

**ARS Research Update**  
for  
**National Grape and Wine Initiative Board**  
April 18, 2012

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**Sally Schneider**

# Welcome Back!



**Organizational Overview**



**Introductions**



**Research Highlights**



**Creating the Next Success Story!**

**Secretary  
Deputy Secretary**

**Chief Financial Officer**

**Inspector General**

**General Counsel**

**Executive Operations**

**Director of Communications**

**Chief Information Officer**

**Under Secretary for Natural Resources and Environment**

Forest Service  
Natural Resource Conservation Service

**Under Secretary for Farm and Foreign Agricultural Services**

Farm Service Agency  
Foreign Agricultural Service  
Risk Management Agency

**Under Secretary for Rural Development**

Rural Utilities Service  
Rural Business-Cooperative Service  
Rural Housing Service

**Under Secretary for Food, Nutrition, and Consumer Services**

Food and Consumer Service

**Under Secretary for Food Safety**

Food Safety and Inspection Service

**Under Secretary for Research, Education and Economics**

Agricultural Research Service  
National Institute for Food and Agriculture  
Economic Research Service  
National Agricultural Statistics Service

**Assistant Secretary for Congressional Relations**

Office of Congressional Relations  
Office Intergovernmental Relations

**Under Secretary for Marketing and Regulatory Programs**

Agricultural Marketing Service  
Animal and Plant Health Inspection Service  
Grain Inspection, Packers and Stockyards Administration

**Assistant Secretary for Administration**

Human Resources Management  
Office of Operations  
Administrative Law Judges  
Judicial Officer  
Board of Contract Appeals  
Property and Procurement Management  
OSDBU

**Assistant Secretary for Civil Rights**

Office of Civil Rights  
Office of Outreach  
USDA/1890 Programs  
Conflict Prevention and Resolution Center



# Implementation

Administrator

OFFICE OF  
NATIONAL  
PROGRAMS

National planning  
and coordination  
to meet  
Congressional  
directives

AREA DIRECTOR

Managing funds,  
personnel, facilities

OFFICE OF  
TECHNOLOGY  
TRANSFER

Managing  
intellectual  
property

Research Leader  
Lab Director

Scientist

# Office of National Programs

 **Acting Associate Administrator - Molly Kretsch**

 **Deputy Administrators**

 **Kay Simmons, Crop Production & Protection**

 **Steve Kappes, Animal Production & Protection**

 **Steve Shafer, Natural Resources & Sustainable Agricultural Systems**

 **Molly Kretsch, Nutrition, Food Safety, & Quality**

# ARS National Programs

## Animal Production

Food Animal  
Production

Animal Health

Arthropod Pests of  
Animals and Humans

Aquaculture

## Natural Resources

Water Availability &  
Watershed  
Management

Soil Resource  
Management

Climate Change,  
Soils, & Emissions

Pasture, Forage and  
Range Land  
Systems

Agricultural and  
Industrial  
Byproducts

Agricultural  
Systems  
Competitiveness &  
Sustainability

Bioenergy

## Crop Production

Genetic Resources,  
Genomics and  
Genetic  
Improvement

Plant Diseases

Crop Protection &  
Quarantine

Crop Production

Methyl Bromide  
Alternatives

## Human Nutrition

Human Nutrition  
Food Safety  
(Animal & Plant  
Products)

New Uses,  
Quality &  
Marketability of  
Plant & Animal  
Products



# Crop Production & Protection



**Peter Bretting – Genetics and Genetic Resources**



**Deb Fravel – Plant Diseases**



**Kevin Hackett – Insects & Biocontrol**



**John Lydon – Weeds**



**David Marshall – Grain Crops, Acting**



**Jack Okamuro – Plant Biology & Biotechnology**



**Sally Schneider – Horticulture & Crop Production**



**Roy Scott – Oilseeds & Cotton**



**Dan Strickman – Insects & Biocontrol**



**Gail Wisler – Horticulture & Viruses**

# Natural Resources & Sustainable Agricultural Systems

 **Matt Smith – Organics & Soil Management**

 **Jeff Steiner - Bioenergy**

 **Mark Walbridge - Water**

 **Charlie Walthall – Climate Change, Soils, & Emissions**

# Nutrition, Food Safety, & Quality

-  **Bob Fireovid – Quality & Utilization**
-  **John Finley – Nutrition**
-  **Dave Klurfeld – Nutrition**
-  **Jim Lindsay – Food Safety**
-  **Mary Torrence – Food Safety**

# Office of Technology Transfer



**June Blalock – Technology Licensing  
Program Coordinator**



**Jim Poulos – Technology Transfer  
Coordinator**



**Marion Ravelonandro- International  
Program Assistant**

# Retirements

-  **Judy St. John – Associate Administrator, Office of National Programs**
-  **Ken Vick – NPL, Postharvest Entomology**
-  **Mike Shannon – NPL, Water**
-  **Frank Flora – NPL, Quality & Utilization**

# USDA- ARS Input

Executive and  
Legislative Branch



Customers,  
Partners & Stakeholders →

**ARS  
Program &  
Budgeting  
Priorities**

← Agency  
Scientists &  
Managers



Scientific Communities

# Research Highlights

# High Resolution Computed Tomography

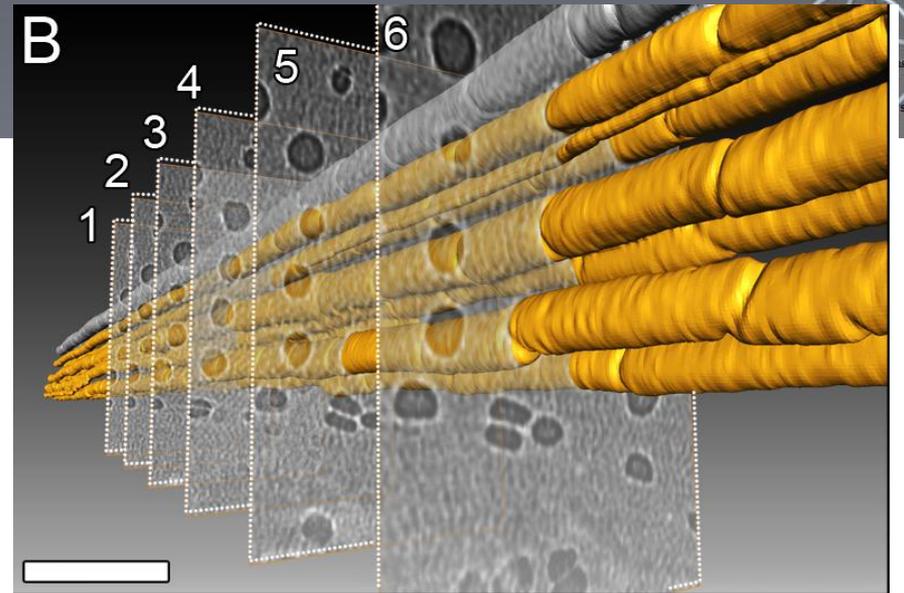
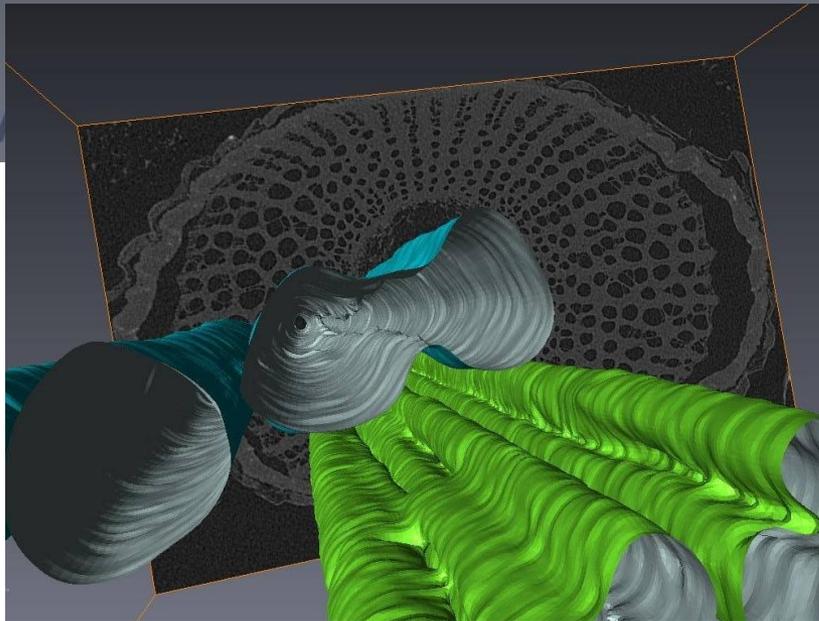
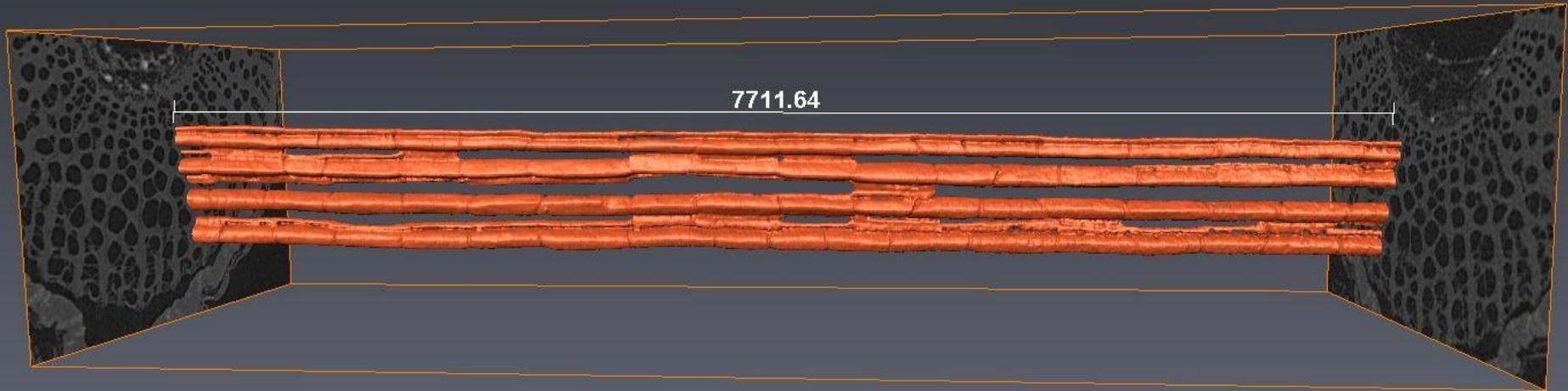
A CAT Scan for Grapevines



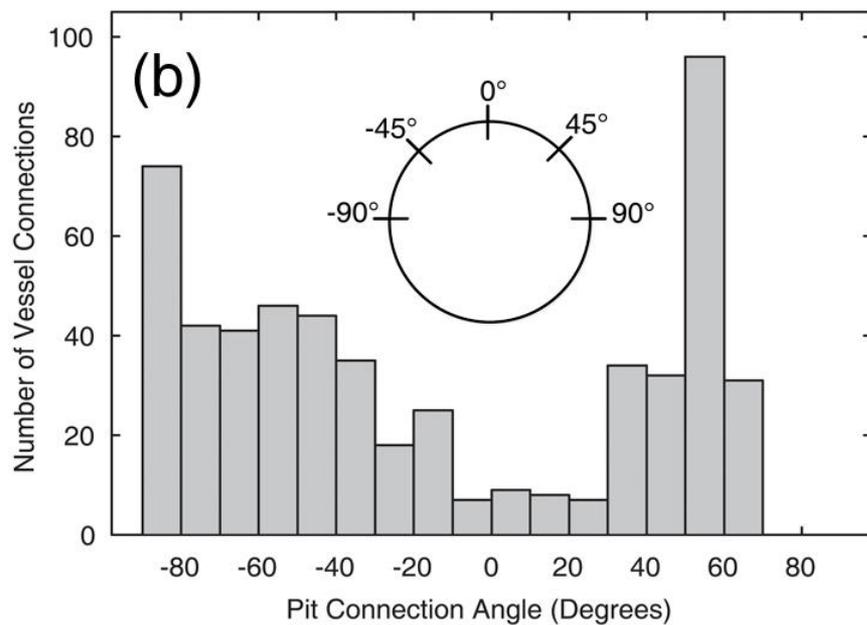
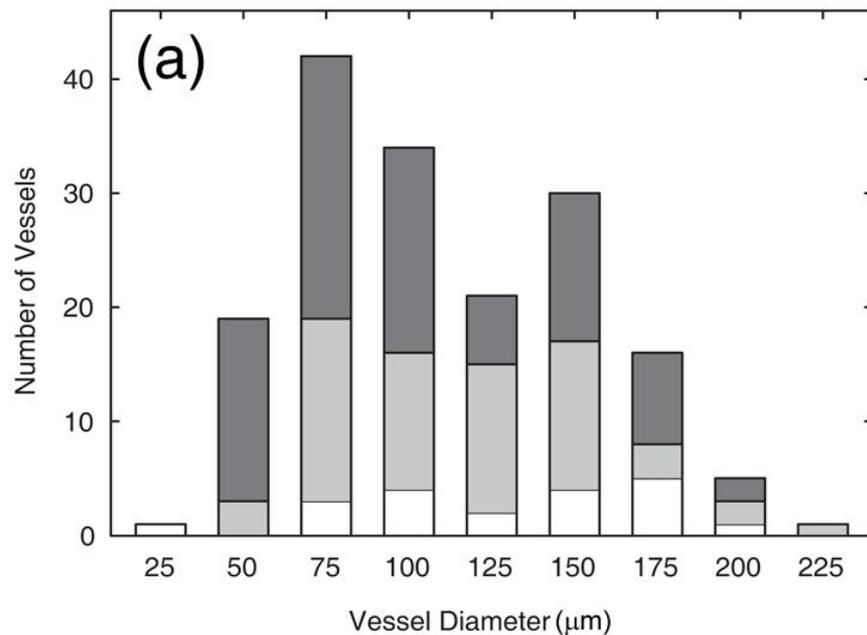
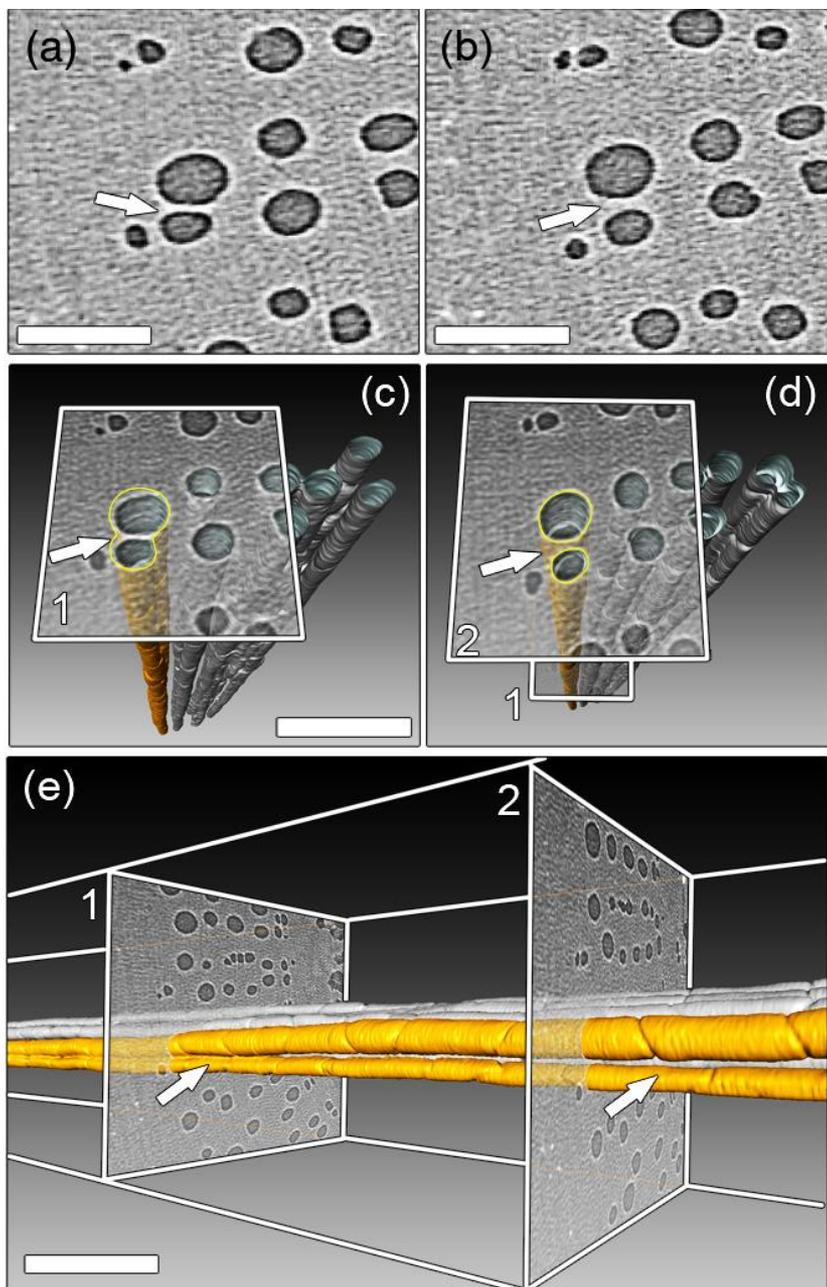
# Advanced Light Source Synchrotron—LBNL, Berkeley, CA

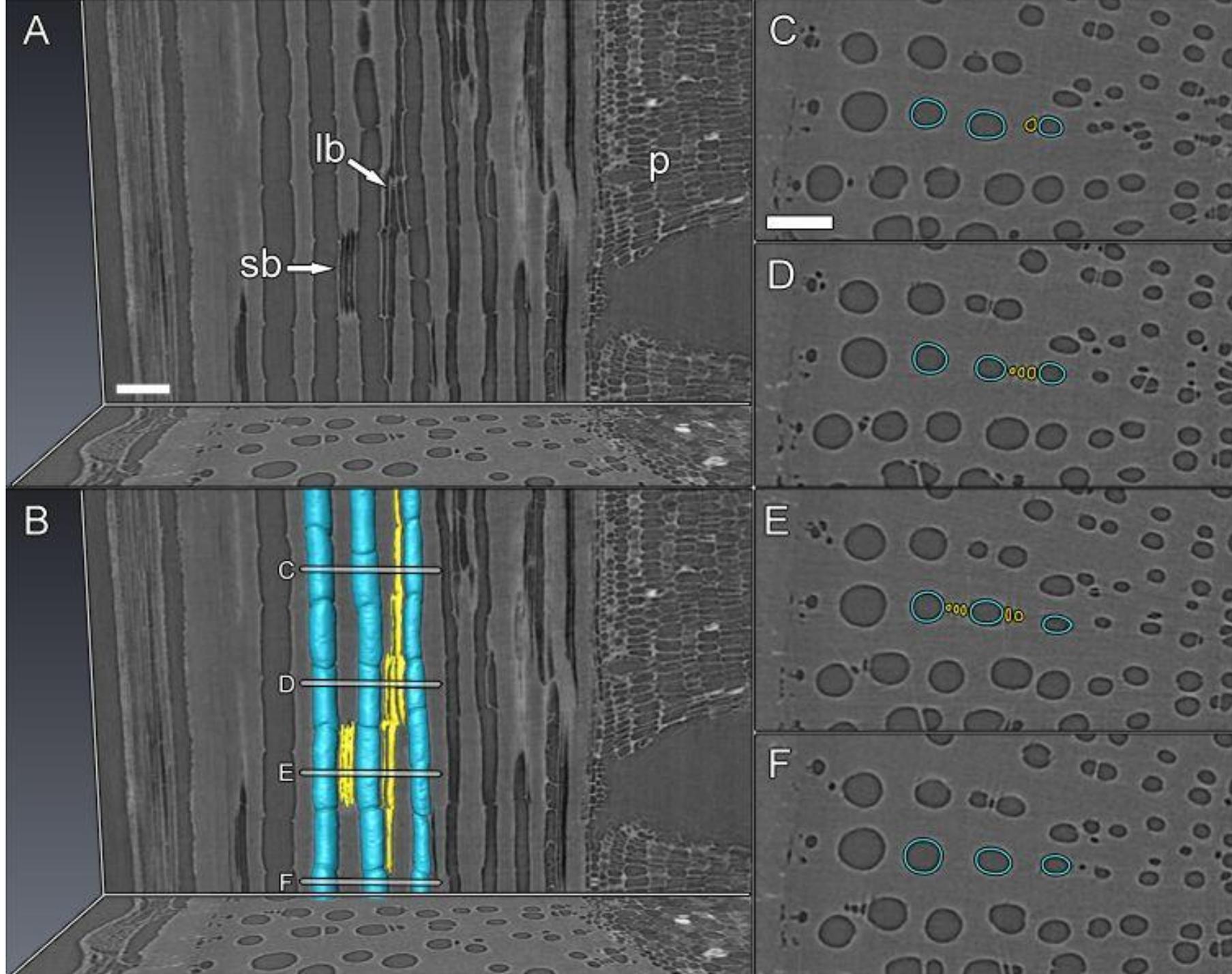


# Examples of Grapevine Xylem

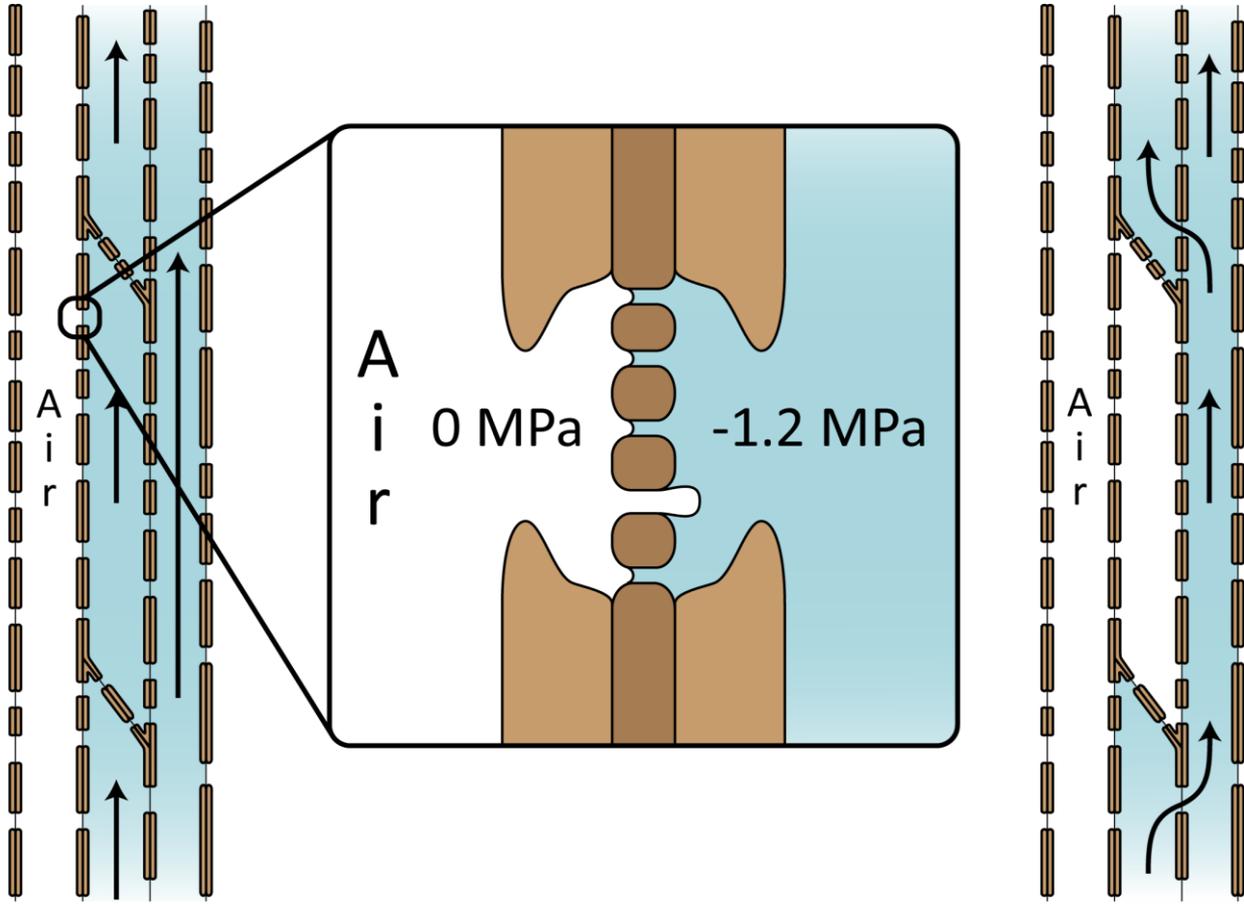


# TANAX- Tomography-based Automated Network Analysis for Xylem

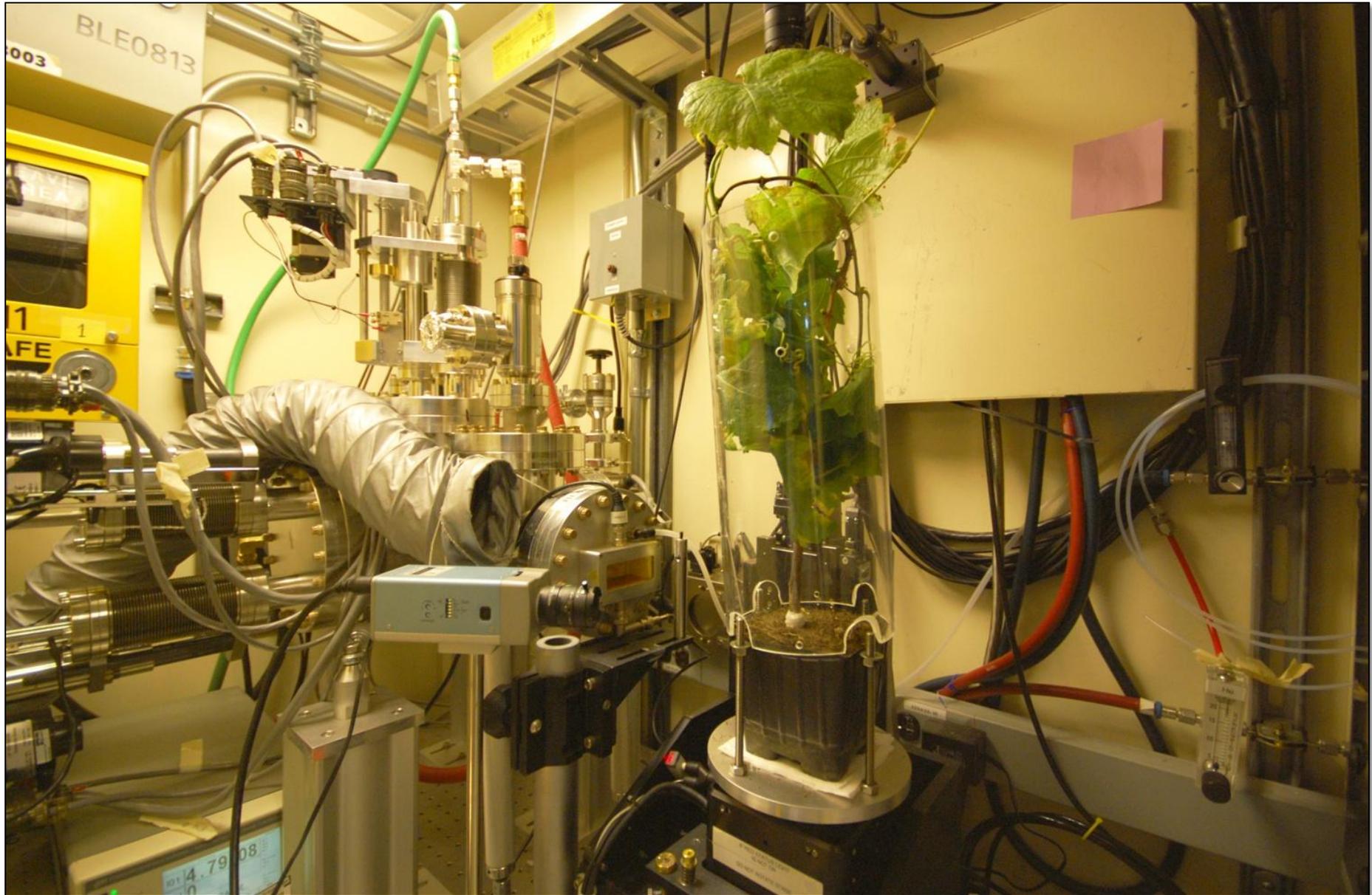


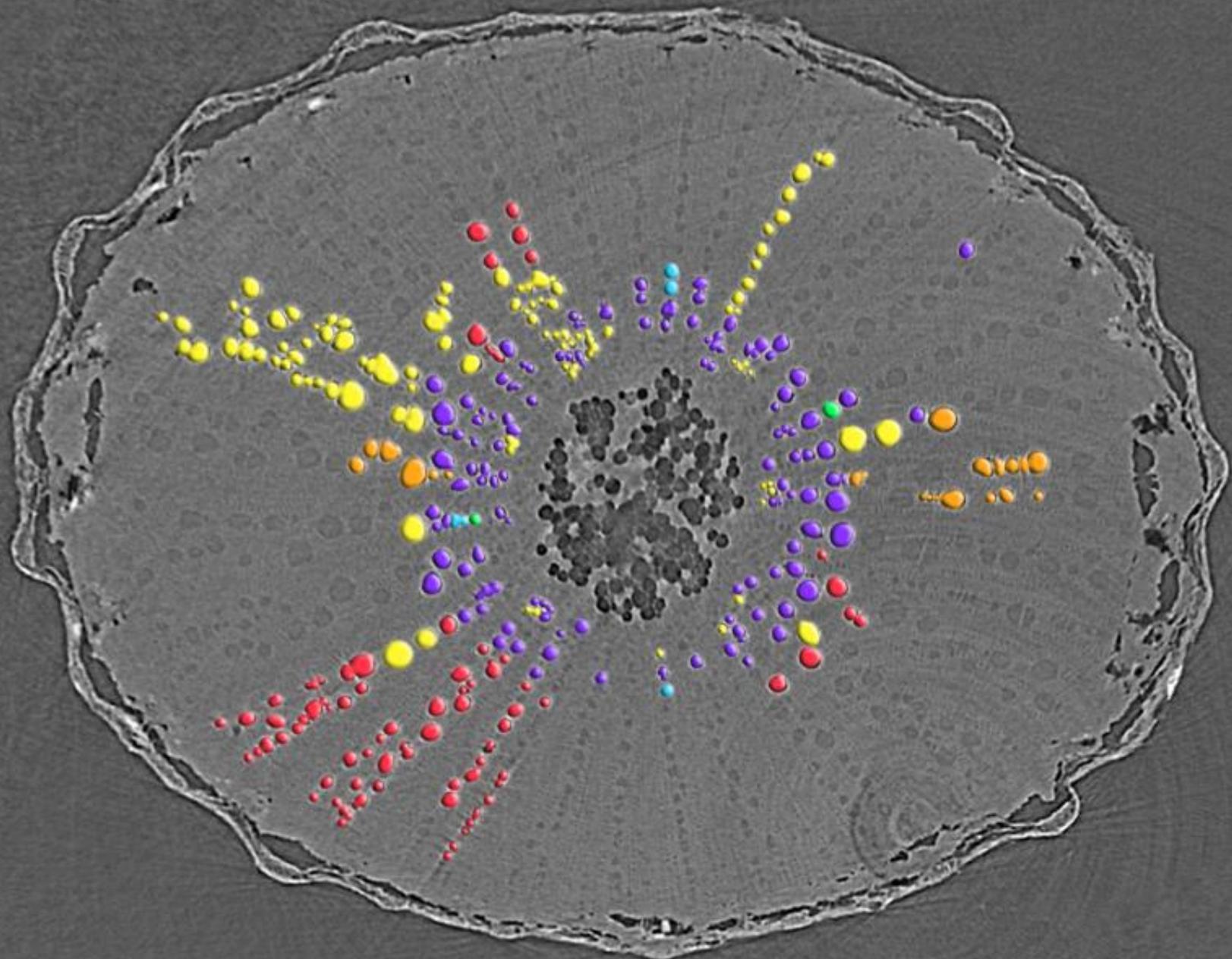
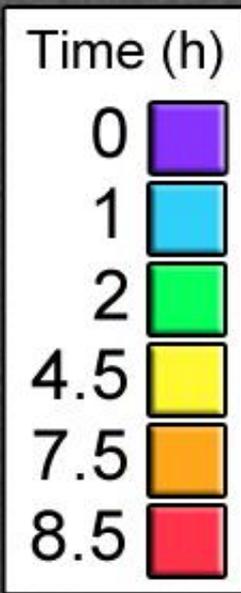


# Embolism Propagation through Pit Membranes



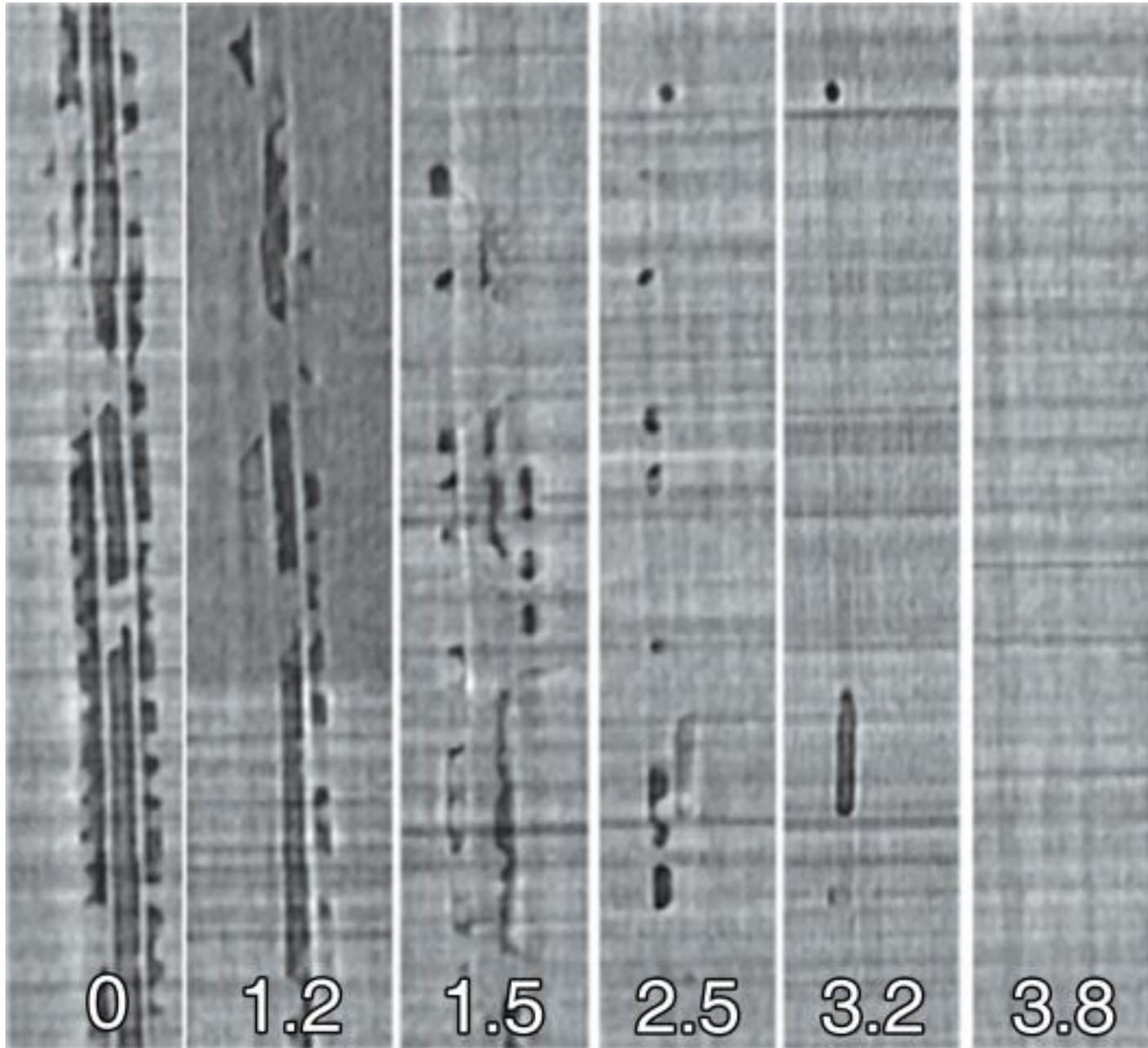
# Live, Potted Grapevine in the HRCT system





Brodersen *et al* unpublished data

# Embolism repair in grapevines



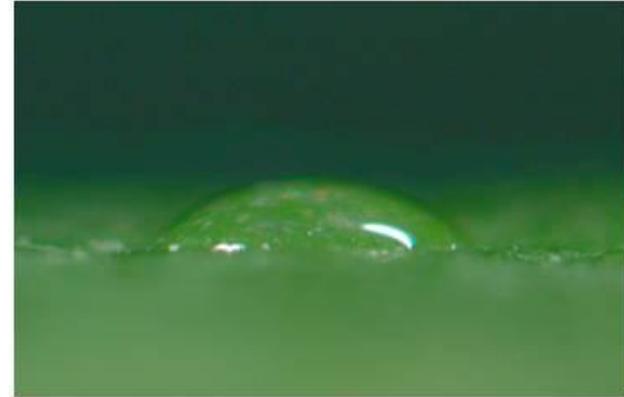
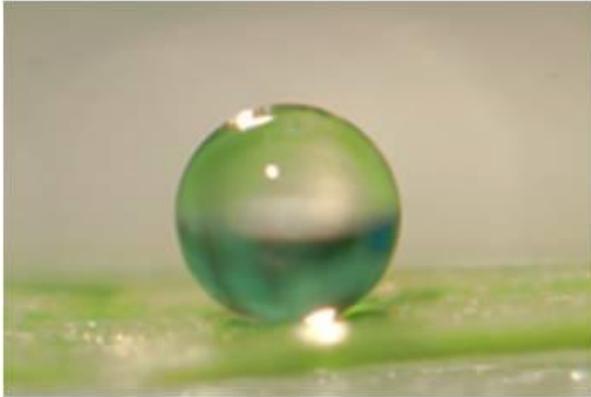
# **Application Technology Research Unit**

**Wooster, OH**

# Comprehensive application technology and strategy to reduce pesticide use



# Droplet behaviors on leaves



# Variable Rate Sprayer



# Application System for Entomopathogenic Nematodes



# **Automation & Mechanization for Fruit Trees**

**Kearneysville, WV**



# Automation and mechanization are essential for economic sustainability in tree fruit production



**High density peach orchards for mechanization**



**Computer vision that locates fruit**



**Over-the-row sprayers**



**Mechanical fruit thinner**



**Computer vision of tree form to aid mechanical pruning**

**Automated practices**



# One area of emphasis - Mechanized thinning

**Problem:** Removal of excess flowers or young fruit (thinning)

**Action:** Developed and demonstrated a method for mechanical thinning of peach flowers and green peach fruit.



*Mechanical and chemical thinning*

**Impact:** Saving of 30% to 50% in hand thinning costs has been demonstrated for high-density peach production systems.

# A second area of emphasis - Computer Vision applied to Fruit Production Systems

- AFRS is currently working on automated dormant pruning.
- Pruning is done when the leaves are absent. The shape of the tree without leaves is the simplest that it will be all year, making automation of pruning feasible.
  - .1. Take photographs of the trees with digital cameras.
  - .2. Generate a three-dimensional model of the tree given the photographs of step 1.
  - .3. Select the pruning points according to the criteria specified by horticulturists.
  - .4. Use a robot to cut branches at the points specified.

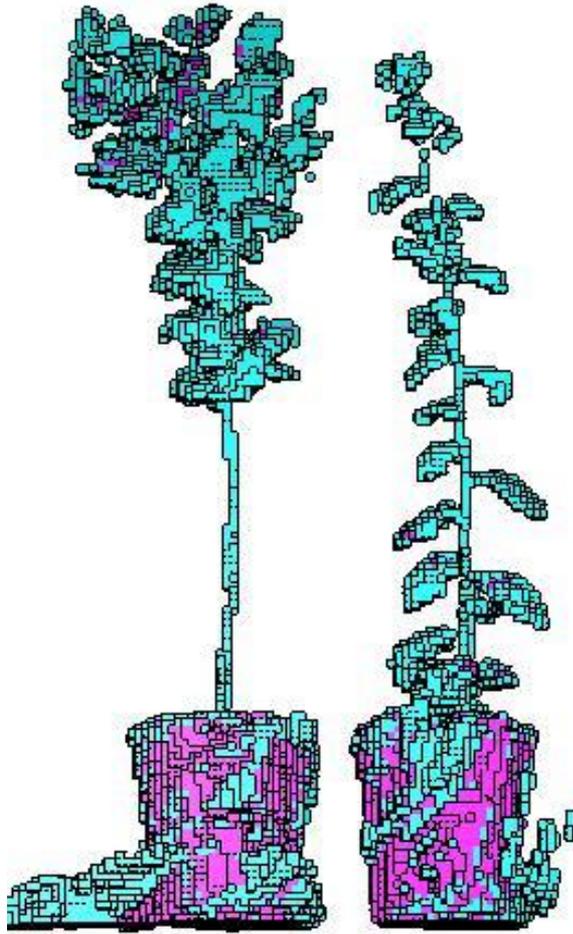


# Step 1: Acquire photographs of the tree



- Digital images of the tree from various different positions and angles are acquired.

## Step 2: Generate a 3D model of the tree from the images after preprocessing



- The tree to the left shows the 3D model of the plants from the previous [slide](#).
- Error in the preliminary image acquisition, calibration, and processing is common for agricultural objects. Research at AFRS has focused on algorithms to create representative models even when there is error.
- A question associated with this work is what level of precision is necessary in the model in order to make pruning cuts that are acceptable to growers.

# Equipment & materials in support of this program

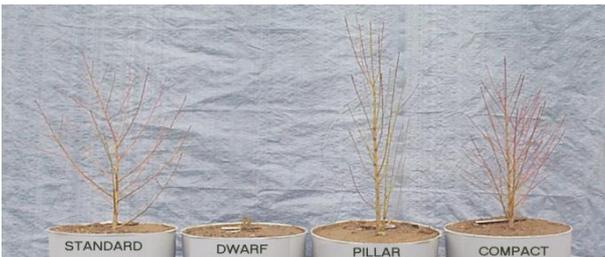
- Color and NIR/color cameras
- Robot arms and controllers, one for laboratory use and one for field use
- Mobile platform to mount robot for field operation
- Trees that complement robotics



# Knowledge of biological processes to regulate tree architecture that is compatible with high density plantings and orchard mechanization



Genetic routes



Cultural practices  
(e.g. size-controlling rootstocks)

# GENETICS, GENOMICS, AND BREEDING

-  A single dominant powdery mildew resistance gene in the Chinese grape species *Vitis rotundifolia*.
-  Position of cold hardiness genes in the grape genome.
-  Rootstock mediated gene transcription that affects fire blight disease susceptibility of apple trees.
-  'HoneySweet' plum registered by EPA.
-  Deregulation of genetically engineered (GE) Rainbow papaya in Japan

# PESTS



**Japanese beetles, a key pest of horticultural crops, paralyzed by a chemical from zonal geranium.**



**Improved fermentation process for biological insecticide.**



**Cell division regulates dormancy in root buds of leafy spurge.**

# CROP PRODUCTION

-  Cover crop residue conserves soil moisture and enhances weed control and grapevine root growth.
-  Nitrogen alters cold hardiness of nursery trees.
-  Basil polyphenolics influenced by inoculation with mycorrhizal fungi.



# OUTPUTS ARE NOT OUTCOMES

-  **Outputs are products that our research programs develop**
-  **Outcomes are what our customers do with our Outputs**
-  **Impact is the result of Outcomes**



**What Industry Needs  
(Solutions to problems)**

**Communication  
and Partnership**

**What ARS Wants  
(Researchable questions  
to solve important  
problems)**





**On to the Presentations!**

