

Video Article

March 2015: This Month in JoVE - Solving Crime with Science, Applying Technology to Understand Trees, and Studying Protein Synthesis on a Chip

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Abstract

Here's a look at what's coming up in the [March 2015 issue](#) of [JoVE: The Journal of Visualized Experiments](#).

In [JoVE Environment](#), we really love trees-especially for the data stored in tree rings, which are not only valued by historians, geologists, and archeologists, but also environmental scientists who study how forest ecosystems respond to environmental changes. [Gärtnert et al.](#) expand on traditional tree ring research with new protocols for sampling, preparing, and analyzing wooden specimens. They also present a way to resolve digital images for time-series analyses. These techniques will help scientists understand the effects of specific environmental factors on trees and other woody plants.

In [JoVE Biology](#), we have two protocols that can be used in forensic investigations.

When individuals touch objects or other individuals, they can transfer cellular material that contains traces of DNA. But recovering this DNA from a forensic sample is like finding a needle in a haystack. Therefore, [Grüner et al.](#) use a targeted approach, zeroing in on potential biological material under a microscope, and amplifying DNA microsatellite markers called short tandem repeats (STRs). Using bioparticles collected from various objects, they successfully obtain useful genetic profiles from "touch DNA" evidence.

Also in [JoVE Biology](#), scientists have been collecting blood on filter paper for diagnostic and forensic analyses for over a century. But after all this time, protocols for preparing and processing dried blood spots remain poorly standardized. So [Farash et al.](#) present a comprehensive, step-by-step protocol for collecting blood, preparing blood spots; drying and storing the filter papers, and eluting the blood for analysis. They demonstrate the effectiveness of this protocol by detecting markers of various viral infections on an automated analytical platform, and in a pilot study for detecting viral infections in active drug users.

In [JoVE Bioengineering](#), all the extrinsic "noise" in living cell systems can complicate the study of specific cellular processes. So scientists use cell-free systems to study the dynamics of biological reactions, such as the intrinsic noise of protein synthesis. [Norred et al.](#) present a microfabricated device that can confine cell-free protein synthesis to femtoliter-scale reaction volumes. They demonstrate how to use this device to measure the noise of protein expression in a confined cell-free environment.

You've just had a sneak peek of the [March 2015 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 <https://www.jove.com/video/5702/>

Protocol

Dried Blood Spots — Preparing and Processing for Use in Immunoassays and in Molecular Techniques

Nico Grüner, Oumaima Stambouli, R. Stefan Ross

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The preparing and processing of dried blood spots (DBS) for their final analysis are still poorly standardized for most diagnostic applications. To overcome this shortcoming, a comprehensive step-by-step protocol is suggested and subsequently evaluated with regard to its effectiveness for detecting markers of viral infections.

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.

Enhanced Genetic Analysis of Single Human Bioparticles Recovered by Simplified Micromanipulation from Forensic 'Touch DNA' Evidence

Katherine Farash^{1,2}, Erin K. Hanson³, Jack Ballantyne^{1,2,3}

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Here we describe an optimized and efficient removal strategy for the collection of bio-particles present in 'touch DNA' samples, together with an enhanced amplification protocol involving a one-step 5 µl micro-volume lysis/STR amplification, to permit the recovery of short tandem repeat (STR) profiles of the bio-particle donor(s).

Sealable Femtoliter Chamber Arrays for Cell-free Biology

Sarah Elizabeth Norred^{1,2}, Patrick M. Caveney^{1,2}, Scott T. Retterer^{1,2}, Jonathan B. Boreyko^{1,2}, Jason D. Fowlkes^{2,3}, Charles Patrick Collier², Michael L. Simpson^{1,2,3}

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A microfabricated device with sealable femtoliter-volume reaction chambers is described. This report includes a protocol for sealing cell-free protein synthesis reactants inside these chambers for the purpose of understanding the role of crowding and confinement in gene expression.

Disclosures

No conflicts of interest declared.