Video Article

# October 2013 - This Month in JoVE

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## Abstract

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

This month we are pleased to introduce JoVE Environment, multidisciplinary section devoted to research methods in environmental sciences and green technologies, from biofuels to oceanography to atmospheric sciences. These experimental techniques aim to understand the Earth, protect natural resources, and create a more sustainable and environmentally conscious planet.

One video in JoVE Environment describes a technique called tree endotherapy, which might sound like tree hugging, but it's a method based on the fluid dynamics in the xylem vessels of woody plants for the targeted delivery of compounds (like pesticides). Endotherapy is progressively supplanting traditional air spray methods for trees. However, most tree endotherapy methods involve drilling into trees, which can cause damage or infections. Montecchio presents a new a drill-free method that uses a small, perforated blade to separate the woody fibers. This produces a Venturi effect, a phenomenon where fluid flowing through a pipe decreases in pressure and increases in velocity when the pipe becomes narrow. Because the Venturi effect causes the tree sap to flow faster, it also increases the uptake of external liquids. This method represents a significant advance in the development of minimally invasive endotherapeutic techniques.

Also in JoVE Environment we feature optimized methods for performing crosses in *Setaria viridis*, which serves as a model for bioenergy feed stocks and grain crops.

Genetic crosses in *Setaria* usually involve emasculation of the male parent by removing the anthers from the flowers. Jiang et al. present an alternative method that uses heat to kill the developing pollen grains. A GUS transgene driven by a rice ubiquitin promoter facilitates the identification of successful controlled genetic crosses. This method will help accelerate genetic discovery in this emerging model system.

In JoVE Bioengineering, it is a common theme to build biological systems, such as the vasculature, on chips for *in vitro* assays. Li et al. have developed a system of endothelialized microchannels-on-a-chip, which mimics the three-dimensional geometry of *in vivo* microvessels and runs under controlled and continuous perfusion flow. By combining a photolithographic reflowable photoresist technique with soft lithography and microfluidics, this is a useful assay for microvascular research that allows steady and accurate flow control over cultured endothelial cells for up to two weeks.

In JoVE Neuroscience, Silvestri et al. present an optical method called confocal light sheet microscopy (CLSM), which is capable of obtaining micron-scale images of mouse brains without the need to perform physical sectioning. Optical tomography stacks are obtained and stitched together to reconstruct the entire mouse brain. This method can be used to study the fine anatomical structure of the brain or other tissues.

You've just had a sneak peek of a few highlights from the October 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/5121/

## Protocol

### Micron-scale Resolution Optical Tomography of Entire Mouse Brains with Confocal Light Sheet Microscopy

Ludovico Silvestri[1], Alessandro Bria[2,3], Irene Costantini[1], Leonardo Sacconi[1,4], Hanchuan Peng[5], Giulio Iannello[2], Francesco Saverio Pavone[1,4,6,7]

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In this article we describe the full experimental procedure to reconstruct, with high resolution, the fine brain anatomy of fluorescently labeled mouse brains. The described protocol includes sample preparation and clearing, specimen mounting for imaging, data post-processing and multi-scale visualization.

## Procedure for the Development of Multi-Depth Circular Cross-Sectional Endothelialized Microchannels-on-a-Chip

Xiang Li[1], Samantha Marie Mearns[1], Manuela Martins-Green[2], Yuxin Liu[1]

[1]Lane Department of Computer Science and Electrical Engineering, **West Virginia University**, [2]Department of Cell Biology and Neuroscience, **University of California at Riverside**

A microchannels-on-a-chip platform was developed by the combination of photolithographic reflowable photoresist technique, soft lithography, and microfluidics. The endothelialized microchannels platform mimics the three-dimensional (3D) geometry of *in vivo* microvessels, runs under controlled continuous perfusion flow, allows for high-quality and real-time imaging, and can be applied for microvascular research.

## Methods for Performing Crosses in *Setaria viridis*, a New Model System for the Grasses

Hui Jiang[1], Hugues Barbier[2], Thomas Brutnell[1]

[1]**Donald Danforth Plant Science Center**, [2]**Boyce Thompson Institute**

We have developed a methodology for performing crosses in *Setaria viridis* (*S. viridis*). The method involves pruning the panicle prior to a hot water treatment to kill viable pollen. Crosses are performed following a well-controlled growth regime and typically result in the recovery of 1 to 7 cross-pollinated seed/s per panicle.

## A Venturi Effect Can Help Cure Our Trees

Lucio Montecchio

Department of Land, Environment, Agriculture and Forestry (TeSAF), **Unversity of Padova**

Compared to the more traditional hole-based methods, most of which require the tree to be drilled, tools with lenticular blades transform the basics of endotherapy easing the closure of the wound and allowing the natural uptake of the solutions.

## Disclosures

No conflicts of interest declared.

 