Pellionisz, A. & Llinàs, R. (1977) Analysis of Anuran Vestibulo-Cerebellar Control by Computer Modeling. Soc. Neurosci. Abst. 3, 60.

180 ANALYSIS OF ANURAN VESTIBULO-CEREBELLAR CONTROL BY COMPUTER MODELING. A. Pellionisz and R. Llinas. Dept. Physiol. & Biophys., N. Y. Univ. Med. Ctr., 550 First Ave., New York, NY 10016.

A software computer model was developed as a self-consistent framework to study global functional properties of the vestibulo-cerebellar system of frog. The model was based on existing morphological and physiological data from the vestibular system and the cerebellum. For the latter the neuronal circuitry, as well as the particular functional properties of cells, was implemented. The actual detailed activity of given cells was simulated by means of a multicompartmental model using Hodgkin-Huxley parameters for each compartment. A previous study (Pellionisz, Llinas & Perkel: *Neuroscience 2:* 19-35, 1977) modeled the anuran cerebellar cortex and gave us a first order description of the spatial distribution of neuronal activity produced by inputs through particular sets of mossy fibers

In the present study the physiological activation of the peripheral vestibular system was simulated. This input was projected onto a model vestibular nucleus and cerebellar cortex. At the cortex the spatial organization of the Purkinje cells activated by different kinds of rotation (pitch, roll and yaw) was displayed. The overall distribution of the activity in these modeled neurons suggests that much of the functional specificity found in this cortex does not require specific connectivity. Rather, it seems to be related to the location of the mossy fiber input with respect to the granular layer and in particular with its location in the cerebellar peduncle. These properties, such as spatial distribution of Purkinje cell thresholds and dynamic responsiveness of these cells to tonic and phasic inputs, were displayed and analyzed by the model. The study suggests that such patterns of activity may in fact represent emergent properties inherent in the morphological organization of the circuit. The output of the cortex was utilized as a closed loop control system in the modulation of limb movement. This type of modeling must be considered, therefore, as an heuristic tool which can provide an independent test for many of the neuronal circuit hypotheses which are constantly being postulated in neurobiology.

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