

# USFS International Programs Wood Identification and Screening Center



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# WISC Program

- Forensic chemistry-based analyses for US government agencies
- Expansion of wood spectra database
- Collaboration with international and domestic partners to expand wood identification technologies
- Provide training and capacity building for wood identification both internationally and domestically



# Services Offered by WISC

## Forensic chemical analysis:

- Genus/species identification of timber
- Cultivated vs wild populations
- Geographic origin identification (**limited**)

## Forensic wood anatomical analysis:

- Plywood identification

## Service provider for US Government agencies:

- Homeland Security Investigations (HSI)
- Customs and Border Protection (CBP)
- Animal and Plant Health Inspection Service (APHIS)



# Other (Non-Forensic) Services

- Canoe analysis - Wisconsin Historical Society
  - Anatomy
- Analysis of Commercial Products
  - Chemistry & Anatomy
- 1850s Chinese Dawn Redwood Pagoda - New Almaden Museum, San Jose, CA
  - Chemistry

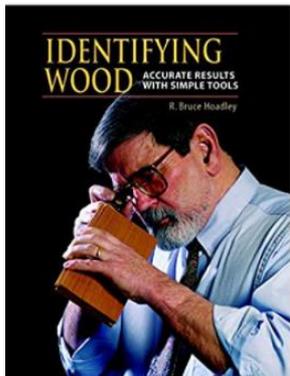


## Other (Non-Forensic) Services

- WISC has “on-call” personnel stationed in Seattle that provide on-site sampling assistance to CBP
- Items are sent to the WISC laboratory for 24-hour screening results
- Leverage International Programs (IP) network to provide this sampling service to other CBP stations



# Genus Identification: Wood Anatomy



- Oldest method for wood identification
- Ideal for identification to **genus level**
- Insufficient for identification to species level (exceptions do exist)

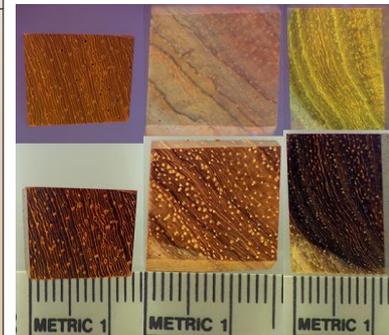
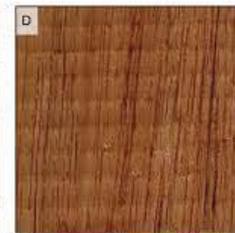
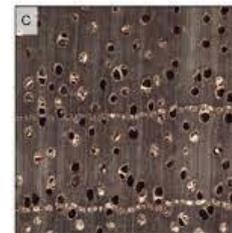
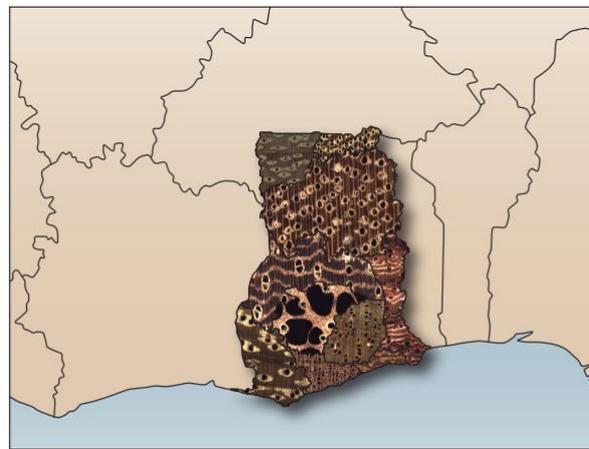
*Baphia nitida*

Odwen, Abolooba



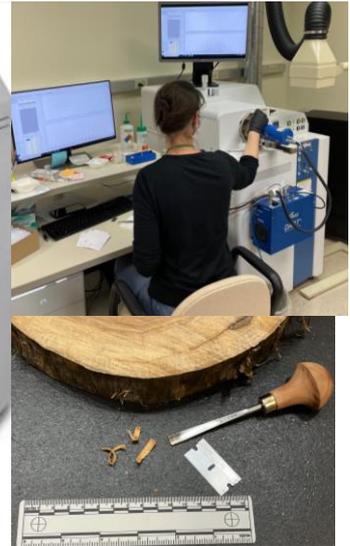
## Field Identification Manual for Ghanaian Timbers

Rafael Arévalo  
Emmanuel Ebanyente  
Alberta Asi Ebeheakey  
Kofi Abban Bonsu  
Ophilious Lambog  
Richard Soares  
Alex C. Wiedenhoef

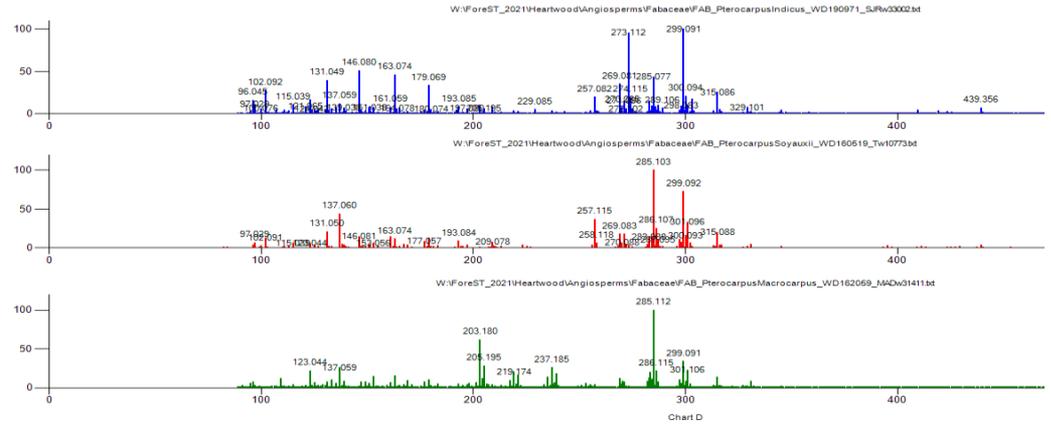
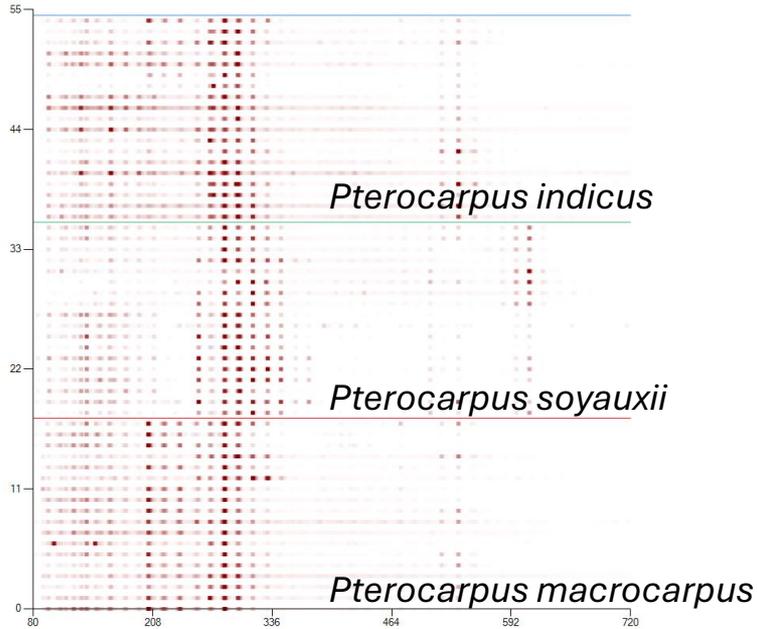


# Direct Analysis in Real Time Time-of-Flight Mass Spectrometry (DART TOFMS)

- Open-air sample collection
- Rapid data collection
- No sample preparation needed
- Small (sliver) sample size
- 20 specimens per species needed for statistical testing
- Broad range geographic origin is possible
- Inexpensive data collection (compared to other methods)
  - ~\$1/sample



# DART TOFMS Mass Spectra



- Each individual *spectrum* is composed of charged molecules, or “ions”
- The mass spectrum represents the chemical composition of the wood species which acts as a “fingerprint”

# Why DART TOFMS?

- The largest database of timber spectra in the world
- 630 genera (~**1600 species**)
- > 20,000 spectra
- Expanded by collaborations between wood collections (xylaria) worldwide

## Forensic Spectra of Trees database (ForeST)

US Fish & Wildlife Forensics Lab

# WISC International

WISC provides training and capacity building for international partners to enhance and/or develop their wood identification methods and capabilities to better assist their law enforcement needs.

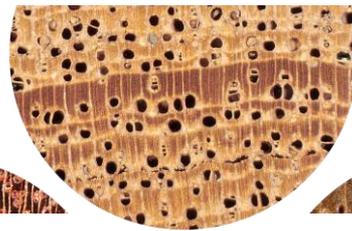
**VIETNAM**



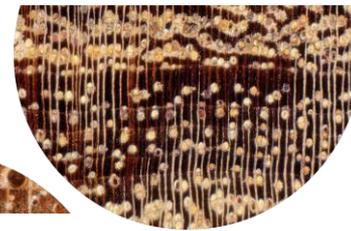
**MEXICO**



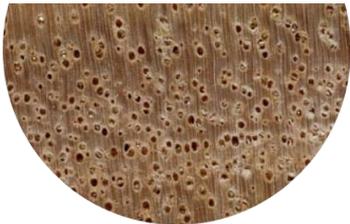
**THAILAND**



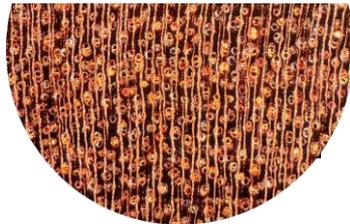
**BRAZIL**



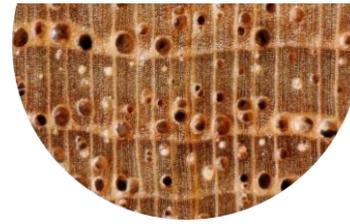
**PERU**



**NAMIBIA**



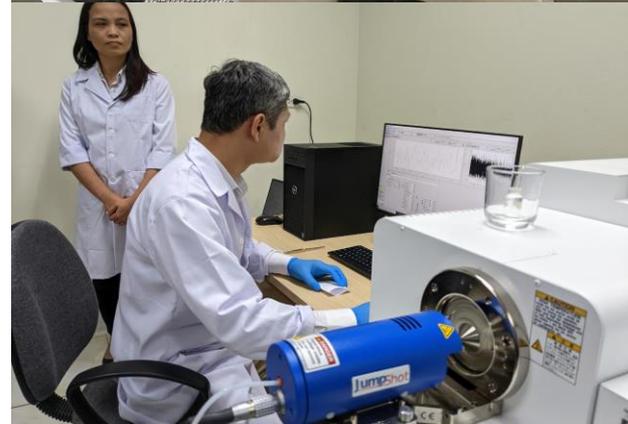
**INDIA**



# International Collaboration

*Each country has their own unique needs for the DART TOFMS*

- **Vietnam**
  - 301 investigation takeaways included focusing on finding illegal timber and increasing collaboration with law enforcement.
- **Peru**
  - Needed to assist law enforcement in stopping the trafficking of illegal timber species in domestic and international markets.
- **Mexico**
  - Important transshipment country for timber trade, major trade partner with the US, increasing identification capabilities.
- **India**
  - Increase the Government of India's ability to enforce national and international laws against illegal logging and associated trade.
- **Namibia**
  - Transit point of legal and illegal timber for neighboring countries, identifying protected rosewood.



# Research and Method Development

- WISC
  - Direct Analysis in Real Time Time-of-Flight Mass Spectrometry (DART TOFMS)
    - **Lab-based:** origin and species identification
- University of Delaware
  - Laser Induced Breakdown Spectroscopy (LIBS)
    - **Field-based:** origin and species identification



# Research and Method Development

## USA hardwoods geographic identification

- US Geological Survey
  - Creating a geospatial database of the top 12 domestic commercial species
  - Stable Isotope-Ratio Mass Spectrometry (SIR MS) & trace elemental analysis via Inductively Coupled Plasma Mass Spectrometry (ICP MS)
    - (**Lab-based**: origin identification)



# Law Enforcement Questions

*Law enforcement does occasionally request origin identification for potential Lacey Act or tariff violations, the majority of questions surround species identification.*

## **Primary questions:**

What species is this?

Are the claims on the paperwork correct?

## **Occasional questions:**

Where did this come from?

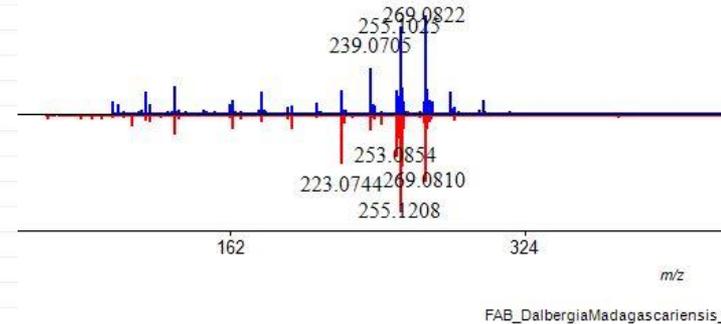


# Case Example: Bowl



File Name	Fwd.	Rev.
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	803	804
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	800	801
<input type="checkbox"/> CAL_MesuaFerrea_WISCw200579_Kw1...	799	800
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	794	794
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	793	794
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	788	795
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	788	788
<input type="checkbox"/> FAB_DalbergiaTucurensis_WD171236_...	778	778
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	772	775
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	770	773
<input type="checkbox"/> FAB_DalbergiaTucurensis_WD171234_...	766	766
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	765	768
<input type="checkbox"/> FAB_DalbergiaTucurensis_WD140738_...	759	759
<input type="checkbox"/> FAB_DalbergiaCochinchinensis_WD173...	756	756
<input type="checkbox"/> FAB_DalbergiaTucurensis_WD160134_...	755	755
<input type="checkbox"/> FAB_DalbergiaLanceolaria_WD150526...	754	754
<input type="checkbox"/> FAB_DalbergiaRetusa_WD190830_Lab...	751	751
<input type="checkbox"/> FAB_DalbergiaMadagascariensis_WD1...	751	751

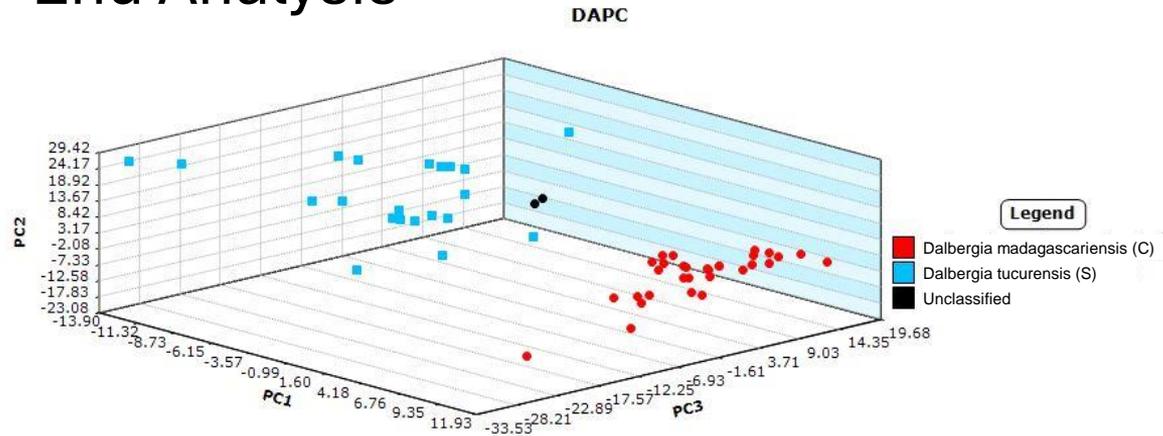
## 1st Analysis



# Case Example: Bowl



## 2nd Analysis



File	Distance	Class	Prob. %	Class name
LAB1b-1.txt	33.59734682...	0	97.58	Dalbergia madagascariensis
LAB1b-2.txt	31.76334675...	0	96.90	Dalbergia madagascariensis

# Case Example: Bowl



- Importation of wood from Madagascar has been banned since 2006
- Lacey Act: Unlawful to knowingly import, export, sell, acquire, or purchase wildlife in violation to US or foreign law (2008)
- All *Dalbergia* species are protected under CITES
  - *Dalbergia madagascariensis* is CITES II



# Thank you! Questions?

## Contact Information

**Email:** [erin.mcclure-price@usda.gov](mailto:erin.mcclure-price@usda.gov)

**Website:** [Wood Identification & Screening Center | US Forest Service](#)

## Videos:

Promo: <https://vimeo.com/662762278/4f73ba0298>

Full: <https://vimeo.com/662762758/8a4a27d818>