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## CONFERENCE ABSTRACTS

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**[P241] Anatomical evidence for ultraviolet vision in larval stomatopod crustaceans**

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Adult stomatopod crustaceans are well-studied and known for having arguably the most complex visual system in the world. In contrast, there are limited studies of the larval eye, which is physiologically and morphologically distinct from the adult eye. There remains a gap in understanding of the function and development of the larval visual system. It is generally assumed that all pelagic larval crustaceans contain similar compound eyes with a single spectral class of photoreceptor, regardless of adult eye complexity. We hypothesize that stomatopod larval eyes are more complex than previously believed and contain a second ultraviolet (UV) photoreceptor, making them more similar to adult crustacean retinas. Stomatopod larvae are planktonic and live in pelagic ocean environments where UV light is known to penetrate up to several hundred meters. Planktonic species are hypothesized to use UV light for a variety of tasks, including aiding in vertical migration for crustaceans and detection of prey for planktivorous larval fish. The hypothesis that UV photoreceptors are present in stomatopod larvae was tested through investigation of the ultrastructure of the larval eye. Preliminary transmission electron microscopy (TEM) images of a stomatopod larval eye display evidence of an extra cell in the photoreceptor, predicted to be analogous to the R8 photoreceptor in adult stomatopods responsible for UV vision. If R8 cells are present in stomatopod larval retinas, this will be among the first evidence that stomatopod larvae have UV sensitivity. Follow up studies will be needed to understand the ecological function of UV vision for stomatopod larvae.

**[P242] A model explaining the colour interaction in the receptive fields of the ganglion cells in the goldfish retina**

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Three types of cones (long-wave, middle-wave and short-wave sensitive) in the goldfish retina determine its color vision observed in its behavior. However the most of retinal ganglion cells (GCs) projecting to the tectum opticum – motion detectors – seem to be colour blind. Our electrophysiological experiments with cone-isolated visual stimulation of different spectral types of cones demonstrated that these GCs are connected with all three types of cones. Simultaneous stimulation of two types of cones reveals complex interaction of colour channels which sometimes is difficult for description, and the retinal circuitry underlying this interaction looks unclear and needs to be modelled. The model is made in the form of a three-layer artificial neural network. An input layer consists of three receptors corresponding to three spectral cone types of the goldfish. Neurons of the second layer (bipolar cells) are connected with receptors by adjustable synaptic connections. The neuron of the third layer (a GC) is connected with second layer neurons by non-inverting rectifying synaptic contacts. The weights and signs of the synapses of the second layer neurons are adjusted by the researcher to get the responses to color stimulation similar to those observed in the experiments. There is no unambiguous relationship between the constructed network and the real scheme of retinal cell connections. Nevertheless the model permits to combine the experimental data on the interaction of color channels in the receptive fields of the GCs of different types and to imagine the number of neuronal units necessary for organizing such an interaction. Supported by the RFBR grant 16-04-00029

**[P243] Fluorescence emission from photonic structures in beetles' elytra**

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Fluorescence emission occurs in the integuments of many natural species including but not limited to insects, arachnids, mammals, anthozoans (e.g., sea anemones and corals) and scyphozoans (i.e., true jellyfish). In arthropods, fluorescent molecules, such as papiliochrom II and biopterin, are at the origin of such light emission. In some cases, they are naturally embedded in photonic structures, which influence the emission in terms of spectral intensity and spatial distribution[1-2]. Using different microscopy (i.e., light, electron and fluorescence) and spectroscopy (i.e., spectrophotometry and spectrofluorimetry) techniques, the cases of fluorescent beetles with different types of photonic structures (quasi-ordered photonic crystals and randomly-disordered structures) were investigated. These structures control both the colourations of these insects and the emissions of the embedded fluorophores. In addition to optical simulations, such observations allow to study the photonic confinement within the beetles' structures. Fluorophores contained within one species were chemically characterised by liquid chromatography-mass spectrometry. Additionally, Third-Harmonic Generation and two-photon fluorescence analyses performed on selected species unveiled the multi-excited states character of the fluorophores and, through light polarisation effects, the role of the photonic structures' anisotropy in the fluorescent behaviour. In addition to the elaboration of new concepts and the development of technological applications through a