where the axons of the tectofugal cells make synaptic contacts with tegmento-spinal projecting neurons in vivo or in vitro preparations. Transverse sections of the brain were cut at 40 μm with a cryostat. The sections were incubated in the AB-HRP complex, processed by the method of Adams, and counterstained. Spatial autocorrelogram was computed to examine the regularity of the distribution of labeled cells.The results showed that 1)the labeled somata (15 to 30 μm in diameter) are mainly located from lower layer 8 to upper layer 6 and are distributed periodically, 2)two types of periodicity are found: one has short period of less than 100 μm, the other has long one of about 150 μm. These facts suggest that the cells form clusters, and their periodic distribution could correspond to the resolution of the tectal output controlling prey orienting behavior.

VISUAL INFORMATION PROCESSING OF DEPTH TO CONTROL ESCAPE VELOCITY OF THE FROG, *RANA CATESBEIANA*

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We have shown that the visual angle subtended by an approaching object is a critical cue to collision avoidance behavior of the frog in our previous study. However, the frog can not estimate how far an object is approaching based on only the size of its retinal image. The visual stimulus generated by a computer was presented in the dorsal visual field of the frog with the computer display placed 20 cm or 30 cm above the experimental stage. This simulated a retinal image of a black square (35 x 35 cm^2) approaching at a velocity of 2 m/s through a path of 6 m. We measured maximum velocity of avoidance behavior, threshold size of retinal image of approaching object, and occurrence probability of the frog collision avoidance. The results showed that the means of threshold size of the visual stimulus presented 30 cm away was one and a half times as large as that presented 20 cm away as shown in our previous study. On the other hand, the means of maximum velocity of avoidance behavior and occurrence probability were not significantly different in both cases. We conclude that the frog do not utilize depth information to control escape velocity during collision avoidance.

FUNCTIONAL ORGANIZATION OF THE PREY ORIENTING BEHAVIOR IN *RANA CATESBEIANA*

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In our previous histological experiment, we have suggested that the optic tectum of the frog (*Rana catesbeiana*) has some functional units with different sizes, and each one corresponds to the output resolution of specific orienting behavior. Here, we examined orienting behavior of the frog in detail by using frame-by-frame analysis. First, prey orienting behavior towards the cricket (*Gryllus bimaculatus*) was captured into a computer with time resolution of 33.0 ms from videotapes and saved as 60-80 successive still video frames. Then, the X-Y coordinates of the snout and vent of the frog before and after orienting turn and that of the center of the cricket were obtained by means of a program written in our laboratory. Based on these positional parameters, we calculated the turn angle of the frog (θ_1), the angle between the frog and the cricket (θ_2), and the angular velocity of orienting behavior. The results showed that turning behavior is performed at a constant velocity while the orienting to the prey is accurate, but when the frog comes to miss the target as the distance increases, the animal makes velocity increase to compensate the orienting delay to the prey.

ANALYSIS OF HEAD SACCADES TOWARD AUDITORY, VISUAL AND BIMODAL STIMULI IN THE BARN OWLS

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The optic tectum, or superior colliculus, contains circuitry that controls the orienting movements of the head, eyes, or ears. In the barn owl, it has a topographic map of auditory and visual space composed of bimodal (auditory/visual) neurons with spatial receptive fields (RFs). Although the bimodal neuron's auditory and visual receptive fields (RFs) are largely aligned, the visual RFs are considerably finer (Knudsen 1982). This raises the possibility that characteristics of owl's visual head saccades would be different from auditory saccades. We compared the owl's head saccades toward auditory, visual and bimodal targets. The head saccades were measured using a search coil system. Latencies of auditory and bimodal saccades were significantly shorter than visual saccades. There was a clear linear increase of saccade speed with the distance to the target. Accuracies for auditory and visual saccades were generally indistinguishable, and accuracy for bimodal saccades was not different from unimodal saccades. In general, the owl's head saccades to the bimodal target were similar to auditory rather than visual saccades. Supported by the JSPS to SY and the NIDCD to TT.

NILE TILAPIA ERYTHROPHORES SENSITIVE TO UVA

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We reported that light with a peak wavelength of 400-440 nm and of 550-600 nm induces pigment aggregation in Nile tilapia erythrophores, whereas dispersion occurs in response to light at 470-540 nm. Cultured erythrophores also respond to light similarly. RT-PCR demonstrated the expression of mRNAs of tilapia cone opsins: red opsin and green opsin. In the present study, we found that UVA with a peak wavelength of 365 nm induced pigment aggregation only in erythrophores using the skin preparations from the tail fin of the Nile tilapia. The aggregation response was reversible, and the response was gradually delayed as the UV intensity was decreased by ND filters. Moreover, tilapia erythrophores were found to be very sensitive to UVA. At 6 x 10^{-4} mW/cm^2, almost erythrophores responded to UVA by complete aggregation within 5 min, while, in spectral regions between 400-440 nm and 550-600 nm, almost complete aggregation was caused by 5-min irradiation at the intensity of 10 - 30 mW/cm^2. Since the action of UVA was not blocked by phentolamine, alpha-adrenoceptor antagonist, the effect may be direct and is not mediated indirectly through the actions of adrenergic neurotransmitters.

REGULATION OF BODY FLUID AND IMMUNOHISTOLOGICAL ANALYSIS OF RENAL ION TRANSPORTERS IN THE MARINE TOAD, *BUFO MARINUS*

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Bufo marinus is known to tolerate in a saline environment. In order to define the regulating mechanisms of its body fluids, we examined the following acclimation experiments in *B. marinus*. We treated 5 animals in each group for 7days. The acclimation conditions are (1)dehydration, (2)300 mOsmol NaCl (hyperosmotic) and (3)tap water (hypoosmotic). After each treatment, we measured hematocrit value, plasma osmolality, Na^+, K^+, Cl^-, urea and aldosterone level. Plasma osmolality increased from 240 mOsm to 330 mOsm in the dehydrated and hyperosmotic treated groups. Plasma ion concentrations also increased significantly in comparison with those of control group. Although volume of the body fluid decreased to 75% in the dehydrated group, that markedly increased in the hyperosmotic treated group. Aldosterone level in the dehydrated group was the highest in all treated groups. In the hypoosmotic treated group, plasma osmolality and Na^+ decreased significantly in comparison with those of control group, though aldosterone level was higher than that of control group. We are also going to discuss about the immunohistochemical observations of several ion transporters in the kidney.

ANALYSIS OF CHLORIDE TRANSPORT MECHANISMS IN THE ISOLATED SKINS OF *HYLA JAPONICA* AND *RANA NIGROMACULATA*

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Chloride transport in the skin of frogs (*H. japonica* and *R. nigromaculata*) were studied electrophysiologically. A piece of abdominal skin was mounted vertically between the two halves of Ussing-type chamber filled with Ringer's solution. Then, transepithelial potential difference (PD) and short-circuit current (Isc) were measured. In the skin of two species, sodium transport was observed at open-circuit condition. In *H. japonica*, 10^{-5} M forskolin administration to the serosal side increased PD and Isc. In *R. nigromaculata*, however, forskolin decreased in PD and Isc. Then, Cl^- transport inhibitors (NPPB, furosemide and DIDS) were used. Each inhibitor (10^{-4} M) was applied to the serosal or mucosal side of the skin treated with forskolin. In *H. japonica*, the increase of forskolin-dependent Isc was reduced by adding NPPB to both serosal and mucosal side, and by furosemide to serosal side. In contrast, the forskolin-induced decrease in Isc was inhibited by application of all inhibitor to mucosal side in *R. nigromaculata*. These results suggest that the mechanisms of forskolin-induced chloride transport differ from *H. japonica* to *R. nigromaculata*.

ANALYSIS OF ACTION IN ISOLATED EPITHELIAL CELLS FROM THE URINARY BLADDER OF JAPANESE TREE FROG, *HYLA JAPONICA*

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In the urinary bladder of amphibian, absorptions of ions and water from the urine significantly can contribute to fluid and electrolyte homeostasis. It has been known that ANP acting through its second messenger, guanosine 3',5'-cyclic monophosphate (cGMP), is known to lead natriuresis and concomitant diuresis in the kidney of mammals. In this study, we examined the involvement of ANP-stimulated processes of ion transports in the urinary bladder according to the whole-cell patch-clamp technique.The current-voltage relationships showed slightly outward rectification in control condition. Bath application of ANP significantly increased currents in