

Video Article

May 2012: This Month in JoVEAaron Kolski-Andreaco¹

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The May issue of JoVE (Journal of Visualized Experiments) includes a handful of articles that deal with the senses and perception. Specifically, articles involving gustation (taste), olfaction (smell), nociception (pain), and the vestibular senses (balance and inertial movement) will be released.

The vestibular system is important for perceiving inertial movement, and inertial information is an important component of path integration. Path integration is a process by which the brain integrates multisensory information during movement, so that we maintain a sense of our body's position, relative to a starting point. In nature, many organisms make use of this process, in order to find their way back to their nests or burrows after looking for food.

This May, JoVE will publish a method filmed at the Max Plank Institute of Biological Cybernetics, which explores how path integration occurs in three dimensions. Most studies of this phenomenon are conducted in two dimensions, but thanks to a motion simulator with a large range of motion, path integration can be assessed in the horizontal and vertical planes. By controlling the sensory stimuli delivered to subjects in this device, our authors can dissect the relative contributions of visual and inertial information to estimations of starting position.

Through an elegantly designed series of experiments, these investigators find that subjects are more likely to overestimate angles of movement in the horizontal plane versus the verticals. They also find that subjects were slower to point to the starting position when they had to rely only on inertial stimuli. The underlying neuronal mechanism behind path integration is poorly understood, and further experiments using this system will provide insight into how humans maintain spatial orientation during movement, which has implications that range from understanding vestibular disorders and training better pilots.

Concerning gustation, JoVE will publish a procedure for isolating and culturing human fungiform taste cells this May. Back in 2010, we published an article that dealt with isolation of human fungiform papillae – a subtype of the tiny structures on our tongues that contain tastebuds. While papillae collection is suitable for acute experiments, long-term studies of taste cells require them to be isolated and cultured.

For the first time ever reported, our authors demonstrate the isolation and culture of human fungiform taste cells and show that they can be maintained in culture for up to 8 passages, or one year. The ability to culture these cells for an extended period of time enables studies of proliferation and regeneration, and obviates the need to repeatedly collect papillae from donors.

Regarding olfaction, JoVE will release an article from the Department of Agriculture, which describes an experiment that transforms the antennae of insects into a screening tool for new pesticide alternatives. After isolating plant volatile compounds via gas chromatography and mass spectrometry, these investigators screen the compounds for biological activity using the electroantennogram (EAG).

Because not all of the volatile compounds emitted by plants elicit biological responses, such a bioassay is incredibly important for finding candidate molecules that can affect insect behavior. In turn, behavioral experiments, can determine whether or not a plant volatile can attract an insect. Plant volatile attractants can be used to confuse insects and potentially could serve as a safe alternative to pesticides.

Thermal nociception, or the perception of noxious thermal stimuli, is the focus of an article from the University of Texas this May. Specifically, thermal nociception is investigated in *Drosophila* larvae using two methods: the heat probe assay and the heat plate assay. Interestingly, for both methods, larvae must first be treated with UV radiation to induce tissue damage and sensitize thermal nociceptive neurons, which usually respond with a very high threshold.

As its name implies, the heat probe assay, uses a custom-built thermal probe to locally administer thermal stimuli. Nociception is quantified by recording the latency between stimulus onset and withdraw behavior. Intuitively, the second method, or heat plate assay, involves placing *drosophila* larvae on a heating plate within a drop of water to test whole body responses to noxious heat. Upon placement, *drosophila* exhibit a series of characteristic behaviors including rolling, whipping, or even seizure-like activity. When combined with genetic manipulation, these assays can provide information about the genes underlying thermal nociception – a highly conserved process, from larvae to mammals.

Naturally, an exploration of the senses is not all JoVE has to offer this may. Other notable publications involve painting the pancreas to maintain orientation during histology, using an automated operant device to test multi-cognitive functions in mice, examining tamoxifen-induced apoptosis using timelapse video microscopy, and creating a convenient tool for fishing out lost samples from liquid nitrogen tanks. Stay tuned.

Video Link

The video component of this article can be found at <https://www.jove.com/video/4464/>

Protocol

MPI CyberMotion Simulator: Implementation of a Novel Motion Simulator to Investigate Multisensory Path Integration in Three Dimensions

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An efficient way to gain insight into how humans navigate themselves in three dimensions is described. The method takes advantage of a motion simulator capable of moving observers in ways unattainable by traditional simulators. Results confirm that movement in the horizontal plane is underestimated, while vertical movement is overestimated.

Enhancement of Apoptotic and Autophagic Induction by a Novel Synthetic C-1 Analogue of 7-deoxypancratistatin in Human Breast Adenocarcinoma and Neuroblastoma Cells with Tamoxifen

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We have synthesized a novel analogue of pancratistatin with comparable anti-cancer activity as native pancratistatin; interestingly, combinatory treatment with tamoxifen yielded a drastic enhancement in apoptotic and autophagic induction by mitochondrial targeting with minimal effect on noncancerous fibroblasts. Thus, JCTH-4 in combination with tamoxifen could provide a safe anti-cancer therapy.

Isolation and Culture of Human Fungiform Taste Cells

Hakan Ozdener¹, Andrew I. Spielman², Nancy E. Rawson³

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We aimed to develop a reproducible protocol for isolating and maintaining long-term cultures of human fungiform taste papillae cells. Cells from human fungiform papillae obtained by biopsy were successfully maintained in culture for more than eight passages (12 months) without loss of viability.

Local and global methods of assessing thermal nociception in *Drosophila* larvae

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In this article, we demonstrate assays to study thermal nociception in *Drosophila* larvae. One assay involves spatially-restricted (local) stimulation of thermal nociceptors^{1,2} while the second involves a wholesale (global) activation of most or all such neurons³. Together, these techniques allow visualization and quantification of the behavioral functions of *Drosophila* nociceptive sensory neurons.

Do-It-Yourself Device for Recovery of Cryopreserved Samples Accidentally Dropped into Cryogenic Storage Tanks

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Here we present a low cost, durable cryotolerant device for sample retrieval from Dewar tanks filled with liquid nitrogen. The ease of construction and modular design of the device makes the process of sample retrieval from cryogenic tanks safe and easy.

Electroantennographic Bioassay as a Screening Tool for Host Plant Volatiles

John J. Beck, Douglas M. Light, Wai S. Gee

Plant Mycotoxin Research, U.S. Department of Agriculture, Agricultural Research Service

A method to rapidly screen host plant volatiles by measurement of the electrophysiological response of adult navel orangeworm (*Amyelois transitella*) antennae to single components and blends via electroantennographic analysis is demonstrated.

Collection Protocol for Human Pancreas

Martha L. Campbell-Thompson, Emily L. Montgomery, Robin M. Foss, Kerwin M. Kolheffer, Gerald Phipps, Lynda Schneider, Mark A. Atkinson

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This video demonstrates a dissection procedure for processing human pancreas into multiple storage formats. Anatomical orientation is maintained throughout the pancreatic regions to allow definition of regional islet composition and density.

Disclosures

No conflicts of interest declared.