A MODEL FOR HOW THE CEREBELLUM MAY MODULATE PREDICTIVELY THE VESTIBULO-OCULAR REFLEX (VOR).

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The gain of the VOR inmonkeys ismodulated bymany inputs including eye position, target distance and otolith signals. We have developed a kinematic equation for the VOR that describes how the signals from the vestibular canals and otoliths can be combined with eye position and vergence angle signals to give the idealVOR response for any head rotation and translation in three dimensions. By simulating head rotations for different locations of the axis of rotation, and by including delayed otolith and canal inputs, we obtain resultswhich quantitatively match the VOR dynamics observed in monkeys (Snyder & King; J.Neurophys. 67:4,1992).

We have also developed a new theory which assigns a predictive role to the cerebellum. We show how the model above can be extended to explain anticipative gain changes of the VOR with vergence movements (Snyder & King; Vision Res. 32:3,1992). This model suggests that the cerebellum is responsible for predicting the timing and nature of sensory feedback which can be used to improve performance. This view of the cerebellumis consistentwith awide range of physiological and anatomical data.