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ANALYSIS OF SPATIAL DISTRIBUTION OF PURKINJE CELLS WITH INDIVIDUAL DYNAMISMS ACTIVATED BY VESTIBULAR INPUT : A COMPUTER SIMULATION STUDY

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Electrophysiological recordings*from single Purkinje cells, activated by adequate vestibular stimulation (horizontal angular acceleration) in frog revealed a marked spatial distribution of cells with different types of spike trains: Type I-II-III cells responded only to ipsi- or contralateral rotation or both. Moreover, cells of all types could be further distinguished, according to their dynamism, along a continuous spectrum from phasic to tonic character. Importantly, closely located cells, within the same track of electrode were often found extremely different in their dynamic character and that dynamism remained consistent regardless of ipsi or contralateral rotation. This raised the crucial question if this difference can be attributed to the spatial variance of the excitation carried by parallel fibers to Purkinje cells, or the *neurons genuinely behave in a highly individual manner*, that is their spike producing mechanisms are *a priori* different. The analysis of this question required a combination of holistic circuitry- and single unit models. Using the previously developed computer model of circuitry the spatial projection of vestibular input is represented by a cluster of mossy fibers entering one or the other cerebellar peduncle for the cases of ipsi- or contralateral rotation. The emerging parallel fiber input to Purkinje cells at each randomly picked locations was then processed by an *identical* model of spike generator. This model was kept simple enough to simulate seconds of activity for dozens of cells but at the same time elaborate enough to simulate an integrative mechanism capable of eliciting dendritic spikes. Results show all those features found in the experiments but not the consistent character of dynamism either ipsi- or contralateral rotation. Thus, neurons may have to be considered *individual*.

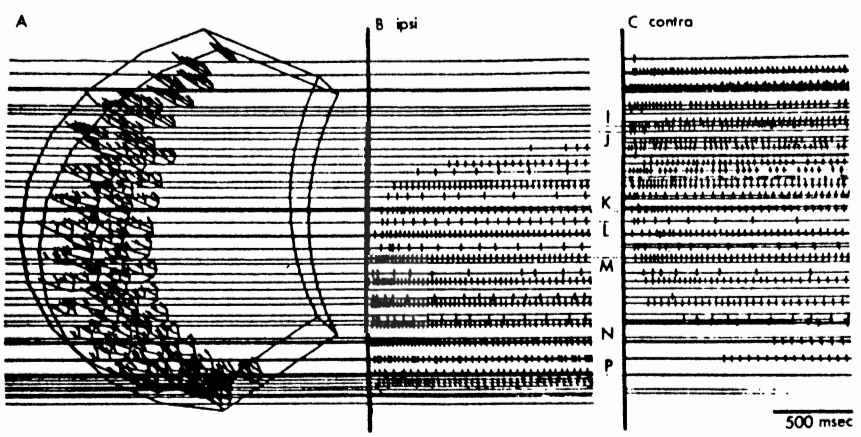

Fig.1. Simulated PC activities in frog cerebellum. I-J: type I, K-P: III cells

*Llinás,R;&Precht,W. (1972) Vestibulocerebellar input: Physiol. Progr. In Brain Res. 37. Elsevier, Amsterd.

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