

## PH 9

DOPAMINERGIC SENSORY CELLS IN THE GILL EPITHELIUM OF *APLYSIA*.

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An aminergic reticular structure, which we refer to as the neural plexus, has been revealed by glyoxylic acid-induced fluorescence in the gill of *Aplysia kurodai* and *A. juliana*. The plexus contains three types of aminergic cells. One of the three types of the cells is localized in the pinnule epithelium. The cells have a cone cell body with a short dendritic extension and a long process joining reticular nerve fascicles. HPLC analysis of amines in epithelial tissue showed the exclusive presence of dopamine. The cells showed immunoreactivity to antityrosinehydroxylase antiserum. Aminergic varicose processes were seen in areas surrounding neurons in the branchial ganglion (BGNs). BGNs showed excitatory responses to bath-application of dopamine and serotonin. BGNs were also activated by supernatant of the homogenate of the pinnule epithelium. In response to tactile stimuli applied to the gill, BGNs produced compound EPSPs. The EPSPs were depressed by bath-applied haloperidol, but not by methysergide. These results show that the cone cells may be the tactile sensory neurons, and that transmission of sensory impulses from the tactile receptors to BGNs may be mediated by dopamine.

## PH 10

THE EFFECT OF OCTOPAMINE TO THE RETRACTOR MUSCLE ACTIVITIES ON THE OVIPOSITOR IN FEMALE CRICKET AND THE ROLE OF DUM NEURON ACTIVITY FROM THE TERMINAL ABDOMINAL GANGLION, *TELEOGRYLLUS COMMODUS*.

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One of C-5 neurons on the DUM cluster located in the terminal abdominal ganglion has already been reported to have innervation bilaterally for the posterior tergosternal muscle (M-4) as retractor on the ovipositor (Ai and Ai, 1989), and also to have closely contact and physiological relationship with the descending neuron. The anterior connective of the above terminal abdominal ganglion being extracellularly stimulated with repetitive pulses, EPSPs were risen frequently with spike potential.

By using intracellular recording electrode penetrated to DUM, the concerned DUM neuron was clearly evoked EPSP and some m times spike-like potential with high frequency stimulation not low one.

On treatment of octopamine (OA)  $10^{-6}$  M to retractor muscle M-4 of ovipositor, spontaneous and repetitive slow potentials were gradually disappeared intracellularly. But, OA  $7$  M solution being applied to M-4, these activities were more gradual prolongation in their appearance and decrease in potentiation and then, finally, disappeared.

After treated OA solution was rinsed out of retractor M-4, spontaneous and repetitive action potential were confirmed to have appearance again.

## PH 11

## DIRECTIONAL SENSITIVITY OF THE LINEAR RESPONSE IN CERCAL NONSPIKING INTERNEURONS OF THE COCKROACH

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In white noise analysis, a cellular response is defined by a series of Wiener kernels produced by a cross correlation of a generalized input, Gaussian white noise, and the evoked response. The first- and second-order Wiener kernels represent the linear and static nonlinear responses, respectively. The stimulus of air displacement modulated in a white noise fashion was applied to the cockroach to analyze the dynamics of the graded response in identifiable, nonspiking local interneurons.

In interneurons H, E and 203, the first-order kernel was biphasic, and closely matched the time differential of a pulse. The waveform of the kernel depends on the direction of the stimulus. For example, in the H-cell, stimulus wind from the side ipsilateral to the cell body produced the on-off type kernel, the initial depolarization followed by a hyperpolarization. This differential waveform was reversed when stimulated on the contralateral side.

The linear models predicted by convolving the first-order kernels with the arbitrary input well simulated the actual response at preferred directions. The stimulus was, however, null for the linear part of the response at a particular direction, as suggested by the large mean square errors (MSEs) of the linear models. The null direction differs between the cell types. The static non-linear components predicted by the second order kernel comprise only a minor part of the response, as indicated by the large MSEs of the second-order models. In conclusion, the graded responses in interneurons H, E, and 203 are nearly linear, and code the time differential of the signal and the direction of its source.

## PH 12

## IDENTIFICATION OF THE DEUTOCEREBRAL NEURONS RESPONDING TO THE THERMAL STIMULATION IN THE COCKROACH BRAIN

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Thermal responses of the deutocerebral neurons of the cockroach, *Periplaneta americana*, were recorded extra- and intracellularly. The neurons were morphologically identified by cobalt-lysine intracellular staining.

Most of the deutocerebral neurons responded to cold air stimuli and showed the response pattern of on-phasic-tonic-inhibition type. In the range of temperature examined (20-30°C), the impulse frequency increased with increase in temperature drop. Their morphological structures showed the local interneurons which had arborizations in many glomeruli restricted to the antennal lobe. Moreover, other response patterns to cold stimuli were on-phasic type and on-tonic type.

In addition to these neurons, the excitatory responses to warm air stimuli were also recorded. The impulse frequency increased with increase in temperature rise. This type had a short inhibition at the beginning of the stimulus before impulse frequency increased. The morphological structure of this type was also a local interneuron which had arborizations in many glomeruli.