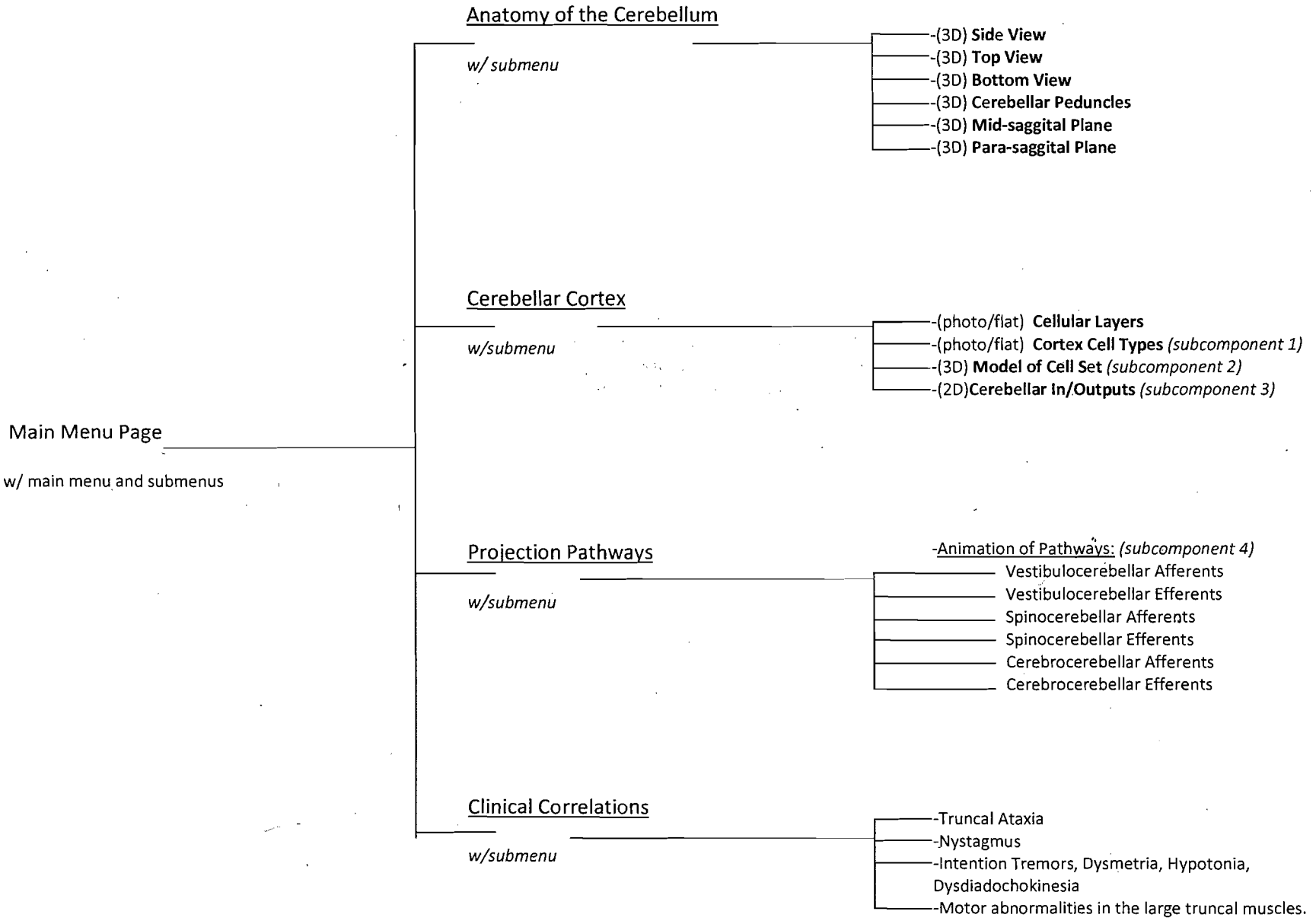
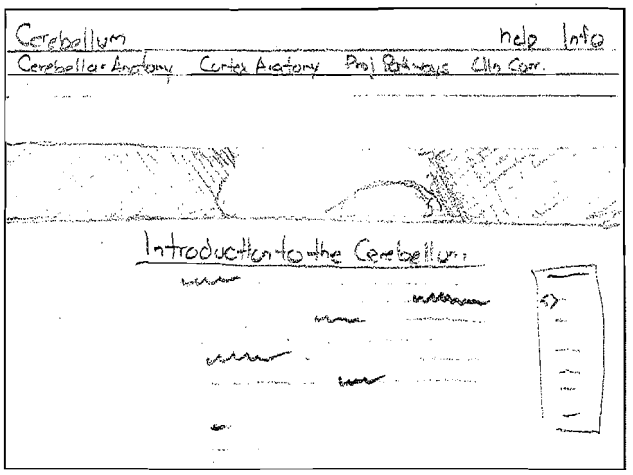

Main Menu Page
w/ main menu and submenus
Anatomy of the Cerebellum
w/ submenu
-(3D) Side View
-(3D) Top View
-(3D) Bottom View
-(3D) Cerebellar Peduncles
-(3D) Mid-saggital Plane
-(3D) Para-saggital Plane
Cerebellar Cortex
w/submenu
-(photo/flat) Cellular Layers
-(photo/flat) Cortex Cell Types (subcomponent 1)
-(3D) Model of Cell Set (subcomponent 2)
-(2D)Cerebellar In/Outputs (subcomponent 3)
Projection Pathways
w/submenu
-Animation of Pathways: (subcomponent 4)
Vestibulocerebellar Afferents
Vestibulocerebellar Efferents
Spinocerebellar Afferents
Spinocerebellar Efferents
Cerebrocerebellar Afferents
Cerebrocerebellar Efferents
Clinical Correlations
w/submenu
-Truncal Ataxia
-Nystagmus
-Intention Tremors, Dysmetria, Hypotonia, Dysdiadochokinesia
-Motor abnormalities in the large truncal muscles.

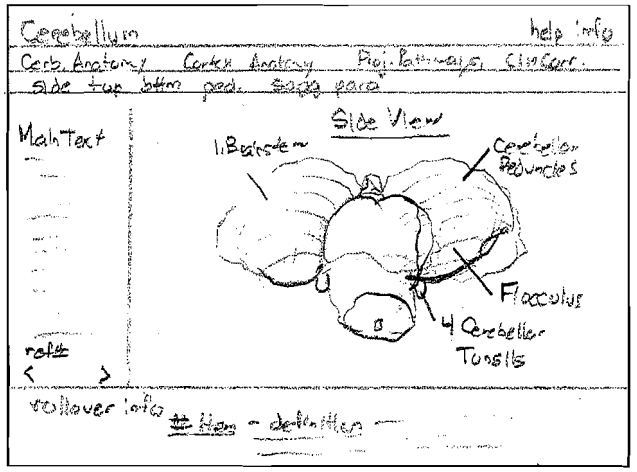
Slide 1



Introduction Slide

3D model of brain which when clicked again orients to specific anatomy as the view specified by the item requires

Slide 2 - Chapter 1 Anatomy of the Cerebellum

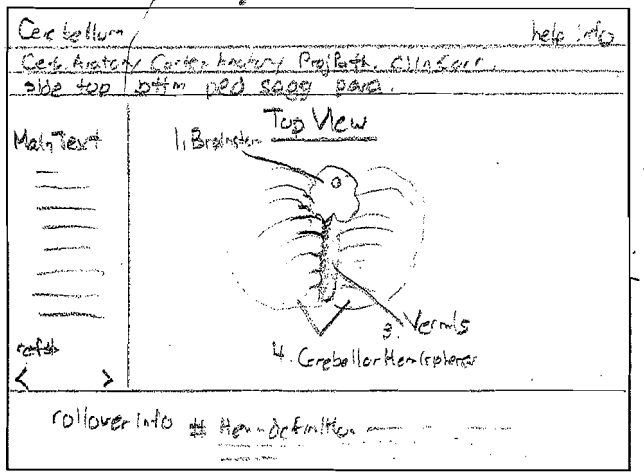


Side View

Main Text: The cerebellum or "little brain" is the structure occupying most of the volume of the posterior cranial fossa. It represents an important component of the motor system with functions including: maintenance of balance and equilibrium, coordination of eye movements, coordinating ongoing motor activity in the extremities.

Rollovers: 1. **Brainstem**- comprises midbrain, pons and medulla oblongata 2. **Cerebellar peduncle**- attaches to the cerebellum via the brainstem and contain axons leaving and entering the cerebellum3. **Flocculi**- two tufts of cerebellar parenchyma visible on anterior (ventral) surface of cerebellum. 4. **Cerebellar tonsils**- lie in the inferior-medial aspect of each hemisphere next to the brainstem. 5. **Folia**- external surface is characterized by multiple narrow-parallel ridges called cerebellar folia, like "leaves" or pages of a book, allowing for an enormous amount of surface area to the cerebellar cotex.

Slide 3



Top View

Main Text: The cerebellum rests on the floor of the posterior cranial fossa and is covered superiorly by a dural reflection known as the tentorium cerebelli. The cerebellum receives its blood supply from branches of the vertebral-basilar arterial system. A number of the fissures ("grooves") of the cerebellum have specific names and have been used to subdivide the cerebellum into a number of rather complex regimes. In this presentation we will take a simpler functional approach, dividing the cerebellar cortex into three medial to lateral subdivisions.

Rollovers: 1. **Brainstem**- the medulla is the most caudal part of the brainstem 2.Cerebellar **Hemispheres**-subdivisions of the distinct regions of the cerebellum 3. **Cerebellar Vermis**- a midline "worm-like" component of the cerebellum.
4. **Cerebellar Hemispheres**- two large hemispheres lie on either side of the Vermis.

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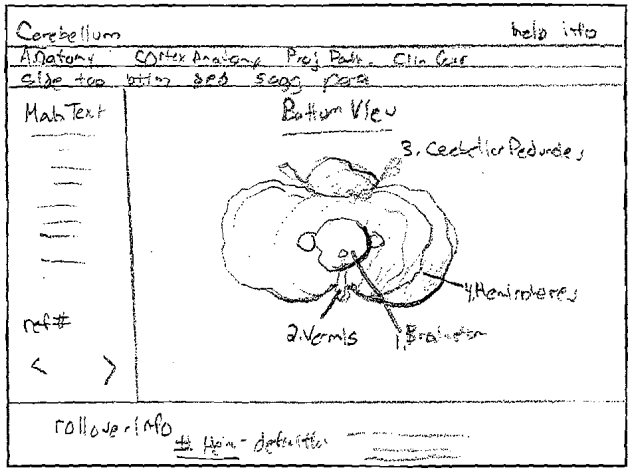
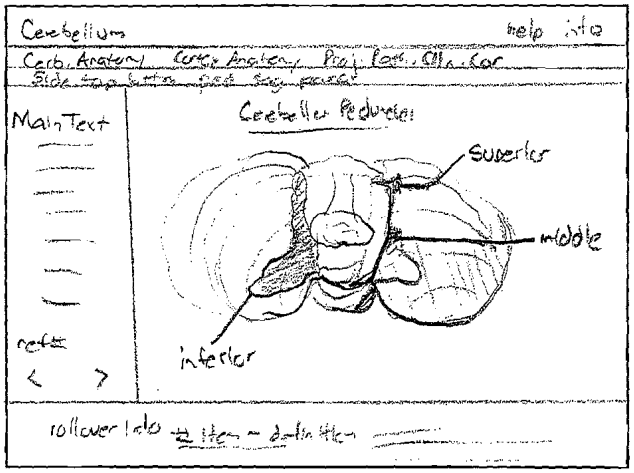
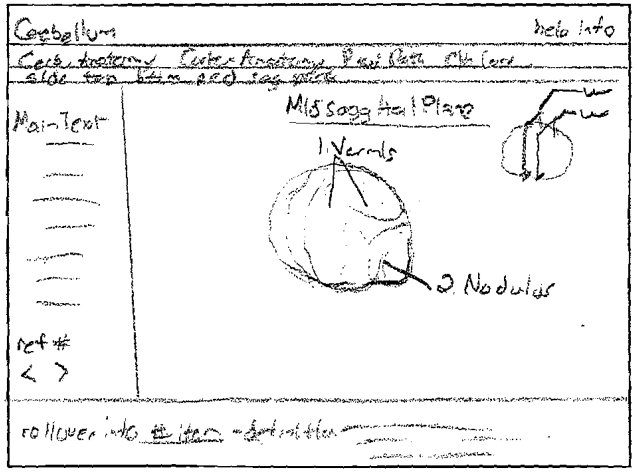
Slide ~~4~~ 3



Slide 5



Slide 6



inf

~~Bottom View~~

Main Text: As the cerebellum is rotated to give us a view of its inferior surface, some of the landmarks unrecognizable previously are now visible along with the midline vermis and the hemispheres which are still visible.

Rollovers: 1. Brainstem- the medulla is the most caudal part of the brainstem 2. Vermis- 3.Hemispheres- distinct of the cerebellum. 4. Cerebellar Tonsils- Not discrete functional regions, but important landmarks that can become compressed in conditions that displace the cerebellum and brainstem downwards through the foramen magnum(cerebellar tonsilar herniations".

	Afferent →	← Efferent
Inferior	Dorsal Spino Cuneo Vestibular Sys Contralateral Inf. Olive	Flocculus, nodulus, , fastigial nuclei to vestib sys
Middle	Contra Axons/ basal pontine	none
Superior	Ant Spino	Dent/Int, VAVL

Cerebellar Peduncles

Main Text: Cerebellar Peduncles attach the cerebellum to the brainstem and contains axons entering and leaving the cerebellum. **Superior**- contains major efferent pathways and few entering. **Middle**- It contains only afferent axons. **Inferior**- originates in medulla oblongata. It has predominant afferent projections with a smaller number of efferent.

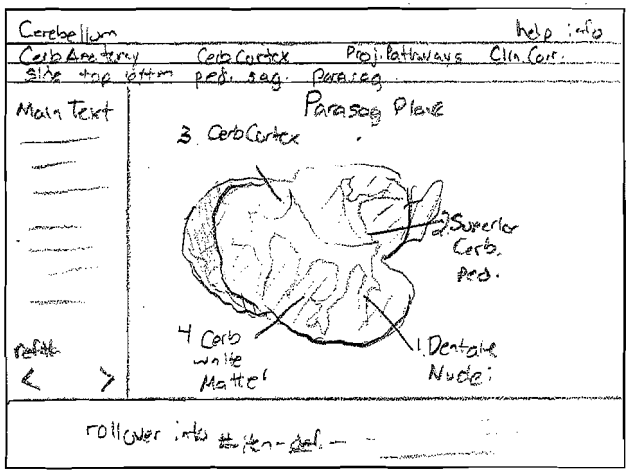
Midsaggital Plane

Main Text: On the cut surface the cerebellar folia are composed of a thin layer of gray matter (cortex), supported by branching white matter cores. The white matter is comparatively scanty within the vermis but much more abundant within the hemispheres of the cerebellum.

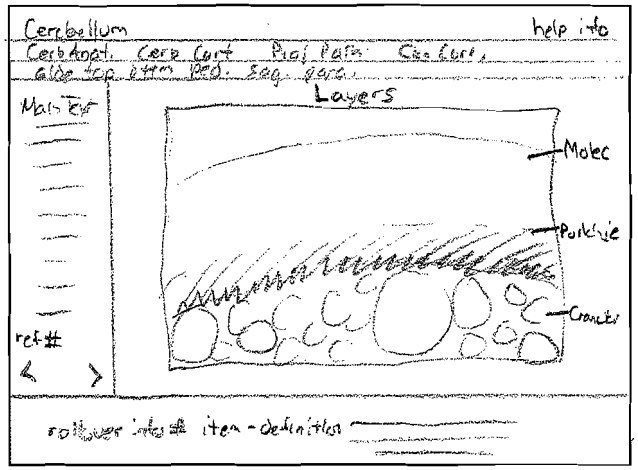
Rollovers: 1. **Vermis**- divisions of the cerebellum by white matter. 2. **Nodulus**- is one of nine subdivisions of the cerebellum. We will discuss this further when we consider the "vestibulocerebellum ", which is one of three functional divisions of the cerebellum.

prv 1 nxt 2

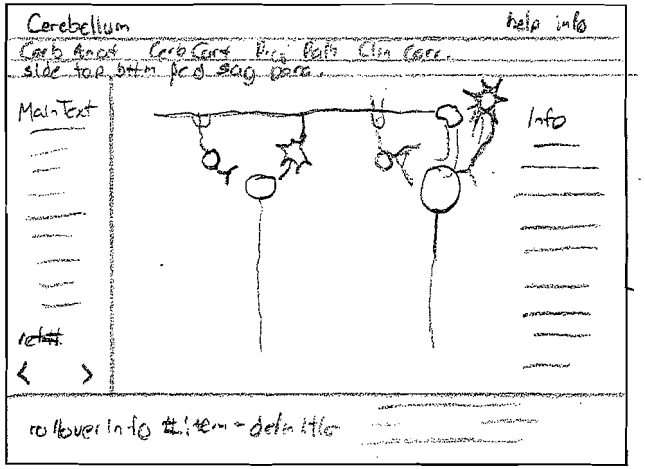
Slide 7



Slide 8- Chapter 2 Cerebellar Cortex



Slide 9



Parasaggital Plane

Main Text: The cerebellum contains four paired deep nuclei: Dentate, Emboliform, Globose and Fastigial ("don't eat gross food") laterally to medially. The largest is the dentate nuclei.

Rollovers- 1. **Dentate nucleus**- largest and most laterally situated of the deep cerebellar nuclei. 2. **Superior Cerebellar Peduncle**- emanates from the hilar region of the dentate. 3. **Cerebellar Cortex**- is functionally divided into three sections and directs inputs to deep cerebellar nuclei 4. **Cerebellar White Matter**-myelinated cerebellar axons also known as "arbor vitae".

Layers of the Cortex

Main Text: Although the cerebellum has distinct functional divisions, from a microscopic standpoint, the appearance is remarkably uniform from area to area. Externally it contains a relatively hypocellular zone- **the molecular layer**. Below this is the prominent layer or large pyramidal neurons- **Purkinje cells**. Deepest is the densely cellular **granular layer**.

Rollovers: 1.**Granular Cell Layer**-sometimes called the internal granular layer,is the deepest layer of the cerebellar cortex.Important Structures: Granular cells, golgi cells, cerebellar glomeruli. 2. **Purkinje cell layer**- prominent purkinje cells are the "grand central station" of the cerebellar cortex, which are the ultimate target of all projections to the cerebellum and the only source of output from it. 3. **Molecular Layer** is the most external layer containing stellate cells and basket cells which inhibit purkinje cell activity. It also contains numberous cell processes that will be illustrated later- Purkinje cell dendrites, granule cell axons and others.

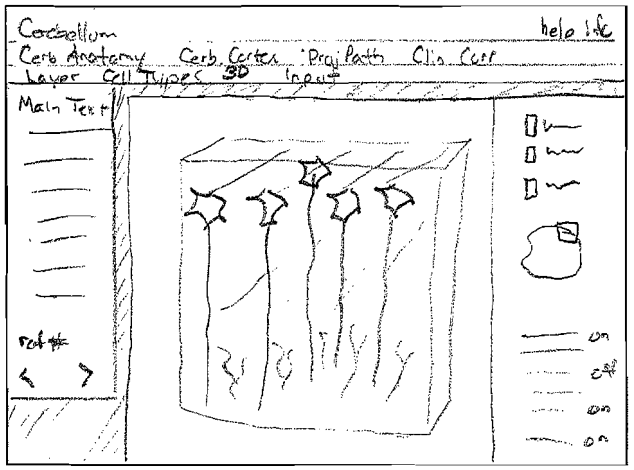
Cell Types

Detailed in (subcomponent 1)

Main Text: using this higher resolution image of the cerebellum, we can now take a closer look at the specific cells and cell processes that populate the cerebellar cortex, their connections and their functions.

Rollovers: descriptions for each cell type based off syllabus: 1. Parallel fibers, 2. stellate cells, 3. basket cells, 4. molecular cells,5. purkinje cells, 6. granular cells, 7. climbing fibers, 8. mossy fibers, 9. deep cerebellar nuclei. Texts found in **Appendices 1.**

Slide 10

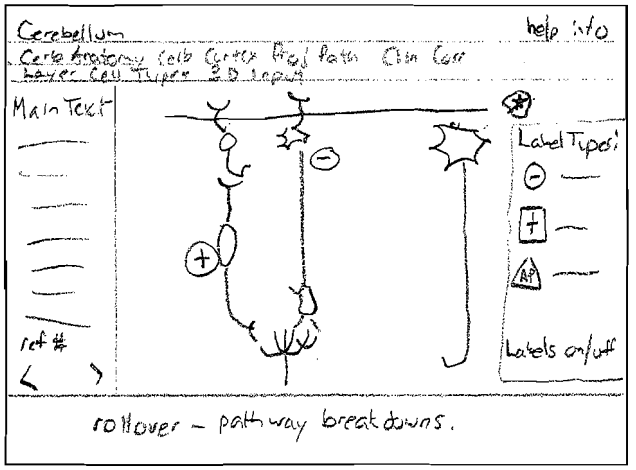


3D Rotatable Model

Detailed in (subcomponent 2)

Main Text: This 3D image provides us with a 3D look at the various cell types discussed in the previous panel. Note the fan like distribution of the Purkinje cells, the processes which are oriented perpendicular to the long axis of the cerebellar folium. Because of this arrangement a parallel fiber is able to synapse with the dendrites of multiple Purkinje cells. Also the Purkinje cells is situated to receive multiple excitatory inputs from multiple granule cells

Slide 11



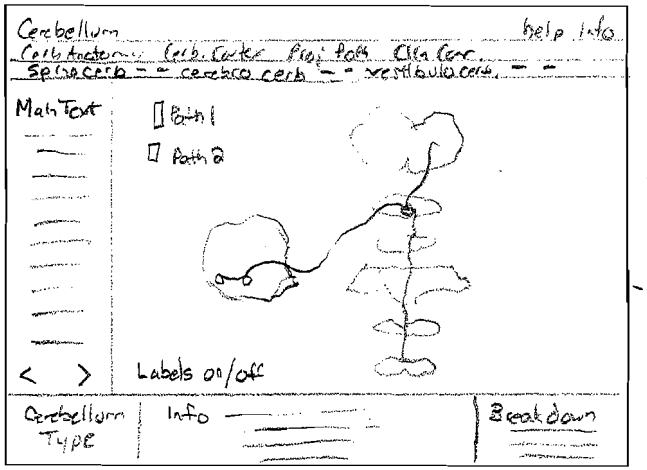
Cortex Excitatory and Inhibitory Pathways

Detailed in (subcomponent 3)

Main Text: This sequence allows us to trace the different action potentials from the cerebellar cortex. Lets take a closer lok at the signals coming in to the cortex through mossy fibers, climbing fibers, etc.

Rollovers 1. Mossy fibers are exciting granular cells. They have many interesting effects. One of these is the excitation of Golgi cells, which in turn inhibits the activity of the granule cell creating a feedback loop and shutoff sequence.2. In addition to exciting Golgi cells it also sends excitation influences to Purkinje cells and excitatory signals to basket cells and stellate cells which in turn inhibit the Purkinje cell. It creates a reciprocal effect of excitation and inhibition.3. The excitation via climbing fibers is much more straight forward as they send signals straight up the axons and excite the target cells.

Slide 12-18 Chapter 3 Cerebellar Pathways



Projection Pathways

Detailed in (subcomponent 4)

Broken into 6 identical slide layouts with movie clips specific to each efferent or afferent pathway. They will be user guided animations to better help visualize destination. Includes option of maskable overlay of entire pathway for related circuit.

Rollovers- similar squares. 1 stating the destination of the pathway, 2 telling the inputs to the pathway, 3 telling the outputs of the pathway.

Appendices 1

Golgi Cells- receives excitatory projections from granule cells via parallel fibers and sends inhibitory fibers back to granular cells at the level of the cerebellar glomerulus (make a cerebellar glom. Definition somewhere on the page with accompanying dotted line to explain).

Granule Cells- receives excitatory projections from mossy fivers in the cerebellar glomerulus, inhibitory projections from Golgi cells in the cerebellar glomerulus. Sends excitatory projections via parallel fibers to Golgi cells, stellate cells and basket cells.

Mossy Fibers- account for the majority of axons coming into the cerebellum. Excitatory projections to granular cells. Come from a wide range of neurons in the spinal cord, brainstem and cerebral hemispheres.

Climbing Fibers- the other source of excitatory influence in the cerebellar cortex. Mossy fibers come exclusively from the contra lateral inferior olive and encircle Purkinje cell processes much like tendrils of Ivy climbing up the branches of a tree.

Basket Cell- is an inhibitory cell that provides a "basket-like" axonal connection to the cell body of the Purkinje cell.

Stellate Cell- are excited by granule cells via parallel fibers. They send star like inhibitory processes to Purkinje cell dendrites.

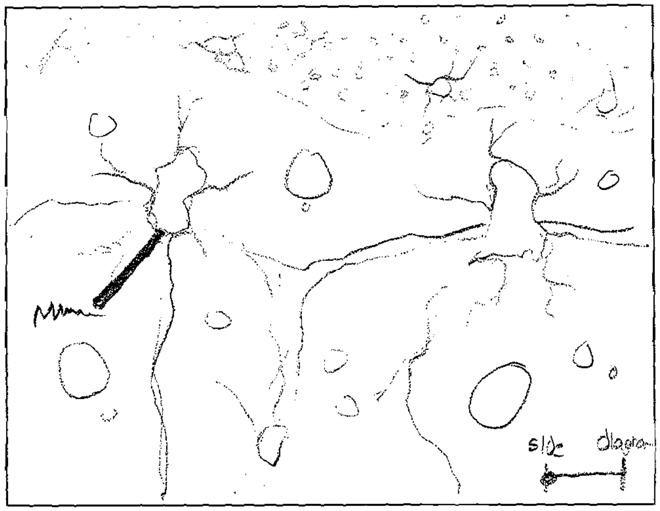
Purkinje Cells- are the "grand central station" to the cerebellar cortex and serve/provide the only source of signaling leaving the cerebellar cortex. It receives excitatory signaling from climbing fivers and mossy fibers(via) granular cells. They receive direct inhibition from stellate and basket and indirect inhibitory influence from Golgi cells which in turn send inhibitory projections to deep cerebellar nuclei and vestibular nuclei.

Sub Component 1 - Schematic Diagram of Cell Types
project name

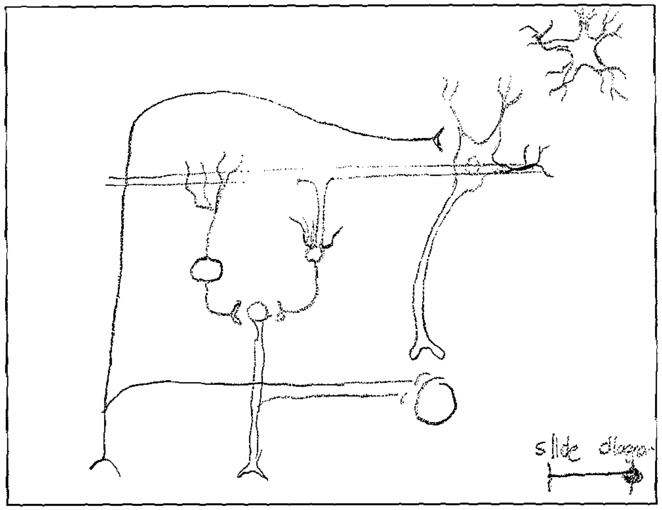
WERKMEISTER

date: 1/20/09

scene 1



scene 2



scene

nts includes rollovers that would label the specific type of cell within a specific slide & give info pertaining to each specific cell type.

visual simplification of slide portion.

① Parallel Fibers

② Stellate Cells

③ Basket Cells

④ Molecular Cells

⑤ Purkinje Cells

⑥ Granular Cells - most numerous cells, appear in routine sections as small lymphocyte-like nuclei.

⑦ Climbing Fibers

⑧ Cerebellar Glomeruli

⑨ Mossy Fibers

⑩ Deep Cerebellar Nuclei

⑪ Golgi Cells - larger & far less numerous than granular cells. Their cell bodies & axons lie in granular cell layer.

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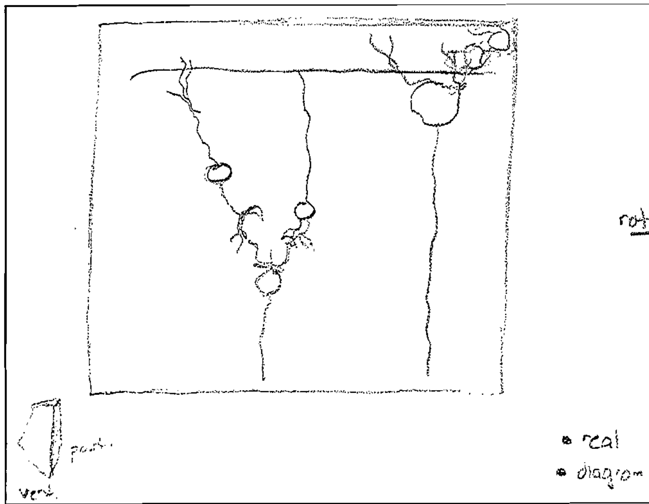
SubComponent 2 - 3D Rotatable View
project name

WERKMEISTER

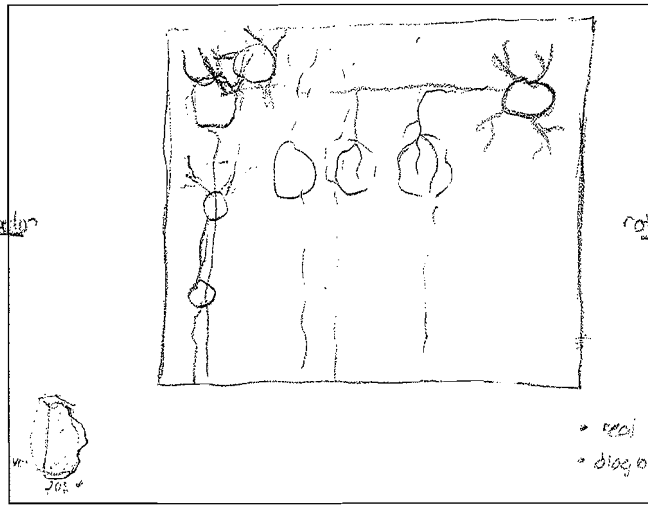
date: 1/20/09

scene 1 w/corresponding diagram



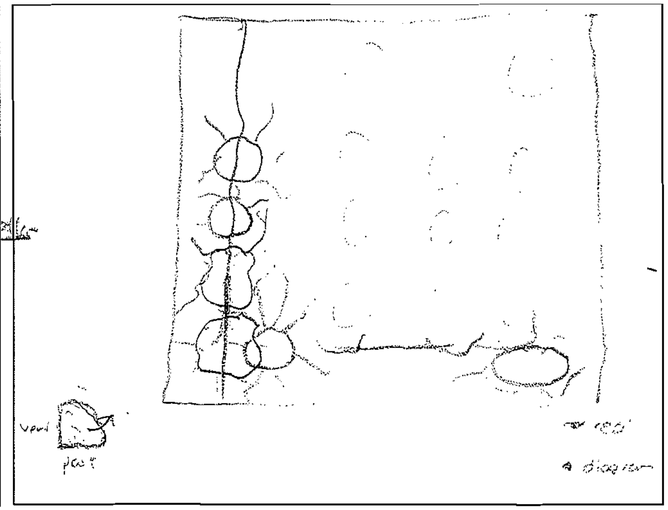
rotation

scene 2 w/corresponding diagram



rotation

scene 3 w/corresponding diagram



front view

3D model created with corresponding diagram to simplify concept explain dimensionality of cerebellar circuitry.

— [illegible] delay of movement?

side view

top view

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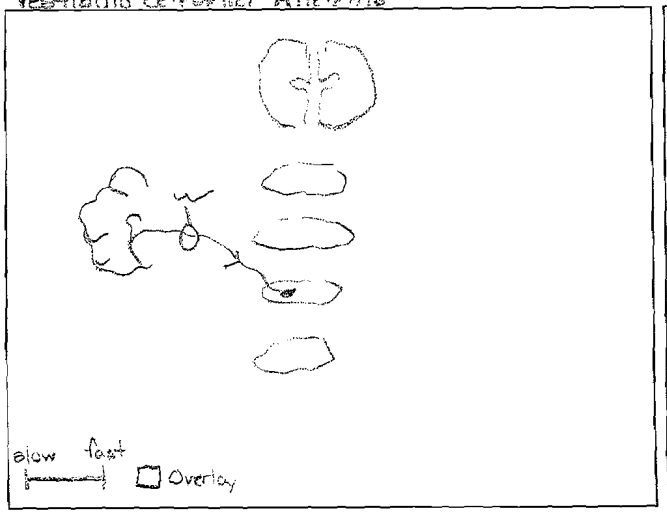
WERKMEISTER

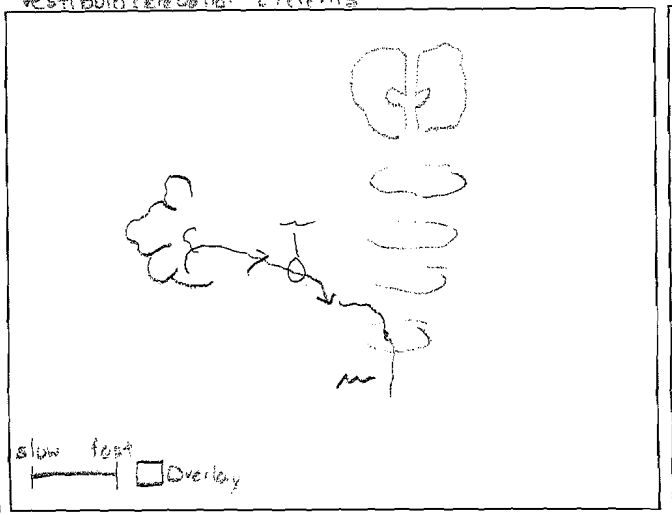
Sub Component 3- Afferent/Efferent Videos
project name

date: 1/20/09

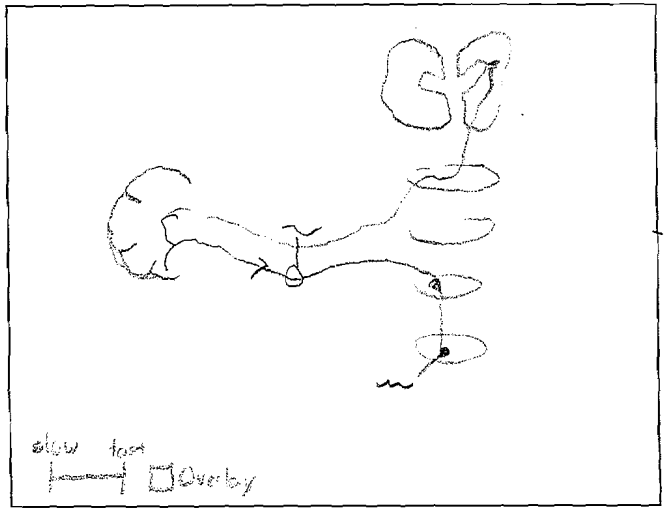
scene 1
Vestibulocerebellar Afferents



scene 2A
vestibulocerebellar Efferents



scene 2B



nts

for each component the audience is given a pathway w/ option of overlaying all pertinent pathways for that specific afferent/efferent system.

(motion movies)

nts

when multiple paths exist within specific system the user is prompted to choose a direction; given the direction chosen the viewer may see the course of the signal & also choose to see the path overlays.

* same for all 10 versions of projection path

of

Rev# 1

Page 1 of 1