



**TESTIMONY OF PETER NEUFELD
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SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION
HEARING ON
STRENGTHENING FORENSIC SCIENCE IN THE UNITED
STATES: THE ROLE OF THE NATIONAL INSTITUTE OF
STANDARDS AND TECHNOLOGY
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Thank you Chairman Gordon, Ranking Member Hall, and members of the Committee. My name is Peter Neufeld and I am the co-director of the Innocence Project, affiliated with the Cardozo School of Law, which co-director Barry C. Scheck and I founded in 1992. The project is a national litigation and public policy organization dedicated to exonerating wrongfully convicted people through DNA testing and reforming the criminal justice system to prevent future miscarriages of justice.

Without the development of DNA testing, there would be no Innocence Project; 233 factually innocent Americans would remain behind bars, and 17 of those 233 could have been executed. Our research into the causes of wrongful conviction reveals that police and prosecutors' reliance on un-validated and/or improper forensics was the second – greatest contributing factor to those wrongful convictions. Our analysis regarding wrongful convictions involving unvalidated or improper forensic science that were later overturned through DNA testing is attached to this testimony.

Given what those DNA exonerations have taught us about the shortcomings of forensic science, the Innocence Project is extremely thankful to Congress for authorizing and appropriating funds to establish the National Academies of Science Committee on

Identifying the Needs of the Forensic Science Community. By convening some of the very best minds in the nation to focus on the needs and shortcomings of forensic practice and how to remedy them, the nation has been provided with both an alarm regarding the serious shortcomings that exist regarding forensic evidence, and a roadmap to addressing the major improvements in the forensic system necessary to ensure the most accurate evidence – and therefore justice – possible.

I am also extremely pleased to participate in this hearing reviewing the recommendations and conclusions of the National Academies' report *Strengthening Forensic Science in the United States: A Path Forward*. Thank you for the invitation to testify before you today.

While the Innocence Project is known for its association with DNA evidence, we are forever cognizant of the importance of non-DNA forensic evidence to determinations of justice. Our criminal justice system relies heavily on non-DNA forensic techniques. The Bureau of Justice Statistics' 2005 Census of Publicly Funded Forensic Crime Laboratories reported that new lab requests for DNA work consist of only approximately 3% of all of all new requests for lab work.

As our review of DNA exonerations shows, unvalidated and improper forensics contributed to approximately 50% of wrongful convictions overturned by DNA testing. In the DNA exonerations alone, we have had wrongful convictions based on unvalidated or misapplied serological analysis, microscopic hair comparisons, bite mark comparisons, shoe print comparisons, fingerprint comparisons¹, forensic geology (soil comparison), fiber comparison, voice comparison, and fingernail comparison², among the many forensic disciplines that have produced these tragic miscarriages of justice in our courts. There have even been a few innocents whose convictions relied, in part, on shoddy DNA testing in the early years of its forensic application. It comes as no surprise to us that the NAS concluded: "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

¹ Garrett and Neufeld, *Virginia Law Review*, Vol. 95, No.1, March 2009, p. 8.

² *Ibid.*, p. 13.

or source.”³ The overarching problem has been that all too frequently, these other forensic disciplines have been improperly relied upon to connect our innocent clients to crime scene evidence.

Just as DNA exonerations reveal inherent shortcomings in other forensic disciplines, the evolution and regulation of DNA in the forensic setting (from basic research to crime lab and to casework) contrast starkly with the near total absence of validation and demonstrable reproducibility for many other forensic technologies. Long before there was a national forensic DNA testing program, the National Institutes of Health (NIH) and others funded and conducted extensive and relevant basic research and followed it with applied research. Scientists appreciated the challenge of transferring the technology from research lab to clinical lab and from clinical lab to crime lab. The forensic methods were validated for case work, and individual crime labs further validated the kits and protocols for use in their own laboratory settings.

In contrast to DNA, the vast majority of non-DNA forensic assays, which have often been erroneously used to suggest an individual match, have never been subjected to basic scientific research or federal review. Moreover, as pointed out by the NAS, neither the FBI nor the National Institute of Justice have, over the years, “recognized, let alone articulated, a need for change or a vision for achieving it. Neither has full confidence of the larger forensic science community. And because both are part of a prosecutorial department of the government, they could be subject to subtle contextual biases that should not be allowed to undercut the power of forensic science.”⁴ Without a push for vigorous adherence to the scientific method, innocent people have gone to prison or death row while the real perpetrators remained at liberty to commit other violent crimes.

The NAS report references several of the forensic disciplines which have gone unregulated and without proper validation and reliability:

³ Strengthening Forensic Science in the United States: A Path Forward, Committee on Identifying the Needs of the Forensic Science Community, The National Academies Press (2009), p. 5-5.

⁴ Ibid., p. S-12.

- **Hair Comparisons:**

“No scientifically accepted statistics exist about the frequency with which particular characteristics of hair are distributed in the population. There appear to be no uniform standards on the number of features on which hairs must agree before an examiner may declare a “match.”⁵ The report notes that along with the imprecision of microscopic hair analysis, the “problem of using imprecise reporting terminology such as ‘associated with’, which is not clearly defined and which can be misunderstood to imply individualization.”⁶ The committee found no scientific support for the use of hair comparisons for individualization in the absence of nuclear DNA. Microscopy and mtDNA analysis can be used in tandem and may add to one another’s value for classifying a common source, but no studies have been performed specifically to quantify the reliability of their joint use.”⁷

Jimmy Bromgard spent 14.5 years in prison for the rape of an 8 year old girl that he did not commit. The semen found at the crime scene could not be typed, so the forensic case against Bromgard came down to the hairs found at the crime scene. The forensic expert, Arnold Melnikoff, a hair examiner and Laboratory Manager of the state crime lab in Montana, testified that the head and pubic hairs found at the scene were indistinguishable from Bromgard's hair samples. He claimed that there was a one in 100 chance of a head hair “matching” an individual, and a one in 100 chance of a pubic hair “matching” – and then he multiplied these statistics to say that there was less than a one in 10,000 chance that the hairs did not belong to Bromgard. This damning testimony was also fraudulent: there has never been a standard by which to statistically match hairs through microscopic inspection. The criminalist took the impressive numbers out of thin air.

- **Bite mark Comparisons:**

“Although the methods of collection of bite mark evidence are relatively noncontroversial, there is considerable dispute about the value and reliability of

⁵ Ibid., p. 5-25.

⁶ Ibid., p. 5-26.

⁷ Ibid., p. 5-26.

the collected data for interpretation. Some of the key areas of dispute include the accuracy of human skin as a reliable registration material for bite marks, the uniqueness of human dentition, the techniques used for analysis, and the role of examiner bias... Although the majority of forensic odontologists are satisfied that bite marks can demonstrate sufficient detail for positive identification, no scientific studies support this assessment, and no large population studies have been conducted. In numerous instances, experts diverge widely in their evaluations of the same bite mark evidence, which has led to questioning of the value and scientific objectivity of such evidence... Bite mark testimony has been criticized basically on the same grounds as testimony by questioned document examiners and microscopic hair examiners. The committee received no evidence of an existing scientific basis for identifying an individual to the exclusion of all others.”⁸

Kennedy Brewer spent 7 years on death row in Mississippi for the murder of a 3 year old girl that he did not commit. An independent examiner, forensic odontologist, Dr. Michael West, analyzed several marks on the child’s body that he testified were bitemarks inflicted by Brewer, and then only by his top two teeth. West said that “within reasonable medical certainty,” Brewer’s teeth caused the marks, and then explained that “reasonable medical certainty” meant that Brewer was the source of the marks. The “bite marks” turned out to be caused by insects in the pond where the girl’s body was discovered and by the natural sloughing of skin a body experiences when left in the water for several days.

- **Fingerprint Comparisons:**

“ACE-V provides a broadly state framework for conducting friction ridge analyses. However, this framework is not specific enough to qualify as a validated method for this type of analysis. ACE-V does not guard against bias; is too broad to ensure repeatability and transparency; and does not guarantee that

⁸ Ibid., p. 5-37.

two analysts following it will obtain the same results.⁹ Errors can occur with any judgment-based method, especially when the factors that lead to the ultimate judgment are not documented.¹⁰ As was the case for friction ridge analysis and in contrast to the case for DNA analysis, the specific features to be examined and compared between toolmarks cannot be stipulated a priori.”¹¹

Although not a DNA exoneration, **Brandon Mayfield**'s case was referred to in the NAS Committee's report as, “surely signal caution against simple, and unverified, assumptions about the reliability of fingerprint evidence.”¹² Brandon Mayfield was arrested as a material witness in the Madrid Bombings of March 2004. Several FBI fingerprint experts "matched" his print to fingerprints lifted from a plastic bag containing explosive material found at the crime scene. Mayfield, a Portland Oregon lawyer, who had converted to Islam and married an Arab woman, had his prints in the national database because years earlier he had served in the US armed forces. Mayfield's print was one of 20 prints returned from a search of the national Automated Fingerprint Identification System (AFIS) as being very similar to the crime scene print. Following a further visual inspection of the 20 prints, two FBI fingerprint experts swore in affidavits that they were 100% certain that the crime scene prints belonged to Mayfield. When the Spanish police ultimately arrested the real source of the fingerprint, the FBI initially defended their “mistake” as the result of poor digital image. Obviously, the two FBI experts could not have been 100% certain if the image was poor. Several major investigations followed, including one conducted by the Inspector General of the Department of Justice.¹³

The NAS report revealed similar lapses in validation and inappropriate associations in several other forensic disciplines:

- **Shoe Print Comparisons:**

⁹ Ibid., p. 5-12.

¹⁰ Ibid., p. 5-13.

¹¹ Ibid., p. 5-21.

¹² Ibid., 3-16.

¹³ Ibid., footnotes 75 and 76, which indicated that contextual bias and confirmation bias played an important role in the misidentification.

“[I]t is difficult to avoid biases in experience-based judgments, especially in the absence of a feedback mechanism to correct an erroneous judgment.¹⁴ [C]ritical questions that should be addressed include the persistence of individual characteristics, the rarity of certain characteristic types, and the appropriate statistical standards to apply to the significance of individual characteristics.”¹⁵

- **Fiber Comparisons:**

“Fiber examiners agree, however, that none of these characteristics is suitable for individualizing fibers (associating a fiber from a crime scene with one, and only one, source) and that fiber evidence can be used only to associate a given fiber with a class of fibers.”¹⁶

- **Other Pattern/Impression Evidence: Fingernail Comparison, Voice Comparison, Forensic Geology:**

“Although one might argue that those who perform the work in laboratories that conduct hundreds or thousands of evaluations of impression evidence develop useful experience and judgment...the community simply does not have enough data about the natural variability of those less frequent impressions, absent the presence of a clear deformity or scar, to infer whether the observed degree of similarity is significant.¹⁷ Also, little if any research has been done to address rare impression evidence. Much more research on these matters is needed”¹⁸

The aforementioned disciplines all require further validation. The Innocence Project agrees with the NAS report regarding what is needed: “(1) information about whether or not the method can discriminate the hypothesis from an alternative, and (2) assessment of the sources of error and their consequences on the decisions returned by the method.”¹⁹

¹⁴ Ibid., p. 5-17.

¹⁵ Ibid., p. 5-18.

¹⁶ Ibid., p. 5-26.

¹⁷ Ibid., p. 5-17.

¹⁸ Ibid., p. 5-18.

¹⁹ Ibid., p. 4-2.

It is critical that we all understand the real world consequences of the forensic problems I and the NAS have discussed. These were not incidents reflective of one bad actor, or one wayward jurisdiction; our review of the nation's DNA exonerations showed that seventy-two forensic analysts from 52 different labs, across 25 states had provided testimony that was inappropriate and/or significantly exaggerated the probative value of the evidence before the fact finder in either reports or live courtroom testimony. According to the NAS Forensic Committee's report, the shortcomings in education, training, certification, accreditation, and standards for testing and testifying that contributed to wrongful convictions in those cases threaten the integrity of forensic results across virtually all non-DNA forensics.

It is important to recognize that these 233 individuals represent just the tip of the iceberg. In the vast majority of cases DNA is simply useless to indicate innocence or guilt – in fact, DNA is estimated to be probative in only 10% of all murder cases, and a far lower percentage of all criminal cases. What's more, in most cases where convicted people seek our representation to use post-conviction DNA testing to prove their innocence, we don't have the opportunity to conduct a DNA test because the biological evidence has either been lost or destroyed. And in some cases, when we have the evidence and testing it can prove innocence, the state simply refuses to allow the test that can indicate the truth.

DNA testing has become the gold standard in forensics because it is science-based and tested. It was discovered through basic research and later applied to clinical DNA diagnostics, developing under the same scrutiny given to medical devices. So when it entered the courtroom, there was already a tremendous body of literature in highly respected scientific journals, amassed over a number of years, to support and validate its accuracy. Subsequently, the National Research Council twice convened some of the top scientists from leading research universities to discuss not only the scientific application of DNA in courts, but also to validate the statistical implications of the data that was produced.

Non-DNA forensic assays have not been scientifically validated, and there is no formal apparatus in place to do so for developing forensic technology. Though the technology has changed over time, the sources of human error, misinterpretation, and misconduct have not. Most of the assays used in law enforcement have no other application; they were developed for the purpose of investigation, prosecution and conviction and took on a life of their own without being subjected to the rigors of the scientific process. Essentially, the assays were simply accepted as accurate. Many of these forensic disciplines – some of which are experience-based rather than data-based – went online with little or no scientific validation and inadequate assessments of their robustness and reliability. No entity comparable to the Food and Drug Administration ever scrutinized the forensic devices and assays, nor were crime laboratories subject to mandatory accreditation and forensic service practitioners subject to certification. Enforceable parameters for interpretation of data, report writing, and courtroom testimony have also never been developed.

While there is research and work that establishes what needs to be done to improve various forensic practices, the fact is that no existing government entity, nor the forensics community itself, has been able to sufficiently muster the resources nor focus the attention necessary to use the existing information as a launching pad to comprehensively improve the integrity of non-DNA forensic evidence. The NAS Report is the first step – and a tremendous one – toward fully establishing and acting upon what we already know. From the perspective of justice and public safety, it is tragic that it has taken this long to act on the desperate need to improve the quality of forensic evidence. Given the clear and comprehensive message delivered by the NAS on this subject, further delay would be unconscionable.

The report calls for Congress to act, strongly and swiftly. This is because as I speak, many of these assays and technologies are being used in investigations, prosecutions and convictions daily everywhere in this country, despite their potential to mislead police, prosecutors, judges and juries away from the real perpetrators of crime. Although the conventional wisdom once stated that a sound defense and cross-examination would enable courts to properly assess the strength of forensic evidence, the Report

unequivocally states and the post-conviction DNA exoneration cases clearly demonstrate that scientific understanding of judges, juries, defense lawyers and prosecutors is wholly insufficient to substitute for true scientific evaluation and methodology. It is beyond the capability of judges and juries to accurately assess the minutiae of the fundamentals of science behind each of the various specific forensic assays in order to determine the truth in various cases, and it is an unfair and dangerous burden for us to place on their shoulders. Indeed, the NAS report deems that “judicial review, by itself, will not cure the infirmities of the forensic science community.”²⁰

It is absolutely clear – and essential – that the validity of forensic techniques be established “upstream” of the court, before any particular piece of evidence is considered in the adjudicative process. For our justice system to work properly, standards must be developed and quality must be assured before the evidence is presented to the courts – or even before police seek to consider the probative value of such testing for determining the course of their investigations. There is simply no substitute for requiring the application of the scientific method to each forensic assay or technology, as well as parameters for report writing and proper testimony, as part of the formal system of vetting the scientific evidence we allow in the courtroom.

The Innocence Project whole-heartedly supports the primary recommendation of the National Academy of Sciences’ report to create a federal National Institute of Forensic Sciences. We believe that federal oversight body must conduct research into the scientific validity and reliability of forensic disciplines and set standards for their use in the courtroom. A federal entity is needed to ensure that we don’t have 50 states operating under 50 definitions of “science”; forensic science in America needs one standard of science so we can have one standard for justice. As Congress considers the establishment of such an agency, there are several principles that it should adhere to.

First, the National Institute of Forensic Sciences should focus on three critical priorities: (1) basic research, (2) assessment of validity and reliability, and (3) quality assurance,

²⁰ Ibid., p. 3-20.

accreditation, and certification. This body should identify research needs, establish priorities, and precisely design criteria for identifying the validity and reliability of various extant and developing forensic assays and technologies. Then, using the data generated by research, this entity should then undertake a comprehensive assessment of the validity and reliability of each assay and technology to develop standards by which the practitioners must adhere and under which their reporting and court room testimony must operate. Given NIST's reputation as a highly respected and admired standard-setting agency, as well as its history of employing Nobel prize-winning scientists who conduct superb research and translate basic science to applied commercial standards and its tradition of objective, independent, science-grounded work, we agree with the NAS report that NIST would make a sensible partner for setting those standards. The Innocence Project also believes strongly that this body must play a central role in accreditation and certification. Laboratories that seek accreditation must have quality controls and quality assurance programs to ensure their forensic product is ready for the courtroom. Individual practitioners must meet certain training and education requirements, continuing education, proficiency testing, and parameters for data interpretation, report writing and testimony.

Second, to ensure this agency's objectivity and scientific integrity, and to prevent any real or perceived institutional biases or conflicts of interest, it is paramount that NIFS be a non-partisan, independent agency, with its basic and applied research products and standards grounded in the best traditions of the scientific method. We agree with the NAS report that "Governance must be strong enough – and independent enough – to identify the limitations of forensic science methodologies and must be well connected with the Nation's scientific research base in order to affect meaningful advances in forensic science practices."²¹

Third, this entity will coordinate all existing and future federal functions, programs, and research related to the forensic sciences and forensic evidence.

²¹ Ibid., p. 2-19.

Fourth, in order for this entity to be successful, forensic oversight must be obligatory and an effective mechanism of enforcement of these standards must exist. After having been given the proper direction and opportunity to comply, noncompliant laboratories or practitioners should lose their ability to participate in the business. These corrective actions can be overseen in conjunction with other government agencies; however enforcement powers must be under the command and control of the NIFS.

Fifth, this entity must be a permanent program in order to ensure ongoing evaluation and review of current and developing forensic science techniques, technologies, assays, and devices; and continued government leadership, both publicly and through private industry, in the research and development of improved technology with an eye toward future economic investments that benefit the public good and the administration of justice.

Finally, Congress must allocate adequate resources to the NIFS so that it can undertake its critical work quickly, effectively, and completely, and so its mandates can be executed in full.

Our work has shown the catastrophic consequences of such a lack of research, standards, and oversight. It is clear that the nation's forensic science community is ready and willing to work with the federal government, law enforcement, and other scientists to ensure a brighter future for forensic science. Science-based forensic standards and oversight will increase the accuracy of criminal investigations, strengthen criminal prosecutions, protect the innocent and the victims, and enable law enforcement to consistently focus its resources not on innocent suspects, but on the true perpetrators of crimes. For as the nation's post-conviction DNA exonerations have proven all too clearly, when the system is focused on an innocent suspect, defendant or convict, the real perpetrator remains free to commit other crimes.²²

²² In the wake DNA exonerations of the wrongfully convicted, that same DNA analysis has enabled us to identify 100 of the true suspects and/or perpetrators of those crimes.

The investment of time, effort and resources necessary to deliver us from our false reliance on some forensic assays will pay tremendous dividends in terms of time, effort and resources not wasted by virtue of this false reliance. In short, it will make criminal investigations, prosecutions and convictions more accurate, and our public more safe – and perhaps most importantly, justice more assured.

We have been directed toward an irrefutable and unprecedented opportunity to significantly improve the administration of criminal justice in the United States. By evaluating and strengthening forensic science techniques with the strong, well-funded, and well-staffed entity we described, we can create a formal system to ensure that criminal justice is accurately conducted and justly performed. The research and development of both existing and new forensic disciplines will create new industries and jobs in the U.S., just as the development of DNA technologies and their applications has done. With your support, we will not only significantly enhance the quality of justice in the United States, but we will also minimize the possibility that tragedies like that endured by the nation's 233 (and counting) exonerees and their families will needlessly be repeated time and again.

