

## Activity of red nucleus neurons associated with a skilled forelimb movement in the cat

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Microstimulation within the red nucleus produces contraction of single flexor and extensor muscles in contralateral limbs<sup>2</sup>. As in the motor cortex, there is a somatotopic arrangement of the sites from which contraction of different muscles can be elicited and the stimulus parameters required to produce corresponding effects are similar. These observations suggest the possibility that neurons in the red nucleus also contribute to the initiation and guidance of voluntary movement. The present study was undertaken to determine the activity of neurons in the red nucleus during the performance of a trained movement of the contralateral forelimb. More specifically, we sought to determine the time of onset of changes in activity of rubral neurons and the relationship of this activity to the displacement and the force exerted. A tracking task was chosen to give maximal control over movement parameters. These preliminary results were obtained in two cats trained to position a lever with their forelimb in relation to a compensatory display<sup>6</sup>.

The apparatus, training procedure and behavior will be described more fully elsewhere (Ghez, in preparation). In brief, during training and recording, the animals were restrained in a snug fitting sleeve from which head and left forelimb protruded. The head was rigidly fixed to an external frame. By flexing and extending the left elbow, the animals could rotate the lever of a manipulandum controlled by a torque motor<sup>8</sup>. The axis of rotation of the lever was approximately aligned with that of the animal's elbow. The torque motor generated simulated springs whose stiffness (or spring constant) could be varied by the experimenter, and a small amount of friction was introduced to prevent terminal oscillations during movement. A potentiometer, tachometer and strain gauge indicated angular position, velocity and the force applied to the lever.

A display assembly which could be moved from side to side by a second servo-controlled torque motor was placed in front of the animal. The assembly consisted of a pair of lamps and a retractable feeder. Its position was a function of an error signal

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