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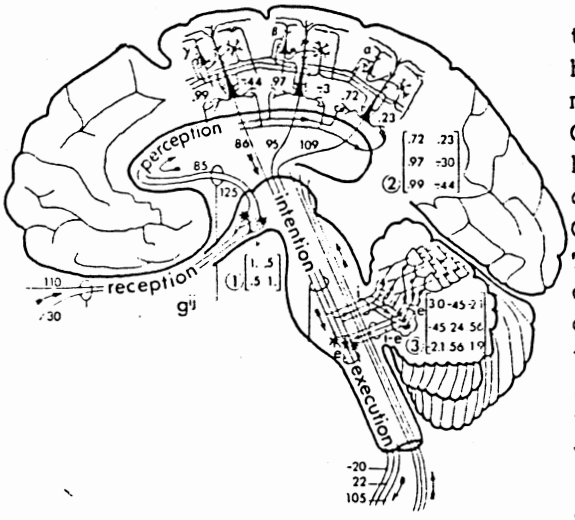
METAORGANIZATION OF FUNCTIONAL GEOMETRIES IN THE BRAIN. GENESIS AND MODIFICATION OF CEREBELLAR AND SENSORIMOTOR METRIC TENSORS.

A. Pellionisz and R. Llinas. Dept. of Physiology & Biophysics, New York University Medical Center, 550 First Ave., NY 10016.

Tensor Network Theory of CNS is based on the concept that the function of the brain is to match a system of relations, existing in the external world, with a multidimensional functional geometry within the CNS. The process when one geometry organizes another, so that they become homeomorphic if not isomorphic is called here "Metaorganization". Indeed, a system can effectively relate to another if a) it contains a representation of the other's geometry, b) its own geometry is linked to the external system through a suitable interim geometry. Such multidimensional functional geometries could be most concisely given by their metric tensors, expressed in the intrinsic frame of references of the CNS, and implemented within the brain by neuronal networks. Thus, sensorimotor function was explained as representing the external relations by a sensory metric (corresponding to tectal function), motor metric (cerebellum) and a sensorimotor transformation matrix



An answer is announced in this talk to the question how these transformation matrices are created by the CNS, in particular, and how hierarchic geometries can create one another in the CNS & man-made organisms. This will be demonstrated by computer modeling & cinematography. The proposed tensor theory of Metaorganization is based on oscillations in the system where covariant vectorial expressions of invariants are re-entered as contravariants, thereby successively establishing the eigenvectors of a system by repeated reverberations. The found covariant-contravariant eigenvectors are used, in the form of their dyadic (matrix) products, for generating a cumulative matrix-expansion of the generalized metric tensors and their inverses. The method also yields a means for modifying an existing but inadequate (misperforming) metric by experience: in effect altering the curvature of the space. This provides experimentally testable paradigms for the function of modification mechanisms such as the olive-climbing fiber system. Supported by Grant NS13742.

Pellionisz, A., Llinas R. (1983) Metaorganization of Functional Geometries in the Brain: Genesis and Modification of Cerebellar and Sensorimotor Metric Tensors. Soc. Neurosci. Absts. 9.

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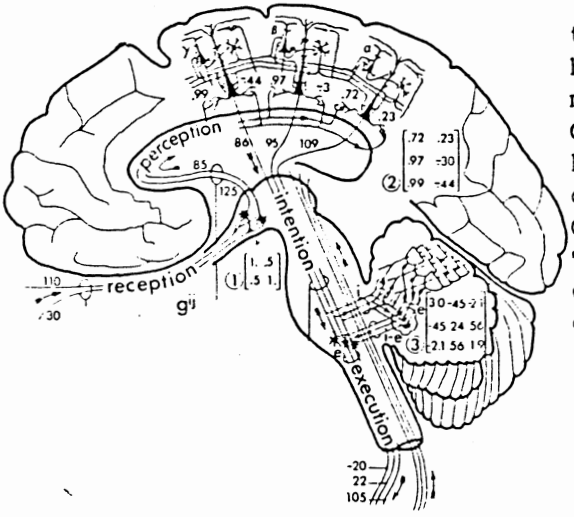

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