Global COE セミナー

遺伝子実験施設セミナー

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日時　平成 19 年 12 月 18 日（火）　10：00～12：00

場所　理学部旧 1 号館 4 階 450 号室
http://www.u-tokyo.ac.jp/campusmap/cam01_06_08_j.html

タイトル　"Neuronal and theoretical analysis of spatial orientation behavior in *C. elegans*."

要旨

Regulation of locomotion is the final common path for orientation to taste, smell, oxygen, temperature, and other ecologically significant stimuli in *C. elegans*. Locomotory state (forward vs. reverse) is thought to be controlled by a network of forward and reverse command neurons in two reciprocally connected pools, but how this network functions is poorly understood. We propose a model in which the network acts as a stochastic, bi-stable switch. The model makes three simple assumptions: (a) forward command neurons act as a single unit, as do reverse command neurons; (b) unit activation switches stochastically between two states: OFF and ON; (c) the stochastic processes underlying the state changes of the forward and reverse units are uncorrelated. The model predicts that forward and reverse locomotion, and also the transitions between them, are punctuated by brief pauses in which crawling speed drops to zero. It further predicts that there are two pause states (i.e. both units off or both units on). Using a new tracking system that records velocity with a precision of ±19 um/sec at a rate of 30 samples/sec, we detected frequent episodes of near-zero speed which we interpret as the predicted pause states. The dwell-time distribution for pauses has two exponential components consistent with the existence of at least two pause states. Mean dwell times of these states are 10 and 100 ms. We are currently developing methods to determine the rate constants for transitions between the forward, reverse, and pause states. Mathematically, the rate constants strongly constrain the signs and strengths of synaptic connections among command neurons in the model offering, thereby, a means of inferring neuronal connectivity from behavior. We are testing this idea by determining how the rate constants are altered by chronic depolarization and hyperpolarization of command neurons, ablations, and feeding state.

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