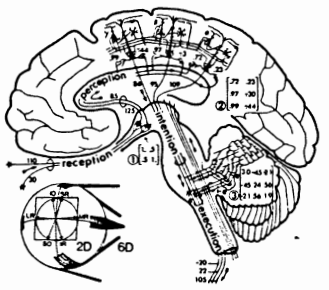
93.12 GENERATION & MODIFICATION OF NEURONAL NETWORKS ACTING AS METRIC TENSORS: A COMPUTER DEMONSTRATION OF THE PROCESS OF ORGANIZING SENSORIMOTOR TRANSFORMATIONS. A. Pellionisz, G. Ostriker and R. Llinas. Department of Physiology and Biophysics, New York University Medical Center, 550 First Avenue, New York, NY 10016.

Tensor network theory assumes that, globally, the function of the CNS is that of matching relationships of the external invariants with internal multidimensional geometries, comprised in neuronal networks acting as metric tensors. Sensorimotor coordination, described by other theories as transformations of vectors via matrices expressed in external Cartesian frames, can be generalized via tensor network theory. Since tensorial models can use generalized natural coordinates intrinsic to sensorimotor systems rather than being restricted to Cartesian description, the problem of coordination may be solved in a reference-frame independent manner as a covariant embedding followed by covariant-contravariant metric-type transformation.

The question of how such CNS networks may be generated and modified then remains the core of the problem. Here results, offered by tensor network theory (MS, submitted for publication) are demonstrated, where metric networks are organized and tailored by the process called in the MS metaorganization. Results of the procedure, based on the well-known biological phenomena of oscillations set up by re-entry to the system, are demonstrated here both in a general sensorimotor scheme (Fig), modeling the emergence of covariant embedding and cerebellar metric tensor-type matrices (1-3) and in a tensorial computer model of gaze-control, involving vestibulo-ocular reflex and neck muscle coordination. Here, the procedure of generating a network acting as an oculomotor metric tensor, necessary for transforming a vestibular vector to a higher dimensional gaze vector, accounts for Listings' law, which confines movements of the 6D eye muscle system into 2D. The general concept of metric network metaorganization leads to experimentally testable paradigms of the genesis and functional maturation of such networks, eg. in the emergence of the cerebellar metric via the climbing fiber system. --- Supported by USPHS grant NS13742.



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ABSTRACTS

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