NAS REPORT

Strengthening Forensic Science in the US: 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

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Congress directs NAS to undertake study – led to NAS report

Recognized significant improvements needed in FS.

Heard from practitioners, forensic laboratories, MEs, teachers, scholars, legal profession, researchers, law enforcement etc.

SURPRISE AND CONSISTENT

"The forensic science system, encompassing both research and practice, has serious problems that can only be addressed by a national commitment to overhaul the current structure that supports the forensic science community in this country. This can only be done with effective leadership at the highest levels of both federal and state governments, pursuant to national standards, and with a significant infusion of federal funds."

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RECOMMENDATION

Remove all public forensic labs and facilities from the control of law enforcement agencies or prosecution offices

Establish independent federal entity National Institute of FS

Purpose - independent accreditation and oversight of forensic scientists and forensic labs

Issues Covered During Hearings and Deliberations

See NAS Report S 2-3

(a) the fundamentals of the scientific method as applied to forensic practice—hypothesis generation and testing, falsifiability and replication, and peer review of scientific publications;

(b) the assessment of forensic methods and technologies—the collection and analysis of forensic data; accuracy and error rates of forensic analyses; sources of potential bias and human error in interpretation by forensic experts; and proficiency testing of forensic experts;

(c) infrastructure and needs for basic research and technology assessment in forensic science;

(d) current training and education in forensic science;

(e) the structure and operation of forensic science laboratories;

(f) the structure and operation of the coroner and medical examiner systems;

(g) budget, future needs, and priorities of the forensic science community and the coroner and medical examiner systems;

(h) the accreditation, certification, and licensing of forensic science operations, medical death investigation systems, and scientists;

(i) Scientific Working Groups (SWGs) and their practices;

(j) forensic science practices:

Pattern/experience evidence -
- **fingerprints (including the interoperability of AFIS)**
- **firearms examination**
- **toolmarks**
- **bite marks**
- **impressions (tires, footwear)**
- **bloodstain pattern analysis**
- **handwriting**
- **hair**

Analytical evidence -
- **DNA**
- **coatings (e.g., paint)**
- **chemicals (including drugs)**
- **materials (including fibers)**
- **fluids**
- **serology**
- **fire and explosive analysis**

Digital evidence;

(k) the effectiveness of coroner systems as compared with medical examiner systems;

(l) the use of forensic evidence in criminal and civil litigation—
- **the collection and flow of evidence from crime scenes to courtrooms;**
- **the manner in which forensic practitioners testify in court;**
- **cases involving the misinterpretation of forensic evidence;**
- **the adversarial system in criminal and civil litigation;**
- **lawyers' use and misuse of forensic evidence;**
- **judges' handling of forensic evidence;**

(m) forensic practice and projects at various federal agencies, including NIST, the FBI, DHS, U.S. Secret Service, NIJ, DEA, and DOD;

(n) forensic practice in state and local agencies;

(o) nontraditional forensic service providers; and

(p) the forensic science community in the United Kingdom.

One Stop Primer in Forensic Science
INDESPENSIBLE
Comprehensively Researched

- Explanation of FS area
- How to Sample Data and Collection
- Analysis
- Scientific Interpretation and Reporting of Results
- Summary Assessment

Two categories of Forensic Disciplines

Science Based – DNA, Analytical Chemistry, Forensic Pathology

Heuristically Based – Firearms/tool-marks, Fingerprints, blood spatter, writing samples, bite marks, hair

Intuition and common sense v. rigorous application of the scientific method

Scientific Culture
FS disciplines will profit by adoption of this scientific culture

- Encourages cautious, precise statements
- Discourages statements that go beyond established facts
- Acceptable for colleagues to challenge one another

Critical Step in Validation Studies

- Publication in peer-reviewed journals so experts can review, question and check repeatability of results

Accredited Laboratories Make Mistakes

Standard setting, accreditation of labs, certification of individuals aim to address many of these problems, but all labs make mistakes!

Replication

Replication will expose additional sources of variability and lead to greater understanding and scientific knowledge that can be used to improve the method.

Validation of results over time increases confidence.

Scientific Culture vs. FS culture

Critical questioning of results and of colleagues is encouraged!!!

Analytical v. Interpretation

Analytically based disciplines generally hold a notable edge over disciplines based on expert interpretation.

Variability Across FS Disciplines
CJS Ineffective in Excluding Unreliable Forensic Testing

-techniques
-methodologies
-reliability
-types and numbers of potential errors
-research
-general acceptability
-published material

Lack of Mandatory Standardization, Certification, and Accreditation

Most jurisdictions do not require:

forensic practitioners to be certified, and most forensic science disciplines have no mandatory certification programs.

Moreover, accreditation of crime laboratories is not required in most jurisdictions.

No Standard Protocols

Often there are no standard protocols governing forensic practice in a given discipline.

Even when there are:

Often are vague and not enforced in any meaningful way.

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Bottom line

Quality of forensic practice varies:

- Absence of adequate training and continuing education
- Absence of rigorous mandatory certification and accreditation programs
- Absence of and adherence to robust performance standards, and effective oversight

Shortcomings Pose Serious Threat

These shortcomings obviously pose a continuing and serious threat to the quality and credibility of forensic science practice.

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Except For Nuclear DNA

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.

In terms of scientific basis, the analytically based disciplines generally hold a notable edge over disciplines based on expert interpretation.

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KEEP CHALLENGING DNA

Talking about DNA as it has been validated as a science NOT the practical application in labs on a daily basis.

Challenges Facing the Scientific Community

Advances in science show potential;

Same advances revealed that, in some cases, substantive information and testimony based on faulty forensic science analyses may have contributed to wrongful convictions of innocent people.

This fact has demonstrated the potential danger of giving undue weight to evidence and testimony derived from imperfect testing and analysis.

Imprecise or exaggerated expert testimony has sometimes contributed to the admission of erroneous or misleading evidence.

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Problems Relating to the Interpretation of Forensic Evidence

Forensic evidence – offered to support conclusions about individualizations.

Terminology: "matching" a specimen to a particular individual or other source.

After NAS report – another must read

Next two slides will focus on an article by Garrett and Neufeld:

Invalid Forensic Science Testimony and Wrongful Convictions

Neufeld's Study

1. *Non-Probative Evidence Presented as Probative*
2. *Exculpatory Evidence Discounted*
3. *Inaccurate Frequency or Statistic Presented*
4. *Statistic Provided Without Empirical Support*
5. *Non-numerical Statements Provided Without Empirical Support*
6. *Conclusion that Evidence Originated from Defendant*

Eighty two cases

60% misstated empirical data or conclusions were unsupported by empirical data.

72 Analysts

52 Laboratories

25 States

Defense rarely cross examined.

Judges seldom provided relief.

Two questions should underlie admission of and reliance upon forensic evidence in criminal trials

(1) the extent to which a particular forensic discipline is founded on a reliable scientific methodology that gives it the capacity to accurately analyze evidence and report findings and

(2) the extent to which practitioners in a particular forensic discipline rely on human interpretation that could be tainted by error, the threat of bias, or the absence of sound operational procedures and robust performance standards.

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Daubert and its progeny have engendered confusion and controversy

Accused parties in criminal cases are convicted on the basis of testimony from forensic science experts, therefore, much depends upon whether the evidence offered is reliable.

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.

Courts loath to insist

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 disciplines can presently offer."

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Adversarial Process Not Suited to finding "scientific truth"

The judicial system is encumbered by, among other things, judges and lawyers who generally lack the scientific expertise necessary to comprehend and evaluate forensic evidence in an informed manner, trial judges (sitting alone) who must decide evidentiary issues without the benefit of judicial colleagues and often with little time for extensive research and reflection, and the highly deferential nature of the appellate review afforded trial courts' *Daubert* rulings. Given these realities, there is a tremendous need for the forensic science community to improve.

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Federal List Inquiry

We rec'd notice in one of our cases that the FBI bullet lead analysis and relevant testimony indicating that the evidentiary specimen came from a single box of ammunition "exceeds the limits of science and cannot be supported by the FBI."

NRC found:

Detailed patterns of distribution of ammunition are unknown, and as a result, an expert should not testify as to the probability that a crime scene bullet came from the defendant. Geographic distribution data on bullets and ammunition are needed before such testimony can be given.

Bloodstain Pattern Analysis

Helps investigators understand the events of the crime

Appear in homicide, sexual battery, burglary, hit and run

Interpretation Not Straightforward

Need:

Appropriate scientific education

Knowledge of terminology (angle, arterial spurting, back spatter, castoff pattern)

Understand Limitations of measurement tools (calculators, software, lasers, protractors)

Understand applied mathematics and use of significant figures

Understand physics of fluid transfer

Understand pathology of wounds

Understand general patterns blood makes after leaving body

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Professional Societies For BSPA

IAI and SWGSTAIN – but IAI has no educational requirements for certification in BSPA.

Therefore – "emphasis on experience over scientific foundations seem misguided, given the importance of rigorous and objective hypothesis testing and the complex nature of fluid dynamics."

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- Recommendations 1-13 - See NAS Report S 14-S 24

Things You Can Do

1. Select a team in the office to be the "forensic experts".
2. Train them in the various disciplines.
3. Have them available for consultation on specific cases.
4. Update training materials yearly.
5. Begin to formulate motions to challenge forensic evidence routinely.
6. Educate judges about the NAS report.
7. Talk to DAs that don't want to use bad forensic evidence in their cases.

Suggestions

How Will Justice Be Served

- Learn the science
- Think like a doctor
- Teach someone else
- Don't bite off more than you can chew

Hold things under a Microscope

- If it walks like a duck and talks like a duck, in science you must prove it's a duck!

IF ALL ELSE FAILS

Call me:

Diane MB Savage
Attorney at law and DRC Certified Mediator
dianes2@bellsouth.net
919 932-7239