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NONSPIKING VISUAL INTERNEURONS IN THE CRAYFISH BRAIN.

Y.Okada and T.Yamaguchi. Dept. of Biol., Fac. of Sci., Univ. of Okayama. Okayama.

It was found by means of intracellular staining technique of Lucifer yellow that there are six pairs of nonspiking visual interneurons which may connect post-synaptically to the sustaining fibers (third order visual interneurons). These interneurons have thick (25-50 um) and long (400-500 um) dendritic processes in the protocerebrum and their somata are located near the distal end of the optic tract. Electrophysiological study of these interneurons revealed that they are characterized by the spontaneous fluctuation of resting membrane potential (30-50 mV) without stimulus and by the initiation of depolarizing or hyperpolarizing potential without spikes in response to the ipsilateral or contralateral illumination.

Three pairs of them (G-type) have thick (50 um) dendritic processes and form a cluster in which they are interwound each other. The remaining three pairs (S-type) surround closely the cluster and they have thin (25 um) dendritic processes.

The firing rate of the eye-up fiber (one of the compensatory oculomotor neurons) is increased or decreased by depolarizing or hyperpolarizing current injection into each of G-type nonspiking interneurons. This fact indicates that these nonspiking interneurons may function as premotor neurons.

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CHROMATIC PROPERTIES AND INPUT STEMMATA OF THE MEDULLA NEURONS IN THE SWALLOWTAIL BUTTERFLY LARVA.

T. Ichikawa. Dept. of Biol., Fac. of Sci., Kyushu Univ., Fukuoka.

The larvae have six stemmata on each side of the head. Spectral properties of the neurons in the second neuropile (medulla) of the optic lobe were intracellularly examined by stimulating the six stemmata individually by monochromatic flashes. Most medulla neurons received specific specral inputs from more than two stemmata. They can be classified into two groups. The first receive dominant inputs from one stemma and weak inputs from other two to five stemmata; the weak inputs are usually antagonistic to the dominant ones, when tested by white light stimuli. At least 14 types of neurons are identified, depending on the spectral properties of their dominant inputs. Ten of them show color-opponency in the dark and/or under light-adapted conditions. They usually include a few analogous neurons which receive dominant inputs of the same spectral type from different stemmata. Neurons in the second group receive inputs of similar magnitude from two to six stemmata. The stemmata feed some neurons with synergistic inputs and some neurons with antagonistic inputs.

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ANATOMY AND RESPONSE OF THE HIGHER-ORDER NEURONS OF COCKROACH OCELLI.

M.Mizunami, and H.Tateda. Dept. of Biol., Fac. of Sci., Kyushu Univ., Fukuoka.

The neurons of the posterior slope neuropiles of the protocerebrum whose activities were affected by the ocellus were studied anatomically and physiologically in the cockroach. These neurons, which are the 4th or 5th order ocellar neurons, are divided into three classes from their anatomy as follows.

Class I. Neurons whose branches are restricted in the brain. They are further divided into four types. One type connects bilateral posterior slopes and exhibits inhibitory response during illumination, one has branches in the central body and in the alpha- and beta-lobes of the mushroom body and exhibits transient on-hyperpolarizing and off-depolarizing response, one has branches in the protocerebral bridge and exhibits transient off-hyperpolarizing response, and the other has branches in the tritocerebrum and exhibits transient off-depolarizing response.

Class II. A neuron with terminal branches in the lamina neuropile of the optic lobe. It exhibits tonic spike discharge during illumination.

Class III. Descending neurons. They exhibit a few spikes or transient depolarizations when the light is off.

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CYTOSKELTONS OF TWO TYPES OF INSECT MECHANORECEPTORS.

Y. Toh. Dept. of Biol., Fac. of Sci., Kyushu Univ., Fukuoka

Cytoskeltons of two types of insect mechanoreceptors have been examined with reference to the receptor mechanism. The campaniform sensillum on the haltere of *Drosophila* possesses a single fan-shaped sensory cilium, which contains distally a tubular body. The tubular body consists of regularly arranged microtubules, which are interconnected to each other by dense substance, and connected to the ciliary membrane by fine filaments. The antennal chordotonal sensillum of *Periplaneta* contains two receptor cells: their sensory cilia are flagellar-shaped. The two cilia are free in the lumen formed by a scolopale cell. One cilium ends free in the cap, whereas the other ends with a swollen terminus trapped in the cap. Axonemal microtubules extend throughout the cilium. The microtubules and the ciliary membrane are connected at some intervals. Membrane specializations are found around the distal margin of the sensory dendrite, where the cilium originates. These results suggest that the sensory cilium itself may be a receptor site in the campaniform sensillum, whereas the cilium may be an accessory structure and the distal region of the dendrite may be a receptor site of the chrdotonal sensillum.