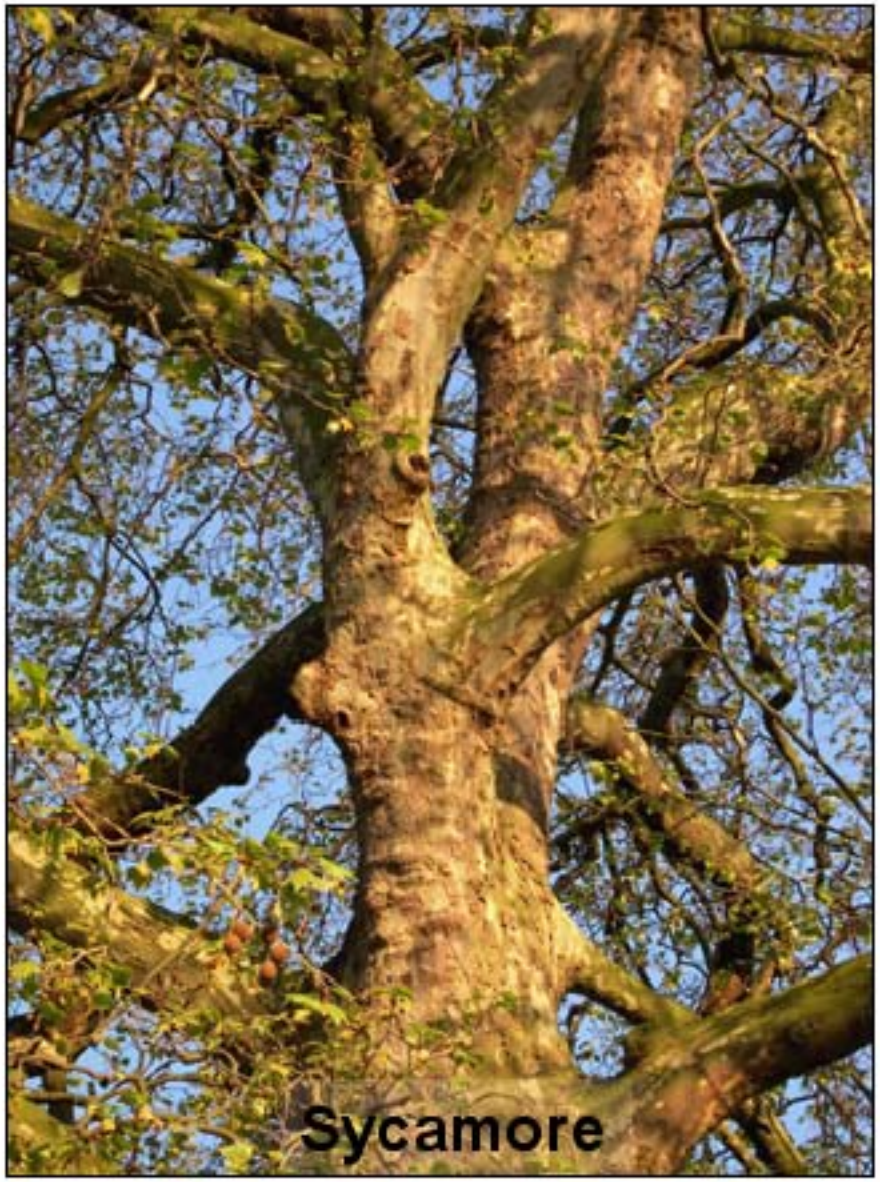


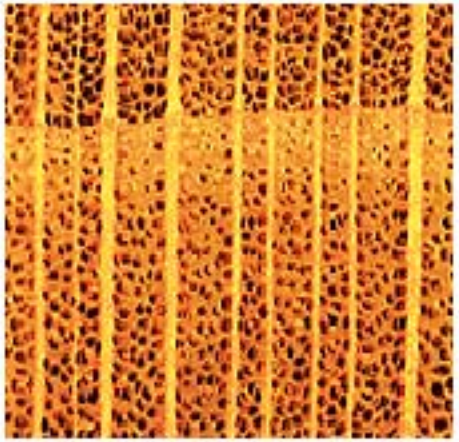
InsideWood

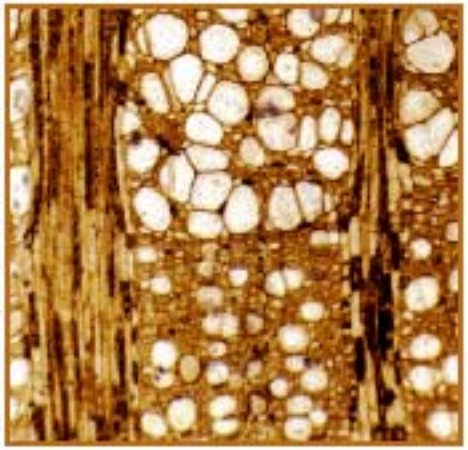
Funded by NSF's
Biological Research
Collections Program

July 1, 2003 -- June 30, 2005

NCSU Libraries

Dept. Wood & Paper Science





Background for Project

Objectives, Audience,

Background: wood anatomy database

What we've done in year 1

Web-Searchable database built

Have established collaborations

Year 2 Objectives.

Images preoccupation now

Possibilities / Opportunities

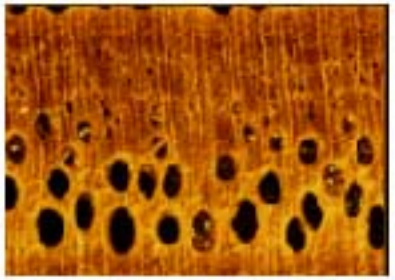
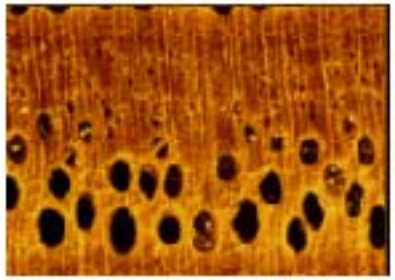
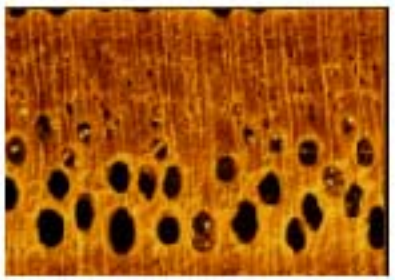
Instructional materials

Adding fossil wood database

Objective of InsideWood

Create internet accessible wood anatomy reference, research, and teaching tool.

Modern and fossil wood identification
Provides wood anatomical descriptions
Source of data for inclusion in phylogenetic analyses
Source of data for studying relationships of wood structure to climate, tree physiology, physical and mechanical properties

Who "Needs" to Identify Wood

Tree photo by Lisa Bouchet

Archaeologists,
Paleontologists,
Forensic scientists,
Customs officials,
Antique dealers,
Museum curators
Wood scientists
Forestry professionals

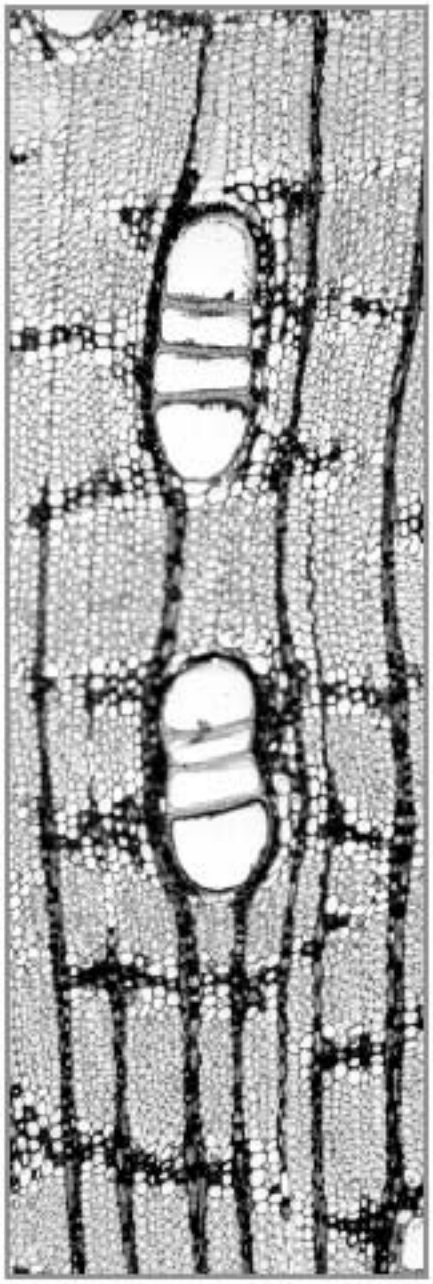
Modern Wood Database

Starting point:

Multiple entry key data (86 features)
of L. Chalk, CFI Oxford
data acquired 1930's - 1940's
for "Anatomy of the Dicotyledons"

Classic two volume set summarizing anatomical information on all families of dicotyledons. 1950

Baobab photos by Lisa Bouchet



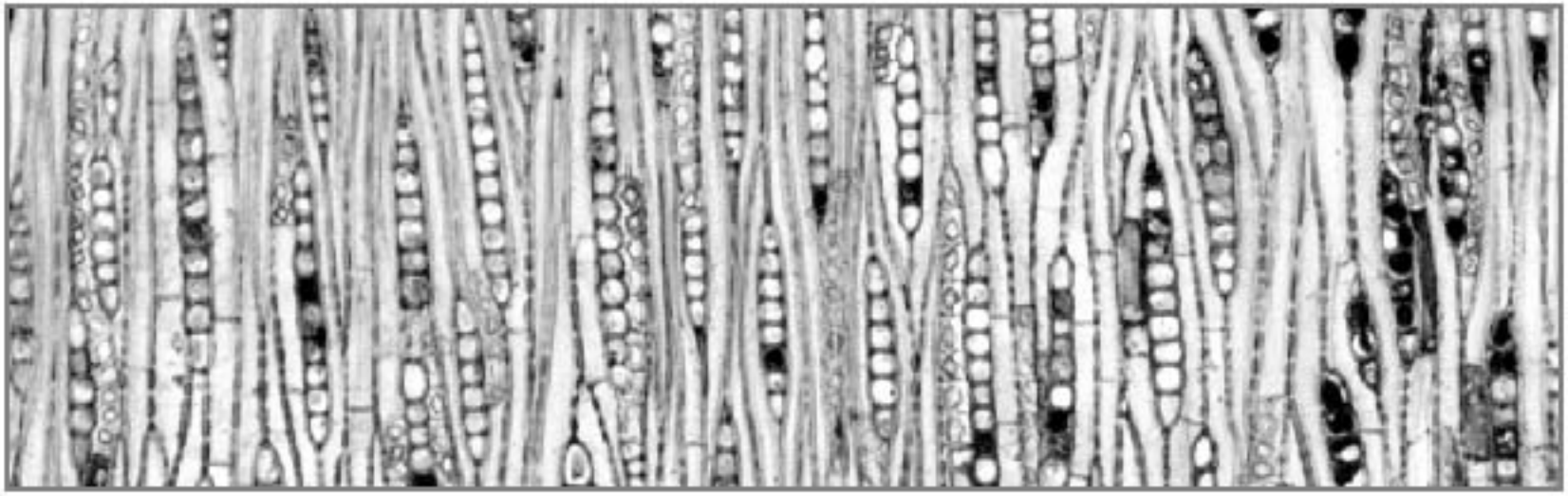
DATABASE and PROGRAMS

- 1981 computerized Chalk data in Search program PL/I on mainframe. 4700 entries.
- 1986 GUESS: Wood ID Software for PCs program in Turbo Pascal. 5200 entries. Program near-obsolete (Mac OS 9 ok, no PCs)

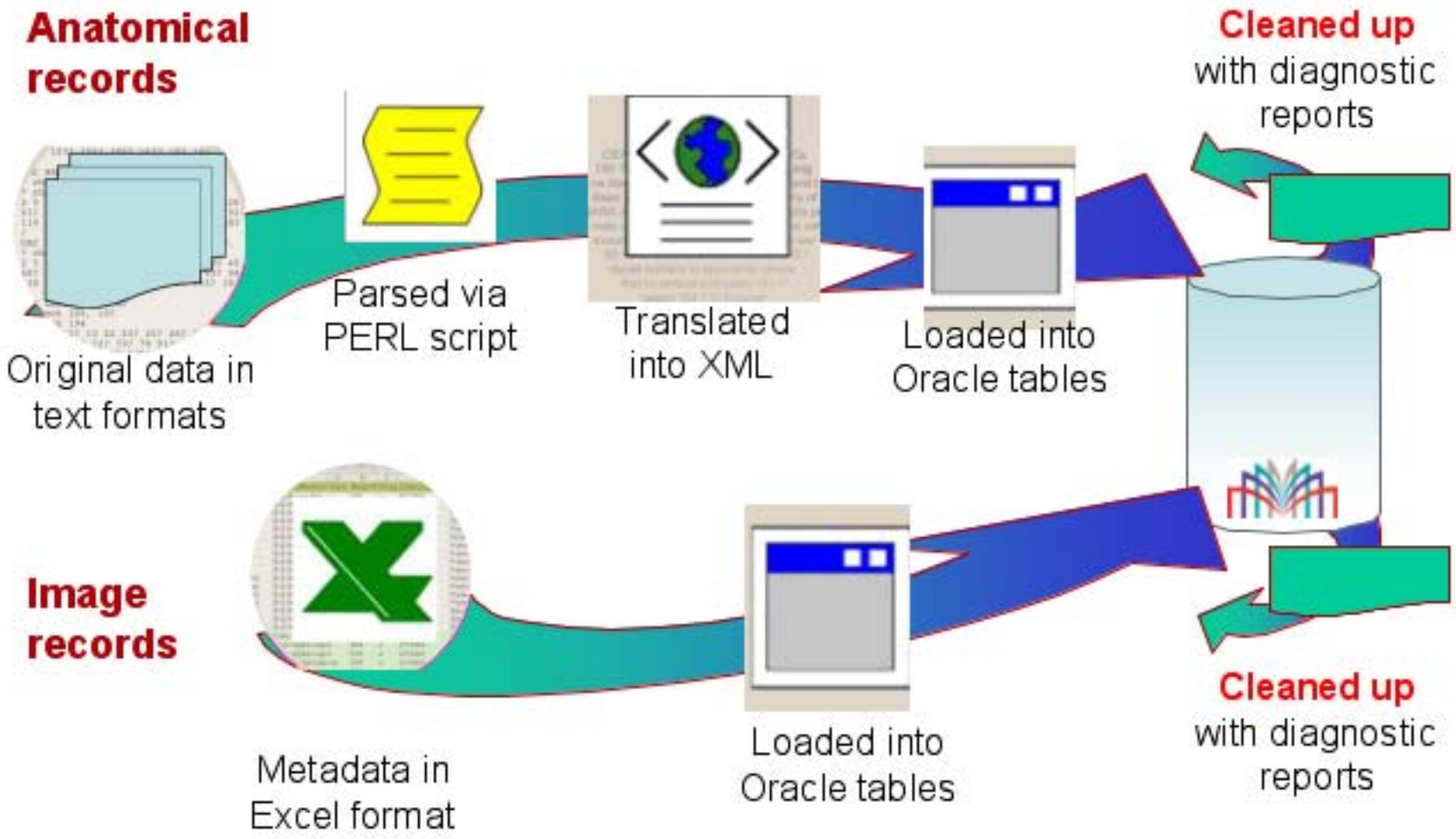
Translated Descriptions into IAWA Features

ACE Acer rubrum - ST (Red maple)
1 5 13 22 23v 26 30 36 37 40 41 48 49 53 58 61 66 68v 69v 71 72 75v 76v 78v 89v 92 93v 94v 97 98v 105 115 136 142v 182 189 192 194 196v 197

Family Genus specific epithet - citation (Common name)
List of numbers -- each number = attribute present in wood
" International Association of Wood Anatomists Features Useful for Hardwood Identification " (203 features)

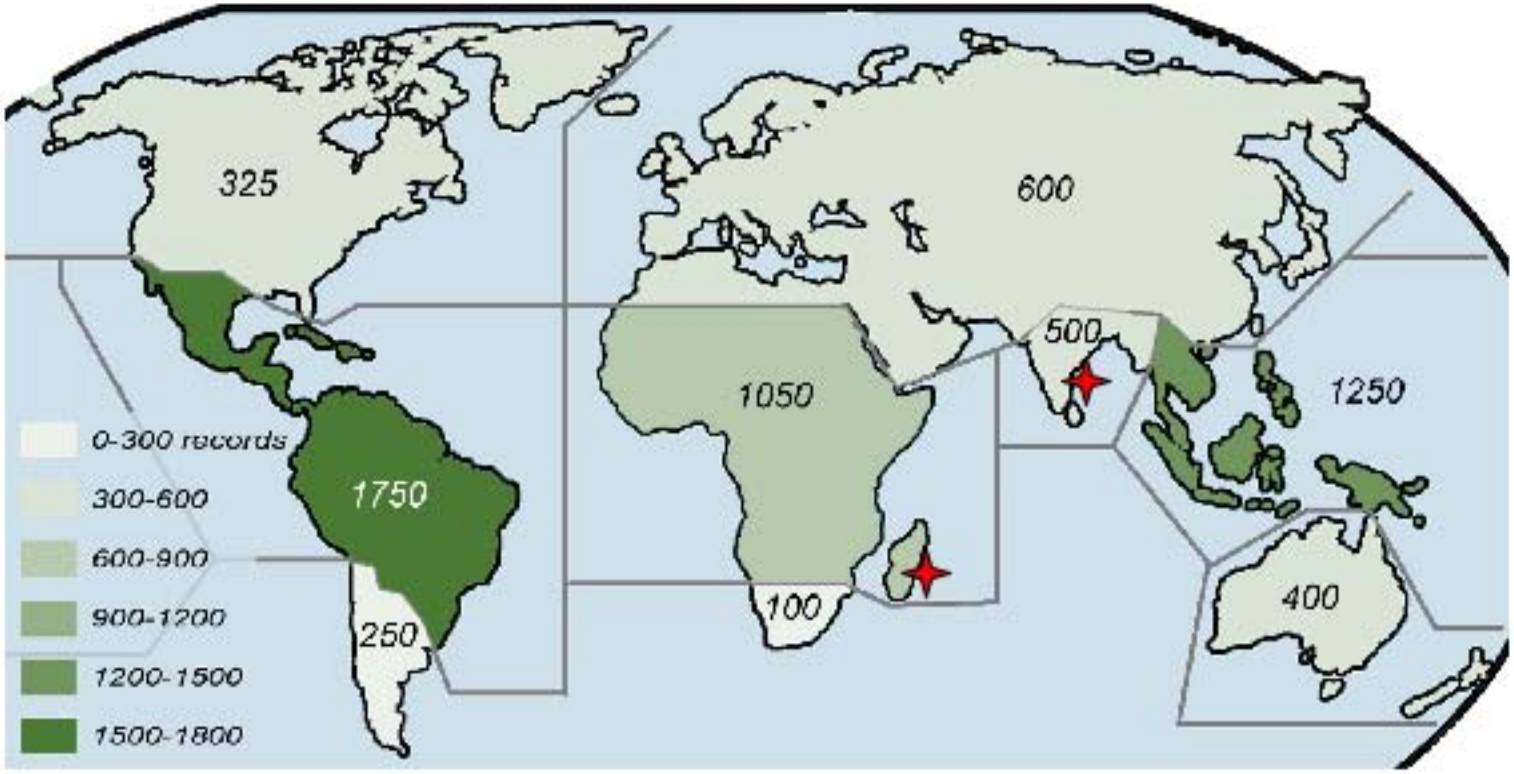


Building the Database
Year 1: Anatomical descriptions



Shirley Rodgers, Jeff Bartlett

Data : Distribution of records reflects relative regional diversity



5,500 Descriptions

> 200 families, > 2,500 genera, > 10,000 species

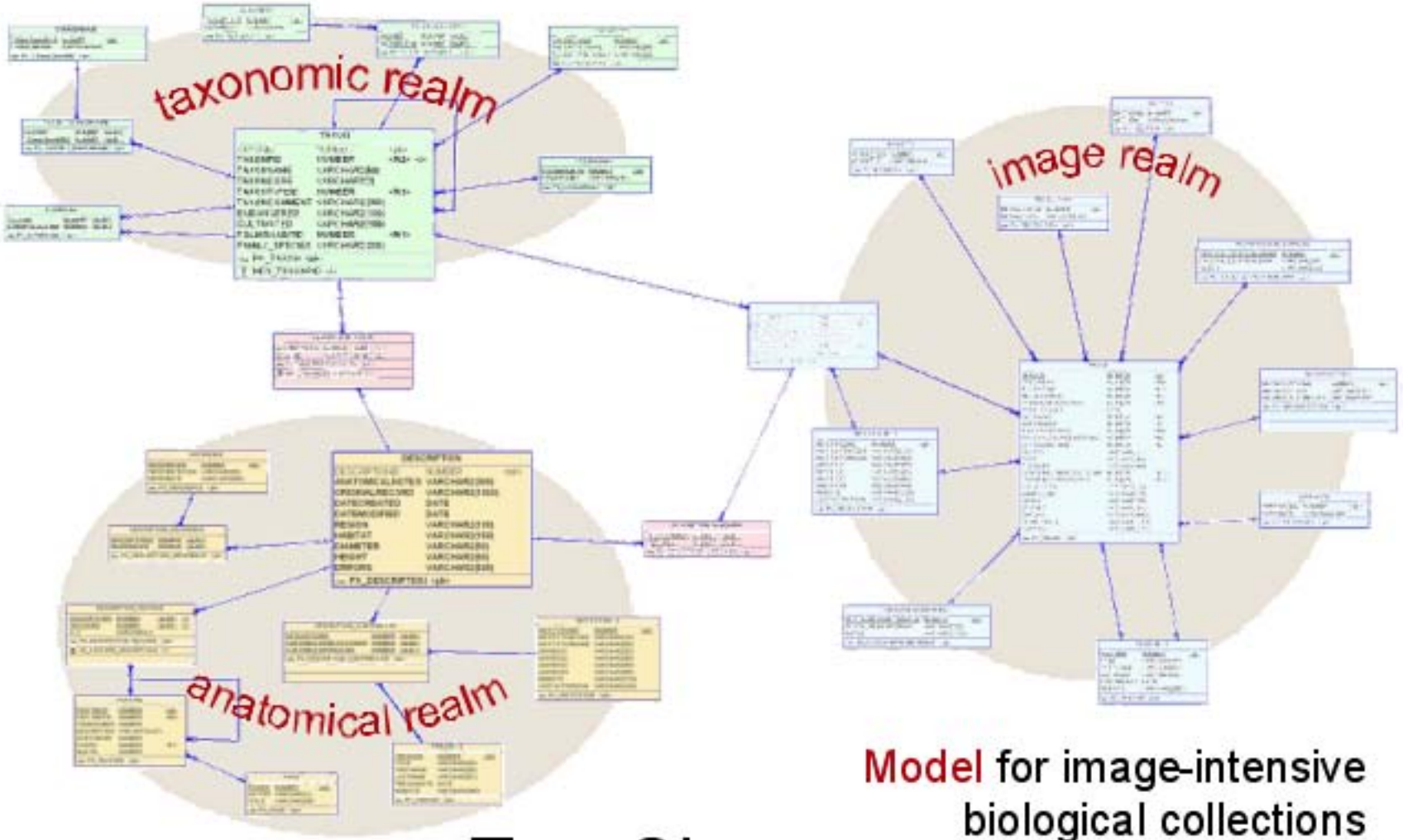
Largest database for hardwood microscopic anatomy

✦ New: Woods of Madagascar, P. Detienne, Cirad

Offered results of work now in progress on Indian woods

Data Structure

Complexly related via names, specimens, characteristics and images



Model for image-intensive biological collections

Troy Simpson

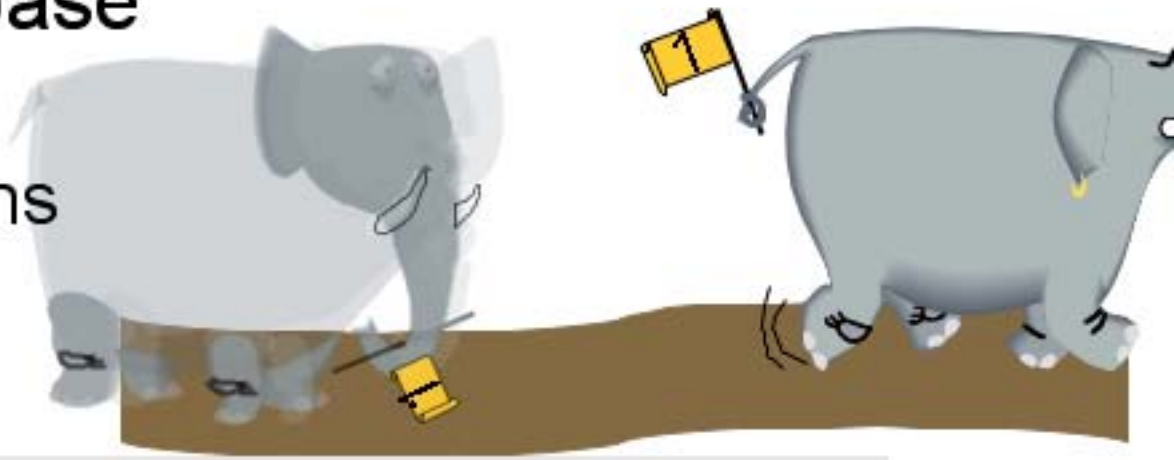
Year 1 "done"

Searchable database

however….

editing of descriptions

never-ending



http://insidewood.lib.ncsu.edu/search/

Search by IAWA features: use menus, coding of presence / absence of anatomical features

Keyword search (common name, wood collection, etc.)

Browse by family or genus

Collaboration Building

Partnerships

NORTH CAROLINA MUSEUM of NATURAL SCIENCES

Nationaal Herbarium Nederland

ROYAL BOTANIC GARDENS KEW

FFPRI Japan Forestry and Forest Products Research Institute

Contributions

CIRAD France

Africa Belgium

Germany

BFH

CSIRO, Australia
USDA FPL, Madison, WI

Komarov Institute,Russia
UNESP, Brazil

Nationaal Herbarium Nederland

Partnerships

Pieter Baas, Director, NHN

"..the freely available treasure... a unique resource...is immensely useful...the service rendered by the NSCU libraries to the international community cannot be overestimated."

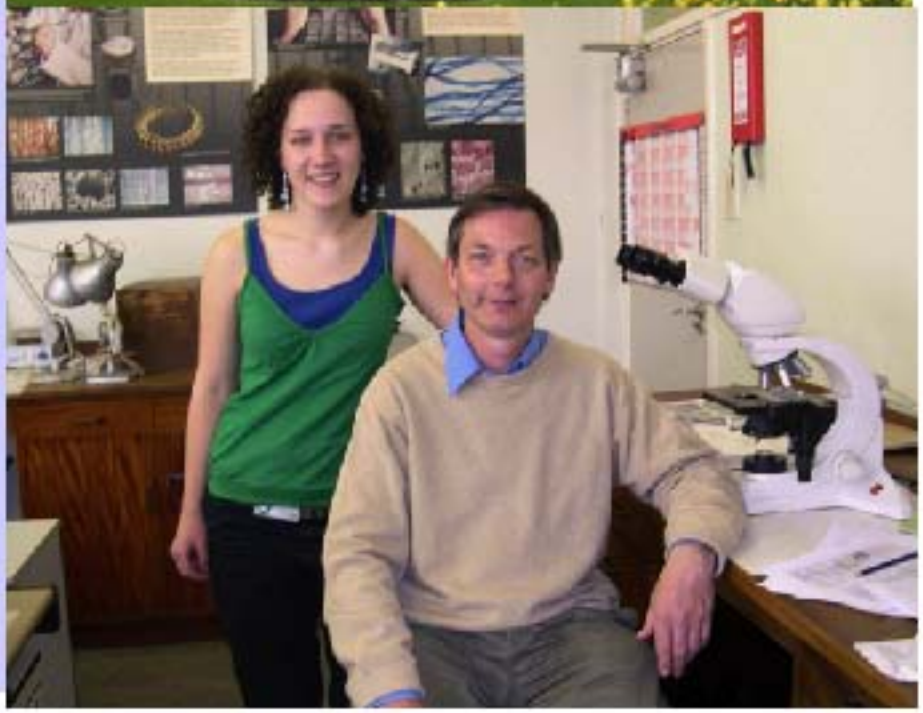
Partnerships

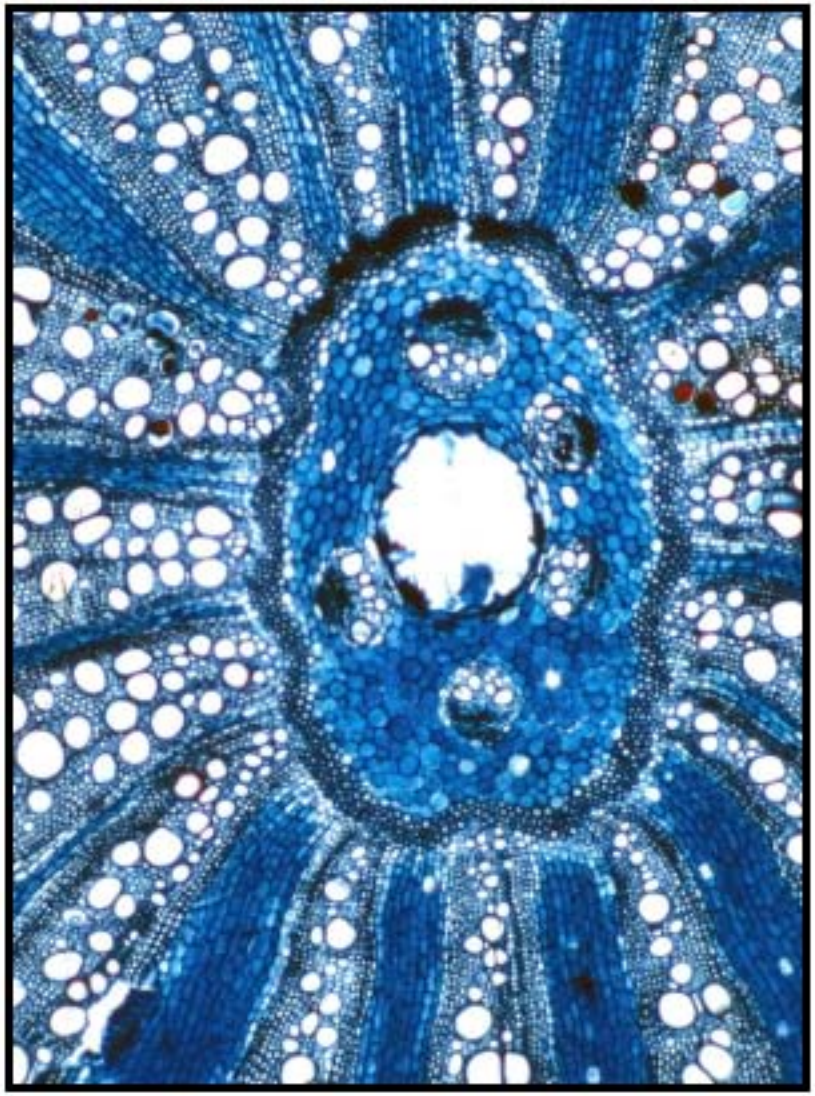
ROYAL BOTANIC GARDENS KEW

Peter Gasson, Kew, U.K.

.

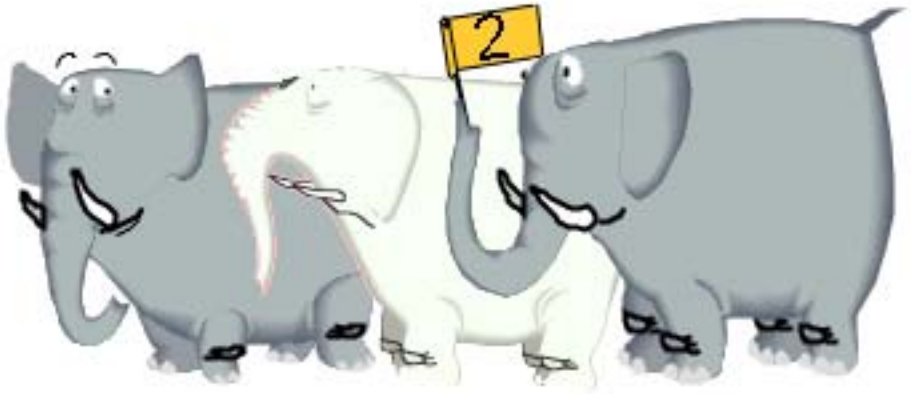
" Dear Shirley,
I'm delighted that the InsideWood database is now online. It will be an invaluable resource for years to come .. I am very aware of and grateful for the collaboration and coordination of the NCSU libraries and their hosting the database. ..
Congratulations.





Year 2 in progress

- image collection internet-accessible
- website spiffied
- incorporate new contributions
- administrative interface
- information sharing (publications) and library standards



Digitizing Images
Initially to use for 8 a.m. required class (FR, SO)

Wood is an ordered tissue.

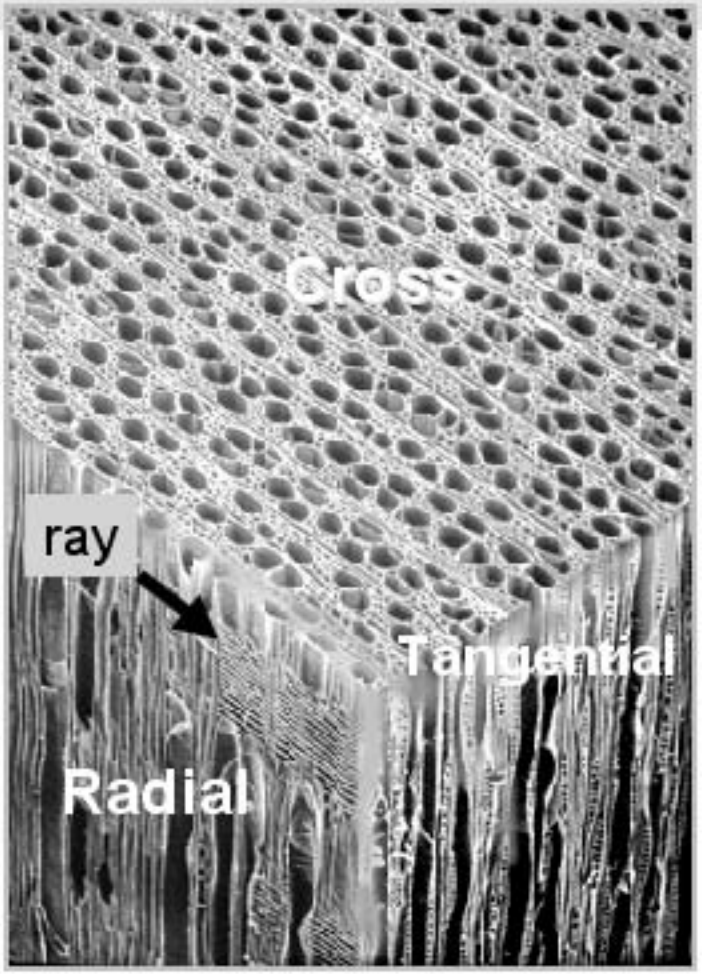
longitudinally oriented cells (along the grain) hollow tubes, length and width vary with tree type

and

rays: aggregations of radially oriented cells, extend from bark toward center of tree

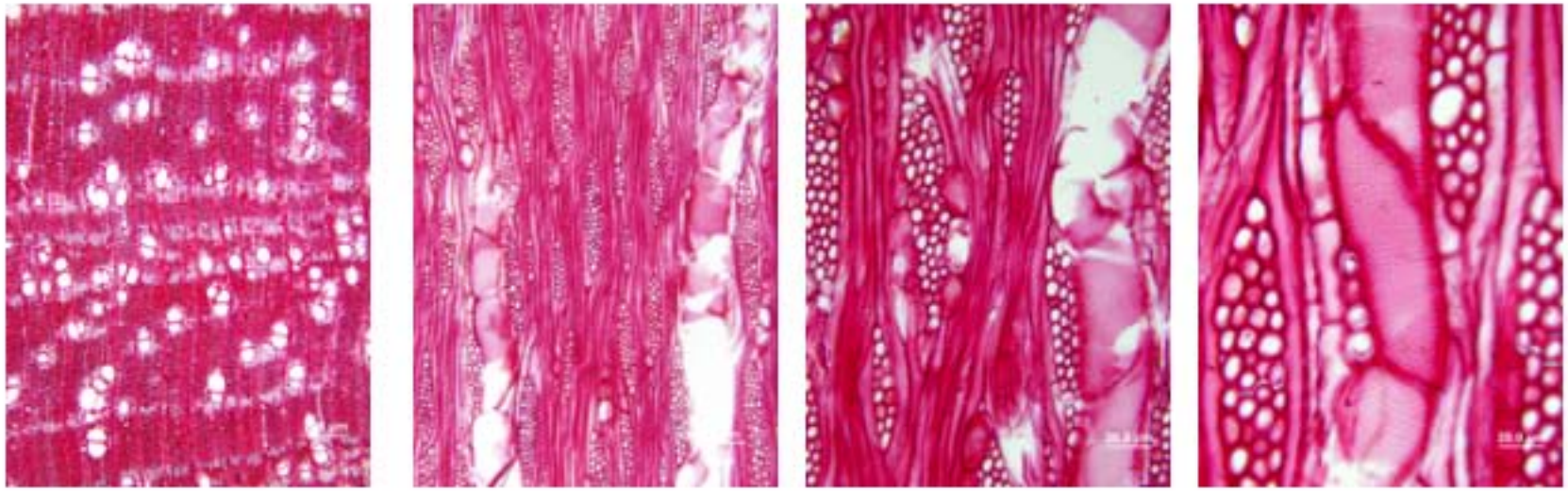
Functions:

Water conduction roots to leaves, support, food storage



SWEETGUM. *Liquidambar styraciflua.*
Scanning Electron Microscope View
Photo courtesy of SUNY

Minimum of Three Light Microscope Images Per species Needed to Illustrate Diagnostic Features



Cross section: 4x lens. Tangential sections: 10x, 20x, and 40x lenses

***Chrysophyllum oliviforme*, native to Florida, Endangered**

From Project I Collection. BWCw 831.
Documenting wood structure of US woody plants.

The American Woods:

Exhibited by actual specimens with copious notes

By Romeyn B. Hough

Images : stats

Now archived: 22,105

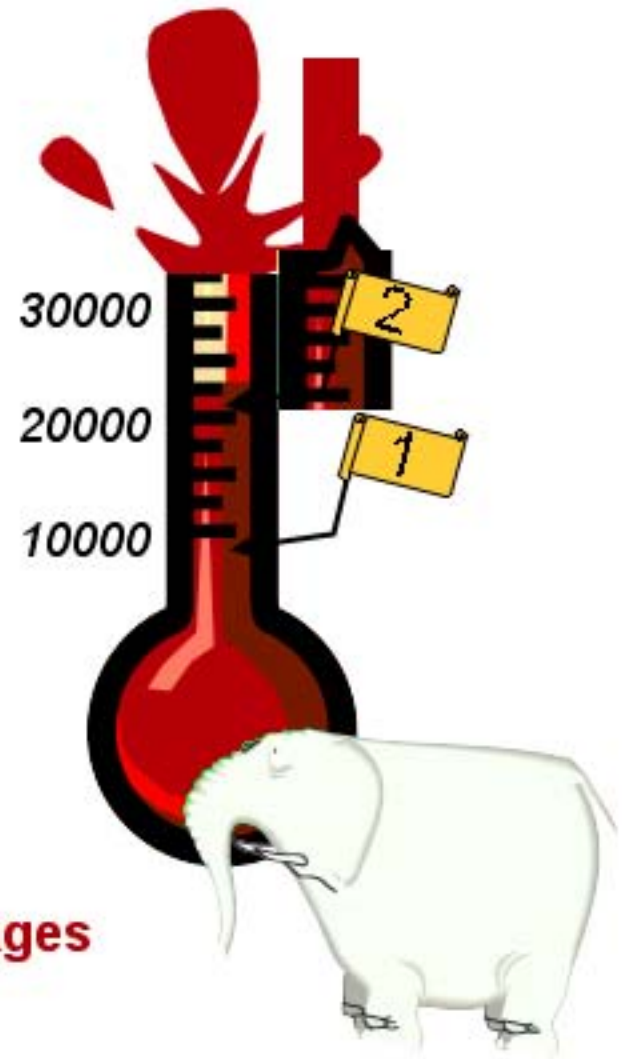
6300 University of Utrecht, NL
4250 NCSU, Kew, Tokyo, Hamburg +
875 fossil collection (EW) +
900 Hough collection
900 Afrikamuseum Tervuren, Belgium
800 new digital images (EW)
8000 CSIRO, Australia

In hand, now being scanned:
2000 Mennega collection, NHN +
500 R. Miller, USDA FPL +

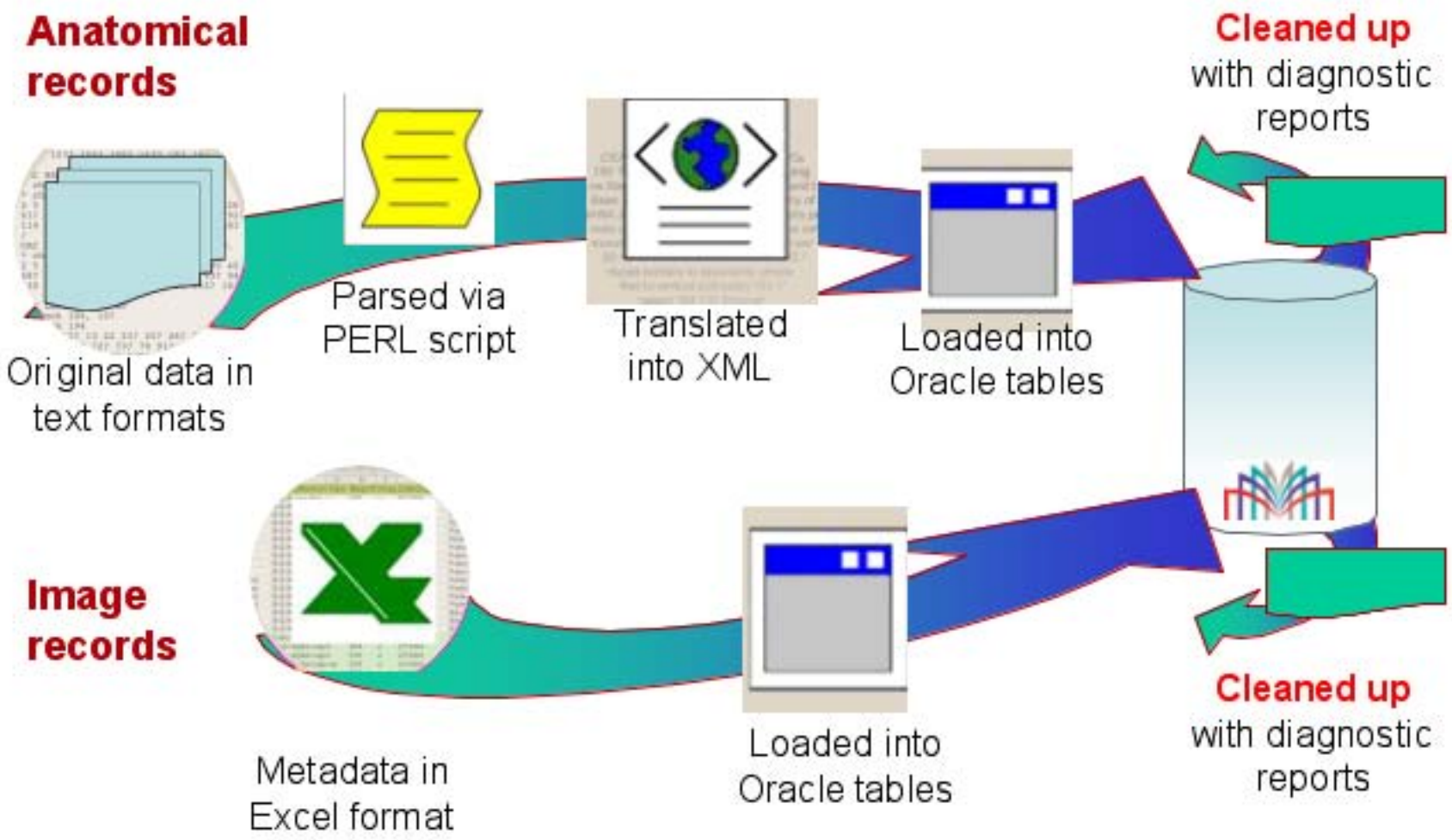
Maybe more:
7000? CSIRO glass negatives +
7500 Tervuren +
500? FFPRI, Japan
2000? CIRAD, France +
1000? S. Jansen, F. Lens, Belgium +

+ not digital to start

Potential 39,000 + images

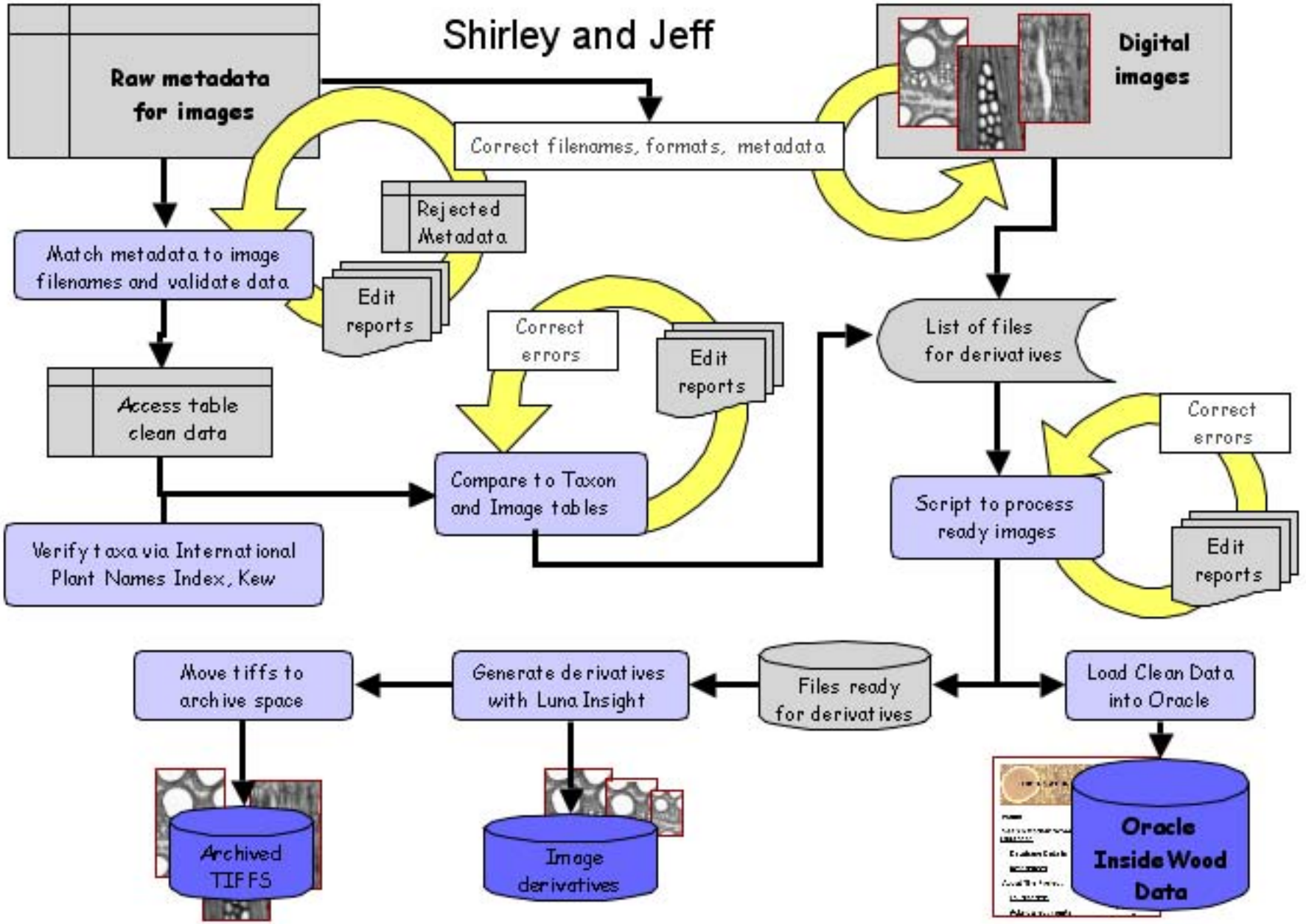


Building the Database
Year 2: Images



Shirley Rodgers, Jeff Bartlett

Integration Process for Image files and Metadata



Interface

Year 2 work:
Image retrieval and manipulation

5059 images loaded
22 Feb. 2005

User queries
retrieve linked
data and images

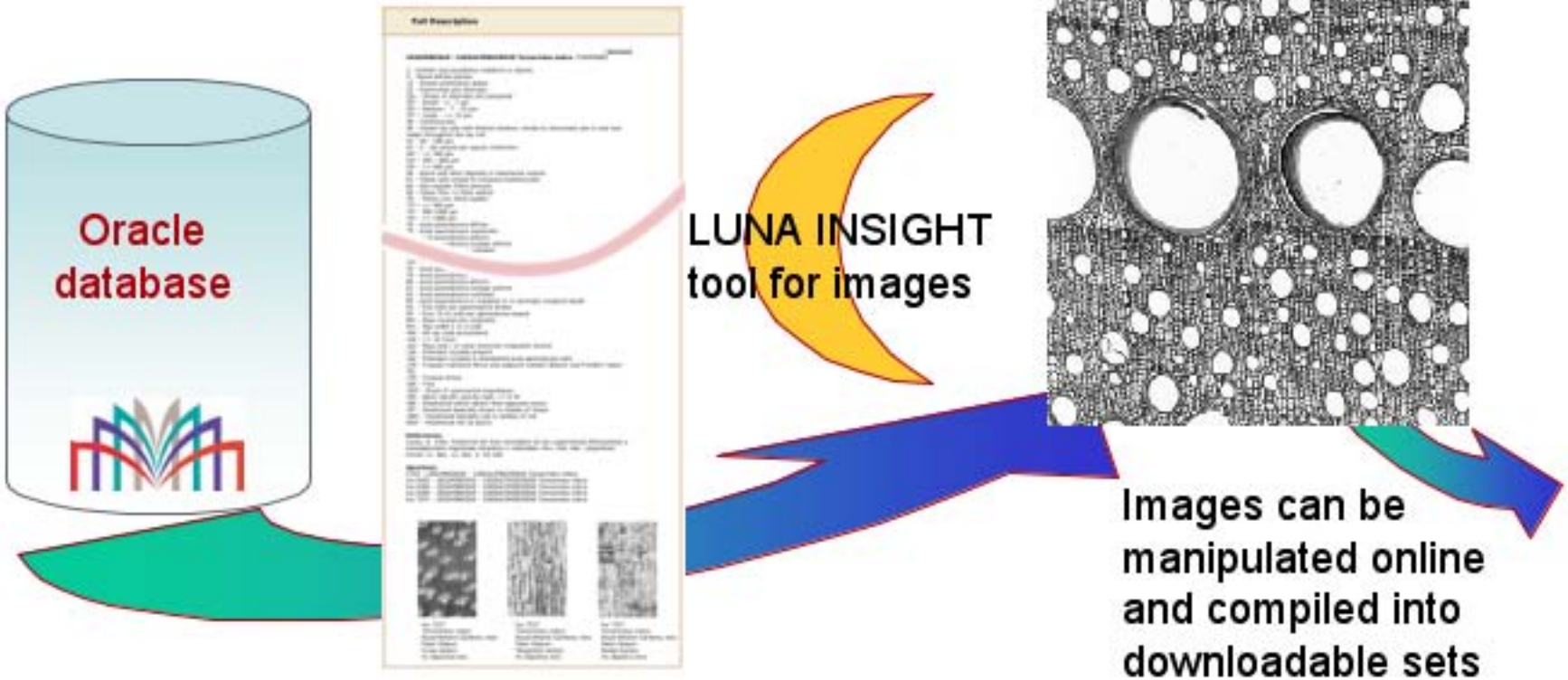
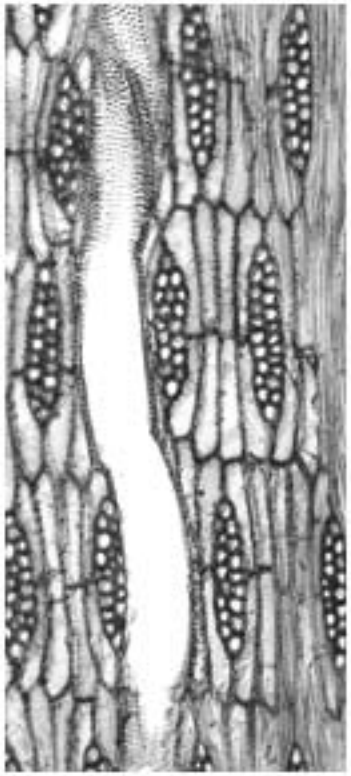


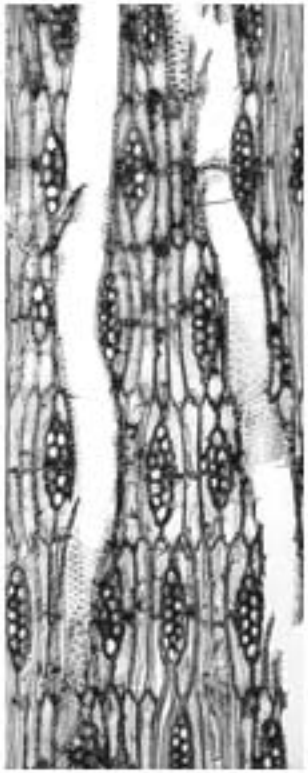
Photo by Pieter Baas, NHN, Netherlands,

Images for Teaching

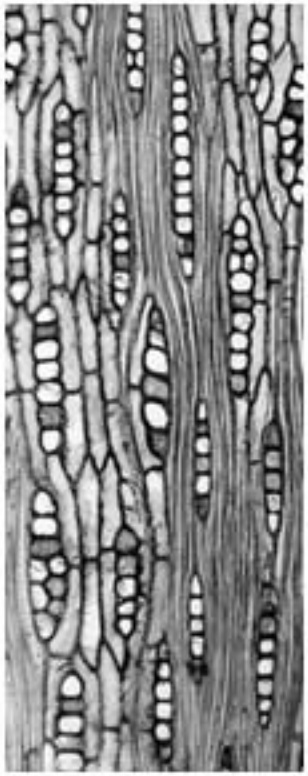
Comparison of species within one genus: *Tabebuia*



T. catinga

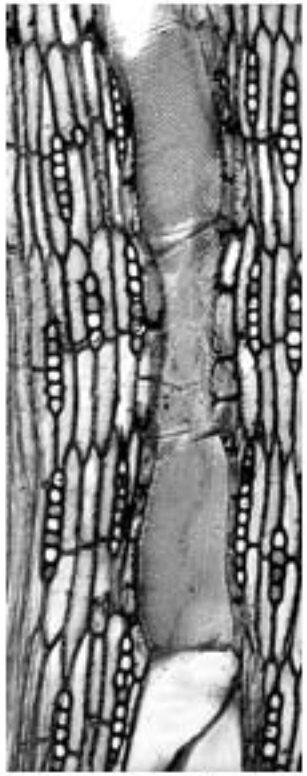


T. impetiginosa



T. caraiba

T. stenocalyx



T. angustata

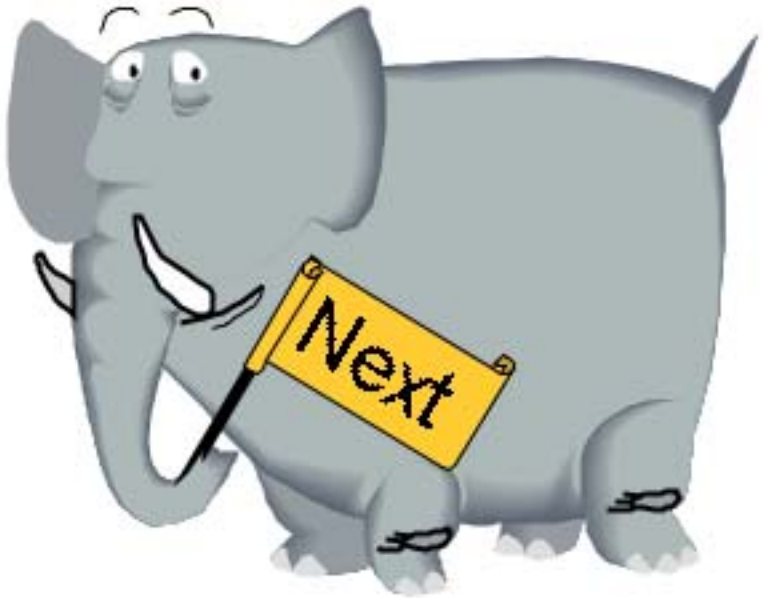
Photos by Peter Gasson, Kew, U.K.

Possibilities / Opportunities

Web-accessible
Fossil wood database
- Descriptions
- Images

Incorporate donated images

Proposal submitted to NSF's Biological Databases and Informatics Program.



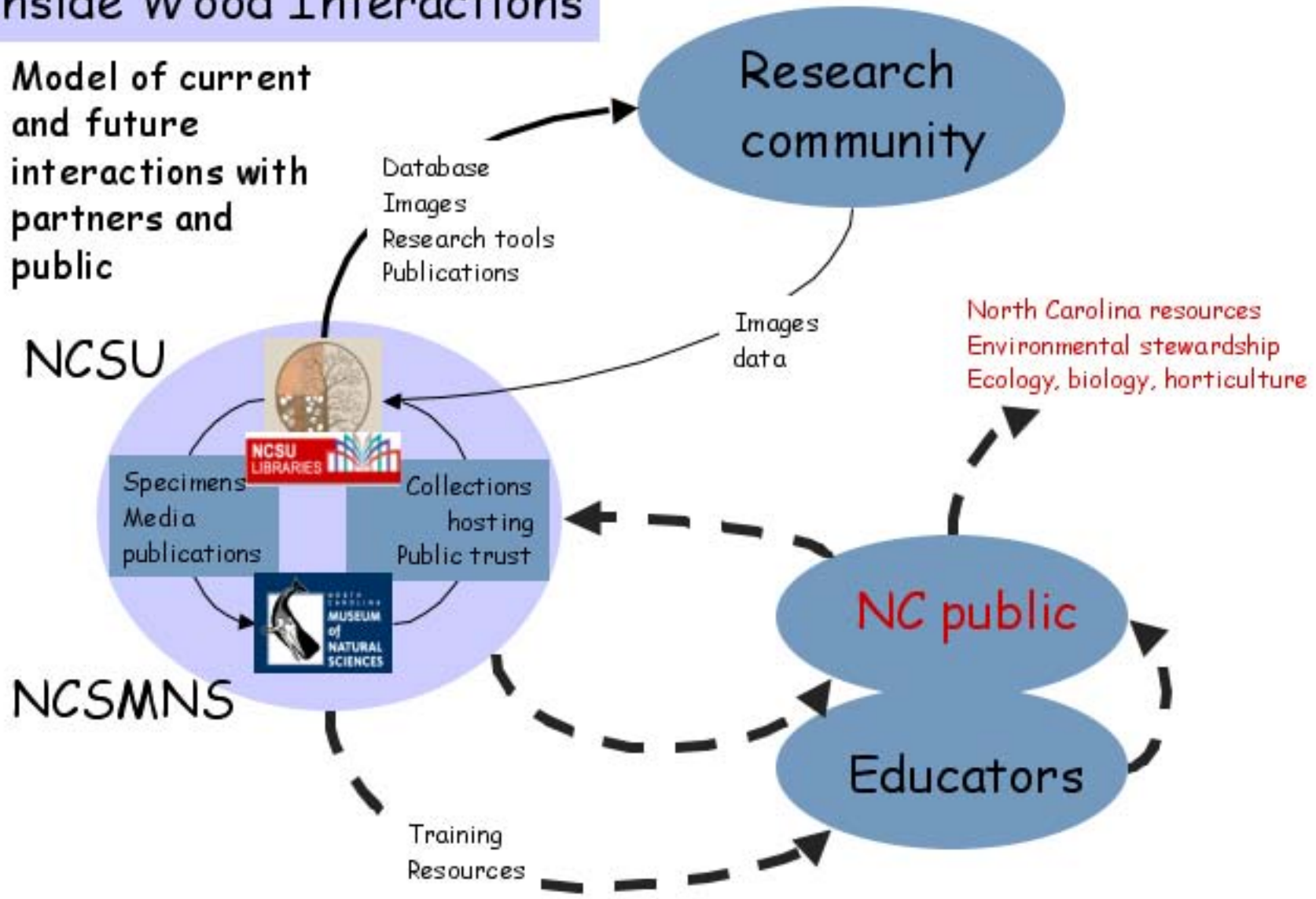
Educational components
- University level
- K - 12
- Park & Museum Staff

Collaboration NC Museum of Natural Sciences

Apply data model to conifers or other datasets

Inside Wood Interactions

Model of current and future interactions with partners and public



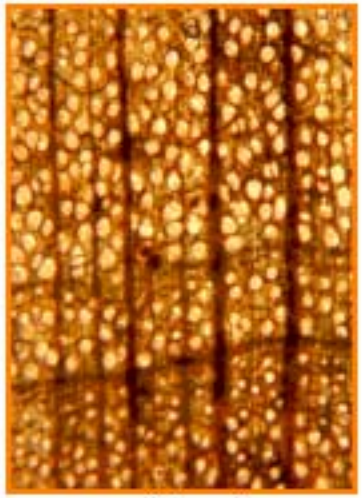
Next grant cycle targets public as principal population

Adding Documentation

How to best interact with web site

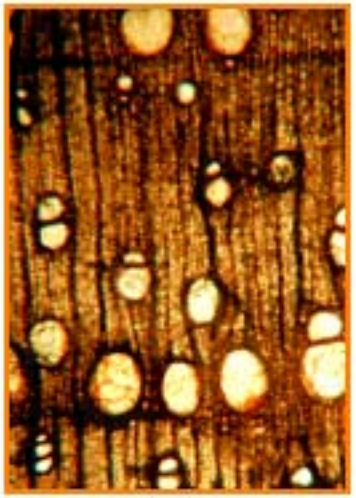
- Where the data came from, how to interpret them
- Limitations of database
- Take advantage of the search options

Under Construction



Beech

Horse Chestnut

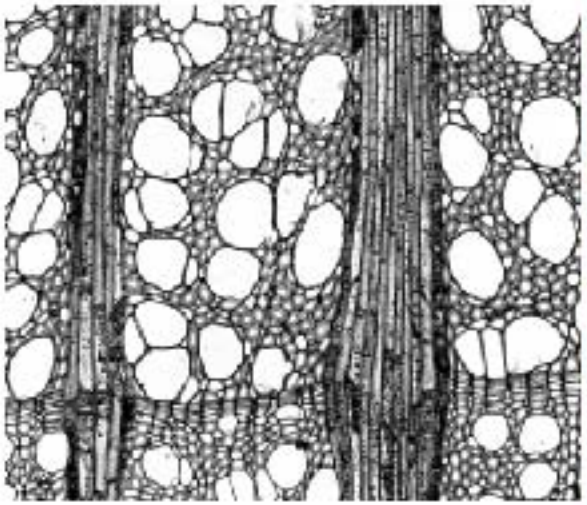


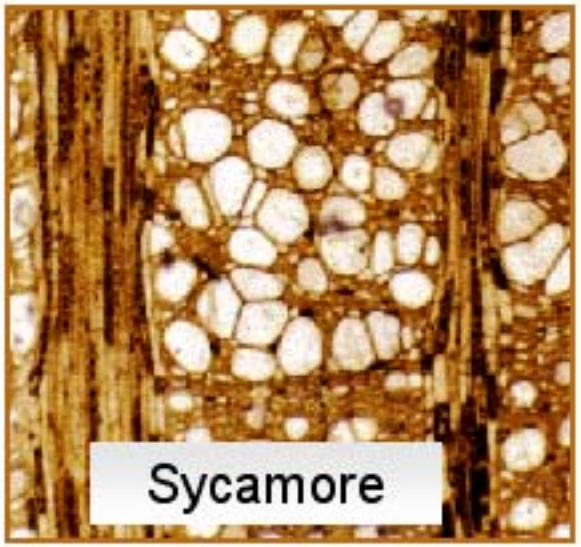
Ash

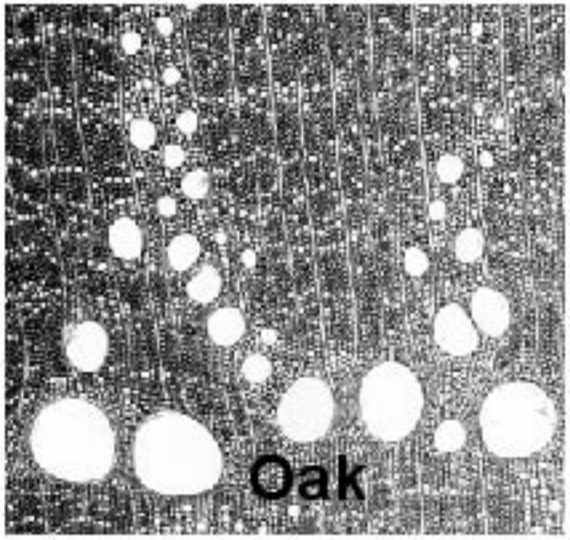
Above images of 16 million yr. old woods

Fossil Wood Database

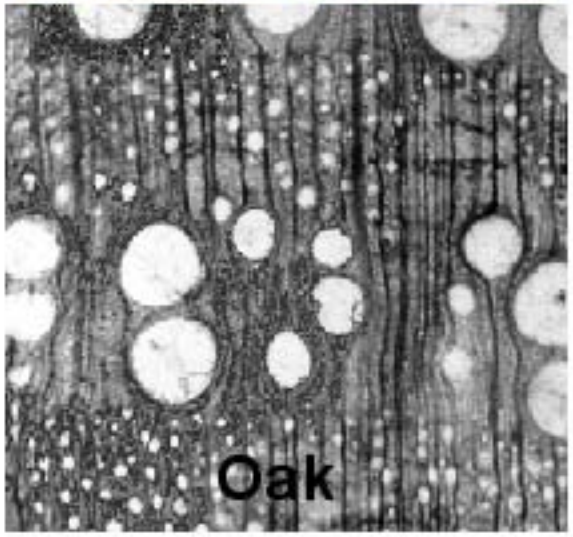
1500 descriptions
850 images





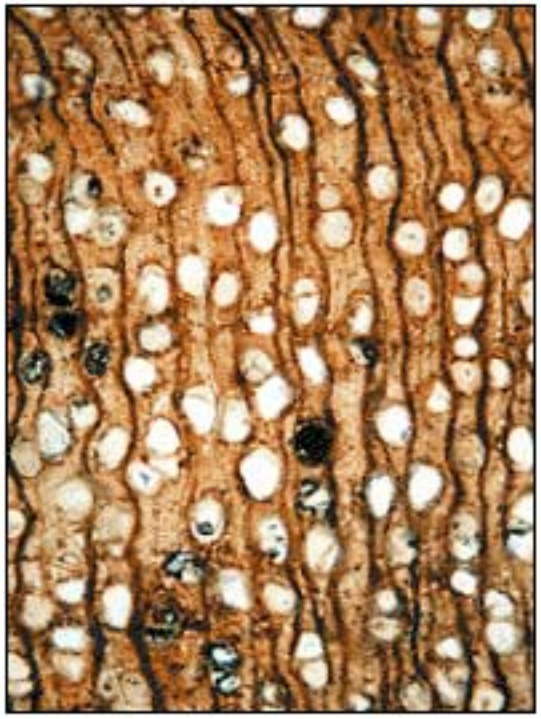


Modern



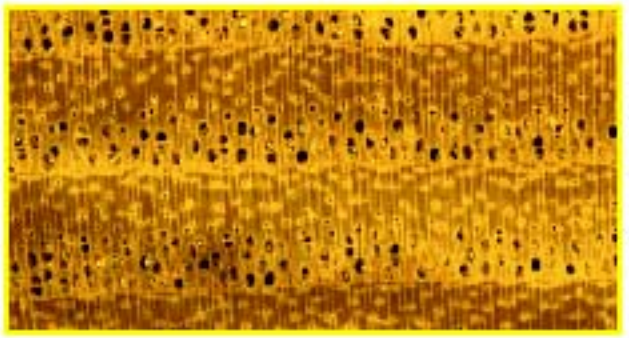
16 Million Years Old

Fossil Wood Database
For U.S. images over 50 % of the fossil wood species known .
Example: Denver Basin.



Early Paleocene. 64 million years, post- dinosaur

InsideWood Project



- Model structure
- Open, persistent architecture insures long - term viability of database
- Rich linked metadata
- Global scope - incorporates orphaned collections, useful to broad audience.

http://insidewood.lib.ncsu.edu/search/