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The National Academy of Sciences Forensic Report and Recent Developments: Using Science in the Family Courts[1]

by

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A. NAS Brief History
   1. Formed by President Abraham Lincoln during the Civil War.
   2. Currently investigates and reports on issues in the sciences and the arts when requested by the government.
   3. Over 2100 members, acceptance considered one of the highest honors a scientist can receive, membership has over 200 Nobel Prizes, unquestioned integrity.

B. The NAS Report
   1. The official title is "Strengthening Forensic Science in the United States: A Path Forward" (National Academies Press, 2009).
   2. This report was requested by Congress in 2005.
   3. Charge from Congress was *inter alia* to assess present and future needs of the forensic science community, make recommendations for maximizing forensic technologies and techniques to solve crimes, investigate deaths and protect the public; identify potential scientific advances; recommend

[1] All references to the NAS Report are: "NAS Report" followed by page number.

programs which will increase the numbers of qualified forensic scientist and medical examiners; disseminate best practices and guidelines concerning the collection and analysis of forensic evidence. NAS Report, pp. 1-2.

4. Importance of the Charge
    a. Defines the parameters of what the NAS can and cannot do. Here the NAS was NOT charged with opining on the law of admissibility of evidence.
        (1) Important to know limit of charge since prosecution often argues that the NAS Report did not state that the forensic disciplines it studied were not admissible in court; hence the argument to the court is that such forensic evidence is admissible.
        (2) NB: Only one organization in the United States – The National Association of Criminal Defense Lawyers – has called for a halt to the admissibility of forensic evidence to prove guilt beyond a reasonable doubt until such time as it is scientifically validated by independent scientific research.
        (3) NB: Prosecutors argue that the NAS Report should be dismissed and not considered by the court since it is only a policy report intended for use by policy makers (the subtext of this argument, sometimes stated in a motion but more often in oral argument is that the report is not accurate, it is only opinion.

C. The Bottom Line Findings of the NAS Report:
    1. "In a number of forensic science disciplines forensic science professionals have yet to establish the validity of their approach or the accuracy of their conclusions and the courts have been utterly ineffective in addressing these problems."
    2. "Forensic disciplines are supported by 'little rigorous systematic research to validate the disciplines basic premises and techniques."
    3. Research is needed to address the accuracy, reliability and validity of the disciplines.
    4. Measures of uncertainty have not been quantified.
    5. There are no best practices in many of the disciplines.
    6. Standardization and error rates have not been established.
    7. Accreditation and certification are voluntary.

D. Disciplines That the NAS Reviewed
    1. Fingerprints, Tools/Ballistics, Questioned Documents, Trace

Evidence, Fire Debris/Arson, Impression Evidence, Blood Splatter Analysis, Forensic Odontology.

E. What Has Been Learned from The NAS Report
   1. Lack of or no standards.
   2. Lack of or no protocols.
   3. Untested and unwarranted assumptions not supported by science.
   4. Examiner Bias
      (a) By virtue of the examiner's position as a lab technician operating in police laboratory, there is a potential bias to skewer the results in favor of law enforcement.
   5. Contextual Bias.
      (a) The examiner is given information which causes them to Skewer the results. The most famous example of this was the erroneous identification of attorney Brandon Mayfield as an individual associated with the Madrid train bombing in 2004.
      (b) An excellent study relied upon by the NAS Report regarding an experiment which showed the pernicious effects of examiner bias is "Why Experts Make Mistakes," I.E. Dror and D. Charlton, Journal of Forensic Identification, 56(4):600-616; NAS Report, p. 123.
      (c) See also "Inside The Judicial Mind," C. Guthrie, J.J. Rachlinski, et al, Cornell Law Review, 86:777-830 (2001)
      (d) See also "The Invisible Gorilla," C. Chabris and D Simons, (Crown Publishers, 2010).
   6. No testing methods.
   7. Insignificant or no research into error rates.
   8. Lack of training.
   9. Lack of expert certification.
   10. Lack of standards for report writing. See NAS Report, p. 185.
      (1) Language used by forensic "experts" on the witness stand:

"It's a match"
"It is consistent with..."
"It is identical...:
"It is similar in all respects tested....."
(AND MY ALL TIME PERSONAL FAVORITE)
"It cannot be excluded as a source of....."

      (2) The impreciseness in language results from the paucity of research and the corresponding limitations in inter preting the results of forensic analyses.

F. The NAS and Scientific Principles
   1. The scientific method presumes that events occur in consistent

patterns and can be understood through careful comparison and systematic study.

2. Knowledge is produced though a series of steps in which data is accumulated methodically, strengths and weaknesses of information are assessed and knowledge about causal relations is inferred.
3. Scientists develop a knowledge of the precision of the observations, the inferred nature of the relationships and the key assumptions behind the inferences.
4. Hypothesis are developed and measured against data and are either supported or refuted.
5. Rather than claiming absolute truth, science approaches truth through breakthrough discoveries or incrementally by testing theories repeatedly.
6. Experiments are done over a broad range of conditions.
7. Methods to reduce errors are part of the study design
8. The size of the study is carefully chosen so as to draw conclusions which have a high level of confidence or to understand factors which confound the results.
9. Practices are put into effect to detect biases and to minimize their effects on conclusions.
10. Unbiased experiments are designed to provide useful data about hypothesis. The collected data is then analyzed to support or refute the hypothesis.
11. Validation studies are subjected to peer review journals so that others can attempt replications as a means of further validating or exposing weaknesses.
12. Measurement error is taken into account.
13 Error rates are studied to determine the accuracy of measurement, performance; attention is given to the possible sources of error; error rates are a key component of the mission of forensic science.
14. Sources of bias are studied; cognitive bias – a willingness to ignore base information in assessing the probative value of information; a common cognitive bias is the tendency for conclusions to be affected by how a question is framed or how data is presented; cognitive dissonance - persuading oneself through rational argument that a preliminary conclusion is so good that there is an unwillingness to accept new information; seeing patterns where they do not exist due to our underestimating the complexity that can exist in nature ("Human intuition is not a good substitute for careful reasoning when probabilities are concerned").
    a. Bias can occur in many ways such as what information is conveyed by a police officer to the forensic technician. in this regard for the best example of how the relation-

ship can lead to biased reporting and even the suppression of favorable forensic evidence. See the North Carolina Attorney General's Audit of the North Carolina State Bureau of Investigation's Forensic Laboratory (available from website of the Raleigh News and Observer or the NACDL website or from the NACDL Resource Center).

b. See I. Dror, "Why Experts Make Errors," Journal of Forensic Science, 56(4): 600 – 616, (2006), NAS Report, p. 185.

G. Touchstone Concepts of the NAS Report

1. There is a vast difference between SCIENCE and the APPLICATION of science. Fingerprint analysis is an application of science while biology is the underlying science. Tool mark analysis is an application of science while physics, chemistry, and metallurgy are the underlying sciences.
2. There is no finality in science. There is no such animal as 100%. There are probabilities.
   a. How the FBI changed its stripes after 35 years of declaring fingerprint comparisons to be "100% matches."
   b. The International Association for Identification (IAI) recently changed its standard for reporting fingerprint comparisons. It now reads as follows:

"THEREFORE BE IT RESOLVED that any member, officer or certified latent print examiner <u>who initiates or volunteers oral or written reports, or testimony</u> of possible, probable or likely friction ridge identification, or who, when required in a judicial proceeding to provide such reports or testimony, <u>does not qualify it with a statement that the print in question could be that of someone else</u>, shall be deemed to be engaged in conduct unbecoming such member,..."

Therefore be it

RESOLVED that, based upon the results of a multi-year study by the Standardization II Review Committee, the IAI hereby recognizes the following:

1. For over a century, the examination and comparison of human friction ridge skin impressions have been used to determine the specific source of those impressions.
2. The practice of this form of comparative analysis by

trained and competent examiners has been shown, through experience and study, to be reliable with rare occurrences of error.

3. This reliability and extremely low occurrences of error have afforded friction ridge skin evidence a high degree of value and importance when used in the forensic arena.

4. It is the responsibility of forensic experts to offer a clear and unambiguous presentation of their conclusions.

5. Friction ridge skin impressions can display varying levels of commonality (pattern type, ridge flow) in appearance with other impressions which do not derive from the same source.

6. Friction ridge skin impressions can share class characteristics (pattern type, ridge flow) and any associations based on these criteria require, ethically and professionally, that the examiner clearly state any limitations of their conclusions.

7. The use of mathematically based models to assess the associative value of the evidence may provide a scientifically sound basis for supporting the examiner's opinion. Examiners shall only use mathematically based models that have been accepted as valid by the IAI in partnership with the relevant scientific community and in which they have been trained to competency.

8. Mathematically based models may not be used as the sole determinant when concluding that friction ridge impressions share a common source. The use of mathematically based models does not relieve the examiner of responsibility for their expert opinion.

(Emphasis Supplied)

c. WHAT ARE THE IMPLICATIONS OF PROBABILITY TESTIMONY
    1. The Reasonable Doubt Dilemma
    2. Cross –Examination on Credibility
    3. Expert witness refusal to accept probability and use of a defense witness
    4. The use of statistics and statistical affidavits in challenge motions

H. Scientific Disciplines and Related Problems
    1. Fingerprinting
        a. The ACE-V Method – Analysis, Comparison, Evaluation, Verification.
        b. The perception of zero error rates and of infallibility are notions that the public, and hence, juries have and share.

c. The problem with the fingerprint methodology is that it it is too broad. It is subject to error. It is subject to bias, both contextual and examiner.
d. No two examiners can reliably get the same results or put another way two examiners looking at the same material can reach different conclusions based on different analysis.
    (1) In I. Dror's experiment involving fingerprint analysts, a group of examiners were given a fingerprint comparison problem to analyze (but were not told that the work they would be looking at was previously their own). Half the group was told before the analysis commenced that "the suspect had confessed to the crime," or the "suspect was in custody at the time of the crime." In six of the 24 contextually manipulated examinations the examiners reached conclusions that were consistent with the biasing information and different from the results they had reached when examining the same prints in their daily work.
    (2) For context bias in another sphere, read "Picking Cotton: Our Memoir of Injustice and Redemption" by Jennifer Thompson-Cannino, Ronald Cotton and Eric Torneo, (St Martin's Griffin, 2010).
    (3) For context bias in judicial decision making, see "Inside the Judicial Mind," C. Guthrie, J.J. Rachlinski and A.J. Wistrich, Cornell Law Review 86:777-830, (2001)
e. Examiners do different things at different stages (lack of and no requirement of documentation).
f. No quantitative standards (points of particularity, what are ridges, whorls).
g. The Twin Concepts of Uniqueness and Persistence
    1. Prints are unique and are unchanged throughout life.
    2. Even if true it does not support claim that a person can readily discern whether or not two friction ridge impressions come from the same person.
    3. Impressions left by a finger differ each time because: (a) Variations in pressure.
    4. The variables have not been quantified, characterized or compared.
    5. Research is needed into ridge flows and crease patterns, discriminating values of various ridge formations and clusters of ridge formations.
    6. More research needed into factors which affect latent

prints such as skin conditions, residue, touch mechanics, distortion.

7. Distortions are too often explained away as "differences" or "acceptable distortions."

h. United States v. Zajac, United States District Court, District of Utah, Central Division, Case No. 2:06 Cr 811, September, 2010.

1. In this fingerprint exclusion case the court held that that the identifying fingerprint comparison expert could testify about the frequency of Level 1 fingerprint types in the population but because no scientific evidence was presented regarding the Level 2 and 3 frequencies in the population no testimony would be permitted.
2. The expert can testify that the defendant's print is consistent with the latent recovered print and even that they match closely and can opine on the specific markers which formed his opinion, but he cannot testify or otherwise represent that there is an objective basis for that opinion or that it is supported by scientific principles or scientific methods. Nor can the expert even offer an opinion on the probability that the fingerprints match. The expert is also prohibited from stating either in general background testimony or in testimony about individualization or permanence.

2. Tool Mark Analysis

a. The concept: manufacturing tools experience wear, abrasion as they shape metal.
b. The marks are transferred to softer metals such as ridges and rifling's on a gun barrel (rifling's improve accuracy) which in turn are transferred to softer metals such as bullets
c. Class characteristics – distinctive features shared by many items of the same type, e.g., grooves in a gun barrel
d. Individual characteristics – fine microscopic markings and textures unique to an individual.
e. Sub class characteristics – somewhere between class and individual characteristics, e.g., common to a small number of firearms produced by a manufacturing process.
f. Comparisons are made when examiner identifies individual characteristics from class and subclass

characteristics and assesses the extent of agreement in individual characteristics in the two sets of tool marks.

g. The Association of Firearms and Tool Mark Examiners (AFTE):
   (1) acknowledges that the examiner's decisions are subjective quality judgments.
   (2) accuracy is dependent on skill and training.
   (3) NAS found that even with newer techniques and more training the final decision rests upon subjective judgments based upon unarticulated standards and no statistical foundation for the estimation of error rates.
      a. The NAS concluded that not enough is known about the variability of guns and hence we cannot specify how many points of similarity are necessary fro a given level of reference; not enough studies have been done to demonstrate the reliability and repeatability of the methodology.
      b. Class characteristics are helpful in narrowing the pool of tools and individual characteristics may in some cases suggest one source but studies still need to be done making the process of individualization more precise and reliable.
      c. There is no defined process – there is a theory of identification but no protocols:
         (1) An examiner can render an opinion when "sufficient agreement" exists in a pattern of two sets of tools.
   (4) Agreement is defined"
      WHEN IT EXCEEDS THE BEST AGREEMENT DEMONSTRATED BETWEEN TOOLMARKS KNOWN TO HAVE BEEN PRODUCED BY DIFFERENT TOOLS AND IS CONSISTENT WITH THE AGREEMENT DEMONSTRATED BY TOOL MARKS KNOWN TO HAVE BEEN PRODUCED BY THE SAME TOOL
   (5) The terms "exceeds the best agreement" and "consistent with" are not defined.
      a. An examiner is expected to draw upon his/her experience.
      b. The AFTE Criteria for Identification Committee Report issued in 1992 did not address or consider: variability, reliability, repeatability, and/or correlations needed to achieve a given degree of confidence.

I. Recent Developments in the Law

1. The Court Cases and Holdings Re B/T Identification

(a) United States v. Taylor, No. CR 07-1244, 2009 WL 3347485

1. Prosecution witness can testify as an expert
2. His testimony is admissible in evidence.
3. Expert can give his opinion that there was a match.
4. Expert cannot testify that his conclusion is a matter of scientific certainty.
5. Expert not allowed to testify that he could conclude that there is a match to the exclusion, either practical or absolute, of all other guns.
6. Expert can testify that in his opinion the bullet came from the suspect gun to within a reasonable degree of certainty in the firearms field.

(b) United States v. Glynn, 578 F. Supp 2d 567 (SDNY) 2008)

1. Expert can testify that a match was "more likely than not." At 574-575
2. Expert cannot testify that ballistics is a science. At 568.
3. Expert cannot testify that he reached his conclusion to any degree of certainty, whether ballistic or otherwise. At 569
4. Whatever ballistics identification could be called, it could not fairly be called a science. At 570.
5. Ballistics methodology was too subjective to permit opinions to be stated "to a reasonable degree of certainty." At 570.
6. Ballistics opinions are significantly subjective. At 572.
7. The gun manufacturing process never operates identically in any given case and therefore causes differences between any two guns that, while tiny, may still be detected by use of a comparison microscope. At 572-3
    a. While this assertion has never been put to the rigorous testing that science demands, it has been sufficiently well-documented as to support a reasonable hypothesis of its validity. At 573.

b. There is an assumption that the unique characteristics of each firearm are to an appreciable degree copied on to some or all of the bullets and casings fired from a gun. At 573.
    1. While this assumption has never been proven to a degree of scientific certainty, the assertion is both plausible and sufficiently documented by experience as to provide a good working assumption for most practical purposes. At 574.

(c) United States v. Diaz, No. 05-167, 2007 WL 485967 (N.D. Cal. Feb. 12, 2007)
    1. Because the accepted practice in the field is based on subjective assessment, in actual case work it is impossible to determine that an examiner's conclusion is correct or incurrect. That alone does not mean that the theory is not testable.
    2. Literature from the field demonstrates that pattern matching theory has been tested and verified for decades and this weighs in favor of admissibility.
    3. The AFTE Journal publishes a "peer reviewed" journal and that the peer reviewed literature generally supports the AFTE Theory of Identification.
    4. Cartridge cases can be identified from a specific firearm regardless of how many times the weapon is fired.
    5. For spent bullets, the literature indicates that individual characteristics can change after many firings but the matching of spent bullets to a particular firearm is frequently done and is well-accepted.
    6. It is not possible to calculate an absolute error rate partly because the standards and criteria are subjective. Yet enough data has been provided to show that error rates among trained firearms examiners are sufficiently low.
    7. While the term "sufficient agreement" in the AFTE definition of the theory of identification could be construed as vague, it is not an unreasonable standard when utilized by

competent firearms examiner.

8. The evidence before the court does not support the theory that firearms examiners can conclude that a bullet or casing was fired by a particular firearm to the exclusion of all other firearms in the world.
9. The government in this case will only be permitted to have the expert witness testify that the bullets or casings were fired from a particular firearm "to a reasonable degree of ballistic certainty."
10. In some ways firearms identification is analogus to eyewitness identification.
    a. We recognize person on the street but there is always the possibility that it is not who we think it is. Yet we know when we are confident in the pattern to make an "identification." (Some courts call this MISTAKEN IDENTIFICATION).
    b. A zookeeper knows each animal by name, where any other person would not be able to tell the difference between two elephants. (HOW DO WE KNOW THAT THE ZOOKEEPER KNOWS EVERY ANIMAL BY NAME? IS THERE A STUDY OF THIS PHENOMENON? IS THIS BASED ON AN ANIMAL PLANET SPECIAL?)

(d) United States v. Monteiro, 407 F. Supp. 2d 351 (D. Mass. 2006)

1. The court determined that B/T methodology is sufficiently reliable.
2. Examiner can testify "to a reasonable degree of ballistic certainty."
3. Because examiner in this case used replacement parts when testing the weapon and has never had his work peer reviewed his testimony is not admissible. If done, he can testify.

(e) United States v. Mouzone, 8 Cr 86, (USDC of Md., October 29, 2009)

1. A B/T case
2. Federal courts have almost without exception admitted tool mark evidence often without applying the Daubert factors.

3. Relying on U.S. v. Williams, 506 F. 3d 151 (2d Cir. 2001) the court noted that past acceptance of does not render expert testimony admissible; expert testimony long assumed reliable still must be tested pursuant to Daubert and Kuhmo Tire.
3. B/T has a long way to go before it can claim to be "science."
4. Despite the fact that there is no agreement as to how much correspondence exceeds the best known non-matching situations the AFTE courses and the CTS proficiency testing with all its limitations demonstrate the existence of standards governing B/T methodology with two important qualifycations: the conclusion expressed in court is only as good as the underlying photographs, sketches and notes that support it and that these materials are critical to juries who can learn of any deficiencies through cross-examination.
5. B/T evidence can only be offered with the proper qualifications as to its accuracy.
6. Reduced to its essentials, the AFTE "sufficient agreement" conclusion can hardly be regarded as an absolute identification.
7. In this case court will not permit officer/expert to express his opinion to the same degree of certainty other courts have permitted. He can state his opinion and basis without any characterization as to certainty (including "more likely than not" or "to a reasonable degree of ballistic certainty." If these recommendations are rejected then all the ballistics/expert should be permitted to state is "more likely...." Or to "a reasonable degree...."
    a. Because the government was not forthcoming with discovery court found the prejudice to the defense was great.

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

(g) United States v. Alls, No. CR2-08-223(1), United States District Court, Southeastern District of Ohio, Eastern Division, December 12, 2009)
1. Permits B/T technician to testify to her

methodology but not her opinion attributing the casings exclusively to one firearm.

2. Such testimony (re her conclusion) would be misleading and prejudicial given the inherent subjectivity of B/T identification.

B. Court Cases and Holdings Re Other Forensic Disciplines

1. United States v. Smallwood, 2010 WL 4168823 (W.D. KY)

(a) This cases addressed issues surrounding arson investigation and non-firearms tool marks identification

(b) The issue framed by the court was whether the testimony of the prosecutions arson expert was reliable.

(c) The court concluded that it was within the area of this expert's expertise to testify that the defendant could not have been on a stairwell where she claimed to have received the burns on her legs based upon the expert's knowledge of radiant heat and the layout of the scene.

(d) The expert could not testify whether the defendant received the burns to her legs from being chased up the stairs, extending her legs over a patio roof and attempting re-entry through the bedroom window as being speculative, not supported by any scientific analysis as to how the fire would have progressed after ignition in the living room, traveling up the stairs, down a hall and into a bedroom. Further no studies were presented showing any of the expert's own experiments or other studies regarding heat levels, smoke inhalation and timing of fires.

(e) The expert could not opine as the defendant's burns being consistent with someone who set the fire because there is no valid scientific basis for this opinion. Further there are no systematic studies on the burns sustained by persons igniting a fire that would allow the court to determine the reliability of the expert's testimony. Indeed the expert's own writings on the subject note that victims of fires suffer no antemortem damage.

(f) While the court acknowledges that the expert has the requisite training, education and experience in the field his particular opinion re the burns suffered by the defendant as being consistent with those of someone who ignited a fire are unsupported and unreliable.

(g) As for the government presenting as an expert witness a person who will testify that a knife recovered in the house was the same knife that made the marks on the tires of a vandalized car outside of the home, this is not permitted because, while this witness is likely an expert

in the field of firearms identification, that expertise cannot be translated into being an expert on knife markings. The expert had but one class on knife identification, and that class was not entirely devoted to knife identification. Further the witness acknowledges she has never testified in a court of law regarding knife mark identifications. She does not have the skill and educational training upon which to assert a reliable opinion. Most important of all the witness when cross examined upon photographs she had submitted stated the photos were not great pictures and it was difficult to see what she was testifying about. In doing so she effectively insulated herself from cross-examination which runs afoul of the Melendez-Diaz v. Mass, 129 S.Ct. 2527 (2009). Moreover, the Court's research could not find a single federal decision on the admissibility of knife identification. In the end, the Court compared knife mark identification to polygraph examinations where there studies have shown wildly varying error rates.

J. A New Way of Doing Business
   1. No longer "where can I find an opposing expert" but instead "what experts do I need to challenge the science and application in a particular case."
   2. United States v. Hebshie, United States District Court for the District of Massachusetts, 02 Cr 10185 (NG), Nov. 15, 2010
      a. This was a Writ of Habeas Corpus based upon a claim of ineffective assistance of trial counsel and specifically how trial counsel addressed (or did not) scientific testimony presented at the defendant's arson trial.
      b. The court concluded in a 65 page decision that counsel was ineffective and vacated the conviction.
      c. At trial the prosecution presented two kinds of expert scientific testimony: (1) Trooper Lynch who testified at length about the abilities of Billy the accelerant-detection dog and (2) firefighter Meyers who testified as to an arson caused fire based on his observations made with a thermal imaging camera which showed "hot spots."
      d. Lynch vouched for Billy' accuracy noting she had been "certified" although the basis for the certification was not clear. He also stated that Billy was "97%" accurate. If Billy were ever wrong it was the handler's fault based upon Lynch's conversations with lab techs in Connecticut and Massachusetts. Billy was directed to an area of the location where the cause-and-origin investigator had already determined was the source of the arson. Billy

reacted positively that accelerants were present. The dog did not alert to anything else on the premises.

e. Domingos, the cause-and-effect investigator, had looked at the pile of rubble left after the fire had been extinguished and almost immediately concluded that it was an arson fire. Domingos on cross-examination discounted that the fire could have been caused by an electrical malfunction in the basement of the building notwithstanding that his reports did not mention the basement of the building. Domingos noted that no control samples were taken at the scene to determine if accelerants had been used even though he conceded that such samples are necessary to insure that whatever accelerants are found are not part of the ambient environment. Domingos did not know why such samples were not taken and suggested that Lynch be asked that question. Lynch in his testimony pointed the finger at Domingos.

f. Defense counsel did not challenge the breadth of Lynch's testimony, its emotional quality (love of the dog), or irrelevant references to other dogs nor did defense counsel challenge the 97% accuracy claim or the scientific literature on false negatives when dogs alert. Lynch tool only one sample at the scene and that was not challenged by the defense either.

g. The sample was tested in a laboratory and found to contain a light petroleum distillate but beyond that the substance was not identified.

h. The defense did not challenge the thermal imaging "hot spots" testimony instead relying on its hired expert Titus to give a different interpretation of what those "hot spots" meant, namely a fire in the walls consistent with a basement fire traveling through the walls of the building.

i. Titus noted that a control sample was part of the scientific method and necessary to validate results but Titus did not present any evidence about the basement's condition, photographs, samples or even notes.

j. Defense counsel was asked at the hearing why he did not bring a Daubert challenge to the cause-and-origin testimony and the arson evidence and responded that he assumed predecessor counsel had decided not to pursue such a challenge but he also believed he never spoke to predecessor counsel about it. Predecessor counsel contradicted trial counsel indicating that he never told trial counsel he had ruled out filing a Daubert challenge or suggested not filing one, and in fact he was certain he

discussed with trial counsel challenging the government's experts. Trial counsel conceded there was no strategic reason for failure to exclude or object to the expert testimony.

k. Significantly an insurance investigator had taken a photo of the steps leading to the basement of the demolished location. Trial counsel never asked for any photos from the insurance investigation, and Titus stated he never saw such a photo. The hearing court found the photo to be significant because it showed, in the area of the basement, charring and significant soot deposits, indicating a fire had come out of the basement.

l. While there is a great deal more to the decision then can be outlined here suffice it to say the hearing court found that there was not a complete failure of defense but counsel did fail to bring a Daubert challenge, did not seek to exclude the expert testimony, did not argue that the expert testimony failed to meet the minimal threshold for reliability of scientific evidence and should not have been admitted and finally defense counsel failed to alert the court to the ways in which the government's investigation undermined their ability to present a defense. Moreover, the court found that not only was the defense counsel's pre-trial performance deficient but the trial performance also failed.

m. In sum and substance Hebshie stands for the proposition that a failure in the post-NAS world to mount a Daubert challenge, to adequately understand and prepare before trial to examine and understand scientific evidence amounts to ineffective assistance of counsel.

3. Challenge Motion for Ballistics
   a. What the Motion Might Look Like.
   b. Challenges the evidence as not sufficiently acceptable in a relevant scientific community, subjective method is not generally acceptable, the practice of a match is not acceptable, the examiner failed to compare the markings in this case with those of similar weapons, absence of empirical data does not support the identifications claim.
   c. The "relevant scientific community" concept includes not just practitioners of forensic science but everyone with a scientific background and training sufficient to allow them to comprehend and understand the process.
      (1) See U.S. v Porter, 618 A 2d 629, 632 (D.C. 1002)
      (2) In ballistics this includes metallurgists, material scientists, statisticians, and mechanical engineers.

d. An explanation of what ballistics examination involves
   (1) The education component.
   (2) Rifles, lands, striations (do not assume judges know these definitions).
e. Delineate the specific controversial areas
   (1) the validity of scientific assumptions such as uniqueness and reproducibility.
   (2) the soundness of subjective pattern matching especially as to the ability of the examiner to distinguish between subclass and individual characteristics.
   (3) the practice of claiming a match in the absence of a statistical or scientific foundation for a claim
   (4) The Uniqueness Concept and Unique Tool Marks Reproduce Idea
      (a) NRC "Ballistics Imaging" 2008 report categorically states that these two assumptions have not been demonstrated.
f. Submission of affidavits from NRC Committee.
g. The subjective method for comparison comes down to a side by side comparison through a microscope with no threshold standards and no methodology for determining subclass from individual characteristics.
h. Firearm examiners admit to the subjectivity of the method:
   (1) Nichols, "Defending the Scientific Foundations of the Firearms and Tool Mark Discipline," 52(3) Journal of Forensic Science, 585, 590 (2007)
      (a) the actual definition of a match is different because of different experience levels.
i. Affidavit of scientist showing that a lack of objective standards is not acceptable in the relevant scientific community.
j. The "exceeds the best agreement" standard calls upon each examiner to search his/her own memory of known matches and non-matches to determine if the examined sample falls within a specific range:
   (1) There are no published databases for non-matches.
   (2) There is disagreement among examiners as to how much of amount and type constitutes agreement.
   (3) Over time an examiner's criteria for determining a "match" will change as they see more and more matches and non-matches.
   (4) Without objective standards, the examiner's subjective standard leaves him/her open to context bias.
   (5) Examiners won't use the six striation standard, i.e., six consecutive matching lines. Why? Because it is

exceedingly rare.

k. Quote the NAS report
   (1) Who was on the committee, who reviewed, who presented testimony.

K. Looming Legal Obstacles and Judicial Education
   1. Court's fallback position: cannot testify it is a match nor that it is a science but can say it is "more likely than not" and can say "I am a technician."
   2. NAS report does not state that forensic disciplines are inadmissible in court. This was not the charge given to the NAS.
   3. Inappropriate comparisons or setups:
      (a) Fingerprints work because you can compare inked to inked fingerprints
      (b) "It has been, is now and so shall it always be."
      (c) Its accepted.
      (d) Thousands of cases have admitted the discipline.
      (e) Fingerprints are unique and unchangeable
   4. Jurors get it right (judge's sometimes justification for admissibility).
   5. Jury instructions will take care of everything.
   6. Vigorous cross-examination will ferret out the truth (the famous negative rule of evidence).

L. Where We Are Heading
   1. Slowly but surely the Courts are beginning to scrutinize so-called forensic scientific evidence much more closely. As a result courts are either excluding or severely limiting the testimony. In some cases the courts are finding that a witness is not an expert but in some the trend is to find the expert qualified and then to permit only testimony that the expert can back up or limit where the expert does not properly document his claims. to be sure there are still federal cases finding that the forensic disciplines are totally acceptable, that they have been admitted into evidence in hundreds and even thousands of cases and that alone is enough to continue admission. That many courts still do not properly apply the Daubert criteria or continue to believe that if a relevant scientific community accepts a forensic discipline, then it is enough for the court to accept the same even in the face of new evidence and scientific research casting doubt upon the validity of the underlying scientific assumptions. Yet the change has started and will continue unabated.