

Video Article

May 2014: This Month in JoVE - Bioengineering Limb Prostheses, Protecting Trees from Fungal Pathogens, and Investigating the Kinematics of Swallowing

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Abstract

Here's a look at what's coming up in the [May 2014 issue](#) of [JoVE: The Journal of Visualized Experiments](#).

In [JoVE Environment](#) we examine beech bark disease, which affects susceptible trees after they are attacked by the beech scale insect. When it feeds on tree bark, the insect creates small fissures that allow the causative fungal species to establish infection. In the late 1890s, the beech scale insect was accidentally brought from Europe to Nova Scotia. By the 1930s, the insects and the associated fungal disease had reached the United States, subsequently spreading across the entire northeast towards the south and Midwest. Beech bark disease can kill up to 50% of infected trees, thus threatening biodiversity in hardwood forests. To address this concern, [Koch and Carey](#) adapt a technique of artificially inoculating seedlings with beech scale eggs, and present a method for screening disease resistance and susceptibility in American beech trees. This method can help to identify resistance and susceptibility genes or to screen mature trees in the field and help minimize the environmental impact of beech bark disease.

Moving on to [JoVE Bioengineering](#), much research is devoted to improving the design and function of prosthetics. This month, [Smith et al.](#) present techniques for directly estimating the inertial properties of below-knee prosthetics. The procedure is performed with the prosthesis fully intact, which reduces the measurement time and eliminates any additional time needed to realign the prosthesis after measurements. This technique allows rapid and direct measurements of the inertial properties of below-knee prosthetics, which could potentially benefit many patients who undergo lower-limb amputations.

In [JoVE Clinical & Translational Medicine](#), [Thompson et al.](#) use coordinate mapping to analyze the pharyngeal phase of swallowing, which is a complex process that involves over 20 muscles coordinated by the autonomic nervous system. To demonstrate this technique, they examine healthy subjects, without known swallowing impairments, who undergo a modified barium swallow. In this test, an X-ray of the throat is taken while the subject ingests food or liquid containing barium. Using image analysis software, the authors record anatomical landmark coordinates during the modified barium swallow. These coordinates are then translated into kinematic variables of interest, which can be useful for studying dysphagia, or difficulty swallowing.

In developing vertebrates, cranial neural crest cells (CNCCs) migrate from the dorsal neural tube to form craniofacial structures. This month in [JoVE Biology](#), [Fish and Schneider](#) examine how these neural crest cells give rise to the wide range of beak patterns in birds. The authors head to Chinatown to obtain white Pekin duck eggs, which they grow to Hamburger-Hamilton stage 9.5. Then, they graft a quail neural fold into the mid- and anterior hindbrain of the duck embryo to generate a quail-duck chimera, or a "quack". Because the quail and the duck have very different beak morphology, this quack can help uncover the mechanisms of species-specific craniofacial patterning.

You've just had a sneak peek of the [May 2014 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/5340/>

Protocol

A Technique to Screen American Beech for Resistance to the Beech Scale Insect (*Cryptococcus fagisuga* Lind.)

Jennifer L. Koch, David W. Carey

Northern Research Station, **US Forest Service**

Beech bark disease is initiated by feeding activities of the beech scale insect that create fungal entry points in the bark. Trees that are resistant to the scale insect are also disease resistant. Here we present the protocol we have developed to screen individual beech trees for beech scale resistance.

Coordinate Mapping of Hyolaryngeal Mechanics in Swallowing

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Coordinate mapping is a method of documenting salient features of hyolaryngeal biomechanics in the pharyngeal phase of swallowing. This methodology uses image analysis software to record coordinates of anatomical landmarks. These coordinates are imported into an excel macro and translated into kinematic variables of interest useful in dysphagia research.

Oscillation and Reaction Board Techniques for Estimating Inertial Properties of a Below-knee Prosthesis

Jeremy D. Smith¹, Abbie E. Ferris¹, Gary D. Heise¹, Richard N. Hinrichs², Philip E. Martin³

¹School of Sport & Exercise Science, **University of Northern Colorado**, ²Kinesiology Program, **Arizona State University**, ³Department of Kinesiology, **Iowa State University**

Body segmental inertial properties are required for inverse dynamics modeling. Using an oscillation and reaction board technique, inertial properties of below-knee prostheses were measured. Using direct measures of prosthesis inertia in the inverse dynamics model of the prosthetic leg resulted in lower magnitudes of resultant joint forces and moments.

Assessing Species-specific Contributions To Craniofacial Development Using Quail-duck Chimeras

Jennifer L Fish, Richard A Schneider

Department of Orthopaedic Surgery, **University of California at San Francisco**

This article describes a method to generate chimeric embryos that is designed to test the species-specific contributions of neural crest and/or other tissues to craniofacial development.