

CFFLD
5 May 2022

NIST Scientific Foundation Reviews

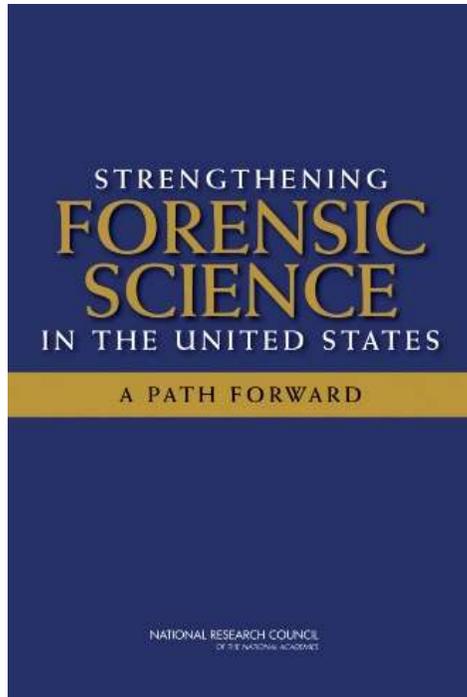
<https://www.nist.gov/topics/forensic-science>



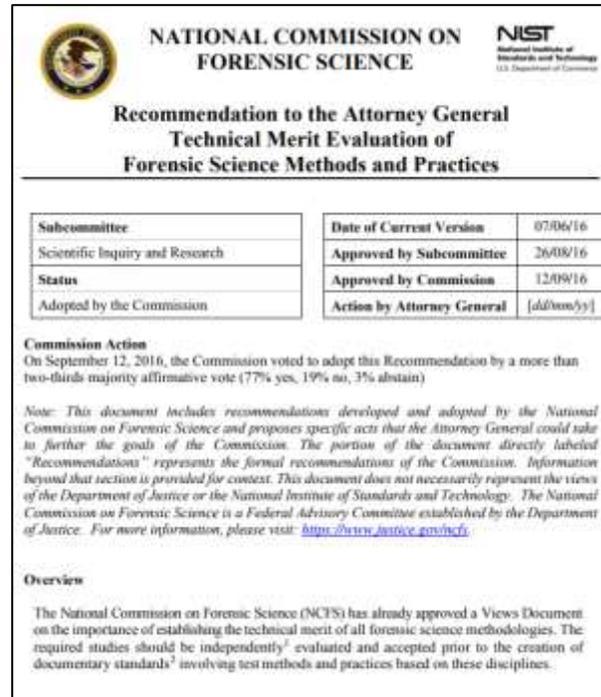
RESEARCH. STANDARDS. FOUNDATIONS.

Requests for Understanding What Data Exists Supporting Forensic Science Methods and Practices

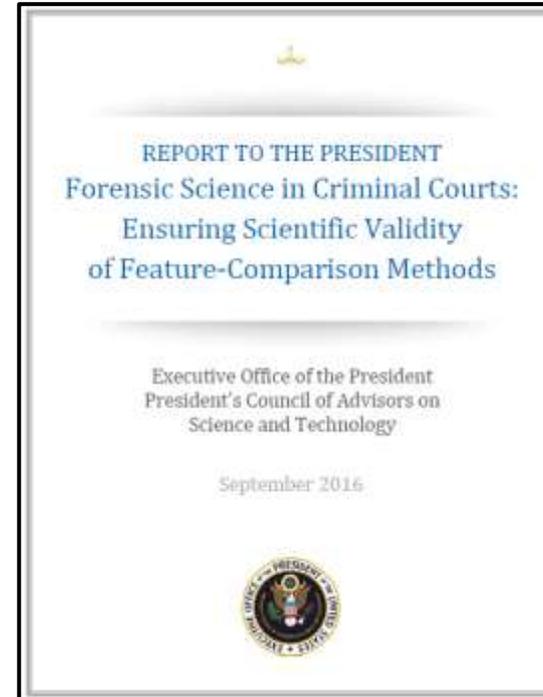
NRC Report (2009)



NCFS Recommendation (2016)



PCAST Report (2016)



NISTIR 8225 (2020)



“demonstrating the validity of forensic methods”
(Recommendation #3)

“technical merit evaluation”

Congressional funding uses NCFS language

“establishing foundational validity”

NIST: a “Scientific Foundation Review”

Trustworthy Results: A Shared Common Interest

- Obtaining reliable (trustworthy, consistently accurate) results is an important goal for forensic science, which NIST, as part of the forensic science ecosystem, shares in all our activities
- With NIST scientific foundation reviews, we are
 1. Documenting the **key scientific principles** that underpin current methods and practices
 2. Cataloging **available literature and information** that describe the state of the field
 3. Recommending strategies so that the community and its stakeholders **can have confidence in the results obtained** from a particular method or practice

NIST Scientific Foundation Reviews Underway in 2022

1. DNA Mixture Interpretation (initial pilot study)

- Began in September 2017
- AAFS 2019, ISHI 2019, ISHI 2020, AAFS 2021, AAFS 2022 workshops conducted
- **250-page report released for public comment on June 9, 2021, with a 3-hour webinar held on July 21**

2. Bitemark Analysis

- Began in October 2018
- Workshop held in October 2019

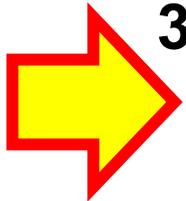
3. Digital Investigation Techniques

- Began in February 2019
- Interlaboratory “black box” study conducted from June to November 2020 → *published Feb 2022*

4. Firearm Examination

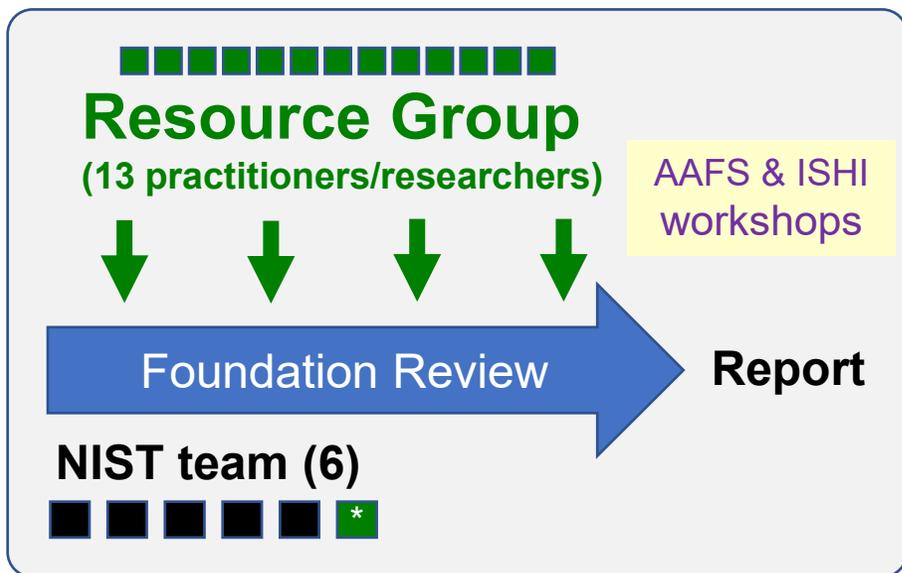
- Began in October 2019
- Gathering literature and focusing on error rate studies

Reports will be provided with each foundation study and made available for a public comment period (usually 60 days)



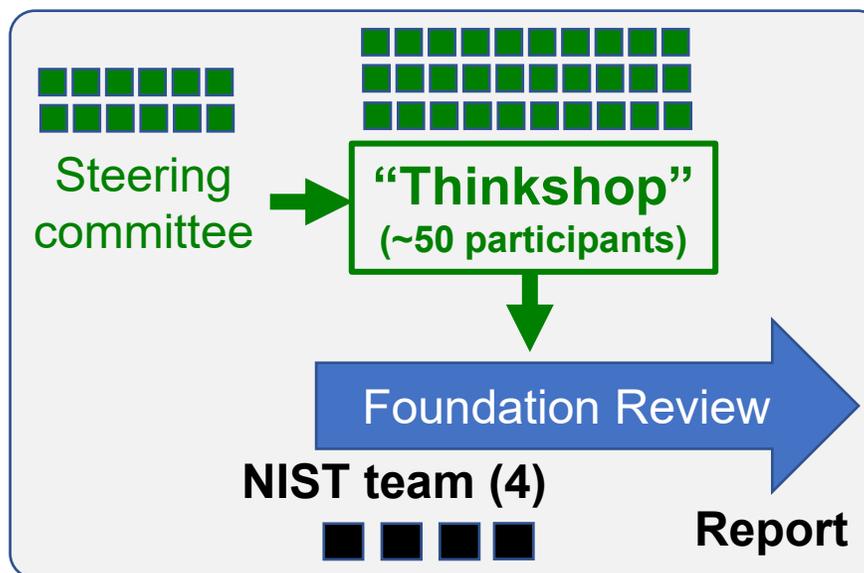
Community Involvement and Input

Model 1



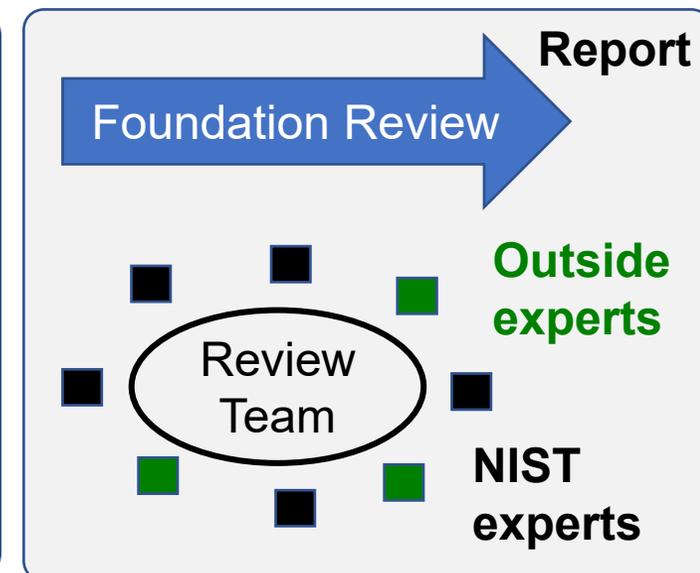
DNA Mixture Interpretation

Model 2



Bitemark Analysis

Model 3



Firearm Examination

Model 4 Digital Evidence
Incorporated an interlaboratory study

Public Comment will be sought on our reports
(they will be initially released as "DRAFT")

NIST Process

Initial Input
(Resource Group,
Workshop, Interlab
Study, etc.)



**DRAFT
Report**

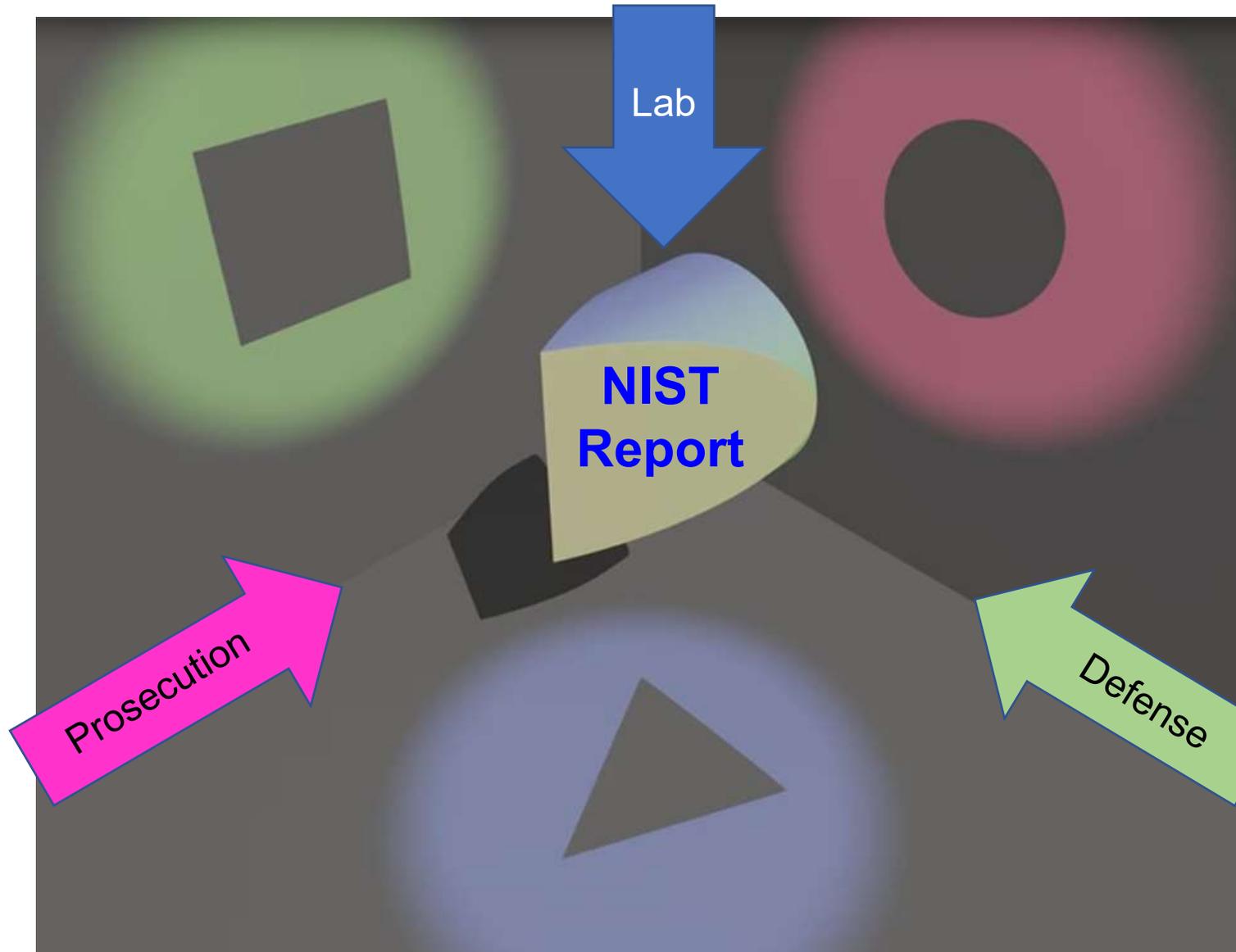


**Public Comments
on Draft Report**



**FINAL
Report**

We Recognize That There Are and Will Be Many Different Perspectives and Lenses on Our Foundation Reports...



**This is Why
Public Comment
is so Important!**

Clarification on What NIST Is and Is Not



- NIST is a Federal government **science agency** and does not comment on legal admissibility
- NIST is **not a regulatory agency**, which is why key takeaways are provided in our draft report rather than formal recommendations
- NIST **focuses on research and assisting with developing standards** (e.g., OSAC or SRMs); NIST does not conduct forensic science casework

Our Desire with This Report is to Help Move the Field Forward to Improved Practices in DNA Mixture Interpretation

From the Executive Summary (page 1):

“As with any field, the scientific process (research, results, publication, additional research, etc.) continues to lead to advancements and better understanding. Information contained in this report comes from the authors’ technical and scientific perspectives and review of information available to us during the time of our study. Where our findings identify opportunities for additional research and improvements to practices, we encourage researchers and practitioners to take action toward strengthening methods used to move the field forward. **The findings described in this report are meant solely to inform future work in the field.**”

Digital Forensic Interlaboratory Study

NISTIR 8412

Results from a Black-Box Study for Digital Forensic Examiners

Barbara Guttman
Mary T. Laamanen
Craig Russell

*Software and System Division
Information Technology Laboratory*

Released

February 17, 2022

†Chris Atha

††James Darnell

†National White Collar Crime Center
†† United States Secret Service

This publication is available free of charge from:
<https://doi.org/10.6028/NIST.IR.8412>

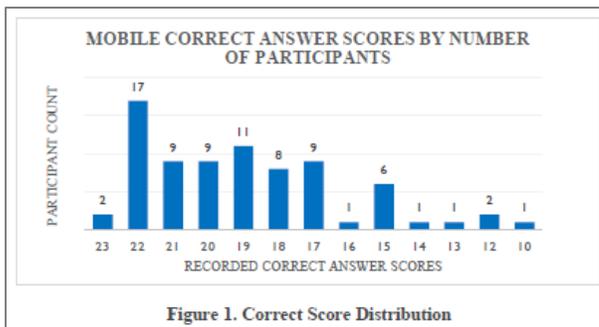


Figure 1. Correct Score Distribution

February 2022



U.S. Department of Commerce
Gina M. Raimondo, Secretary

National Institute of Standards and Technology

James K. Olthoff, Performing the Non-Exclusive Functions and Duties of the Under Secretary of Commerce for Standards and Technology & Director, National Institute of Standards and Technology

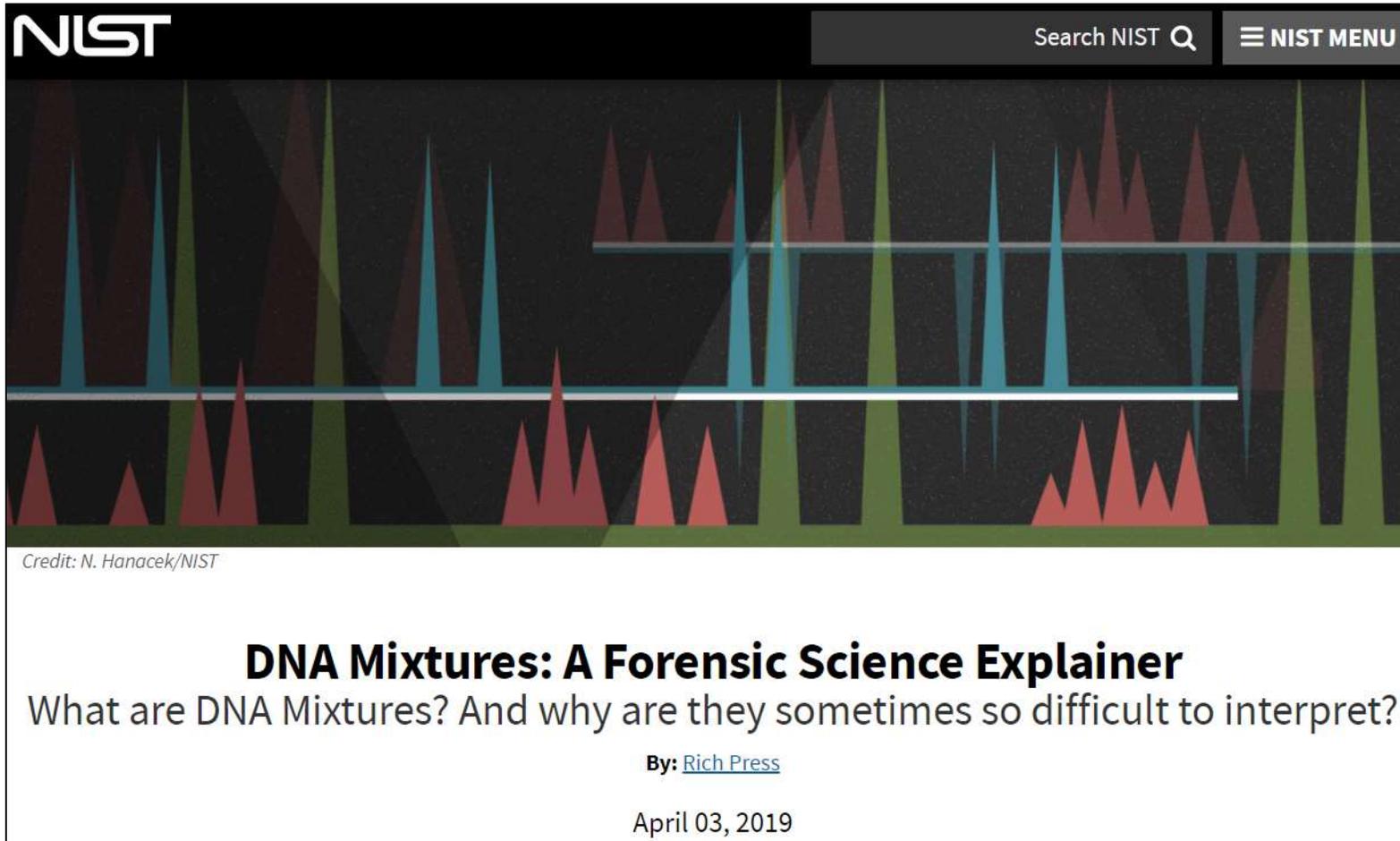
- Part of the NIST Scientific Foundation Review on Digital Investigation Techniques (NISTIR 8354-DRAFT)
 - This study was open to anyone in the public or private sectors who work in the field of digital forensics
- Evaluated accuracy of volunteer digital examiners with **24 questions using case scenarios and test artifacts for mobile devices and computer hard-drives**
 - Tests were developed in collaboration with the U.S. Secret Service and the National White Collar Crime Center
- Study participants:
 - **77 mobile device** and **102 hard-drive analyses**
 - Demographic data collected related to an individual's workplace environment, education, and work experience

NIST DNA Mixtures Explainer

#1 Result with a Google Search on "DNA mixtures"

Topics Covered

- Why have DNA mixtures and trace DNA become so prevalent?
- Are all DNA mixtures difficult to interpret?
- Why are complex DNA mixtures difficult to interpret?
- UNCERTAINTY #1: When is a peak a peak?
- UNCERTAINTY #2: Whose peak is it anyway?
- What is probabilistic genotyping software, and how does it help?
- How confident can one be that the DNA is related to the crime?
- Should labs just stop analyzing complex DNA mixtures altogether?



Credit: N. Hanacek/NIST

DNA Mixtures: A Forensic Science Explainer

What are DNA Mixtures? And why are they sometimes so difficult to interpret?

By: [Rich Press](#)

April 03, 2019



<https://www.nist.gov/featured-stories/dna-mixtures-forensic-science-explainer>

Future Plans for a Terminology Document

(perhaps connected to validation efforts planned in FY22)

1. Accuracy
2. Consistency
3. Precision
4. Uncertainty
5. Error
6. Repeatability
7. Reproducibility
8. Replicability
9. Reliability
10. Validity
11. Validation
12. Verification
13. Robust
14. Sensitivity
15. Specificity

Thank you for your attention!

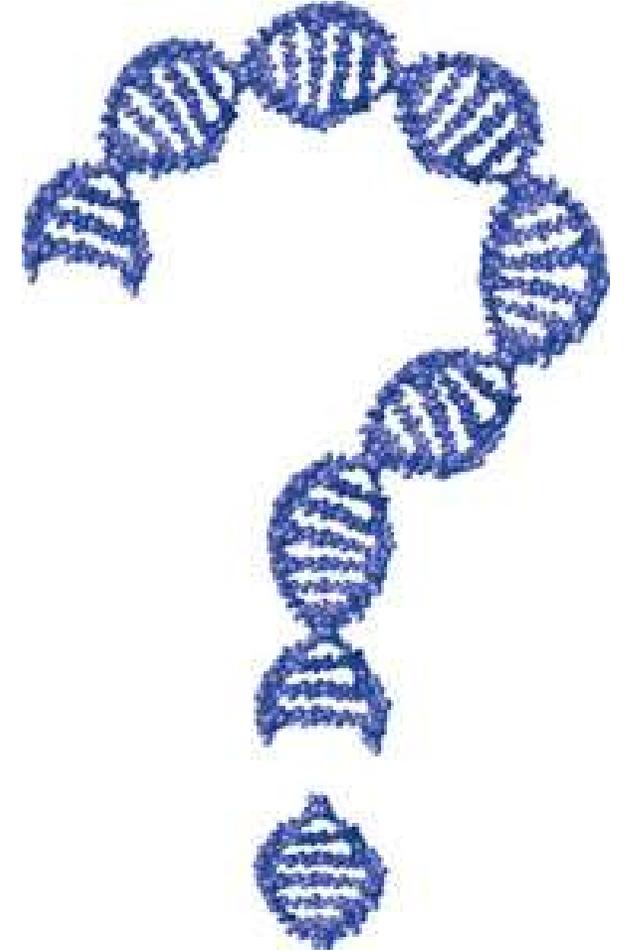
John Butler

john.butler@nist.gov

<https://www.nist.gov/topics/forensic-science>



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Questions?