Video Article

2012: A Year In Review

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Abstract

Here's a look at some of the milestones and highlights of the year 2012 in Journal of Visualized Experiments (JoVE).

At the start of 2012, JoVE reached a major milestone by publishing our 1500th article. In this publication, in JoVE Bioengineering, Yu *et al.* described a method for analyzing the free radical composition of cigarette smoke. This method simulated cigarette puffing with a single-port smoking device, and combined it with electron spin resonance (ESR) spectroscopy to measure the degree to which antioxidant compounds can scavenge free radicals in cigarette smoke. A possible outcome of this research is the creation of less harmful cigarettes.

JoVE Bioengineering also contained the most-viewed article of 2012. Owczarczak *et al.* described a method for hacking a standard inkjet printer, loading ink cartridges with a cell-suspension "bioink," and printing lines of live cells onto glass slides. The thermal inkjet printing process creates temporary pores in the cell membrane, visualized by the incorporation of fluorescently labeled actin monomers. This concept, called "bioprinting," has many potential applications in cell and tissue engineering.

Also in 2012, JoVE Bioengineering featured a protocol by Hsia *et al.* for isolating and purifying spider silk protein, spinning it into fibers, and assessing the fiber strength. This protocol for laboratory-scale production of spider silk, which is stronger than tensile steel, can potentially be extended to large-scale manufacturing.

In JoVE Clinical and Translational Medicine, we featured a number of articles related to stroke, one of which. In one article, Möbius-Winkler *et al.* demonstrated placement of the WATCHMAN left atrial appendage occlusion device from Boston Scientific. This device is designed to prevent strokes by trapping clots within the left atrial appendage of the heart before they exit. Our authors demonstrated how to insert the guide wire through the femoral artery into the heart, advance the device into the left atrium, and deploy the device in the left atrial appendage.

Another article focused on stroke, Hamel *et al.* described the use of a driving simulator to study how patients compensate for visual field defects following stroke. By analyzing the compensatory gaze behavior of patients as they navigated through virtual driving courses with varying degrees of complexity, our authors see great potential for the use of driving simulators in stroke rehabilitation.

In JoVE Immunology and Infection, we published an article by Keyel *et al.* describing the real-time kinetics of immune cell responses to bacterial toxins using live cell microscopy. Combined with high-speed 3D confocal microscopy, this technique can also visualize the cellular repair response.

Also in JoVE Immunology and Infection, we featured an article by Yap *et al.* describing methods for diagnosing helminth infections in children. Helminths are parasitic worms that can infect the intestinal tract of humans and animals, and may be distinguished based on their morphology. The same article demonstrated how to measure the impact of helminth infections on physical fitness in children, which is a measure of overall health.

In JoVE Neuroscience, we featured a method by Hoffmann *et al.*, who used tiny headphones to alter the auditory feedback in songbirds, and analyzed the computational and neurophysiological basis of vocal learning in birds when they adjust their singing in response to altered acoustic signals.

Also in JoVE Neuroscience, we moved from birds to bees with a method that assesses associative and non-associative tactile learning in honeybees. This method, by Mujagić *et al.*, allowed bees to scan different metal surfaces with their antennae, then conditioned them to expect sugar water when their antennae touched particular surfaces, and analyzed the corresponding changes in antennal movement.

In 2012, we launched a brand-new section: JoVE Applied Physics, which features articles on subjects ranging from plasma physics to material science. The Applied Physics section also contained JoVE's 2000th video article, filmed in a synchrotron radiation facility, where Borisenko *et al.* showed how to determine the electronic structure of complex materials using angle-resolved photoemission spectroscopy.

In the JoVE General section, we published an article by Artioli *et al.* demonstrating the use of a portable gas analyzer to measure oxygen consumption during complex exercise - such as judo. By analyzing oxygen consumption and collecting blood for measuring plasma lactate concentration, this method can determine the relative contributions of different energy systems to specific aspects of complex exercise.

Finally, JoVE followed Dolhi *et al.* to a permanently ice-covered saline lake in Antarctica. There, scientists drilled through the ice to study single-celled microorganisms called protists that live in the harsh conditions of Antarctica.

This Year in Review was just a brief glimpse of a few of over 600 video articles that JoVE offered in 2012. Browse the JoVE archives to see thousands of other videos, and stay tuned for what's coming up this year in JoVE: The Journal of Visualized Experiments.

Video Link

The video component of this article can be found at https://www.jove.com/video/5049/

Protocol

A Protocol for Detecting and Scavenging Gas-phase Free Radicals in Mainstream Cigarette Smoke

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[1]CDCF-AOX Lab, [2]National Biomedical Center for Advanced ESR Technology (ACERT), Department of Chemistry and Chemical Biology, Cornell University, [3]ACERT Research, Center Department of Chemistry and Chemical Biology, Baker Laboratory, Cornell University

Spin-trapping ESR spectroscopy was used to study the effect of plant antioxidants lycopene, pycnogenol and grape seed extract on scavenging gas-phase free radicals in cigarette smoke.

The WATCHMAN Left Atrial Appendage Closure Device for Atrial Fibrillation

Sven Möbius-Winkler, Marcus Sandri, Norman Mangner, Phillip Lurz, Ingo Dähnert, Gerhard Schuler
University of Leipzig Heart Center

The accompanying video describes a procedure for percutaneous placement of the WATCHMAN Left Atrial Appendage (LAA) Device. The WATCHMAN is a nitinol device designed to be permanently implanted at, or slightly distal to, the opening of the left atrial appendage (LAA) to trap blood clots before they exit the LAA, preventing thromboembolic stroke.

Determining the Contribution of the Energy Systems During Exercise

Guilherme G. Artioli[1], Rômulo C. Bertuzzi[2], Hamilton Roschel[1, 3], Sandro H. Mendes[1], Antonio H. Lancha Jr.[1], Emerson Franchini[4]
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This protocol allows researchers focused on exercise and sports sciences to determine the relative contribution of three different energy systems to the total energy expenditure during a large variety of exercises.

Establishment of Microbial Eukaryotic Enrichment Cultures from a Chemically Stratified Antarctic Lake and Assessment of Carbon Fixation Potential

Jenna M. Dolhi, Nicholas Ketchum, Rachael M. Morgan-Kiss
Department of Microbiology, Miami University

Microbial eukaryotes are both a source of photosynthetically-derived carbon and top predatory species in permanently ice-covered Antarctic lakes. This report describes an enrichment culture approach to isolate metabolically versatile microbial eukaryotes from the Antarctic lake, Lake Bonney, and assesses inorganic carbon fixation potential using a radioisotope assay for Ribulose-1,5-bisphophate carboxylase oxygenase (RubisCO) activity.

Synthetic Spider Silk Production on a Laboratory Scale

Yang Hsia, Eric Gnesa, Ryan Pacheco, Kristin Kohler, Felicia Jeffery, Craig Vierra
Department of Biological Sciences, University of the Pacific

Despite the outstanding mechanical and biochemical properties of spider silks, this material cannot be harvested in large quantities by conventional means. Here we describe an efficient strategy to spin artificial spider silk fibers, which is an important process for investigators studying spider silk production and their use as next-generation biomaterials.

Determining Soil-transmitted Helminth Infection Status and Physical Fitness of School-aged Children

Peiling Yap[1, 2], Thomas Fürst[1, 2], Ivan Müller[1, 2], Susi Kriemler[1, 2], Jürg Utzinger[1, 2], Peter Steinmann[1, 2]
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Chronic infection with soil-transmitted helminths (STHs) causes malabsorption, stunting, and wasting in the growing child. Hence, it is plausible that these infections also reduce the physical fitness of children. Here, we visualize two techniques for the diagnosis of STHs and the 20-meter shuttle run test for assessing children's physical fitness.

Driving Simulation in the Clinic: Testing Visual Exploratory Behavior in Daily Life Activities in Patients with Visual Field Defects

Johanna Hamel[1, 2], Antje Kraft[1], Sven Ohl[3], Sophie De Beukelaer[1], Heinrich J. Audebert[1, 2], Stephan A. Brandt[1]
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Patients with visual deficits after stroke report about different constraints in daily life most likely due to variable compensatory strategies, which are difficult to differentiate in clinical routine. We present a clinical set-up which allows measurement of different compensatory head- and eye-movement-strategies and evaluating their effects on driving performance.

Visualization of Bacterial Toxin Induced Responses Using Live Cell Fluorescence Microscopy

Peter A. Keyel[1], Michelle E. Heid[1], Simon C. Watkins[2], Russell D. Salter[1]
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Methods for purifying the cholesterol binding toxin streptolysin O from recombinant *E. coli* and visualization of toxin binding to live eukaryotic cells are described. Localized delivery of toxin induces rapid and complex changes in targeted cells revealing novel aspects of toxin biology.

Angle-resolved Photoemission Spectroscopy At Ultra-low Temperatures

Sergey V. Borisenko[1], Volodymyr B. Zabolotnyy[1], Alexander A. Kordyuk[1, 2], Danil V. Evtushinsky[1], Timur K. Kim[1, 3], Emanuela Carleschi[4], Bryan P. Doyle[4], Rosalba Fittipaldi[5], Mario Cuoco[5], Antonio Vecchione[5], Helmut Berger[6]
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The overall goal of this method is to determine the low-energy electronic structure of solids at ultra-low temperatures using Angle-Resolved Photoemission Spectroscopy with synchrotron radiation.

A Lightweight, Headphones-based System for Manipulating Auditory Feedback in Songbirds

Lukas A. Hoffmann[1, 2], Conor W. Kelly[1, 3], David A. Nicholson[1, 2], Samuel J. Sober[1]
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We describe the design and assembly of miniaturized headphones suitable for replacing a songbird's natural auditory feedback with a manipulated acoustic signal. Online sound processing hardware is used to manipulate song output, introduce real-time errors in auditory feedback via the headphones, and drive vocal motor learning.

Tactile Conditioning And Movement Analysis Of Antennal Sampling Strategies In Honey Bees (*Apis mellifera* L.)

Samir Mujagić, Simon Michael Würth, Sven Hellbach, Volker Dürr
Biological Cybernetics, CITEC - Cognitive Interaction Technology - Center of Excellence, Bielefeld University

In this protocol we show how to condition harnessed honey bees to tactile stimuli and introduce a 2D motion capture technique for analyzing the kinematics of fine-scale antennal sampling pattern.

Disclosures

No conflicts of interest declared.