g&feature=related>
- Poor muscle tone (hypotonia)
- Adiadochokinesia/Dysdiadochokinesia - can't rapidly alternate movements <http://www.neuroexam.com/36.html> 2
- Nystagmus-jerky, oscillating eye movements (see dbnystag. clip) <http://www.youtube.com/watch?v=oUUVWQx7zI>
- Midline lesion most likely to cause gait, posture, balance problems - Romberg test <http://www.neuroexam.com/37.html>

•Symptoms

- **Dysmetria** - poor targeting of movement; over- or under-reach
- Can't do finger to nose test
- Intention tremor while targeting movement (see clip)
- **Asynergia** - loss of fluid coordination & cooperation between muscles; movements jerky & disjointed
- **Dysarthria/Dysphonia** - slurred, uncoordinated speech & speech volume
- **Lateral lesion**- affects ipsilateral limbs
- <http://www.youtube.com/watch?v=5eBwn22Bnio>



Cerebellar Underdevelopment in a Cat

- <http://www.youtube.com/watch#!v=xLIL24shW7E&feature=related>
- 3 year old with cerebellar symptoms
- <http://www.youtube.com/watch?v=jx9Eq6Jxg9s>

•Test for Dysdiadochokinesia



•Medulloblastoma

- A cerebellar tumor usually originating in the vermis, which then presses down on the brainstem
- Accounts for ~1 in 20 brain tumors (1 in 5 in kids). 2/3 cases occur before age of 15 (median age = 5-6)
- Symptoms: Falling, nausea & vomiting, double vision, headache, eventually trouble moving. If its located on midline child will tend to fall forward or backward

•Medulloblastoma



•Other Causes of Cerebellar Damage

- Strokes or tumors affecting cerebellum
- Demyelination due to MS
- Genetically based degenerative disorders (e.g. Friedrich's ataxia caused by degeneration of spinocerebellar tracts)
- Alcoholic cerebellar atrophy. Cerebellum can also be damaged by some anticonvulsants or chemotherapy.