Video Article

November 2013: This Month in JoVE

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Abstract

Here's a look at what's coming up in the November 2013 issue of JoVE: The Journal of Visualized Experiments.

In the biomedical sciences, many principles are based on a handful of model organisms—but experimental findings in traditional models don't always translate to humans or other organisms, nor can they answer all fundamental questions. Therefore, scientists often look to non-traditional models, especially in emerging and multidisciplinary fields.

In JoVE Neuroscience, we have two video articles with common animals that are not so common in the lab. One is the freshwater leech, the bloodsucking worm that is firmly embedded in traditional medicine and also appreciated in neuroscience. It has an extremely simple nervous system, which allows neuroscientists to study individual neurons and how their connections influence behavior. Titlow *et al.* demonstrate how to dissect ventral ganglions and culture isolated neurons (which can retain their electrical characteristics for up to 45 days) and obtain stable intracellular recordings in sensory cells. They might not be very appealing, but leeches are valuable tools for teaching neural anatomy, the principles of intracellular recordings, and intercellular communication.

Another article in JoVE Neuroscience features the American cockroach, an unwelcome guest in households all over the world. Anyone who has seen cockroaches in action knows how quickly they can change directions, especially when running away from predators. In fact, of all animals, the cockroach has one of the fastest escape responses, which has been attributed to a reflex circuit that involves two horn-like structures called cerci on the abdomen. Hundreds of tiny sensory hairs on the cerci transform stimuli into neural events, which result in escape behavior. Titlow *et al.* demonstrate how to prepare the cockroach for electrophysiology and perform neural circuit recordings from intact cockroach nervous systems. These techniques can help identify the neural circuits that underlie certain behavioral responses.

Our featured article from Clinical and Translational Medicine deals with acute ischemic stroke, where any delay with emergency treatment can negatively affect the outcome. Therefore, Ebinger *et al.* present the STEMO, or stroke emergency mobile, a specialized ambulance equipped with a computed tomography scanner and point-of-care lab. This allows vital diagnostics and interventions before the patient gets to the hospital. Preliminary examinations are performed and blood samples taken to determine international normalized ratio (INR), which guides anticoagulation treatment. Advanced diagnostics are also possible through telemedicine, where CT images are transmitted electronically to a neuroradiologist on call. If appropriate, thrombolysis is initiated using recombinant tissue plasminogen activator. The emergency room is notified before transport so everything is in place when the patient arrives. While this pre-hospital concept has not yet been tested in all urban and rural settings, it represents a logical approach for shortening time to treatment for stroke patients.

Many video articles in JoVE show how to create small-scale simulations of larger systems. This month in JoVE Applied Physics, a very large system is approximated in the lab: the planet Earth, and simulation of its interior differentiation processes to study planetary core formation. Fei does this by mixing olivine silicate, iron powder, and iron sulfide, then loading into a high-pressure cell assembly and heating to 1800°C. The sample is recovered and prepared for 3D imaging. By analyzing high-resolution images and the chemical compositions of the liquid and solid phases, scientists can better understand the process of planetary core formation.

You've just had a sneak peek of a few highlights from the November 2013 issue of JoVE. Visit the website to see the full-length articles, plus many more, in JoVE: The Journal of Visualized Experiments.

Video Link

The video component of this article can be found at http://www.jove.com/video/5162/

Protocol

Pre-hospital Thrombolysis: A Manual from Berlin

Martin Ebinger[1,2,5], Sascha Lindenlaub[1,3,5], Alexander Kunz[1,2,5], Michal Rozanski[2,5], Carolin Waldschmidt[2,5], Joachim E. Weber[2,5], Matthias Wendt[2,5], Benjamin Winter[1,2,5], Philipp A. Kellner[4,5], Sabina Kaczmarek[4,5], Matthias Endres[1,2,5], Heinrich J. Audebert[1,2,5]

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Identification of suspected stroke in the dispatch center of the Berlin Fire Brigade prompts the deployment of a CT-equipped ambulance. If ischemic stroke is confirmed and contraindications are excluded pre-hospital thrombolysis is applied.

Neural Circuit Recording from an Intact Cockroach Nervous System

Josh S. Titlow[1], Zana R. Majeed[1,2], H. Bernard Hartman[3], Ellen Burns[1], Robin L. Cooper[1]

[1]Department of Biology, **University of Kentucky**, [2]Department of Biology, **University of Salahaddin**, [3]Oregon Institute of Marine Biology, **University of Oregon**

This article describes the cockroach ventral nerve cord dissection and extracellular recordings from the cercal nerve and connectives. Evoked responses are generated by electrical stimulation of the cercal nerve or direct mechanical stimulation of the cerci.

Intracellular Recording, Sensory Field Mapping, and Culturing Identified Neurons in the Leech, *Hirudo medicinalis*

Josh Titlow[1], Zana R. Majeed[1,2], John G Nicholls[3], Robin L. Cooper[1]

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This article describes three nervous system preparations using leeches: intracellular recording from neurons in ventral ganglia, culturing neurons from ventral ganglia, and recording from a patch of innervated skin to map sensory fields.

Simulation of the Planetary Interior Differentiation Processes in the Laboratory

Yingwei Fei

Geophysical Laboratory, **Carnegie Institution of Washington**

The high-pressure and high-temperature experiments described here mimic planet interior differentiation processes. The processes are visualized and better understood by high-resolution 3D imaging and quantitative chemical analysis.

Disclosures

No conflicts of interest declared.

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