

THE SCIENTIFIC COMMUNITY SPEAKS:

Utilizing the NAS Report to keep the Government's "Junk Science" out of the courtroom.

Robert Epstein
Assistant Federal Defender
Defender Association of Philadelphia



**STRENGTHENING FORENSIC SCIENCE IN
THE UNITED STATES:
A PATH FORWARD**

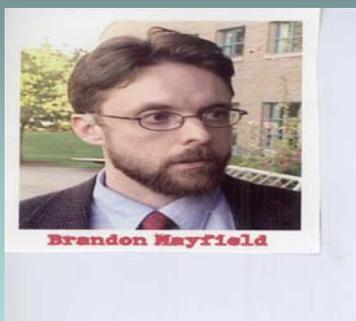
Committee on Identifying the Needs of the Forensic Science Community

Committee on Science, Technology, and Law
Policy and Global Affairs

Committee on Applied and Theoretical Statistics
Division on Engineering and Physical Sciences

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

Put a Human Face on the Story.



4 Lessons of Mayfield

- 1) Fingerprints of different people can have substantial similarity
- 2) Even the "best" examiners can make misidentifications
- 3) Internal verification does not ensure that errors will be caught
- 4) The ability of defendants to hire their own examiners does not ensure that errors will be caught

The Ultimate Lesson of Mayfield

- Any given forensic identification can be a mistake like Mayfield and, with the exception of DNA, we have no idea of what the probability is of that happening.
- This is the ultimate message of the NAS Report.

What exactly is the National Academy of Sciences

- The NAS is an honorific society of distinguished scholars engaged in scientific research.
- Created by Lincoln in 1863 to investigate, examine and report upon any subject of science whenever called upon by any department of the Government.
- NAS is composed of 2,100 members of whom nearly 200 have won Noble Prizes. Election to the Academy is considered one of the highest honors that can be accorded a scientist.

3

NAS Reports are considered "authoritative" and are controlling evidence of whether a technique or methodology is generally accepted by the scientific community

- United States v. Morrow, 374 F.Supp.2d 42, 49 (D.D.C. 2005);
- Coy v. Renico, 414 F.Supp.2d 744, 762 (E.D.Mich. 2006);
- United States v. Shea, 957 F.Supp. 331, 338-39 (D.N.H. 1997);
- United States v. Lowe, 954 F.Supp. 401, 403 (D.Mass. 1996);
- United States v. Moultrie, 552 F.Supp.2d 598, 601 (N.D.Miss. 2008).

How Did This Report Come To Be?

- November 2005, Congress enacts a statute authorizing NAS to evaluate the state of forensic science in this country.
- NAS forms a forensic science committee and over the course of the next two years conducts the most comprehensive study of forensic science ever attempted.

WHO WAS ON THE COMMITTEE

- Federal Judge, Law Professors (2)
- Crime Laboratory Director
- Biostatistician, Statistician
- Chemist, Chemical Engineer
- Computer Scientist
- Medical Examiners (2), Forensic Biologist, Forensic Chemists (2)

The Honorable Harry T. Edwards,
Senior Circuit Judge
and Chief Judge Emeritus
D.C. Circuit Court of Appeals

Solving the problems that
plague the forensic science
community

JUDGE EDWARDS

- “[T]he forensic science community is plagued by serious problems.”

Fields Examined by NAS

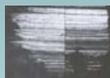
- Fingerprints
- Toolmark and Firearm Identification
- Handwriting
- Hair
- Fiber
- Shoeprints and Tire Tracks
- Bite Marks
- Explosives Evidence and Fire Debris
- Paint and Coatings
- Bloodstain Pattern Analysis
- Analysis of Controlled Substances
- Biological Evidence
- Digital and Multimedia Analysis

Two Fields I’m Focusing on

- **Fingerprints**



- **Toolmarks/Firearms**



What These and Other Forensic Identification Fields Have in Common: Individualization

1. Fingerprints – Identify – Individualize crime-scene print to a print from the defendant to the exclusion of all other fingerprints in the world.
2. Toolmarks/firearms – Identify – Individualize a mark left by a tool as having been made by a particular tool associated with the defendant to the exclusion of all other tools in the world.

2

These Forensic Identification Fields Are Based on the Same Premise: “Uniqueness”

Everything in the world is unique. Every fingerprint, everyone’s handwriting, every tool, every gun.

Practitioners of These Techniques Make the Same Claim:

Because everything in the world is unique, we can make an identification to the exclusion of every other object in the world -- every finger with respect to fingerprints, and every tool with respect to tool marks.

What does NAS say about this claim of individualization?

Often in criminal prosecutions . . . Forensic evidence is offered to support conclusions about "individualization"

With the exception of nuclear DNA analysis, however, **NO FORENSIC METHOD** has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source. (S-5)

NAS CONCLUSIONS

- The fact is many forensic tests – such as those used to infer the source of toolmarks or bite marks – have never been exposed to stringent scientific scrutiny.
- Most of these techniques were developed in crime laboratories to aid in the investigation of evidence from a particular crime scene, and researching their limitations and foundations was never a top priority. (1-6)
- A body of research is required to establish the limits and measures of performance. Such research is sorely needed, but it seems to be lacking in most of the forensic disciplines that rely on subjective assessment of matching characteristics. (S-6)



What does this mean in terms of admissibility?

NAS on The Courts

- “Epstein was right; Courts were wrong; Let his clients go.”



NAS on the Courts

- “Over the years the courts have admitted fingerprint evidence, even though this evidence has made its way into the courtroom without empirical validation of the underlying theory and/or its particular application.” (3-14)
- The bottom line is simple: In a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, and, the courts have been utterly ineffective in addressing this problem. (1-14)



NAS on the Courts (cont)

- We must limit the risk of having the reliability of certain forensic science methodologies judicially certified before the techniques have been properly studied and their accuracy verified by the forensic science community.
- “[T]here is no evident reason why ‘rigorous systematic’ research would be infeasible.” However, some courts appear to be loath to insist on such research as a condition of admitting forensic science evidence in criminal cases, perhaps because to do so would likely “demand more by way of validation than the discipline can presently offer.” (S-9)



NAS Recommendations:

Create a new federal agency:

1) The National Institute of Forensic Science:

- establish standards for mandatory accreditation of laboratories and mandatory certifications of forensic examiners
- promote research

(S-14)

NAS Recommendations

2) Remove all public forensic laboratories and facilities from the administrative control of law enforcement agencies or prosecutor's offices. (S-17,18)

NAS recognizes the problems caused by law enforcement bias.

NAS Recommendations

3) Research to address issues of accuracy reliability and validity in the forensic science disciplines.

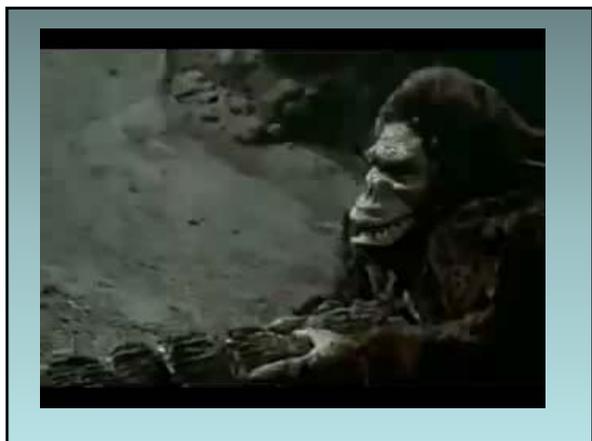
- studies establishing the scientific bases demonstrating the validity of forensic methods.
- should be peer-reviewed and published in respected scientific journals. (S-16,17)

NAS Recommendations

4) Establishment of standard terminology and model lab reports. (S-16)

Great recommendations for the future but what do we do now

	COURTS Immovable Object
	
NAS Irresistible force	



Using the NAS Report to convince Courts that particular techniques are unreliable.

The *Daubert* Factors

- Testing
- Publication and Peer Review
- Error Rates
- Standards
- General Acceptance by the Relevant Scientific Community





NAS: Forensic Science Fails the Testing Prong of *Daubert*

NAS Recommendation No. 3

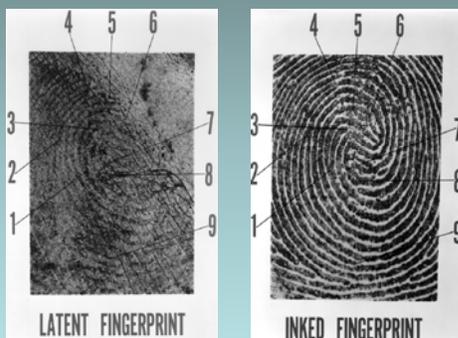
Research is needed to address issues of accuracy, reliability and validity in the forensic science disciplines.

(S-16)

What Kind of Studies are needed

Population Statistics, Probabilities

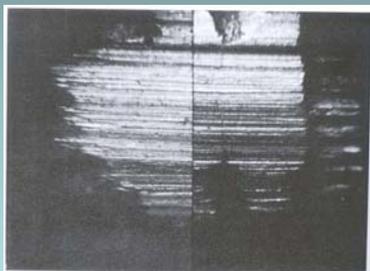
Inked Print / Latent Print



Lessons of Mayfield

- 1) Different people can have fingerprints with substantial similarity and we have no idea what the probability is of that occurring.

Toolmark Comparison



Similarity of Different Toolmarks

Different tools can leave marks that have significant similarity and we don't know what the probability is of that occurring



Recognized by Experts in the Field

For the first time, there is access to hundreds of computerized images of projectiles fired from similarly rifled firearms . . .

When using a comparison microscope . . . it is difficult to eliminate comparisons even though we know they are from different firearms.

Joseph Masson, *Confidence Level Variations in Firearms*, 29(1) AFTE Journal (Winter 1997)

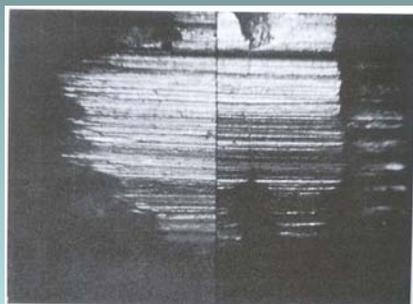
Toolmarks Change Over Time

The marks that a tool will make will change as the tool is used as a result of wear, and/or damage and corrosion.

What this means, for example, is that there will be significant dissimilarity between bullets fired from the same gun.

Alfred Biasotti & John Murdock, *Criteria for Identification*, 16(4) Ass'n Firearms & Tool Mark Examiners 16,17 (Only 21-38% of the striae on pairs of bullets fired from the same revolver matched).

Bullets Fired From the Same Barrel



NAS: Probability Studies are Needed

- The determination of uniqueness requires [much research]
- Population statistics for fingerprints have not been developed, and friction ridge analysis relies on subjective judgments by the examiner.. (5-10)
- A significant amount of research would be needed to scientifically determine the degree to which firearms-related toolmarks are unique or even to quantitatively characterize the probability of uniqueness. (5-20)

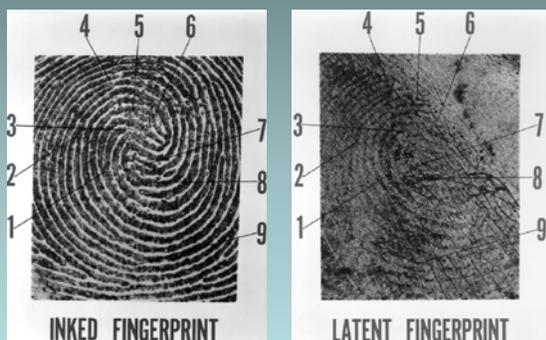
NAS: Research is needed on Accuracy

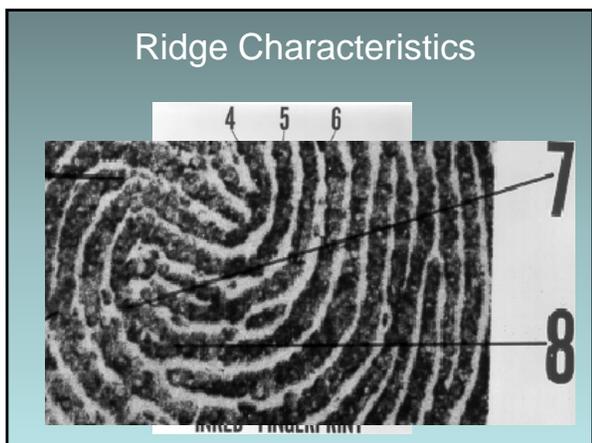
Recommendation No. 3

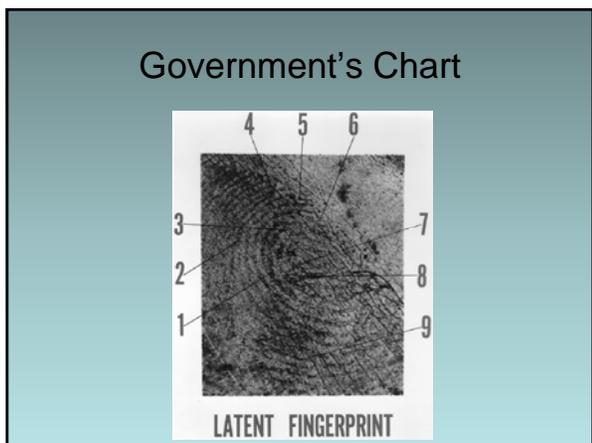
Research is needed to address issues of accuracy, reliability, and validity in the forensic science disciplines. (S-16)

NAS Recognizes Uniqueness is Only the Starting Point, it is Not Even Close to the Whole Issue

- The question is less a matter of whether each person's fingerprints are permanent and unique – uniqueness is commonly assumed – and more a matter of whether one can determine with adequate reliability that the finger that left an impression at a crime scene is [truly one of the defendant's.] (1-7)

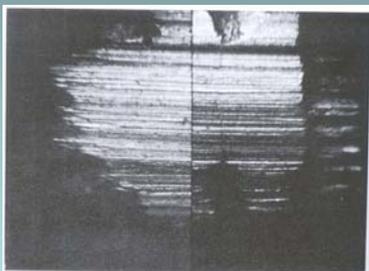








Toolmark Comparison





NAS: Rejects Claim That Adversarial Courtroom Testing is a Substitute for Scientific Testing

NAS says it's "Silly"

- [M]any fingerprint decisions of recent years . . . display a remarkable lack of understanding of certain basic principles of the scientific method. Court after court, for example, [has] repeated the statement that fingerprinting met the *Daubert testing criterion by virtue of having been tested by the adversarial process over the last one-hundred years. This silly statement is a product of courts' perception of the incomprehensibility of actually limiting or excluding fingerprint evidence.*

Bottom line: we win on the testing prong

STANDARDS

Fingerprint Examiners and their ACE-V Methodology

NAS: ACE-V is a Joke

- Under ACE-V examiners must make subjective assessments. (5-9)
- ACE-V is not specific enough to qualify as a validated method. (5-12)
- We have reviewed available scientific evidence of the validity of the ACE-V method and found none.

There Are No Standards for Comparing Prints

Any unbiased intelligent assessment of fingerprint Identification practices today reveals that there are, in reality, no standards.

David A. Stoney, *Measurement of Fingerprint Individuality in Advances in Fingerprint Technology* (Henry C. Lee and R.E. Gaensslen eds. 2nd Ed. 2001.)

Examiners Do Not Know How Much They Have to See to Declare a Match

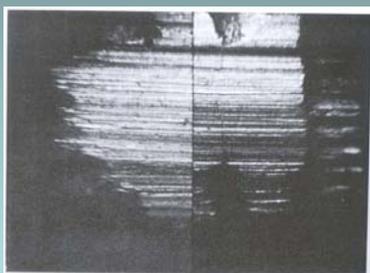
No Agreed-Upon Standard:

1. FBI: **No** standard
2. Local U.S. crime labs: **8-12**
3. France and Italy: **16**
4. Brazil and Argentina: **30**

A Field in Conflict

If the analysts do not quantify their analysis then their opinion of identity is strictly subjective. A subjective analysis without quantification makes the identification process as reliable as astrology. **Dusty Clark, "What's the Point" (Dec. 1999)**
http://www.latent-prints.com/id_criteria_idc.htm

Toolmark Comparison



Subjectivity Recognized in the Field

AFTE: Theory of identification as it relates to toolmarks.

1. The theory of identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when the unique surface contours of two toolmarks are in "sufficient agreement."
2. No definition of "sufficient."
3. Currently the interpretation of individualization/identification is subjective in nature, and based on the examiner's training and experience.

Conflict in the Field Over Standards

Some examiners have recognized the need for an objective standard and have adopted their own

- CMS – 6 consecutive matching striae in one group, 3 consecutive matching striae in two groups.

Steven G. Bunch, *Consecutive Matching Striation Criteria A General Critique*, 45(5) J. Forensic Sci. 955, 962 (2000).

NAS: Forensic Science Needs Standards

Toolmarks

- A fundamental problem with toolmark and firearms analysis is the lack of a precisely defined process. AFTE has adopted a theory of identification, but it does not provide a specific protocol [and it] does not even consider, let alone address, questions regarding variability, reliability, repeatability, or the number of correlations needed to achieve a given degree of confidence. (5-21)
- Because not enough is known about the variabilities among individual tools and guns, we are not able to specify how many points of similarity are necessary for a given level of confidence in the result.

2

Why “Standards” is a *Daubert* Factor

Without **standards** we have nothing to hold the expert to.

NAS: Forensic Science Needs
Minimum Competency Standards
for Labs and for Examiners

- Mandatory Lab Accreditation
- Mandatory Examiner Certification

(S-14)

To Do

- Find out if lab is accredited?
- Find out if examiner is certified?
- If not, why? Did he fail the test?
- Did he never take the test?

Bottom Line

- Forensic Science fails the standards prong of Daubert

ERROR RATES

NO TESTING
=
NO ERROR RATES



NAS: Forensic Science Needs to Establish Error Rates

- “Although there is limited information about the accuracy and reliability of friction ridge analyses, claims that these analyses have zero error rates are not scientifically plausible.” (5-12)
- “Much forensic evidence including for example, bite marks and firearm and tool mark identifications is introduced in criminal trials without any meaningful scientific validation, determination of error rates, or reliability testing to explain the limits of the discipline. (3-18)

2

JUDGE EDWARDS ON ERROR RATES

The committee’s report rejects as scientifically implausible any claims that fingerprint analyses have “zero error rates.” There is no such concept as a zero error rate in good scientific analysis. Yet, for years the courts were led to believe otherwise.

When Testing is Done, Error Rates May be Unacceptably High

- 1) Look at results on proficiency tests.

1995 FORENSIC TESTING PROGRAM LATENT PRINTS EXAMINATION

48 False identifications made by 34 examiners

Only 44% of the participants correctly identified the five latent prints that were supposed to be identified and correctly noted the two elimination latent prints that were not to be identified.

HANDWRITING PROFICIENCY TESTS 1976-1987

Forensic document examiners were correct 36% of the time, incorrect 42% and inconclusive 22%.

Risenger Denbeaux & Saks, Exorcism of Ignorance as a Proxy for Rational Knowledge, 137 U. Pa L. Rev 737 (1989).

TOOLMARK PROFICIENCY TESTS 1980-1991

- 74% of determinations made by tool examiners were correct, 26% incorrect

- Results understate day-to-day lab error rates because the testing was declared rather than blind and labs spent much more time on them than on actual case work

Joseph Peterson & Penelope N. Markham, Crime Lab Proficiency Testing Results, 1978-1991, 40 J. Forensic Sci. 1009, 1110, 1019, 1024 (1995).

To Do

- Get Discovery
- Get the proficiency test files

Errors in Real Cases

“LAPD Flunks Fingerprinting”

L.A. Times October 18, 2008

Internal Audit

Risk Assessment

The risk associated with an erroneous identification is high due to the vulnerability of the process, the frequency of occurrence and sufficient indication that quality controls in the LPU are inadequate to ensure accuracy.

Detroit Police Firearms Unit Closed Down

- 2008 Audit reveals misidentification in 3 out of 33 cases

Bottom Line

- We win on error rates

PUBLICATION AND PEER REVIEW

- Purpose of publication and peer review
- Internal non-blind verification does not insure reliability

GENERAL ACCEPTANCE

- Relevant scientific community
- NAS is the scientific community
- Must look beyond the practitioners of the field itself
- State of Maryland v. Bryan Rose, K06-0545 (Cir. Balt. Co. 2008) ("general acceptance of latent print identification by its practitioners does not constitute general acceptance by the 'scientific community' . . ."); United States v. Saelee, 162 F.Supp.2d 1097 ("Finally, the evidence does indicate that there is general acceptance of the theories and techniques involved in the field of handwriting analysis among the closed universe of forensic document examiners. This proves nothing.")
- Government has not and will not be able to produce anyone beyond law enforcement technicians

5

Bottom Line

- NAS report means we win on general acceptance

We win on every Daubert factor.
What are we seeking?

- Outright exclusion
- Severe limits on examiner's testimony. Examiners should not be allowed to testify to identifications with absolute certainty.

NAS: Forensic Experts Must Be Limited

At present, fingerprint examiners typically testify in the language of absolute certainty... such claims of absolute, certain confidence in identification are unjustified . . . Therefore, in order to pass scrutiny under *Daubert*, fingerprint identification experts should exhibit a greater degree of humility. Claims of 'absolute' and 'positive' identification should be replaced by more modest claims about the meaning and significance of a 'match.'" (5-11,12)

NAS: Forensic Experts Must Be Limited

Firearms examiners tend to cast their assessments in bold absolutes, commonly asserting that a match can be made 'to the exclusion of all other firearms in the world.' **Such comments cloak an inherently subjective assessment of a match with an extreme probability statement that has no firm grounding and unrealistically implies an error rate of zero.**

National Research Council, 2008 Ballistic Imaging

JUDGE EDWARDS LIMITS ON TESTING

When their testimony is admitted, forensic experts should offer nothing more in the way of evidence than what they actually know, leaving it to the jury or judge to weigh the evidence offered against the other evidence that is presented in a case. My concern is that some forensic practitioners may not know what they do not know about the limits of their discipline; they will have to be taught this so they can be circumspect in their testimony.

Firearms Expert Limited

United States v. Glynn, 578 F. Supp. 2d 567 (S.D.N.Y. 2008)
(Requiring firearms examiner to express his opinion of a match as only “more likely than not”, and recognizing that “because the burden of proof in a criminal case is ‘beyond a reasonable doubt,’ it follows that a conviction in a criminal case may not rest exclusively on ballistics testimony.”)

Firearms Expert Limited

United States v. Green, 405 F. Supp 2d 104 (D. Mass. 2005)

Expert not permitted to give opinion of a match, only allowed to testify to similarities.

Forensic Experts Limited

Handwriting - United States v. Hines, 55 F.Supp.2d 62 (D. Mass. 1999); United States v. Santillan, 1999 WL 1201765 (N.D. Cal. 1999); United States v. Rutherford, 104 F.Supp.2d 1190 (D. Neb. 2000); United States v. Brown, No. CR-184ABC (C.D. Cal. Dec. 1, 1999); United States v. Hernandez, 42 Fed. Appx. 173 (10th Cir. 2002) (not an abuse of discretion to limit the document examiner’s testimony); United States v. Hidalgo, 229 F.Supp. 2d 961 (D. Ariz. 2002)

Forensic Experts Excluded

- **Handwriting:** United States v. Fuji, 152 F. Supp. 2d 989 (N.D. Ill. 2002); United States v. Saelee, 162 F. Supp. 2d 1097 (D. Alaska 2001).
- **Fingerprints:** State of Maryland v. Bryan Rose, K06-0545 (Balt. Co. 2008);
- **Toolmarks:** Ramirez v. State, 819 So. 2d 836 (Fla. 2001)

The Report is Admissible

- It comes in under 803(8)(c) as a public report. NAS is a "quasi-public" entity. Erickson v. Baxter Healthcare, Inc., 151 F.Supp. 2nd. 952, 967(N.D. Ill. 2001); Green Mountain Chrysler v. Crombie, 2007 WL 1601518 at *2 (D. Vt. 2007) ("Regardless of whether NAS qualifies as a public office or agency, its 2002 report was commissioned . . . at the direction of Congress and will be admitted pursuant to 803(8)(c).")

NAS Experts

- **Fingerprints** – Ralph Haber - humanfactorsconsultants.com
- **Simon Cole** scole@uci.edu
- **Handwriting** – Mark Denbeaux - denbeama@shu.edu; Michael Saks - michael.saks@asu.edu
- **Toolmark's** – Adina Schwartz - aschwartz@jjay.cuny.edu

Prior NAS Forensics Reports
ON THE THEORY AND PRACTICE OF
VOICE IDENTIFICATION

- The practice of voice identification rests on the assumption that intraspeaker variability is less than or different from interspeaker variability. However, at present the assumption is not adequately supported by scientific theory and data. Viewpoints about probable errors in identification decisions at present result mainly from various professional judgments and fragmentary experimental results rather than from objective data representative of results in forensic applications.
- The Committee takes no position for or against the forensic use of the aural-visual method of voice identification, but recommends that if it is used in testimony, then the limitations of the method should be clearly and thoroughly explained to the fact finder, whether judge or jury.
- The government stops seeking to introduce voice identifications.

FORENSIC ANALYSIS WEIGHING
BULLET LEAD EVIDENCE

- It is up to prosecutors and judges to use the conclusions of this report to decide whether CABL evidence has enough value to be introduced in any specific case.
- Variations among and within lead bullet manufacturers makes any modeling of the general manufacturing process unreliable and potentially misleading in CABL comparisons.
- The available data do not support any statement that a crime bullet came from, or is likely to have come from, a particular box of ammunition, and references to "boxes" of ammunition in any form is seriously misleading under Federal Rule of Evidence 403.
- Interpretation and testimony of examiners should be limited
- The government stops seeking to introduce FBI's bullet lead analysis.

WHAT WILL BE THE RESPONSE OF LAW
ENFORCEMENT

- 1) Shoot the messenger – Attack the NAS
- 2) Spin the Report – "The most profound and promising aspect of the NAS Report was its refusal to affirmatively deny the reliability of many forensic disciplines that have come under the fire of critics around the country. The report makes no claim that disciplines such as firearm identification, toolmark identification, latent print identification and forensic odontology (bitemark comparisons), to name a few, are invalid or incapable of producing consistently accurate results." Crime Lab Report.
- 3) Produce quick research and claim problem has been solved.

**RESEARCH MUST BE
PUBLISHED AND
SUBJECTED TO PEER REVIEW**

- United States v. Llera-Plaza, 188 F. Supp. 2d 549, 566 (E.D. Pa 2002) - FBI fingerprint proficiency tests found to be seriously lacking.
- United States v. Mitchell - FBI's Lockheed Martin Study never published and academics who did review it, trashed it. David Kaye, Questioning a Courtroom Proof of the Uniqueness of Fingerprint, 71(3) International Statistical Review 521 (2003)
