Video Article

JoVE - Year in Review: 2015

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Abstract

In January 2015, JoVE Developmental Biology became the newest addition to the JoVE family, and featured a live-imaging protocol for visualizing the developing *Drosophila* eye.

In February, JoVE Medicine showed state-of-the-art cranial ultrasound imaging in neonates. Advances in this technique have improved its diagnostic value, allowing timely therapeutic intervention.

In March, JoVE Environment featured dendroecology, the science of using tree rings to study ecological effects of specific environmental factors.

In April, JoVE Biology examined a mode of bacterial motility called swarming with a two-phase swarm assay. that can be used to study various aspects of bacterial growth.

In May, JoVE Chemistry described the self-assembly of single-stranded DNA tiles into complex 2D shapes. This demonstrated the principles of DNA tiling as an approach for making programmable nanostructures.

June 2015 marked the release of JoVE's 100th issue, and in JoVE Behavior, we featured protocols for assessing cognition, including a method of quantifying learning in young infants by tracking leg movements.

In July, JoVE Medicine presented a method for measuring halitosis in dogs by taking breath samples, and performing gas chromatography. This assay could be used in trials of dog food formulated to fight bad breath in our canine companions.

In August, JoVE Bioengineering contained a protocol for bioengineering kidney tissues. Kidneys are decellularized by perfusion, and repopulated with human renal cells, This promising technology can lead to kidney grafts made from a patient's own cells.

In September, JoVE Environment examined herbicide resistance, which threatens commercial crop production. An excised leaf assay determines the rates of herbicide metabolism, which is useful for studying the metabolic basis of resistance.

In October, JoVE Neuroscience featured a method for interfacing 3D neuronal cultures to micro-electrode arrays. The complex 3D assemblies closely approximate *in vivo* neural networks.

November's edition of JoVE Behavior showcased the natural human ability to acquire new motor skills, which is central in a structured rehabilitation program for amputees as they learn how to use multifunctional prosthetics.

In December, JoVE Immunology & Infection prepared us for the impending flu season with an easy protocol for sampling influenza in pigs. Because swine are important hosts for flu viruses, this method helps to monitor virus evolution and currently circulating strains.

This Year in Review was just a sampling of more than 900 video-articles that JoVE published in 2015. Browse the JoVE archives for thousands of other videos, and come back each week to see brand-new material in JoVE: The Journal of Visualized Experiments.

Video Link

The video component of this article can be found at http://www.jove.com/video/5764/

Protocol

Live-imaging of the *Drosophila* Pupal Eye

Mark B. Hellerman, Richard H. Choe, Ruth I. Johnson

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This protocol presents an efficient method for imaging the live *Drosophila* pupal eye neuroepithelium. This method compensates for tissue movement and uneven topology, enhances visualization of cell boundaries through the use of multiple GFP-tagged junction proteins, and uses an easily-assembled imaging rig.

State of the Art Cranial Ultrasound Imaging in Neonates

Ginette M. Ecury-Goossen[1], Fleur A. Camfferman[2], Lara M. Leijser[3,4], Paul Govaert[1,5], Jeroen Dudink[1,2]

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Cranial ultrasound (CUS) is a valuable tool for brain imaging in critically ill neonates. This video shows a comprehensive approach for neonatal (Doppler) CUS for both clinical and research purposes, including a bedside demonstration of the technique.

A Technical Perspective in Modern Tree-ring Research - How to Overcome Dendroecological and Wood Anatomical Challenges

Holger Gärtner, Paolo Cherubini, Patrick Fonti, Georg von Arx, Loïc Schneider, Daniel Nievergelt, Anne Verstege, Alexander Bast, Fritz H. Schweingruber, Ulf Büntgen

Landscape Dynamics / Dendroecology, **Swiss Federal Research Institute WSL**

Here we present a protocol outlining how to sample wooden specimens for the overall assessment of their growth structures. Macro- and microscopic preparation and visualization techniques necessary to generate well-replicated and highly resolved wood anatomical and dendroecological dataset, are described are described.

Preparation, Imaging, and Quantification of Bacterial Surface Motility Assays

Nydia Morales-Soto[1,2], Morgen E. Anyan[1], Anne E. Mattingly[1], Chinedu S. Madukoma[1], Cameron W. Harvey[3], Mark Alber[3], Eric Déziel[4], Daniel B. Kearns[5], Joshua D. Shrout[1,2,6]

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Swarming motility is influenced by physical and environmental factors. We describe a two-phase protocol and guidelines to circumvent the challenges commonly associated with swarm assay preparation and data collection. A macroscopic imaging technique is employed to obtain detailed information on swarm behavior that is not provided by current analysis techniques.

Self-assembly of Complex Two-dimensional Shapes from Single-stranded DNA Tiles

Bryan Wei[1], Michelle K. Vhudzijena[2], Joanna Robaszewski[2], Peng Yin[2,3]

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DNA tiling is an effective approach to make programmable nanostructures. We describe the protocols to construct complex two-dimensional shapes by the self-assembly of single-stranded DNA tiles.

Quantifying Learning in Young Infants: Tracking Leg Actions During a Discovery-learning Task

Barbara Sargent[1], Hendrik Reimann[2], Masayoshi Kubo[3], Linda Fetters[1]

[1]Division of Biokinesiology & Physical Therapy at the Herman Ostrow School of Dentistry, **University of Southern California**, [2]Department of Kinesiology, **Temple University**, [3]Department of Physical Therapy, **Niigata University of Health and Welfare**

A method is described in which 3-4 month old infants learn a task by discovery and their leg movements are captured to quantify the learning process.

Therapeutic Effectiveness of a Dietary Supplement for Management of Halitosis in Dogs

Alessandro Di Cerbo[1], Federica Pezzuto[2], Sergio Canello[3], Gianandrea Guidetti[3], Beniamino Palmieri[1,4]

[1]Department of Surgery and Surgical Specialties, **Azienda Ospedaliero-Universitaria Policlinico di Modena**, [2]Department of Clinical Microbiology, **Universtity of Modena and Reggio Emilia**, [3]**Sanypet S.p.a**, [4]**AIRMO Center Milan**

We describe a simple approach for diagnosis of halitosis in dogs as well as a dietary approach for its management. This protocol may be extended to the management of halitosis in humans in the near future.

Epithelial Cell Repopulation and Preparation of Rodent Extracellular Matrix Scaffolds for Renal Tissue Development

Joseph S. Uzarski[1,2], Jimmy Su[1,2,3,4], Yan Xie[1,2], Zheng J. Zhang[1,2], Heather H. Ward[5], Angela Wandinger-Ness[6], William M. Miller[7,8], Jason A. Wertheim[1,2,3,4,8,9]

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This protocol describes decellularization of Sprague Dawley rat kidneys by antegrade perfusion of detergents through the vasculature, producing acellular renal extracellular matrices that serve as templates for repopulation with human renal epithelial cells. Recellularization and use of the resazurin perfusion assay to monitor growth is performed within specially-designed perfusion bioreactors.

Measuring Rates of Herbicide Metabolism in Dicot Weeds with an Excised Leaf Assay

Rong Ma, Joshua J. Skelton, Dean E. Riechers

Department of Crop Sciences, **University of Illinois**

This manuscript describes how herbicide metabolism rates can be effectively quantified with excised leaves from a dicot weed, thereby reducing variability and removing any possible confounding effects of herbicide uptake or translocation typically observed in whole-plant assays.

Interfacing 3D Engineered Neuronal Cultures to Micro-Electrode Arrays: An Innovative *In Vitro* Experimental Model

Mariateresa Tedesco[1], Monica Frega[1,2], Sergio Martinoia[1], Mattia Pesce[3], Paolo Massobrio[1]

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In this work, a novel experimental model in which 3D neuronal cultures are coupled to planar Micro-Electrode Arrays (MEAs) is presented. 3D networks are built by seeding neurons in a scaffold made up of glass microbeads on which neurons grow and form interconnected 3D structures.

A Structured Rehabilitation Protocol for Improved Multifunctional Prosthetic Control: A Case Study

Aidan Dominic Roche[1,2], Ivan Vujaklija[3,4], Sebastian Amsüss[3,4], Agnes Sturma[1,5], Peter Göbel[6], Dario Farina[3,4], Oskar C. Aszmann[1,2]

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As prosthetic development moves towards the goal of natural control, harnessing amputees' inherent ability to learn new motor skills may enable proficiency. This manuscript describes a structured rehabilitation protocol, which includes imitation, repetition, and reinforcement learning strategies, for improved multifunctional prosthetic control.

Nasal Wipes for Influenza A Virus Detection and Isolation from Swine

Jacqueline M. Nolting, Christine M. Szablewski, Jody L. Edwards, Sarah W. Nelson, Andrew S. Bowman

Department of Veterinary Preventive Medicine, **The Ohio State University**

The authors present a protocol to collect swine nasal wipes to detect and isolate influenza A viruses.

Disclosures

No conflicts of interest declared.