Pellionisz, A. & Llinàs, R. (1979) The Cerebellum: A Neural System with Parallel Distributed Organization. AAAS Abst., p.54. Washington, DC.

Abstracts of Papers

of the 145th National Meeting

3-8 January 1979

Houston, Texas

Edited by Arthur Herschman

The Cerebellum:A Neural System with Parallel Distributed Organization A. PELLIONISZ and R. LLINAS (New York Univ.).

A fundamental problem regarding the functional interpretation of systems and subsystems of the brain is to establish the principles of their parallel distributed organization. Available morphological and physiological knowledge concerning the cerebellum suggest that the brain may utilize organizational principles other than the traditionally assumed "random connectivity","reflex loops" or "redundancy". It has been proposed formally and demonstrated by computer modeling (Pellionisz & Llinas:Soc. Neurosci. Abs.,1978; Neuroscience, in press) that the firings of individual cells over a cortical area may be interpreted as a spatially distributed, finite series expansion of a time-function, which is reconstructed by summation in the nucleus. Thus, when considered as representation of a Taylor expansion, Purkinje cell firings yield a prediction in the cerebellar nuclei of the temporal properties of the input arriving at the cortex. This prediction is an emergent property of the inherently parallel distributed network. According to the concepts introduced recently, abstract treatment of parallel distributed neural networks such as cerebellum may be facilitated when considering their function in a multidimensional vector space. Thus, cerebellar coordination of ballistic movements can be described as guiding the movement by virtue of the coordination -and inhibition vectorsprovided by the cerebellum unto "wired in" trajectory of the curved space. In all, cerebellum emerges from these studies as a parallel processor for predictive coordination.

American Association for the Advancement of Science
1515 Massachusetts Avenue, NW, Washington, DC 20005

The Cerebellum:A Neural System with Parallel Distributed Organization A. PELLIONISZ and R. LLINAS (New York Univ.).

A fundamental problem regarding the functional interpretation of systems and subsystems of the brain is to establish the principles of their parallel distributed organization. Available morphological and physiological knowledge concerning the cerebellum suggest that the brain may utilize organizational principles other than the traditionally assumed "random connectivity","reflex loops" or "redundancy". It has been proposed formally and demonstrated by computer modeling (Pellionisz & Llinas:Soc. Neurosci. Abs.,1978; Neuroscience, in press) that the firings of individual cells over a cortical area may be interpreted as a spatially distributed, finite series expansion of a time-function, which is reconstructed by summation in the nucleus. Thus, when considered as representation of a Taylor expansion, Purkinje cell firings yield a prediction in the cerebellar nuclei of the temporal properties of the input arriving at the cortex. This prediction is an emergent property of the inherently parallel distributed network. According to the concepts introduced recently, abstract treatment of parallel distributed neural networks such as cerebellum may be facilitated when considering their function in a multidimensional vector space. Thus, cerebellar coordination of ballistic movements can be described as guiding the movement by virtue of the coordination -and inhibition vectorsprovided by the cerebellum unto "wired in" trajectory of the curved space. In all, cerebellum emerges from these studies as a parallel processor for predictive coordination.