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MECHANICAL PROPERTIES AND ANGLE THRESHOLDS OF CERCAL FILIFORM SENSILLA OF A CRICKET.

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Sensory thresholds of cercal hairs of Gryllus bimaculatus to alternating air-current were measured at various frequencies. The hairs were range-fractionated depending on the length; long hairs were velocity sensitive and short ones were acceleration sensitive.

The long-hair deprivation had no effect on the thresholds of large interneurons LGI and MGI. Comparison of threshold between hairs and interneurons revealed that the long hairs converge upon interneurons' 10-2 and 10-3, and that the short ones do upon LGI and MGI.

After the measurement of spring stiffness of hair base, the hair deflections were estimated by a numerical computation of the equation of motion. The boundary layer due to air viscosity was taken into account. Based on the estimated deflections and the measured thresholds, the angle threshold of sensory neuron was determined as 0.002° in long hair. Sensory neurons of short hair were sensitive to the rate of deflection but not to a stationary deflection.

The combination of hair length, spring stiffness, and rate of relaxation of sensory process, underlies the range fractionation of the filiform sensilla.

PH 50

SENSORY HAIRS ON THE THORACIC TERGITE IN ISOPODA, LIGIA EXOTICA : ODOR AND WIND RECEPTION

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Sensilla on the carapace of Ligia exotica were studied by scanning electron microscopy and single-unit extracellular recording. The sensillum was composed of three structures which were arranged along the longitudinal axis of the animal body; anterior cuticullar creases, a blunty tipped sensory hair and a spoon-like foliate plate laying posteriorly. A single apical pore and an articulation of the hair suggested chemo- and mechano-sensitivity.

Air current with various orientation and various odor puffs were applied as a mechanical and a chemical stimulations respectively. Wind blowing from behind of the animal was most effective, and this directional sensitivity probably reflected the morphological orientation of the sensillum. Each unit responded to only one or two odors used. A relatively narrow spectral sensitivity and differences in threshold and slope of dose-response curve among units seemed to be available to odor discrimination.

Chemical and mechanical reception supposed by morphological study was confirmed by electrophysiological study.

PH 51

THE EFFECT OF ABSTINENCE FROM WATER ON THE RESPONSE OF THE HYGRORECEPTORS OF THE COCKROACH.

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The sensillum capitulum of the cockroach Periplaneta contains moist and dry hygroreceptors, both responding to the relative humidity (Yokohari et al., 1976). In the present study effects of abstinence from water on the responses of hygroreceptors of Periplaneta were electrophysiologically investigated. After four days of abstinence from water, the responses to humidity stimuli increased in the moist receptor and decreased in the dry receptor as compared with those before the abstinence. After watered, responses recovered to the initial level. Therefore, the abstinence from water appears to increase probabilities of animals to detect water through change of their internal environment. After cockroaches were adapted to some humidity levels, responses of hygroreceptor were recorded. When the animals were adapted to lower humidity, sensitivities of moist receptors increased and those of dry receptors reduced. Thus, both abstinence from water and adaptation of animal to a dry environment produce a similar effect on the hygroreceptor responses. These results may show some steps of hygroreception may be simultaneously controlled by both external and internal factors.

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AN ANTENNAL COLD RECEPTOR OF THE COCKROACH, PERIPLANETA AMERICANA.

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The responses of a cold receptor were recorded from the thermo-olfactory sensillum on the cockroach antenna, in order to determine what the receptor respond to. Its candidates are as follows; temperature itself, temperature difference, temperature gradient, and change rate of temperature gradient. As for the temperature itself, the receptor activity at constant temperature had tendency to be somewhat high at 20° C to 30°C within 19-40°C examined, but it varied considerably from time to time.

If the receptor were to respond exclusively to the temperature gradient, the response to it should be constant and be independent of temperature itself. We measured the responses to linearly falling temperature within the range of 23°C-27°C. Our results were $F=29.1-0.37T$ ($r=0.97$) at $dT/dt=-0.052$ C/s and $F=39.2-0.88T$ ($r=0.97$) at $dT/dt=-0.014$ C/s in a single receptor cell, where F is impulse activity (Hz), T is temperature and t is time. The relation between the response and temperature gradient (dT/dt) was $F=11-100dT/dt$ ($r=0.93$) at 26°C. The response was highly dependent on temperature gradient but seemed to be somewhat dependent on temperature itself. The examination on the other candidates is in progress.