

Forensic DNA Mixture Interpretation

MAFS Workshop

Milwaukee, WI
September 25, 2012



**Dr. John M. Butler &
Dr. Michael D. Coble**
National Institute of
Standards and Technology

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Introductions

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Outline for Today's Workshop

- Introductions (*John, Mike & each of you!*)
- Mixture Fundamentals & Literature Review (*John*)

BREAK

- Statistical Approaches for Mixtures (*Mike*)

LUNCH BREAK

- Thresholds & Low Level Mixtures (*John*)

BREAK

- Probabilistic Genotyping & Software (*Mike*)



Dr. John M. Butler

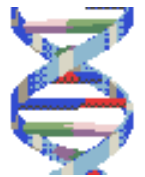
<http://www.cstl.nist.gov/biotech/strbase/butler.htm>

Experience

- University of Virginia/FBI Laboratory (1992-1995)
 - Work performed in Bruce McCord's lab
- NIST NRC Postdoc (1995-1997)
- GeneTrace Systems Inc (1997-1999)
- NIST Human Identity Project Leader (1999-present)

- Ph.D. dissertation (Aug 1995): "Sizing and quantitation of polymerase chain reaction products by capillary electrophoresis for use in DNA typing"
- *Forensic DNA Typing* textbook (now in its 2nd Edition)
- STRBase website: <http://www.cstl.nist.gov/biotech/strbase/>
- Family: wife Terilynne and 6 children
- Hobbies: reading, writing, and making PowerPoint slides

Contact Information
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Dr. Michael D. Coble

http://www.nist.gov/mml/biochemical/genetics/michael_d_coble.cfm

Experience

- George Washington University/AFDIL (1996-2004)
 - Work performed with Tom Parsons
- NIST NRC Postdoc (2004-2006)
- AFDIL Research Section Chief (2006-2010)
- NIST Applied Genetics Group (2010-present)

- Ph.D. dissertation (Jan 2004): “The Identification of Single Nucleotide Polymorphisms in the Entire Mitochondrial Genome to Increase the Forensic Discrimination of Common HV1/HV2 Types in the Caucasian Population”
- Family: wife Karen and 3 children
- Hobbies: Fantasy baseball and football team owner

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NIST History and Mission

- National Institute of Standards and Technology (NIST) was created in 1901 as the National Bureau of Standards (NBS). The name was changed to NIST in 1988.
- NIST is a **non-regulatory agency within the U.S. Department of Commerce** with a mission to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life.
- NIST supplies over 1,300 Standard Reference Materials (SRMs) for industry, academia, and government **use in calibration of measurements.**
- **NIST defines time for the U.S.**

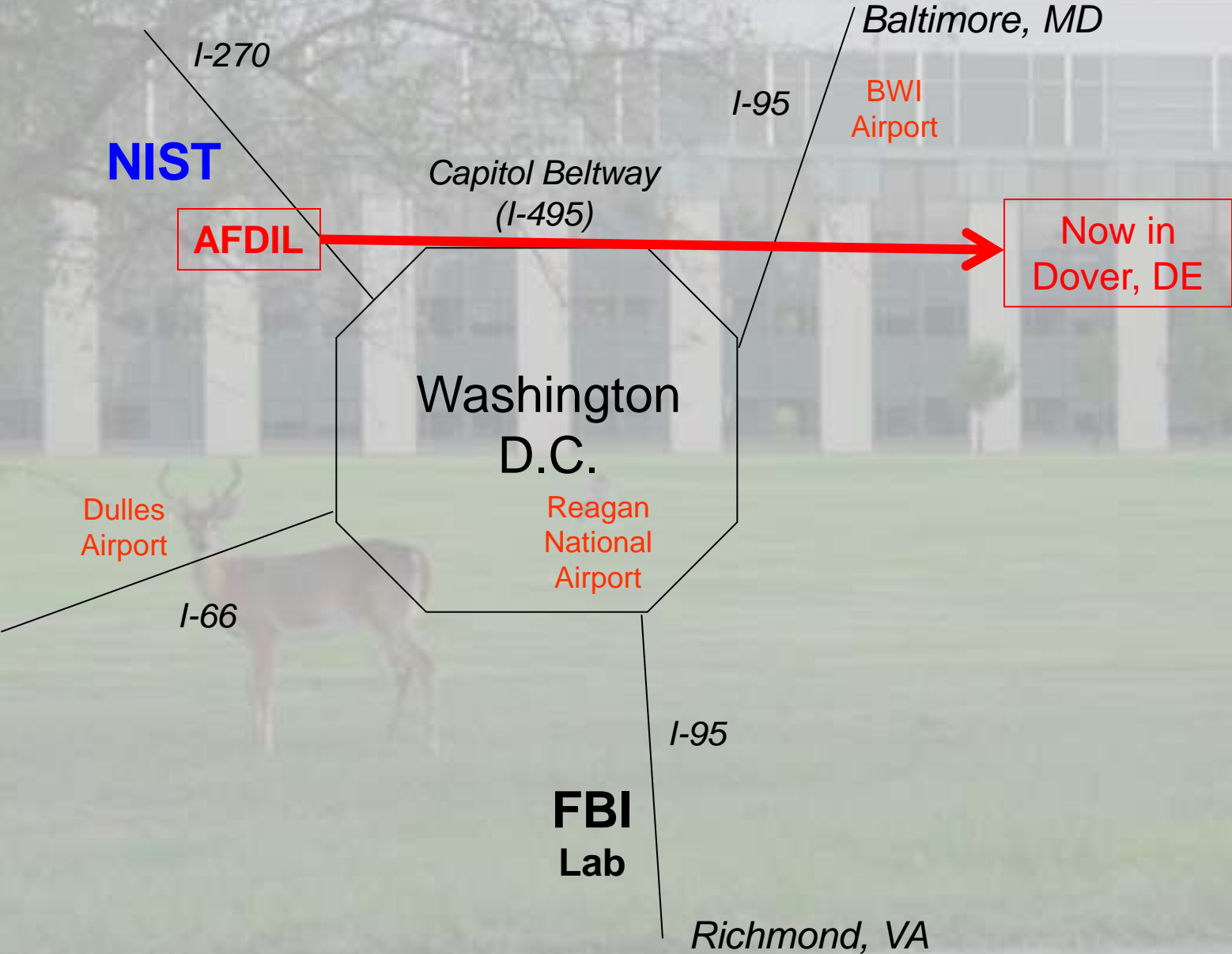


\$686 for 3 jars



DNA typing standard

Location of NIST



NIST Gaithersburg Campus

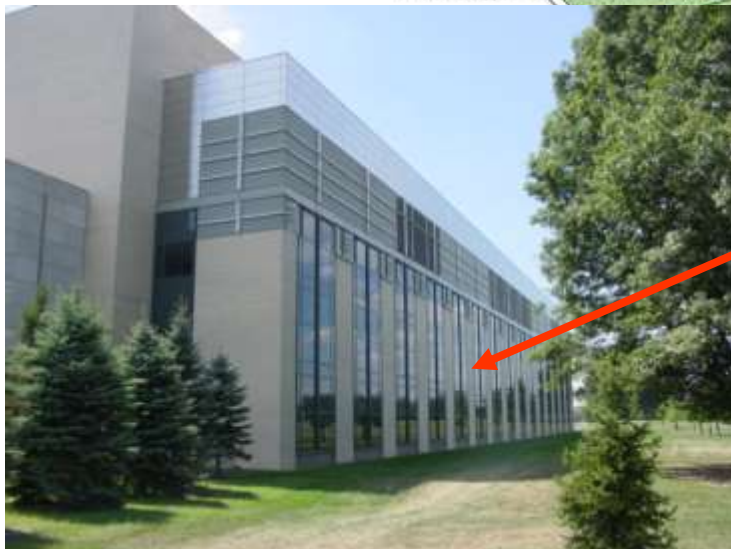
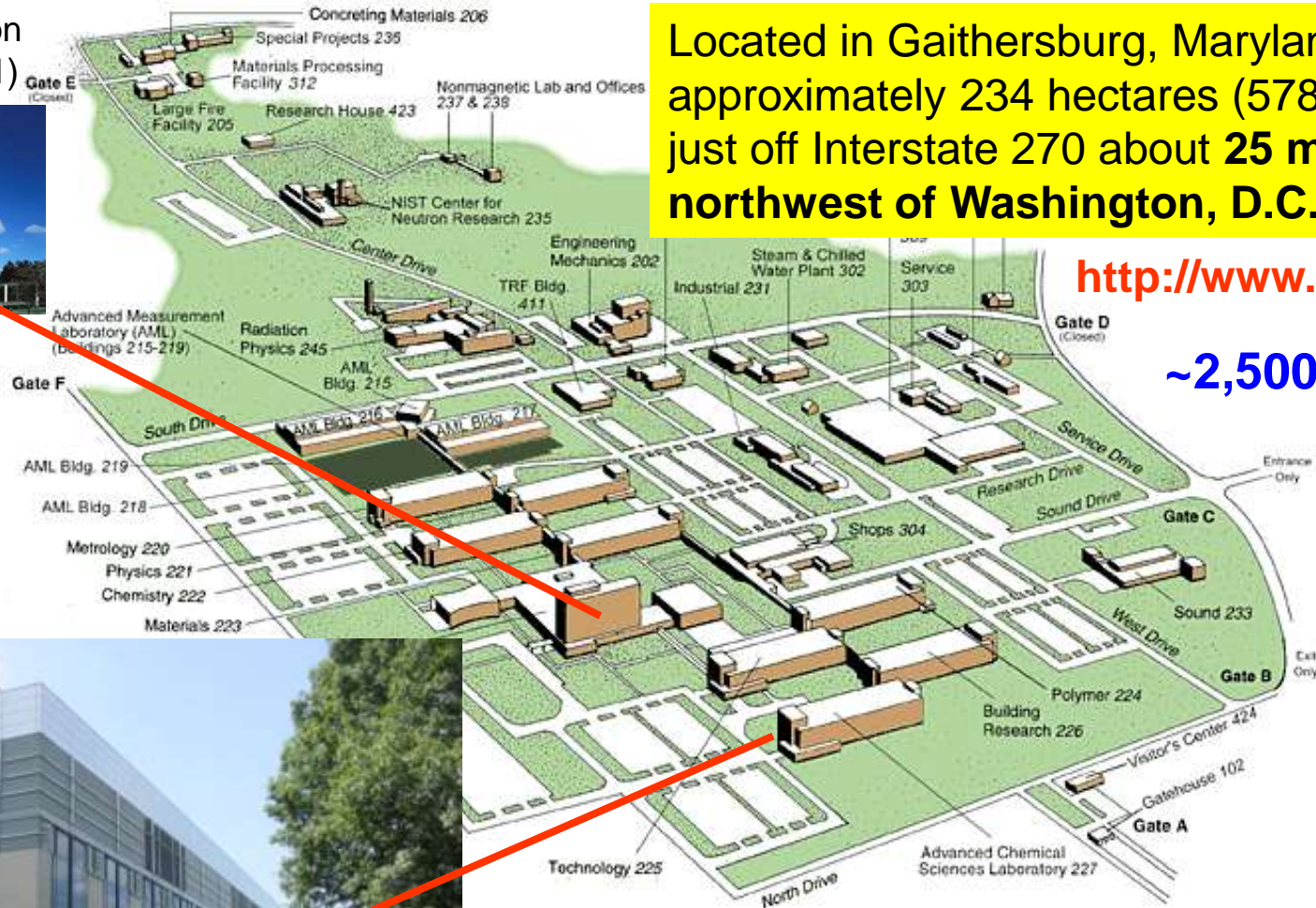
Administration
(Building 101)



Located in Gaithersburg, Maryland, on approximately 234 hectares (578 acres) just off Interstate 270 about **25 miles northwest of Washington, D.C.**

<http://www.nist.gov>

~2,500 staff



Advanced Chemical Sciences
Laboratory (Building 227)

Group Leader

NIST Applied Genetics Group



**John
Butler**



**Mike
Coble**



**Margaret
Kline**



**Marcia
Holden**



**Pete
Vallone**



Patti Rohmiller
Office Manager



**Becky
Hill**



**Ross
Haynes**



**Erica
Butts**



**Kevin
Kiesler**

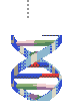


***Bringing calibration to clinical DNA diagnostics, speed to DNA testing,
and technology to the scales of justice***

APPLIED GENETICS Group

Major Programs Currently Underway

- **Forensic DNA**
 - STRBase website
 - New loci and assays (26plex)
 - **STR kit concordance & new autosomal STR loci**
 - Ancestry SNP assays
 - Low-template DNA studies
 - **Mixture interpretation research and training**
 - Variant allele cataloging and sequencing
 - ABI 3500 validation
 - Training workshops to forensic DNA laboratories
 - **Y-STR markers**
 - Validation experiments, information and software tools
 - **Textbooks – 3rd ed.** (3 volumes)
- **Clinical Genetics**
 - Huntington's Disease SRM
 - CMV SRM
 - Exploring future needs
- **Ag Biotech**
 - “universal” GMO detection/quantitation (35S promoter)
- **DNA Biometrics**
 - **Rapid PCR methods**
 - Efforts to standardize testing of future portable DNA systems
 - Kinship analysis
- **Cell Line Authentication**
 - ATCC documentary standard



NIST Human Identity Project Teams

within the Applied Genetics Group

Forensic DNA Team

Guest Researcher

DNA Biometrics Team

Funding from the **National Institute of Justice (NIJ)** through NIST Office of Law Enforcement Standards

Funding from the **FBI S&T Branch** through NIST Information Access Division



Returned to Spain in July 2012

Manuel **Fondevila Alvarez**



Pete Vallone



Erica Butts



Kevin Kiesler

Rapid PCR, Direct PCR & Biometrics

ABI 3500 & DNA Extraction

PLEX-ID & NGS Exploration

Data Analysis Support



Dave Duewer



John Butler



Mike Coble



Becky Hill



Margaret Kline

STRBase, Workshops & Textbooks

Mixtures, mtDNA & Y

Concordance & LT-DNA

SRM work, variant alleles & Cell Line ID

Office Manager Patti Rohmiller



Forensic DNA Typing Textbook

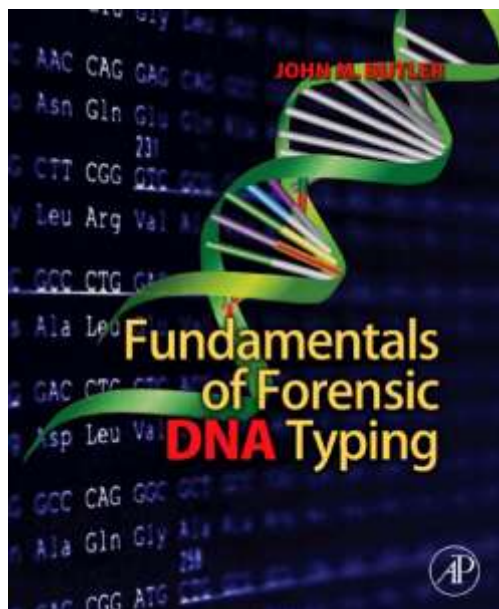
3rd Edition is Three Volumes

Now part of my job at NIST (no royalties are received)



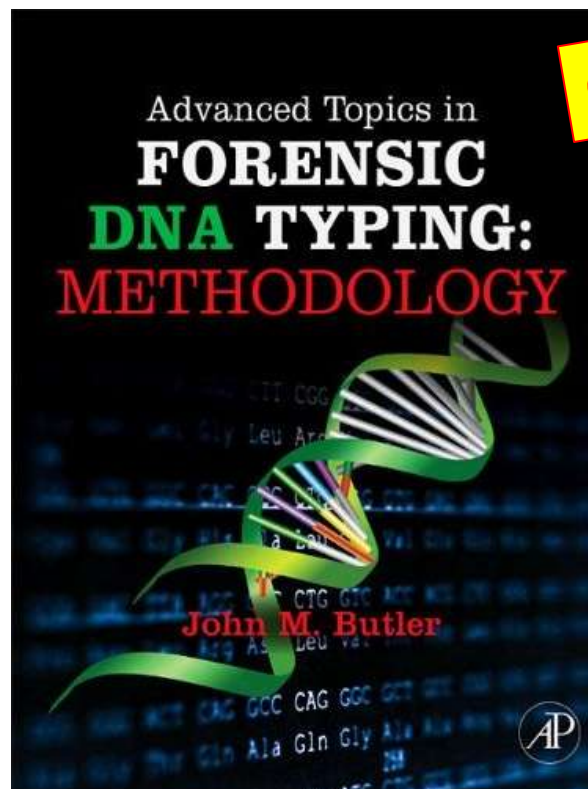
John Butler

*For beginning students,
general public, & lawyers*



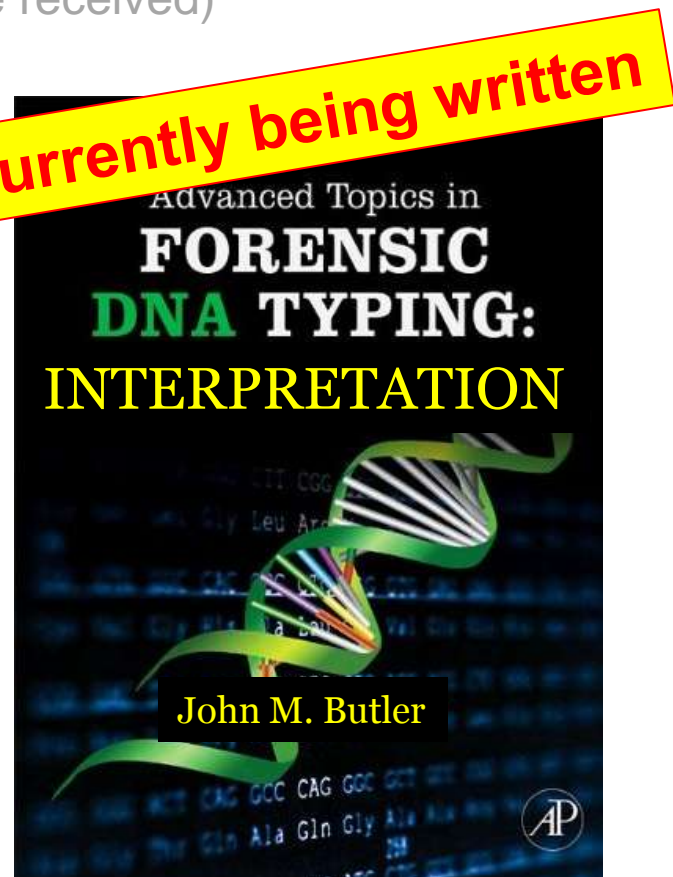
Sept 2009

~500 pages



August 2011

~700 pages



Fall 2013

~500 pages

MAFS 2012 Mixture Workshop Registrants

20 states

60 people

53 state or local lab

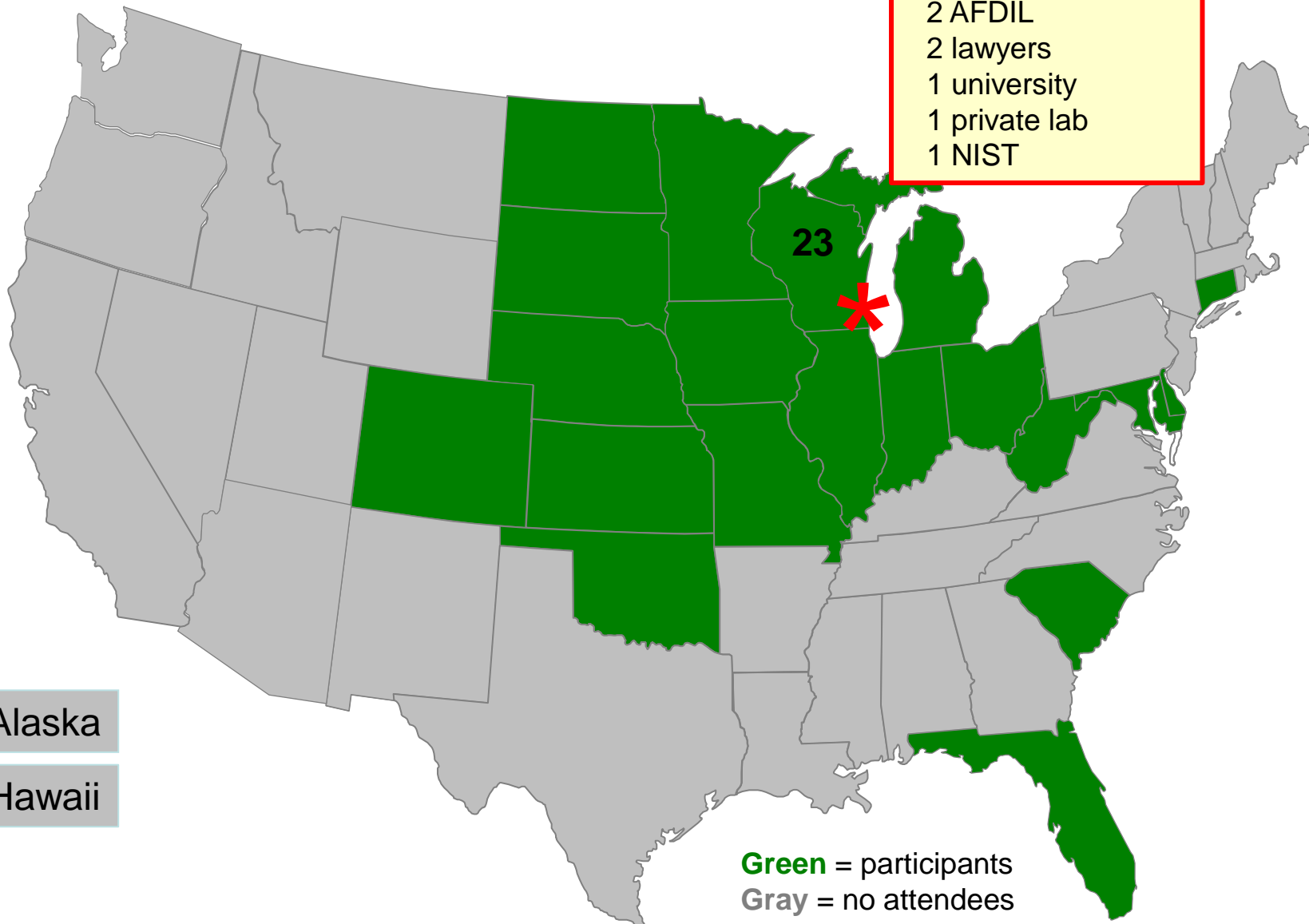
2 AFDIL

2 lawyers

1 university

1 private lab

1 NIST



Alaska

Hawaii

Understanding the Audience Here

Name, Laboratory, what you hope to learn in workshop

- Where is everyone from?
 - State lab?
 - Local lab?
 - Private lab?
- Experience level?
 - Less than 1 year?
 - 1-3 years?
 - >3 years?
- STR kits in use?
 - Profiler Plus/COfiler
 - Identifiler (Direct, Plus)
 - PowerPlex 16 (HS)
 - Y-STRs?
- Instrumentation in use?
 - ABI 310
 - ABI 3100/3130/3130xl
 - ABI 3500/3500xl
- Software in use?
 - GeneMapper*ID*
 - GeneMapper*ID-X*
 - Other?

Benefits of this exercise:

- 1) We can tailor remarks to your interests and needs
- 2) You feel more comfortable asking questions and being involved when you know others

Contributors to These Workshop Slides



Becky Hill

NIST

STRs



Erica Butts

NIST

**ABI
3500**



Bruce McCord

**Florida
International
University**

CE



Robin Cotton

**Boston
University**

Mixture Interpretation



Catherine Grgicak

**Boston
University**



Charlotte Word

Consultant

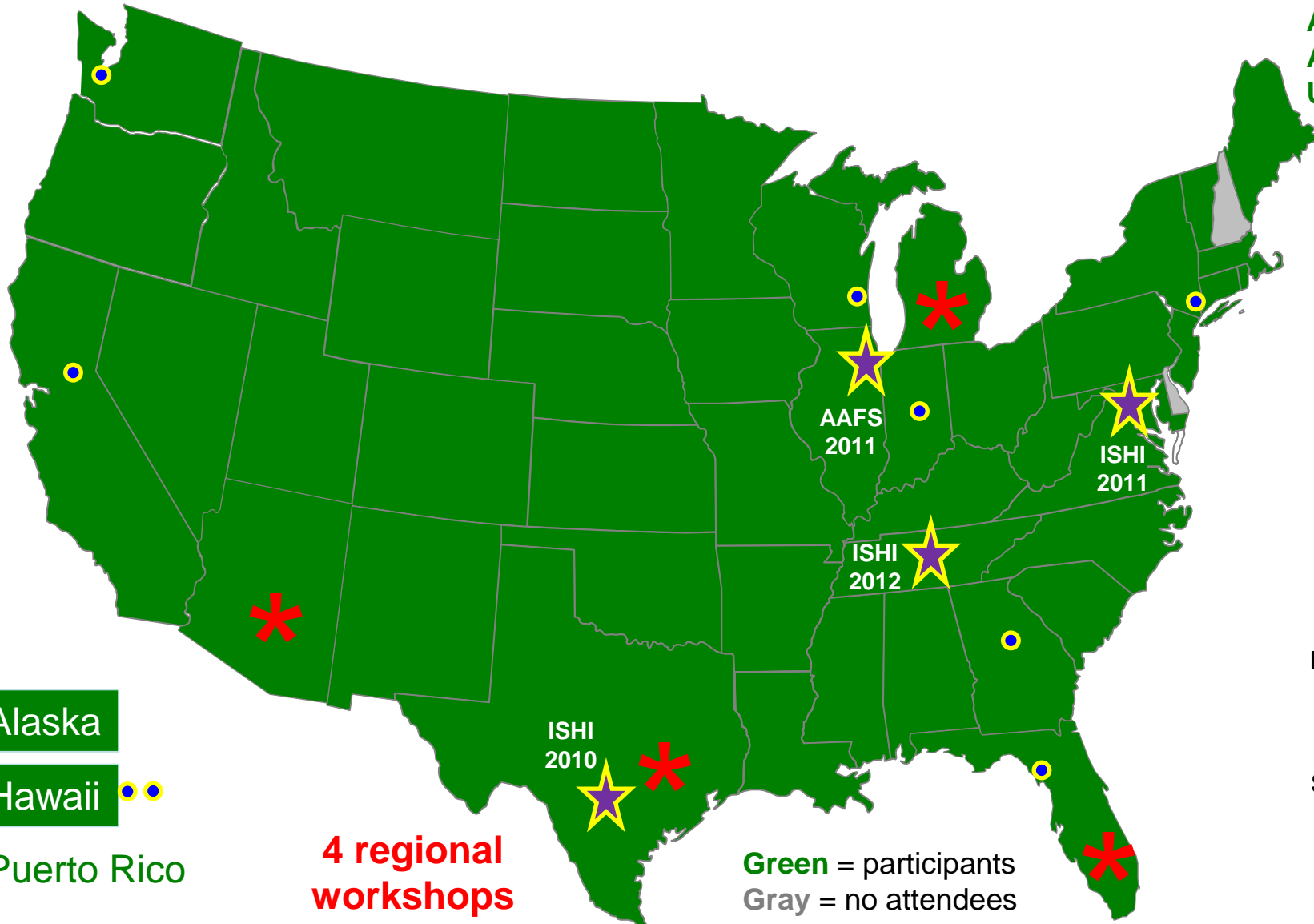
2010-2012 Mixture Workshop Attendees

49 states and 25 other countries

Federal Labs

FBI
ATF
AFDIL
USACIL

Algeria
Argentina
Bahamas
Belgium
Brazil
Canada
Croatia
Finland
France
Israel
Italy
Jamaica
Japan
Korea
Mexico
Netherlands
New Zealand
Panama
Peru
Russia
Saudi Arabia
Singapore
Spain
Switzerland
UK



Alaska

Hawaii

Puerto Rico

4 regional workshops

Green = participants
Gray = no attendees

STRBase Mixture Section

- <http://www.cstl.nist.gov/strbase/mixture.htm>
- Slides from various mixture workshops
- SWGDAM Mixture Committee Resource Page
 - <http://www.swgdam.org/resources.html>
- Information and links to mixture software
- Literature listing by topic

NIST and NIJ Disclaimer

Funding: Interagency Agreement 2010-DN-R-7121 between the [National Institute of Justice](#) and NIST Office of Law Enforcement Standards

Points of view are the presenters and do not necessarily represent the official position or policies of the US Department of Justice or the National Institute of Standards and Technology.

Certain commercial equipment, instruments and materials are identified in order to specify experimental procedures as completely as possible. In no case does such identification imply a recommendation or endorsement by the National Institute of Standards and Technology nor does it imply that any of the materials, instruments or equipment identified are necessarily the best available for the purpose.

SWGDM and FBI CODIS Loci WG Disclaimer...

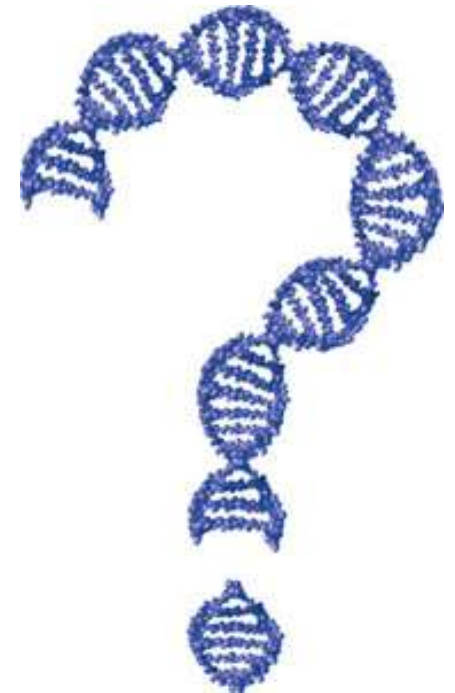
Now on with the workshop...

Our team publications and presentations are available at:
<http://www.cstl.nist.gov/biotech/strbase/NISTpub.htm>

Funding from the **National
Institute of Justice (NIJ)**
through NIST Office of Law
Enforcement Standards



Questions?



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