NATIONAL RESEARCH COUNCIL'S PUBLICATION "STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD"

HEARING

BEFORE THE

SUBCOMMITTEE ON CRIME, TERRORISM, AND HOMELAND SECURITY

OF THE

COMMITTEE ON THE JUDICIARY HOUSE OF REPRESENTATIVES

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MAY 13, 2009

NATIONAL RESEARCH COUNCIL'S PUBLICATION 'STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD'

WEDNESDAY, MAY 13, 2009

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CRIME, TERRORISM,
AND HOMELAND SECURITY
COMMITTEE ON THE JUDICIARY,
Washington, DC.

The Subcommittee met, pursuant to notice, at 3:36 p.m., in room 2141, Rayburn House Office Building, the Honorable Robert C. "Bobby" Scott (Chairman of the Subcommittee) presiding.

Present: Representatives Scott, Weiner, Gohmert, and Poe.

Staff present: Bobby Vassar, Majority Subcommittee Chief Counsel; Mario Dispenza, (Fellow) ATF Detailee; Veronica Eligan, Majority Professional Staff Member; Jesselyn McCurdy, Majority Counsel; Caroline Lynch, Minority Counsel; and Kimani Little, Minority Counsel.

Mr. SCOTT. The Subcommittee will now come to order. Good afternoon, and welcome to the hearing before the Subcommittee on Crime, Terrorism, and Homeland Security on the National Research Council's Publication "Strengthening Forensic Science in the United States: A Path Forward."

The term "forensic science" refers to a broad range of disciplines, each of which aims to solve and understand crimes based on physical evidence. Forensic science has played a critical role in criminal investigations and prosecutions for decades, and law enforcement and prosecutors have come to rely on it and for good reason.

Scientific evidence offered at a trial by a witness identified by the court as an expert can be powerful and often indisputable. Forensic science is also popular. So popular that television networks have created a number of successful fictional, sometimes nonfictional, programs based on forensic science, which reach virtually every jury pool across the country.

Between the popularity of forensic science and the court's acknowledgement of the forensic evidence witness as an expert, the evidence presented against a defendant can be very persuasive. Unfortunately, the reality is that not all forensic techniques have the same reliability. DNA is now recognized as among the most reliable and useful tools in the area of forensic science.

The development of DNA technology has allowed scientists to use genetic evidence to identify victims and perpetrators with almost

complete accuracy, enable investigators not only to solve many crimes that otherwise would have gone unsolved, but also to establish innocence of 233 wrongfully convicted people in the United States.

Alarmingly, in over 50 percent of these wrongful conviction cases, other non-DNA forensic evidence was introduced and likely contributed to the wrongful conviction. This revelation has raised serious questions about the reliability of many forms of non-DNA forensic evidence. Where the defendant's liberty or even life at stake, evidence as powerful as forensic evidence must have the utmost reliability.

In response to these disturbing questions about the reliability of forensic science, Congress authorized the National Academy of Sciences to conduct a study. The committee made up of members of the forensic science and legal communities examined the current state of forensic science and, in February 2009, issued a report entitled, "Strengthening Forensic Science in the United States: A Path Forward."

The report confirmed our fears and cites many serious problems with the national forensic science system. The report shows that the most pressing problem is a need for a comprehensive knowledge base for many disciplines.

While DNA evidence has benefited from extensive scientific research, other forensic fields such as hair and fiber analysis, ballistic analysis, and handwriting samples, among others, have not had the same level of research and scrutiny leaving their reliability questionable. The report also describes a system that is woefully understaffed and undertrained and lack uniform standards and poor oversight.

Perhaps the most disturbing part of this study's findings is that trial judges rarely exclude forensic evidence at trial even though the scientific community cannot ensure reliability of the evidence. Moreover, trial lawyers lack scientific training to adequately assess and question the forensic witnesses' conclusions.

This condition does not bode well for justice, and changes are clearly in order. The report makes a number of recommendations to approve forensic sciences in the United States, most prominently, creating a National Institute for Forensic Science. The NIFS would be a new entity, independent from the existing forensic science system, law enforcement agencies and would be tasked with organizing and overseeing all forensic science operations in the country.

It would be tasked with, among other things, establishing best practices, creating accreditation standards, coordinating and promoting research initiatives, and assessing new and existing technologies and funding state and local forensic science agencies. Today we will discuss the study's findings and recommendations.

It is now my pleasure to recognize the Ranking Member of the Subcommittee, the gentleman from Texas, Judge Gohmert.

Mr. GOHMERT. Thank you, Mr. Chairman. And thank you for having a hearing to address the ongoing efforts to identify weaknesses and make improvements to the forensic science community in the United States.

I do welcome the witnesses, appreciate your being here. Thank you for joining us and, obviously, you submitted written testimony, and we appreciate your being here to talk to us in person. I also understand too well the significance of forensic science to our criminal justice system at every level of government having been a prosecutor, a district judge, and then a chief justice.

But forensic science, particularly DNA technology, has an extraordinary ability to assist in solving crimes, identifying missing persons and victims of mass casualties as well as guaranteeing justice in American courtrooms and courtrooms throughout the world.

As noted by the National Academy of Science's study on forensic science that brings us here today, nuclear DNA testing is now the forensic gold standard by which all other forensic disciplines are measured. For it is now well-accepted, scientifically validated ability to support individually specific conclusions to the level of research funding so that the legal foundation for its admission in courtrooms, DNA testing is a forensic science that has grown up right, so to speak.

The NAS study does not, however, portray other forensic disciplines in such positive light. In fact, it calls into question the scientific validity and legal reliability of a number of forensic disciplines that have been admitted into courtrooms throughout this country for decades.

The study takes great pains to question the scientific validity of many, if not all, of the so-called "pattern based" disciplines, such as friction ridge analysis, ballistics, and tool mark identification. Excuse me.

Not surprisingly, the study's findings have caused significant concerns among those in the legal profession who are involved with these forensic disciplines. In a recent article of the National Law Journal, the real life consequences of these findings are explored. The article documented numerous defense councels who are citing the report's finding in post-conviction motions, appeals, and pending trials challenging what they claim is invalid ballistics testimony.

The article went on to quote a member of the board of directors of the National District Attorneys Association as saying, the science of ballistic has been tested over and over again, and the problem was not with the science but with those applying it. By contrast, various defense attorneys work hard at suggesting that the science of ballistics did not support the testimony that was being given.

Which brings me to what I think is an important point that was not brought out in much of the reporting following the release of this study. That is this: the belief that particular forensic disciplines have not been scientifically validated does not mean that they are invalid or unreliable, simply that more research needs to be done to validate them. I will be interested in hearing the panel review on that topic.

The study does not stop there. It documents what is called fragmented forensic community in need of oversight and governance, community that lacks standard methodologies and terminologies, mandatory accreditation and subrogation, and sufficient peer-reviewed research.

The study recommends that we create a new independent Federal entity, the National Institute of Forensic Science, to accomplish these objectives. I wonder given the current economic climate whether it makes sense to create an entirely new entity that will attempt to replicate what a number of other state and Federal agencies as well as private entities are already doing.

Recent history has shown us that creating new agencies at the Federal level can be a tremendously costly and complex endeavor with moderate success. By its terms, the study did not purport to address the financial largesse that will be required to implement this new recommendation.

The study specifically left that task to the congressional budget office. Similarly, there was very little discussion about the downsides of creating such an entity. I look forward to hearing the panel's views on this matter as well as the possibility of leveraging some of the strengths of those currently involved in the forensic community to address some of the needs documented in the study.

But it was my understanding this was addressed years back when the U.S. Supreme Court said that the judge in a case would be the gatekeeper. You couldn't bring in scientific evidence and a supposed ballistic expert, for example, could not testify unless the judge found that they met the requirements as set up by the Supreme Court for legal sufficiency.

As a former gatekeeper myself, sometimes I let in evidence, sometimes I didn't, but it had more to do, particularly in the case of ballistics, of whether the individual seeking to testify had the required requisite training and experience and, you know, whether it was credible testimony and worthy of being presented to the jury before it was presented to the jury. That was our job.

You are a distinguished panel of witnesses with a wealth of experience dealing with the legal, scientific, and leadership aspects of forensic science, and I look forward to hearing from you. And, again, I do appreciate your time here today.

Thank you, Mr. Chairman. I yield back.

Mr. SCOTT. Thank you. We have been joined by the gentleman from New York, Mr. Weiner. I will ask if you have a brief comment; otherwise, we will ask for opening statements to be placed on the record.

Mr. WEINER. I appreciate the offer——

Mr. SCOTT. Thank you. We have a distinguished panel of experts for us today. Our first witness is Mr. Kenneth Melson, acting director of the Bureau of Alcohol, Tobacco, Firearms and Explosives. He is a past president of the American Academy of Forensic Sciences, and in 2006 became chair of the Council of Scientific Society Presidents.

He presently represents the Department of Justice as a board member on the American Society of Crime Laboratory Directors Laboratory Accreditation Board, serves on the editorial board of the Journal of Forensic Science, on the ethics committee of the AAFS and on the advisory council of the National Clearing House for Science, Technology, and the Law at Stetson University College of Law. He is a graduate of National Law Center at George Washington University.

Our next witness will be Mr. Peter Marone, director of the Virginia Department of Forensic Science and a Member of the Committee that developed the report. He is a member of the Forensic Science Education Accreditation Commission of the American Academy of Forensic Science and the National Academy of Sciences Committee on identifying the needs of the forensic science community.

He is also chair of the Consortium of Forensic Science organizations. He has a bachelor's degree and master's degree in chemistry, each from the University of Pittsburgh, and I would like to particularly welcome him, because he is representing the Commonwealth of Virginia, which has a great reputation in forensic science, particularly in the development of DNA.

So I want to give you a personal welcome, Mr. Marone.

Next witness is John Hicks who is director of Northeast Regional Forensic Institute at the University of Albany, State University of New York, which provides specialized workforce development training and educational services for forensic laboratory personnel.

He is the former director of the Office of Forensic Sciences, New York State Division of Criminal Justice Services, deputy director of the Alabama Department of Forensic Sciences, and assistant director in charge of the FBI laboratory. He holds a bachelor's degree in chemistry from Arkansas State University, master's degree in public administration from the University of Southern California.

Our final witness is Peter Neufeld, cofounder and codirector of the Innocence Project at the Benjamin Cardozo School of Law. The Innocence Project is directly responsible for the release of hundreds of people who were wrongfully convicted, who were factually innocent of the charges, some of which were actually sentenced to death.

Mr. Neufeld's work has therefore shaped the course of case law across the country and helped to lead another influential study—and he helped to lead another influential study by the National Academy of Sciences on Forensic DNA testing as well as important state and Federal legislation settings standards for the use of DNA testing. He has a bachelor's degree from the University of Wisconsin and his law degree from New York University School of Law.

I would like to welcome all of our witnesses for joining us. Their written statements will be made a part of the record in their entirety, but I would ask that you summarize your testimony in 5 minutes or less, and to help stay within that time, there is a timing device before you, which will start with green, when a minute is left, it will go to yellow, and when the 5 minutes are up, it will turn to red.

Mr. Melson?

TESTIMONY OF KENNETH E. MELSON, ACTING DIRECTOR BUREAU OF ALCOHOL, TOBACCO, FIREAMS AND EXPLOSIVES, FORMER DIRECTOR, EXECUTIVE OFFICE FOR THE UNITED STATES ATTORNEYS, U.S. DEPARTMENT OF JUSTICE, WASHINGTON, DC

Mr. MELSON. Thank you very much. Good afternoon, Chairman Scott and Ranking Member Gohmert. Thank you for the oppor-

tunity to present the views of the Department of Justice on the NRC report.

DOJ considers the report to be a helpful addition to the public discourse on the state of the forensic science community. It recommends many of the same useful steps to strengthen forensic science that the 1999 and the 2004 Department of Justice reports recommended.

While the NRC recommendations are not entirely new, the Department certainly agrees with virtually all of them. The forensic community has been and continues to address most of the recommendations in the report. Laboratory accreditation programs under ISO 17025 standards are in place.

Scientific working groups are establishing standards and protocols. A uniform code of ethics for accredited laboratories have been adopted. NIJ grant solicitations for validation research have been issued. And experts in the field have already begun to conduct research on such topics as context and confirmation bias. In fact, yesterday I was pleased to get in the mail my copy of the Journal of Forensic Sciences, which is one of the world's foremost peer-reviewed forensic journals.

And there was an article in there on just that type of bias, and it was funded by a grant. So the work is ongoing, but more needs to be done.

Although one charge the NRC by Congress was to assess the present and future needs of the forensic science community to include state and local crime labs, medical examiners and coroners, the report did not attempt to create a so-called gap analysis or needs assessment with funding requirements.

The cost of developing and implementing the report's recommendations and achieving significant capacity building are important and urgent questions. For the first time, a President's proposed budget includes $35 million for the Paul Coverdell Forensic Science Improvement grant in anticipation of such an assessment.

As the President's leadership in this regard reflects, the Federal Government has an important role to play in support of our criminal justice stakeholders and constituents, and the Department of Justice has already focused on that effort.

We have been consulting with our Federal laboratory directors across the government on ways to harness the full power of the Federal experience and expertise to assist these ongoing efforts.

We have met with forensic science groups to listen to their concerns and ideas, discussed the issues with groups like ISAP and crime lab directors at the Crime Laboratory Management Symposium sponsored by the FBI, and we have participated in conferences throughout the U.S. since the report was published.

The Department intends to continue to work with the FBI-sponsored scientific working groups, also known as SWGs to create consensus standards and guidelines for testing protocols while significant advances have been made in the accreditation programs regarding report writing and terminology, we will continue to work with the non-profit internationally recognized accreditation programs like AFSCA Lab to enhance the reporting guidelines and consistent use of terminology.

And as I have already mentioned, the National Institute of Justice has issued grant solicitations for validation studies and is arranging for community input on a variety of forensic science issues. And NIJ is also working with NIFT on AFIS interoperability issues, which is one of the recommendations in the report and the expert working group on human factors on latent print analysis project, all of which address the issues that were raised in the report.

And, of course, as always, we look forward to working with Congress to develop and refine a comprehensive approach including necessary executive branch action and legislation to address serious issues raised by the NRC report. There are two recommendations, however, that the Department does not, at this time, support. One is the creation of the National Institute of Forensic Sciences, of NIFS, to oversee the Nation's entire forensic science community, and the removal of all forensic labs from administrative control of law enforcement agencies or prosecutors.

Since my time is almost up, I hope I will have the opportunity to comment on those two recommendations during the question and answer period. Thank you.

[The prepared statement of Mr. Melson follows:]

PREPARED STATEMENT OF KENNETH E. MELSON

Department of Justice

STATEMENT OF

KENNETH E. MELSON
ACTING DIRECTOR
BUREAU OF ALCOHOL, TOBACCO, FIREARMS AND EXPLOSIVES
UNITED STATES DEPARTMENT OF JUSTICE

BEFORE THE

UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON THE JUDICIARY
SUBCOMMITTEE ON CRIME, TERRORISM, AND HOMELAND SECURITY

CONCERNING

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

PRESENTED

MAY 13, 2009

The Department of Justice (DOJ) welcomes the report of the National Research Council entitled, *Strengthening Forensic Science in the United States: A Path Forward.* The report is a helpful addition to the public discourse on the state of the forensic science community, and it recommends many useful steps to strengthen the community and enable it to continue to contribute to an effective criminal justice system. In fact, many of these steps are familiar to those in the forensic science community, including DOJ, and have been discussed among practitioners for some time. In large part, it builds on previous reviews conducted under DOJ's auspices in 1999 and 2004 that similarly identified numerous areas for improvement.

We must also be cognizant, however, of what the report does not do. The report does not, and was never intended to, comprehensively assess the forensic sciences themselves. That was not the mandate of the committee that drafted the report. Likewise, the report does not undermine the use of forensic science generally – or any specific discipline – in the courtroom. As one of the co-chairs of the report committee put it, "The question of whether forensic evidence in a particular case is admissible under applicable law is not coterminous with the question whether there are studies confirming the scientific validity and reliability of a forensic science discipline." Further, the report does not, and was never intended to, offer any judgments on any cases currently in the judicial system. Finally, the report does not recommend any rule or law changes in the area of evidentiary admissibility. That, too, was outside the mandate of the committee.

In sum, DOJ views the report as a positive contribution to a critical debate, but it should be considered in the appropriate context. The report's publication is thus an opportunity for policy-makers to re-focus their attention on this critical issue. We look forward to working with partners in the forensic science community to act on its recommendations and on other ways to improve the use of the forensic sciences.

Background

On February 18, 2009, the National Research Council of the National Academies published *Strengthening Forensic Science in the United States: A Path Forward.* The report was commissioned by Congress in 2005 at the instigation of the forensic science community itself. It is a consensus document written by a committee co-chaired by Judge Harry T. Edwards of the U.S. Court of Appeals for the D.C. Circuit and Dr. Constantine Gatsonis, a professor of biostatistics at Brown University. The committee heard testimony from a cross-section of persons involved in forensic science disciplines, including representatives of the Federal Bureau of Investigation (FBI) and United States Secret Service labs, the National Institute of Justice (NIJ), forensic science professional organizations, academics critical of the forensic sciences, and advocacy groups, such as the Innocence Project.

The report concludes that forensic science, as a whole, produces valuable evidence contributing to the successful prosecution and conviction of criminals, as well as to the exoneration of the innocent. However, the report also identifies what the committee considers to be systemic weaknesses in the use of forensic evidence that can and have led to wrongful

convictions. The report contains 13 recommendations designed, in the committee's opinion, to remove or ameliorate these systemic weaknesses.

The Value of Forensic Science

The report rightly acknowledges the important contributions that forensic science has made to the criminal justice system, both in convicting the guilty and exonerating the innocent. As Judge Harry Edwards stated, "The work of the forensic science community is critically important in our system of criminal justice."

Forensic science is crucial to the criminal justice system from start to finish. During an investigation, forensic science evidence is a vital exculpatory tool, often excluding potential suspects and narrowing the focus of investigations for the police. Forensic evidence may provide important clues to places, objects or people that can lead police to an arrest before another crime has been committed by a particular individual, thus harnessing the power of crime prevention. In a post-mortem context, forensic examinations are imperative for suspicious deaths and are vital to determining a cause of death. Competent and complete autopsies also greatly facilitate establishing the manner of death, as well as other vital information for a death investigator.

After an arrest, forensic evidence often expedites dispositions of cases and, frequently, when confronted with the results of forensic analyses, defendants choose to accept a plea rather than assume the risk of going to trial. At trial, forensic evidence and the expert testimony proffered by forensic scientists can be key to securing a conviction or appropriate sentence. Forensic evidence can associate the victim to a defendant or a defendant to a victim or crime scene, and in some instances, may implicate the defendant to the exclusion of all others. In every instance, our adversarial system provides the defense the opportunity to challenge the probative value of forensic evidence, either through cross-examination or though independent testing and testimony from a defense expert.

Improving the Forensic Science Community

For some time, it has been clear that the forensic science community is in need of change. Indeed, twice in the last 10 years, even prior to the report, DOJ, working with partners from the forensic science community, recognized this. A 1999 report published by NIJ entitled *Forensic Sciences: Review of Status and Needs*, identified lapses in training, standardization, validation, and funding. In 2004, responding to a Congressional directive, NIJ published *Status and Needs of Forensic Science Service Providers: A Report to Congress*, a survey of forensic science organizations that emphasized the need for more basic research; manpower and equipment resources; education; professionalism through accreditation and certification; quality assurance; and enhanced coordination among Federal, State, and local stakeholders. The National Academies report raises these same issues and makes many recommendations that, while not necessarily new to the forensic science community, will help garner attention and lead to action.

In that vein, DOJ supports virtually all of the recommendations. Many of them are directed toward state and local forensic entities, which is to be expected as around 98 percent of forensic science is performed outside the federal government. But the Federal government has a crucial leadership role to play in support of our criminal justice stakeholders and constituents. Indeed, the federal government is already engaged in activities along the lines of many of the recommendations, but recognize that a significant new effort is required to appropriately address the issues raised by the community and in the report.

Specifically, DOJ supports: standardizing terminology across the forensic science community (Rec. #2); more research on the accuracy, reliability, and validity of the forensic sciences (Rec. #3); more research on human observer bias and sources of human error in the forensic sciences (Rec. #5); the development of standards, practices, and protocols for use in forensic sciences (Rec. #6); lab accreditation and practitioner certification (Rec. #7); stronger quality assurance and control procedures (Rec. #8); establishment of a code of conduct, including ethical principles (Rec. #9); support for higher education in the forensic sciences (Rec. #10); the improvement of the medicolegal death investigation system (Rec. #11); AFIS interoperability (Rec. #12); and, the use of forensic science to aid homeland security (Rec. #13).

We are already working to address many of the recommendations, and we have concrete ideas about how to do more:

- The National Institute of Justice is collaborating with the National Institute on Standards and Technology (NIST) on an Expert Working Group on Human Factors in Latent Print Analysis, the first of several working groups which are envisioned to address validation and practice to limit contextual and other biases in qualitative forensic disciplines.

- Standards created by the nine FBI-sponsored Scientific Working Groups (SWGs), composed of experts in nine forensic disciplines from local, state, and federal agencies across the world, should be adopted nation-wide to set forth a uniform guideline for methods, processes, procedures, practices, standard specifications, and test methods. Established standards should be consistently applied across the full spectrum of the work, including ancillary methods encompassing the acceptance, processing, and reporting of results.

- Forensic practitioners should also adopt the use of standardized or model laboratory reports which contain uniformly standardized definitions to delineate the precise meaning of the words or phrases used to summarize the results of their analyses. Similarly, the criteria used to measure performance and business processes requires standardization so that a clear picture of backlogs, case flow, and other management parameters can be obtained that is consistent across the nation.

- Today, 97 percent of public forensic science laboratories are accredited by the two accrediting bodies, ASCLD-LAB (on whose board I serve) and the Forensic Quality Services - International (FQS-I). In addition, the International Organization for Standardization (ISO) has develop its standard 17025 (ISO 17025) for forensic labs,

based on the standard for calibration and testing laboratories. ISO 17025 should become the cornerstone of a new, comprehensive accreditation program.

- The number of private forensic science laboratories is unclear (although more than 40 private laboratories are accredited between the two accreditation programs) but accreditation of all private forensic science service providers is paramount.

- Equally important is the accreditation of operational units external to the crime laboratory, such as latent print and firearms units housed within police departments. While these are not traditional "laboratory environments" and may not be amenable to accreditation, standards should be developed to ensure that a process is in place which provides the mechanism to demonstrates their compliance.

- NIJ facilitates the accreditation process by requiring that any eligible applicant seeking funds under its DNA grant programs must be accredited or be in the process of obtaining accreditation. NIJ also enforces good laboratory practice through its Grant Progress Assessment program which includes on-site visits to hundreds of crime laboratories each year, (including the private sector), and enforces conditional eligibility requirements which encompass allegations of misconduct, among many others.

- Certification of individual forensic practitioners should be part of the effort to improve the forensic science community. To demonstrate that forensic practitioners comply with professional standards, a comprehensive certification effort should be pursued, ensuring that an individual possesses the knowledge, skills, and abilities to competently perform analyses in their individual discipline or sub-discipline. A blended approach for demonstrating competencies could include, but not be limited to, proficiency tests and compliance with continuing education requirements, and adherence to a code of ethics.

- Certification should be recurring and, perhaps, could be stipulated as a requirement before their work or expert opinion can be proffered in a court of law for either the prosecution or defense.

A number of these ideas will require legislation to implement, especially in the area of enforcement, and DOJ is eager to work with Congress in finding ways to accomplish this.

Other Recommendations

There are two recommendations that need further study: the creation of a National Institute of Forensic Sciences (NIFS) to oversee the nation's entire forensic science community and the removal of all forensic science labs from administrative control of law enforcement agencies or prosecutors' offices. The report is correct in observing that, currently, the nation's forensic science community is somewhat fragmented given the sheer number of independent law enforcement, prosecutorial units, and crime laboratories. However, there is important work going on within the community helping to unify it, as national organizations such as ASCLD/LAB and the SWGs are working to standardize quality control and strive to implement

uniform standards. It is not clear that a new organization is necessary to achieve implementation of most of the report's recommendations. In fact, it could detract from this effort by refocusing energies and resources toward bureaucracy-building rather than substantive improvement in the field. A decision to establish a NIFS must be done carefully, and only after a thorough assessment of the strengths and weaknesses of both the concept and its proposed implementation.

Along those lines, DOJ also questions whether full independence of laboratories from law enforcement is advisable or feasible. The report cites an inherent potential for conflict of interest in the operational function of the majority of forensic service providers as they currently exist. The concept of "independence" that the report raises in recommendation #4 is not new to the law enforcement or forensic science community. In fact, states such as Arizona and Virginia have moved in this direction. However, it should not be surmised that this model can or should be adopted nation-wide because there is inherent value to a collaborative process among forensic practitioners and law enforcement in determining the best course of action as it relates to the analysis of forensic evidence. To be separated completely from interaction with investigative partners would likely cause missteps in decision-making that could result in either loss and/or destruction of evidence, or important analyses left undone. Instead, we agree with language in the report stating that autonomy within law enforcement entities should be the goal. And, in fact, accredited laboratories have management requirements to ensure independence of their scientific work. And while removing the administration of the SWGs from operational crime labs could establish an increased measure of independence, it is not clear that much more would be necessary.

In addition to the recommendations in the report, we note that the previous reports cited above called for action in other areas – especially personnel, equipment, technology transfer, and greater coordination across layers of government. A comprehensive strategy to improve the forensic science community should include measures along those lines.

The Reliability of the Forensic Disciplines

Along with understanding what the report does, it is important to note that the report does not take the position that any of the forensic disciplines is scientifically invalid. It is crucial to emphasize this point given the way the report has been presented in the media and has been taken by the public and the defense bar as labeling forensics not "real" science. Rather, in the chapter cataloguing some of the disciplines, the report highlights the lack of research and other scientific validation methods within several disciplines. In fact, many disciplines have received a greater level of scientific scrutiny and validation than was recognized in the report. For example, NIST, through funding from NIJ and in collaboration with the FBI, has validated a large number of digital forensics tools over a period of many years. However, limited validation does not mean that those disciplines are invalid; it means simply that more research needs to be done. And, critically, we believe it is incorrect to compare the non-DNA forensic sciences to DNA. DNA is unique, since it is amenable, for example, to large-scale statistical studies of various populations. Non-DNA forensic disciplines might not lend themselves to individualization, for example, but that does not mean that the science behind these methods is faulty, or that the probative value of the evidence is not relevant to prove guilt or innocence.

For these reasons, DOJ has confidence in the validity and reliability of the forensic sciences when correctly applied in the laboratory and when appropriately represented in the court room. It is true that the extent of scientific work performed among the forensic disciplines varies, with some having undergone more rigorous validation studies than others. At the same time, each of the disciplines has sub-disciplines that among themselves vary as to the degree of their foundational scientific research. In addition, there are levels of "validity" not easily captured by that one term, such as the basic science behind a forensic analysis or methodology, standardized protocols for analysis, and demonstrated error rates. At one end of this range would be DNA, at another end, perhaps, voice-stress analysis, and the rest are somewhere in the middle. In fact, one might think not of one range, but of a series of parallel lines of ranges for each discipline and sub-discipline regarding each form of validation. The report acknowledges these complexities in some respects, but in a number of places overstates the case against one or another discipline and slights the amount of work that has been done to establish their scientific bone fides.

Indeed, the report does not, and was not intended to be, a full-scale review of the state of each discipline. Rather, the report summarizes a portion of the current knowledge about the disciplines, but does not recount in detail the full scope of the science that has been done on each. If the report had included a more comprehensive review of the literature, it could have cited a wealth of published, peer-reviewed research that demonstrates the rigor of particular scientific methods when applied in a forensic context. (The FBI Lab is in the process of publishing such a review for each of the disciplines.) After all, it would be difficult to do so in the case of, for example, fingerprint analysis, a discipline that has a more than 100-year history of use in law enforcement but is addressed in only six and half pages in the report. There is a vast amount of research that validates the use of latent fingerprints that was not cited by the report. For example, NIJ has supported development of the *Friction Ridge Sourcebook* through the West Virginia University Forensic Science Initiative which will serve as a single authority on the history, terminology, morphology, examination procedures, and admissibility of fingerprints, among other pertinent matters relevant to latent print examiners.

That is not to say that enough has been done already. Rather, more research is certainly needed in order to further validate the forensic disciplines. More research is consistent with the scientific method, for part of that process is continual questioning and re-assessment of the hypothesis in the particular question posed. The traditional forensic sciences have developed over decades, and sometimes centuries. The forensic science community has been burdened with severe backlogs and lack of resources and funding leaving little time to conduct needed research and validation studies. In fact, this is another area where the traditional forensic sciences differ from DNA. DNA profiling was introduced into the criminal justice system after it had been extensively studied in the medical community and through the Human Genome Project. The challenge was to take the process out of the clinical and research laboratories and transform its application to serve a different purpose. Because DNA profiling is based in biology and chemistry and is well understood by the broader scientific community, the underlying validity and reliability in a forensic context could be rigorously demonstrated. The challenge was to ensure the efficacy of the technique in a forensic laboratory setting. That situation was not true with the classic or traditional forensic sciences. Thus, it is inappropriate to compare the DNA gold standard with the other disciplines, many of which are not analytically based, like

DNA and drug examinations, but more experiential and judgment based, like other forms of evidence introduced in court.

Further, we respectfully disagree with the report's assertion that the adversarial system is not capable of evaluating scientific evidence. The Supreme Court has made a point of noting its confidence in the capacity of federal trial judges to undertake the review of the validity of the science and the proper application of the particular method to the case at hand. See, *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 593 (1993). Courts have held in-depth "Daubert hearings" and have written extensive and very detailed decisions on the admissibility of forensic science evidence. That is not to say, however, that improving forensic science will not help improve the courts' analyses of the validity and reliability as a condition of admissibility. The more well-established the validity and reliability of a discipline becomes through robust research, the easier it is for the courts to determine its admissibility. Moreover, the criminal justice system will also be improved by supporting continuing forensic science education programs for judges and lawyers. While there is room to do better in all parts of the adversarial system, courts have handled and do handle extremely complex issues, both legally and factually, and are fully capable of examining forensic science issues in the context of individual cases.

Conclusion

The publication of *Strengthening Forensic Science in the United States: A Path Forward* provides a renewed opportunity for the forensic science community, the Executive Branch, Congress, and the public to focus on ways to improve the use of forensic science. DOJ looks forward to working with Congress to develop and refine a comprehensive approach – including necessary Executive Branch action and legislation – to address the serious issues raised by the report.

Mr. SCOTT. Thank you.
Mr. Marone?

TESTIMONY OF PETER M. MARONE, DIRECTOR, VIRGINIA DEPARTMENT OF FORENSIC SCIENCE, RICHMOND, VA

Mr. MARONE. Good afternoon, Mr. Chairman, Ranking Member Gohmert, Congressman Weiner.

My testimony today——

Mr. SCOTT. Is your mic on?

Mr. MARONE. No.

Mr. SCOTT. Thank you.

Mr. MARONE. I would like to simplify the 250-page report, if you will, into the scientific and technical challenges that must be met in order for the forensic science community in the United States to operate to its full potential.

Specifically, I will discuss these challenges in the four categories of resources, and it should be resources, resources, resources, but resources, research, standardization, and education. These are the primary challenges for our community at this time. The report found that some of the work has already begun by many of the forensic scientists but that additional efforts and coordination are needed to carry it through.

To make this effective, however, an annual assessment—this is one thing the report didn't do—an annual assessment or, if you will, a requirements analysis, need to be done to set forth a valid national strategy.

The first element of the charge of the committee while not specifically addressed in the form of a recommendation was very clearly put in the report, "For the state and local laboratories, there has been a lack of resources—money, staffing, training, and equipment—necessary to promote and maintain strong forensic science laboratory systems. The state and local crime labs as well as the medical examiner community have not been receiving the support they need, but the case loads have been increasing exponentially."

If we continue to—and that is the end of the quote—if we continue to focus solely on backlog reduction rather than on actual capacity enhancement and methodology advancement, the capacity of the labs that process the work will be continuing to keep getting backlogs back again.

I want to make it clear, Mr. Chairman, that this is the root of many of our issues, and as a laboratory director, I am asking Congress to please establish funding in an adequate level for all disciplines, not just a single discipline, but on the other hand not in place of that discipline. In other words, we are not asking to take the DNA money away, we are looking to spread the bigger pie around.

Congress has been consistently putting some funding for other disciplines, but it falls short of what is necessary. The amount of funding to accomplish this is probably the most difficult to estimate, since we really don't have an accurate number of forensic service providers, and that may be a term that you haven't heard before. You are familiar with forensic laboratories. Forensic service providers would include the crime scene units or the ID units, fingerprint sections in police departments.

And the instrumentation and facilities involved are equally difficult to ascertain their conditions and needs. There are over 17,000 police and sheriff departments, and we have roughly estimated there may be 11,000 forensic service providers—units, not people—in those departments in addition to the 400 plus publicly funded laboratories across the country.

All of these numbers need to be verified and understood. Under the category of research, the report determined that some of the forensic science disciplines need further research to provide the proper underlying validation for some of the methods in common use and to provide the basis for more precise statements about their reliability and precision.

However, as Congressman Gohmert mentioned, not validated by one man or another does not mean it is of no value. The report clearly states that there is a value in many of the disciplines addressed. We need studies, for instance, that look at a large population of fingerprints or tool marks so as to quantify how many sources might share similar features.

In addition to investigating the limits of the techniques themselves, the research also is needed on issues of context effect and examiner bias. In the realm of standardization, the report raises concerns about the lack of mandatory requirements for professional certification and for laboratory accreditation and also the variability in ways that forensic science results are reported in courts.

I think it is critical to first understand that most of the forensic science laboratories in the community have already begun to move in the direction of accreditation. In fact, in the recently published census of publicly funded crime labs, which was from 2005, just recently published, it stated then that 82 percent of the public laboratories were accredited.

That number is much higher now, but more can be done. There are a significant number of forensic service providers—those are the police ID units—which need to be notified of the existence of accreditation programs, which are appropriate for their functions.

Few realize that existing ISO/IEC 17025, that is the international accreditation, is actually applicable for their use. The community fully supports mandatory accreditation, but we do not believe one needs to reinvent the wheel. The report did not intend to establish new accreditation or certification programs but to bolster the existing structure.

Lastly, the NRC report stresses a need for establishing a robust educational component. The Federal Government needs to support such a program and the institutions applying to the program for accreditation. The example for accreditation for forensic education programs has already been mentioned, FEPAC. It has been quite successful in raising—in just the 5 years it has been in place—in raising the scientific rigor of the program for which it has been—the programs it has been accredited.

The primary recommendation of the report, Mr. Melson has already mentioned, so I will skip over that, and I would like to thank the opportunity to speak to the Committee and answer any of your questions.

[The prepared statement of Mr. Marone follows:]

PREPARED STATEMENT OF PETER M. MARONE

STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD

Statement of

Peter M. Marone
Director, Virginia Department of Forensic Science

before the

Subcommittee on Crime, Terrorism and Homeland Security
Judiciary Committee
U.S. House of Representatives

May 13, 2009

Good morning, Mr. Chairman and members of the Committee. My name is Pete Marone. I am Director of the Commonwealth of Virginia's Department of Forensic Science. The NRC study was sponsored by the National Institute of Justice at the request of the Senate Appropriations Committee. This study, as you know, was requested by Congress at the urging of the Crime Lab Community itself.

In my testimony today in the interest of time, I will simplify, the report—*Strengthening Forensic Science in the United States: A Path Forward*—into the scientific and technical challenges that must be met in order for the forensic science community in the United States to operate to its full potential. Specifically, I will discuss these challenges in four classes of resources, research, standardization, and education. These are the primary challenges for our community at this time. The report found that some of this work has already been begun by forensic scientists, but that additional effort and coordination are needed to carry it through. However, to make that an effective effort, an annual assessment, an actual requirements analysis if you will, is needed to set forth a valid national strategy. In the past, federal strategy to help State and Local Forensic Service providers has been determined by political factors and not hard data. We need to roll up our sleeves and determine the specific needs on an annual basis.

The first element of the charge, while not specifically addressed in the form of a recommendation, was clearly addressed in the report, "for the state and local laboratories there has been a lack of resources (money, staff, training, and equipment) necessary to

promote and maintain strong forensic science laboratory systems." As I know you are acutely aware, many states are in a fiscal crisis. As a State Crime Lab Director, I know that this has in fact been the situation for many of us for some time. As such, the State and local crime labs, as well as the Medical Examiner community, have not been receiving the support they need, but the caseloads have been increasing exponentially. If we continue to focus solely on backlog rather than the actual capacity of a lab to process its workload we will continually have a backlog. Further, the funding from the Federal government has been focused overwhelmingly on the discipline of DNA, which is not our largest caseload. Congress has consistently put some funding in for the other disciplines, but it falls far short of what is necessary. I want to make it clear, Mr. Chairman, that this is at the root of many of our issues and, speaking as a laboratory director, I am asking Congress to please establish funding in at an adequate level for all of forensic science, not just a single discipline, but not instead of that discipline (DNA). The amount of funding to accomplish this is probably the most difficult to estimate since we do not have an accurate number of forensic service providers (laboratories and police identification sections) and the instrumentation and facilities involved are equally difficult to ascertain the conditions and needs. . There are over 17,000 police and sheriff departments and we have roughly estimated that there may be 11,000 forensic service providers in those departments in addition to the 400+ publicly funded laboratories. All of these numbers need to be verified and understood.

Under the category of research, the report determined that some of the forensic science disciplines need further research to provide the proper underlying validation for some of the methods in common use and to provide the basis for more precise statements

about their reliability and precision. However, "not validated" by one manner or another does not mean "of no value". The report clearly states that there is value in many of the disciplines addressed. But as the forensic community has been stating for more than a decade, in order to accomplish this, we need more funding for research and a stronger, broader research base. The disciplines based on biological or chemical analysis, such as toxicology, drug analysis, and some trace evidence sub-disciplines such as explosives, fire debris, polymers to include paint and fiber analysis, are generally well-validated and should not be included in the same category as the experience-based disciplines, such as fingerprints, firearms and toolmarks, and other pattern-recognition types of analysis. We need studies, for instance, that look at large populations of fingerprints and toolmarks so as to quantify how many sources might share similar features. In addition to investigating the limits of the techniques themselves, research is also needed on the issues of context effect and examiner bias.

In the realm of standardization, the report raised concerns about the lack of mandatory requirements for professional certification and for laboratory accreditation and the variability in the way forensic science results are reported in courts. I think it is critical to first understand that most in the forensic science laboratory community have already begun to move in the direction of accreditation; in fact the recently published *Census of Publicly Funded Crime Laboratories, 2005* stated that by 2005, 82% of the public laboratories were accredited. That number is even higher today. But more can be done. There are a significant number of forensic service providers (police ID sections) which need to be notified of the existence of accreditation programs which are

appropriate for their functions. Few realize that the existing ISO/IEC 17025 standards are applicable. Each policy and method in these police departments must be reviewed to determine if it is in compliance and, if not, what must be done to bring it into compliance. This process may take a few years due to the sheer number of labs. That is not to say that the work done by these units is suspect during the process, but that the standards and criteria are quite specific. The community fully supports mandatory accreditation, but we do not believe one needs to reinvent the wheel. Utilize the programs already in place.

The report also calls for certification of individuals that is based on written examinations, supervised practice, proficiency testing, and adherence to a code of professional practice. There are already many recognized certifying bodies and very many certified individuals, voluntarily. These certification programs need to be supported in order for them to be able to expand.

Lastly, the NRC report stresses the need for establishing a robust educational component. The federal government needs to support such a program and the institutions applying to the program for accreditation. The example for accreditation of forensic science educational programs would be the Forensic Education Program Accreditation Commission (FEPAC), which is a standing committee of the American Academy of Forensic Sciences. While this Commission has been in existence for just five years, it has shown significant success in raising the scientific rigor of the programs which it has already accredited. This also applies to laboratory accreditation and individual certification. There is a quantum difference between overseeing the accrediting or

certifying bodies and creating a new body from the ground up. The report did not intend to establish a new accreditation program, but to bolster the existing structure.

The report's primary recommendation is that the forensic science enterprise does not have a unified plan and needs strong, fresh national direction. Strong leadership is needed to adopt and promote an aggressive, long-term agenda to strengthen forensic science. It also strongly urges Congress to establish a new, independent National Institute of Forensic Science to lead research efforts, establish and enforce standards for forensic science professionals and laboratories, and oversee education standards. While the difficulty with establishing a new agency is recognized, the root of the struggles this community has, is the lack of federal support and unified guidance.

The report also calls on this new entity to lead an effort to remove public forensic laboratories from the administrative control of law enforcement agencies or prosecutors' offices, or be autonomous within such agencies such that scientific decisions and technical policies are made by the scientists. That is likely to be a difficult task, one that requires knowledge of relationships among those operations and between federal, state, and local jurisdictions. It is critical for us to remember that forensic science is indeed a tool for the criminal justice system and that the science must be objective.

Mr. Chairman and Members of the Committee, I thank you for the opportunity to come before you today. I'd like to conclude by quoting a part of the NRC study which I believe is one of the most important statements and findings:

"Numerous professionals in the forensic science community and the medical examiner system have worked for years to achieve excellence in their fields, aiming to follow high ethical norms, develop sound professional standards, ensure accurate results in their practices, and improve the processes by which accuracy is determined. Although the work of these dedicated professionals has resulted in significant progress in the forensic science disciplines in recent decades, major challenges still face the forensic science community." Again, thank you for your attention, and I will be pleased to answer questions.

Below are excerpts from the NRC report, specifically speaking to the three disciplines which received the most attention:

Chapter 5-page 12

"Summary Assessment Historically, friction ridge analysis has served as a valuable tool, both to identify the guilty and to exclude the innocent. Because of the amount of detail available in friction ridges, it seems plausible that a careful comparison of two impressions can accurately discern whether or not they had a common source. 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."

Chapter 5-page 21

"Summary Assessment 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. Sufficient studies have not been done

to understand the reliability and repeatability of the methods. The committee agrees that class characteristics are helpful in narrowing the pool of tools that may have left a distinctive mark. Individual patterns from manufacture or from wear might, in some cases, be distinctive enough to suggest one particular source, but additional studies should be performed to make the process of individualization more precise and repeatable."

Chapter 5- page 30

"Summary Assessment The scientific basis for handwriting comparisons needs to be strengthened.[98] Recent studies have increased our understanding of the individuality and consistency of handwriting and computer studies[99] and suggest that there may be a scientific basis for handwriting comparison, at least in the absence of intentional obfuscation or forgery. Although there has been only limited research to quantify the reliability and replicability of the practices used by trained document examiners, the committee agrees that there may be some value in handwriting analysis."

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Mr. SCOTT. Thank you very much.
We have been joined by the gentleman from Texas, Judge Poe.

Mr. Hicks?

TESTIMONY OF JOHN W. HICKS, DIRECTOR, NORTHEAST REGIONAL FORENSIC INSTITUTE, THE UNIVERSITY AT ALBANY, STATE UNIVERSITY OF NEW YORK, ALBANY, NY

Mr. HICKS. Thank you, Mr. Chairman. It is a pleasure to be here with you today, and I thank you for this opportunity. I must say, first, I share many of the views that have already been expressed by the previous panelists here.

I also should say that I also do not support the notion that there should be a separate independent agency developed as was put forth in the National Academy, but on the other hand, there does need to be close coordination amongst the Federal agencies that are involved in forensic's development and we can look to the DNA experience to kind of see how that has successfully been applied to bring in the new DNA technology as, again, was acknowledged in the report.

The three agencies that played key roles—there are many agencies involved and many academic institutions and research centers that were involved throughout the country—throughout the world for that matter—with DNA.

But the three primary agencies were the FBI, the National Institute of Justice, and the National Institute of Standards and Technology. Each of those agencies, I think, bring certain elements that can help in addressing many of the issues that were raised in the National Academy report.

With respect to the—what I think is probably the primary recommendation—the most significant recommendations of the report, and that is to address the—there were recommendations number one, three, and ten in the report, but they speak to providing funding that would be directed to promoting scholarly, competitive peer-reviewed research, which addresses issues of accuracy, reliability and validity in forensic science disciplines.

As Mr. Marone has already said, that is an area, clearly, of need and application, particularly in areas which have been around for many years, and from my perspective, I think we can have confidence in many of these pattern-based recognition techniques if they are applied by people that are properly trained and they have experience in the field, and they operate in a way that accreditation programs call for, and that is a quality management system that has appropriate review processes in place to verify the systems.

I think we can have confidence in the systems. That is not to say that mistakes can't be made and that there is definitely a need to know more about those technologies and applications and do some of the kind of developmental research work that really is within the core competencies of the National Institutes of Standards and Technology.

I think they should play a lead role in helping to apply their expertise in developing some of this kind of data that has been called for. I think just to sum up my perspective. I think I have already said it, but that is that the most efficient, effective way to quickly try to address the kinds of recommendations and issues that came up in the National Academy of Science report is to assure that you

have a high degree of coordination among these agencies, that there is a lot of input from the forensic community at large.

Of course with the DNA experience, one of the key elements to help coordinate the development was what was called the technical working group on DNA analysis methods. Now it has been sort of changed to the scientific working group, and based in part on that experience, the community has adopted scientific working groups in virtually all disciplines, and their products can be seen in different kinds of publications where they have been working toward articulating standards and coming to more uniformity in the practice nationally.

So, in my judgment, that kind of a model might be a very useful model to follow with respect to the other recommendations in the report.

Thank you, sir.

[The prepared statement of Mr. Hicks follows:]

PREPARED STATEMENT OF JOHN W. HICKS

Mr. Chairman and members of the Subcommittee, thank you for the opportunity to appear before you today and to offer my perspective on the findings and recommendations found in the recently released report of the National Academy of Sciences (NAS), *Strengthening Forensic Science in the United States: A Path Forward.* The Academy was given a broad charge to assess the state of forensic practices across the country and to make recommendations for improvement. In addition to traditional forensic laboratory services, the scope of its review included functions of medical examiners and coroners in determining cause and manner of death.

First, I should say I do not support the call for the creation of a National Institute of Forensic Science. In my view, a separate federal agency would be costly to establish and unnecessarily duplicative of well-established programs and activities now found within several federal agencies. I do agree with the underlying premise of this proposal that there needs to be a well coordinated effort among these agencies and within the national forensic community to focus attention on issues related to the quality and delivery of forensic services by publicly funded agencies.

The essential recommendations found in the NAS report may be grouped into four broad categories:

(1) methods development and standardization;

(2) laboratory accreditation and quality assurance;

(3) research and training; and

(4) resource needs.

As described briefly below, a number of congressional initiatives over the past few years have directed much needed attention to the resource needs within the forensic community and to forensic laboratory quality improvement issues, including laboratory accreditation and staff training. It is recommended that support for these initiatives be continued. It is clear, however, that additional steps are needed to address critical concerns related to methods development and validation, especially for forensic disciplines other than DNA analysis.

Priority attention should be directed to elements found in NAS recommendations numbered 1, 3 and 10. Specifically, under NAS recommendations 1 and 3, funding should be directed at promoting scholarly, competitive peer-reviewed research which addresses issues of accuracy, reliability, and validity in forensic science disciplines. Funds should also be directed at assessing the development and introduction of new technologies in forensic investigations, especially technologies that improve the detection and discrimination potential for materials typically encountered at crime scenes and those automation technologies which can be applied to reduce evidence processing times.

As called for under the NAS recommendation 10, funding should be made available for distribution to educational institutions and other appropriate organizations to encourage the development, improvement, and delivery of graduate education programs in the forensic sciences. Funding should also support continuing education programs for lawyers, judges, law enforcement personnel, practitioners and other groups that are involved in the collection of physical evidence or groups that utilize

the results of forensic analyses within the criminal justice system. Such groups might include those involved in the medical treatment of victims of crimes.

It should be noted that with regard to the forensic use of DNA technology, the Congress has already authorized a series of highly relevant and critically needed programs that provide the resources to help meet the unprecedented demand for DNA testing services. These programs are administered by the National Institute of Justice (NIJ) and are intended to help eliminate testing backlogs and reduce case turnaround times, to provide defendants with access to post-conviction DNA testing, and to help assure that the technology is used effectively to identify missing persons.

With regard to "non-DNA" forensic laboratory services and medical examiner services, legislation was enacted in 2000 which created the Paul Coverdell Forensic Sciences Improvement Program which awards grants to states and units of local government to help improve the quality and timeliness of forensic science and medical examiner services. Among other things, the Coverdell program calls for laboratory accreditation by recognized accrediting bodies and provides for staffing and training needs. To assure transparency in laboratory operations, especially when problems may be indicated, Coverdell also requires that there be an independent entity with authority to investigate allegations of malfeasance or misconduct by laboratory personnel. While working in New York State, it has been my experience that these programs have been highly effective in bringing needed improvements to the 22 state and local forensic laboratories across the State.

It is strongly recommended that federal support be continued for these programs which have already been demonstrated to address critical needs identified in the NAS report. There is a need to expand or establish other programs which can focus greater attention on the development and validation of methodologies used in forensic disciplines. In addition, funding is needed to support a range of in-service and other specialized training initiatives to maintain and improve the technical skills of forensic laboratory personnel.

In the NAS report, as in the Senate report that ordered the NAS study, forensic DNA technology was set apart from other forensic disciplines with the recognition of the robustness of the underlying research and validation work that was conducted to support its applications in the criminal justice system. The confidence in forensic DNA technology is the result of the considerable efforts of scores of scientists in the public and private sectors—academic researchers and forensic science practitioners—to identify, assess, validate and optimize the various DNA testing methods in use today. A national Technical Working Group was formed at the outset to facilitate communication among forensic practitioners and help advance the technology in a coordinated way. The Technical Working Group on DNA Analysis Methods (TWGDAM) was specifically cited in the DNA Identification Act of 1994 which authorized CODIS, the national DNA Database. This effort was driven by Congressional leaders and agency administrators who recognized the importance and potential of this emerging technology as an identification tool to solve crimes and assure justice in the courts. This high level support and direction was essential to maintain a focus that would assure the standardized methods necessary for data compatibility to enable the mutual sharing of information which has been proven so helpful in resolving crimes which might otherwise have gone unsolved. Key federal agencies that contributed to the development and validation of forensic DNA technology include the Federal Bureau of Investigation (FBI), the National Institute of Justice (NIJ) and the National Institute of Standards and Technology (NIST).

The NAS Committee expressed concern over the apparent lack of systematic research to validate the basic premises and techniques for forensic disciplines that have been in practice since before the emergence of DNA technology. Disciplines which drew particular attention in their report are those that rely, in large part, on pattern recognition techniques as used in the examination of fingerprints; firearms and fired ammunition components; tool marks; and handwriting. For these and other "non-DNA" forensic techniques that are widely used today, it would be helpful to identify and gather existing empirical studies, to conduct other studies as deemed necessary to update or supplement these data, and to put the information in a form that is readily disseminated within the relevant forensic and scientific communities. Based on these studies, appropriate standards should be developed or updated to assure the use of uniform and scientifically validated examination techniques by forensic practitioners. These kinds of activities are among the core competencies found in NIST and supported by other federal agencies such as NIJ and the FBI.

While perhaps best known for its work in industry, NIST has been actively involved with elements in the forensic community over the past decade and has made important contributions working collaboratively with other federal agencies as well

as with industry and academia. For example, in close coordination with the FBI and NIJ, the agency undertook a number of inter-laboratory and other studies pertaining to individual markers used in DNA identification which have helped guide the successful development and forensic application of this revolutionary technology. The results of these efforts are in daily use in public and private forensic DNA laboratories and NIST scientists have presented their work in academic courses in order to prepare the next generation of forensic scientists. They have also provided in-service training sessions and seminars at professional meetings across the country.

NIST has also performed studies designed to validate and improve the performance of large data systems used in criminal justice applications such as the Automated Fingerprint Identification System (AFIS), a vital system in continuous use by law enforcement and other agencies to resolve personal identification issues, and the National Integrated Ballistics Identification Network (NIBIN) which correlates imaged data from bullets and cartridge casings recovered during the course of criminal investigations. NIST provides standard reference materials for use by laboratories in private industry as well as public laboratories (including forensic laboratories). As new technologies continue to emerge with potential applications in forensic laboratories, NIST is uniquely positioned to facilitate communications between the forensic community and private industry to assure the timely and appropriate development and production of laboratory equipment, reagents and other supplies needed for implementing new techniques.

In my view, the most efficient, effective, and economical way to move the forensic community forward, especially in those disciplines where such a need is indicated, is through a coordinated effort by agencies already engaged in forensic science research under the general guidance of a national advisory board comprised of forensic science practitioners, research scientists and academicians. The DNA experience provides a useful model and a framework upon which to build. The National Advisory Board for Forensic Sciences might include federal, state and local officials from the criminal justice and crime laboratory communities, key professional associations, and established accrediting organizations such as the American Society of Crime Laboratory Directors—Laboratory Accreditation Board (ASCLD/LAB) and the American Board of Forensic Toxicology (ABFT). Established Scientific Working Groups for the various forensic disciplines would be engaged in this effort subject to the general guidance of the national advisory board. This process should be sufficiently transparent to assure the courts of the general acceptance and scientific validity of forensic techniques. It would be important to engage the academic research community in this effort and to provide expanded resources to support the development and delivery of specialized training programs not only for forensic laboratory personnel but also for the "client" groups that receive their work product such as investigators, prosecutors, defense attorneys and judges. Again, the forensic DNA experience provides a helpful and proven model in this regard.

Mr. SCOTT. Mr. Neufeld?

TESTIMONY OF PETER NEUFELD, CO-DIRECTOR, THE INNOCENCE PROJECT, NEW YORK, NY

Mr. NEUFELD. Good afternoon, Mr. Chairman. Good afternoon, Ranking Member, Mr. Gohmert.

On September 18 of 1985, a 16-year-old girl was abducted in Utica, New York and eventually sexually assaulted and murdered. Initially, one of the people who was suspected of that crime was a gentleman named Steven Barnes, only because he owned a pickup truck which fit the description of a truck seen driving along the road at about the time that the young gal was abducted.

He wasn't arrested then, because they didn't have enough evidence. But during the next 2 years, they built a forensic case against Mr. Barnes. He was ultimately charged, convicted, sentenced to life in prison and spent 20 years in prison before, just a couple of months ago, forensic DNA testing on the semen recovered from the victim and on the clothing recovered from the victim exonerated Steven Barnes.

I would like to introduce Mr. Barnes to the Committee. Would you stand up 1 second. As Mr. Barnes was exonerated in the last couple of months after 20 years in prison for a crime he did not commit.

The reason I wanted to mention Mr. Barnes' case to you is because a very professional criminalist forensic scientist working at a first rate forensic science laboratory—the Connecticut State Crime Laboratory—provided three pieces of very powerful evidence that were used to convict him.

First, she testified that the soil under the truck that Mr. Barnes was driving was very consistent with the soil found on the dirt road where the victim was found. Two, that hairs found inside Steven's vehicle were consistent with hairs belonging to the victim. Indeed, that they were microscopic matches to those hairs.

And, three, that a layer of dust found inside the van left an impression of blue jeans and of blue jean stitching, and that the victim wore similar blue jeans, and that she looked at other manufacturers of blue jeans—five or six of them—and didn't see that particular pattern and, therefore, these were very unusual patterns.

Now, this was somebody who probably came from a laboratory that would no doubt be accredited, a person who is extremely professional and would be certified. However, the underlying disciplines that she was describing had never been adequately validated.

And when I say "adequately validated," it doesn't mean that somebody can't examine soil or somebody can't look at hairs under a microscope or can't look at a pair of blue jeans, but what it means is—and this is one of the things that the National Academy of Science talked about so vociferously—is that well, what does it mean to say that something is similar or matches? Is it one in 10, one in a million, or one in a billion?

And what you realize is—and what the National Academy realized is that the hypothesis suggesting that a certain piece of evidence left at a crime scene had as its source a particular defendant or may have come from that defendant is the type of the thing that hasn't been adequately validated. And that is one of the main problems here.

And that is why the National Academy of Science found—not me, I don't know science. I am a lawyer with a project in New York, but what the scientists found is that with the exception of nuclear DNA analysis, no forensic method has been rigorously shown to have the capacity to consistently and with the high degree of certainty demonstrate a connection between evidence and a specific individual or source.

That is their finding, not ours. And the problem is that you now want to figure out how to test that hypothesis to see whether or not they can be validly used for that specific purpose or whether they can't be. And no doubt if we do studies like that some will pass, some might not.

But, you know, what is interesting is that in other institutions, we don't do that kind of testing after the horse is out of the barn. We don't decide after we first have the FDA look at a new piece of medicine or a medical device and decide whether it has been adequately validated before we unleash it on the consumer public.

We don't have the pharmaceutical companies decide how the National Institute of Health should give out grant money for basic research and applied research. We don't do that for other kinds of applied science. Why should we do it in forensic science? We shouldn't.

We should have, number one, an entity that looks at these things before they are used, not after. One of the problems that other speakers have recognized here is that some of these systemic problems were known for a long time, yet no one at NIJ, no one at the FBI laboratory did anything affirmatively about many of these systemic problems and testing that basic hypothesis for 5 or 10 or more years.

Now they want to do something because the NAS report is out, but the other thing, which is very important for us to learn in terms of a lesson from what we do with clinical laboratories in medicine, is we don't have the users themselves decide when a product is ready. We have independent people do that.

What is being suggested by some other people at this point in time is that it is okay to have the leaders of the forensic laboratories or the leaders of these different forensic disciplines decide when a device has been adequately validated.

We have never felt that is an adequate assurance when matters of public health are at stake. I don't see any reason why we should have less rigor when matters of criminal justice are at stake.

Thank you.

[The prepared statement of Mr. Neufeld follows:]

PREPARED STATEMENT OF PETER NEUFELD

Thank you Chairman Scott, Ranking Member Gohmert, 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. I am 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.

The development of DNA testing has allowed the Innocence Project to help exonerate 238 factually innocent Americans—17 of whom were on death row awaiting execution.

However, fewer than 10 percent of cases that come before the courts involve biological evidence that could be subjected to DNA testing; DNA testing cannot help us identify the truth in the remaining 90 percent of cases, many of which involve some form of forensic evidence. Thus the need to be as sure as possible about the probative value of non-DNA forensic evidence is critical to the integrity of our criminal justice system.

This is particularly true given the fact that our work with DNA exonerations has shown us the shortcomings of non-DNA forensics. Our cases have allowed us the opportunity to examine what went wrong, and that research has yielded a stunning statistic: police and prosecutors' reliance on un-validated and/or improper forensics was the second-greatest contributing factor to those wrongful convictions.[1] Those cases show what the NAS report documents—that the lack of science underpinning non-DNA forensics has tremendous potential to mislead the criminal justice system away from the real perpetrators of crime, and that the system must use science to

[1] The Innocence Project's analysis regarding wrongful convictions involving unvalidated or improper forensic science that were later overturned through DNA testing is attached to this testimony.

address these scientific shortcomings in order to improve the reliability of forensic evidence, and thus our criminal investigations, prosecutions and convictions.

The Innocence Project strongly believes that the NAS report provided a critical wakeup call 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. While the findings of this expert scientific panel was a source of alarm about the criminal justice system's forensic practices, we must recognize that it provides the system with a tremendous opportunity. Namely, its recommendations will allow us to increase the accuracy of criminal investigations; strengthen criminal prosecutions; bring justice to victims; conserve resources so law enforcement can dedicate them toward finding true perpetrators; and protect the innocent from wrongful conviction. The Innocence Project therefore strongly endorses the report's recommendations; the findings and recommendations of this report are critical to the improvement of our criminal justice system.

The Innocence Project strongly supports the Academy's central recommendation: to ensure the integrity of the forensic evidence used to guide the criminal justice system, the federal government must create a National Institute of Forensic Sciences. Many forensic techniques—such as hair microscopy, bite mark comparisons, fingerprints, firearm tool mark analysis and shoe print comparisons—have never been subjected to rigorous scientific evaluation. Yet as I speak, 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. Likewise, forensics techniques that have been properly validated—such as serology, commonly known as blood typing—are sometimes improperly conducted or inaccurately conveyed in trial testimony. The overarching problem has been that all too frequently, these forensic disciplines have been improperly relied upon to connect our innocent clients to crime scene evidence.

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 NAS 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.

An example of this is the case of Steve Barnes. Barnes was convicted in 1989, at the age of 23, of the rape and murder of a high school classmate he did not commit. Three types of unvalidated forensic science were used in the trial to convict him. Eyewitness testimony at his trial was shaky and the lack of other strong evidence put particular weight on the forensic evidence involved in the case. That evidence included testimony that soil on Barnes' truck tires was similar to soil at the crime scene, that an imprint in the dirt on the surface of Barnes' truck matched the fabric pattern on a particular brand of jeans the victim wore when she was killed, and that two hairs collected from Barnes' truck were microscopically similar to the victim's hairs and dissimilar from Barnes' hair.

The soil, fabric, and hair analysis are examples of an area of forensics called "pattern evidence" techniques. These techniques take an item found at the crime scene and determine if it is a match with a sample from the suspect to link them to the scene. However, microscopic hair analysis, soil comparison and fabric print analysis have not been tested to determine their scientific reliability or validity; as a result, it is impossible to know how many other soil samples might be similar to soil from the crime scene or the likelihood that other brands of jeans can make prints of a similar pattern, and there is not adequate empirical data on the frequency of various class characteristics in human hair. Without an existing database or set of "knowns," a proper statistical inference of likelihood cannot be made.

However, neither the defense counsel, judge, nor jury were familiar with these underlying facts, and as a result this misleading and inaccurate forensic evidence was accepted as scientific fact. In 2007, the Innocence Project secured the latest DNA testing, which yielded conclusive results on sperm cells from the victim's body and clothing—none of which matched Barnes. After serving near 20 years in prison for a murder and rape he always said he didn't commit, Barnes was freed on November 25, 2008. His exoneration became official on January 9, 2009, when prosecutors announced that they were dropping all charges. Shortly after his exoneration he celebrated his 43rd birthday—the first one at home in two decades.

According to the NAS report, "[f]or a variety of reasons—including the rules governing the admissibility of forensic evidence, the applicable standards governing appellate review of trial court decisions, the limitations of the adversary process, and the common lack of scientific expertise among judges and lawyers who must try to comprehend and evaluate forensic evidence—the legal system is ill-equipped to correct the problems of the forensic science community. In short, judicial review, by itself, is not the answer." [2]

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.

The vast majority of forensic employees are hardworking, ethical and responsible. They use the best scientific techniques available to them to deliver objective, solid information—regardless of whether the science favors the defendant, supports the prosecution or is inconclusive. In most cases, the science—rather than the scientist—is inadequate. In other cases, forensic analysts make mistakes that could result from lack of training, poor support or insufficient resources to meet an ever-growing demand. In still other cases, forensic analysts' testimony goes further than the science allows because the techniques that have been practiced for years have not been subjected to the rigors of scientific research. Our review of the nation's DNA exonerations showed that 72 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. They are accepted and repeated as fact, leaving juries with the impression that the evidence is more scientific than it is. According to the NAS report, the shortcomings in education, training, certification, and standards for testing and testifying that contributed to wrongful convictions in those cases threaten the integrity of forensic results.[3]

Some may argue that mandatory accreditation and certification would be a sufficient oversight mechanism for the forensic community. While this would, of course, be superior to no oversight structure at all, the NAS Report makes clear that this alone would fail to solve some of the most pressing deficiencies in forensic evidence. Specifically, mandatory accreditation and certification alone would fail to address the lack of validity and reliability the NAS identified in numerous forensic practices.

Voluntary accreditation of laboratories and voluntary certification of analysts have, of course, been part of the forensic system for years. However, many of the accredited labs and certified practitioners have, nevertheless, been reporting results that the NAS concludes—and DNA exonerations have confirmed—have never been scientifically validated for their accuracy. Accreditation only provides assurance that protocols for laboratory operations, evidence handling, personnel management, review of lab reports, and monitoring of testimony takes place; and certification only monitors education, experience, training, and completion of a skills-based test. Neither practices are determinative of the accuracy of the forensic product.

Without the basic and applied research and comprehensive assessment and standardization needed to validate the various forensic techniques and assays, mandatory accreditation and certification alone would do little to address the fundamental scientific shortcoming which is of such serious concern to the NAS. If the underlying forensic discipline adopted by the lab and used by the analyst has not been scientifically validated nor its reliability assessed, the final product proffered to prosecutors and court will remain in question.

However, we cannot expect the courts to sort through or overcome the patchwork of standards, or to assess for themselves the reliability of a device or technique, no matter how widely used. Judges nor juries cannot be expected to understand the accuracy of an expert witness's testimony and whether the science they claim to represent has been tested and validated by the best scientific practices. Because of the fragmentation of the criminal justice system, and because of the lack of a sound scientific foundation for many forensic technologies and assays, 50 states may be operating under 50 definitions of "science"—and therefore 50 standards of justice. While states' autonomy must be respected, it is entirely appropriate for the federal government to establish the scientific standards that foster justice when any court is considering forensic evidence.

For our justice system to work properly, standards must be developed and quality must be assured as part of the formal system of vetting the scientific evidence we allow in the courtroom. Before the evidence is presented to the courts—or even be-

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[2] 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. 3–20.

[3] Ibid., p S–3.

fore police seek to consider the probative value of such testing for determining the course of their investigations—the application of the scientific method to each forensic assay or technology, as well as parameters for report writing and proper testimony, must be required. Since the police officers, lawyers and judges who are tasked to adjudicate these cases are very rarely forensic specialists themselves, properly understanding forensic scientific evidence presents a challenge that demands a strong, unified, federal response before scientific evidence reaches the courtroom. This is particularly important because the overwhelming majority of cases are resolved with plea bargains, necessitating defense lawyers and prosecutors—with no judicial involvement—to interpret and rely on the reports' conclusions as a basis for making an important decision affecting the liberty of life of the accused.

Another challenge to the quality of forensic evidence is information dissemination. When information about new technologies and technique surfaces, there are few formal channels for sharing that information with practitioners in the field. As a result, many practitioners continue to practice unaware of the latest critical advances and news that can inform their work, a problem that is exacerbated because of the lack of resources for continuing education and training to adapt to those advances, when they are known A formal entity is needed to track the latest advances, and to serve as a centralized repository and to validate the newest technological advances, and ideally to promote innovative research as well. This is also an opportunity to harness the federal government's resources to promote and subsidize continuing education and training.

The NAS report states that "The forensic science enterprise also is hindered by its extreme disaggregation—marked by multiple types of practitioners with different levels of education and training and different professional cultures and standards for performance and a reliance on apprentice-type training and a guild-like structure of disciplines . . ."[4] What is called for is a standardized approach to education, training, proficiency testing, and ultimately certification of practitioners to ensure a consistent and high standard is met nationwide. Likewise, enforceable parameters for interpretation of data, report writing, and courtroom testimony must be developed.

Because of both a lack of resources and the current fragmented allocation of funding streams, most crime labs are focused on eradicating backlogs in addition to new casework. In addition, current funding is not adequate to allow necessary research to be conducted to improve the various disciplines. This both delays justice and hinders the ability of a practitioner to conduct his or her work as well as possible. It is clear that a comprehensive assessment of the resource needs of the forensic science community—and those who employ forensic evidence—must be conducted to ensure that funding is allocated appropriately. This will also allow us to fully grasp the magnitude of the problem and work to make sure that suitable funds are appropriated to address the work that needs to be done.

And of course, the variety of assays, devices, and technologies must be closely examined and subjected to the scientific method. The Innocence Project can cite well over a hundred cases that involved faulty forensics, from the nation's 239 post-conviction DNA exonerations alone. And the NAS report is very clear: "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."[5] Non-DNA forensic assays have not been scientifically validated, and there is no formal apparatus in place to do so for developing forensic technology. 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. 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 FDA ever scrutinized the forensic devices and assays, nor were crime laboratories subject to mandatory accreditation and forensic service practitioners subject to certification. Only the federal government has the resources and the power to undertake such a challenge.

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

[4] Ibid., p. S–11
[5] Ibid., p. 5–5.

Report is the first step 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. 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. Given the clear and comprehensive message delivered by the NAS on this subject, further delay would be unconscionable.

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, 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. 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."[6]

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

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.

The investment of time, effort and resources necessary to improve forensic sciences will pay tremendous dividends in terms of time, effort and resources not wasted by faulty data. It will make criminal investigations, prosecutions and convictions more accurate, and our public more safe—and perhaps most importantly, justice more assured. It will allow us to eliminate backlogs, allowing properly-funded crime labs to turn around evidence in time for a quick trial. There will be no question about what evidence is admissible: all forensic assays, devices, and technologies will have been validated, reliability studies will have been done, and reports will be properly documented. Clear guidelines for testimony will be set which will prevent evidence from being manipulated or mischaracterized to benefit the defense or prosecution. Research on developing technologies will not only improve forensic technology, but will uncover ways to innovate and improve upon current technology and devices.

Our work has shown the catastrophic consequences of such a lack of research, standards, and oversight. Science-based forensic standards and oversight will increase the accuracy of criminal investigations, strengthen criminal prosecutions,

[6] Ibid., p. 2–19.

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.[7]

We have an unprecedented opportunity to significantly improve the administration of criminal justice in the United States. By strengthening forensic science 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, just as the development of DNA technologies and their applications has done. With your support, we will minimize the possibility that tragedies like those endured by the nation's 238 (and counting) exonerees and their families will be needlessly repeated, and we will significantly enhance the quality of justice in the United States.

[7] 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.

ATTACHMENT

INNOCENCE PROJECT

Wrongful Convictions Involving Unvalidated or Improper Forensic Science that Were Later Overturned through DNA Testing

The table below lists DNA exoneration cases (through February 1, 2009, the first 225 DNA exonerations in the nation) where unvalidated or improper forensic science contributed to the underlying wrongful conviction.

The Innocence Project defines unvalidated or improper forensic science as:

- the use of forensic disciplines or techniques that have not been tested to establish their validity and reliability;
- testimony about forensic evidence that presents inaccurate statistics, gives statements of probability or frequency (whether numerical or non-numerical) in the absence of valid empirical data, interprets non-probative evidence as inculpatory, or concludes/suggests that evidence is uniquely connected to the defendant without empirical data to support such testimony; or
- misconduct, either by fabricating inculpatory data or failing to disclose exculpatory data.

The determinations in this table make no conclusions about the state of mind of analysts involved in cases, which cannot typically be known. Many cases are included where the analyst's role is not at issue at all, but the forensic disciplines and techniques being used were not validated. Where the analysts' conduct is at issue, it may be attributed simply to innocent error, or it could be the result of negligence, recklessness or intent.

The determinations in this table are based on trial transcripts and other official sources. Many of these determinations are based on underlying research from Professor Brandon Garrett and Peter Neufeld for Invalid Forensic Science Testimony and Wrongful Convictions, 95 Va. L. Rev. 1 (2009). Garrett and Neufeld focused on one aspect of this category, invalid testimony by forensic analysts. In their research, Garrett and Neufeld consulted with a number of forensic scientists, attorneys and other experts in the field. The Innocence Project reviewed transcripts for cases that were included in Garrett and Neufeld's study, as well as transcripts in cases that were not included (because Garrett and Neufeld's scope was more limited).

This table includes specific quotes from trial transcripts and other official sources where available. In many cases, there may be additional bases for determining that unvalidated or improper forensic science was involved, but further research was not conducted once the case fit within the definition. Some cases may also not be included in this list at all because sufficient source material could not be located. Anyone with information about a DNA exoneration case involving unvalidated or improper forensic science that is not listed here should send that information to info@innocenceproject.org. Similarly, anyone

who believes that a case listed here does not fit the Innocence Project's definition of cases involving unvalidated or improper forensic science should send that information to the same email address. Since its inception, the Innocence Project has collected information about DNA exoneration cases – and has encouraged anyone with more information about these cases to share it for our review.

Name of Defendant	State	Years Served	Details/Notes
Abdal, Wahir Abdal (Jenkins, Vincent)	NY	16.0	**Incorrect Hair Analysis.** An analyst testified that hairs from the crime scene were "distinctively different" from the defendant's but that he couldn't exclude the defendant based on the distinction because "it's not unusual to have different hairs come from the same person." The analyst went on to say that diet affects hair, giving a statistical probability that other unexamined hairs could be similar: "The study shows it would not be unusual to have a look at 4,500 strands of hair from the head in order to get a match with any one particular hair. And, from the pubic hair, one may have to look at as much as 800 hairs, and it could be from the same person. That gives an idea of how much a hair can vary just within one single person." (Garrett/Neufeld, March 2009)
Adams, Kenneth	IL	17.5	**Incorrect Hair Analysis.** An analyst testified that the hair looked the same: "I couldn't distinguish if I was looking almost at two hairs. They looked just like one." The analyst said the hairs were "just like if you drop two dollar bills and you see dollar bills on the floor. You see two one dollar bills. It's obvious. And that's how it looked there." (Garrett/Neufeld, March 2009). **Incorrect Serology.** An analyst also testified that Adams' blood exhibited an "H reaction" similar to the type A blood found in samples from the victim, and that less than 2% of the population has that type of clumping due to an "H reaction." (Garrett/Neufeld, March 2009).
Alejandro, Gilbert	TX	3.5	**Incorrect DNA Analysis.** A forensics expert claimed that there was a DNA match (based on banding that the analyst said "could only have originated from" the defendant), without providing a random match probability. In fact, DNA testing hadn't been done, or at best, only partial testing had been done. (Garrett/Neufeld, March 2009)
Atkins, Herman	CA	11.5	**Incorrect Serology.** An analyst testified properly that the sample could have come from the victim or could have been a combination of people. However, the analyst then said that the population of people who are A secretors and PGM type PGM 2+1+ is 6.1% of the white population and 4.4% of black people. (Garrett/Neufeld, March 2009)
Avery, Steven	WI	17.5	**Unvalidated Hair Analysis.** An analyst testified that after comparison, a hair sample from the crime scene and another taken from Avery were "similar" and "consistent." (Garrett/Neufeld, March 2009)
Barnes, Steven	NY	19.5	**Other Unvalidated Science.** An analyst testified that soil on Barnes' truck tires was similar to soil from the crime scene. An analyst also testified that a marking on the outside of Barnes' truck was similar to a unique pattern that is associated with one brand and style of blue jeans (the same brand and style of blue jeans the victim was wearing). (Trial transcript, page 587, 600, 607)
Bauer, Chester	MT	8.0	**Incorrect Serology.** The victim and the perpetrator were both O secretors, and an analyst limited the potential donor source to O secretors, ignoring the potential that the victim's blood groupings masked the perpetrator's. The analyst also said 7.5% of men could have been the source (improperly dividing the population statistic in half for males). (Garrett/Neufeld, March 2009) **Incorrect Hair Analysis.** An analyst provided unsupported statistics in comparing the hairs. The analyst said that "to have them both match, it would be the multiplication of both factors so as an approximately using that 1 out of 100, you come out with a number like 1 chance in 10,000." (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Bibbins, Gene	LA	15.5	**Incorrect Fingerprint Analysis.** An analyst testified that lab analysis of fingerprints from the crime scene were inconclusive, and that the analyst had checked those findings with the state crime lab, which had reached the same conclusion. In fact, Bibbins was excluded as the source of the fingerprints, which was in a state crime lab report. (Garrett/Neufeld, March 2009)
Blair, Michael	TX		**Incorrect Hair Analysis.** An analyst testified that the victim had unusual hairs: "The interesting thing about Ashley's hair, when you look at her standard, is that she has microovoid bodies. These are very small air inclusions that are smaller than a true ovoid body. Ovoid bodies are mostly found in cattle hair and they're much larger, but Ashley, thoughout her standard or known head hairs, has these microstructures." He linked the characteristics of the hair to the commission of an assault, claiming he observed evidence that "the hair has been crushed or particle filamant or frayed ends. The other end of this hair has a similar appearance indicating that this hair piece has been subjected to some sort of blunt force." The analyst also testified that evidence found at the crime scene included hairs he identified as Michael Blair's. The analyst explained "I've never seen a Caucasian or Mongoloid hair that was opaque like that." The analyst then added, "I haven't seen a hair like that before. Not a human hair." The analyst also identified a fiber in Blair's car as being from the victim's toy, stating that "This is a fiber seldom encountered in forensic work." (Garre
Boquete, Orlando	FL	12.0	**Incorrect Serology.** An analyst testified that both the victim and Boquete were both O non-secretors. However, two spots on the victim's panties had Type A substances, while two other spots had no blood group substances. The analyst did not exclude Boquete based on the A substances. Regarding the spots that had no blood group substances, the analyst said they could have come from Boquete because he was a non-secretor, adding that 20% of the population are non-secretors. In fact, those two spots with no blood group substances could have come from the victim. (Garrett/Neufeld, March 2009)
Bravo, Mark Diaz	CA	3.0	**Incorrect Serology.** An analyst testified that 3% of the population is PGM 2-1+, but then erroneously divided that statistic in half (supposedly eliminating females) to claim that 1.5% of men could be the source. (Garrett/Neufeld, March 2009)
Brewer, Kennedy	MS	7.0	**Unvalidated Bite Mark Analysis.** A forensic odontologist testified that there was "reasonable medical certainty" that Brewer's top two teeth caused bite marks found on the victim. When explaining what "medical certainty" means, analyst testified, "yes, he did" leave the marks. (Garrett/Neufeld, March 2009)
Briscoe, Johnny	MO	23.0	**Unvalidated Hair Analysis.** An analyst testified that pubic hairs from the crime and Briscoe's pubic hairs exhibited "similar microscopic characteristics." (Trial transcript, page 196)
Brison, Dale	PA	3.5	**Unvalidated Hair Analysis.** An analyst testified that hairs from the crime were "consistent" and "similar" to Brison's hair. (Trial transcript, page 144)
Bromgard, Jimmy Ray	MT	14.5	**Incorrect Hair Analysis.** An analyst testified to fabricated hair match statistics. He testified that hair from the crime scene "matches all the characteristics" of Bromgard's pubic hair "and they almost look like one hair." He testified that there is a one in 100 chance of a head hair matching an individual, and a one in 100 chance of a pubic hair matching an individual – and that "it's a multiplying effect," so there was a one in 10,000 chance that the hairs belonged to anyone else. "[I]t's the same as two dice," he testified. "If you throw one dice with a one, one chance out of six; if you throw another dice with a one, it's a one chance out of six, you multiply the odds together." (Garrett/Neufeld, March 2009)
Brown, Dennis	LA	19.0	**Incorrect Serology.** Both the victim and Brown were O secretors, and the stains were also Type O. An analyst testified that the source of stains found on the crime scene would have to be from a Type O secretor or non-secretor, and said that 46.5% of the population could have been the donor. However, no person should have been excluded because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Brown, Roy	NY	15.0	**Unvalidated Bite Mark Analysis.** A forensic odontologist testified that at least four bite marks on the victim's body were "entirely consistent" with Brown. The analyst also noted an "apparent inconsistency," but rather than exclude Brown, he called it an "explainable consistency" because the mark was on a curved thigh. In fact, the bite marks showed four incisor teeth, while Brown only had two. (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Bryson, David Johns	OK	16.0	**Unvalidated Hair Analysis.** An analyst said hairs from the crime scene matched Bryson. The analyst said hair has "unique characteristics" that make it possible to determine a match. (Bryson v. Gonzales decision, U.S. Court of Appeals for the 10th Circuit, July 28, 2008)
Buntin, Harold	IN	13.0	**Incorrect Serology.** An analyst testified that the victim and Buntin were both Type O, as was the fluid recovered from the victim. The analyst testified that 36% of the population is Type O. No person should have been excluded because the victim's blood group markers could have masked the perpetrator's. (Statement of Facts in the Trial Record)
Byrd, Kevin	TX	12.0	**Incorrect Serology.** Byrd is a non-secretor. No antigens were detected on a stain at the crime scene, so the analyst assumed that the victim was also a non-secretor, as well. The analyst testified that 15-20% of the population are non-secretors. In fact, no donor could be eliminated because no determination had been made about the victim's secretor status (so it's impossible to know whether her blood group markers masked the perpetrator's) and because the sample could have lacked antigens due to degradation. (Garrett/Neufeld, March 2009)
Charles, Clyde	LA	17.0	**Unvalidated Hair Analysis.** An analyst testified that hairs from the crime were "similar" to Charles'. (The analyst also testified that hair analysis is not "an exact science" and that it's possible to "find people whose hair is the same.") (Trial transcript, page 307)
Charles, Ulysses Rodriguez	MA	17.0	**Impropriety/Negligence/Misconduct.** Charles was a B secretor and the victims were O secretors; stains from the crime contained antigens consistent with the victims' O type. Two experts testified that rudimentary testing for the presence of sperm found none; since Charles was a B secretor the absence of sperm was highly relevant (it explained why no B substances were detected). When a private forensic lab tested the evidence years later, analysts detected sperm using a microscope, the same technology analysts used before Charles' trial. (Garrett/Neufeld, March 2009)
Cotton, Ronald	NC	10.5	**Other Unvalidated Science.** An analyst testified that material from Cotton's tennis shoes was consistent with rubber found at one of the crime scenes. (Alamance County Superior Court Order, November 5, 1984; Judge D.M. McLelland)
Cowans, Stephan	MA	5.5	**Incorrect Fingerprint Analysis.** An analyst testified that fingerprints at the crime scene matched Cowans. However, Cowans' fingerprints were actually compared to themselves and not to the fingerprint on the evidence. (Garrett/Neufeld, March 2009)
Criner, Roy	TX	10.0	**Incorrect Serology.** Criner was an O secretor, and the victim's blood group marking was not determined. An analyst testified that 44% of the population are O secretors and could have been the donor. H blood group substances were detected, which could have come from the victim if she were a secretor, so nobody could be excluded as the donor. (Garrett/Neufeld, March 2009)
Crotzer, Alan	FL	24.5	**Unvalidated Hair Analysis.** An analyst testified that hairs from the crime scene exhibited "the same microscopic characteristics" as Crotzer's hair. (Trial transcript, page 44) **Incorrect Serology.** The victim and Crotzer were both O secretors, PGM1, as were the swabs. An analyst testified that she could "only say it was either from a non-secretor or person of ABO Type O secretor PGM Type 1," which is made up of "38.4% of the total population." She then divided the 38.4% in half to testify that "approximately 19%" of males could have been the source. Dividing the statistic in half was erroneous, but moreover the analyst could not exclude anyone as the potential source, since the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Dillon, William	FL	26.0	**Other Unvalidated Science.** The state introduced testimony from a dog handler that connected Dillon to the crime scene. Authorities hired John Preston, a purported expert in handling scent-tracking dogs. Eight days after the crime, Preston and his dog, Harass II, conducted two tests which he said linked the T-shirt to the crime scene and Dillon to the T-shirt. In the second test, a "paper lineup" which allegedly linked Dillon to the T-shirt, Preston allowed his dog to sniff the T-shirt and then pieces of paper, including one Dillon had touched. Preston said the dog selected Dillon's paper. (Motion for Postconviction Relief to Vacate Judgment and Sentence, August 25, 2008)
Dominguez, Alejandro	IL	4.0	**Incorrect Serology.** The victim was a B secretor and Dominguez was an O secretor. Two of the tested stains had B and H antigens, which were consistent with the victim. However, the analyst testified that Dominguez could not be excluded and that O secretors comprise 36% of the population. In fact, nobody in the population could be excluded because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Dotson, Gary	IL	10.0	**Unvalidated Hair Analysis.** An analyst testified that a pubic hair removed from complainant's underwear was "similar" to that of defendant but "dissimilar to that of complainant." (Appellate Court of Illinois Ruling, November 12, 1997) **Incorrect Serology.** The victim and Dotson were both B secretors. B substances were found on the victim's underwear, and the analyst testified that that the donor was a B secretor. Those substances could have been entirely from the victim, so any male could have been the donor. Another stain had A antigens that were foreign to both Dotson and the victim, but the analyst failed to exclude Dotson as the source -- telling the court it could be a mixture of blood and sweat, wood, leather, detergents or other substances. (Garrett/Neufeld, March 2009)
Durham, Timothy	OK	3.5	**Incorrect Hair Analysis.** An analyst testified that hair from the crime and Durham's hair shared supposedly rare characteristics: the hair curled, something that the analyst said he had never seen in Caucasoid hair. The analyst also assigned a percentage to a reddish hue observed on the sample, testifying, "I have seen it in less than 5% of the hairs that I examined. These particular hairs were especially light. I have not found any pubic hairs as light as these before." (Garrett/Neufeld, March 2009)
Erby, Lonnie	MO	17.0	**Incorrect Serology.** The victim and Erby were both O secretors, but the analyst testified that the perpetrator had to be an O secretor or a non-secretor. In fact, no donor could be excluded because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Fain, Charles Irvin	ID	17.5	**Incorrect Hair Analysis.** An analyst testified that Fain's hair and hairs from the crime shared unique characteristics. The analyst said the hairs had bifurcated medulla, which the analyst said gave "the sample uniqueness," explaining that "it's not often seen in hair samples . . . it's not a characteristic that is very common, so that's -- that's the reason why I remember this particular characteristic." (The analyst also noted that hair comparison is subjective.) (Garrett/Neufeld, March 2009) **Other Unvalidated Science.** An analyst connected footprints found at the crime scene to shoes belonging to Fain, saying, "I found, therefore, that the shoe which made this impression, and this left shoe had sustained wear in the same area. To a -- a shoe print examiner, this would indicate that the individual who walked with these shoes has the same walking gait." (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Fritz, Dennis	OK	11.0	**Incorrect Serology.** An analyst did not detect blood group substances in fluids from the crime. The analyst testified that this meant the perpetrator was a nonsecretor. In fact, if the victim was a non-secretor nobody could be excluded because her blood group markers could mask the perpetrator's, or the lack of blood group substances could have been the result of degradation. (Garrett/Neufeld, March 2009) **Incorrect Hair Analysis.** An analyst testified that 11 pubic hairs and two head hairs from the crime were "consistent" with Fritz's hairs. The analyst told the court that "generally three main results can be considered, but there's actually five or more ways of reporting hair examinations. One is that hairs are consistent microscopically and could have the same source. This means that they match if you want it in one word." The analyst went on to testify that there was an increased significance to finding that both pubic hairs and head hairs matched. (Garrett/Neufeld, March 2009)
Fuller, Larry	TX	19.5	**Incorrect Serology.** The victim was an O non-secretor and Fuller was an AB non-secretor; the rape kit sample was O. The analyst testified that the source could have been a non-secretor, and that Fuller and 20% of the population were possible donors. In fact, both Fuller and the victim should have been excluded since neither of them secretes blood groups. (Garrett/Neufeld, March 2009)
Good, Donald Wayne	TX	13.5	**Incorrect Serology.** Good was an O secretor; a stain on a blanket was Type O, while a swab was A and H blood groups. About the swab, the analyst testified that it was impossible to put a percentage on the potential donor population because the fluid could be a mixture of vaginal secretions and seminal fluids. While the analyst was correct about the potential for masking, the percentage for the possible donor population would be 100%. About the blanket, which could have also been a mixture, the analyst said Good could have been the source, along with "one-third of the Caucasian male population." (Garrett/Neufeld, March 2009)
Gray, Paula	IL	9.0	**Incorrect Serology.** An analyst testified that the tested sample "contained Group A blood and also had distinct characteristic of showing up slight agglutination in the O well, which would indicate person had H substance found in his blood." (Garrett/Neufeld, March 2009)
Green, Anthony Michael	OH	13.0	**Incorrect Hair Analysis.** An analyst testified that the hair characteristics "eliminated a large percentage of the population." (Garrett/Neufeld, March 2009) **Incorrect Serology.** The victim and Green were both B secretors, and the stain showed both B and H antigens. The analyst testified that B secretors were 16% of the population; the analyst conclusively ruled out 84% of the population as the source. The testimony failed to account for the possibility that the victim's blood group markers could mask the perpetrator's. (Garrett/Neufeld, March 2009)
Gregory, William	KY	7.0	**Incorrect Hair Analysis.** An analyst testified that hairs from the crime scene "more than likely" came from Gregory. She said the hairs had unique characteristics, including ovoid bodies, and said, "I told you, there is no statistics on this. I can tell you this is the first time I have ever had a Negroid origin hair that has not had a medulla in it." When asked what percentage of people have ovoid bodies in them, analyst testified, "This is probably the first time I have ever seen an ovoid body in a human hair. I have seen them in cattle hair before." Testifying about how common similarities in hair are, the analyst said that siblings might share "very similar characteristics" in their hair but that "in general, you wouldn't see that kind of an overlap in two people you would just pick up off the street." The analyst failed to testify that she had determined that at least one additional hair was not consistent with Gregory's. (Garrett/Neufeld, March 2009)
Halstead, Dennis	NY	16.0	**Unvalidated Hair Analysis.** An analyst testified that hairs found in a co-defendant's van were "microscopically alike" to samples from the victim. (The analyst acknowledged that he could not say the hairs were "identical" and that he "wish[ed]" hair analysis was "a bit more exact.") (Trial transcript, page 1,213)
Harris, William	WV	7.0	**Incorrect Serology.** An analyst testified that the victim could not be the source of the material tested, even though both the victim and Harris were O secretors, PGM1+, as were the swabs. Rather than saying that 100% of the population could be the source (because the victim's blood group markers could have masked the perpetrator's), the analyst said that 11.8% of the population could have been the source, then erroneously divided that statistic in half for the male population. (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Harrison, Clarence	GA	17.5	**Incorrect Serology.** Harrison is an O secretor and the victim was an A secretor; the swabs had A and O antigens. The analyst concluded that the only group that could be excluded were B secretors and AB secretors, which would eliminate 22% of the population, and that Harrison was not within that 22%. In fact, nobody could be excluded because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Hatchett, Nathaniel	MI	10.0	**Unvalidated Hair Analysis.** An analyst testified that a pubic hair found on the passenger-side floor of the victim's car was "similar" to Hatchett's hair sample. (Michigan Court of Appeals Ruling, May 19, 2000)
Heins, Chad	FL		**Incorrect DNA Analysis.** An analyst gave faulty testimony by failing to provide relevant statistics for the population included by DQ Alpha type DNA testing. (Garrett/Neufeld, March 2009)
Hicks, Anthony	WI	5.0	**Unvalidated Hair Analysis.** An analyst testified that tested hairs were "consistent" and "similar" with Hicks. (The analyst also said microscopic hair analysis cannot specifically match individuals, like fingerprints.) (Trial transcript, page 454)
Holland, Dana	IL	8.0	**Incorrect DNA Analysis.** An analyst testified that the evidence sample taken from the crime scene was too small for DNA testing. An independent DNA expert explicitly refutes the analyst's claim, saying that at the time of the trial, with technology available at the time, DNA testing could have been conducted. (Report from Orchid Cellmark analyst Kristen Koch, September 23, 2002)
Honaker, Edward	VA	9.5	**Incorrect Hair Analysis.** An analyst testified that the tested hair was "consistent" with Honaker and concluded that it came from Honaker or someone of the same race, coloring and microscopic makeup: "It is unlikely that the hair would match anyone other than the defendant; but it is possible." (Garrett/Neufeld, March 2009)
Jackson, Willie	LA	17.0	**Unvalidated Bite Mark Analysis.** An analyst testified, "My conclusion is that Mr. Jackson is the person who bit this lady." (Garrett/Neufeld, March 2009)
Jimerson, Verneal	IL	10.5	**Incorrect Serology.** The victim and Jimerson were both Type O, and the slain had A and O antigens -- yet the analyst failed to exclude Jimerson. (Garrett/Neufeld, March 2009)
Johnson, Calvin	GA	15.5	**Incorrect Serology.** The victim was an A secretor and Johnson was an O secretor; the swabs had A and H. The analyst testified that the potential donor group was the 44% of the population who are O secretors, plus 20% who are non-secretors, plus A secretors (for which the analyst did not give a statistic), leaving out the B and AB secretors. In fact, 100% of the population could have been the donor because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Jones, Ronald	IL	10.0	**Incorrect Serology.** Jones was an O non-secretor and the victim was an A secretor; the swabs had A antigens. The analyst testified that the percentage of the population who could be the donor was the number of non-secretors added to A secretors. In fact, no donor could be excluded because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Kogut, John	NY	17.0	**Incorrect Hair Analysis.** The analyst testified, "I'm saying that in this particular instance that the questioned hair could have originated from the scalp of Theresa Fusco, with a high degree of probability." (Garrett/Neufeld, March 2009)
Kordonowy, Paul	MT	U	**Incorrect Serology.** Kordonowy and the victim were both O secretors, but A secretions were found on the swabs. The analyst should have excluded Kordonowy but instead testified that sugars produced by bacteria could have caused the A substance reading. (Garrett/Neufeld, March 2009) **Incorrect Hair Analysis.** An analyst testified that hairs from the crime "match" Kordonowy, and that for each there is a 1 in 100 probability of a match, claiming that hairs from different parts of the body are "independent events." The analyst multiplied that figure to arrive at a 1 in 10,000 probability of a match. (Garrett/Neufeld, March 2009)
Krone, Ray	AZ	10.0	**Unvalidated Bite Mark Analysis.** An analyst testified that he was "certain" that Krone's teeth caused bites on the victim, and that it was "a very good match." He went on to say that bite mark comparison "has all the veracity, all the strength that a fingerprint would have." The prosecution also failed to disclose that an FBI expert had examined the bite marks and said they weren't from Krone. (Garrett/Neufeld, March 2009)
Laughman, Barry	PA	16.0	**Incorrect Serology.** The victim was an A secretor and Laughman was a B secretor. No B substances were detected in the evidence, but the analyst said bacteria could have "worked on these antigens" or they could have broken down. The analyst also testified that medications could have interfered with the antigens. The analyst then claimed that bacteria could actually convert one blood group substance to another: "Given sufficient time for those bacteria to act, it would be possible to convert a group A substance to a B, or a B substance to an A." (Garrett/Neufeld, March 2009)
Lavernia, Carlos	TX	15.0	**Incorrect Serology.** The victim was an O secretor and Lavernia was an O non-secretor. The analyst said, "The semen donor was either a blood group O secretor or a non-secretor" and that "O secretor is found in 33% of the population, so that's a third of the people, of males." The analyst did not say that 100% of the population could be the donor because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Linscott, Steven	IL	3.0	**Unvalidated Hair Analysis.** An analyst testified that hairs from the crime were "consistent" with Linscott's and "similar" to Linscott's. (Trial transcript, pages 131 and 137)
Lowery, Eddie	KS	9.5	**Incorrect Serology.** An analyst found Type A substances in the sample but claimed that the semen originated from an O secretor. The analyst determined that Lowery was an O secretor, and the victim was determined to be an A secretor. From an expert independent forensic expert's report on the case: "It is unclear how the analyst determined that the semen from the victim's vaginal swabs originated from O secretor when she found A blood group substance in this sample." (Forensic Science Associates report, 2002)

Name of Defendant	State	Years Served	Details/Notes
Ochoa, James	CA	1.0	**Other Unvalidated Science.** A police bloodhound linked Ochoa to the crime. The dog had followed a scent for an hour from the perpetrator's hat to Ochoa's front door. (Los Angeles Times, April 24, 2008)
O'Donnell, James	NY	2.0	**Unvalidated Bite Mark Analysis.** An analyst testified that O'Donnell's teeth were "consistent" with bite marks found on the victim. (Trial transcript, page 371)
Ollins, Calvin	IL	13.5	**Incorrect Serology.** An analyst never explained a lab report's finding of a PGM type foreign to the victim. Instead, the analyst testified that 37% of the population shared Ollins' type, never saying that Ollins was not a secretor and could not have been the donor. Further, the type that the analyst attributed to Ollins could have come from the victim. In a report on the case years later, an expert DNA analyst said the analyst at trial "failed to state that her findings eliminated Larry and Calvin Ollins, Sa[u]nders and Bradford unless there was another semen source who was an ABO Type O secretor." (Dr. Edward Blake, Review of the Testimony of Pamela Fish, January 9, 2001. Garrett/Neufeld, March 2009)
Ollins, Larry	IL	13.5	**Incorrect Serology.** See Calvin Ollins, (above).
Pendleton, Marlon	IL	U	**Incorrect DNA Analysis.** An analyst testified that the DNA sample taken from the crime scene was too small for testing at the time of trial, but analysis by a forensic expert chosen by the defense and prosecution to handle post-conviction DNA testing said the sample was large enough to test at the time of the trial, using the technology then available. (Center on Wrongful Convictions. Brian Wraxall, chief forensic serologist at Serological Research Institute as quoted in Chicago Tribune November 23, 2006, and November 24, 2006)
Peterson, Larry	NJ	16.5	**Incorrect Hair Analysis.** At trial, the prosecutor asked the analyst whether s/he was saying that "every hair that was known as a questioned hair has been identified as either belonging to the victim or as belonging to Mr. Peterson?" The analyst responded, "Yes." (Garrett/Neufeld, March 2009) **Impropriety/Negligence/Misconduct.** No serology was conducted because the analyst detected no semen in the rape kit. Later testing readily observed sperm in the rape kit and elsewhere. (Garrett/Neufeld, March 2009)
Pierce, Jeffrey	OK	14.5	**Incorrect Hair Analysis.** An analyst testified that hair had a unique "banding effect," which the analyst interpreted to mean that part of the perpetrator's hair was exposed to the sun and part wasn't (since some was blonde and some was brunette), which supported the prosecution theory because Pierce regularly wore a bandana. (Garrett/Neufeld, March 2009) **Incorrect Serology.** Pierce was an AB secretor and the victim was an O secretor. H substances were detected in the sample. The analyst testified that the semen donor was a Type O or a non-secretor, which failed to recognize the potential that the victim's blood group markers masked the perpetrator's. (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Pope, David Shawn	TX	15.0	**Other Unvalidated Science.** When testifying about a voice on an answering machine and Pope's voice, an analyst was asked, "The bottom line analysis on the known voice and the unknown voice in this situation were only made by one single person in the whole wide world?" and the analyst replied, "Exactly." The analyst was then asked, "Just like fingerprints, it is unique?" and the analyst said, "Exactly." (Garrett/Neufeld, March 2009)
Rainge, Willie	IL	17.5	**Incorrect Serology and Hair Analysis.** See Kenneth Adams (above). Adams, Rainge and Dennis Williams were tried together and the hair and serology testimony linked all three to the crime.
Restivo, John	NY	16.0	**Unvalidated Hair Analysis.** See Dennis Halstead, above. Restivo and Halstead were tried together and the hair testimony linked both to the crime.
Reynolds, Donald	IL	9.5	**Incorrect Serology.** The victim was an A secretor and Reynolds was an O secretor. An analyst testified that swabs from the crime showed both A and H activity, which the analyst said is indicative of Type A and O individuals. The analyst testified that Reynolds could not be excluded (while also saying 43% of the population has that type). The substances were entirely consistent with the victim, and the analyst ignored the potential that the victim's blood group markers masked the perpetrator's. (Garrett/Neufeld, March 2009)
Richardson, James	WV	9.0	**Incorrect Serology.** Substances detected on the evidence were consistent with the victim, but the analyst ignored the potential that the victim's blood group markers masked the defendant's. The analyst also improperly divided the statistic for the population of possible donors in half to eliminate females. (Garrett/Neufeld, March 2009)
Richardson, Kevin	NY	5.5	**Incorrect Hair Analysis.** An analyst compared hairs found at the crime scene to Richardson's hair; asked whether it was possible that the hairs came not from Richardson but from another, unknown person, the analyst said it was possible "in a sense" but unlikely. The analyst testified that, based on experience examining hair standards, finding similarities between hairs has greater probative value: "I've looked at thousands of hair standards over the course of my work and I haven't seen any that have the same range of physical characteristics yet … But I have in fact looked at thousands of standards and haven't seen two that matched exactly." (Garrett/Neufeld, March 2009)
Robinson, Anthony	TX	10.0	**Incorrect Serology.** Both the victim and Robinson were A secretors. An analyst testified that "the sub type found in the semen was the same as the sub type found in the blood of the victim and the suspect" and said that 40% of the population is Type A. In fact, 100% of the population could have been the donor, since the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Rodriguez, George	TX	17.0	**Incorrect Serology.** Both the victim and Rodriguez were O non-secretors, while another suspect was an O secretor. The stains were Type A. The analyst testified that Rodriguez could not be excluded but the other suspect could "because he is a secretor and the grouping would be O," adding that "none of those O secretions did show up by the testing." The A substances on the stain were foreign to the victim and to Rodriguez, so he should have been excluded. Later analysis by an independent lab found that the other suspect was actually an O non-secretor. (Garrett/Neufeld, March 2009)
Rollins, Lafonso	IL	10.0	**Impropriety/Negligence/Misconduct.** Serological testing excluded Rollins, but the stipulation about the testing reported only that sperm had been detected. The analyst requested DNA testing, but forensic supervisors refused to allow DNA testing to be conducted. (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
Rose, Peter	CA	8.0	**Incorrect Serology.** The victim was an O secretor PGM1+, and Rose was an A secretor PGM1+; the stain was PGM1+, ABO type inconclusive. The analyst testified that Rose could not be excluded and said that "about 30% of the population" possesses PGM1+, failing to state that 100% of the population could have been the donor because the PGM1+ could have come entirely from the victim. (Garrett/Neufeld, March 2009)
Salaam, Yusef	NY	5.5	**Unvalidated Hair Analysis.** See Antron McCray (above).
Santana, Raymond	NY	5.0	**Unvalidated Hair Analysis.** See Antron McCray (above).
Saunders, Omar	IL	13.5	**Incorrect Serology.** See Calvin Ollins (above).
Scott, Calvin Lee	OK	20.0	**Incorrect Hair Analysis.** In testimony, an analyst was asked whether there have been studies conducted about the probabilities of hair similarity. The analyst cited one study but noted the lack of research. About the one study, the analyst was asked: "Would he have given, or would there be any number type odds to the probability of the hair found on [the victim's] bottom sheet and the unknown hair found in her pubic combings, both belonging to anyone other than the defendant?" The analyst responded: "His hair, I would say this: his studies were made on Caucasian hair, I believe. In this case having two hairs identified, two hairs of different kind, I mean, head hair from one person would be quite large, I would say, I would not give a figure. It would be quite large." (Garrett/Neufeld, March 2009)
Sutton, Josiah	TX	4.5	**Incorrect DNA Analysis.** An analyst testified that "no other two persons will have the same DNA except in the case of – identical twins" without giving a random match probability. Also, evidentiary samples were mixed and findings on one test in combination with a second actually excluded Sutton as a contributor. (Garrett/Neufeld, March 2009)
Taylor, Ronald Gene	TX	12.0	**Impropriety/Negligence/Misconduct.** In initial tests, the analyst failed to detect semen on a bed sheet from the crime, so no testing could be done to include or exclude Taylor as a possible donor. Those tests for the presence of semen were either not conducted or conducted incorrectly, because DNA testing that exonerated Taylor was done on the same spot on the sheet the analyst claimed to test for the presence of semen. Prior to conducting DNA testing on the spot, the private forensics lab conducted acid phosphatase testing (to determine the presence of semen -- the same kind of testing the lab analyst claimed to conduct pretrial) and the testing showed a positive result for the presence of semen. Subsequent DNA testing on that spot exonerated Taylor. (Trial transcript, page 295; Post Conviction Writ, Presiding Judge Denise Collins, October 9, 2007; Memorandum of Law in Support of Application for a Writ of Habeas Corpus, page 3, page 14, October 2007)
Tillman, James C.	CT	16.5	**Incorrect Serology.** An analyst testified that it was impossible that a stain or part of a stain could be from a secretor and not include the relevant antigens. The testimony ignored the possibility that a finding of no antigens could be the result of degradation. Later, DNA testing on the stain on the dress matched a stain on the pantyhose, highlighting how the failure to see antigens on the pantyhose stain was the result of the quality or quantity of the stain on the pantyhose. (Garrett/Neufeld, March 2009)
Vasquez, David	VA	4.0	**Unvalidated Hair Analysis.** An analyst testified that hair from the crime was "consistent" with hair samples taken from Vasquez. ("Convicted by Juries, Exonerated by Science," U.S. Department of Justice, National Institute of Justice, June 1996, page 73)

Name of Defendant	State	Years Served	Details/Notes
Velasquez, Eduardo	MA	12.5	**Unvalidated Hair Analysis.** The analyst testified that two pubic hairs (one from the victim's slip and one that was with some of the victim's hairs that also contained the perpetrator's semen) were "within the [same] range" as the defendant's and "consistent" with the defendant's hair. (The analyst also testified that hair analysis cannot "be taken as positive identity.") (Trial transcript, page 125, 131)
Waller, James	TX	10.0	**Incorrect Hair Analysis.** An analyst testified that hairs from the crime did not match Waller's hair, but also said it's impossible to make an exclusion: "If you wanted to say that this hair did not come from this individual, you would have to check it against every hair to be positive that it did not come from that individual ... [one would] practically have to denude a person to make a proper comparison." (Garrett/Neufeld, March 2009)
Wardell, Billy	IL	9.5	**Incorrect Serology.** The victim was an A secretor, Wardell was a B secretor, and his co-defendant (Reynolds, above) was an O secretor. The analyst testified that A and H activity was detected in the sample, "which is indicative of a Type A individual and a Type O individual." The analyst agreed that more than 43% of the population have those types, but the analyst failed to state that the findings were entirely consistent with the victim and that the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Washington, Calvin	TX	13.0	**Unvalidated Bite Mark Analysis.** An analyst testified that a bite mark found on the victim was "consistent" with Washington's co-defendant. While the analyst excluded Washington as the source of the bite mark, his bite mark testimony about the co-defendant (which was given at Washington's trial) tied Washington to the crime. (Trial transcript, page 1,270)
Washington, Earl	VA	17.0	**Impropriety/Negligence/Misconduct.** An analyst detected Tf CD (an unusual plasma protein) during serology testing on crime scene evidence. Once Washington, who does not possess Tf CD, became a suspect, an amended forensic report was prepared (without additional testing being conducted) that said the Tf typing on the crime scene evidence was "inconclusive." (Garrett/Neufeld, March 2009)
Watkins, Jerry	IN	13.5	**Incorrect Serology.** The victim was an A secretor, Watkins was an O secretor, and the swabs from the victim showed **A** and B substances. Rather than exclude Watkins, however, the analyst speculated that bacteria may have caused the inconsistent finding: "You are dealing with a dead body in which you have decomposition and sometimes bacteria will acquire a B blood group substance activity which could possibly be causing it." (Garrett/Neufeld, March 2009)
Webb, Thomas	OK	13.0	**Unvalidated Hair Analysis.** An analyst testified that two scalp hairs and a pubic hair recovered from the victim's home were "consistent" with samples taken from Webb. (Oklahoma Court of Criminal Appeals decision, November 20, 1987)
Webb, Troy	VA	7.5	**Incorrect Serology.** Webb was a non-secretor and swabs from the victim were an A Type that could not have come from the victim. Webb should have been excluded, but the analyst instead testified that he was among the 20% of the population who are non-secretors. The analyst testified, "It's a possibility because I stated you have to have two or more seminal fluids present in that mixture. If that is indeed true, then yes. There's one possibility a non-secretor can be present. Definitely an A secretor is present because we found A which is foreign to the victim." (Garrett/Neufeld, March 2009)
Webster, Bernard	MD	20.0	**Incorrect Serology.** The victim was Type B (secretor status unknown) and Webster was A. The tested stain had A and B substances, so the perpetrator could have been an A or AB secretor. However, an analyst testified that the perpetrator "should have been a Type **A**." (Garrett/Neufeld, March 2009)

Name of Defendant	State	Years Served	Details/Notes
White, John Jerome	GA	U	**Incorrect Hair Analysis.** An analyst testified that hair from the crime and White's hair "shows sufficient similarity to say or conclude that the hairs were of the same origin." (Garrett/Neufeld, March 2009)
Whitley, Drew	PA	16.5	**Incorrect Hair Analysis.** An analyst acknowledged that the hairs were unsuitable for comparison, but went on to compare them and deem them consistent: "Because they were so small, they had very little in characteristics. Except for the two that had no roots, all of them had no tips on them, so they had very limited characteristics, what characteristics were there ... In examining these questioned hairs and the facial hairs of Drew Whitley, I concluded there were many, many overlapping characteristics and similarities." The analyst also said: "I found no inconsistencies. Based on what I am basing my comparing on, yes, they are consistent." And later said: "I wouldn't go that far to say they were microscopically consistent." (Garrett/Neufeld, March 2009)
Williams, Dennis	IL	17.5	**Incorrect Serology and Hair Analysis.** See Kenneth Adams (above). Adams, William Rainge and Williams were tried together and the hair and serology testimony linked all three to the crime. In addition, an analyst testified that Williams was an A secretor; in fact, he was an A non-secretor. (Garrett/Neufeld, March 2009)
Williams, Willie "Pete"	GA	21.5	**Incorrect Serology.** The victim was an O secretor and O group substances were found; Williams was a non-secretor. The analyst testified that 44% of the population could be excluded and that O secretors and all non-secretors (but not A or B secretors) could be the donor. In fact, none could be excluded because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)
Williamson, Ron	OK	11.0	**Incorrect Serology.** The victim was Type A (and was not tested for secretor status) and Williamson was an O non-secretor. There was no antigen activity in the stains, but rather than attribute this to degradation, the analyst testified this meant the perpetrator could be a non-secretor. (Garrett/Neufeld, March 2009) **Unvalidated Hair Analysis.** An analyst testified that pubic hair and scalp hair from the crime scene were "consistent microscopically" with Williamson's. (The analyst also testified that "hairs are not absolute identification.") (Trial transcript, page 733, 766)
Willis, John	IL	7.0	**Impropriety/Negligence/Misconduct.** An analyst testified that serology testing was inconclusive when it in fact excluded Willis. (Center on Wrongful Convictions; Chicago Tribune, October 20, 2004, based on lab notes and records the newspaper filed a lawsuit to obtain)
Wise, Kharey	NY	11.5	**Incorrect Hair Analysis.** See Kevin Richardson, above. (Richardson and Wise were tried together; the analyst's testimony about Richardson's hair also linked Wise to the crime.)
Woodall, Glen	WV	4.5	**Incorrect Serology.** Woodall was a B secretor, GLO I Type 2-1and both victims were also GLO I Type 2-1. The perpetrator could have had one of several GLO types, but the analyst testified that just 6 out of 10,000 people have the same blood groupings as Woodall, "based specifically just on the male population of Cabell County." (Garrett/Neufeld, March 2009) **Incorrect Hair Analysis.** Comparing hairs from the crime to Woodall's hair, an analyst testified that "it would be very highly unlikely that due to no dissimilarities identifiable and distinguishable, that the hair could have originated from anyone else." (Garrett/Neufeld, March 2009)
Woods, Anthony D.	MO	18.0	**Incorrect Serology.** The victim was an A secretor and the stains all had A blood group substances. However, the analyst excluded AB and B people, which is 11% of the black population. In fact, nobody could be excluded because the victim's blood group markers could have masked the perpetrator's. (Garrett/Neufeld, March 2009)

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Mr. SCOTT. Thank you very much. We will now recognize ourselves observing the 5-minute rule. And I will begin by recognizing the gentleman from New York who has been relentless in his advocacy for getting overdue and rape kits tested in New York. I mean,

we have an embarrassing backlog, and he has just been relentless trying to get funding for that particular science.

I will recognize the gentleman from New York, Mr. Weiner.

Mr. WEINER. Thank you, Mr. Chairman, and I appreciate your continuing this conversation going.

Peter, let me pick up on what you just finished with. The difference between a pharmaceutical drug or a process is that no one has to go into a court of law ask a judge, do you think this—I am a kosher expert, do you think that this is—you know, no one is going to stand there and present that evidence without having someone on the other side.

It strikes me that the report identified some problems with collection, some problems with the standards for testing, and now you are talking about problems with how you interpret any information that is presented before a jury.

Now, in the tragic case of your client—and I welcome him here today—wasn't this just a case though that you had a jury was too willing and a judge that were too willing to let into evidence as proof of a hypothesis stuff that was really just stuff that you—wasn't really up to standard, that even if we solved the other problems of standards, that you are still going to have someone saying, aha, I found a jean print in dust, and going to a jury and said here is the picture, and I think that this is the jean of whatever.

So why don't you take a stab at that.

Mr. NEUFELD. Okay. First of all, you are not going to have that problem for two reasons: one is, it is one thing for someone to say that this jean print is consistent with or matches whatever, I don't even have a problem with that. The problem is that the jury has to be told is it a rare jean or a common blue jean, okay?

If the jury doesn't know that, they don't know how to interpret the evidence. When an expert very often says that something is consistent with or similar, there is a whole series of psychological studies which prove that jurists take that to mean it is his, it is a match, it is unique, it is individualized.

The problem is that that hypothesis—you don't know what it is. Is it one in 10 or one in 1,000? That has to be proved scientifically. That is what the NAS report says. Before the evidence comes into court.

The other difference that you mentioned between pharmaceuticals and the FDA and NIH and the criminal justice system is a suggestion that there is a judge who is a gatekeeper. And, yes, there are several judges who are good gatekeepers, and there are even a few lawyers who know when to challenge something, be they prosecutors or defense attorneys, but I did a peer-reviewed published study showing the way that Daubert was administered over the first 12 years of existence.

And in the civil context, it was administered very rigorously. In the criminal context, it wasn't administered at all to speak of. So 90 percent of the time, the evidence would be kept out in a civil case and only 2 or 3 percent of the time would it be kept out in a criminal case. There was no either meaningful challenge. There was no meaningful cross examination. Most the judges, frankly, were interested in other kinds of legal issues as opposed to scientific issues.

After all, they didn't go to medical school, they went to law school and then went onto become judges, and I mean that in all fairness, sir, that is just a natural tendency. But the data speaks for itself. There haven't been any kind of meaningful scrutiny, and that is why the NAS said in its report that it is too late if you wait until it gets to court.

Mr. WEINER. Right.

Mr. NEUFELD. The idea is to try and fix a lot of this upstream before it gets to court. The judges can still be gatekeepers, but at least they will have much more guidance.

Mr. WEINER. I appreciate that. Can I change subjects and ask the rest of the panel this question? You know, it is true that we have made strides on dealing with the backlog, although there are problems that have emerged.

But in the testimony that I heard here today that now we have got other types of problems that are building up. Are we reaching a place though that the process of taking collected DNA evidence, presenting it into a form that attorneys like Mr. Neufeld can use it—are we reaching a place where through advance of technology or economies of size that that is getting more foolproof.

It is getting easier now to take data and to take this information is it more likely that you are going to be able to reduce the costs, make it simpler to process the evidence, and then our problem moves elsewhere in the system. I mean, is it getting more foolproof, kind of like developing film a hundred years ago turned into a Fotomat 50 years ago, turned into a digital one-click camera today.

Are we reaching that point with DNA evidence collection?

Mr. MARONE. I would have to say that is simply putting it, yes. But the bottom line is that a lot of the methods now are lending themselves quite more easily to automation and when you get into automation, obviously, you get an efficiency of scale, one.

Two, it is less chances for manipulation errors with individuals, because you are working on a math scale, an automated scale with robotics, you can use smaller samples. So I would say yes to all those, but the caveat with that is, when you start looking at smaller and smaller samples and higher and higher sensitivity, you then have to worry about the consequences of unintended DNA that you are picking up——

Mr. WEINER. Contamination.

Mr. MARONE. I hesitate to use contamination, because it may or may not be a contamination issue. For example, if you are looking at door lobs, you are now looking at everyone who touched a doorknob. Those kinds of issues.

So, yes, we are getting better along those lines, but one must still have that caution to realize what it is that you are looking at.

Mr. WEINER. Thank you.

Thank you, Mr. Chairman.

Mr. SCOTT. The gentleman's time has expired. Thank you.

The gentleman from Texas, Judge Gohmert.

Mr. GOHMERT. Thank you, Mr. Chairman. Obviously, for Mr. Barnes to serve any time improperly is particularly egregious. I am curious, when did that case go to trial?

Mr. NEUFELD. It went to trial 4 years after the incident, in 1989.

Mr. GOHMERT. 1989, okay. So that was before DNA evidence really came to the forefront.

Mr. NEUFELD. It was before they had DNA testing. The problem, sir, from our perspective, and I think everybody on the panel would agree, is that DNA, which obviously has revolutionized the criminal justice system in a lot of ways, is unavailable as the truth test, if you will, in many cases.

Mr. GOHMERT. Right.

Mr. NEUFELD. So crime——

Mr. GOHMERT. It wasn't in that case, though.

Mr. NEUFELD. Right.

Mr. GOHMERT. In the current day, it wouldn't not even be an issue, and as far as the dust left behind an impression of blue jeans. I mean, if I am the gatekeeper on that case, somebody testifies to that, that tells me maybe we are looking for someone wearing blue jeans or we are looking for a 2-year-old wearing denim Osh Kosh overalls, you know.

That is nothing. That evidence I am surprised that anybody would let that in. That is just way too vague as to be supported scientifically. I just can't imagine that coming in. The soil under a truck? They don't do an analysis and say it is exactly the soil or, I mean, those kind of things are kind of hard to believe that any kind of adequate gatekeeper would allow that stuff in.

Obviously, a judge did, an appellate court didn't see through it, and so Mr. Barnes served unnecessarily, but I am curious and liked to get the panel's consensus here. You know, the study talks about pattern-based disciplines. Do any of you believe that fingerprints have inadequate scientific validation? I would like to know is there anybody that believes that pattern-based fingerprints have inadequate scientific validation?

Mr. NEUFELD. In all fairness, sir, I don't think necessarily that the four of us are the best qualified people to answer that question. I think what the National Academy of Science report said is that that is a scientific question, and——

Mr. GOHMERT. Okay, so your opinion is it is not appropriate for you to have an opinion, but I would like your opinions anyway.

Mr. Hicks?

Mr. HICKS. Now it is on.

Mr. GOHMERT. Yes.

Mr. HICKS. Okay. I do believe that fingerprint technology has an enormous amount of data behind it. I mean, we have established automated systems that are in use in every police department in the country. They are connected nationally. They are used internationally. They have been shown to be highly effective in distinguishing people.

I think what may be lacking is having put some of that the information and experience there into a form and this sort of meets what is being defined now as these rigorous scientific studies. I think there may be some validation-type studies that may be performed and published that would help to support—may provide new information about the limits or extent of fingerprinting, but my personal opinion is that there is——

Mr. GOHMERT. Adequate validation.

Yes, Mr. Marone?

Mr. MARONE. Two things, actually. Let me, let me quote from the report itself. This is in chapter five, the chapter that dealt with the scientific disciplines. Historically, fiction ridge analysis has served as a valuable tool both to identify the guilty and exclude the innocent.

Because of the amount of detail available in friction ridges, it seems plausible that a careful comparison of two impressions can accurately discern whether or not they had a common source. Although there is limited information about the accuracy and reliability of friction ridge analysis, claims that these analyses have zero error rates are not scientifically plausible, and I think that is the crux of the matter.

Where DNA, because of its nature, has very discrete alleles, each one of those low—the alleles in each—have a particular probability that they show up in the population, and that lends itself very well to coming up with a nice number, a possibility of occurrence.

With fingerprinting, there are a number of ridge details. What hasn't occurred here is someone mapping those details and give a statistically supportable conclusion as to if I have X number of points of comparison, how strong is that?

Mr. GOHMERT. Right.

Mr. MARONE. And that is what, I think, is lacking there is not that you can't do it.

Mr. GOHMERT. Well, I don't know that it is lacking. I used to hear that testimony.

Mr. MARONE. Right. You can't put a level——

Mr. GOHMERT. I used to hear that testimony. Some say seven points was enough, and we didn't allow less than 10 points, and you had to be positive about those 10 points, and then we heard about the statistical analysis of what that did when you went from seven to 10 points.

Mr. MARONE. Sure, and then two compound that issue, because again, where DNA has those alleles, think about circumstances where you don't have 13 losa, you don't have 26 alleles, the numbers reduce significantly.

Mr. GOHMERT. Right.

Mr. MARONE. If you have three or four or five, you can't even search it unless you have 10. But fingerprinting, it is not like it is a nice clean print, may be smudged, may be smeared so all those other environmental aspects of it——

Mr. GOHMERT. They didn't have enough points, they didn't come in.

Mr. MARONE. Exactly. But, I mean, that is——

Mr. GOHMERT. The jury never heard it.

Mr. MARONE. That is where the argument is.

Mr. GOHMERT. Yes. But if there were enough points, you don't have a problem with that being scientifically validated?

Mr. MARONE. I think after——

Mr. GOHMERT. As long as the jury understood——

Mr. MARONE. After all these studies are done, I have no doubt that the underlying science will be found to be valid. The application of it by an individual might be a different issue.

Mr. GOHMERT. My time has expired, but if I could hear from Mr. Melson.

Mr. MELSON. Well, I think the science is applicable and probative for court when it is properly applied by a qualified individual. The problem is you can make a generalized statement, because you may have a very clear latent print to compare with the rolled print, then it is easy, probably nobody would object to that.

But once you get to the smaller smudges, the partial latent prints, then it becomes much more difficult to make a comparison. Doesn't mean it can't be done, but that is where the research needs to be done. So all of these areas, even though there may be questions about them, and even though courts allow them into evidence, more research should be done on all the areas.

Mr. GOHMERT. When you say courts allow them into evidence, what are——

Mr. MELSON. Courts are allowing this type of pattern evidence into evidence every day.

Mr. GOHMERT. With how many points?

Mr. MELSON. Well, it depends on the circumstance. The admission of the evidence is so case-specific. You have got to make sure that your expert is qualified.

Mr. GOHMERT. Sure.

Mr. MELSON. You have to have confidence in his ability to do the examination. You find that out through direct and cross examination. And if you believe that based upon what he did, whether he is from an accredited laboratory, whether he is certified, all of the other evidence that you take in holistically, you have to make a judgment call as to whether that is probative in this particular case for the issue at hand.

Mr. NEUFELD. Congressman Gohmert, if I just may, because I didn't take advantage of it before?

Mr. GOHMERT. Do I have unanimous consent?

Mr. SCOTT. Yes, please.

Mr. NEUFELD. I think your last question was incredibly poignant. You said, how many points does it have to be that they say it is a match? One of the problems is that in one state it could be five, in another state it could be seven, another place it could be nine or 11.

You would not be satisfied if you sent your blood out to four different laboratories and they had a different way of determining whether you had a certain disease or whether or not you reached a certain threshold that you need a certain medication. You want to create one kind of standardized way of interpreting data.

And one of the problems is we haven't done that, and that is why people talk about having a National Institute of Forensic Science so there would be some group other than just the users who would just say, you know what, it has got to be nine, or it has got to be seven, whatever it has to be, it becomes a national standard.

Mr. GOHMERT. Was that seven before they consider it an acceptable match?

Mr. MELSON. The FBI has no——

Mr. GOHMERT. They have no——

Mr. MELSON [continuing]. No standards.

Mr. GOHMERT. Okay.

Mr. MELSON. Now, there are no minimum points that you have to have. It is on a case-by-case basis.

Mr. GOHMERT. Alright, and what Mr. Neufeld seems to forget sometimes is when he talks about the medical laboratories. They are dealing with pristine samples. You know, they aren't contaminated; they aren't partial draws of blood and things like that. It is pristine, so it is a lot different than doing an analysis of a latent fingerprint and a rolled fingerprint.

You can't have, necessarily, specific rules that apply to every single type of analysis.

Mr. MELSON. Okay. I appreciate the Chair's indulgence. Thank you.

Mr. SCOTT. Thank you. Let me just follow up on this fingerprint, because if all you have for evidence is five points, and you look at it as absolutely consistent, you do a visual overlay, and it just overlaps exactly, does the jury not get to see that if the standard is nine?

You only get seven. You have a standard of nine, but seven is all you have got. I mean, would the jury not get to see that?

Mr. MELSON. Well, that is the problem with having a uniform standard that is not flexible to meet the particular case at hand. Those five points of comparison may be relatively unique and, therefore, could even be a better identification than another comparison with nine points.

So what you are doing is you are setting an artificial standard for the community which deprives juries of probative evidence.

Mr. SCOTT. Mr. Neufeld? Why was Mr. Barnes tested when he was tested? What were the circumstances that—I assume he was claiming innocence all along.

Mr. NEUFELD. He was claiming innocence all along. He actually wrote to the Innocence Project way back in the early 1990's, and we tried to do then state-of-the-art DNA testing, but as these folks here will know better than I will, the type of testing at the time was friction fragment laying polymorphism needed a larger sample than the kind of very sensitive Y-STRs and other STRs that we were able to finally exonerate him with in 2008 and 2009.

So we did testing way back when, then we just waited for the technology to catch up, and that is how he finally got out.

Mr. SCOTT. Did you get a cold hit to know who it was?

Mr. NEUFELD. On this case, no, but on more than a hundred of our 238 exonerations, we have worked with police and prosecutors to identify the real perpetrator, and invariably those people who are identified committed other serious violent crimes in the intervening years.

And that is why when we are talking about these reforms that the NAS is talking about, it is not just about avoiding a wrongful conviction, it is about public safety. It is about trying to make sure that the system is working as scientifically as possible so we can get the most powerful evidence to solve crime and identify perpetrators.

Mr. SCOTT. Well, you indicated your—in questions and in your testimony something along the lines of the purpose for which it is used. So you could have very good science, and there would be a difference between, for example, using it for screening or investigations and using it as evidence in a trial.

DNA, for example, you would have all kinds of—if you have got all these samples out there, you would have all kinds of chain-of-custody problems if you tried to use the sample in the database in court. But we don't do that. You use the sample in the database for screening. When you get a cold hit, you go to that person, get the sample, and that sample is what you introduce in court. So you don't have any of the chain-of-custody problems.

Is there good science that will help you solve a crime that may not be good enough for admissibility in court?

Mr. NEUFELD. That is a good question. I think that police are constantly using different investigative tools to work leads that nevertheless may not be admissible in a court of law. A police officer can secure, for instance, a confession from somebody in violation of their Miranda rights, in violation of all kinds of things that would prevent the confession from being admitted, but it may leave the police other evidence which corroborates somebody's guilt, okay.

Mr. SCOTT. What happened to poison fruit?

Mr. NEUFELD. No, no, no. What I am saying is the confession——

Mr. SCOTT. Fruit of the poison tree.

Mr. NEUFELD. The confession itself won't be admissible but, for instance, even with confessions, under a case called *Harris v. New York,* if the defendant testifies and says something that contradicts the confession he gave, even though it was involuntary, they can then introduce the confession as part of the rebuttal case.

I mean, there are all kinds of evidentiary rules to handle those situations. But the point here is that, you know, I don't even have a problem with the forensic scientists in the Barnes' case doing the kind of work that she did. She was a very professional person, very highly regarded in the community, and since New York didn't have someone with this expertise, they went to the Connecticut State Crime Laboratory who availed them this woman to do the work.

The problem is once you have some leads like that, unless you are able to quantify the probative value of that evidence, what is the jury supposed to do? And so what you have to realize, it is not enough with a lot of these forms of evidence, whether it is ballistics, whether it is bite marks, pattern evidence, or hair evidence, in this case, okay, which was probably the most probative of all.

It is not enough to say that something is consistent with or matches or whatever unless you can communicate the jury what does it mean to be consistent?

Okay, and that is science, by the way. That is not just a judge as gatekeeper. The scientific community must ensure when they validate something that they have not only validated the analytic capacity of it, but they have also validated the way it will be interpreted and explained.

Mr. SCOTT. Is the use of the word "match" problematic in court?

Mr. NEUFELD. Well, it is interesting. Just to give an example of it, the board of forensic odontology has five different types of testimony that you can give, and the lowest, in terms of its evidentiary significance, is match, okay? Yet, when the psychological studies were done at Arizona State University on jurors, 84 percent of the people tested said "match" is the equivalent of it is his to the exclusion of the whole planet.

So obviously, one of the things that the NAS talks about here is, you know, we really have to have a scientific basis for the way these words are used, and the best way to do that, they say, is that for all these different pattern and impression evidence systems is to go out, roll up their sleeves like they do with DNA and get data.

Find out, you know, how common a certain class characteristic is. Once you know how common or rare a class characteristic is scientifically, you get to communicate that to the juror as opposed to words like, match, similar, or consistent with.

Mr. SCOTT. I have several other questions.

Mr. Gohmert? Do you have further questions?

Mr. GOHMERT. Just a couple of brief—you know, the study recommended this new National Institute of Forensic Science, and indicated that the National Institute of Standards and Technology had limited ties to the forensic community and would not be seen as a leader by scholars, scientists, and practitioners.

Mr. Hicks? You had indicated in your testimony that you didn't support the new NIFS. How do you respond to the report saying that it may not be seen as adequately a leader by scholars and scientists?

Mr. HICKS. Well, I guess, in looking——

Mr. GOHMERT. I mean, the NIST.

Mr. HICKS. Right. In looking at NIST, NIST played a very significant role in the DNA development, and their scientists at NIST continue to play a significant role in terms of teaching and passing along a technology to others.

NIST was very much involved in the optimization, I guess, of the automated fingerprint identification systems. They were involved in the automated firearms identification systems in trying to optimize those systems. They are involved in standards development for industry for all sorts of clinical applications and other applications, and they produce the traceability standards that are used as a quality management device or control in any laboratory and quality management system.

So I am not sure where that statement would come from. It may be that some forensic people don't have a full recognition or appreciation for the role that NIST has played, but from perspective, they were a key player in the development of those systems.

Mr. GOHMERT. Okay. Well, thank you.

And, Mr. Neufeld? You know, I applaud the efforts of the Innocence Project, you know, where you could work so hard, take so much time and effort to exonerate someone who was wrongfully convicted, but it is my understanding that since 2004 of the significant number of innocent people that you have helped get released that there have just been two since that time.

Is that not accurate?

Mr. HICKS. Right, in looking at NIST——

Mr. GOHMERT. Okay, thank you. And Mr. Newfeld——

Mr. NEUFELD. No, that is not accurate at all. In fact, I think just in the last——

Mr. GOHMERT. Who were convicted since 2004.

Mr. NEUFELD. Oh, yes, well——

Mr. GOHMERT. Yes.

Mr. NEUFELD [continuing]. Also know that. In fact, the average life—Mr. Barnes is a good example. Mr. Barnes we took on as a client in 1993. It took us—you do the arithmetic—15 or 16 years to get him exonerated. The average client who we represent, it can take 5 or 6 years before we exonerate them. So you wouldn't expect any people who were convicted since 2004 to yet make it into our cycle.

Mr. GOHMERT. Yes.

Mr. NEUFELD. First of all, we have a backlog now of, I think, more than 2,000 cases.

Mr. GOHMERT. But you said with Mr. Barnes, you had to wait for the science to catch up, and we have come so far in the last 20 years, and that is why I was thinking that perhaps the courts are doing a better job now. Perhaps that is an indication they are doing better now than they were——

Mr. NEUFELD. I don't——

Mr. GOHMERT [continuing]. When he was inappropriately convicted.

Mr. NEUFELD. Well, I don't think that is the answer, and the reason that is not the answer, sir, is because DNA is only available in a small minority of violent crimes. And if we realized that these other disciplines were being used and provided misleading evidence then, and those other disciplines may be still utilized today where there is no DNA evidence to correct it, then there is the very real likelihood and risk that other innocent people will continue to be wrongly convicted.

The reason we do our work, sir, is because DNA can't solve all the problems. If it could, I would go home and go fishing. But we have all these other disciplines that are not as reliable or robust as DNA that are still out there, and we want to make them better.

Mr. GOHMERT. And I appreciate that. That answered my question, thank you.

Mr. SCOTT. The gentleman from New York.

Mr. WEINER. Thank you. Can I ask—I don't know who referred to it in their testimony—have all of these CSI shows polluted our debate over this to a point that it is almost irretrievable? I mean, they are—I mean a lot of these conceptions that jurors must walk in with, and even language like, "match" or "a hit" or—I mean, I don't know who would be best to answer this.

I mean, aren't we in this circumstance that we went for this long period of time, we got this great new technological tool that everyone looks at, as you can see on this Committee, through their own ideological lens—some people see it as a tool to put away bad guys, some people see it as a tool to exonerate people who didn't do anything wrong.

I think most Americans see it as both, and that is what the beauty of these tools, but are we at a point now that there is something that even a new government agency would have difficult handling, which is the language that we use when talking about it.

Is it your suggestion, Mr. Neufeld, that there be these terms of art that get built into any standards that are arrived at, that putting aside the mathematics that you would say a judge would hear objection if someone used the word match, and they would have to

say with reasonable probability to one in two—you know, one in a million or whatever—how do you solve the language problem here?

Mr. NEUFELD. Well, what the National Academy says, and I am not a scientist, I am not a mathematician, I am not a statistician. But what the scientists in the National Academy of Science report say is that we should probably ultimately eliminate terms like match, consisting with, and similar to, and instead have science-based testimony.

So, in other words, if you have a database that says that a particular—let's say they do the research and they show that this particular impression made by a shoe occurs in, you know, one out of 80 pairs of shoes that are marketed in the United States—whatever it is—whatever the data is, okay.

Then an expert can get up there, and instead of saying, similar or consistent with, he would say, you know, one out of every 80 pairs of shoes is like this one, the defendant had it and the perpetrator had it.

So if you do away with all those general——

Mr. WEINER. But isn't there an unlimited number of combinations and permutations of pieces of evidence? How would you conceivably do that? I mean, you are going to have a shoe match standard for Keds in the year 1972 to 1981, you know, how do you do that?

Mr. NEUFELD. Well, actually, I think, for instance, Mr. Hicks could answer that better than I could, because the FBI laboratory maintain databases on lots of things like that with fibers, you know, and——

Mr. WEINER. And tires and things like that.

Mr. NEUFELD. And things like that, okay. But what they didn't do in terms of the wear of a used tire or a used shoe, you know, you didn't have necessarily databases on class characteristics when it came to wear.

Mr. WEINER. I am sorry, go ahead.

Mr. NEUFELD. So all I am simply saying is, is that we have science-based testimony for DNA, and it doesn't have to be necessarily as definitive as DNA. I remember the old days when I was trying a case where if the serologist said, you know, your client had the same ABO and PGM type, which was good science, and that we would only see that particular profile in one in 50 people, I thought that was pretty persuasive evidence of guilt.

Of course when it is now matched given the CSI world of DNA and one in a trillion or one in a billion, it may not seem that persuasive, but it was very powerful then. The point is no one should try and exaggerate or overstate the probative value of evidence.

And I think it is a lot to ask gatekeepers to know exactly what is out there. It would be much better if there was some standard-making body which said, this is all you can say about the sneakers, or this is all you can say about the screwdriver, nothing more, okay. And these are your arrow bars, these are your confidence intervals, this is the chance of human error. You say all that. You put——

Mr. WEINER. Well, let me just let Mr. Hicks weigh in on this. Let's take the case of Mr. Barnes. Let's say there was jeans impres-

sions in dust. Is it reasonable, as Mr. Neufeld and—is it reasonable to come up with types of standards for something like that?

I mean, is it reasonable to say, alright, we have got 220 brands of jeans, 900 different combinations, permutations, and sizes, here is the math. Is that a reasonable thing to expect in advance of a jury?

Mr. HICKS. I don't think so. I think you have already characterized there are certain elements of randomness there that may not lend themselves to those kinds of studies.

Now, the types of reference files that Peter alluded to there, the shoeprint file, the tire tread file, those weren't used for court testimony purposes, but basically to provide lead information. So if you saw a certain type of image of a shoeprint I said it was available at a scene, you might be able to tell the investigators it looks like this was a characteristic of a Keds product produced during some certain time frame. You might be able to provide that lead.

But that is a class characteristic not an individualizing characteristic. So the next challenge would be, of course, for the investigators to find a suspect that happened to have those kind of shoes, and then see if a direct comparison of those can find those wear characteristics, those things that might suggest that they are similar in appearance.

Mr. WEINER. Can I just squeeze in one final question? The report talked about the disparities in forensic science capabilities from one community to another. Are there trends that you four have seen that leads you to believe if you are in a big city, you don't want to get into problems with DNA because the prosecutors are less—or is there a regional thing, you know, if you are in the West coast, you know they are much better at dealing with these things.

Are there some labs that we can look at? Are there some systems that on their own have gotten much better that you can say, you know what, St. Louis is a good system. They train their forensic people very well. I mean, are there those types of things that we can learn—best practices from someone before—as we are starting to arrive at what the national standard should be?

Or is it purely random? There are cases like Mr. Barnes, tragically, throughout the country, and there are cases where people were caught because of evidence as well. I mean, are there any conclusions we can draw from one community to the next? I know Virginia is just great, I hear. Just terrific.

Mr. MELSON. Well, Virginia is great. I used to be a state prosecutor there, and we had great service from Pete Marone's lab. I think there are some labs out there that are better than others. In the accreditation program when a lab has applied for accreditation and they are just starting, we see a tremendous difference between the time that they begin the process and the time that they are actually accredited.

And during that process, we see that some labs are better funded than others. Some labs have better training programs than others. So it is possible to point to particular labs and say they seem to be exceptional labs. That doesn't mean they can't make a mistake from time to time, but there are difference in quality between laboratories and communities.

And the issue usually is surrounding funding. How much money do they get to invest in the infrastructure, the capacity building, the education, the training, and the certification and retraining.

Mr. WEINER. And have any states gotten ahead of the curve on this in terms of the accreditation of laboratories, accreditation of, or standards for, within their own state courts that we can look at and say, here, this is a state that has tried to do it better?

Peter? Do you have some sense that there are some states that you have operated in that seem to be more advanced on this than others?

Mr. NEUFELD. Well, there are some states, for instance, which are trying to proactively deal with the problems of forensic science by having an oversight commission. For instance, in Texas, in the congressman's state, on the one hand, we have had the most exonerations through DNA in Texas, and it is not a reflection at all, I believe, on the criminal justice system in Texas.

There have been a lot of people out there who were able to locate the evidence. It wasn't destroyed in the intervening years. Thank goodness the laboratory saved all the old samples from 20 years ago, and they were able to do the testing.

But what they did do very affirmatively in Texas was they set up a forensic science commission, one of the first in the country. And, for instance, they are taking a look at arson—at the mechanisms that were utilized in the old days to determine that a fire was caused intentionally as opposed to accidental origin, and they are actually trying to wrestle with that.

New York has a commission also that is trying to do some of that. Virginia now has an oversight commission as well. But that isn't enough, okay. It would be much better if there were a single entity nationwide that could look at this stuff, because there is actually no reason—there is no reason why someone should think that you are going to get better quality forensic science in Nebraska than you will in Arkansas.

Something as important as that should be consistent throughout the country just as we require that the use of medical devices or drugs is the same throughout the country.

Mr. WEINER. Thank you, Mr. Chairman.

Mr. SCOTT. Thank you. I think we have decided that the judge would be inadequate as a gatekeeper to decide what kind of scientific evidence comes in and comes out.

The next question, if it is not the judge, who is it? I have heard an accreditation standards, but would we have an accreditation standard for each different technique, that is somebody to accredit ate fingerprints, somebody to accredit some other technique, or would it be one agency for everything?

Mr. MARONE. Well, I think you have got a number of issues there. If you are looking at setting up the methodologies, Mr. Melson mentioned the SWGs as a starting places. These are scientific working groups.

That doesn't mean that those SWGs necessarily composed all of forensic scientists. There can be other scientists in there. In fact, the committee that was also mentioned in this—has psychologists on it looking at biased concerns and so forth.

And so, I think, the methodology is set up by technical groups that have particular interest or expertise in those areas, one. There are recognized international accrediting bodies that accredit laboratories who utilize these approved methods.

You have approved certifying bodies—already recognized certifying bodies that are in place that set the credentials of the individuals. Now, it is not to say that the Federal entity doesn't have a role in each one of those developments, but the role of the Federal entity is to make sure that all these things are working in tandem and it—well together.

That is where you need the oversight of, are you accredited by appropriate means, yes-no? Are you certified by a recognized body, yes-no? Are you using appropriate methods, yes-no? All these things coming together at the same time. Do you have appropriate people who have the proper graduate or undergraduate education, yes-no?

And so for me, that is what I see the oversight is being the facilitator, if you will, of all these different functions that need to all come together and really be meshed together quite intricately.

Mr. SCOTT. Just following up on that. Mr. Hicks, could you indicate what effect the Coverdell Forensic Science Improvement Program has had? Has that helped in this?

Mr. HICKS. It has been very helpful, yes. Of course, one of the elements of the eligibility for funding under Coverdell requires that the laboratory be accredited or be working toward accreditation. So that, I am sure, has had a significant effect in moving laboratories toward those standards.

And in New York state, it has been very helpful in that regard in helping laboratories to update their systems, and to be sure that they are complying with the standards.

If I may just go back to the scientific working group issue too. I wonder if it is almost as the DNA experience, of course, as that technology was evolving and emerging, there was a high level recognition amongst lots of people about the potential of that technology.

The scientific working group was established to help draw that together and do it in a coordinated way that would meet the needs of the criminal justice system, and following that, we saw scientific working groups emerge in other disciplines as well.

But just as with DNA where once we got started, there were questions of backlogs and difficulty keeping up with the work, and the Federal Government came in and supported that activity, and it has helped to address that to some extent, that is sort of where we are, it seems to me, with respect to some of these other disciplines.

Perhaps now that the elements are in place to sort of work on this, it just needs some funding support to help drive the system. It needs some centralized coordination to help guide the system and address the kind of questions that were raised in the Academy report.

Mr. SCOTT. One of the worst pieces of evidence and one of the most frequently cause of mistakes is eyewitness identification. How would we let eyewitness identifications come in?

Mr. NEUFELD. The way we have let eyewitness identifications come in for the last 25 years, after a series of Supreme Court decisions such as *Manson v. Brathwaite* and *Neil v. Biggers,* is we look at five factors of reliability.

The problem is that several of those factors, again, don't have a scientific basis for them. Although they were articulated by the Supreme Court 25 or 30 years ago, there is a whole new body of social scientific research done in laboratories coupled with the compelling data of the Innocence Project where 75 or 80 percent of our cases involve misidentifications that would warrant a second look, if you will, at what the court should utilize before an identification is deemed sufficiently reliable to be heard by the jury.

One other thing, Mr. Chairman, which is that you were asking about accreditation. There is a fundamental difference between accrediting a laboratory and accrediting an actual methodology. The ASPA lab system accredits laboratories.

We talked about certification. We certify individual practitioners. But before you get to accrediting and certifying, you got to be darn sure that the actual technology that these people and these laboratories are going to use has been sufficiently validated. And, you know, folks said that well, we have SWGs to do that. SWGs, in large part, are user groups. They are some of the better people at better laboratories, but they are user groups.

We would never ever allow user groups such as pharmaceutical companies or doctors to be the people who sit at the FDA to decide whether a device can be utilized or not. We use an independent group, and it has always been a tradition in important matters of health and safety to use independent people as opposed to users to decide whether or not something has been sufficiently validated or not.

And that is one of the reasons why the NAC called for a National Institute of Forensic Science.

Mr. SCOTT. Thank you.

Mr. Marone? We were talking about backlogs and money. I don't think I heard a number. How much money do we need to eliminate these backlogs and improve the technology? In just order of magnitude, what are we talking about?

Mr. MARONE. When we begin to look at the complexity of all the issues that we are talking about, there are some things you can put a dollar figure on easily by estimating.

One of those is not how many people we need or how much equipment we need, because we still don't have the numbers on that. But let me give you a for instance. One of the report's recommendations said that we need to look at a bigger pool of employees. We need better qualified people.

How do you do that? You get the kids going to school interested in that. I am old enough—some of the folks in the room remember LEAA. I went to graduate school under LEAA. I worked 4 years. My loans were forgiven in graduate school. I worked in a lab for 4 years, boom. We need to do that again.

What would that cost? FEPAC accredited institution—these are accredited institutions in forensic programs. There is only 20 some out there. I don't have a handle on how many students, just a cou-

ple hundred students. Giving them loans for $30,000 a year, is $5 million. That is what it costs.

To do that for undergraduate for all the existing programs that are there is $55 million. I mean, that is easy to estimate what you need. Now, that may swell when, you know, more institutions see that, but what it does is it makes those people competitive with the kid who gets a free ride to go get a Ph.D. in chemistry at Duke.

So you can get the better qualified—the sharper kids into the system. When we are looking at accreditation, accreditation roughly averages about $10,000 per site—excuse me, per site visit.

If we are looking at 11,000 entities out there that need to be accredited, 11,000 times $10,000, $110 million. So those are the ones that I can put easy numbers on to begin with. What does it cost to train the people to become accredited? Somebody is going to take classes in a year or two to work for that particular agency to be accredited.

Training for that person alone is $5,000. If there is one in each one of these institutions, it is 11,000 times $5,000. So those are the ones that are easy to figure. The ones that are impossible to figure right now is, we don't even know if 11,000 is a good number, because we can't ascertain how many of these ID units or crime scene units are out there.

I do in Virginia, because we did a survey. There are about 20 or 30 that do it full time, crime scene, and another 15 or so that have ID units—fingerprint units. So we need to do that nationwide to figure out what we are looking at and what kind of facilities they are in, what kind of equipment needs it is a very significant needs assessment.

The military would call it, you know, their requirements document, if you will. What do we need before we move on? The number is going to be staggering.

Mr. SCOTT. Thank you.

And final question, Mr. Melson, in your testimony, you ended by saying that you would hope that somebody would ask you about the two recommendations you were not supporting. Did you want to comment on that?

Mr. MELSON. Yes, sir. On those two recommendations, which the department feels needs further review, the first is whether or not there ought to be an independent agency, and I think that requires more review to see whether or not we could spend our money more wisely and our time more wisely than creating a new bureaucracy.

Both here at home and abroad, we have seen how difficult that is, how time consuming it is. The needs of forensic science are much more urgent than we can wait to have a new entity created.

With respect to taking the law enforcement laboratory, or the laboratories out of law enforcement, that needs further review too. I mean, just to give you an example, and going off of Mr. Marone's comment about the 11,000 small forensic science service providers in police stations and sheriff's units and so forth, to get them out of there into their own separate laboratory is going to be immensely costly.

It is going to be very disruptive. You are going to get a lot of pushback, I would think, from the chiefs and the police officers and so forth. The good news is that when you are accredited under the

ISO standards, like many of our laboratories are accredited, there are required management standards in there that require autonomy from the parent organization so that, number one, you can maintain your scientific integrity and independence, and two, there is independence of some nature with regard to the funding stream for those laboratories.

So there is something in place there that meets the goals, I think, of the NAS report without stripping out these laboratories from law enforcement at an immense cost and disruption.

Mr. SCOTT. Thank you.

Mr. Gohmert?

Mr. GOHMERT. Just an observation with the greatest of respect, the Chairman had indicated that it seems that we have established the judge is inadequate as a gatekeeper. And I am still not sure that is the case. It just seems that——

Mr. SCOTT. I think the judge, in fact, will be the gatekeeper.

Mr. GOHMERT. Okay.

Mr. SCOTT. There is no question about that.

Mr. GOHMERT. Okay.

Mr. SCOTT. I thank the judge for his comment.

Mr. GOHMERT. They may need greater training and understanding in order——

Mr. SCOTT. And also the scientific backup. If he is going to determine it has to be some scientific peer review to ascertain whether this is junk science or regular science.

Mr. GOHMERT. Yes.

Mr. SCOTT. And then what happens after you find out that it doesn't particularly work? 60 Minutes ran a report on ballistics, suggesting that the protocol for ballistics evidence wasn't up to par.

Mr. Hicks? Do you want to comment on where we are on that?

Mr. HICKS. I am not sure what you are referring to.

Mr. SCOTT. 60 Minutes did a——

Mr. HICKS. It was about bullet lead identification.

Mr. SCOTT. Tracing ammunition on——

Mr. HICKS. On compositional analysis, bullet lead identification, I think. Is that correct?

Mr. SCOTT. Yes.

Mr. HICKS. Right. Of course I am not really prepared to comment very much on that other than what was in the report. But I think essentially for some period of time, the FBI would look at the elements within a particular batch of lead, for example, look for the signature elements, if you will, that would be present there.

And if they found consistency between one bullet lead and another bullet lead, they would draw the inference that they could have come from the same batch. And I think there have been studies shown that suggest that maybe that is the variability and the manufacturing process and everything else, it may not support that conclusion.

And so I think they made their decision to discontinue that type of service.

Mr. SCOTT. Mr. Melson? Did you want to comment?

Mr. MELSON. Well, I was just going to say that I don't think they found that the science was bad. The science was good, because it

is an elemental analysis. What they found was that the conclusions that were drawn from that analysis were not necessarily accurate.

So it kind of talks to what Mr. Neufeld is saying is that we have to understand what it means to be consistent within other things. We have to determine that terminology and make terminology understandable to the lay person.

Mr. NEUFELD. Just to clarify that. It is part of the science to communicate the probative value of the experiment that you did. It is not a separate matter. Scientists would say that you need a scientific basis in statistics and probabilities to communicate the value of the experiment or the analysis.

So it is all part of the same thing. What is interesting about the CBLA matter is that the FBI continued testifying in many, many cases over 25 years that they could say that a particular bullet found in a body or at a crime scene came from a particular box of cartridges found in the home of a defendant.

And they didn't on their own realize that they had never validated sufficiently to make that claim. They never looked at that, and they allowed their examiners to so testify. After the NAS did its study saying, there is not enough science there to permit that kind of conclusion, subsequent to that, the FBI finally started writing letters to prosecutors around the country saying, you know what, when our expert testified in your case back in 1995 or 2001, okay, his conclusion was not sufficiently based in science.

So it is all about science as well when you give these probabilistic estimates, and why you need a separate independent entity to do this is because—and bullet lead is a perfect example of it—the laboratory didn't come to the conclusion on its own. It took the National Academy of Science to do it for them.

Mr. SCOTT. Thank you.

Mr. Gohmert?

Mr. GOHMERT. The other thing I was going to mention though—the study recommends that Congress provide funds with strings attached to state and local forensic programs in order to gain compliance with the best practices and standards. Because what this comes back to—and it has been alluded to already, but we are the Federal Government, and most of the crimes we are talking about are state crimes.

And although some would like to obliterate the state lines and just say, we are taking charge of everything here, it is a matter of state, and some states provide better justice than others, and I would hope that we could bring states along as effectively as possible.

But I applaud those who do hold their prosecutions to the proper standards, because I don't want the public that may be watching to get the wrong impression that people aren't trying to do a proper job before they allow people to be convicted.

I think most people are, but I thank you for the time.

Mr. SCOTT. Gentleman from New York? Any final comments?

Well, thank you. I would like to thank our witnesses for their testimony today. Members may have additional written questions, which we will forward to you and ask you to answer quite as promptly as you can in order that you response can be made part of the record.

Without objection, the hearing record will remain open for 1 week for the submission of additional materials.

I, again, want to thank all of the witnesses. This is very helpful testimony, and we are going to follow through on what we have heard. Thank you very much.

Without objection, the Subcommittee stands adjourned.

[Whereupon, at 5:03 p.m., the Subcommittee was adjourned.]

APPENDIX

MATERIAL SUBMITTED FOR THE HEARING RECORD

PREPARED STATEMENT OF THE HONORABLE SHEILA JACKSON LEE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS, AND MEMBER, SUBCOMMITTEE ON CRIME, TERRORISM, AND HOMELAND SECURITY

Thank you, Mr. Chairman. I would like to thank the witnesses here this afternoon, and everyone at the National Research Council who worked so hard to bring us this report.

In 2005, the Congress asked the National Academy of Sciences to conduct a study on forensic science.

They were told to assess the present and future resource needs of the forensic science community; make recommendations for maximizing the use of forensic technologies and techniques; identify potential scientific advances in the field; disseminate the best practices and guidelines concerning the collection and analysis of forensic evidence; examine the role of the forensic community in the homeland security mission; as well as any other additional issues concerning forensics determined by the committee.

We are here today to look at the findings of this report, and to find ways to improve the forensic skills across the country, so that they may better solve crimes, investigate deaths, and protect the public.

There are many examples of incidents where the men and women responsible for our law enforcement would have been better served by improved forensics. In my home city of Houston, Mr. Gary Allen Richard knows this all too well.

He was put on trial in 1987 for rape and robbery. Blood-typing evidence from the Houston Police Department crime lab led to a conviction and to what would be a 22 year prison sentence. Less than three weeks ago, new tests were conducted, and now both Mr. Richard's attorney and prosecutors say that the jury was not informed of all the necessary facts.

Just as DNA forensics let an innocent man go free, so can it help criminals who had thought that the past years had allowed them to escape the consequences of their actions. Houston saw this when, in 2003, a leader in private forensic DNA testing, aided the local police in analyzing biological evidence from a 1992 murder. This cooperation resulted in the identification and arrest of Anthony Allen Shore. He confessed, and is now known to be responsible for the sexual assault and strangulation deaths of four Houston-area women dating back to 1986. The city has advancements in forensics to thank for this recent justice.

Indeed, I have offered amendments on the safekeeping and collection of DNA samples in various crime bills. I believe that improvements in forensics science will help criminal justice and criminal law enforcement. In the past, Harris County has had problems with retaining DNA and has had difficulty maintaining the integrity of samples. Samples were either lost or polluted. I am hopeful that as technology becomes more advanced that forensics science will also improve. As members of Congress, we must work to ensure that forensic science is advanced and perfected to ensure the proper conviction of defendants that have committed wrongs against society.

That is why I look forward to speaking with the witnesses here today about the findings of this report. Congress owes to the victims of forensics failures past to better the science that is now so central to our law enforcement.

Thank you, Mr. Chairman, and I yield back the balance of my time.

PREPARED STATEMENT OF ASTM INTERNATIONAL

INTRODUCTION

Thank you for the opportunity to submit written comments. ASTM International is a leading non-profit organization devoted to the development of international standards. For more than 100 years, ASTM has served society as a leading venue for consumers, industry and regulators to work collaboratively under a balanced and consensus-based process to craft voluntary consensus standards. ASTM standards are widely recognized and valued for their technical quality and relevance.

The National Research Council report entitled *Strengthening Forensic Science in the Unites States: A Path Forward* offers many recommendations on how to improve forensic science in the criminal justice system. One of the report's recommendations specifically identifies a need for standards for forensic terminology and reporting. ASTM Committee E30 on Forensic Science maintains over 54 standards on test methods, guides, practices, classifications, and terminology for, but not limited to, definitions, methods and standard reference materials for the collection, preservation, scientific examination, preparation and reports relating to physical evidence for forensic purposes; and the general practice of forensic science.

COMMITTEE MEMBERSHIP

Drawing on a diverse membership of more than 825 members, ASTM Committee E30 is a leader in the development of consensus standards for forensic science applications. The committee includes technical experts from government agencies including the Department of Justice (National Institute of Justice); Federal Bureau of Investigation (FBI), Secret Service, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF); Internal Revenue Service (IRS); City, County, and State police departments and crime labs, District Attorneys and Attorney General Offices, National Institute of Standards and Technology (NIST); and the Department of Defense. Participation from the government along with other stakeholder such as forensic science professional organizations and academics makes ASTM an ideal environment for the development of standards that advance science and technology in the forensic field.

FORENSIC SCIENCE STANDARDS

Existing ASTM forensic science standards include:

- ASTM E1732 Standard Terminology Relating to Forensic Science
- ASTM E620 Standard Practice for Reporting Opinions of Technical Experts
- ASTM E1658–08 Standard Terminology for Expressing Conclusions of Forensic Document Examiners
- ASTM E678 Standard Practice for Evaluation of Scientific or Technical Data
- ASTM E1492 Standard Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory
- ASTM E1843 *Standard Guide for Sexual Assault Investigation, Examination, and Evidence Collection*
- ASTM E2329 *Standard Practice for Identification of Seized Drugs*

In addition to the standards that are already developed, E30 is in the process of exploring standards related to Practice for Computer Forensics, Education and Training in Digital Forensics, Continuing Education and Professional Development of Forensic Document Examiners, the Restoration and Preservation of Charred Documents just to name a few.

THE U.S. VOLUNTARY CONSENSUS STANDARDS SYSTEM

Another recommendation by the National Research Council report encourages the National Institute of Forensic Science (NIFS) to work with the National Institute of Standards and Technology (NIST) on tools for advancing the forensic science discipline as it relates to testing, reliability and validation. NIST is a major participant in ASTM's E30 work, but also participates in the standards work of other standards development organizations, allowing the agency to be keenly aware of the standards community.

The National Technology Transfer and Advancement Act of 1995 (NTTAA) requires federal agencies to work with private sector to create, use, and adopt voluntary consensus standards in lieu of creating their own and NIST is the coordinating agency for this law. Adherence to this law is perhaps one reason why ASTM E30 membership is comprised of members of various law enforcement agencies at the local, state, and national level. Thus, the NRC's recommendation is correct in

asking for the appropriations of funds to ensure that NIST can properly carry out its duties to promote a better understanding of the existing system. NIJ and FBI also play an important role in this area by providing scientific knowledge and tools that can be transferred to underpin the development of standards and test methodologies through ASTM E30. ASTM's standards development process is accredited by the American National Standards Institute and adheres to procedures for due process, openness, balance and transparency.

ASTM STANDARDS AND THE CODE OF FEDERAL REGULATIONS

ASTM has a long history of working in partnership with Federal agencies to develop standards that meet evolving regulatory and procurement needs. According to the National Institute of Standards and Technology (NIST) Standards Incorporated by Reference Database, there are 2,500 standards from ASTM International incorporated by reference in the US Code of Federal Regulations. An additional 500 ASTM standards have been identified by NIST as federal procurement standards incorporated by reference in various Federal policies. Accordingly, ASTM International is the single most Federally-referenced standards developing organization in the US.

CONCLUSION

In summary, ASTM International has demonstrated success in working cooperatively with all interested stakeholders to craft voluntary consensus standards that meet the emerging needs of forensic science disciplines. Enhancing public-private cooperation and Federal participation in ASTM Committee E30 on Forensic Sciences will help to develop standards that advance science and technology in the forensic science field and improve the overall accuracy, reliability, and validity of forensic evidence.

ASTM International welcomes the opportunity to transmit these comments. For more information about ASTM Committee E30, please visit http://www.astm.org or contact Tim Brooke at 610-832-9729 or tbrooke@astm.org.

Statement to US House of Representatives
Committee on the Judiciary
Subcommittee on Crime

My name is Jay Siegel, Ph.D. I am the Director of the Forensic and Investigative Sciences Program and Chair of the Department of Chemistry and Chemical Biology, Indiana University Purdue University, Indianapolis. I have been a forensic scientist in a public crime lab and in private practice, an educator and researcher (2 Federal NIJ grants), for more than 30 years. I have testified in court as an expert witness more than 200 times in seven states as well as federal and military courts. I am also a member of the National Academy of Sciences Committee on the Needs of Forensic Science that was recently released and was the subject of a hearing by this Subcommittee of the Committee on the Judiciary. I write this statement for the record.

There have now been 4 hearings held in the Congress since the NAS report came out. Only two members of the NAS Committee that wrote the report have been called to testify. One is Judge Harry Edwards, Chair of the Committee and the other is Peter Marone, Director of the Division of Forensic Sciences of the State of Virginia. Mr. Marone testified in his role as lab director, not as a member of the NAS Committee. None of the five forensic scientists who were on the NAS Committee has been called to testify. (Jay Siegel, Randall Murch, Robert Shaler, Marcella Fiero, Ross Zumwalt). All of the rest of the witnesses at these hearings have been attorneys or a former director of the FBI lab. Of these witnesses, only Peter Neufeld of the Innocence Project, has advocated strongly for the recommendations of the NAS Committee and he has been doing so for his own purposes. Since none of the witnesses at any of the hearings have been forensic scientists, it is high time you heard from one.

First, I would like to address the central recommendation of the NAS Committee, that an independent National Institute of Forensic Sciences be formed. The Committee spent many hours debating this issue and looking at possible homes for such an entity in existing agencies. None were found to be a proper home because they do not have the expertise and missions that would be able to effectively support the needs of forensic science. We examined the National Science Foundation, the National Institute of Justice, the National Institutes of Health and the National Institute of Standards and Technology. It is critical that the Congress create and fund such an agency. Forensic science is, as the report indicates, fragmented and in need of an overall national structure and oversight. It would not reinvent the wheel, but would make use of existing entities and processes such as accreditation, certification, and standard setting bodies and would work towards making some important initiatives mandatory that are now voluntary. This Institute would also act as a proper source of funds for responsible, rigorous, peer reviewed research into best practices, methods and processes of forensic science especially in those areas where empirical research is needed to establish proper scientific validation for many areas such as fingerprints.

There are many other important recommendations by this Committee that need to be funded. These include development of a consensus code of ethics with real teeth, development of standards for the analysis and reporting of scientific testing for ALL areas of forensic science – not just DNA typing. There needs to be research funded on the subject of the role of contextual bias in forensic analysis – a phenomenon which has been long recognized in other scientific

endeavors but is only recently coming to light in forensic science. There needs to be an overhaul of the way that forensic pathology and the medicolegal investigation of death is carried out in this country. The coroner systems in many states are a travesty. There are insufficient forensically trained pathologists which jeopardizes effective and proper criminal investigations. We must improve the education of the next generation of forensic scientists by offering financial aid and incentives to our most talented science students and fund forensic science research in our best universities by our best faculty. As I stated above, voluntary accreditations of laboratories must be made mandatory and apply to all laboratories that analyze forensic evidence. There must be a mandatory certification process for all scientists who offer expert testimony in courts of law in the U.S. We must also take advantage of the work being done in homeland security and make sure that the forensic science community has the opportunity to participate in these efforts.

One of the more controversial recommendations is to remove public forensic science laboratories from the budgetary control and management of police departments and prosecutors offices. This recommendation does not contemplate physically relocating laboratories, as desirable as this might be. The climate of a law enforcement agency is not compatible with the neutrality of a scientific testing lab. Forensic science should not have to compete with guns and police cars for budget dollars. If we were creating a forensic science laboratory system today, it is highly doubtful that we would purposefully put these labs in police departments, let alone prosecutors offices.

The federal government funds forensic science in the U.S. at a level that is lower than the funding for holistic medicine. Forensic science is vital to the proper investigation and prosecution of criminal and civil cases and is becoming more important all the time. The work of the Innocence Projects and others shows that there are issues with forensic science that need to be addressed. Too much forensic evidence is being analyzed using unvalidated methods. The forensic science community and our nation's leaders can no longer ignore these problems. Too much is at stake.

I am not naïve about the task at hand. I understand that budgets are tight. They always are. I also understand the legislative process. I spent a year as science advisor to Senator Kent Conrad under the AAAS Congressional Fellows Program. I also know that some of the issues presented by the NAS Committee are state rather than federal issues and that the best the Congress can do is to provide incentives and funding for change. I understand that there is resistance to the formation of an independent Institute for Forensic Sciences because people are afraid of change and there is politics involved. But these issues are too important to ignore or fail to act on. Leadership is badly needed now. Further delay imperils our criminal justice system and especially its fairness.

I urge this Committee to hold further hearings and to hear from some of the forensic scientists in this country on and off of the NAS Committee instead of the usual suspects.

Thank you.

JOINT STATEMENT OF
Brent E. Turvey, MS & William "Jerry" Chisum, BS[1], Forensic Scientists and co-authors of *Crime Reconstruction* (2007)

TO:
The United States House of Representatives, Committee on the Judiciary, Subcommittee on Crime, Terrorism, and Homeland Security

REGARDING
NAS Committee on *Identifying the Needs of the Forensic Science Community* report: "Strengthening Forensic Science In The United States: A Path Forward" & related testimony on May 13, 2009

Date
May 19, 2009

The purpose of this joint statement is to explain our support of the NAS Committee on *Identifying the Needs of the Forensic Science Community* and its recently published findings (the NAS Report). This is done in light of the recent testimony given before the USHR Subcommittee on Crime, Terrorism, and Homeland Security by Peter Marone, Director of the Virginia Department of Forensic Science (of ASCLD-LAB and the AAFS); Kenneth Melson, acting Director of the Bureau of Alcohol, Tobacco, Firearms and Explosives; John Hicks, Director, Northeast Regional Forensic Institute, SUNY-Albany (formerly of the FBI); and Peter Neufeld of the Innocence Project in New York. Save Mr. Neufeld, this selection of professionals represented the management of law enforcement employed and affiliated individuals that are, as explained in the NAS Report (2009; p. S-13) "too wedded to the current "fragmented" forensic science community, which is deficient in too many respects." We do not feel that objective forensic science views were present or represented at this hearing in a meaningful fashion – and the substantive findings of the NAS Report appear to have been glossed over, misrepresented, or simply ignored.

We stand in strong support of the findings published in the NAS Report and also its recommendations, to wit: the separation of law enforcement and forensic science practice; the development of an independent National Institute of Forensic Science (NIFS); the promulgation of basic scientific education requirements for forensic scientists; and the nurturing of forensic science graduate programs along with related PhD level research. Part of this research should encompass error rates, bias, and fraud – scientific fundamentals that the forensic science community has had a half century

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to develop and engage, but has instead chosen to ignore. Now these basic subjects have become vital reforms necessary for forensic science to continue to serve society.

Separating Scientific and Law Enforcement Cultures

Chapter 4 of the NAS Report is entitled "The Principles of Science and Interpreting Scientific Data". The inclusion of an entire chapter on a subject this fundamental is important for a number of reasons. It makes clear what science is, what it involves, and defines it as a culture with its own philosophy, mission, and objectives. As stated in the NAS Report (2009; p.4-11):

> The methods and culture of scientific research enable it to be a self-correcting enterprise. Because researchers are, by definition, creating new understanding, they must be as cautious as possible before asserting a new "truth." Also, because researchers are working at a frontier, few others may have the knowledge to catch and correct any errors they make. Thus, science has had to develop means of revisiting provisional results and revealing errors before they are widely used. The processes of peer review, publication, collegial interactions (e.g., sharing at conferences), and the involvement of graduate students (who are expected to question as they learn) all support this need. Science is characterized also by a culture that encourages and rewards critical questioning of past results and of colleagues. Most technologies benefit from a solid research foundation in academia and ample opportunity for peer-to-peer stimulation and critical assessment, review and critique through conferences, seminars, publishing, and more. These elements provide a rich set of paths through which new ideas and skepticism can travel and opportunities for scientists to step away from their day-to-day work and take a longer-term view. The scientific culture encourages cautious, precise statements and discourages statements that go beyond established facts; it is acceptable for colleagues to challenge one another, even if the challenger is more junior. The forensic science disciplines will profit enormously by full adoption of this scientific culture.

This is a welcome acknowledgment that the mandates of good science need to be written out and explained, because they are so poorly understood both within the forensic science community and amongst its end-users – the courts and law enforcement. The NAS Report also makes clear at multiple points that forensic science is often developed and practiced outside of scientific culture, by non-scientists, and that the forensic science community has yet to fully embrace fundamental scientific mandates.

This echoes of warnings expressed in Thornton and Peterson (2002), that forensic scientists are rarely trained in the scientific method, do not understand its implications, and that this ignorance leads to abuse[2]. Similarly concerned, we wrote (2007; p.85) "most practicing [forensic examiners] would probably have a great deal of enthusiasm for strict adherence to standards that embrace diminished bias, analytical logic, and the scientific method, if only they understood what these things are."

The NAS Report further provides for the need to separate the forensic science community from law enforcement culture. This is discussed in many sections, and all

[2] The work of Dr. Joseph L. Peterson, criminalist practitioner, researcher, and educator, is referenced multiple times in the NAS Report. He also presented before the NAS Committee as part of their inquiry.

throughout Chapter 6, "Improving Methods, Practice, and Performance in Forensic Science", where it is explained (2009; p.6-1):

> The majority of forensic science laboratories are administered by law enforcement agencies, such as police departments, where the laboratory administrator reports to the head of the agency. This system leads to significant concerns related to the independence of the laboratory and its budget. Ideally, public forensic science laboratories should be independent of or autonomous within law enforcement agencies. In these contexts, the director would have an equal voice with others in the justice system on matters involving the laboratory and other agencies. The laboratory also would be able to set its own priorities with respect to cases, expenditures, and other important issues. Cultural pressures caused by the different missions of scientific laboratories vis-à-vis law enforcement agencies would be largely resolved. Finally, the forensic science laboratories would be able to set their own budget priorities and not have to compete with the parent law enforcement agencies.

The NAS Committee's recognition of the incompatibility between scientific and law enforcement/prosecutorial goals, and the bias this can and has created, is perhaps its most significant contribution to the future of the forensic science community. This is consistent with the discussion found in Cooley and Turvey (2007; p.79)[3]:

> To correct institutional bias, which accounts for many of the unwanted observer effects discussed in this chapter, it may be time to consider separating the forensic scientist once and for all from police culture. In other words, it may be time to consider separating all state crime lab systems physically, philosophically, and fiscally from law enforcement and to advocate for the creation of wholly independent state divisions of forensic science that are publicly funded but available to all.
>
> The idea is not new. [Dr. Paul L.] Kirk and [Lowell] Bradford (1965, pp. 22–23)[4] advocated for independent crime labs four decades ago[24]:
>
> > An independent operation, not directly a part of any other law enforcement agency, but available to all, would certainly find it easier to maintain the high degree of scientific objectivity that is so essential to good operation. It is very probable that the quality of service furnished would be higher than is now possible, because there would be no dependence on budgets of the other organization with their inevitable competition for available funds, and there would be no question of comparable rank of personnel, which is a problem in some organizations under the common American system.
>
> Fn 24 - Similarly, Professor [James] Starrs (1993)[5] urged that the "inbred bias of crime laboratories affiliated with law enforcement agencies must be breached." Professor [Paul] Gianelli (1997)[6] also advocated for independent crime labs, stating, "These laboratories should be transferred from police control to the control of medical examiner offices, agencies that are already independent of the police."

Forensic scientists perform objective analysis on evidence in order to educate the triers of fact. As such, their methods and means should not be biased by, aligned with, or subordinate to, the law enforcement agenda. They must not be measured by arrests

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[3] Cooley, C. & Turvey, B. (2007) "Observer Effects and Examiner Bias: Psychological Influences on the Forensic Examiner" in Chisum, W.J. & Turvey, B. (Eds) *Crime Reconstruction,* Boston: Elsevier Science.

[4] Kirk, P. & Bradford, L. (1965) *The Crime Laboratory: Organization and Operation,* New York: Charles C. Thomas Pub. Ltd.

[5] Starrs, J. (1993) "The Seamy Side of Forensic Science: The Mephitic Stain of Fred Salem Zain," *Scientific Sleuthing Review,* Vol. 17, Winter; pp.1-8.

[6] Giannelli, P. C. (1997) "The Abuse of Scientific Evidence in Criminal Cases: The Need for Independent Crime Laboratories," *Virginia Journal of Social Policy & Law,* Vol. 4, Spring; pp.439-470.

assisted or convictions secured. They must also not compete with police budgets, with lab equipment set against patrol car maintenance. They must be under the management of other scientists, and evaluated and promoted by virtue of their scientific competence.

If the Subcommittee on Crime, Terrorism, and Homeland Security takes nothing else from the NAS Report, let it be that science cannot survive, and therefore does not belong, in the culture of law enforcement. This means that every federally funded crime lab must be removed from law enforcement control or affiliation and made autonomous.

The Forensic Science Community Cannot Reform Itself

As explained in the NAS Report, the forensic science community is fragmented and broken; it cannot identify let alone fix its own problems, and does not speak with a single voice about what is best for its future. Moreover, it has proven incapable of holding itself accountable for anything that it does – with a history of failing to correct identifiable errors and scientific deficiencies.

Consider the following two examples:

The American Academy of Forensic Sciences (AAFS): The AAFS is often touted as a forward thinking science-minded professional organization, with respect to promoting good practice and educational development in the forensic sciences. In reality, the AAFS is primarily a professional networking organization with many non-science and law enforcement members – including a jurisprudence section for attorneys and judges, and a general section for law enforcement. It does not mandate a science degree for membership or advancement, offers no general knowledge exam or certification, and has no specific ethical guidelines for members save those that protect the interests of AAFS. Also, numerous AAFS members remain in good standing despite having been determined by the courts to have provided false testimony and findings under oath. The value of any professional organization is found in the degree to which it credentials and regulates its membership, and the AAFS fails both of these tests.

American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB): ASCLD-LAB is the laboratory accrediting body of ASCLD. It is governed by lab directors drawn from the very labs that it accredits. This means that it is run by laboratory stakeholders and is not an independent, impartial credentialing body. Nor do they see it as beneficial to make audit results public. The FBI lab did not lose their ASCLD/LAB accreditation after the fingerprinting errors revealed in Brandon Mayfield case, nor were they sanctioned; DNA Security Inc. didn't lose their ASCLD/LAB accreditation after its senior analyst committed forensic fraud in the Duke-Lacrosse rape case.

Moreover, ASCLD/LAB requires that accredited labs set all laboratory procedures in stone. Deviations from established procedures are not allowed – reducing the scientist to a technician. This sounds good unless the procedure is dated or uninformed, as may be the case. It also goes against the spirit of the scientific method (developing, testing

and eliminating all possibilities). Forensic scientists are not free to even try methods published in scientific journals and analyze evidence within the constraints of a particular case under the ASCLD/LAB "must be in the lab manual" model.

These examples, taken from many, show how self-interested and unscientific the forensic science community can be when governing itself. However, the most compelling argument that the forensic science community cannot reform itself is that after more than 50 years it hasn't. The NAS Report is clear on this issue, and its findings have the virtue of being both informed and impartial.

The Adversarial Process Cannot Reform the Forensic Science Community

Contrary to the impression left by some during the NAS Report hearing this month, judges and lawyers have not held the forensic science community accountable for identifiable errors and scientific deficiencies. As explained in the NAS Report (2009; pp. S-19):

> The adversarial process relating to the admission and exclusion of scientific evidence is not suited to the task of 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. Judicial review, by itself, will not cure the infirmities of the forensic science community.

The point, which cannot be stressed enough, is reiterated later in the NAS Report with less diplomacy (2009; p.1-14):

> 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. For a variety of reasons—including the rules governing the admissibility of forensic evidence, the applicable standards governing appellate review of trial court decisions, the limitations of the adversary process, and the common lack of scientific expertise among judges and lawyers who must try to comprehend and evaluate forensic evidence—the legal system is ill-equipped to correct the problems of the forensic science community. In short, judicial review, by itself, is not the answer.

We agree that judicial review is not and never has been the answer to quality forensic science for the following reasons – beyond the lack of scientific expertise:

Scientific fact and legal truth are not the same, despite their confusion by some. *Scientific fact* refers to information and events that have been established based on a broad factual record to a reasonable degree of scientific certainty by scientists using the scientific method. *Legal truth* refers to information and events that have been established by a court ruling based on a narrow factual record – either at the discretion of a judge or jury. Scientific fact is the result of objective and analytical deliberation;

legal truth is the result of something else entirely, as explained in Thornton and Peterson (2002; p.149)[7]:

> Scientific "truths" are established when the validity of a proposition is proven to the satisfaction of a prudent and rational mind. Legal "truths" are not established by the exercise of the scientific method, but by the processes of the adversary system.
>
> The role of physical evidence in the administration of justice may reasonably be described as follows: Science offers a window through which the law may view the technological advances of our age. Science spreads out a smorgasbord of (hopefully) valid facts and, having proudly displayed its wares, stands back. The law now picks out those morsels that appear most attractive to it, applying selection criteria that may or may not have anything to do with science. These selection criteria may appear sensible, even obligatory to the law, but may appear illogical or even whimsical to science.

Scientific fact and legal truth are therefore very different propositions. Not only are they established by entirely different means, they are also sought for what can be incompatible ends. Science seeks to find out what happened and why; the law seeks just resolution of legal conflict.

Moreover, judicial players have their own agendas and cultures to satisfy. None of this is a secret, but it will not be heard from beneficiaries of the current law enforcement dominated forensic science community. In plain language, too many prosecutors are focused on obtaining convictions, not justice or fact-finding; too many defense attorneys lack sufficient motive, education or resources to question law enforcement employed or affiliated forensic personnel; and too often judges are former prosecutors with the agenda of protecting law enforcement employed or affiliated forensic personnel from scrutiny.

Because there is a need to separate forensic science from law enforcement culture; because the forensic science community cannot reform itself; and because the adversarial process is not suited to the task developing and regulating scientific practice, subsequently, we wholly support the NAS Report's recommendation for the development of a National Institute of Forensic Science (NIFS). This would be an "independent federal agency" that is not "in any way committed to the existing system" and not "part of a law enforcement agency", with "a culture that is strongly rooted in science", must be wholly endorsed (2009; p. S-13). It must be created separate from DOJ, separate from any law enforcement oversight, and separate from any law enforcement budget priorities.

Forensic Scientists Must Meet Basic Educational Requirements: They Must be Educated as Scientists

The imposition of basic educational standards is one of the greatest challenges confronting the forensic science community. A major contributing factor to the problem is, again, the alignment of forensic science with law enforcement. Many

[7] Thornton, J. & Peterson, J. (2002) "The General Assumptions and Rationale of Forensic Identification," in D.L. Faigman, D.H. Kaye, M. J. Saks, and J. Sanders (eds) *Modern Scientific Evidence: The Law and Science of Expert Testimony*, St. Paul, MN: West Publishing Co.

forensic examiners work for or within law enforcement agencies that have very low educational requirements – where a vocational criminal justice degree is viewed as an acceptable substitute for a scientific education. This is not something that the law enforcement community prefers to acknowledge or be reminded of. To retain membership of the non-scientific forensic examiners employed by law enforcement, most forensic organizations either do not impose degree requirements, or provide exceptions for law enforcement experience. This has created the very problem that the NAS Report has identified: an overall lack of scientific education and training, let alone a culture of science, in the forensic sciences.

The NAS Report makes clear in its discussion of education reform that an undergraduate degree in the forensic sciences, or some other related science, is necessary, and that a graduate degree is preferable. It also provides that on the job training is an inadequate substitute (2009; p.8-1):

> Forensic examiners must understand the principles, practices, and contexts of science, including the scientific method. Training should move away from reliance on the apprentice-like transmittal of practices to education at the college level and beyond that is based on scientifically valid principles, as discussed in Chapter 4. For example, in addition to learning a particular methodology through a lengthy apprenticeship or workshop during which a trainee discerns and learns to copy the skills of an experienced examiner, the junior person should learn what to measure, the associated population statistics (if appropriate), biases and errors to avoid, other threats to the validity of the evidence, how to calculate the probability that a conclusion is valid, and how to document and report the analysis. Among many skills, forensic science education and training must provide the tools needed to understand the probabilities and the limits of decision making under conditions of uncertainty.
>
> To correct some of the existing deficiencies, the starting place must be better undergraduate and graduate programs, as well as increased opportunities for continuing education. Legitimating practices in the forensic science disciplines must be based on established scientific knowledge, principles, and practices, which are best learned through formal education and training and the proper conduct of research.

This runs contrary to the views of many law enforcement forensic examiners who argue that experience trumps education and that science can be learned on the job. It also helps with task of preventing law enforcement examiners and prosecutors from suggesting that one must be in law enforcement, or work for law enforcement, in order to be a forensic scientist. In fact precisely the opposite is true.

Forensic Science Graduate Programs and Scholarly Research Must Be Federally Supported

Currently, many forensic science programs operate out of schools of criminal justice aligned with or taught by current and former law enforcement. The model is vocational rather than scholarly. In other words, they are designed to produce police officers, correctional officers, crime scene technicians, or bench criminalists for government crime labs. This is reflected by type of instructors employed, too many of which are criminal justice practitioners and not objective scientists or academic scholars. In this environment, research is not supported, funded, or viewed as necessary within forensic science. The NAS Report offers that (2009; p.8-11):

> Many forensic degree programs are found at small colleges or universities with few graduate programs in science and where research resources are limited. The lack of research funding has

> discouraged universities in the United States from developing research-based forensic degree programs, which leads to limited opportunities to attract graduate students into such programs. Only a few universities offer Ph.D.-level education and research opportunities in forensic science, and these are chemistry or biology programs with a forensic science focus.
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> Most graduate programs in forensic science are master's programs, where financial support for graduate study is limited. In addition, the lack of research funds means that universities are unlikely to develop research programs in forensic science. This lack of funding discourages top scientists from exploring the many scientific issues in the forensic science disciplines. This has become a vicious cycle during which the lack of funding keeps top scientists away and their unavailability discourages funding agencies from investing in forensic science research. Traditional funding agencies have never had a mission to support forensic science research.

This passage explains the need for establishing PhD forensic science programs that would generate research in the forensic sciences. It is something that just about every other scientific discipline benefits from. Such programs need to be initiated, developed, and funded. Two areas where PhD level research is desperately needed by the forensic sciences are error rates and examiner bias, as discussed repeatedly throughout the NAS Report.

Error Rates

Too many in the forensic science community have falsely believed and testified that the error rates of their methods and examinations are essentially zero or are too complex for measurement. As such, it is argued, they need not be studied at all. This misconception about error rates and whether they may be reliably gauged, or relevant, often starts at the top. The seed of arrogance and ignorance of senior examiners is planted in the forensic community – in soil of loyalty or fear. It is gathered and spread as junior examiners are trained to parrot responses that they cannot question and do not understand. Once this happens enough times on the record, they are vested and stuck for life with the errors of previous testimony.

Consider, for example, the continued testimony of Dr. Bruce Budowle, the FBI's top forensic scientist[8]. As provided in *U.S. v. Llera Plaza et al* (2002; p.510)[9]:

> Dr. Budowle's testimony with respect to methodology error was as follows:
>
> Q: Tell us how it [error rate] applies to scientific methods, methodology.
>
> A: Well, this transcends all kinds of forensic, it transcends all disciplines in that, but in the forensic area particularly, this has been an issue discussed repeatedly in lots of disciplines, whether it is DNA chemistry and latent fingerprints.
>
> We have to understand that error rate is a difficult thing to calculate. I mean, people are trying to do this, it shouldn't be done, it can't be done…
>
> An error rate is a wispy thing like smoke, it changes over time because the real issue is, did you make a mistake, did you make a mistake in this case? If you made a mistake in the past, certainly that's valid information that someone can cross-examine or define or describe whatever that was, but to say there's an error rate that's definable would be a misrepresentation.

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[8] Dr. Bruce Budowle is referenced multiple times in the NAS Report, and also presented before the NAS Committee as part of their inquiry.

[9] *U.S. v. Carlos Ivan Llera Plaza, Wilfredo Martinez Acosta, and Victor Rodriguez*, Case Nos. CR. 98-362-10, CR. 98-362-11, 98-362-12, United States District Court, E.D. Pennsylvania, January 7, 2002.

> So we have to be careful not to go down the wrong path without understanding what it is we are trying to quantify.
>
> Now, error rate deals with people, you should have a method that is defined and stays within its limits, so it doesn't have error at all. So the method is one thing, people making mistakes is another issue.

The NAS Report makes clear that any testimony suggesting near or complete infallibility regarding a method or an examiner is unscientific and, worse still, false. Furthermore, there was great concern by the NAS Committee regarding the number practitioners in the forensic science community who were unwilling to concede that they had an error rate of "more than zero"[10]. As described in the NAS Report (2009; pp.1-9 - 1-10):

> In testimony before the committee, it was clear that some members of the forensic science community will not concede that there could be less than perfect accuracy either in given laboratories or in specific disciplines, and experts testified to the committee that disagreement remains regarding even what constitutes an error... Failure to acknowledge uncertainty in findings is common: Many examiners claim in testimony that others in their field would come to the exact same conclusions about the evidence they have analyzed.
>
> ...
>
> The insistence by some forensic practitioners that their disciplines employ methodologies that have perfect accuracy and produce no errors has hampered efforts to evaluate the usefulness of the forensic science disciplines. And, although DNA analysis is considered the most reliable forensic tool available today, laboratories nonetheless can make errors working with either nuclear DNA or mtDNA—errors such as mislabeling samples, losing samples, or misinterpreting the data.

The NAS Report puts these issues to rest, clearly identifying a need for humility and future research when it explains that based on its inquiry (2009; p.1-6):

> The fact is that 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. There is some logic behind the application of these techniques; practitioners worked hard to improve their methods, and results from other evidence have combined with these tests to give forensic scientists a degree of confidence in their probative value. Before the first offering of the use of DNA in forensic science in 1986, no concerted effort had been made to determine the reliability of these tests, and some in the forensic science and law enforcement communities believed that scientists' ability to withstand cross-examination in court when giving testimony related to these tests was sufficient to demonstrate the tests' reliability. However, although the precise error rates of these forensic tests are still unknown, comparison of their results with DNA testing in the same cases has revealed that some of these analyses, as currently performed, produce erroneous results.

The report goes on to define the type of errors that can occur in forensic casework, explains that they can indeed be measured when clearly distinguished, and warns "[t]he assessment of the accuracy of the conclusions from forensic analyses and the estimation of relevant error rates are key components of the mission of forensic science" (p.4-9).

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[10] For an excellent discussion of this issue, see Cole, S. A. (2005) "More Than Zero: Accounting for Error in Latent Fingerprint Identification," *J. Crim. L. Criminology*, Vol. 95.

Examiner Bias

The NAS Report discusses the issue of examiner bias and subconscious observer effects at length. It explains (2009; p.4-9):

> Human judgment is subject to many different types of bias, because we unconsciously pick up cues from our environment and factor them in an unstated way into our mental analyses. Those mental analyses might also be affected by unwarranted assumptions and a degree of overconfidence that we do not even recognize in ourselves. Such cognitive biases are not the result of character flaws; instead, they are common features of decision making, and they cannot be willed away[9].
>
> A familiar example is how the common desire to please others (or avoid conflict) can skew one's judgment if coworkers or supervisors suggest that they are hoping for, or have reached, a particular outcome. Science takes great pains to avoid biases by using strict protocols to minimize their effects.
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> Fn9: See, e.g., M.J. Saks, D.M. Risinger, R. Rosenthal, and W.C. Thompson. 2003. Context effects in forensic science: A review and application of the science of science to crime laboratory practice in the United States. *Science and Justice* 43(2):77-90.

This is an important discussion to have on record, as many in the forensic community believe and argue one or more of the following regarding examiner bias and observer effects: they don't exist; they can be willed away; they are dealt with by peer review and publication; and/or they have never heard of them. Of course, none of these are true – save the last.

In failing with these arguments, the next line of attack from vested forensic practitioners and their law enforcement employers has been to suggest that if these concerns were real, it wouldn't just be the defense bar discussing them in law review articles. This is why a chapter on this subject was included in Chisum and Turvey's *Crime Reconstruction* (see Chapter 3: "Observer Effects and Examiner Bias: Psychological Influences on the Forensic Examiner"). Like the NAS Report, we found that (Cooley and Turvey, 2007; pp.52-53)[11]:

> Although the forensic community is attenuated to the potential for extreme forms of outright fraud and overt bias, it tends to be wholly unaware when it comes to understanding and accepting that well-documented forms of covert bias can taint even the most impartial scientific examinations. This is disheartening for the simple reason that covert and subconscious biases represent a far greater threat to the forensic community than do the small percentage of overtly biased, dishonest, or fraudulent forensic examiners.

And further, we found that (p.55):

> Because the forensic community has generally ignored this basic principle of cognitive psychology and good research methodology, by failing to account for subconscious examiner influences on research and casework, the following tends to be true:
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> ■ Forensic examiners are unaware that observer effects do exist and can impact their

[11] Cooley, C. & Turvey, B. (2007) "Observer Effects and Examiner Bias: Psychological Influences on the Forensic Examiner" in Chisum, W.J. and Turvey, B. (Eds) *Crime Reconstruction*, Boston: Elsevier Science.

> examinations, or
>
> ■ Forensic examiners naively profess to be aware of subconscious observer effects yet, at the same time, refuse to admit that anything could possibly impact their conclusions; they claim that they have been trained to be objective and can, by exercising a unique will power, purge their minds of any impurities (conscious and subconscious alike) that may taint their analyses.
>
> With respect to the latter situation (i.e., "these effects cannot distort my analysis"), what forensic examiners are in fact claiming is that their training montage consists of learning a special ability that is denied all other scientific disciplines, which makes them invulnerable to subconscious influences. This position is not defensible, although many upper tier forensic scientists continue to profess otherwise.

Given these previously published findings, and their agreement with the NAS Report, we concur with its assessment that (2009; p.4-11) "Research has been sparse on the important topic of cognitive bias in forensic science—both regarding their effects and methods for minimizing them." Further, we agree with the inference that more study of these subjects is necessary – not less.

Because of the politics involved, error rates and examiner bias best researched by disinterested students of criminology and forensic science studying at the PhD level. Within a university environment, scholarship and the mandates of good science can be supported and encouraged. Such researchers are also freer to make objective findings, and to publish them, than those who are politically bound to the interpretive policies of an agency or organization with a vested interest in appearing infallible to the courts.

Conclusion

Despite to the remarks of some and the fears of others, we do not view the NAS Report as an attack on the forensic science community. On the contrary, we view it as a call to salvage its scientific credibility. Currently the forensic science community needs lacks scientific research and scientific leadership – and you need one to encourage the other. Though it is imperfect in many ways, the NAS Report is an excellent set of starter blueprints for the continued scientific development of forensic science, and much needed forensic reform.

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Hon. Abishi C. Cunningham, Jr. (Ret.) • Public Defender

HOUSE JUDICIARY COMMITTEE, SUBCOMMITTE ON CRIME

Meeting of May 13, 2009

Regarding the National Academy of Sciences Report on Forensic Science

Written Testimony by the Honorable Abishi C. Cunningham, Jr. (Ret.)
Public Defender of Cook County, Chicago, Illinois

Defending Against Bad Science in Courts

The National Academy of Sciences' (NAS) report, "Strengthening Forensic Science in the United States: A Path Forward," reveals a forensic science system in need of significant reform. It needs research to support the fair and effective use of techniques like fingerprint and firearms evidence in our courts; it needs clearer and more accurate lab reports, and the NAS report rightly calls for improved standards of ethics and ethics enforcement regarding the use of forensic science in our criminal justice system. It rightly rejects the myth of forensic infallibility and recommends *studies to determine the effects of bias and human error in forensic practice.*

The report missed, however, a crucial point: forensic science is litigated in courts, and the duty to counter bad science falls on defense counsel, most often public defenders. To fulfill their duty, public defenders need the resources to do their job of effectively litigating forensic science issues. Congress could help remedy the problems noted by the NAS report by creating grants targeted at this narrow problem. The amount needed to make significant inroads in this area would be a tiny fraction of what Congress now spends on grants to fund law enforcement, prosecutors, and especially laboratories in forensic science.

While it is our clients, indigent, often minorities, who suffer when bad science leads to a miscarriage of justice, public defenders have been left out of this debate in Congress. Our perspective, however, must be heard for a balanced view of this problem to emerge. We need expertise and resources to effectively assess and challenge forensic science issues. This includes resources to acquire and retain expertise in our lawyers, and to expert consultants and witnesses. This is a message Congress, counties, legislatures, court systems and other funding agencies must take from the report.

Resources for the defense are scarce, but the hazards of inadequate forensic science representation are clear: Slower case processing in the trial courts, ineffective assistance

of counsel, the innocent wrongly convicted, and costly malpractice claims. Public defenders forensic science caseloads are higher than they have ever been. Where ten years ago the Office of the Public Defender managed a dozen DNA cases at a time, it now manages almost 400. The trend has been clear for years. The use of forensic science continues to grow. Police and prosecutors have acquired forensics funding from Congress and the states, they do more forensic work each year, and this trend will only accelerate. Indeed the National Academy of Sciences suggests increasing funding for laboratories. Public defenders need resources to help keep the system in balance.

America's courts need effective forensic science defense. When Duke Lacrosse players were charged with a sexual assault, they were assumed guilty by many, and vilified in the press. The prosecutor hid DNA evidence of innocence. Only work by defense counsel uncovered this, and it took him a month of 18-hour days to complete his review of the DNA file. This prevented college students from being railroaded into wrongful convictions and decades in prison. Chicago and Cook County are no strangers to wrongful convictions. In the last decade the City of Chicago and County of Cook have had to approve almost ***$20 million to settle lawsuits*** from men wrongfully convicted who had brought claims of forensic science misconduct. After an $8 million settlement in April 2007, Alderman Ed Smith said, "We just have to do a better job when looking into these cases to make sure that we have the right people." To do that job, those charged with crimes need quality of representation in forensic science cases, just like those Duke athletes. Leadership should not be lacking: in the Illinois Senate, President Obama was a leader in forensic science reform, as chief co-sponsor to the post-trial DNA statute, the nation's second, in 1997 and also of the preservation of evidence for forensic testing statute – the first in the nation in 1999.

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May 18, 2009

Rep. Louie Gohmert, Ranking Member
Subcommittee on Crime Terrorism, and Homeland Security Membership
511 Cannon HOB
Washington, DC 20515

Dear Representative Gohmert:

On behalf of the National District Attorneys Association, please accept the attached statement from NDAA board member, Matt Redle, as a part of the record for the hearing on National Research Council's publication *Strengthening Forensic Science in the United States: A Path Forward.*

The NDAA considers this an issue of particular importance to the nation's prosecutors and we look forward to working with the Subcommittee to address issues surrounding criminal forensic sciences in the 111th Congress.

Sincerely,

Scott Burns
Executive Director

CC: Rep. Bobby Scott

Enclosure

Statement of

Matthew F. Redle
County and Prosecuting Attorney
Sheridan County, Wyoming

Submitted to the

Subcommittee on Crime, Terrorism and Homeland Security
Judiciary Committee
U.S. House of Representatives

Regarding the Hearing on the

National Research Council's publication

Strengthening Forensic Science in the United States:
A Path Forward

Hearing Date: May 13, 2009

Submission Date: May 18, 2009

My name is Matthew F. Redle. I am the duly elected County and Prosecuting Attorney of Sheridan County, Wyoming. I am also Wyoming's State Director to the National District Attorneys Association which represents state and local prosecutors across the country. It is in that capacity, as a member of the Board of Directors of the National District Attorneys Association, that I am submitting this statement for the consideration of the subcommittee.

This is a matter of great interest to prosecutors around the country. We are, in a most instances, the end consumer of forensic science services. The reliability and integrity of that product is critical if we are to effectively execute our role as "ministers of justice" within the criminal justice system. The publication of the National Research Council report *Strengthening Forensic Science in the United States: A Path Forward* represents the start of a critical dialogue about the course of justice in our country. On behalf of the nation's state and local prosecutors the National District Attorneys Association offers this body the benefit of our expertise and insight throughout this process.

In his statement before this subcommittee Mr. Melson expressed reservations about two of the recommendations contained in the report, "laboratory independence from or autonomy within the law enforcement community" and the establishment of a new and independent federal entity, the National Institute of Forensic Science. We share Mr. Melson's concern.

The recommendation (#4) regarding laboratory autonomy, to the extent it would require independence from law enforcement entities, is more placebo than panacea. Certainly laboratories must be afforded maximum autonomy as a body charged with maintaining scientific objectivity in the conduct of their duties. To the extent that scientific objectivity is enhanced by budgetary and managerial autonomy, such autonomy should be provided. The accreditation standard recommended by the report, 17025 ISO/IEC, contains provisions specifically addressing necessary levels of laboratory autonomy. This accreditation standard has already been implemented and available to laboratories since April 2004 through the American Society of Crime Laboratory Directors/Laboratory Accreditation Board.

The underlying concern seems to be that if laboratories are not independent of law enforcement agencies or prosecutors offices the objectivity of its scientists will be compromised. Independence is no guarantee however. Professor Paul Giannelli made a presentation to the National Research Council. Professor Giannelli has twice written previously with recommendations regarding the regulation and

independence of forensic laboratories. In his first article,[1] Professor Giannelli offered examples of several infamous examples of forensic fraud. Several examples involved misconduct on the part of employees in public laboratories, either in this country or in the United Kingdom. However, three of the individuals cited enjoyed the independence suggested by the report recommendation.

Dr. Ralph Erdman[2] was a Texas pathologist who served as a contract medical examiner in more than forty Texas counties. In 1992 Dr. Erdman was convicted of faking 100 autopsies. Dr. Erdman's fraud came to light when an autopsy report listed the weight of a decedent's spleen. Relatives of the deceased subsequently reported that the spleen had been removed several years earlier.

Dr. Michael West,[3] a dentist, did not limit his testimony to bite marks but rather offered opinions with respect to tool marks, shoeprints, fingernail and knife wound comparisons. He apparently used an alternate light source to detect and analyze wounds. West claimed that three other experts used this same method which he called the "West Phenomenon." The other three experts subsequently denied the claim in sworn testimony.

Dr. Louise Robbins[4] is cited by Professor Giannelli for her testimony for her "Cinderella Analysis" in which she was able to match the insole of shoes found at a crime scene with insoles obtained from suspects. Dr. Robbins, a professor of anthropology, is reported to have testified for the prosecution in several cases in which William Bodziak, a shoeprint expert for the FBI and author of *Footwear Impression Evidence*, apparently testified on behalf of the defense. In one reported case she testified that size nine tennis shoes found at a scene were a match to a defendant's footprint exemplars despite the fact that the defendant wore a size 10 ½ or 11 shoe.

In these three instances each of the "experts" was independent of any law enforcement agency. Obviously such independence did not deter their brazen misconduct. If anything, such examples may serve as justification for regulation of private laboratories and certification of private scientists. Even if forensic laboratories were independent of law enforcement, one might reasonably expect that a working relationship or, in the case of a private lab performing testing for law enforcement

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[1] Giannelli, *The Abuse of Scientific Evidence in Criminal Cases: The Need for Independent Crime Laboratories*, 4 Virginia Journal of Social Policy and the Law 439 (1997).
[2] Giannelli, *The Need for Independent Crime Laboratories*, id. at p. 449-53.
[3] Giannelli, *The Need for Independent Crime Laboratories*, id. at p. 453 -57.
[4] Giannelli, *The Need for Independent Crime Laboratories*, id. at p. 458- 62.

agencies, a financial relationship would develop between lab and law enforcement personnel. Claims of bias, real or imagined, would inevitably ensue. At the time Professor Giannelli recognized some of weaknesses inherent in his proposal:

> "As noted above, this proposal is not a panacea. It does not affect defense experts or prosecution experts not affiliated with a crime lab. Nor does it address lawyer incompetence in the use of scientific evidence. Nevertheless, it is a substantial step in the right direction."[5]

> Ten years later, in another article[6] he wrote:
> "Independent crime labs are a solution, but whether they are politically viable seems doubtful, and they would present some disadvantages." **fn.453**

> **fn. 453.** For example: Increasing the laboratory's geographical or organizational remoteness, however, can limit the effectiveness of the laboratory's participation in the investigative phases of a case, when its scientific input may have the greatest chance of contributing to justice. Remoteness also makes the police department less able to direct the efforts of the laboratory toward the cases that the department considers most important...." [Citations omitted].

Under the circumstances it would seem wiser to save the money it would cost in "incentive funds" to relocate laboratories out of existing accommodations in law enforcement or prosecution agencies. Instead such resources would better be spent in ways that will enhance the quality of evidence leaving crime laboratories. In its experience with forensic DNA profiling Congress created a model it can use as a template to improve the condition of the nation's forensic science laboratories.

The Scientific Working Groups (SWGs) originally began as the Technical Working Group on DNA Analysis Methods (TWGDAM) in 1988. When the "DNA Identification Act of 1994" created the CODIS DNA database system it also created a DNA Advisory Board (DAB) for the purpose of promulgating quality assurance and quality control standards to insure the proper operation of the national database system. TWGDAM (then SWGDAM) in cooperation with NIST and under the direction of the DNA Advisory Board provided the technical assistance necessary for the creation of standards covering forensic DNA analysis.

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[5] Giannelli, *The Need for Independent Crime Laboratories*, id. at p. 478.

[6] Giannelli, *Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs*, 86 North Carolina Law Review 163, 228 (2007)

If a state or local laboratory wished to participate in the database system as a "CODIS" laboratory it had to comply with the DNA Advisory Board standards. CODIS performance audits to assure compliance with those same standards became routine. Federal funding to DNA laboratories for backlog elimination or for the purchase of Laboratory Information Management Systems (LIMS) or for other various DNA grant programs likewise were contingent upon compliance with the "DAB standards." The passage of the "Justice for All Act of 2004" made laboratory accreditation of DNA laboratories mandatory.

The DAB standards and laboratory accreditation requirements created a laboratory environment in which necessary practices existed that would deter or eliminate fraud and improve quality. Among those practices, and in addition to the required autonomy, are the following:
Written, validated protocols;
Appropriate testing documentation;
Standardized technical procedures;
Accreditation;
Internal peer review procedures;
Proficiency testing;
Quality assurance and quality control programs;
External and internal performance audits; and
Corrective action procedures when proficiency testing or casework errors are detected.

Local and state laboratories that brought DNA analysis methods on-line also anticipated the direction that other disciplines within that laboratory might expect. Many of those labs, as a result, have already implemented processes and procedures in other divisions within the laboratory that were first required within the DNA section. By anyone's measure, the effort to encourage laboratory accreditation has already proven to be a success even before it was made mandatory by the 2004 "Justice for All Act." At the start of 1998, 56% of DNA labs were accredited and 18% had applied.[7] "As of January 1, 2001, 63% of laboratories were accredited by an official organization, and 19% had applied accreditation or had a pre-accreditation inspection by an accredited laboratory."[8] In May of 2004, ASCLD/LAB reported it had accredited 256 laboratories. As of April 1, 2009, ASCLD/LAB reports that it had accredited 359 crime laboratories, including 181 state laboratories, 117 local laboratories, 22 federal laboratories, 12

[7] Bureau of Justice Statistics Bulletin, *Survey of DNA Crime Laboratories, 1998*, 3 (USDOJ February 2000).
[8] Bureau of Justice Statistics Bulletin, *Survey of DNA Crime Laboratories, 2001*, 3 (USDOJ January 2002).

international laboratories and 27 private laboratories.[9] It is my understanding that represents 90% of all public forensic laboratories.

The recipe for such success has been one-third the value CODIS represents as a service to state and local laboratories, one third the value of the federal funding labs thereby become eligible for and one third the recognition of the credibility that adherence to a set of national standards confers upon a laboratory. When the U.S. Supreme Court in the *Daubert* decision[10] discussed the importance the existence and maintenance of standards had as a factor in admissibility, proof of adherence to such standards became the forensic version of the "Good Housekeeping Seal of Approval." External performance audits, whether for accreditation purposes or participation in CODIS, have proven effective as a means of monitoring compliance with DAB standards.

While the size of the task at hand is made more complex by the multiple disciplines and methods involved, the experience with forensic DNA should warrant the belief that such an ambitious program can nevertheless be accomplished without the creation of wholly new federal entity. The successes experienced with DNA were executed with the assistance of SWGDAM and other already existing agencies such as NIST. Following on the model that DNA has provided, other SWGs now exist to aid other forensic disciplines and are available in helping to provide technical expertise in the drafting of standards.

The funding called for by the report is substantial. The funding issues attendant to DNA analysis have still not been entirely resolved and efforts must continue. The National Academy report proposes a multiple times more ambitious fiscal investment in many long neglected and under-funded laboratories than what was experienced with effort in DNA profiling. It is right that the federal government participate monetarily in this investment. One of the most compelling recommendations found in the report is the accompaniment to the charge Congress gave the National Academy, *i.e,* to examine the role of the forensic community in homeland security. In that charge and the Academy's response is the recognition that whether at times of natural disaster like that of Katrina or in the event of attack by our enemies, our nation needs an integrated system of forensic services and systems. In such an event the need for medical examiners, their investigators and forensic analysis services must serve an even larger purpose – national security.

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[9] See http://www.ascld-lab.org/legacy/aslablegacylaboratories.html.
[10] *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

Again, the National District Attorneys Association is eager to assist the Committee as it begins the task of assessing the issues raised by the National Academy report. We believe this work and the decisions that lie ahead are critical to our criminal justice system. George Washington once wrote: "The true administration of justice is the firmest pillar of good government." Those words are no less true today.

Free Executive Summary

Strengthening Forensic Science in the United States: A Path Forward

Committee on Identifying the Needs of the Forensic Sciences Community; Committee on Applied and Theoretical Statistics, National Research Council

ISBN: 978-0-309-13130-8, 254 pages, 6 x 9, paperback (2009)

*Scores of talented and dedicated people serve the forensic science community, performing vitally important work. However, they are often constrained by lack of adequate resources, sound policies, and national support. It is clear that change and advancements, both systematic and scientific, are needed in a number of forensic science disciplines to ensure the reliability of work, establish enforceable standards, and promote best practices with consistent application. Strengthening Forensic Science in the United States: A Path Forward provides a detailed plan for addressing these needs and suggests the creation of a new government entity, the National Institute of Forensic Science, to establish and enforce standards within the forensic science community. The benefits of improving and regulating the forensic science disciplines are clear: assisting law enforcement officials, enhancing homeland security, and reducing the risk of wrongful conviction and exoneration. Strengthening Forensic Science in the United States gives a full account of what is needed to advance the forensic science disciplines, including upgrading of systems and organizational structures, better training, widespread adoption of uniform and enforceable best practices, and mandatory certification and accreditation programs. While this book provides an essential call-to-action for congress and policy makers, it also serves as a vital tool for law enforcement agencies, criminal prosecutors and attorneys, and forensic science educators. *

SUMMARY

INTRODUCTION

On November 22, 2005, the Science, State, Justice, Commerce, and Related Agencies Appropriations Act of 2006 became law.[1] Under the terms of the statute, Congress authorized "the National Academy of Sciences to conduct a study on forensic science, as described in the Senate report."[2] The Senate Report to which the Conference Report refers states:

> While a great deal of analysis exists of the requirements in the discipline of DNA, there exists little to no analysis of the remaining needs of the community outside of the area of DNA. Therefore . . . the Committee directs the Attorney General to provide [funds] to the National Academy of Sciences to create an independent Forensic Science Committee. This Committee shall include members of the forensics community representing operational crime laboratories, medical examiners, and coroners; legal experts; and other scientists as determined appropriate.[3]

The Senate Report also sets forth the charge to the Forensic Science Committee, instructing it to:

(1) assess the present and future resource needs of the forensic science community, to include State and local crime labs, medical examiners, and coroners;
(2) make recommendations for maximizing the use of forensic technologies and techniques to solve crimes, investigate deaths, and protect the public;
(3) identify potential scientific advances that may assist law enforcement in using forensic technologies and techniques to protect the public;
(4) make recommendations for programs that will increase the number of qualified forensic scientists and medical examiners available to work in public crime laboratories;
(5) disseminate best practices and guidelines concerning the collection and analysis of forensic evidence to help ensure quality and consistency in the use of forensic technologies and techniques to solve crimes, investigate deaths, and protect the public;
(6) examine the role of the forensic community in the homeland security mission;
(7) [examine] interoperability of Automated Fingerprint Information Systems [AFIS]; and
(8) examine additional issues pertaining to forensic science as determined by the Committee.[4]

In the fall of 2006, a committee was established by the National Academy of Sciences to implement this congressional charge. As recommended in the Senate Report, the persons selected to serve included members of the forensic science community, members of the legal community, and a

[1] P.L. No. 109-108, 119 Stat. 2290 (2005).
[2] H.R. REP. NO. 109-272, at 121 (2005) (Conf. Rep.).
[3] S. REP. NO. 109-88, at 46 (2005).
[4] Ibid.

diverse group of scientists. Operating under the project title "Identifying the Needs of the Forensic Science Community," the committee met on eight occasions: January 25-26, April 23-24, June 5-6, September 20-21, and December 6-7, 2007, and March 24-25, June 23-24, and November 14-15, 2008. During these meetings, the committee heard expert testimony and deliberated over the information it heard and received. Between meetings, committee members reviewed numerous published materials, studies, and reports related to the forensic science disciplines, engaged in independent research on the subject, and worked on drafts of the final report.

Experts who provided testimony included federal agency officials; academics and research scholars; private consultants; federal, state, and local law enforcement officials; scientists; medical examiners; a coroner; crime laboratory officials from the public and private sectors; independent investigators; defense attorneys; forensic science practitioners; and leadership of professional and standard setting organizations (see the Acknowledgments and Appendix B for a complete listing of presenters).

The issues covered during the committee's hearings and deliberations included:

(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.

The testimonial and documentary evidence considered by the committee was detailed, complex, and sometimes controversial. Given this reality, the committee could not possibly answer every question that it confronted, nor could it devise specific solutions for every problem that it identified. Rather, it reached a consensus on the most important issues now facing the forensic science community and medical examiner system and agreed on 13 specific recommendations to address these issues.

Challenges Facing the Forensic Science Community

For decades, the forensic science disciplines have produced valuable evidence that has contributed to the successful prosecution and conviction of criminals as well as to the exoneration of innocent people. Over the last two decades, advances in some forensic science disciplines, especially the use of DNA technology, have demonstrated that some areas of forensic science have great additional potential to help law enforcement identify criminals. Many crimes that may have gone unsolved are now being solved because forensic science is helping to identify the perpetrators.

Those advances, however, also have 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. Moreover, imprecise or exaggerated expert testimony has sometimes contributed to the admission of erroneous or misleading evidence.

Further advances in the forensic science disciplines will serve three important purposes. First, further improvements will assist law enforcement officials in the course of their investigations to identify perpetrators with higher reliability. Second, further improvements in forensic science practices should reduce the occurrence of wrongful convictions, which reduces the risk that true offenders continue to commit crimes while innocent persons inappropriately serve time. Third, any improvements in the forensic science disciplines will undoubtedly enhance the Nation's ability to address the needs of homeland security.

Numerous professionals in the forensic science community and the medical examiner system have worked for years to achieve excellence in their fields, aiming to follow high ethical norms, develop sound professional standards, ensure accurate results in their practices, and improve the processes by which accuracy is determined. Although the work of these dedicated professionals has resulted in significant progress in the forensic science disciplines in recent decades, major challenges still face the forensic science community. It is therefore unsurprising that Congress instructed this committee to, among other things, "assess the present and future resource needs of the forensic science community," "make recommendations for maximizing the use of forensic technologies and techniques," "make recommendations for programs that will increase the number of qualified forensic scientists and medical examiners," and "disseminate best practices and guidelines concerning the collection and analysis of forensic evidence to help ensure quality and consistency in the use of forensic technologies and techniques." These are among the pressing issues facing the forensic science community. The best professionals in the forensic science disciplines invariably are hindered in their work because these and other problems persist.

The length of the congressional charge and the complexity of the material under review made the committee's assignment challenging. In undertaking it, the committee first had to gain an understanding of the various disciplines within the forensic science community, as well as the community's history, its strengths and weaknesses, and the roles of the people and agencies that constitute the community and make use of its services. In so doing, the committee was able to better comprehend some of the major problems facing the forensic science community and the medical examiner system. A brief review of some of these problems is illuminating.[5]

Disparities in the Forensic Science Community

There are great disparities among existing forensic science operations in federal, state, and local law enforcement jurisdictions and agencies. This is true with respect to funding, access to analytical instrumentation, the availability of skilled and well-trained personnel, certification, accreditation, and oversight. As a result, it is not easy to generalize about current practices within the forensic science community. It is clear, however, that any approach to overhauling the existing system needs to address and help minimize the community's current fragmentation and inconsistent practices.

Although the vast majority of criminal law enforcement is handled by state and local jurisdictions, these entities often are sorely lacking in the resources (money, staff, training, and equipment) necessary to promote and maintain strong forensic science laboratory systems. By comparison, federal programs are often much better funded and staffed. It is also noteworthy that the resources, the extent of services, and the amount of expertise that medical examiners and forensic pathologists can provide vary widely in different jurisdictions. As a result, the depth, reliability, and overall quality of substantive information arising from the forensic examination of evidence available to the legal system vary substantially across the country.

Lack of Mandatory Standardization, Certification, and Accreditation

The fragmentation problem is compounded because operational principles and procedures for many forensic science disciplines are not standardized or embraced, either between or within jurisdictions. There is no uniformity in the certification of forensic practitioners, or in the

[5] In this report, the "forensic science community," broadly speaking, is meant to include forensic pathology and medicolegal death investigation, which is sometimes referred to as "the medical examiner system" or "the medicolegal death investigation system."

accreditation of crime laboratories. Indeed, 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. Often there are no standard protocols governing forensic practice in a given discipline. And, even when protocols are in place (e.g., SWG standards), they often are vague and not enforced in any meaningful way. In short, the quality of forensic practice in most disciplines varies greatly because of the absence of adequate training and continuing education, rigorous mandatory certification and accreditation programs, adherence to robust performance standards, and effective oversight.[6] These shortcomings obviously pose a continuing and serious threat to the quality and credibility of forensic science practice.

The Broad Range of Forensic Science Disciplines

The term "forensic science" encompasses a broad range of forensic disciplines, each with its own set of technologies and practices. In other words, there is wide variability across forensic science disciplines with regard to techniques, methodologies, reliability, types and numbers of potential errors, research, general acceptability, and published material. Some of the forensic science disciplines are laboratory based (e.g., nuclear and mitochondrial DNA analysis, toxicology and drug analysis); others are based on expert interpretation of observed patterns (e.g., fingerprints, writing samples, toolmarks, bite marks, and specimens such as hair). The "forensic science community," in turn, consists of a host of practitioners, including scientists (some with advanced degrees) in the fields of chemistry, biochemistry, biology, and medicine; laboratory technicians; crime scene investigators; and law enforcement officers. There are very important differences, however, between forensic laboratory work and crime scene investigations. There are also sharp distinctions between forensic practitioners who have been trained in chemistry, biochemistry, biology, and medicine (and who bring these disciplines to bear in their work) and technicians who lend support to forensic science enterprises. Many of these differences are discussed in the body of this report.

The committee decided early in its work that it would not be feasible to develop a detailed evaluation of each discipline in terms of its scientific underpinning, level of development, and ability to provide evidence to address the major types of questions raised in criminal prosecutions and civil litigation. However, the committee solicited testimony on a broad range of forensic science disciplines and sought to identify issues relevant across definable classes of disciplines. As a result of listening to this testimony and reviewing related written materials, the committee found substantial evidence indicating that the level of scientific development and evaluation varies substantially among the forensic science disciplines.

Problems Relating to the Interpretation of Forensic Evidence

Often in criminal prosecutions and civil litigation, forensic evidence is offered to support conclusions about "individualization" (sometimes referred to as "matching" a specimen to a particular individual or other source) or about classification of the source of the specimen into one of several categories. 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. In terms of scientific basis, the analytically based disciplines generally hold a notable edge over disciplines based on expert interpretation. But there are important variations among the disciplines relying on expert

[6] See, e.g., P.C. Giannelli, 2007. Wrongful convictions and forensic science: The need to regulate crime labs. 86 N.C. L. REV. 163 (2007); B. Schmitt and J. Swickard. 2008. "Detroit Police Lab Shut Down After Probe Finds Errors." *Detroit Free Press.* September 25.

interpretation. For example, there are more established protocols and available research for fingerprint analysis than for the analysis of bite marks. There also are significant variations within each discipline. For example, not all fingerprint evidence is equally good, because the true value of the evidence is determined by the quality of the latent fingerprint image. These disparities between and within the forensic science disciplines highlight a major problem in the forensic science community: The simple reality is that the interpretation of forensic evidence is not always based on scientific studies to determine its validity. This is a serious problem. Although research has been done in some disciplines, there is a notable dearth of peer-reviewed, published studies establishing the scientific bases and validity of many forensic methods.[7]

The Need for Research to Establish Limits and Measures of Performance

In evaluating the accuracy of a forensic analysis, it is crucial to clarify the type of question the analysis is called on to address. Thus, although some techniques may be too imprecise to permit accurate identification of a specific individual, they may still provide useful and accurate information about questions of classification. For example, microscopic hair analysis may provide reliable evidence on some characteristics of the individual from which the specimen was taken, but it may not be able to reliably match the specimen with a specific individual. However, the definition of the appropriate question is only a first step in the evaluation of the performance of a forensic technique. A body of research is required to establish the limits and measures of performance and to address the impact of sources of variability and potential bias. Such research is sorely needed, but it seems to be lacking in most of the forensic disciplines that rely on subjective assessments of matching characteristics. These disciplines need to develop rigorous protocols to guide these subjective interpretations and pursue equally rigorous research and evaluation programs. The development of such research programs can benefit significantly from other areas, notably from the large body of research on the evaluation of observer performance in diagnostic medicine and from the findings of cognitive psychology on the potential for bias and error in human observers.[8]

The Admission of Forensic Science Evidence in Litigation

Forensic science experts and evidence are used routinely in the service of the criminal justice system. DNA testing may be used to determine whether sperm found on a rape victim came from an accused party; a latent fingerprint found on a gun may be used to determine whether a defendant handled the weapon; drug analysis may be used to determine whether pills found in a person's possession were illicit; and an autopsy may be used to determine the cause and manner of death of a murder victim. In order for qualified forensic science experts to testify competently about forensic evidence, they must first find the evidence in a usable state and properly preserve it. A latent fingerprint that is badly smudged when found cannot be usefully saved, analyzed, or explained. An

[7] Several articles, for example, have noted the lack of scientific validation of fingerprint identification methods. See, e.g., J. J. Kochler. Fingerprint error rates and proficiency tests: What they are and why they matter. 59 HASTINGS L.J. 1077 (2008); L. Haber and R.N. Haber. 2008. Scientific validation of fingerprint evidence under *Daubert*. *Law, Probability and Risk* 7(2):87; J.L. Mnookin. 2008. The validity of latent fingerprint identification: Confessions of a fingerprinting moderate. *Law, Probability and Risk* 7(2):127.

[8] The findings of forensic science experts are vulnerable to cognitive and contextual bias. See, e.g., I.E. Dror, D. Charlton, and A.E. Péron. 2006. Contextual information renders experts vulnerable to making erroneous identifications. *Forensic Science International* 156:74, 77. ("Our study shows that it is possible to alter identification decisions on the same fingerprint, solely by presenting it in a different context."); I.E. Dror and D. Charlton. 2006. Why experts make errors. *Journal of Forensic Identification* 56(4):600; Giannelli, *supra* note 6, pp. 220-222. Unfortunately, at least to date, there is no good evidence to indicate that the forensic science community has made a sufficient effort to address the bias issue; thus, it is impossible for the committee to fully assess the magnitude of the problem.

inadequate drug sample may be insufficient to allow for proper analysis. And, DNA tests performed on a contaminated or otherwise compromised sample cannot be used reliably to identify or eliminate an individual as the perpetrator of a crime. These are important matters involving the proper processing of forensic evidence. The law's greatest dilemma in its heavy reliance on forensic evidence, however, concerns the question of whether—and to what extent—there is *science* in any given forensic science discipline.

Two very important questions should underlie the law's 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. These questions are significant. Thus, it matters a great deal whether an expert is qualified to testify about forensic evidence and whether the evidence is sufficiently reliable to merit a fact finder's reliance on the truth that it purports to support. Unfortunately, these important questions do not always produce satisfactory answers in judicial decisions pertaining to the admissibility of forensic science evidence proffered in criminal trials.

In 1993, in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,[9] the Supreme Court ruled that, under Rule 702 of the Federal Rules of Evidence (which covers both civil trials and criminal prosecutions in the federal courts), a "trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable."[10] The Court indicated that the subject of an expert's testimony should be scientific knowledge, so that "evidentiary reliability will be based upon scientific validity."[11] The Court also emphasized that, in considering the admissibility of evidence, a trial judge should focus "solely" on the expert's "principles and methodology," and "not on the conclusions that they generate."[12] In sum, *Daubert*'s requirement that an expert's testimony pertain to "scientific knowledge" established a standard of "evidentiary reliability."[13]

In explaining this evidentiary standard, the *Daubert* Court pointed to several factors that might be considered by a trial judge: (1) whether a theory or technique can be (and has been) tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) the known or potential rate of error of a particular scientific technique; (4) the existence and maintenance of standards controlling the technique's operation; and (5) a scientific technique's degree of acceptance within a relevant scientific community.[14] In the end, however, the Court emphasized that the inquiry under Rule 702 is "a flexible one."[15] The Court expressed confidence in the adversarial system, noting that "[v]igorous cross-examination, presentation of contrary evidence, and careful instruction

[9] 509 U.S. 579 (1993).
[10] Ibid., p. 589.
[11] Ibid., pp. 590 and 591 n.9 (emphasis omitted).
[12] Ibid., p. 595. In *General Electric Co. v. Joiner*, 522 U.S. 136, 146 (1997), the Court added: "[C]onclusions and methodology are not entirely distinct from one another. Trained experts commonly extrapolate from existing data. But nothing in *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert."
[13] *Daubert*, 509 U.S. at 589, 590 n.9, 595.
[14] Ibid., pp. 593-94.
[15] Ibid., p. 594. *In Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137 (1999), the Court confirmed that the *Daubert* factors do not constitute a definitive checklist or test. *Kumho Tire* importantly held that Rule 702 applies to both scientific and nonscientific expert testimony; the Court also indicated that the *Daubert* factors might be applicable in a trial judge's assessment of the reliability of nonscientific expert testimony, depending upon "the particular circumstances of the particular case at issue." Ibid., at 150.

on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."[16] The Supreme Court has made it clear that trial judges have great discretion in deciding on the admissibility of evidence under Rule 702, and that appeals from *Daubert* rulings are subject to a very narrow abuse-of-discretion standard of review.[17] Most importantly, in *Kumho Tire Co., Ltd. v. Carmichael*, the Court stated that "whether *Daubert*'s specific factors are, or are not, reasonable measures of reliability in a particular case is a matter that the law grants the trial judge broad latitude to determine."[18]

Daubert and its progeny have engendered confusion and controversy. In particular, judicial dispositions of *Daubert*-type questions in criminal cases have been criticized by some lawyers and scholars who thought that the Supreme Court's decision would be applied more rigorously.[19] If one focuses solely on reported federal appellate decisions, the picture is not appealing to those who have preferred a more rigorous application of *Daubert*. Federal appellate courts have not with any consistency or clarity imposed standards ensuring the application of scientifically valid reasoning and reliable methodology in criminal cases involving *Daubert* questions. This is not really surprising, however. The Supreme Court itself described the *Daubert* standard as "flexible." This means that, beyond questions of relevance, *Daubert* offers appellate courts no clear substantive standard by which to review decisions by trial courts. As a result, trial judges exercise great discretion in deciding whether to admit or exclude expert testimony, and their judgments are subject only to a highly deferential "abuse of discretion" standard of review. Although it is difficult to get a clear picture of how trial courts handle *Daubert* challenges, because many evidentiary rulings are issued without a published opinion and without an appeal, the vast majority of the *reported* opinions in criminal cases indicate that trial judges rarely exclude or restrict expert testimony offered by prosecutors; most *reported* opinions also indicate that appellate courts routinely deny appeals contesting trial court decisions admitting forensic evidence against criminal defendants.[20] But the reported opinions do not offer in any way a complete sample of federal trial court dispositions of *Daubert*-type questions in criminal cases.

The situation appears to be very different in civil cases. Plaintiffs and defendants, equally, are more likely to have access to expert witnesses in civil cases, while prosecutors usually have an advantage over most defendants in offering expert testimony in criminal cases. And, ironically, the appellate courts appear to be more willing to second-guess trial court judgments on the admissibility of purported scientific evidence in civil cases than in criminal cases.[21]

Prophetically, the *Daubert* decision observed that "there are important differences between the quest for truth in the courtroom and the quest for truth in the laboratory. Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and

[16] *Daubert*, 509 U.S. at 596.
[17] See *Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 142-143 (1997).
[18] *Kumho Tire*, 526 U.S. at 153.
[19] See, e.g., P.J. Neufeld. 2005. The (near) irrelevance of *Daubert* to criminal justice: And some suggestions for reform. *American Journal of Public Health* 95(Supp.1):S107.
[20] Ibid., p. S109.
[21] See, e.g., *McClain v. Metabolife Int'l, Inc.*, 401 F.3d 1233 (11th Cir. 2005); *Chapman v. Maytag Corp.*, 297 F.3d 682 (7th Cir. 2002); *Goebel v. Denver & Rio Grande W. R.R. Co.*, 215 F.3d 1083 (10th Cir. 2000); *Smith v. Ford Motor Co.*, 215 F.3d 713 (7th Cir. 2000); *Walker v. Soo Line R.R. Co.*, 208 F.3d 581 (7th Cir. 2000); 1 D.L. Faigman, M.J. Saks, J. Sanders, and E.K. Cheng. 2007-2008. *Modern Scientific Evidence: The Law and Science of Expert Testimony*. Eagan, MN: Thomson/West, § 1.35, p. 105 (discussing studies suggesting that courts "employ *Daubert* more lackadaisically in criminal trials–especially in regard to prosecution evidence—than in civil cases—especially in regard to plaintiff evidence").

quickly."[22] But because accused parties in criminal cases are convicted on the basis of testimony from forensic science experts, much depends upon whether the evidence offered is reliable. Furthermore, in addition to protecting innocent persons from being convicted of crimes that they did not commit, we are also seeking to protect society from persons who have committed criminal acts. Law enforcement officials and the members of society they serve need to be assured that forensic techniques are *reliable*. Therefore, 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."[23] 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."[24]

The adversarial process relating to the admission and exclusion of scientific evidence is not suited to the task of 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. Judicial review, by itself, will not cure the infirmities of the forensic science community.[25] The development of scientific research, training, technology, and databases associated with DNA analysis have resulted from substantial and steady federal support for both academic research and programs employing techniques for DNA analysis. Similar support must be given to all credible forensic science disciplines if they are to achieve the degrees of reliability needed to serve the goals of justice. With more and better educational programs, accredited laboratories, certified forensic practitioners, sound operational principles and procedures, and serious research to establish the limits and measures of performance in each discipline, forensic science experts will be better able to analyze evidence and coherently report their findings in the courts. The current situation, however, is seriously wanting, both because of the limitations of the judicial system and because of the many problems faced by the forensic science community.

Political Realities

Most forensic science methods, programs, and evidence are within the regulatory province of state and local law enforcement entities or are covered by statutes and rules governing state judicial proceedings. Thus, in assessing the strengths, weaknesses, and future needs of forensic disciplines,

[22] *Daubert*, 509 U.S. at 596-97.

[23] J. Griffin and D.J. LaMagna. 2002. *Daubert* challenges to forensic evidence: Ballistics next on the firing line. *The Champion*, September-October;20, 21 (quoting P. Giannelli and E. Imwinkelried, 2000. Scientific evidence: The fallout from Supreme Court's decision in *Kumho Tire*. *Criminal Justice Magazine* 14(4):12, 40).

[24] Ibid. See, e.g., *United States v. Crisp*, 324 F.3d 261, 270 (4th Cir. 2003) (noting "that while further research into fingerprint analysis would be welcome, to postpone present in-court utilization of this bedrock forensic identifier pending such research would be to make the best the enemy of the good." (internal quotation marks omitted)).

[25] See J.L. Mnookin. Expert evidence, partisanship, and epistemic competence. 73 BROOK. L. REV. 1009, 1033 (2008) ("[S]o long as we have our adversarial system in much its present form, we are inevitably going to be stuck with approaches to expert evidence that are imperfect, conceptually unsatisfying, and awkward. It may well be that the real lesson is this: those who believe that we might ever fully resolve—rather than imperfectly manage—the deep structural tensions surrounding both partisanship and epistemic competence that permeate the use of scientific evidence within our legal system are almost certainly destined for disappointment.").

and in making recommendations for improving the use of forensic technologies and techniques, the committee remained mindful of the fact that Congress cannot directly fix all of the deficiencies in the forensic science community. Under our federal system of government, Congress does not have free reign to amend state criminal codes, rules of evidence, and statutes governing civil actions; nor may it easily and directly regulate local law enforcement practices, state and local medical examiner units, or state policies covering the accreditation of crime laboratories and the certification of forensic practitioners.

Congress' authority to act is significant, however. Forensic science programs in federal government entities—whether within DOJ, DHS, DOD, or the Department of Commerce (DOC)—are funded by congressional appropriations. If these programs are required to operate pursuant to the highest standards, they will provide an example for the states. More importantly, Congress can promote "best practices" and strong educational, certification, accreditation, ethics, and oversight programs in the states by offering funds that are contingent on meeting appropriate standards of practice. There is every reason to believe that offers of federal funds with "strings attached" can effect significant change in the forensic science community, because so many state and local programs currently are suffering for want of adequate resources. In the end, however, the committee recognized that state and local authorities must be willing to enforce change if it is to happen.

In light of the foregoing issues, the committee exercised caution before drawing conclusions and avoided being too prescriptive in its recommendations. It also recognized that, given the complexity of the issues and the political realities that may pose obstacles to change, some recommendations will have to be implemented creatively and over time in order to be effective.

FINDINGS AND RECOMMENDATIONS

The Fragmented System: Symptoms and Cures

The forensic science disciplines currently are an assortment of methods and practices used in both the public and private arenas. Forensic science facilities exhibit wide variability in capacity, oversight, staffing, certification, and accreditation across federal and state jurisdictions. Too often they have inadequate educational programs, and they typically lack mandatory and enforceable standards, founded on rigorous research and testing, certification requirements, and accreditation programs. Additionally, forensic science and forensic pathology research, education, and training lack strong ties to our research universities and national science assets. In addition to the problems emanating from the fragmentation of the forensic science community, the most recently published *Census of Crime Laboratories* conducted by BJS describes unacceptable case backlogs in state and local crime laboratories and estimates the level of additional resources needed to handle these backlogs and prevent their recurrence. Unfortunately, the backlogs, even in DNA case processing, have grown dramatically in recent years and are now staggering in some jurisdictions. The most recently published BJS *Special Report of Medical Examiners and Coroners' Offices* also depicts a system with disparate and often inadequate educational and training requirements, resources, and capacities—in short, a system in need of significant improvement.

Existing data suggest that forensic laboratories are under resourced and understaffed, which contributes to case backlogs and likely makes it difficult for laboratories to do as much as they could to (1) inform investigations, (2) provide strong evidence for prosecutions, and (3) avoid errors that could lead to imperfect justice. Being under resourced also means that the tools of forensic science—and the knowledge base that underpins the analysis and interpretation of evidence—are not

as strong as they could be, thus hindering the ability of the forensic science disciplines to excel at informing investigations, providing strong evidence, and avoiding errors in important ways. NIJ is the only federal agency that provides direct support to crime laboratories to alleviate the backlog, and those funds are minimal. The forensic science system is under resourced also in the sense that it has only thin ties to an academic research base that could support the forensic science disciplines and fill knowledge gaps. There are many hard-working and conscientious people in the forensic science community, but this under resourcing inherently limits their ability to do their best work. Additional resources surely will be necessary to create high-quality, self-correcting systems.

However, increasing the staff within existing crime laboratories and medical examiners' offices is only part of the solution. What also is needed is an upgrading of systems and organizational structures, better training, the widespread adoption of uniform and enforceable best practices, and mandatory certification and accreditation programs. The forensic science community and the medical examiner/coroner system must be upgraded if forensic practitioners are to be expected to serve the goals of justice.

Of the various facets of under resourcing, the committee is most concerned about the knowledge base. Adding more dollars and people to the enterprise might reduce case backlogs, but it will not address fundamental limitations in the capabilities of forensic science disciplines to discern valid information from crime scene evidence. For the most part, it is impossible to discern the magnitude of those limitations, and reasonable people will differ on their significance.

Forensic science research is not well supported, and there is no unified strategy for developing a forensic science research plan across federal agencies. Relative to other areas of science, the forensic disciplines have extremely limited opportunities for research funding. Although the FBI and NIJ have supported some research in forensic science, the level of support has been well short of what is necessary for the forensic science community to establish strong links with a broad base of research universities. Moreover, funding for academic research is limited and requires law enforcement collaboration, which can inhibit the pursuit of more fundamental scientific questions essential to establishing the foundation of forensic science. The broader research community generally is not engaged in conducting research relevant to advancing the forensic science disciplines.

The forensic science enterprise also is hindered by its extreme disaggregation—marked by multiple types of practitioners with different levels of education and training and different professional cultures and standards for performance and a reliance on apprentice-type training and a guild-like structure of disciplines, which work against the goal of a single forensic science profession. Many forensic scientists are given scant opportunity for professional activities, such as attending conferences or publishing their research, which could help strengthen the professional community and offset some of the disaggregation. The fragmented nature of the enterprise raises the worrisome prospect that the quality of evidence presented in court, and its interpretation, can vary unpredictably according to jurisdiction.

Numerous professional associations are organized around the forensic science disciplines, and many of them are involved in training and education (see Chapter 8) and are developing standards and accreditation and certification programs (see Chapter 7). The efforts of these groups are laudable. However, except for the largest organizations, it is not clear how these associations interact or the extent to which they share requirements, standards, or policies. Thus, there is a need for more consistent and harmonized requirements.

In the course of its deliberations and review of the forensic science enterprise, it became obvious to the committee that, although congressional action will not remedy all of the deficiencies in forensic science methods and practices, truly meaningful advances will not come without

significant concomitant leadership from the federal government. The forensic science enterprise lacks the necessary governance structure to pull itself up from its current weaknesses. Of the many professional societies that serve the enterprise, none is dominant, and none has clearly articulated the need for change or presented a vision for accomplishing it. And clearly no municipal or state forensic office has the mandate to lead the entire enterprise. The major federal resources—NIJ and the FBI Laboratory—have provided modest leadership, for which they should be commended: NIJ has contributed a helpful research program and the FBI Laboratory has spearheaded the SWGs. But again, neither entity has recognized, let alone articulated, a need for change or a vision for achieving it. Neither has the 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.

The forensic science enterprise needs strong governance to adopt and promote an aggressive, long-term agenda to help strengthen the forensic science disciplines. 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 to effect meaningful advances in forensic science practices. The governance structure must be able to create appropriate incentives for jurisdictions to adopt and adhere to best practices and promulgate the necessary sanctions to discourage bad practices. It must have influence with educators in order to effect improvements to forensic science education. It must be able to identify standards and enforce them. A governance entity must be geared toward (and be credible within) the law enforcement community, but it must have strengths that extend beyond that area. Oversight of the forensic science community and medical examiner system will sweep broadly into areas of criminal investigation and prosecution, civil litigation, legal reform, investigation of insurance claims, national disaster planning and preparedness, homeland security, certification of federal, state, and local forensic practitioners, public health, accreditation of public and private laboratories, research to improve forensic methodologies, education programs in colleges and universities, and advancing technology.

The committee considered whether such a governing entity could be established within an existing federal agency. The National Science Foundation (NSF) was considered because of its strengths in leading research and its connections to the research and education communities. NSF is surely capable of building and sustaining a research base, but it has very thin ties to the forensic science community. It would be necessary for NSF to take many untested steps if it were to assume responsibility for the governance of applied fields of science. The committee also considered NIST. In the end analysis, however, NIST did not appear to be a viable option. It has a good program of research targeted at forensic science and law enforcement, but the program is modest. NIST also has strong ties to industry and academia, and it has an eminent history in standard setting and method development. But its ties to the forensic science community are still limited, and it would not be seen as a natural leader by the scholars, scientists, and practitioners in the field. In sum, the committee concluded that neither NSF nor NIST has the breadth of experience or institutional capacity to establish an effective governance structure for the forensic science enterprise.

There was also a strong consensus in the committee that no existing or new division or unit within DOJ would be an appropriate location for a new entity governing the forensic science community. DOJ's principal mission is to enforce the law and defend the interests of the United States according to the law. Agencies within DOJ operate pursuant to this mission. The FBI, for example, is the investigative arm of DOJ and its principal missions are to produce and use intelligence to protect the Nation from threats and to bring to justice those who violate the law. The work of these law enforcement units is critically important to the Nation, but the scope of the work

done by DOJ units is much narrower than the promise of a strong forensic science community. Forensic science serves more than just law enforcement; and when it does serve law enforcement, it must be equally available to law enforcement officers, prosecutors, *and* defendants in the criminal justice system. The entity that is established to govern the forensic science community cannot be principally beholden to law enforcement. The potential for conflicts of interest between the needs of law enforcement and the broader needs of forensic science are too great. In addition, the committee determined that the research funding strategies of DOJ have not adequately served the broad needs of the forensic science community. This is understandable, but not acceptable when the issue is whether an agency is best suited to support and oversee the Nation's forensic science community. In sum, the committee concluded that advancing *science* in the forensic science enterprise is not likely to be achieved within the confines of DOJ.

Furthermore, there is little doubt that some existing federal entities are too wedded to the current "fragmented" forensic science community, which is deficient in too many respects. Most notably, these existing agencies have failed to pursue a rigorous research agenda to confirm the evidentiary reliability of methodologies used in a number of forensic science disciplines. These agencies are not good candidates to oversee the overhaul of the forensic science community in the United States.

Finally, some existing federal agencies with other missions occasionally have undertaken projects affecting the forensic science community. These entities are better left to continue the good work that defines their principal missions. More responsibility is not better for these existing entities, nor would it be better for the forensic science community or the Nation.

The committee thus concluded that the problems at issue are too serious and important to be subsumed by an existing federal agency. It also concluded that no existing federal agency has the capacity or appropriate mission to take on the roles and responsibilities needed to govern and improve the forensic science enterprise.

The committee believes that what is needed to support and oversee the forensic science community is a new, strong, and independent entity that could take on the tasks that would be assigned to it in a manner that is as objective and free of bias as possible—one with no ties to the past and with the authority and resources to implement a fresh agenda designed to address the problems found by the committee and discussed in this report. A new organization should not be encumbered by the assumptions, expectations, and deficiencies of the existing fragmented infrastructure, which has failed to address the needs and challenges of the forensic science disciplines.

This new entity must be an independent federal agency established to address the needs of the forensic science community, and it must meet the following minimum criteria:

- It must have a culture that is strongly rooted in science, with strong ties to the national research and teaching communities, including federal laboratories.
- It must have strong ties to state and local forensic entities as well as to the professional organizations within the forensic science community.
- It must not be in any way committed to the existing system, but should be informed by its experiences.
- It must not be part of a law enforcement agency.
- It must have the funding, independence, and sufficient prominence to raise the profile of the forensic science disciplines and push effectively for improvements.

- It must be led by persons who are skilled and experienced in developing and executing national strategies and plans for standard setting; managing accreditation and testing processes; and developing and implementing rulemaking, oversight, and sanctioning processes.

No federal agency currently exists that meets all of these criteria.

Recommendation 1:

To promote the development of forensic science into a mature field of multidisciplinary research and practice, founded on the systematic collection and analysis of relevant data, Congress should establish and appropriate funds for an independent federal entity, the National Institute of Forensic Science (NIFS). NIFS should have a full-time administrator and an advisory board with expertise in research and education, the forensic science disciplines, physical and life sciences, forensic pathology, engineering, information technology, measurements and standards, testing and evaluation, law, national security, and public policy. NIFS should focus on:

(a) establishing and enforcing best practices for forensic science professionals and laboratories;
(b) establishing standards for the mandatory accreditation of forensic science laboratories and the mandatory certification of forensic scientists and medical examiners/forensic pathologists—and identifying the entity/entities that will develop and implement accreditation and certification;
(c) promoting scholarly, competitive peer-reviewed research and technical development in the forensic science disciplines and forensic medicine;
(d) developing a strategy to improve forensic science research and educational programs, including forensic pathology;
(e) establishing a strategy, based on accurate data on the forensic science community, for the efficient allocation of available funds to give strong support to forensic methodologies and practices in addition to DNA analysis;
(f) funding state and local forensic science agencies, independent research projects, and educational programs as recommended in this report, with conditions that aim to advance the credibility and reliability of the forensic science disciplines;
(g) overseeing education standards and the accreditation of forensic science programs in colleges and universities;
(h) developing programs to improve understanding of the forensic science disciplines and their limitations within legal systems; and
(i) assessing the development and introduction of new technologies in forensic investigations, including a comparison of new technologies with former ones.

The benefits that will flow from a strong, independent, strategic, coherent, and well-funded federal program to support and oversee the forensic science disciplines in this country are clear: The Nation will (1) bolster its ability to more accurately identify true perpetrators and exclude those who are falsely accused; (2) improve its ability to effectively respond to, attribute, and prosecute threats to homeland security; and (3) reduce the likelihood of convictions resting on inaccurate data. Moreover, establishing the scientific foundation of the forensic science disciplines, providing better education and training, and requiring certification and accreditation will position the forensic science community to take advantage of current and future scientific advances.

The creation of a new federal entity undoubtedly will pose challenges, not the least of which will be budgetary constraints. The committee is not in a position to estimate how much it will cost to implement the recommendations in this report; this is a matter best left to the expertise of the Congressional Budget Office. What is clear, however, is that Congress must take aggressive action if the worst ills of the forensic science community are to be cured. Political and budgetary concerns should not deter bold, creative, and forward-looking action, because the country cannot afford to suffer the consequences of inaction. It will also take time and patience to implement the recommendations in this report. But this is true with any large, complex, important, and challenging enterprise.

The committee strongly believes that the greatest hope for success in this enterprise will come with the creation of the National Institute of Forensic Science (NIFS) to oversee and direct the forensic science community. The remaining recommendations in this report are crucially tied to the creation of NIFS. However, each recommendation is a separate, essential piece of the plan to improve the forensic science community in the United States. Therefore, even if the creation of NIFS is forestalled, the committee vigorously supports the adoption of the core ideas and principles embedded in each of the following recommendations.

Standardized Terminology and Reporting

The terminology used in reporting and testifying about the results of forensic science investigations must be standardized. Many terms are used by forensic scientists in scientific reports and in court testimony that describe findings, conclusions, and degrees of association between evidentiary material (e.g., hairs, fingerprints, fibers) and particular people or objects. Such terms include, but are not limited to "match," "consistent with," "identical," "similar in all respects tested," and "cannot be excluded as the source of." The use of such terms can and does have a profound effect on how the trier of fact in a criminal or civil matter perceives and evaluates scientific evidence. Although some forensic science disciplines have proposed reporting vocabulary and scales, the use of the recommended language is not standard practice among forensic science practitioners.

As a general matter, laboratory reports generated as the result of a scientific analysis should be complete and thorough. They should contain, at minimum, "methods and materials," "procedures," "results," "conclusions," and, as appropriate, sources and magnitudes of uncertainty in the procedures and conclusions (e.g., levels of confidence). Some forensic science laboratory reports meet this standard of reporting, but many do not. Some reports contain only identifying and agency information, a brief description of the evidence being submitted, a brief description of the types of analysis requested, and a short statement of the results (e.g., "the greenish, brown plant material in item #1 was identified as marijuana"), and they include no mention of methods or any discussion of measurement uncertainties.

Many clinical and testing disciplines outside the forensic science disciplines have standards, templates, and protocols for data reporting. A good example is the ISO/IEC 17025 standard

(commonly called "ISO 17025"). ISO 17025 is an international standard published by the International Organization for Standardization (ISO) that specifies the general requirements for the competence to carry out tests and/or calibrations. These requirements have been used by accrediting agencies to determine what a laboratory must do to secure accreditation. In addition, some SWGs in the forensic disciplines have scoring systems for reporting findings, but these systems are neither uniformly nor consistently used. In other words, although appropriate standards exist, they are not always followed. Forensic reports, and any courtroom testimony stemming from them, must include clear characterizations of the limitations of the analyses, including measures of uncertainty in reported results and associated estimated probabilities where possible.

Recommendation 2:

The National Institute of Forensic Science (NIFS), after reviewing established standards such as ISO 17025, and in consultation with its advisory board, should establish standard terminology to be used in reporting on and testifying about the results of forensic science investigations. Similarly, it should establish model laboratory reports for different forensic science disciplines and specify the minimum information that should be included. As part of the accreditation and certification processes, laboratories and forensic scientists should be required to utilize model laboratory reports when summarizing the resnlts of their analyses.

More and Better Research

As noted above, some forensic science disciplines are supported by little rigorous systematic research to validate the discipline's basic premises and techniques. There is no evident reason why such research cannot be conducted. Much more federal funding is needed to support research in the forensic science disciplines and forensic pathology in universities and private laboratories committed to such work.

The forensic science and medical examiner communities will be improved by opportunities to collaborate with the broader science and engineering communities. In particular, there is an urgent need for collaborative efforts to (1) develop new technical methods or provide in-depth grounding for advances developed in the forensic science disciplines; (2) provide an interface between the forensic science and medical examiner communities and basic sciences; and (3) create fertile ground for discourse among the communities. NIFS should recommend, implement, and guide strategies for supporting such initiatives.

Recommendation 3:

Research is needed to address issues of accnracy, reliability, and validity in the forensic science disciplines. The National Institute of Forensic Science (NIFS) should competitively fund peer-reviewed research in the following areas:

- **(a) Stndies establishing the scientific bases demonstrating the validity of forensic methods.**
- **(b) The development and establishment of quantifiable measures of the reliability and accuracy of forensic analyses. Studies of the reliability and accuracy of forensic techniques should reflect actual practice on realistic**

case scenarios, averaged across a representative sample of forensic scientists and laboratories. Studies also should establish the limits of reliability and accuracy that analytic methods can be expected to achieve as the conditions of forensic evidence vary. The research by which measures of reliability and accuracy are determined should be peer reviewed and published in respected scientific journals.

(c) The development of quantifiable measures of uncertainty in the conclnsions of forensic analyses.

(d) Automated techniques capable of enhancing forensic technologies.

To answer questions regarding the reliability and accuracy of a forensic analysis, the research needs to distinguish between average performance (achieved across individual practitioners and laboratories) and individual performance (achieved by the specific practitioner and laboratory). Whether a forensic procedure is sufficient under the rules of evidence governing criminal and civil litigation raises difficult legal issues that are outside the realm of scientific inquiry. (Some of the legal issues are addressed in Chapter 3.)

Best Practices and Standards

Although there have been notable efforts to achieve standardization and develop best practices in some forensic science disciplines and the medical examiner system, most disciplines still lack best practices or any coherent structure for the enforcement of operating standards, certification, and accreditation. Standards and codes of ethics exist in some fields, and there are some functioning certification and accreditation programs, but none are mandatory. In short, oversight and enforcement of operating standards, certification, accreditation, and ethics are lacking in most local and state jurisdictions.

Scientific and medical assessment conducted in forensic investigations should be independent of law enforcement efforts either to prosecute criminal suspects or even to determine whether a criminal act has indeed been committed. Administratively, this means that forensic scientists should function independently of law enforcement administrators. The best science is conducted in a scientific setting as opposed to a law enforcement setting. Because forensic scientists often are driven in their work by a need to answer a particular question related to the issues of a particular case, they sometimes face pressure to sacrifice appropriate methodology for the sake of expediency.

Recommendation 4:

To improve the scientific bases of forensic science examinations and to maximize independence from or autonomy within the law enforcement community, Congress should authorize and appropriate incentive funds to the National Institute of Forensic Science (NIFS) for allocation to state and local jurisdictions for the purpose of removing all public forensic laboratories and facilities from the administrative control of law enforcement agencies or prosecutors' offices.

Recommendation 5:

The National Institute of Forensic Science (NIFS) should encourage research programs on human observer bias and sources of human error in forensic examinations. Such programs might include studies to determine the effects of contextual bias in forensic practice (e.g., studies to determine whether and to what extent the results of forensic analyses are influenced by knowledge regarding the background of the suspect and the investigator's theory of the case). In addition, research on sources of human error should be closely linked with research conducted to quantify and characterize the amount of error. Based on the results of these studies, and in consultation with its advisory board, NIFS should develop standard operating procedures (that will lay the foundation for model protocols) to minimize, to the greatest extent reasonably possible, potential bias and sonrces of human error in forensic practice. These standard operating procedures should apply to all forensic analyses that may be used in litigation.

Recommendation 6:

To facilitate the work of the National Institute of Forensic Science (NIFS), Congress should authorize and appropriate funds to NIFS to work with the National Institute of Standards and Technology (NIST), in conjunction with government laboratories, universities, and private laboratories, and in consultation with Scientific Working Groups, to develop tools for advancing measurement, validation, reliability, information sharing, and proficiency testing in forensic science and to establish protocols for forensic examinations, methods, and practices. Standards should reflect best practices and serve as accreditation tools for laboratories and as guides for the education, training, and certification of professionals. Upon completion of its work, NIST and its partners should report findings and recommendations to NIFS for further dissemination and implementation.

Quality Control, Assurance, and Improvement

In a field such as medical diagnostics, a health care provider typically can track a patient's progress to see whether the original diagnosis was accurate and helpful. For example, widely accepted programs of quality control ensure timely feedback involving the diagnoses that result from mammography. Other examples of quality assurance and improvement—including the development of standardized vocabularies, ontologies, and scales for interpreting diagnostic tests and developing standards for accreditation of services—pervade diagnostic medicine. This type of systematic and routine feedback is an essential element of any field striving for continuous improvement. The forensic science disciplines likewise must become a self-correcting enterprise, developing and implementing feedback loops that allow the profession to discover past mistakes. A particular need exists for routine, mandatory proficiency testing that emulates a realistic, representative cross-section of casework, for example, DNA proficiency testing.

Recommendation 7:

Laboratory accreditation and individual certification of forensic science professionals should be mandatory, and all forensic science professionals should have access to a certification process. In determining appropriate standards for accreditation and certification, the National Institute of Forensic Science (NIFS) should take into account established and recognized international staudards, such as those published by the International Organization for Standardization (ISO). No person (public or private) should be allowed to practice in a forensic science discipline or testify as a forensic science professional without certification. Certification requirements should include, at a minimum, written examinations, supervised practice, proficiency testing, continuing education, recertification procedures, adherence to a code of ethics, and effective disciplinary procedures. All laboratories and facilities (public or private) should be accredited, and all forensic science professionals should be certified, when eligible, within a time period established by NIFS.

Recommendation 8:

Forensic laboratories should establish routine quality assurance and quality control procedures to ensure the accuracy of forensic analyses and the work of forensic practitioners. Quality control procedures should be designed to identify mistakes, fraud, and bias; confirm the continued validity and reliability of standard operating procedures and protocols; ensure that best practices are being followed; and correct procedures and protocols that are found to need improvement.

Codes of Ethics

A number of forensic science organizations—such as AAFS, the Midwestern Association of Forensic Scientists, ASCLD, and NAME—have adopted codes of ethics. The codes that exist are sometimes comprehensive, but they vary in content. While there is no reason to doubt that many forensic scientists understand their ethical obligations and practice in an ethical way, there are no consistent mechanisms for enforcing any of the existing codes of ethics. Many jurisdictions do not require certification in the same way that, for example, states require lawyers to be licensed. Therefore, few forensic science practitioners face the threat of official sanctions or loss of certification for serious ethical violations. And it is unclear whether and to what extent forensic science practitioners are required to adhere to ethics standards as a condition of employment.

Recommendation 9:

The National Institute of Forensic Science (NIFS), in consultation with its advisory board, should establish a national code of ethics for all forensic science disciplines and encourage individual societies to incorporate this national code as part of their professional code of ethics. Additionally, NIFS should explore mechanisms of enforcement for those forensic scientists who commit serious ethical violations. Such a code could be enforced through a certification process for foreusic scieutists.

Insufficient Education and Training

Forensic science examiners need to understand the principles, practices, and contexts of scientific methodology, as well as the distinctive features of their specialty. Ideally, training should move beyond apprentice-like transmittal of practices to education based on scientifically valid principles. In addition to the practical experience and learning acquired during an internship, a trainee should acquire rigorous interdisciplinary education and training in the scientific areas that constitute the basis for the particular forensic discipline and instruction on how to document and report the analysis. A trainee also should have working knowledge of basic quantitative calculations, including statistics and probability, as needed for the applicable discipline.

To correct some of the existing deficiencies, it is crucially important to improve undergraduate and graduate forensic science programs. Legitimization of practices in forensic disciplines must be based on established scientific knowledge, principles, and practices, which are best learned through formal education. Apprenticeship has a secondary role, and under no circumstances can it supplant the need for the scientific basis of education in and the practice of forensic science.

In addition, lawyers and judges often have insufficient training and background in scientific methodology, and they often fail to fully comprehend the approaches employed by different forensic science disciplines and the reliability of forensic science evidence that is offered in trial. Such training is essential, because any checklist for the admissibility of scientific or technical testimony is imperfect. Conformance with items on a checklist can suggest that testimony is reliable, but it does not guarantee it. Better connections must be established and promoted between experts in the forensic science disciplines and law schools, legal scholars, and practitioners. The fruits of any advances in the forensic science disciplines should be transferred directly to legal scholars and practitioners (including civil litigators, prosecutors, and criminal defense counsel), federal, state, and local legislators, members of the judiciary, and law enforcement officials, so that appropriate adjustments can be made in criminal and civil laws and procedures, model jury instructions, law enforcement practices, litigation strategies, and judicial decisionmaking. Law schools should enhance this connection by offering courses in the forensic science disciplines, by offering credit for forensic science courses taken in other colleges, and by developing joint degree programs. And judges need to be better educated in forensic science methodologies and practices.

Recommendation 10:

To attract students in the physical and life sciences to pursue graduate studies in multidisciplinary fields critical to forensic science practice, Congress should authorize and appropriate funds to the National Institute of Forensic Science (NIFS) to work with appropriate organizations and educational institutions to improve and develop graduate education programs designed to cut across organizational, programmatic, and disciplinary boundaries. To make these programs appealing to potential students, they must include attractive scholarship and fellowship offerings. Emphasis should be placed on developing and improving research methods and methodologies applicable to forensic science practice and on funding research programs to attract research universities and students in fields relevant to forensic science. NIFS should also support law school administrators and judicial education organizations in establishing continuing legal education programs for law students, practitioners, and judges.

The Medicolegal Death Investigation System

Although steps have been taken to transform the medicolegal death investigation system, the shortage of resources and lack of consistent educational and training requirements (particularly in the coroner system)[26] prevent the system from taking full advantage of tools—such as CT scans and digital X-rays—that the medical system and other scientific disciplines have to offer. In addition, more rigorous efforts are needed in the areas of accreditation and adherence to standards. Currently, requirements for practitioners vary from nothing more than age and residency requirements to certification by the American Board of Pathology in forensic pathology.

Funds are needed to assess the medicolegal death investigation system to determine its status and needs, using as a benchmark the current requirements of NAME relating to professional credentials, standards, and accreditation. And funds are needed to modernize and improve the medicolegal death investigation system. As it now stands, medical examiners and coroners (ME/Cs) are essentially ineligible for direct federal funding and grants from DOJ, DHS, or the Department of Health and Human Services (through the National Institutes of Health). The Paul Coverdell National Forensic Science Improvement Act is the only federal grant program that names medical examiners and coroners as eligible for grants. However, ME/Cs must compete with public safety agencies for Coverdell grants; as a result, the funds available to ME/Cs are inadequate. The simple reality is that the program has not been sufficiently funded to provide significant improvements in ME/C systems.

In addition to direct funding, there are other initiatives that should be pursued to improve the medicolegal death investigation system. The Association of American Medical Colleges and other appropriate professional organizations should organize collaborative activities in education, training, and research to strengthen the relationship between the medical examiner community and its counterparts in the larger academic medical community. Medical examiner offices with training programs affiliated with medical schools should be eligible to compete for funds. Funding should be available to support pathologists seeking forensic fellowships. In addition, forensic pathology fellows could be allowed to apply for medical school loan forgiveness if they stay full time at a medical examiner's office for a reasonable period of time.

Additionally, NIFS should seek funding from Congress to support the joint development of programs to include medical examiners and medical examiner offices in national disaster planning, preparedness, and consequence management, involving the Centers for Disease Control and Prevention (CDC) and DHS. Uniform statewide and interstate standards of operation would be needed to assist in the management of cross-jurisdictional and interstate events. NIFS should support a federal program underwriting the development of software for use by ME/C systems for the management of multisite, multiple fatality events.

NIFS should work with groups such as the National Conference of Commissioners on Uniform State Laws, the American Law Institute, and NAME, in collaboration with other appropriate professional groups, to update the 1954 Model Post-Mortem Examinations Act and draft legislation for a modern model death investigation code. An improved code might, for example, include the elements of a competent medical death investigation system and clarify the jurisdiction of the medical examiner with respect to organ donation.

The foregoing ideas must be developed further before any concrete plans can be pursued. There are, however, a number of specific recommendations, which, if adopted, will help to modernize and improve the medicolegal death investigation system. These recommendations deserve the immediate attention of Congress and NIFS.

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[26] Institute of Medicine. 2003. *Workshop on the Medicolegal Death Investigation System*. Washington, DC: National Academies Press.

Recommendation 11:

To improve medicolegal death investigation:

- **(a) Congress should authorize and appropriate incentive funds to the National Institute of Forensic Science (NIFS) for allocation to states and jurisdictions to establish medical examiner systems, with the goal of replacing and eventually eliminating existing coroner systems. Funds are needed to build regional medical examiner offices, secure necessary equipment, improve administration, and ensure the education, training, and staffing of medical examiner offices. Funding could also be used to help current medical examiner systems modernize their facilities to meet current Centers for Disease Control and Prevention-recommended autopsy safety requirements.**
- **(b) Congress should appropriate resources to the National Institutes of Health (NIH) and NIFS, jointly, to support research, education, and training in forensic pathology. NIH, with NIFS participation, or NIFS in collaboration with content experts, should establish a study section to establish goals, to review and evaluate proposals in these areas, and to allocate funding for collaborative research to be conducted by medical examiner offices and medical universities. In addition, funding, in the form of medical student loan forgiveness and/or fellowship support, should be made available to pathology residents who choose forensic pathology as their specialty.**
- **(c) NIFS, in collaboration with NIH, the National Association of Medical Examiners, the American Board of Medicolegal Death Investigators, and other appropriate professional organizations, should establish a Scientific Working Group (SWG) for forensic pathology and medicolegal death investigation. The SWG should develop and promote standards for best practices, administration, staffing, education, training, and continuing education for competent death scene investigation and postmortem examinations. Best practices should include the utilization of new technologies such as laboratory testing for the molecular basis of diseases and the implementation of specialized imaging techniques.**
- **(d) All medical examiner offices should be accredited pursuant to NIFS-endorsed standards within a timeframe to be established by NIFS.**
- **(e) All federal funding should be restricted to accredited offices that meet NIFS-endorsed standards or that demonstrate significant and measurable progress in achieving accreditation within prescribed deadlines.**
- **(f) All medicolegal autopsies should be performed or supervised by a board certified forensic pathologist. This requirement should take effect within a timeframe to be established by NIFS, following consultation with governing state institutions.**

AFIS and Database Interoperability

Great improvement is necessary in AFIS interoperability. Crimes may go unsolved today simply because it is not possible for investigating agencies to search across all the databases that might hold a suspect's fingerprints or that may contain a match for an unidentified latent print from a

crime scene. It is also possible that some individuals have been wrongly convicted because of the limitations of fingerprint searches.

At present, serious practical problems pose obstacles to the achievement of nationwide AFIS interoperability. These problems include convincing AFIS equipment vendors to cooperate and collaborate with the law enforcement community and researchers to create and use baseline standards for sharing fingerprint data and create a common interface. Second, law enforcement agencies lack the resources needed to transition to interoperable AFIS implementations. Third, coordinated jurisdictional agreements and public policies are needed to allow law enforcement agencies to share fingerprint data more broadly.

Given the disparity in resources and information technology expertise available to local, state, and federal law enforcement agencies, the relatively slow pace of interoperability efforts to date, and the potential gains from increased AFIS interoperability, the committee believes that a broad-based emphasis on achieving nationwide fingerprint data interoperability is needed.

Recommendation 12:

Congress should authorize and appropriate funds for the National Institute of Forensic Science (NIFS) to launch a new broad-based effort to achieve nationwide fingerprint data interoperability. To that end, NIFS should convene a task force comprising relevant experts from the National Institute of Standards and Technology and the major law enforcement agencies (including representatives from the local, state, federal, and, perhaps, international levels) and industry, as appropriate, to develop:

(a) standards for representing and communicating image and minutiae data among Automated Fingerprint Identification Systems. Common data standards would facilitate the sharing of fingerprint data among law enforcement agencies at the local, state, federal, and even international levels, which could result in more solved crimes, fewer wrongful identifications, and greater efficiency with respect to fingerprint searches; and

(b) baseline standards—to be used with computer algorithms—to map, record, and recognize features in fingerprint images, and a research agenda for the continued improvement, refinement, and characterization of the accuracy of these algorithms (including quantification of error rates).

These steps toward AFIS interoperability must be accompanied by federal, state, and local funds to support jurisdictions in upgrading, operating, and ensuring the integrity and security of their systems; retraining current staff; and training new fingerprint examiners to gain the desired benefits of true interoperability. Additionally, greater scientific benefits can be realized through the availability of fingerprint data or databases for research purposes (using, of course, all the modern security and privacy protections available to scientists when working with such data). Once created, NIFS might also be tasked with the maintenance and periodic review of the new standards and procedures.

Forensic Science Disciplines and Homeland Security

Good forensic science and medical examiner practices are of clear value from a homeland security perspective, because of their roles in bringing criminals to justice and in dealing with the effects of natural and human-made mass disasters. Forensic science techniques (e.g., the evaluation of DNA fragments) enable more thorough investigations of crime scenes that have been damaged physically. Routine and trustworthy collection of digital evidence, and improved techniques and timeliness for its analysis, can be of great potential value in identifying terrorist activity. Therefore, the forensic science community has a role to play in homeland security. However, to capitalize on this potential, the forensic science and medical examiner communities must be well interfaced with homeland security efforts, so that they can contribute when needed. To be successful, this interface will require the establishment of good working relationships between federal, state, and local jurisdictions, the creation of strong security programs to protect data transmittals between jurisdictions, the development of additional training for forensic scientists and crime scene investigators, and the promulgation of contingency plans that will promote efficient team efforts on demand. Policy issues relating to the enforcement of homeland security are not within the scope of the committee's charge and, thus, are beyond the scope of the report. It can hardly be doubted, however, that improvements in the forensic science community and medical examiner system could greatly enhance the capabilities of homeland security.

Recommendation 13:

Congress should provide funding to the National Institute of Forensic Science (NIFS) to prepare, in conjunction with the Centers for Disease Control and Prevention and the Federal Bureau of Investigation, forensic scientists and crime scene investigators for their potential roles in managing and analyzing evidence from events that affect homeland security, so that maximum evidentiary value is preserved from these unusual circumstances and the safety of these personnel is guarded. This preparation also should include planning and preparedness (to include exercises) for the interoperability of local forensic personnel with federal counterterrorism organizations.

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

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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Academies' Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process.

We wish to thank the following individuals for their review of this report: R. Stephen Berry, University of Chicago; Christophe Champod, Universite de Lausanne, Switzerland; William Chisum, Retired, National Crime Investigation and Training; Joel Cohen, Rockefeller University; Peter DeForest, John Jay College of Criminal Justice; Stephen Fienberg, Carnegie Mellon University; Barry Fisher, Los Angeles County Sheriff's Department; Mark Flomenbaum, Boston University; Ross Gardner, Gardner Forensic Consulting; Paul Giannelli, Case Western Reserve University; Randy Hanzlick, Emory University; Keith Inman, Forensic Analytical Sciences, Inc.; Dan Kahan, Yale Law School; Roger Kahn, Harris County Medical Examiner's Office; Elizabeth Loftus, University of California, Irvine; C. Owen Lovejoy, Kent State University; Kenneth Melson, George Washington University; Michael Murphy, Office of the Coroner/Medical Examiner, Las Vegas, Nevada; Hyla Napadensky, Retired, Napadensky Energetics Inc.; Joseph Peterson, California State University, Los Angeles; William Press, University of Texas, Austin; Jed Rakoff, U.S. District Court Southern District of New York; Carl Selavka, U.S. Army Criminal Investigation Laboratory; David Stoney, Stoney Forensic, Inc.; and Charles Wellford, University of Maryland.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by John Bailar, University of Chicago, and Royce Murray, University of North Carolina, Chapel Hill. Appointed by the National Academies, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

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PREFACE

Recognizing that significant improvements are needed in forensic science, Congress directed the National Academy of Sciences to undertake the study that led to this report. There are scores of talented and dedicated people in the forensic science community, and the work that they perform is vitally important. They are often strapped in their work, however, for lack of adequate resources, sound policies, and national support. It is clear that change and advancements, both systemic and scientific, are needed in a number of forensic science disciplines—to ensure the reliability of the disciplines, establish enforceable standards, and promote best practices and their consistent application.

In adopting this report, the aim of our committee is to chart an agenda for progress in the forensic science community and its scientific disciplines. Because the work of forensic science practitioners is so obviously wide-reaching and important—affecting criminal investigation and prosecution, civil litigation, legal reform, the investigation of insurance claims, national disaster planning and preparedness, homeland security, and the advancement of technology—the committee worked with a sense of great commitment and spent countless hours deliberating over the recommendations that are included in the report. These recommendations, which are inexorably interconnected, reflect the committee's strong views on policy initiatives that must be adopted in any plan to improve the forensic science disciplines and to allow the forensic science community to serve society more effectively.

The task Congress assigned our committee was daunting and required serious thought and the consideration of an extremely complex and decentralized system, with various players, jurisdictions, demands, and limitations. Throughout our lengthy deliberations, the committee heard testimony from the stakeholder community, ensuring that the voices of forensic practitioners were heard and their concerns addressed. We also heard from professionals who manage forensic laboratories and medical examiner/coroner offices; teachers who are devoted to training the next generation of forensic scientists; scholars who have conducted important research in a number of forensic science fields; and members of the legal profession and law enforcement agencies who understand how forensic science evidence is collected, analyzed, and used in connection with criminal investigations and prosecutions. We are deeply grateful to all of the presenters who spoke to the committee and/or submitted papers for our consideration. These experts and their work served the committee well.

In considering the testimony and evidence that was presented to the committee, what surprised us the most was the consistency of the message that we heard:

> *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.*

The recommendations in this report represent the committee's studied opinion on how best to achieve this critical goal.

We had the good fortune to serve as co-chairs of the committee entrusted with addressing Congress' charge. The committee, formed under the auspices of the National Academies' Committee on Science, Technology, and Law and Committee on Applied and Theoretical Statistics, was composed of many talented professionals, some expert in various areas of forensic science, others in law, and still others in different fields of science and engineering. They listened, read, questioned, vigorously discussed the findings and recommendations offered in this report, and then worked hard to complete the research and writing required to produce the report. We are indebted to our colleagues for all the time and energy they gave to this effort. We are also most grateful to the staff, Anne-Marie Mazza, Scott Weidman, Steven Kendall, and the consultant writer, Kathi Hanna, for their superb work and dedication to this project; to staff members David Padgham and John Sislin, and editor, Sara Maddox, for their assistance; and to Paige Herwig, Laurie Richardson, and Judith A. Hunt for their sterling contributions in checking source materials and assisting with the final production of the report.

Harry T. Edwards and Constantine Gatsonis
Committee Co-chairs