Direct verification of the turn generator model for pheromone orientation

S. Shuichi Haupt[1] and Ryohei Kanzaki[1]
[1]RCAST, The University of Tokyo, Japan

Pheromone orientation behaviour has been extensively investigated from the level of olfactory receptor cells to behavioural strategies in localising pheromone sources. Baker's turn generator model conceived from experiments analysing behavioural responses of moths to various temporal stimulus patterns can explain pheromone orientation behaviour reasonably well. The model assumes that perception of pheromone switches on a turn generator mechanism that is disabled for a short period of time after a pheromone stimulus. After such interval, the turn generator becomes enabled again and induces the moth to turn and counter-turn unless a stimulus is perceived again. We attempted to directly verify the validity of Baker's model. Using a real-time locomotion recorder system, pheromone stimulus timing could be controlled by locomotion behaviour of the moths. Since we could choose at which relative phase of a turn a stimulus is given, it could be directly observed whether turns end around this phase by the stimulation. Our results with different stimulus phases in relation to turning behaviour provide support for the validity of Baker's model of for the description of moth pheromone orientation.