Topics and Techniques for Forensic DNA Analysis
Continuing Education Seminar

Introductions

NYC OCME
Dept of Forensic Biology

New York City, NY
April 18, 2012

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

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michael.coble@nist.gov

Outline for Today's Training

- Introductions
- Data Interpretation and Statistical Analysis *(John)*

BREAK

- Mixture Interpretation *(Mike)*

LUNCH BREAK

- STR Markers & CE Instrumentation *(John)*

BREAK

- Y-STRs, mtDNA, and the Romanov Case *(Mike)*

These slides are all available on STRBase…

http://www.cstl.nist.gov/biotech/strbase/training/NewYork-April2012-Workshop.htm

Two Formats for Download

Full slides (for iPad viewing)

Handouts (for printing)

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)

Contact Information
john.butler@nist.gov
301-975-4049

- 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

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)

Contact Information
michael.coble@nist.gov
301-975-4330

- 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

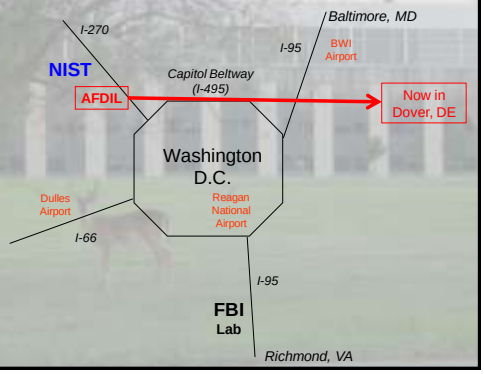
NIST History and Mission

- 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.**

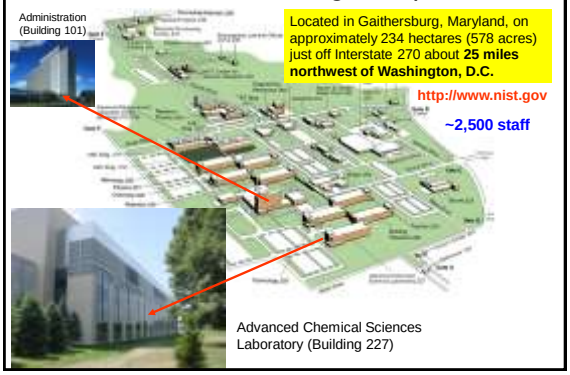
$686 for 3 jars

DNA typing standard

Location of NIST

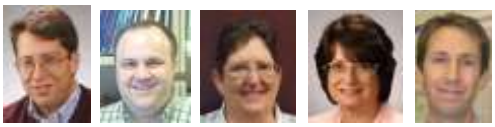


NIST Gaithersburg Campus

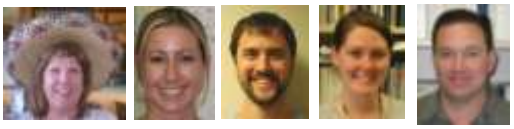


NIST Applied Genetics Group

Group Leader



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

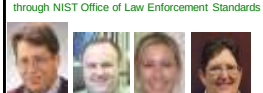
- **Forensic DNA**
  - STRBase website
  - New loci and assays (26plex)
  - **STR kit concordance & new autosomal STR loci**
  - Ancestry SNP assays
  - Low-template DNA studies
  - **Mixture interpretation research and training**
  - Variant allele cataloging and sequencing
  - ABI 3500 validation
  - 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

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



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

Guest Researcher

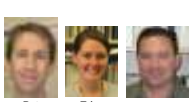
Manuel **Fondevila** Alvarez

Data Analysis Support

Dave Duewer

DNA Biometrics Team

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



Pete Vallone | Erica Butts | Kevin Kiesler

Rapid PCR, Direct PCR & Biometrics | ABI 3500 & DNA Extraction | PLEX-ID & NGS Exploration

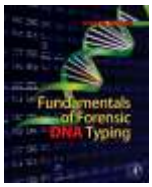
http://www.cstl.nist.gov/biotech/strbase/NISTpub.htm

Forensic DNA Typing Textbook

3rd Edition is Three Volumes

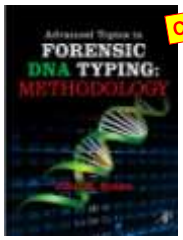
Now part of my job at NIST (no royalties are received)

For beginning students, general public, & lawyers



Sept 2009

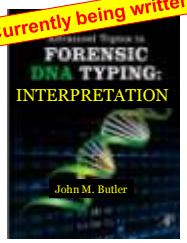
~500 pages



August 2011

~700 pages

Currently being written



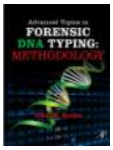
Fall 2012

~500 pages

New Material in *Advanced Topics: Methodology*

Released August 2011

>50% new material from previous editions



- Cites >1500 new references (>2800 ref. total)
- **New chapter** on legal aspects (Ch. 18)
  - expert witness prep, perspectives from lawyers
  - App. 4 (interviews): experts, prosecutors, & defense
- **New chapter** on X-chromosome markers (Ch. 15)
- **Extensive updates** on CE (Ch. 6), validation (Ch. 7), database issues (Ch. 8), disaster victim identification (Ch. 9), miniSTRs (Ch. 10), LTDNA (Ch. 11), SNPs (Ch. 12), Y-STRs (Ch. 13), mtDNA (Ch. 14), non-human DNA (Ch. 16), and new technology (Ch. 17)
- Coverage of all the new STR kits (Ch. 5)
- Listing of all known STR alleles for all 23 kit loci (App. 1)
- Most detail to-date on the Grim Sleeper case (D.N.A. Box 8.5)

Clickers (Audience Response Systems)

- **Allow real-time audience participation**
- Responses are tied to your clicker – but no connection is made between the clicker and you – so **please provide your honest opinion** knowing that **you can respond anonymously**

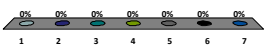
Polling test for clickers:

Have you participated in a presentation where clicker responses were gathered?

1. Yes
2. No

What is your role in the laboratory?

1. DNA analyst
2. DNA technician
3. Database analyst
4. DNA technical leader
5. QA Manager
6. Attorney
7. Other

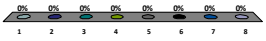


Your Experience Level as a DNA Analyst

1. Trainee — 0%
2. <2 years — 0%
3. 2-5 years — 0%
4. 5-10 years — 0%
5. 10+ years — 0%
6. I am not an analyst — 0%

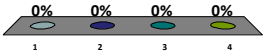
What laboratory are you from?

1. NYC OCME
2. NYSP Albany
3. Westchester Co.
4. Nassau County
5. Suffolk County
6. Monroe County
7. Onondaga County
8. New Jersey SP



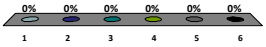
What topic are you most interested in today? (select only one)

1. Interpretation & statistics overview
2. Mixture interpretation
3. STRs & CE
4. Y-STRs, mtDNA, and the Romanovs

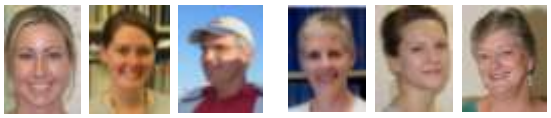


How is the NIST Applied Genetics Group most helpful to you in your work?

1. STRBase information
2. Training workshops
3. SRMs
4. Research papers & presentations
5. More than one of the above choices
6. None of the above



Contributors to These Workshop Slides



Becky Hill	Erica Butts	Bruce McCord	Robin Cotton	Catherine Grgicak	Charlotte Word
NIST	NIST	Florida International University	Boston University	Boston University	Consultant
STRs	ABI 3500	CE	Mixture Interpretation		

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.

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SWGDAM 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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