Cerebellum

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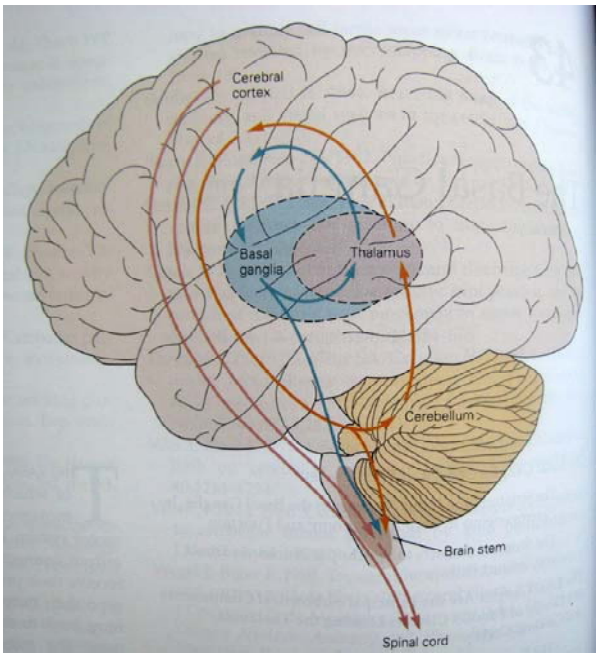
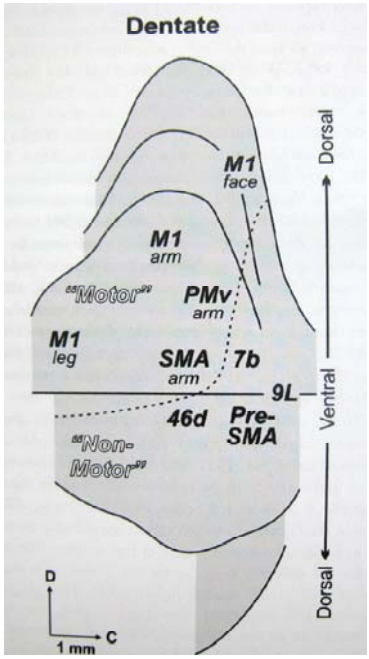
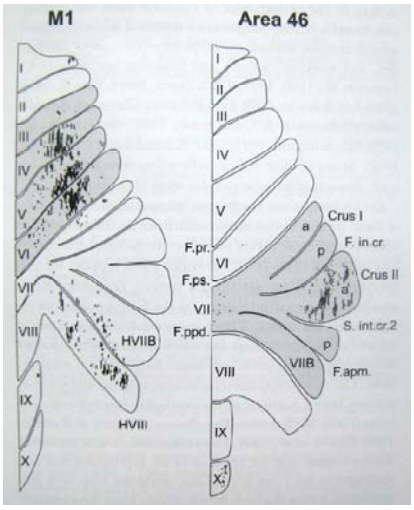
Loops with cortex

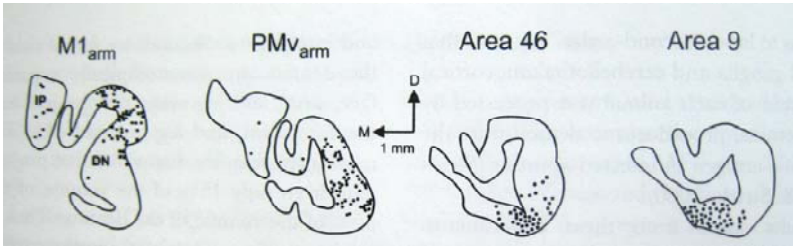


Recurrent loops with specific cortical areas

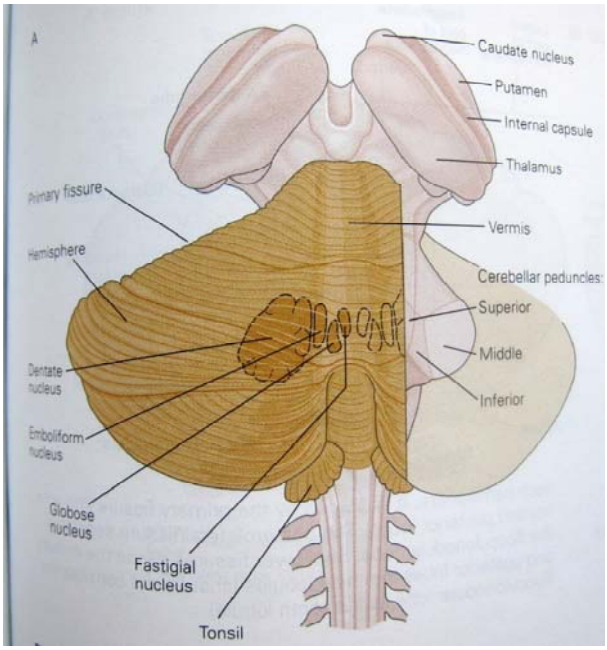


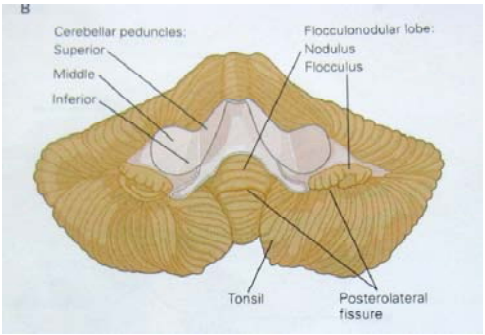
(Strick)

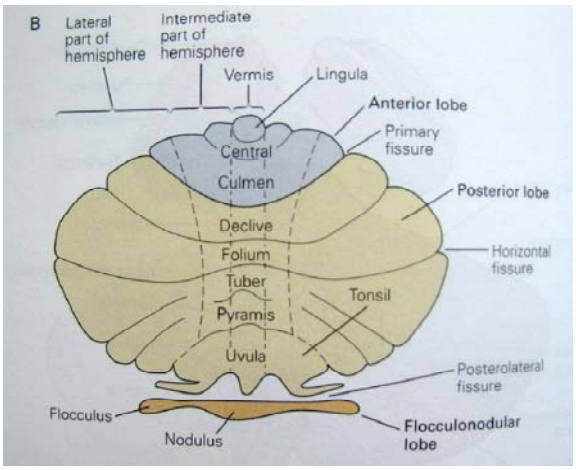




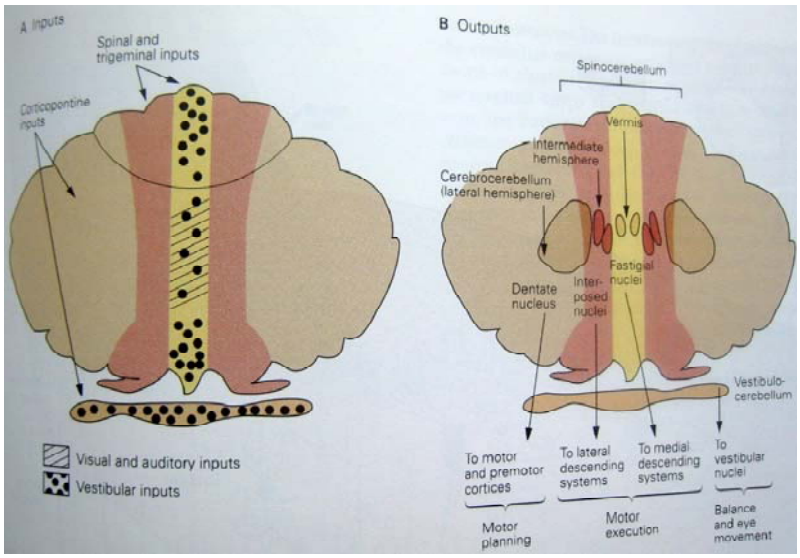
Divisions of the cerebellum



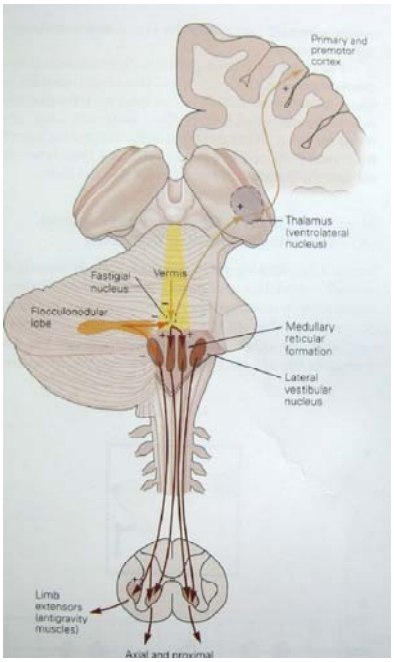


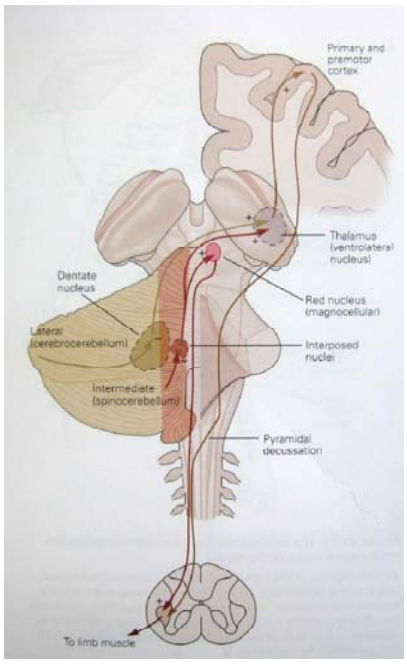


Inputs and outputs

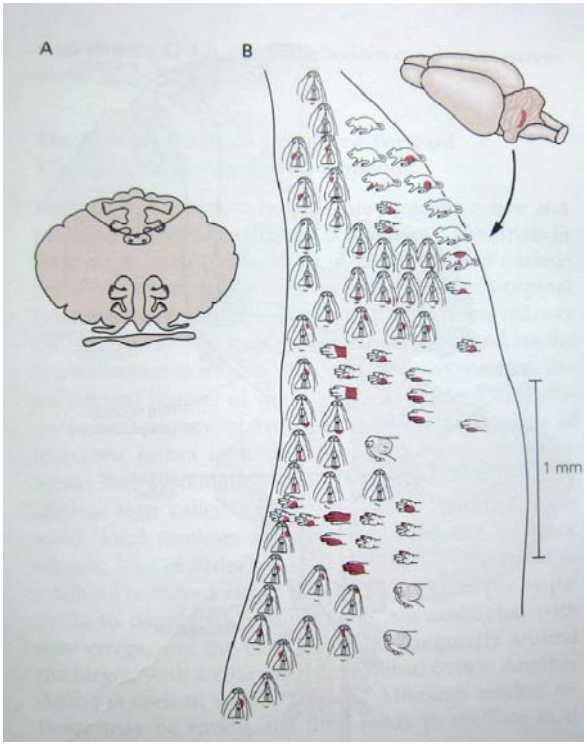


Output tracts from spinocerebellum

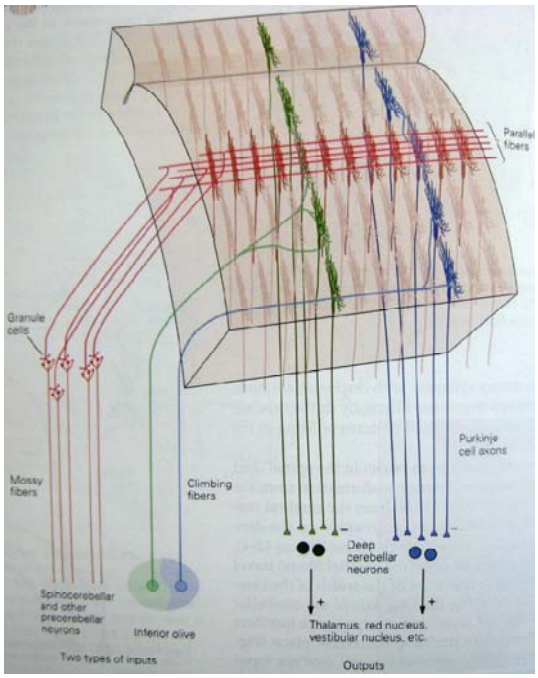


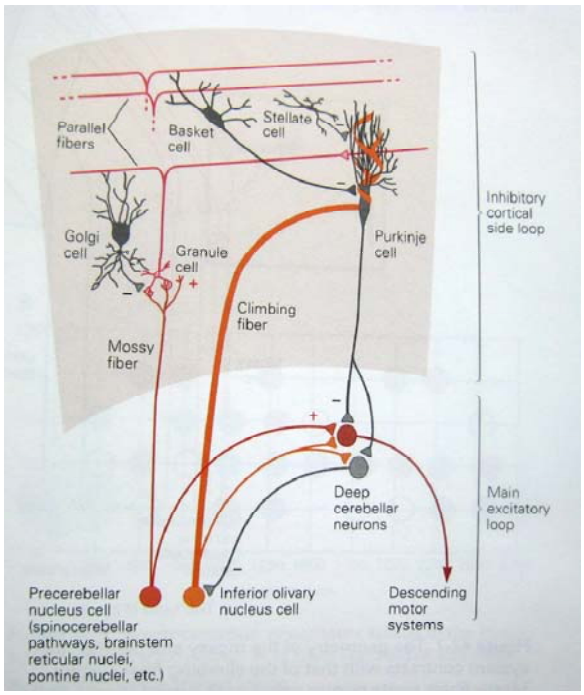


Repeated semi-topographic maps

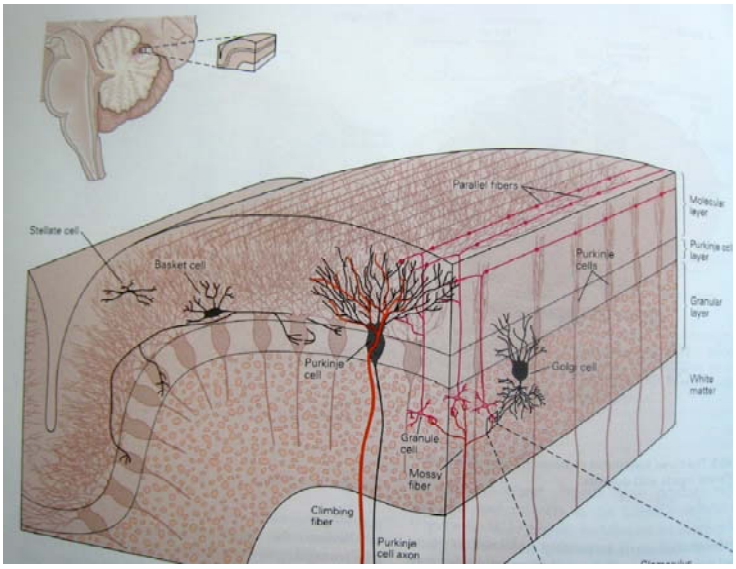


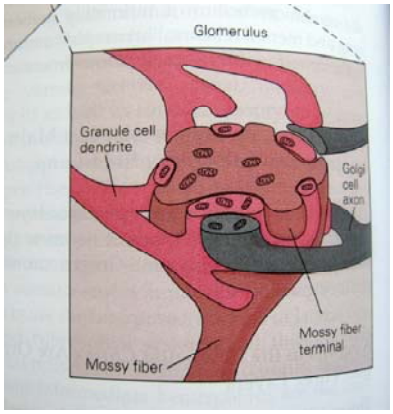
Circuit diagram



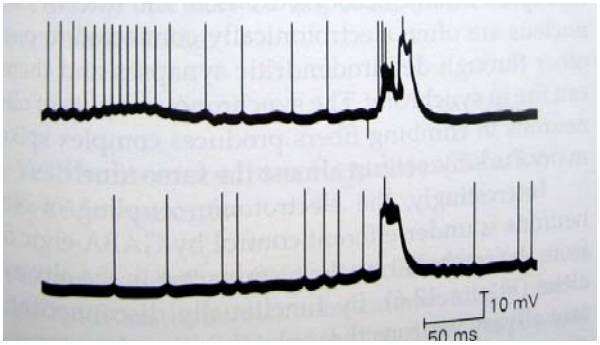


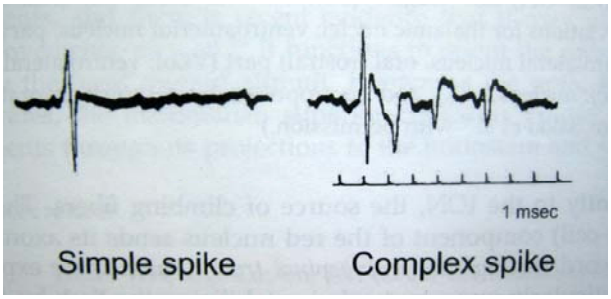
More circuits





Simple and complex spikes in Purkinje cells

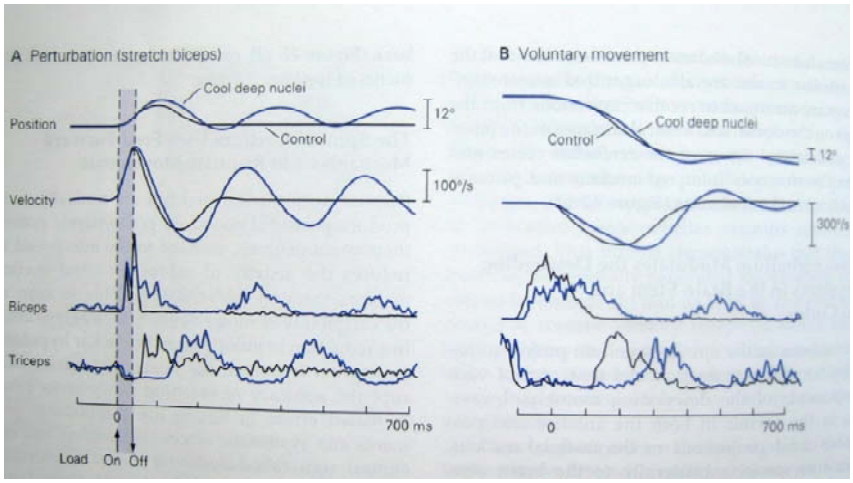


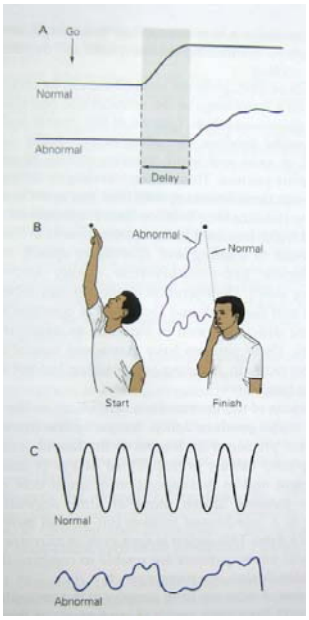


Parallel fibers

Climbing fibers

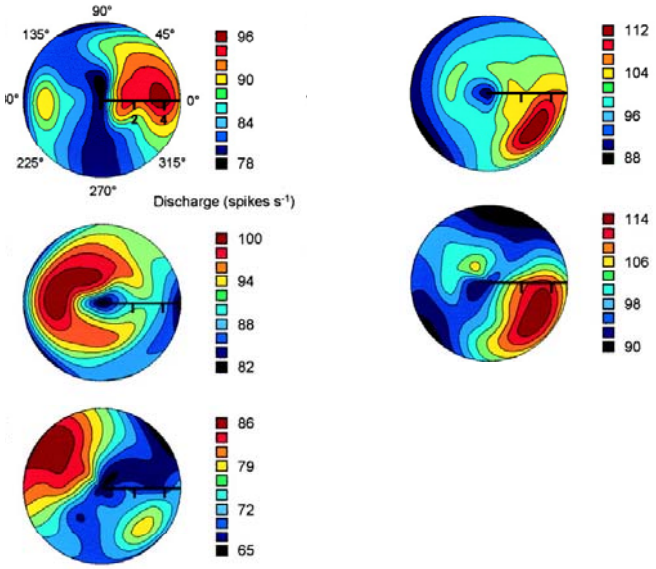
Movement disorders





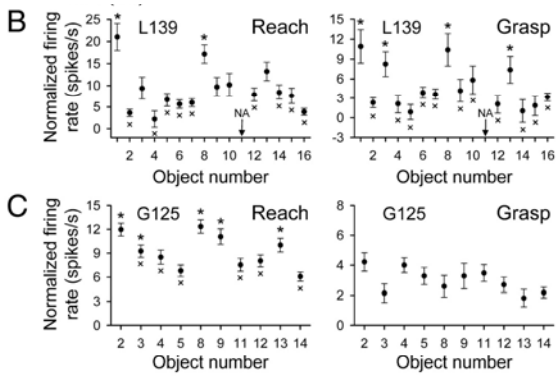
Directional tuning of Purkinje cells

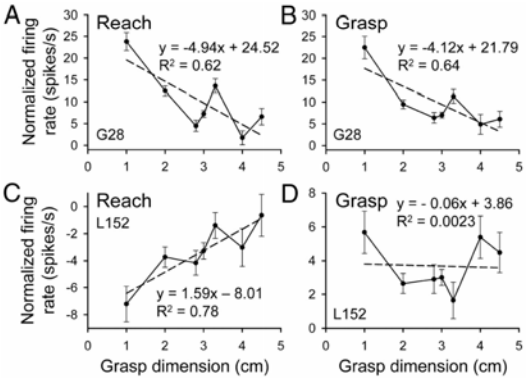
Summary data from 5 cells:
(Ebner)



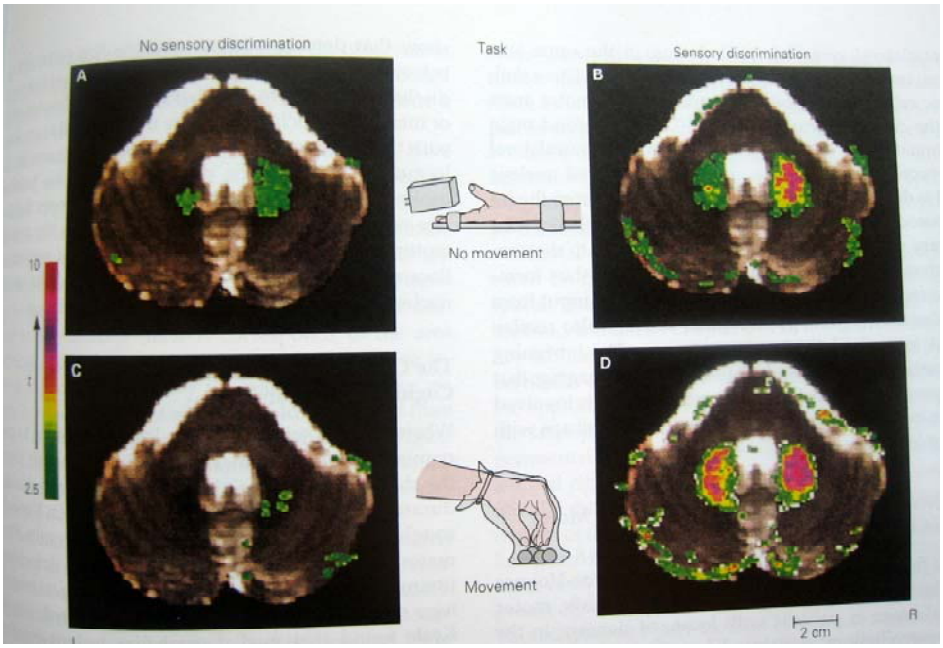
Purkinje cell activity for grasping different objects

(Ebner)





Role in active sensing



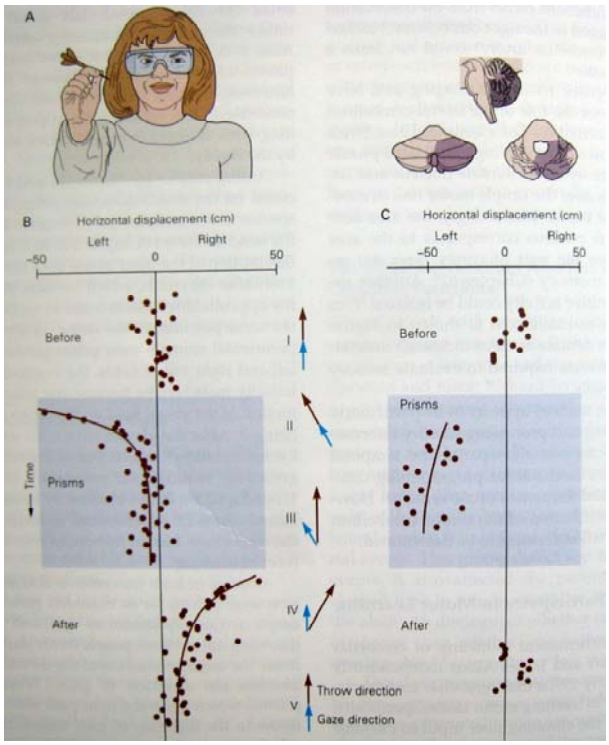
Basic model of learning

(Marr and Albus, many subsequent variations)

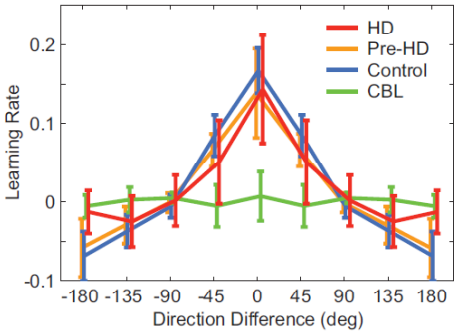
- mossy/parallel fibers carry information about everything ("context")
- climbing fibers carry error/mismatch/surprise information
- complex spikes (caused by climbing fibers) reduce the strengths of parallel fiber -> Purkinje cell synapses, but only for parallel fibers that are active
- as a result, "punished" parallel fibers have less effect on the Purkinje cells

Lesions/inactivation abolish classical conditioning and reflex adaptation

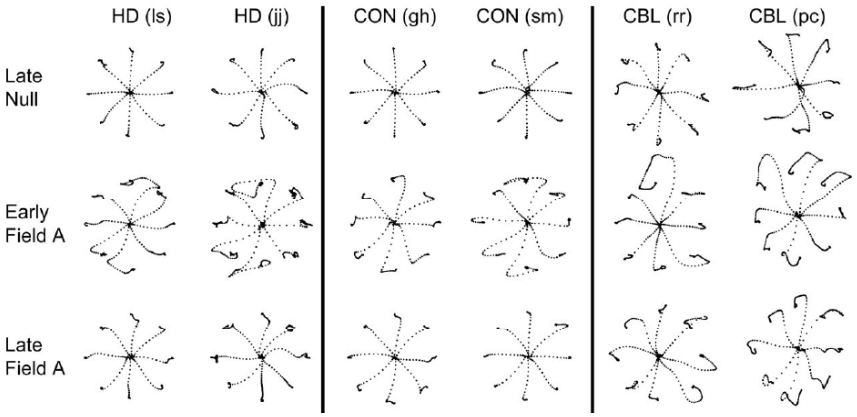
Role in prism adaptation



Role in force field adaptation

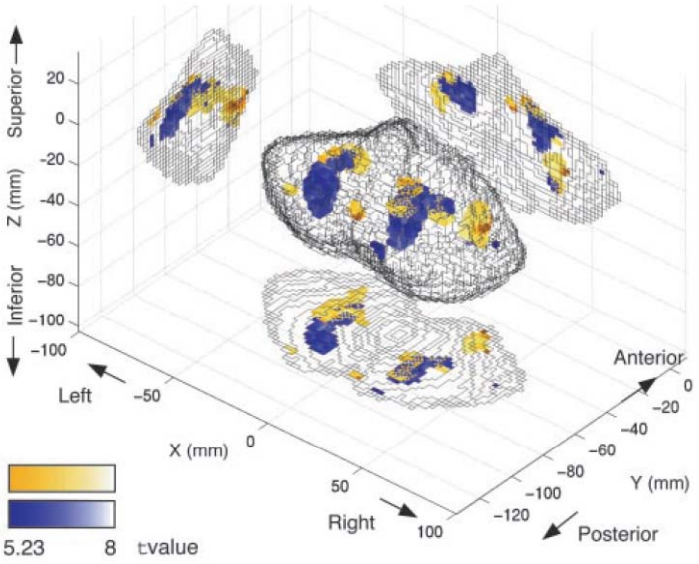


(Shadmehr)



Learning to use new a “tool” (weird mouse)

(Imamizu et al)



Rotated mouse
Velocity mouse

Learning internal models

(Kawato)