DIGITAL AND MULTIMEDIA FORENSICS JUSTIFIED:

AN APPRAISAL ON PROFESSIONAL POLICY AND LEGISLATION

by

AMY LYNNETTE POPEJOY

B.M., University of Texas Arlington, 2010

A thesis submitted to the

Faculty of the Graduate School of the

University of Colorado Denver

in partial fulfillment

of the requirements for the degree of

Master of Science

Recording Arts

2015

This thesis for the Master of Science degree by

Amy Lynnette Popejoy

has been approved for the

Recording Arts Program

by

Catalin Grigoras, Chair

Jeff M. Smith

Mary Dodge

May 28, 2015

Popejoy, Amy Lynnette (M.S., Recording Arts- Media Forensics)

Digital and Multimedia Forensics Justified: An Appraisal on Professional Policy and Legislation

Thesis directed by Director- National Center for Media Forensics, Catalin Grigoras, Ph.D.

ABSTRACT

Recent progress in professional policy and legislation at the federal level in the field of forensic science constructs a transformation of new outcomes for future experts. An exploratory and descriptive qualitative methodology was used to critique and examine Digital and Multimedia Science (DMS) as a justified forensic discipline. Chapter I summarizes Recommendations 1, 2, and 10 of the National Academy of Sciences (NAS) Report 2009 regarding disparities and challenges facing the forensic science community. Chapter I also delivers the overall foundation and framework of this thesis, specifically how it relates to DMS. Chapter II expands on Recommendation 1: *"The Promotion and Development of Forensic Science,"* and focuses chronologically on professional policy and legislative advances through 2014. Chapter III addresses Recommendation 2: *"The Standardization of Terminology in Reporting and Testimony,"* and the issues of legal language and terminology, model laboratory reports, and expert testimony concerning DMS case law. Chapter IV analyzes Recommendation 10: *"Insufficient Education and Training,"* identifying legal awareness for the digital and multimedia examiner to understand the role of the expert witness, the attorney, the judge and the admission of forensic science evidence in litigation in our criminal justice system. Finally, Chapter V studies three DME specific laboratories at the Texas state, county, and city level, concentrating on current practice and procedure.

The form and content of this abstract are approved. I recommend its publication.

Approved: Catalin Grigoras

ACKNOWLEDGEMENT

I would like to thank, from my Texas sized heart, the NCMF TRIPLE THREAT TEAM of the University of Colorado, Denver! Leah, your ability to communicate via distance learning is impeccable. I could not have done this without you. Thank you for directly answering every bullet point of every email I sent, including all the ones you added, with immediate attention. Jeff, thank you for challenging me every step of the way. If I took three steps, you took five, and that dedication to teaching is priceless. I don't know how, on top of everything else that you do, you were able to address any and all questions, with such detail, within 24 hours every time. CG, thank you for being so incredibly intricate and so incredibly simple all at the same time, it's magical this talent that you have. You are brilliant! I will never forget "no problems, only solutions." You are remarkable at removing the intimidation of science from forensic thinking to make it viable. I would also like to thank Mary Dodge, Irma Rios, and David Hallimore for their guidance and contribution.

The team at NCMF didn't just teach media forensics to me. You took me from beginning student and delivered me straight into the core of Digital and Multimedia Science with a professional mindset upholding DMS as a valid forensic discipline. You helped me understand my responsibility to this field as a future expert and I intend to work, with commitment and dedication, on continued advancement of our evolving Federal progress. I am convinced, there has never been a more exciting time to be a part of digital and multimedia forensic science and I am so proud, honored, and grateful to be a graduate of NCMF. Thank you, thank you, thank you.

To the entire digital and multimedia forensic science community, some of you I have met but most not, thank you for 'fighting like hell' since the beginning for our discipline. You are the ones who have paved the way for upcoming professionals like myself and what a great example you have been!

TABLE OF CONTENTS

LIST OF FIGURES

FIGURE

LIST OF ABBREVIATIONS

ABBREVIATIONS

1. AAFS- American Academy of Forensic Science

2. ASCLD- American Society of Crime Laboratory Directors

3. ASTM- American Society for Testing and Materials

4. ATF- Bureau of Alcohol, Tobacco, Firearms, and Explosives

5. CODIS- Combined DNA Index System

6. DEA- Drug Enforcement Agency

7. DFBA- Defense Forensics and Biometrics Agency

8. DFSC- Defense Forensic Science Center

9. DHS- Department of Homeland Security

10. DME- Digital and Multimedia Evidence

11. DMS- Digital and Multimedia Science

12. DOD- Department of Defense

13. DOJ- Department of Justice

14. FBI- Federal Bureau of Investigation

15. FBI-QAS- Federal Bureau of Investigation Quality Assurance Standards

16. FRCP- Federal Rules of Civil Procedure

17. FRCRP- Federal Rules of Criminal Procedure

18. FRE- Federal Rules of Evidence

19. FSSB- Forensic Science Standards Board- OSAC

20. FQS- Forensic Quality Services

21. HCFS- Houston Center of Forensic Science

22. HFC- Human Factors Committee- OSAC

23. IAI- International Association for Identification

24. IAFIS- Integrated Automated Fingerprint Identification System

25. ICSIA- International Crime Scene Investigator’s Association

26. IOCE- International Organization on Computer Evidence

27. IRS-CID- Internal Revenue Service Criminal Investigation Division

28. LGC- Local Government Corporation

29. LRC- Legal Resource Committee- OSAC

30. NAS- National Academy of Sciences

31. NCFS- National Commission of Forensic Science

32. NDAA- National District Attorneys Association

33. NIBIN- National Integrated Ballistic Identification Network

34. NIFS- National Institute of Forensic Science

35. NIJ- National Institute of Justice

36. NIST- National Institute of Standards and Technology

37. NRC- National Research Council

38. NSF- National Science Foundation

39. NSTC- National Science and Technology Council

40. OSAC- Organization of Scientific Area Committees

41. QIC- Quality Infrastructure Committee- OSAC

42. SAC- Scientific Area Committee- OSAC

43. SCSO- Smith County Sheriff's Office

44. SDO- Standards Development Organizations

45. SoFS CoS- Subcommittee on Forensic Science Committee on Science- NSTC

46. SOP- Standard Operating Procedures

47. SWGDE- Scientific Working Group on Digital Evidence

48. SWGSTAIN- Scientific Working Group on Bloodstain Pattern Analysis

49. TSWG- Technical Support Working Group

CHAPTER I

INTRODUCTION- NATIONAL ACADEMY OF SCIENCES REPORT 2009

The Science, State, Justice, Commerce, and Related Agencies Appropriations Act of 2006, became law in November 2005. As a result of that Act, the National Institute of Justice (NIJ), authorized by Congress, sponsored the National Academy of Sciences (NAS) Committee Project – *"Identifying the Needs of the Forensic Science Community,"* to conduct a study within the field of forensic science. (1) The appointed Forensic Science Committee met on eight occasions and later delivered the February 18, 2009, NAS Executive Summary- "*Strengthening Forensic Science in the United States: A Path Forward,*" i.e. the NAS Report 2009. (2) The executive summary identified findings of the study and outlined 13 Recommendations for the forensic science community to consider. This thesis will explore Recommendation 1- *"Promote the Development of Forensic Science,"* Recommendation 2- *"Standardized Terminology in Reporting and Testimony,"* and Recommendation 10- *"Insufficient Education and Training."*

Recommendation 1- *"Promote the Development of Forensic Science,"* suggests allocation of an independent federal entity, funded by Congress, with expertise in but not limited to research, education, multiple forensic science disciplines, and law. The oversight of this entity should develop programs to improve best practices, standards, and all related strategies to advance the credibility and reliability of forensic science at the federal, state, and local levels. Chapter II of this thesis expands on Recommendation 1 and focuses chronologically on professional policy and legislative advances since the release of NAS Report 2009 through 2014, specifically how these developments relate to digital and multimedia science (DMS).

Recommendation 2- *"Standardized Terminology in Reporting and Testimony,"* currently, there are no federally accepted standards or guidelines for terminology used in testifying and reporting results of forensic science investigations or any laboratory format with defined minimums specifying information needed to convey conclusions to the court. Chapter III addresses Recommendation 2 and the issues of legal language and terminology, model laboratory reports, and expert testimony concerning DMS case law.

Recommendation 10- "*Insufficient Education and Training,"* forensic evidence lies at the juncture between science, technology, and the legal community. In the age of information, everyone who plays a

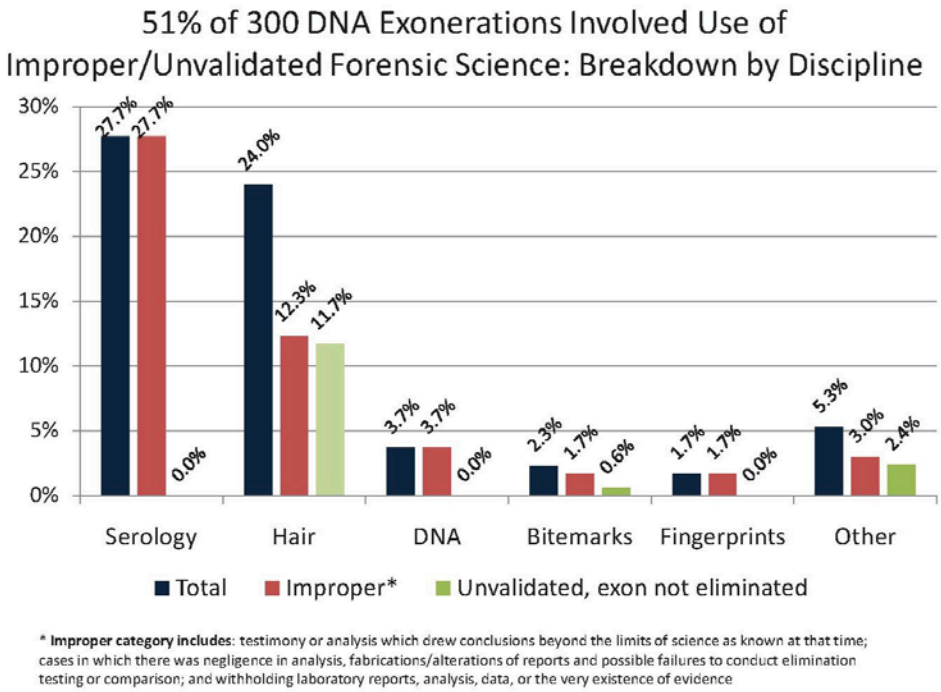
role in the criminal justice system must be accountable to increased learning and knowledge in and around their area of expertise. Chapter IV analyzes Recommendation 10 identifying legal awareness for the digital and multimedia examiner to understand the role of the expert witness, the attorney, the judge and the admission of forensic science evidence in litigation in our criminal justice system.

Challenges Facing the Forensic Science Community

David Shawn Pope, Edgar Steele, Brandon Mayfield, and George Zimmerman, are just a few cases, discussed with detail in Chapter III- Expert Testimony, indicating troubling legal issues based on interpretations of forensic evidence. The Innocence Project website, http://www.innocenceproject.org, highlights the multitude of cases and consequences of invalidated and improper forensic science used in the criminal justice system. In fact, many forensic science disciplines, outside the Deoxyribonucleic Acid (DNA) gold standard, have never been subjected to rigorous peer-reviewed scientific evaluation. The Innocence Project defines 'invalidated and improper forensic science' as 1- the use of forensic disciplines or techniques that have not been tested to establish their validity and reliability, 2- 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 3- misconduct, either by fabricating inculpatory data or failing to disclose exculpatory data. Invalidated and improper forensic science is the second greatest contributing factor of wrongful convictions, first being eyewitness misidentification, liable for 51% of the 300 exonerates to date (Fig 1.1), for which 17 could have been executed. This factor has also led to claims not supported by science, errors due to unreliable methods, scientific negligence, misconduct, concealed evidence of innocence, and vague or confusing terms that jurors could not be expected to understand. An even colder fact is that in 90-95% of all criminal cases, DNA testing is not an option and the justice system must rely on non-DNA forensic disciplines for the presentation of evidence.

Disparities in the Forensic Science Community

The word 'forensic' by definition implies a relationship to scientific knowledge and the court of law and forensic science is a key factor to the fundamental functioning of our criminal justice system. DNA



(Figure 1.1- Innocence Project Wrongful Convictions Breakdown by Discipline)

became a highly accepted discipline standard of science, mainly because of federal funding, research, provision, and necessity. In 1994, as a result of the DNA Identification Act, an advisory board was established to address research relevant to DNA. Professionals from the public and private sector came together and developed quality assurance standards for testing in laboratories. These working groups created a pathway for the DNA community to follow and federal funding supported the implementation of new practices, database index systems, and eventually led to the Innocence Protection Act of 2004 which allows imprisoned people access to DNA testing to prove innocence. DNA is relied upon to provide a high level of certainty in the criminal justice system because it was science-based and tested before it was presented in the courtroom. Likewise, the pharmaceutical industry tests and approves medication long before it is released to the public, but there are differences among the disciplines of science. (3) (4)

In August of 2013, President Barack Obama stated in an interview, "I think there are legitimate concerns that people have that technology is moving so quick that, you know, at some point, does the technology outpace the laws that are in place and the protections that are in place?" (5) This idea, combined with the lack of federal standards referenced across state and local law enforcement investigation units, raises a very valid point. Technology only continues to develop forcing the courts to reconcile related forensic arguments. Digital and multimedia evidence (DME), referred to as a non-DNA discipline, relies to some extent on observation, experience, and reasoning based analysis. DNA evidence relies more on biological and chemical based analysis. Although all forensic analysis is subject to the human factor,

(Figure 1.2- Young Forensic Scientist Forum- "The Past, the Present, and our Future," Orlando 2015)

non-DNA evidence analyzed using the more subjective methods can lead to higher error rates and less accuracy and reliability in drawing expert conclusions. However, when non-DNA forensic evidence is adequate, it can still be accurate and reliable and should not be dismissed altogether.

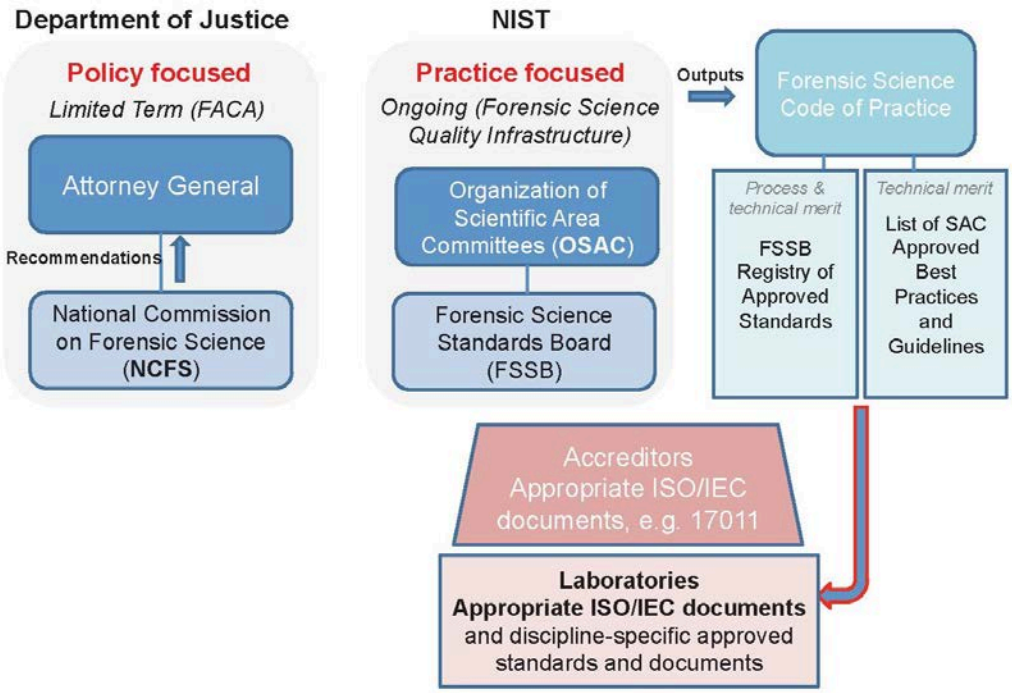
Understanding and evaluating these limitations of evidence will help toward reform of attaining supreme forensic truth, depressing wrongful conviction rates of the innocent and increasing public safety from criminals who go free.

In response to long awaited and disturbing questions about the accuracy and reliability of non-DNA forensic science (Fig 1.2), the Consortium of Forensic Science Organization (CFSO) urged Congress to pass legislation directing NAS to create an independent needs assessment study within these forensic disciplines. The vehicle used to pass this legislation was the Science, State, Justice, Commerce, and Related Agencies Appropriations Act of 2006 and the findings then became the NAS Report 2009. Before the report, it was just assumed that non-DNA forensic science was well grounded in scientific methodology and unlike DNA, non-DNA forensic disciplines did not have a cheerleading commission to support or represent them at the federal level. Creating the National Commission of Forensic Science (NCFS) independent of the jurisdiction of the legal or law enforcement community, allowed a governing board to

(Figure 1.3- Young Forensic Scientist Forum- “The Past, the Present, and our Future,” Orlando 2015)

mandate and manage setting new standards for validation methods and practices to correct inconsistent science. The goal being that through verified and validated methodology, human error and bias can be decreased, terminology can be unified, and report findings can be consolidated with scrutinized evidence *before* it ever reaches the court of law.

There is response to forensic science reform in all three branches of government (Fig 1.3). The Executive Branch is presently building the framework of reform with SoFS, NCFS, and OSAC. The Legislative Branch is continuing to draft and re-introduce legislation in support of that framework and the Judicial Branch persists to decide and argue case law, causing reform. It is the goal of OSAC, to create the



(Figure 1.4- NIST Presentation for NCFS, February 2014) (7)

Forensic Science Code of Practice- Registry of Approved Standards and Registry of Approved Guidelines. This registry will catalog a database of documents from all of the forensic science disciplines (Fig 1.4). OSAC will not write the documents but will require a vetting process, promoting documents for the

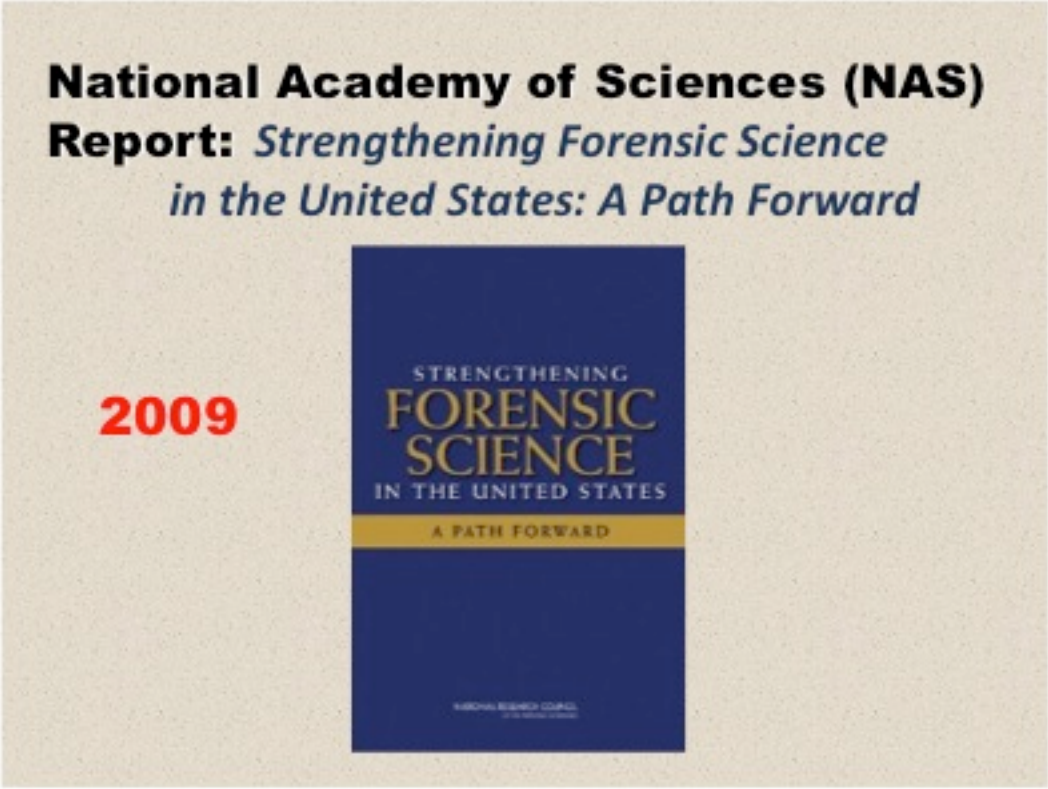
standards development process, in order for the approved standards and guidelines to be added to the registry. (6)

How does DME fit into forensic science reform? How do we validate, for admissibility to the court, every single tool used for analysis of digital and multimedia evidence? How do you factor in, measure or explain, or attempt to mitigate the human factor, i.e. cognitive bias, etc., as an element of forensic science analysis? It is thought provoking to decide how to write best practices and standard operating procedures, or mapping details of likelihood ratio statistics, regarding the limitless conditions and variables related to DME. As soon as technology changes, which happens at an alarmingly rapid rate, the validation process must begin all over again. Just last year in the case of Michael Brown, Ferguson, Missouri, the point was raised again that one technological solution for law enforcement encounters is that all police officers should be required to wear body cameras. Unfortunately, several state and local law enforcement agencies that decide to use this technology, might purchase new equipment first and think about long-term implementation, data storage management, retrieval, and privacy issues after the fact. The progress made since the release of the NAS Report 2009, outlined in the next chapter, ensures that as professionals, we are focusing on the challenges. As a forensic community, we are identifying next steps and the groundwork is being laid to address our challenges. (8) (9) (10)

CHAPTER II

PROMOTION AND DEVELOPMENT OF FORENSIC SCIENCE

Recommendation 1 of the National Academy of Sciences (NAS) Executive Summary Report 2009- '*Strengthening Forensic Science in the United States: A Path Forward,*' (Fig 2.1) is the promotion and development of forensic science. This chapter expands on Recommendation 1 and focuses chronologically on professional policy and legislative advances since the release of said report through 2014, specifically to how these developments relate to digital and multimedia evidence (DME). A brief summary from 1998 -2006, will provide background information relating to the NAS Report 2009. (2)



(Figure 2.1- Young Forensic Scientist Forum- "The Past, the Present, and our Future," Orlando 2015)

In 1998, the Scientific Working Group on Digital Evidence (SWGDE) was formed by the Federal Crime Laboratory Directors group. This group was one of the earliest organizations to explore and combine digital audio, video, and photography with computer forensics as a forensic discipline. Agencies represented by founding SWGDE members were the ATF, DEA, FBI, IRS-CID, U.S. Customs, U.S. Postal

Inspection Service, and the U.S. Secret Service. SWGDE worked in cooperation with other organizations including IOCE and ASCLD adopting and publishing principles and definitions concerning acknowledgement and recognition of 'digital evidence' as an accredited discipline. (11) In 2008, the American Academy of Forensic Science (AAFS) created the Digital and Multimedia Sciences (DMS) Section recognizing the importance of the growing new field. This section to date has 111 members. (12)

In 2006, NIJ sponsored the NAS Project- Identifying the Needs of the Forensic Science Community. (1) The appointed Forensic Science Committee met on eight occasions and later delivered the February 18, 2009 National Academy of Sciences Executive Summary- *Strengthening Forensic Science in the United States: A Path Forward,* ISBN: 978-0-309-13130-8, a total of 352 pages, i.e. the NAS Report 2009. (2)

On March 10, 2009, a hearing before the Subcommittee on Technology & Innovation Committee on Science and Technology, House of Representatives: *'Strengthening Forensic Science in the United States: The Role of the National Institute of Standards and Technology,'* convened. The hearing focused on reviewing scientific and technical issues raised by the NAS Report 2009, along with the role of National Institute of Standards and Technology (NIST). Chairman David Wu, U.S. Democratic Representative from the State of Oregon, opened with three considerations: the possibility of building on federal resources and capabilities versus creating a whole new government structure, full support and agreement to the goal of improving forensic science in the U.S., and taking the first step in moving from 'entertainment' to 'reality' with the expectations of forensic science. Representatives present were Adrian Smith (NE), Paul Broun (GA), and Donna Edwards (MD). The witness panel included Mr. Peter M. Marone, Ms. Carol E. Henderson, Mr. John W. Hicks, Mr. Peter Neufeld, and Dr. J.C. Upshaw Downs. (10)

On March 18, 2009, a hearing before the Committee on the Judiciary United States Senate: *The Need to Strengthen Forensic Science in the United States: 'The National Academy of Sciences' Report on A Path Forward,'* convened. Chairman Patrick J. Leahy, U.S. Democratic Senator from the State of Vermont, in his opening statement addressed the NAS Report 2009 confirming problems demonstrated at the heart of our whole criminal justice system and that it showed the 'CSI Effect' is not 'reality' in the field of forensic science. Leahy gave two examples, Detroit and Houston- Case Study #3 of this thesis, of laboratories shut down when audits found less than adequate case results. In 2005, the DOJ reported a backlog of 350,000

forensic exams nationwide and alleged 1 in 5 labs did not meet American Society of Crime Laboratory Directors (ASCLD) accreditation standards. Leahy stated forensic science is critical to our criminal justice system in order to punish the guilty and exonerate the innocent. He referenced the Brandon Mayfield case, where an FBI examiner affidavit was recanted, and the Kirk Bloodsworth case as two examples of faulty forensic science in the courts. The Honorable Harry T. Edwards, (Senior Circuit Judge and Chief Judge Emeritus, United States Court of Appeals for the District of Columbia Circuit, and Co-Chair, Committee on the Identifying the Needs of the Forensic Science Community, National Research Council of the National Academies, Washington, D.C.) gave his statement. Edwards stated his Committee concluded congressional action was needed to cure serious problems facing the forensic science community and admitted his preconceived views about the practice of scientific disciplines were incorrect assumptions and the simple principal point called for an overhaul of forensic science in the United States.

Hearing Submissions for the Record were as follows:

-ASCLD, Laboratory Accreditation Board, Garner, North Carolina: Jami St Clair, Chair, Lab Board, March 16, 2009, letter, Dean Gialamas, President and Beth Greene, President-Elect, March 17, 2009, letter, Dean Gialamas, President and Beth Greene, President-Elect, December 2008, statement,

-Edwards, Harry T., Senior Circuit Judge and Chief Judge Emeritus, U.S. Court of Appeals for the District of Columbia Circuit, and Co-Chair, Committee on Identifying the Needs of the Forensic Science Community, National Research Council of the National Academies, Washington, D.C., statement,

-IAI, Robert J. Garret, Metuchen, New Jersey, March 18, 2009, letter,

-NDAA, Joseph I. Cassilly, President, Alexandria, Virginia, letter,

-Neufeld, Peter, Co-Director, Innocence Project, New York, New York, statement. (8)

On May 13, 2009, a hearing before the Subcommittee on Crime, Terrorism, and Homeland Security of the Committee on the Judiciary House of Representatives: *National Research Council's Publication 'Strengthening Forensic Science in the United States: A Path Forward'* convened. Chairman Robert C. Scott, U.S. Democratic Representative from the State of Virginia, in his opening statement acknowledged the unreliable role forensic science plays in criminal investigations, the fact that the 'CSI effect' reaches most jury pools across the country, and confirmed fears about the national forensic science system. Scott felt the most disturbing findings regarded judges and trial attorneys. He stated the NAS

Report 2009 found that trial judges rarely exclude forensic evidence and trial attorneys lack scientific training to adequately assess and question the forensic expert witnesses' conclusions. Ranking Member Louie Gohmert, U.S. Republican Representative from the State of Texas, opened with statements from the perspective of prosecutor, district judge, and chief justice. He stated DNA is the forensic gold standard but his most important point challenged the belief that although particular forensic disciplines have not been scientifically validated, it does not mean they are invalid and unreliable. Representatives present were Mr. Robert C. Scott (VA), Mr. Anthony D. Weiner (NY), Mr. Louie Gohmert (TX), and Mr. Ted Poe (TX). The witness panel included Mr. Kenneth E. Melson, Mr. Peter M. Marone, Mr. John W. Hicks, and Mr. Peter Neufeld. (9)

On September 9, 2009, a hearing before the Committee on the Judiciary United States Senate: '*Strengthening Forensic Science in the United States,'* convened. Chairman Patrick J. Leahy, U.S. Democratic Senator from the State of Vermont, in his opening statement suggested the need to ensure the highest scientific standards and maximum reliability of forensic science. Leahy referenced the Cameron Todd Willingham case where an innocent man may have been executed for a crime he did not commit, based in large part on forensic expert witness testimony and forensic evidence without scientific basis. The NAS Report 2009 was summarized as a foundation to move forward with mandating national standards, enforcing best practices, certification of examiners, and accreditation of laboratories. Senators present were Mr. Richard J. Durbin (IL), Mr. Sheldon Whitehouse (RI), Ms. Amy Klobuchar (MN), Mr. Al Franken (MN), and Mr. Jeff Sessions (AL). The witness panel included Mr. Eric Buel, Mr. Paul Giannelli, Mr. Harold Hurtt, Mr. Barry Matson, Mr. Peter Neufeld, and Mr. Matthew F. Redle. (4)

On September 17, 2009, SWGDE released their Position on the National Research Council (NRC) Report to Congress- NAS Report 2009. The position encompassed all 13 recommendations; however, this chapter addresses Recommendation 1- The creation of the National Institute of Forensic Science (NIFS). SWGDE recognized the time needed to create a new federal bureaucracy, NIFS, and supposed an immediate national strategy with existing forensic organizations. SWGDE stated that minimum efforts should include standards for recognizing new forensic disciplines, newly established analytical methods, and a community-wide code of ethics. The position also suggested, that funding allocation could follow the competitive Technical Support Working Group (TSWG) example. (13)

On January 31, 2011, the White House Office of Science and Technology Policy (OSTP), Under Executive Order 12881, issued the National Science and Technology Council (NSTC) Charter of the Committee on Science. The purpose was "to increase overall effectiveness and productivity of federally supported efforts that develop new knowledge in the sciences…" Functions of the Charter included science policy-making processes, science policy decisions and programs, integration of science policy agenda, development and implementation federally, NSTC clearance of documents, and international cooperation in science. On March 29, 2012, OSTP issued the Charter of the Subcommittee on Forensic Science Committee on Science (SoFS CoS) NSTC to authorize and develop a White Paper summarizing the SoFS's recommendation to achieve: the Goals of the NAS Report 2009, a prioritized national forensic science research agenda, and a draft detailing strategy for developing and implementing common interoperability standards to facilitate the appropriate sharing of fingerprint data across technologies. (14) (15)

(Figure 2.2- Young Forensic Scientist Forum- "The Past, the Present, and our Future," Orlando 2015)

On February 15, 2013, through a Memorandum of Understanding, the Department of Justice (DOJ) and NIST announced the intent to establish a National Commission on Forensic Science (NCFS-Fig 2.2). This 30-member group would develop federal guidance at the intersections between forensic science and the courtroom, working together to create national standards for practitioners in the areas of professional policy, training, and certification. Deputy Attorney General James M. Cole stated forensic science is an essential tool in the administration of justice and scientifically valid and accurate forensic analysis strengthens all aspects of our criminal justice system. (16)

On June 18, 2013, chairs for 18 of 21 SWGs gathered and discussed the NIST responsibility to create guidance groups intended to replace SWG's with a new infrastructure. (17)

On September 27, 2013, under Docket No. 130508459-3459-01, NIST, the Department of Commerce released a Notice of Inquiry for proposed reorganization of scientific working groups and considered open input toward the 'Possible Model for the Administration and Support of Discipline-Specific Guidance Groups for Forensic Science'. The goal was to explore the establishment and structure of governance models. Comments were requested across questions concerning the structure, the impact, the representation, and the scope of the guidance groups. (56)

SWGDE and combined SWG's released their DME Response to NIST, Federal Register Notice-September 27, 2013. Two sections spoke to 'Possible Models for the Administration and Support of Discipline-Specific Guidance Groups for Forensic Science'. Section I overviewed the request for model perspectives and Section II provided SWG's opinions with a collected 35 years of direct industry experience. In reference to Recommendation 1 of the NAS Report 2009, Section I indicated the DME discipline has already proven accepted and successfully tested as a science by the courts at all levels of the judicial process by providing information and results to juries as expert testimony through technical assistance and quality assurance guidance. SWGDE's established productive history, dedicated strong leadership, and positions with response to federal progress, display a relentless and continued commitment to DME as a forensic discipline. (57)

By November 26, 2013, the Notice of Inquiry generated 82 public comments consisting of 337 pages across numerous forensic disciplines (20) and the overall infrastructure was defined in the NIST January Summary, renaming the guidance groups the Organization of Scientific Area Committees (OSAC).

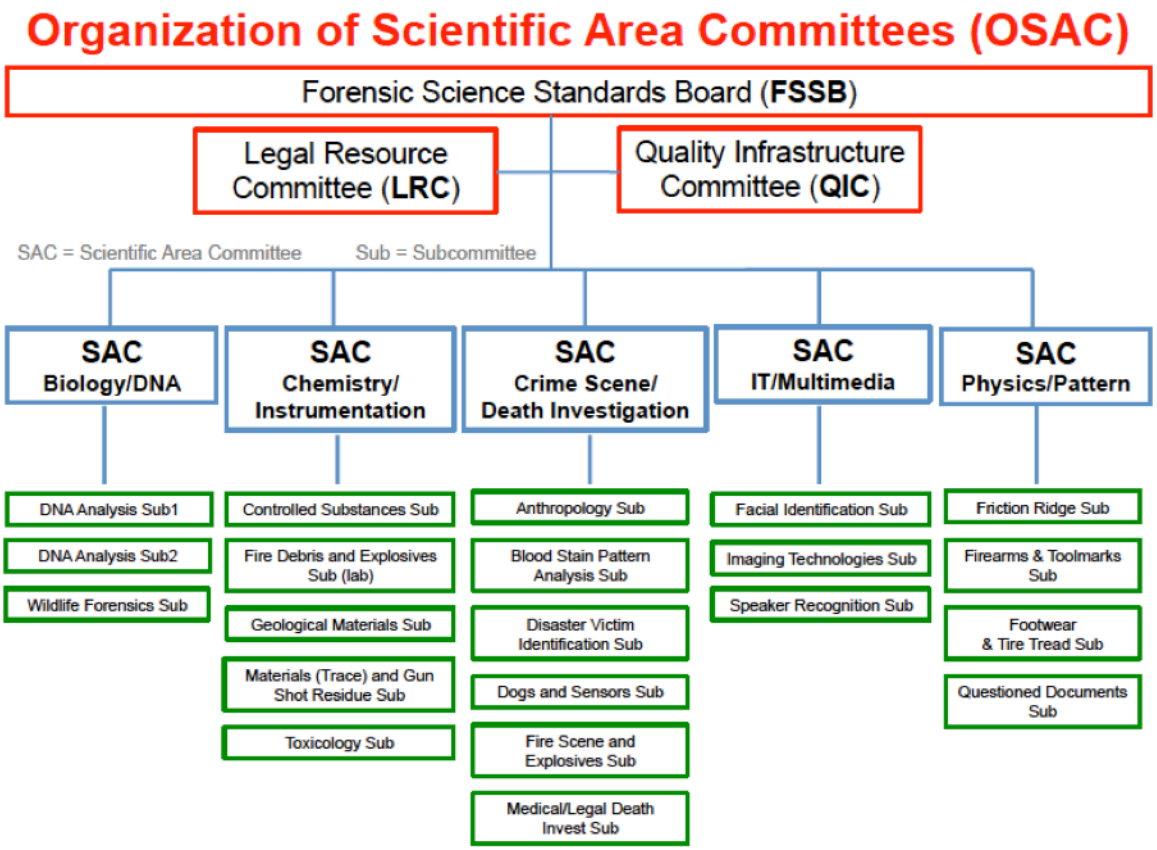
OSAC is practice-focused, reporting only to the Forensic Science Standards Board (FSSB) and will not provide advice to the Attorney General, NIST Director, or the NCFS (Fig 2.3). This summary also detailed the FSSB, LRC, QIC, SACs, and other infrastructure specifics. (17)

(Figure 2.3- Young Forensic Scientist Forum- "The Past, the Present, and our Future," Orlando 2015)

On January 10, 2014, the DOJ and NIST announced the first-ever appointed National Commission of Forensic Science and AAFS released a statement applauding the broad representation listing NCFS named members. NCFS members will work to develop guidance and recommended policy to the U.S. Attorney General on improving forensic science (Fig 2.3). (18) (19)

On February 3-4, 2014, at the first NCFS meeting, NIST presented the infrastructure summary plan and slide presentation for the new OSAC (previously called guidance groups,) unifying and incorporating the independent scientific working groups with more than 600 practitioners. The objective of the infrastructure is to produce standards and guidelines for improving the quality and consistency of

forensic science. OSAC was then launched at the AAFS meeting on February 18th, in Seattle, Washington. It is important to note that digital evidence was not included in the IT/Multimedia SAC, as shown in the figure below (Fig 2.4). (58)



(Figure 2.4- NIST Proposed Organization of Scientific Area Committees- OSAC) (21)

On February 12, 2014, John D. Rockefeller IV, U.S. Democratic Senator from the State of West Virginia, introduced the Forensic Science and Standards Act 2014 to establish a national forensic science research program. The purpose of this act is to strengthen forensic science by promoting scientific research, establishing science-based voluntary consensus standards and protocols across forensic science disciplines, and encouraging the adoption of these standards. (22)

On March 27, 2014, Patrick Leahy and John Cornyn introduced the Criminal Justice and Forensic Science Reform Act. Leahy stated our confidence in the criminal justice system should be strengthened by evidence and testimony, which is accurate, credible, and scientifically grounded. Since 1989, because of faulty forensic evidence, 314 DNA exonerates spent a total of 4,202 unnecessary years in prison and guilty

men went free, possibly continuing to commit other crimes. Law Enforcement, Defense Attorneys, Prosecutors, Judges, Scientists, and Practitioners, all want forensic evidence that is accurate and reliable to the court and executive action is not enough. In the interest of justice, legislation must address comprehensive forensic science reform. (23) (24) Leahy originally introduced this landmark forensics reform legislation bill in 2011. It was read by Congress twice and referred to the Committee on the Judiciary and is still not law. The bill is scheduled to be re-introduced in March, 2015.

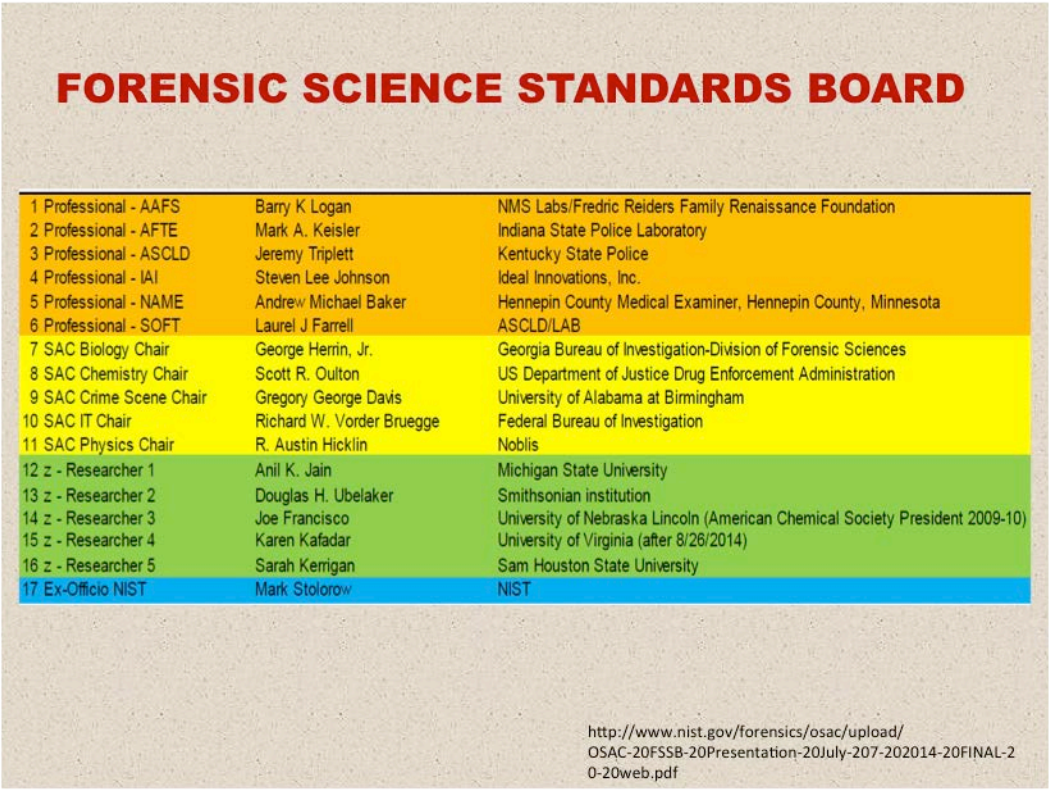
On April 11, 2014, after the DOJ turned the guidance groups over to NIST and OSAC was established, NIST defined the OSAC roles and responsibilities. The Organizational Authorities and Duties outlined the FSSB, HFC, LRC, QIC, SAC, SACsubs, and the process for application. (25)

On May 2, 2014, the NSTC Report *'Strengthening the Forensic Sciences'* was released to summarize three years work of the OSTP SoFS in response to the NAS Report 2009 National Academy of Sciences Executive Summary. SoFS comprised 200 experts across 23 federal agencies and delivered the first set of research findings covering issues related to laboratory accreditation, certification of forensic science, and medicolegal personnel, proficiency testing, and ethics. (26)

On May 7, 2014, NSF and NIJ partnered as co-sponsors to solicit proposals for Industry/University Cooperative Research Centers to develop the relationship between industry, academia, and government in the relevant areas of forensic science. Federal agencies represented are DOD, DFSC, DFBA, DHS, DOJ, ATF, DEA, FBI, and NIST. (27)

On June 26, 2014, NIST and DOJ appointed 17 members of the first Forensic Science Standards Board (FSSB- Fig 2.5). This marked the transition from planning to doing in the effort to improve the scientific basis of forensic evidence used in courts of law. The board consists of 5 research community members, 5 OSAC-SAC Chairs, 6 national forensic science professional organization members, and 1 ex officio. Richard Vorder Bruegge, Ph.D., FBI, Senior Photographic Technologist, will Chair the OSAC-SAC IT/Multimedia. (28)

On August 19, 2014, NIST announced competition to create a Forensic Science Center of Excellence anticipating $4 million in funding annually over 5 years. The mission of this center will focus on two branches of forensic science, pattern evidence and digital evidence. This is just one of several centers that NIST proposes. (29)



FORENSIC SCIENCE STANDARDS BOARD

1 Professional - AAFS	Barry K Logan	NMS Labs/Fredric Reiders Family Renaissance Foundation
2 Professional - AFTE	Mark A. Keisler	Indiana State Police Laboratory
3 Professional - ASCLD	Jeremy Triplett	Kentucky State Police
4 Professional - IAI	Steven Lee Johnson	Ideal Innovations, Inc.
5 Professional - NAME	Andrew Michael Baker	Hennepin County Medical Examiner, Hennepin County, Minnesota
6 Professional - SOFT	Laurel J Farrell	ASCLD/LAB
7 SAC Biology Chair	George Herrin, Jr.	Georgia Bureau of Investigation-Division of Forensic Sciences
8 SAC Chemistry Chair	Scott R. Oulton	US Department of Justice Drug Enforcement Administration
9 SAC Crime Scene Chair	Gregory George Davis	University of Alabama at Birmingham
10 SAC IT Chair	Richard W. Vorder Bruegge	Federal Bureau of Investigation
11 SAC Physics Chair	R. Austin Hicklin	Noblis
12 z - Researcher 1	Anil K. Jain	Michigan State University
13 z - Researcher 2	Douglas H. Ubelaker	Smithsonian institution
14 z - Researcher 3	Joe Francisco	University of Nebraska Lincoln (American Chemical Society President 2009-10)
15 z - Researcher 4	Karen Kafadar	University of Virginia (after 8/26/2014)
16 z - Researcher 5	Sarah Kerrigan	Sam Houston State University
17 Ex-Officio NIST	Mark Stolorow	NIST

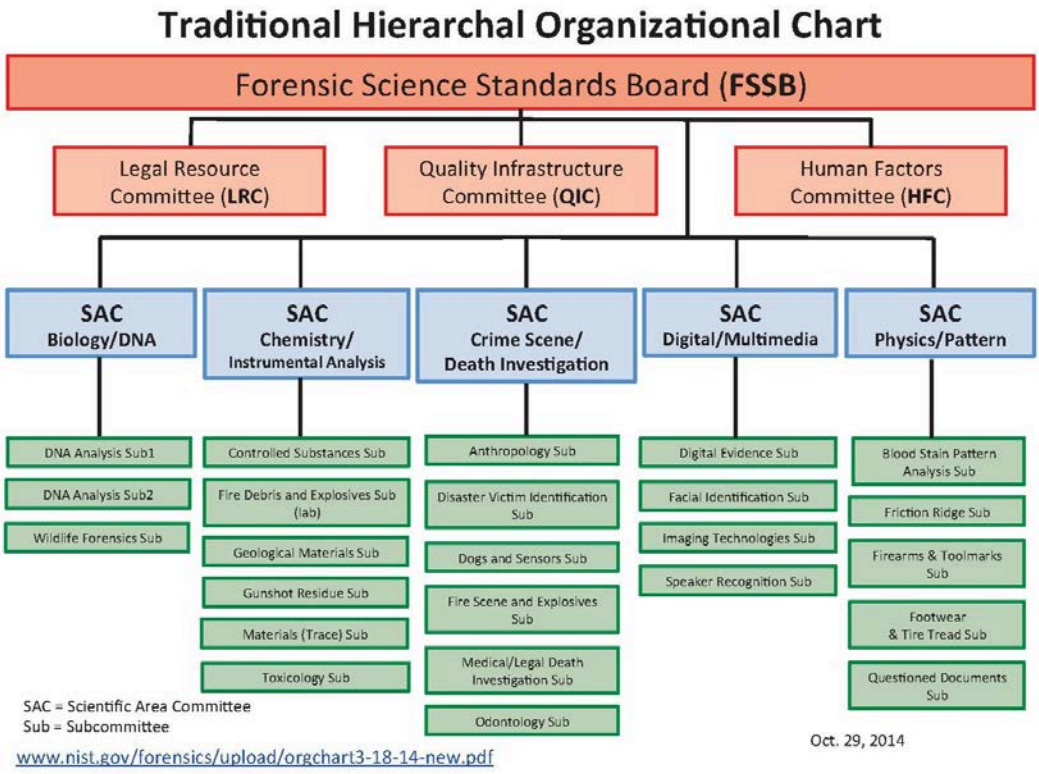
http://www.nist.gov/forensics/osac/upload/OSAC-20FSSB-20Presentation-20July-207-202014-20FINAL-20-20web.pdf

(Figure 2.5- Young Forensic Scientist Forum- "The Past, the Present, and our Future," Orlando 2015)

On September 3-8, 2014, NIST appointed 70 new SAC Committee members bridging the 24 discipline-specific SAC subcommittees with the FSSB. The SAC IT/Multimedia Committee changed to become the 15-member SAC Digital/Multimedia Committee adding digital evidence to the facial identification, imaging technologies, and speaker recognition subcommittees (Fig 2.6). (30) (31) (32)

Richard Vorder Bruegge, Ph.D., Committee Chair, U.S. Federal Bureau of Investigation
Joseph Campbell, Ph.D., MIT Lincoln Laboratory
Eoghan Casey, Ph.D., MITRE
James Darnell, U.S. Secret Service, chair of OSAC Digital Evidence Subcommittee
John Garofolo, U.S. National Institute of Standards and Technology
Carl Kriigel, U.S. Army Criminal Investigation Laboratory, Defense Forensic Science Center, chair of the OSAC Imaging Technologies Subcommittee
Samuel Liles, Ph.D., Purdue University
Abhyuday Mandal, Ph.D., University of Georgia
Hirotaka Nakasone, Ph.D., U.S. Federal Bureau of Investigation, Chair- OSAC Speaker Recognition Subcommittee
Lam Nguyen, U.S. Drug Enforcement Administration
Paul Penders, Connecticut Department of Emergency Services and Public Protection
Michael Piper, Target Corporation
Mark Pollitt, Ph.D., Digital Evidence Professional Services, Inc.

Reva Schwartz, United States Secret Service
Lora Sims, Ideal Innovations Inc., chair of OSAC Facial Identification Subcommittee

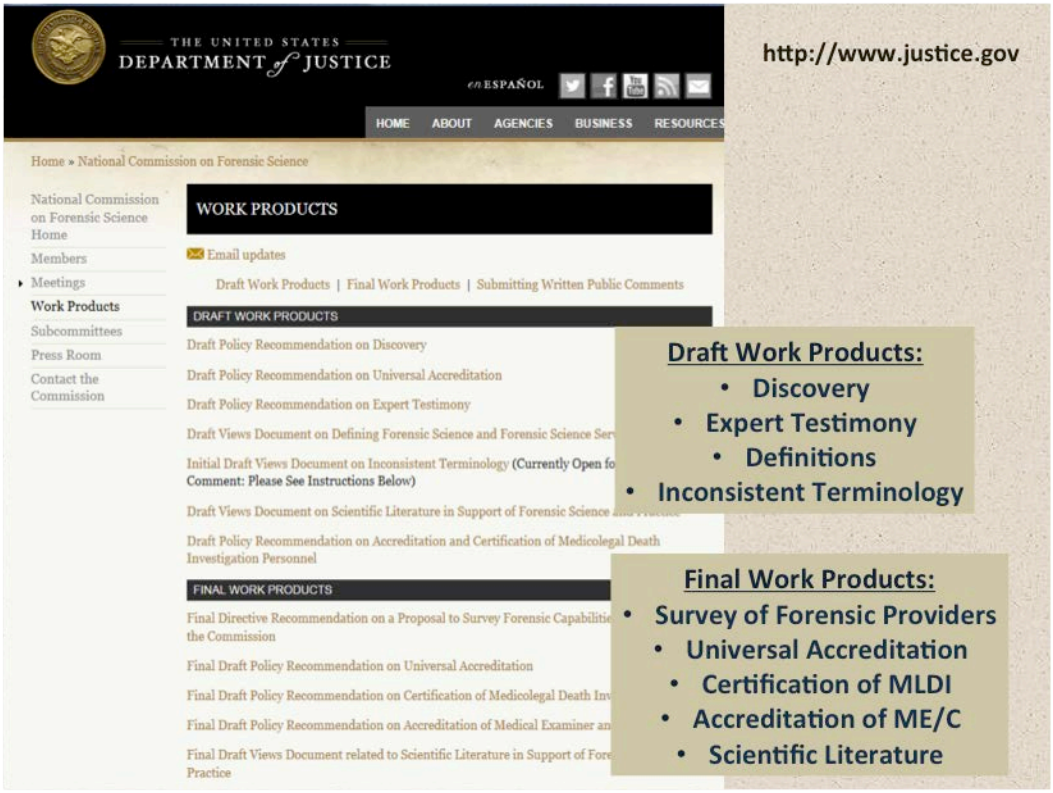


(Figure 2.6- OSAC Organization Chart) (33)

On October 24, 2014, NCFS released six draft policy/view documents for public review and comment: Recommendation on Discovery, Recommendation on Universal Accreditation, Recommendation on Expert Testimony, Document on Defining Forensic Science and Forensic Science Service Provider, Document on Scientific Literature in Support of Forensic Science and Practice, and the Recommendation on Accreditation and Certification of Medicolegal Death Investigation Personnel (Fig 2.7). (34) (35)

On October 29, 2014, NIST appointed 402 members to serve on 24 SAC Subcommittees (Fig 2.8) and the new Digital Evidence Subcommittee was finalized in December 2014; 19 members were appointed:

James Darnell, Subcommittee Chair, U.S. Secret Service
Samuel Brothers, U.S. Customs and Border Protection
Joshua Bruntly, Marshall University
Ovie Carroll, U.S. Department of Justice
Joseph Cassilly, State's Attorney for Harford County, Md.

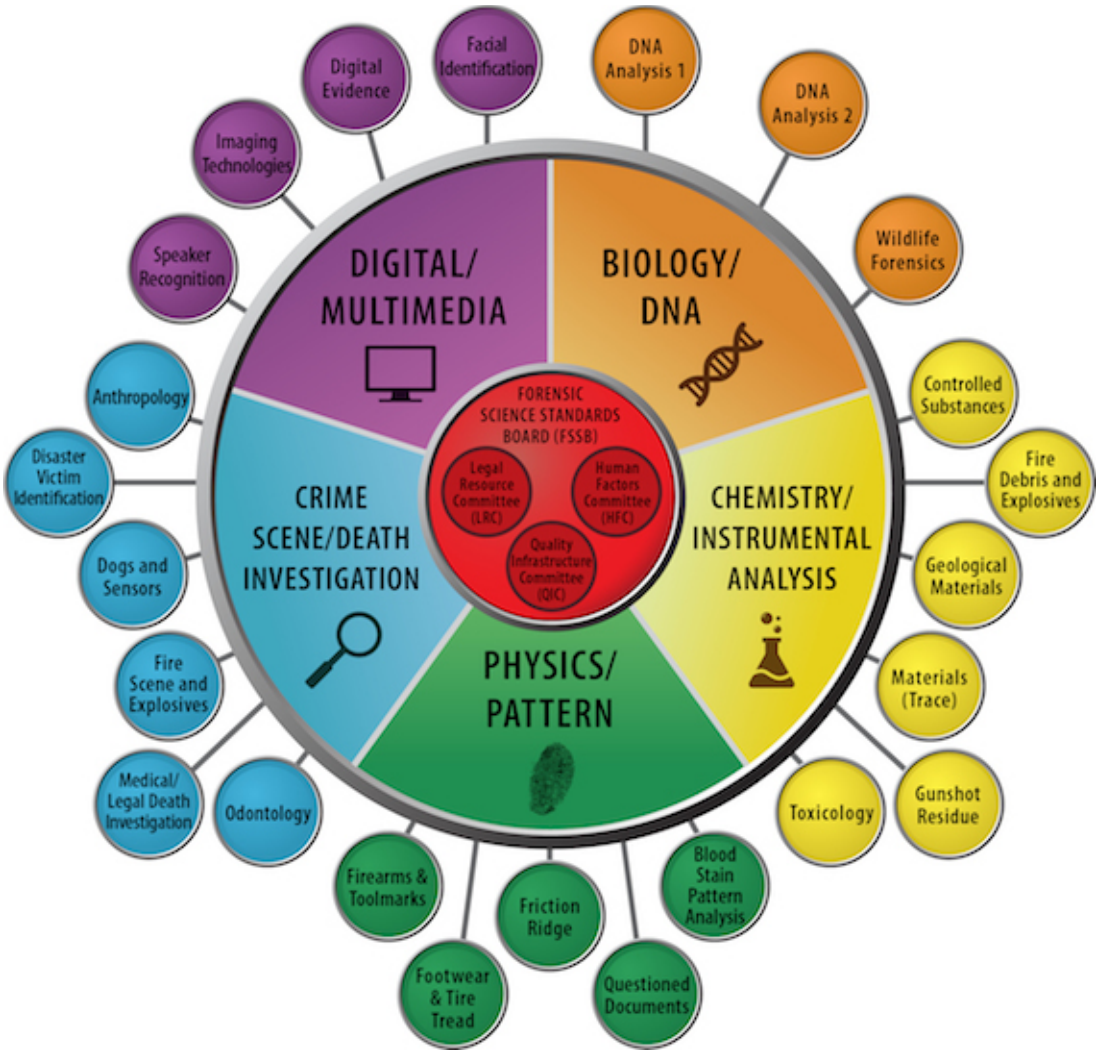


(Figure 2.7- Young Forensic Scientist Forum- "The Past, the Present, and our Future," Orlando 2015)

William Eber, Defense Cyber Crime Center, Air Force Office of Special Investigations
Sabrina Feve, U.S Attorney's Office, Southern District of California, Department of Justice
Daren Ford, Weld County (Colorado) Sheriff's Office
David Hallimore, Houston Forensic Science Center, Inc.
James Holland, Wal-Mart Stores, Inc.
Mary Horvath, U.S. Federal Bureau of Investigation
James Lyle, Ph.D., U.S. National Institute of Standards and Technology
Andrew Neal, TransPerfect Legal Solutions
Mark Phillips, Johnson County (Kansas) Sheriff's Office Criminalistics Laboratory
Ryan Pittman, NASA Office of Inspector General Computer Crimes Division
Paul Reedy, District of Columbia Department of Forensic Sciences
Marcus Rogers, Ph.D., Purdue University
Jeffrey Taylor, Arkansas State Crime Laboratory
Steve Watson, Intel Corporation

Members who are currently part of SWGDE will play a dual role as OSAC will not replace the SWGs.

OSAC Affiliate memberships for task groups are available and encouraged. (36) (37)



(Figure 2.8- Organization of Scientific Area Committees with Subcommittees)

CHAPTER III

STANDARDIZED TERMINOLOGY IN REPORTING AND TESTIMONY

Recommendation 2 of the National Academy of Sciences (NAS) Executive Summary Report 2009- '*Strengthening Forensic Science in the United States: A Path Forward,*' is the standardization of terminology in reporting and testimony. This chapter addresses Recommendation 2 and the issues of legal language and terminology, model laboratory reports, and expert testimony concerning DME case law.

Currently, there are no federally accepted standards or guidelines for terminology used in testifying and reporting results of forensic science investigations or any laboratory format with defined minimums specifying information needed to convey conclusions to the court. SWGDE's Position on the National Research Council Report to Congress- NAS Report 2009, agrees with standardization of terminology. They released an updated SWGDE/SWGIT Digital & Multimedia Evidence Glossary, Version: 2.7 on April 8, 2013, (38) and worked closely with ASCLD/LAB and ASTM International on the document *"Standard Terminology for Digital and Multimedia Evidence Examination E2916 – 13,"* (39) toward a national acceptance of terminology. (13) However, SWGDE confirms a consolidation of terminology is needed across all new Discipline-Specific Guidance Groups for Forensic Science. (57)

Legal Terminology

Although there are several available glossaries related to DME, terminology used in the court of law is not uniform. It contains vague interpretation with analysis instead of a scientific basis and does not adequately express probabilities or likelihood ratios of presented evidence. Scientific literature in support of forensic science and practice must be clearly cited and undergo a rigorous peer-reviewed process. Most evidence is not properly vetted and error rates are not fully understood by juries. To understand the language of DME, the vocabulary must be clear and consistent. All parties involved across the legal and scientific community must communicate on the same page without ambiguity.

In the initial draft views document of Inconsistent Terminology, (35) the NCFS outlines examples of this erratic language. It looks at inconsistency within and across forensic disciplines, the overstatement and exaggeration of terminology meaning and limitations, and the confusion and misapplication of usage as a result. The American Bar Association's Resolution 101C(2) considers the regulation of expert witness testimony and the presentation of opinion regarding the impact of terminology used during the trier of fact

evaluation. Under Misleading Terms in Testimony of the Presentation of Expert Testimony Policy Recommendations, NCFS identifies ‘zero error rate,’ ‘hundred percent accurate,’ ‘scientific,’ ‘reasonable degree of scientific certainty,’ ‘claims of uniqueness,’ ‘consistent with,’ and ‘match’ as potentially misleading terms needing to be validated and explained.

NCFS, in released draft documents, has defined ‘Forensic Science’ as: “the application of scientific practices to the recognition, collection, analysis, and interpretation of physical evidence for criminal and civil law or regulatory purposes.” Digital evidence is inclusive in this definition. They have defined ‘Forensic Science Service Provider’ as: “A person or entity that (1) applies scientific practices to recognizing, collecting, analyzing, or interpreting physical evidence and (2) issues test results, provides reports, or provides interpretations, conclusions, or opinions through testimony with respect to such evidence.” This broad range universal definition will be adopted and cited in footnotes by all NCFS subcommittees for the purpose of work product. (35)

Model Laboratory Reports

There is a lack of enforcement with federal standards for reporting scientific results in the courtroom. Parameters for interpretation of data, report writing, and court testimony have never been developed; therefore, a formal system of vetting evidence is needed. Scientific methods for technology, structure for report writing, and proper expert witness testimony should not fall on the shoulders of the judges to be sifters of the wheat from the chaff. In the medical field, ten different doctors with ten different definitions of one diagnosis along with ten different reporting standards would not be accepted. (10)

The way FRE 702 is written, experience counts as expertise with presentation of evidence. Specified in the *Melendez-Diaz v Massachusetts* case, it is not enough for the examiner to submit a report only. Analysis must have a scientific basis, an examiner must present evidence, and the examiner must be subject to cross-examination. (4) Developing and enforcing federal standards with reporting itself would allows judges another way to measure and qualify experts. Model reports should include error rates to clearly represent probabilities and likelihood ratio statistics when possible. (8)

SWGDE’s Position on the National Research Council Report to Congress- NAS Report 2009, describes a continued development of published documents and templates suitable for report standardization. These models could be used for standard operating procedures, validation testing, and

minimum elements needed for report findings. (13) SWGDE also follows a standardized development process for all work products. A development topic is picked based on need of discipline, specific committees schedule meetings to work on document progress, a draft is completed and general membership votes the draft release for public comment, comments are evaluated, and the final version is released. This process, described in the SWGDE position, is similar to existing standards development organizations (SDO's) and should be recognized by NIST. (57)

Expert Testimony

Several cases demonstrate why we need the highest qualified experts providing opinions based on validated forensic science. In August of 1985, David Shawn Pope was arrested for the rape of a woman from Garland, TX. Prosecutors presented evidence against him that included eyewitness misidentification and invalidated or improper forensic science. Regarding the latter, three experts testified at his trial: Larry Howe Williams, Dr. Henry Truby, and Stuart R. Ritterman. Larry Howe Williams, a Houston police officer, testified as a certified examiner competent to conduct voice print analysis. He claimed to match exactly a comparison of Pope's voice samples to voicemail messages left on the victim's answering machine. Dr. Henry Truby, Ph.Ds. in Linguistics and Phonetics with 40 years experience, used spectrogram comparison to also render a match of Pope's voice to the voicemail messages. Stuart R. Ritterman, an academic professor in Communicology, testified disputing voice spectrographic analysis as a valid science and could not determine an exact match between the voices. (40) Pope was convicted and spent 15 years, of a 45 year sentence, in prison. In January of 1999, Pope's case was reopened and he became the first person to be exonerated by DNA testing in Dallas County. In 2001, Pope was pardoned by Governor Rick Perry. (41)

In May of 2004, Brandon Mayfield was arrested in connection with a train bombing in Madrid, Spain. The Spanish National Police found fingerprints on evidence from the scene that they released to the FBI through Interpol. Mayfield was one of 20 possible matches flagged in the FBI database due to a previous arrest and became the prime suspect. Although Spanish authorities contested Mayfield's fingerprints and eventually announced the arrest of an Algerian national, an FBI examiner described Mayfield's fingerprints as 100% verified and he was detained undisclosed with no access to family or legal

counsel. He was never formally charged. In 2006, the FBI issued a formal apology and Mayfield received a $2 million dollar settlement. (42)

In April of 2011, an alleged murder-for-hire was captured and recorded involving Edgar Steele and Larry Fairfax. The defense team of Edgar Steele was unable to call Dennis Walsh and Dr. George Papcun as audio expert witnesses due to a ruling by U.S. District Judge Lynn Winmill. It was concluded that Walsh, a former New York City detective with a B.A. in Criminal Justice, used unreliable techniques and did not have the background or experience to qualify as an expert. Papcun's testimony, even though he had a Ph.D. Philosophy in Acoustic Phonetics, was ruled irrelevant and potentially misleading to the jury. (43)

In June of 2013, the case of George Zimmerman, 6 audio experts were consulted to testify in regards to the 911 call evidence. Identifying the screams in the recording could have determined the aggressor in a confrontation between Trayvon Martin and George Zimmerman. The prosecution called Tom Owen and Alan Reich. Judge Debra S. Nelson ruled against the prosecution for admissibility of testimony from Owen and Reich as unreliable stating, "There is no evidence to establish that their scientific techniques have been tested and found reliable." Tom Owen, certified by the American College of Forensic Examiners Institute (ACFEI) with a B.A. in History, was retained by the *Orlando Sentinel* to examine the audio-recorded evidence. He used voice-recognition technology (Easy Voice software analysis of which he has a financial interest in) to testify that the seven seconds of screams on the 911 call did not match the voice sample of Zimmerman. Dr. Alan Reich, who holds a Ph.D. in Speech Science, was retained by the Washington Post and testified that the screams matched the voice of Martin. His conclusion was based on digital enhancement and transcription software, aural perception, and acoustic-phonetic analysis methods.

The defense called Dr. Hirotaka Nakasone, Dr. Peter French, Dr. George Doddington, and Dr. Jim Wayman. Dr. Hirotaka Nakasone, Ph.D. in Speech Science and FBI- Senior Scientist Voice Recognition Program, concluded there was less than three seconds of usable audio on the 911 call and that screams were not suitable for comparison to one's normal speaking voice. Dr. Peter French, Ph.D. Analysis of Recorded Conversion, dismissed the recorded 911 call screams as unsuitable for any type of forensic analysis. Dr. George Doddington, Ph.D in Electrical Engineering- Information Technology with NIST affiliation, viewed the State's voice indentification conclusions as "ridiculous." Dr. Jim Wayman, Ph.D. in

Engineering, after reviewing the 911 call evidence, testified that less than one second of data was available in each of the screams and that no software accepted in the forensic science community could produce reliable comparison results. (44) (45) (46) (47)

NCFS released policy recommendations on the Presentation of Expert Testimony (35), which are:

(1) Experts should be asked to identify and explain the theoretical and factual basis for any conclusion and the reasoning on which the conclusion is based- and any limitations of their conclusions,

(2) Experts should present testimony in a manner that accurately and fairly conveys the significance of their conclusions, avoiding unexplained or undefined technical terms or words of art,

(3) Experts should remain neutral, and attorneys should respect this neutrality,

(4) Experts should not testify beyond their expertise and should also appreciate the difference between testimony that the witness may give as an expert and testimony that the same witness may give as a lay/fact witness,

(5) Experts should not testify on direct or redirect examination concerning case-specific conclusions not contained in the report(s)/documentation submitted in discovery- unless in fair response to issues raised on cross-examination. If an expert changes his or her opinion, a supplementary report should be submitted except where the change is occasioned by new information, presented during testimony and not previously available to the witness,

(6) Experts should not testify concerning conclusions that are beyond the limits of a laboratory's testing protocols,

(7) Experts should not use invalid or problematic terms in their reports or when testifying,

(8) Experts should not use misleading terms that suggest that the methodology or the expert is infallible when testifying,

(9) Experts should not use potentially misleading terms in their reports or when testifying without a clear explanation of the term's significance and limitations,

(10) Experts should not use the term "scientific" when testifying unless the basis for their opinions has been scientifically validated,

(11) Trial judges should not declare a witness to be an expert in the presence of the jury,

(12) Attorneys have an obligation to understand the discipline- including its strengths and limitations- underlying the expert testimony that is presented at trial and to appreciate the importance of consulting with experts prior to trial,

(13) The proponent of the expert testimony should not cause an expert to testify beyond the opinion submitted in discovery or beyond the limits of the laboratory's testing protocols and

(14) Attorneys should not mischaracterize expert evidence in their comments to the jury.

CHAPTER IV

INSUFFICIENT EDUCATION AND TRAINING

Recommendation 10 of the National Academy of Sciences (NAS) Executive Summary Report 2009- '*Strengthening Forensic Science in the United States: A Path Forward,*' refers to insufficient education and training. Forensic evidence lies at the juncture between science, technology, and the law. In the age of information, everyone who plays a role in the justice system must be accountable to increased learning and knowledge in and around their domain. This chapter analyzes Recommendation 10 identifying legal awareness for the digital and multimedia examiner to understand the role of the expert witness, the attorney, the judge and the admission of forensic science evidence in litigation in our criminal justice system.

The Role of the Expert Witness

A DNA exonerate review revealed that 72 forensic analysts from 52 labs across 25 states provided inappropriate court testimony. (9) Digital and multimedia examiners, analysts, and technicians must understand their potential role in the criminal justice system. The expert witness is defined as someone who knows more than a layperson based on knowledge, skill, education, training, and experience. Certification, competency and proficiency testing, and continued acknowledgement of procedural updates should be maintained. An examiner should be familiar with digital and multimedia specific case law and understand the precedents set in our forensic discipline. He/she can further understand relevance, reliability, and admissibility of evidence through the Federal Rules of Evidence: Article IV, Article VII, and Article IX. Ultimately, we can help the criminal justice system make our communities safer and aid in the resolution of legal matters.

The examiner must be prepared to give science-based opinions, rely on supplementary expertise, and refer to documentation during testimony. As an expert witness, the examiner assists the trier of fact and is responsible for educating the jury, attorneys, and the judge in their areas of expertise alone. Testimony should remain neutral to the case presenting clear scientific definitions and conclusions without bias. It is acceptable to disclose and testify any information regarding the limitations of technology and to correct any errors concerning the statements of expert testimony. There is obligation to the Brady Rule, which states an affirmative duty to disclose evidence to the Defense even when favorable, hurting the Prosecution or

helping the Defense. The decision of guilt or innocence must be left to the trier of fact and personal opinions should not be reached. All rules of the case regarding full disclosure, discovery, and confidentiality must be realized and maintained.

The process of qualifying as an expert witness begins with current and relevant information provided in the curriculum vitae (CV) proving areas of expertise. Solid pre-trial preparation will ensure valuable testimony and keep the expert witness within their competence level, free to display comfort when admitting areas outside their confines. Learned treatises, social media, transcripts of previous case testimony, and any published material written at any time by the expert witness are fair game in the process of qualifying as a witness. (55)

The Role of the Attorney

In criminal cases, the Prosecutor represents the People's interest carrying the burden of proof in trial, ultimately seeking justice served above all else. They are liable to reviewing and filing the criminal charge, have an affirmative duty to disclose, and must comply with the Brady Rule even after the conviction. The Prosecutor is accountable to all fair and true admissible information, in possession or accessible in the case, including law enforcement investigations and laboratory analysis. During direct examination, open-ended questions like how, what, where, and why are used by the Prosecutor and use of leading questions are not permitted.

The Defense Council is advocate to the client warranting that all elements of the Prosecutor's charge are ascertained before a conviction. A client's rights are protected by Defense under the Sixth Amendment and the Bill of Rights. Cross-examination confronts the People's witness and reserves the right to challenge checks and balances surrounding roles of power in the adversarial justice system. (55)

The Role of the Judge

The Judge can be thought of as the court referee and is the neutral arbiter in the criminal justice system. Charged with the title Gatekeeper, the Judge decides what laws apply to the issues of the case, communicates directly to the jury, and sentences the defendant in criminal cases. He/she also, handles any administrative functions affecting scheduling and courtroom personnel. In a jury trial, the jurors are the finders/triers of fact, but in a bench trial, the Judge becomes the finder/trier of fact. The judge determines if an expert witness is qualified, the limits of their testimony, and whether or not evidence is admissible.

Legal objections raised during trial bring attention to the Judge, and the ruling of sustained or over ruled resolves the dispute. (55)

The Admission of Forensic Science Evidence in Litigation

Invalidated and improper forensic science, stated earlier within the challenges facing the forensic science community, is the second greatest contributing factor of wrongful convictions based on interpretation of forensic evidence and illustrates the cases already present in the criminal justice system. Why is this? The NAS Report 2009 quotes that, "…the judicial system is encumbered by judges and lawyers who generally lack the scientific expertise necessary to comprehend and evaluate forensic evidence in an informed manner." Expert witnesses are testifying with credentials difficult for judges to restrict. Industry experience is permitted as a qualifying component under the FRE 702; therefore, knowledge and practice or 'doing something for a long time' counts, possibly even in the case of the pseudo expert. A nationally approved system of certification would create the standard for which Judges could measure the admissibility of expert witness testimony against. (2)

Carol Henderson is the Director of the National Clearinghouse for Science, Technology, and the Law (NCSTL.org). Chapter II of this thesis notes her involvement at the federal level. NCSTL.org is an online resource that educates and shares information across the forensic science community focusing specifically on gaps between science, technology, and law. An online database can be searched by scientific topic, preference of resource, and can be keyword filtered. For example, case law and legislation specific to digital evidence or voice analysis can be categorized. NCSTL.org's newest partnership with the Law Enforcement Innovation Center is to develop an online course for locating, evaluating, and selecting the expert witness. These types of resources will aid all areas of the legal system. (48)

CHAPTER V

PRACTICE OF FORENSIC SCIENCE- TEXAS CRIME LABORATORIES

Forensic science laboratories and examiners will see changes in areas like accreditation, examiner certifications, and standard operating procedures as the recommendations of the NAS Report 2009 take effect and organizations like OSAC begin to strengthen in purpose. Creating a federal standard means that laboratories qualified as forensic science service providers will have to meet these new requirements and guidelines in order to be allocated federal funding.

Three current Texas laboratories, at the state, county, and city level are surveyed in this chapter using an interview format. The Texas Department of Public Safety is a state ASCLD accredited laboratory under the category of law enforcement division. The Smith County Sherriff's Office Criminal Investigation Division Crime Lab is an unaccredited county laboratory under the category of law enforcement division. The Houston Forensic Science Center is an independent laboratory in the process of attaining accreditation and is under the category of local government corporation (LGC) for the City of Houston, within the government but outside law enforcement. HFSC is of particular interest because the suggestion of the NAS Report 2009 to remove forensic laboratories from the jurisdiction of law enforcement is highly debated.

Case Study I - State Lab - Deputy Assistant Director Brady Mills

Texas Department of Public Safety - LES Crime Lab DME ASCLD #ALI-051-T

5800 Guadalupe St., Austin, Texas 78752 – 512-424-7151

The TXDPS digital and multimedia evidence laboratory conducts audio, video, and computer forensics. I contacted Brady Mills and requested an interview. Although he denied an on-site tour and visit, he agreed to forward any questions I had via email communication. (49)

Interview Questions and Answers: Brady Mills

1. Are you familiar with the '2009 National Academy of Sciences Executive Summary- Strengthening Forensic Science in the United States: A Path Forward' and the progress made at the federal level regarding DME and the resulting recommendations 1, 2, and 10? ***see question 2 answer.***

2. How has/will developments at the federal level in the field of forensic science affect the TXDPS crime lab and its operations at the state level? ***1&2- We are very aware of the progress being made at many different levels regarding the NAS summary. You may be aware of some of the current legislation, here***

is an excerpt and link to the entire article.

> ***"From DNA to digital evidence, prosecutors, defense attorneys, and judges are becoming increasingly reliant on the collection and analysis of various forms of forensic evidence in a criminal investigation or prosecution," Leahy said in a statement. "The legislation I am introducing with Senator Cornyn represents a comprehensive and common sense approach toward guaranteeing the effectiveness and integrity of forensic evidence used in criminal cases, and in ensuring that Americans can have faith in their criminal justice system."***

http://www.leahy.senate.gov/press/leahy-and-cornyn-introduce-sweeping-forensics-reform-legislation

Here closer to home, a good example of local progress is the Houston, Texas PD laboratory. It has been taken from the oversight of the police department and is now a local government corporation created to provide independent forensic services to the HPD and other local law enforcement agencies and others in the legal system.

3. What is the current state governing organization that legally oversees TXDPS crime lab?

Since 2005 the Texas Forensic Science Commission is an independent over sight body, created by the Texas Legislature.

4. What role, if any, do the Scientific/Technical Working Groups play regarding TXDPS crime lab?

With the recent creation of the National Forensic Science Commission and now the inclusion of computer forensics in the establishment of the new Organization for Scientific Area Committees (OSAC) the Texas DPS crime laboratory follows best practices and recommendations set forth by these scientific and technical working groups. Another resource we rely heavily on for guidance is the ASCLD/LAB Guiding Principles of Professional Responsibility for Crime Laboratories and Forensic Scientists. I know of several of our laboratory personnel, including myself, who have recently sent application in to be considered for committee membership or technical points of contact for these organizations as well as ASCLD/LAB Professional Review Committees.

5. Is it possible to get a copy of the current Standard Operating Procedures used by TXDPS crime lab?

To receive a copy of the current Standard Operating Procedures for any or all of our disciplines here in the laboratory, simply email this request to CrimeLabRecords@dps.texas.gov.

6. What are the current standards/guidelines used for forensic report writing? Is it possible to get an

example report? ***Each of our disciplines should have a report-writing module included in their SOPs. We incorporate all of the required elements that our ASCLD/LAB ISO accreditation standards set forth. Specifically to the DME discipline, we also provide a report to our clients in digital form so they can view the files recovered or extracted from the devices they submit. These digital reports are treated and tracked as evidence would be. Our reports are generated by our Laboratory Information Management System (LIMS), which is called JustceTrax®. You can ask in your email for records if there is a generic report template that you can have or request a certain discipline's report template.***

7. What is the 2013 overall percentage of Digital Evidence cases compared to all cases worked by TXDPS crime lab? Are the statistics reported? If so, is it possible to get a copy of the report?

In 2013 DME had 81 cases out of the entire 13-laboratory system total of approximately 86,000+ cases. This would calculate to slightly less than 1% of the laboratory system's cases for the year. Austin is the only lab of the 13 that offers digital evidence services. Statistics are generated and reported regularly to the Public Safety Commission. You can ask for those reports also through the email above.

8. What is the current training program used by TXDPS crime lab to educate your forensic experts in Lab operations? ***Our training programs consist of general laboratory training and discipline specific training. We take advantage of external training courses offered by numerous agencies/organizations/programs such as government funded training and professional organization workshops. We strive for consistency in our training programs, which are evaluated for competency and ultimately end with approval of the Deputy Assistant Director of the laboratory.***

9. What is the current training program used by TXDPS crime lab to educate your forensic experts in court testimony? ***The current training program regarding court testimony consists of something akin to an in-house certification. Required readings, mock trials and direct observation are some of the methods employed. This portion of training also goes through the evaluation process as above.***

10. Does TXDPS crime lab have a forensic expert 'code of ethics'? If so, is it possible to get a copy?

We receive rigorous training on the topic of ethics. There is departmental wide training conducted annually. We abide by the ASCLD/LAB Guiding Principles that I mentioned in an earlier answer, among numerous resources that are scattered in our System Manuals such as the Laboratory Operations Guide, the General Laboratory Training Manual and discipline specific Training Manuals as well.

Case Study II - County Lab - Sgt. Noel Martin and Detective Justin Hall

Smith County Sheriff's Office (SCSO) - Criminal Investigation Division Lab

227 N. Spring Ave, Tyler, Texas 75702 - 903-590-2696

The SCSO Criminal Investigation Division Crime Lab serves a dual role of both the criminalist's Crime Scene and Cyber Crime Units with three total practitioners. Responsibilities include crime scene acquisition, collection and preservation of evidence, chain of custody, all crime scene photography in-house, fingerprint detection, development and comparison, bloodstain pattern analysis, shooting reconstruction, cell phone and digital extraction, computer processing, online impersonation, and others. Professional membership includes ICSIA. All policy documentation covers SCSO as a whole and DME lab specific policy documentation is not available. Continuing education and training is strongly encouraged; however, no DME lab specific training is available.

I spent a total of 6 months interning at SCSO and it was my first exposure to a real world laboratory. The cases analyzed and worked covered all areas of CID including crimes against children, homicide, suicide, theft, burglary, and crime scene. I was impressed with Det. Hall and his willingness to include me as part of the team. It was a comfortable working environment in that I could work on cases at a distance asking any and all questions as they came up. Overall, there was very little awareness in this laboratory of the federal level changes discussed in this thesis. However, when I made suggestions for things that could help Det. Hall, he welcomed the ideas of improvement and when I asked all my 'dumb questions' he would start over at the beginning with complete patience and explain, "Here's how you turn this on…"

I learned first hand how to document chain of custody and intake of evidence by actually filling out the forms necessary for SCSO. We processed guns, clothes, computers, cell phones, and cars as just a few examples. I went into the field and processed vehicles for fingerprints, saw how detectives worked and trained the K9 drug dogs, how the emergency 911 call center operated, pulled CCTV footage from various crime scene locations, and experienced how officers and CID together handled deaths at the scene. I was able to listen to discussions as detectives tried to figure how to write search warrants for social media evidence and I sat in on meetings when major cases were being discussed and organized. I was exposed to horrible images through crime scene photography as well as real life content of numerous digital cases with

various media formats. So far, no nightmares!

Det. Hall was open to new ideas for creation and adoption of new documentation; therefore, a Digital and Multimedia Evidence Submission Form (Fig 5.1), a Monthly Case Log Form (Fig 5.2), and a Monthly Case Log Statistic Form (Fig 5.3) was designed, introduced, approved, and established for SCSO CID. During the time spent at SCSO, approximately 400 case stats were calculated within the Cyber Crime Unit between 2010-2013, to find the following percentages: 60% cell phone, 16% computer, and 23% other data storage. Det. Hall was 100% responsible for analyzing these cases and recalls testifying in only about 8 cases. A policy handbook was suggested to contain the collection of SWGDE best practices and development of an SCSO DME SOP was discussed. Forensic tool upgrades, totaling a $13,000 investment, consisting of a new Digital Intelligence FRED system, a Cellebrite UFED Touch Ultimate, EnCase V7, and Oxygen Forensic Suite Analyst 7 were requested and approved.

Interview Questions and Answers: Detective Hall

1. Are you familiar with the *"2009 National Academy of Sciences Executive Summary- Strengthening Forensic Science in the United States: A Path Forward"* and the progress made at the federal level regarding DME and the resulting recommendations 1, 2, and 10? ***No***

2. How has/will developments at the federal level in the field of forensic science affect SCSO CID and its operations at the state level? ***Federal Case Law***

3. What is the current state governing organization that legally oversees SCSO CID?

Texas Rangers would investigate SCSO as a whole, not necessarily lab specific.

4. What role, if any, do the Scientific/Technical Working Groups play regarding SCSO CID?

Only SWGSTAIN referenced in relation to terminology used for reporting on the crime scene side of lab.

5. Is it possible to get a copy of the current Standard Operating Procedures used by SCSO CID?

No DME lab specific SOP's available.

6. What are the current standards/guidelines used for forensic report writing? Is it possible to get an example report? ***No DME lab specific standards/guidelines available.***

7. What is the 2013 overall percentage of Digital Evidence cases compared to all cases worked by SCSO CID? Are the statistics reported? If so, is it possible to get a copy of the report? ***N/A***

8. What is the current training program used by SCSO CID to educate your forensic experts in Lab

operations? ***No DME lab specific lab operations training available.***

9. What is the current training program used by SCSO CID to educate your forensic experts in court testimony? ***No DME lab specific court testimony training available.***

10. Does SCSO CID have a forensic expert 'code of ethics'? If so, is it possible to get a copy? ***No DME lab specific code of ethics available.***

Since my internship, I have stayed in contact with Det. Hall and on my desk, I have a SCSO patch and a plaque that was given to me before I left. I was lucky to get the internship at SCSO as I have absolutely no background in law enforcement and SCSO is law enforcement only. I think this speaks volumes to the openness of SCSO as an organization. It was a win/win situation. I have also since learned that changes are occurring in this laboratory. Det. Hall is now considered Cyber Unit only and no longer has to crossover to the crime scene side as they are now separated into two units. Det. Hall will focus only on digital evidence, should be receiving his new FRED system any day now, and is headed to Myrtle Beach in June for the Techno Security and Forensic Investigations Conference. We plan on staying in touch to discuss future ideas and cases and if I have it my way, he will be at AAFS next February!

Smith County Sheriff's Office Cyber Crimes
Criminal Investigation Division
227 N. Spring Ave, Tyler, TX 75702
Phone: 903-590-2696 Fax: 903-590-2679

Digital Media Evidence Submission

SCSO Case #_____

Investigator:_____Date:_____

Division/Agency

ase ☐ Photography ☐ Other_____

Case Notes:

_____
_____
_____
_____
_____
_____

Examiner:_____Date Completed:_____

(Figure 5.1- Digital Media Evidence Submission Form)

Smith County Sheriff's Office Cyber Crimes
Criminal Investigation Division
227 N. Spring Ave, Tyler, TX 75702
Phone: 903-590-2696 Fax: 903-590-2679

Monthly Case Log

Date:

SCSO Case #	Division/Agency	Investigator	Device/Analysis	Date
1				
2				
3				
4				
5 6				
7				
8				
9				
10 11				
12				
13 14				
15				
16				
17				
18 19 20				
21				
22				
23				
24				
25				

Examiner:

Date Completed:

(Figure 5.2- Digital Media Evidence Monthly Case Log Form)

Smith County Sheriff's Office Cyber Crimes
Criminal Investigation Division
227 N. Spring Ave, Tyler, TX 75702
Phone: 903-590-2696 Fax: 903-590-2679

Monthly Case Log Statistics

Month/Year:

Examiner:

Days Worked:

Total Cases:

NC	A	CDA	CE	IAFIS	LPC	CSI	IQ	SI	FP	C	CP	AA

NC- New Cases Assigned This Month
CE- Cleared By Exception
CSI- Crime Scene Investigations
FP- Forensic Processing
AA- Agency Assists

A- Active
IAFIS- IAFIS
IQ- Inquests
CP- Cell Phone Analyzed

CDA- Cleared/Filed with DA
LPC- Latent Print Comparisons
SI- Suicide Investigations
C- Computers Analyzed

Examiner:

Date Completed:

(Figure 5.3- Digital Media Evidence Monthly Statistic Form)

Case Study III - City Lab – Irma Rios, Sgt. David Hallimore

Houston Police Department (HPD)- Forensic Audio/Video Unit

Houston Forensic Science Center, Inc. (HFSC)

1200 Travis St, Houston, Texas 77002 – 713-308-3084

Harris County, Texas has had its share of legal controversy resulting in eight total exonerations. (50) Harold Hurtt, Chief of Police Houston, proactively requested an independent state crime laboratory audit by Texas DPS in November 2002. The results suspended DNA testing immediately. Internal Affairs Investigations and two Grand Juries followed. No indictments were charged, but reprimand, terminations, and a separation of management from employees ensued and backlogs of rape kits were outsourced by the City Council costing $4.4 million. (51) In 2003, a review of the DNA cases conducted at HPD were re-tested by three outside agencies and National Forensic Science Technology Center was hired to evaluate lab operations and employees. In 2004, an independent review of the laboratory and property room was conducted with stakeholder oversight and a final disclosure report was issued in June 2007. Chief Hurtt, when asked after the fact, still supports a well-funded independent laboratory as the most appropriate solution for crime laboratory reform. (4)

I first met Sgt. David Hallimore in the Fall of 2013 when I toured the HPD Forensic Audio/Video Unit. At that time, he had 17 years experience with HPD and 10 years affiliation with SWGDE. The lab itself had 6 commissioned employees (2 audio and 4 video) within the Identification Unit, was located in the fourth largest city in the U.S., and was not accredited. Sgt. Hallimore introduced me to the Texas Forensic Science Commission, http://www.fsc.texas.gov, and the 2005 Texas legislative session 79(R) House Bill 1068, as well as other ideas and resources. Although the Forensic Audio/Video Unit was never actually part of the HPD crime laboratory, Sgt. Hallimore is currently appointed to the HPD transition to independence and agreed to disclose information described in this case study.

In 2012, a Texas Local Government Corporation (LGC) began to transition crime laboratory operations from HPD. The nine-member board of directors of the Houston Forensic Science Center (HFSC) was appointed and governed by Mayor Parker and the Houston City Council with Texas State Representative Hon. Scott Hochberg as Chairman. (52) Dr. Daniel Garner became CEO and President leaving his retirement to bring years of credible experience to the new founded center. This transition

required the HPD laboratory to shift out from under the jurisdiction of law enforcement into an independent, third party laboratory and aligns itself to the recommendations of the NAS Report 2009. The transfer was unprecedented and HFSC could likely become the new model for laboratories nationwide. (53)

The legal process took two years and on April 6, 2014, HFSC officially assumed the eight forensic disciplines of HPD and changed over 160 employees across the Houston Police Officer's Union, the Houston Organization of Public Employees, and corporate administrative HPD positions. HFSC organized into five divisions: Evidence Collection, Forensic Analysis, Training, Methods Research and Development, and Quality Assurance. In September 2014, just 6 months after the official launch, HFSC achieved Forensic Quality Services (FQS) accreditation in Controlled Substance, Toxicology, Forensic Biology, and Firearms. Accreditation for Latent Prints, Digital Forensics, Crime Scene, and Forensic Audio/Video will continue to be pursued. The FQS accreditation meets international and global standards of ISO/IEC 17025:2005 and FBI-QAS. As a criminal justice organization, HFSC has access to CODIS, IAFIS, and NIBIN databases. HFSC is currently housed within 20,000 sq. ft. at HPD and is expected, within 3-5 years, to expand to a brand new 200,000 sq. ft. distinct regional service facility. Grants, including those from NIJ, have been awarded to HFSC and substantial efforts to decrease backlog cases are underway. The 'code of ethics' of HFSC was effective as of May 28, 2014. (54)

Interview Questions and Answers: Sgt. Hallimore

1. Are you familiar with the '2009 National Academy of Sciences Executive Summary- Strengthening Forensic Science in the United States: A Path Forward' and the progress made at the federal level regarding DME and the resulting recommendations 1, 2, and 10? ***Yes, intimately familiar.***

2. How has/will developments at the federal level in the field of forensic science affect FAVU and its operations at the state level? ***HFSC's charter documents were a result of the NAS Report 2009. Lab transition began in April 2014. HFSC watching closely to stay aligned with Federal Standards.***

3. What is the current state governing organization that legally oversees FAVU?

Mayor, HFSC Governing Board.

4. What role, if any, do the Scientific/Technical Working Groups play regarding FAVU?

HFSC working toward full FQS accreditation.

5. Is it possible to get a copy of the current Standard Operating Procedures used by FAVU?

HFSC SOPs are in process.

6. What are the current standards/guidelines used for forensic report writing? Is it possible to get an example report?

Narrative case by case, work notes worksheet, chain of custody, no need for scientific opinion.

7. What is the 2013 overall percentage of Digital Evidence cases compared to all cases worked by FAVU? Are the statistics reported? If so, is it possible to get a copy of the report? ***N/A***

8. What is the current training program used by FAVU to educate your forensic experts in Lab operations? ***Internal training program ending with LEVA Competency Test, 6 months of monitored casework, continued education training, vendor support of tools.***

9. What is the current training program used by FAVU to educate your forensic experts in court testimony? ***Various Moot Court training from the Prosecutors Office, but only approximately 35 total expert testimonies given within 60 years of work experience combined with 5 employees working countless cases. State of Texas Code DE exception.***

10. Does FAVU have a forensic expert 'code of ethics'? If so, is it possible to get a copy? ***(Fig 5.4)***

After the previous interview was conducted, on March 23, 2015, I became the first civilian Forensic Analyst hired by the Houston Forensic Science Center for the Forensic Audio/Video Unit. Our unit is one of the four remaining HFSC forensic disciplines working toward accreditation. HFSC is right in the middle of making the cultural shift from law enforcement to independent forensic science service provider and all of my fellow analysts are HPD officers. It is interesting to note that HFSC is actually trying to measure this cultural transition and might eventually present those statistics at future industry events. As I write this, new SOPs, training manuals, and training checklists are underway.

The leadership that represents HFSC is a force steadfast toward the goal of excellence with laboratory independence. I heard Dr. Garner say that, "HFSC wants the best people, with the best training, in the best environment…" when talking about the standards of forensic services provided to customers. I can speak to this personally as within the first 6 months of employment my training will involve certification, on site laboratory audit and assessment, the Texas Forensic Science Commission, a lecture series, and moot court training. It is also being discussed that the HFSC digital evidence and forensic audio/video units might combine into one forensic discipline but that is not confirmed at this time.

HOUSTON FORENSIC SCIENCE CENTER
CODE OF ETHICS
EFFECTIVE MAY 28, 2014

Introduction

The public is entitled to unbiased and quality forensic work conducted with integrity so that stakeholders may have confidence in our collection and testing. To maintain public confidence, it is important that all employees adhere to the highest standards of professionalism in their dealings with members of the public, stakeholders, and one another. Employees at all levels of the organization are committed to these minimum standards of behavior.

The Code

1. **Evidence** – Employees shall be unbiased and objective in all evidence examinations and assignments.

2. **Truth** – Employees shall seek to discover the scientific truth in the evidence and shall report their findings and represent their credentials accurately.

3. **Honesty** – Employees shall interact with others in a cooperative, respectful, and honest manner.

4. **Independence** – Employees shall perform their work in a manner independent of undue influence, whether real or perceived.

5. **Confidentiality** - Employees shall maintain confidentiality of restricted information obtained in the course of professional endeavors.

6. **Scientific** – Employees shall follow sound scientific techniques and practices.

Implementation

Intentional violations of any part of this code may result in corrective action. Employees shall report to the appropriate individual(s) unethical, illegal, or scientifically questionable conduct of which they have knowledge. Moreover, employees should feel free to report violations without fear of retaliation.

(Figure 5.4- Houston Forensic Science Center, Inc. Code of Ethics)

BIBLIOGRAPHY

(1)109th Congress 1st Session. Appropriations Bill. H.R. 2862. U.S. Senate. D.C.: GPO, 2006.

(2)Committee on Identifying the Needs of the Forensic Science Community, National Research Council. Strengthening Forensic Science in the United States: A Path Forward. D.C.: National Academies Press, 2009.

(3)FBI. CODIS- Quality Assurance. Laboratory Services. 2015 <http://www.fbi.gov/about-us/lab/biometric-analysis/codis/codis_quality >.

(4)—. Strengthening Forensic Science in the United States. Hearing. Committee on the Judiciary. D.C.: GPO, 2009.

(5)Obama, Barack. "Transcript of President Obama's Interview on "New Day"" with Chris Cuomo. Pres. Obama on Congress. CNN- Politics. CNN.com. 23 8 2013.

(6)—. "OSAC Catalog of External Standards and Guidelines." Ed. Shannan Williams. 2015 <http://www.nist.gov/forensics/osac/standards-guidelines-catalog.cfm >.

(7)—. "Presentation for NCFS." NIST.gov. 2014 <http://www.nist.gov/forensics/upload/NIST-OSAC-Plan- NCFS-Feb-4-2014-2-3-14-FINAL.pdf>.

(8)—. The Need to Strengthen Forensic Science in the United States: The National Academy of Sciences' Report on a Path Forward. Hearing. Committe on the Judiciary. D.C.: GPO, 2009.

(9)111th Congress 1st Session. National Research Council's Publication "Strengthening Forensic Science in the United States: A Path Forward". Hearing. Subcommittee on Crime, Terrorism, and Homeland Security of the Committe on the Judiciary. D.C.: GPO, 2009.

(10)—. Strengthening Forensic Science in the United States: The Role of the National Institute of Standards and Technology. Hearing. Subcommittee on Technology and Innovation, Committee on Science and Technology. D.C.: GPO, 2009.

(11)Pollitt, Mark M. "Who is SWGDE and What is the History?" 22 1 2003. SWGDE.org. 2014 <https://www.swgde.org/pdf/2003-01-22%20SWGDE%20History.pdf >.

(12)DMS Section. "AAFS 2015 DMS business mtg minutes. ." 67th American Academy of Forensic Science . Orlando: Marcus Rogers, 2015.

(13)—. "SWGDE Position Paper on the NAS Report." 17 9 2009. SWGDE.org. 2014 <https://www.swgde.org/documents/Current%20Documents/2009-09-17%20SWGDE%20Position%20on%20the%20NAS%20Report>.

(14)White House Office of Science and Technology. "Charter of the Committee on Science." 31 1 2011. Whitehouse.gov. 2014 <http://www.whitehouse.gov/sites/default/files/microsites/ostp/CoS-Charter-signed-01-31-11.pdf >.

(15)—. "Charter of the Committee on Science." 29 3 2012. Whitehouse.gov. 2014 <http://www.whitehouse.gov/sites/default/files/sofs_charter_2012_signed.pdf>.

(16)NIST-DOJ. DOJ and NIST announce NCFS. 15 2 2013. Jennifer Huego. 2014 <http://www.nist.gov/oles/doj-nist-forensic-science021513.cfm >.

(17)—. "Summary of the NIST Proposed Plan for the Organization of Scientific Area Committees (OSAC)." 13 1 2014. Nist.gov. 2014 <http://nist.gov/forensics/upload/NIST-OSAC-Summary-1-31-14.pdf >.

(18)American Academy of Forensic Science. 10 1 2014. AAFS.org. Barry K. Logan. 2014 <http://www.aafs.org/sites/default/files/pdf/2014/AAFSNationalCommRel.pdf>.

(19)—. "U.S. DOJ and Commerce Name Experts to First-Ever National Commission on Forensic Science." 10 1 2014. NIST.gov. Ed. Jennifer Huego. 2014 <http://www.nist.gov/forensics/forensic-science-commission-011014.cfm >.

(20)—. "Public Comments on NIST Notice of Inquiry." 26 11 2013. Nist.gov. 2014 <http://www.nist.gov/forensics/upload/commentspdf-020714-small-3-2.pdf>.

(21)—. "NIST Propsed Organization of Scientific Area Committees (OSAC)." 4 2 2014. NIST.gov. 2014 <http://nist.gov/forensics/upload/NIST-OSAC-Plan-NCFS-Feb-4-2014-2-3-14-FINAL.pdf >.

(22)Rockefeller, John D. U.S. Democratic Senator- West Virginia. S.2022. Committee on Commerce, Science, and Transportation. D.C., 2014.

(23)Leahy, Patrick. U.S. Democratic Senator- Vermont. ALB14200. U.S. Senate, 113th Congress. D.C., 2014.

(24)Patrick Leahy, U.S. Democratic Senator- Vermont. "Introduction of the Criminal Justice and Forensic Science Reform Act." 27 3 2014. Leahy.senate.gov. 2014 <http://www.leahy.senate.gov/download/032714-introduction-statement_-forensics-reform-bill-final >.

(25)—. "NIST Organization of Scientific Area Committees Roles and Responsibilities." 11 4 2014. NIST.gov. 2014 <http://www.nist.gov/forensics/osacroles.cfm >.

(26)National Science and Technology Council. "Stregthening the Forensic Sciences." 2 5 2014. AAFS.org. 2014 <http://aafs.org/sites/default/files/2015/Non-Meeting/WHITE_HOUSE%20SUB_COMMITTEE_FS_REPORT.pdf >.

(27)National Science Foundation/NIJ. 7 5 2014. NSF.gov. 2014 <http://www.nsf.gov/pubs/2014/nsf14066/nsf14066.pdf >.

(28)—. "NIST Names Members to First Forensic Science Standards Board." 26 6 2014. NIST.gov. Ed. Jennifer Huego. 2014 <http://www.nist.gov/forensics/first-forensic-science-standards-board-062614.cfm >.

(29)—. "NIST to Establish Research Center of Excellence for Forensic Science." 19 8 2014. NIST.gov. Ed. Michael Baum. 2014 <http://www.nist.gov/coe/forensics/forensic-081914.cfm>.

(30)—. "Organization of Scientifc Area Committees." 3-8 9 2014. NIST.gov. 2014 <http://www.nist.gov/forensics/osac/index.cfm >.

(31)—. "Forensic Science Standards Effort Takes Shape as NIST Appoints Scientific Area Committee Members." 3 9 2014. NIST.gov. 2014 <http://www.nist.gov/forensics/sac-members-announcement.cfm >.

(32)—. "New Forensic Subcommittee on Digital Evidence Added to Organization of Scientific Area Committees." 8 9 2014. NIST.gov. 2014 <http://www.nist.gov/forensics/forensics-090814.cfm >.

(33)—. "Traditional Heirarchal Organizational Chart." 29 10 2014. NIST.gov. 2015 <http://www.nist.gov/forensics/osac/upload/OSAC-org-chart-10-29-14.pdf >.

(34)—. "National Commission on Forensic Science Update." 24 10 2014. AAFS.org. 2015 <http://www.aafs.org/news/national-commission-forensic-science-update >.

(35)Dept of Justice. "Work Products." 24 10 2014. Justice.gov. 2015 <http://www.justice.gov/ncfs/work-products >.

(36)—. "OSAC Digital Evidence Subcommittee." 12 2014. NIST.gov. 2015 <http://www.nist.gov/forensics/osac/sub-de.cfm>.

(37)NIST. "402 Members Named to Forensic Science Standards Organization." 29 10 2014. NIST.gov. Ed. Jennifer Huego. 2015 <http://www.nist.gov/forensics/osac_102914.cfm >.

(38)SWGDE/SWGIT. "SWGDE/SWGIT Digital and Multimedia Evidence Glossary." Vers. 2.7. 8 4 2013. SWGDE.org. 2014 <https://www.swgde.org/documents/Current%20Documents/2013-04-08%20SWGDE-SWGIT%20Glossary%20v2.7>.

(39)ASTM. "Standard Terminology for Digital and Multimedia Evidence." Vers. E2916-13. 2013. ASTM.org. 2014 <http://www.astm.org/Standards/E2916.htm >.

(40)Pope v. State. No. 05-86-00235-CR. Court of Appeals of Texas, Dallas. casetext.com: 4 8 1988.

(41)Innocence Project. David Shawn Pope. 1 1999. 2015 <http://www.innocenceproject.org/cases-false-imprisonment/david-shawn-pope >.

(42)Wikipedia. Brandon Mayfield. 5 2004. 2015 <http://en.wikipedia.org/wiki/Brandon_Mayfield >.

(43)The Spokesman-Review. "Setback for Steele's Bid to Challenge FBI Tapes." 21 4 2011. Ed. Betsy Z. Russell. 2015 <http://www.spokesman.com/stories/2011/apr/21/setback-steeles-bid-challenge-fbi-tapes/ >.

(44)Forensic Science, Statistics & the Law. "Disturbing and Ridiculous Expertise in State v. Zimmerman." 24 6 2013. For-sci-law-now.blogspot.com. Ed. DH Kaye. 2015 <http://for-sci-law-now.blogspot.com/2013/06/disturbing-and-ridiculous-expertise-in.html>.

(45)The Guardian. "Zimmerman Trial Judge: Prosecution Audio Experts Cannot Testify." 22 6 2013. Theguardian.com. 2015 <http://www.theguardian.com/world/2013/jun/22/george-zimmerman-trayvon-martin-phone-calls >.

(46)—. "State of Florida v. George Zimmerman." 11 4 2012. Wikipedia.org. 2015 <http://en.wikipedia.org/wiki/State_of_Florida_v._George_Zimmerman >.

(47)Re-NewsIt! "Tom Owens and Ed Primeau Forensic Audio Witnesses." 6 5 2013. Re-Newsit.com. 2015 <http://www.re-newsit.com/2013/05/tom-owens-and-ed-primeau-forensic-audio.html >.

(48)The National Clearinghouse for Science, Technology, and the Law. Carol Henderson. 2015 <www.ncstl.org>.

(49)Texas Dept. of Public Safety. "Digital/Multimedia Evidence Section." TXDPS. 2014 <https://www.txdps.state.tx.us/CrimeLaboratory/DigitalMultimedia.htm >.

(50)Innocence Project of Texas. Texas Exoneration Statistics. 2015 <http://www.ipoftexas.org/at-a-glance >.

(51)—. Lured Back to Forensic Science, New Lab Director Ready for Challenge in Houston. Ed. Anita Hassan. Houston, 26 9 2014.

(52)Houston Forensic Science Center. 2015 <http://www.houstonforensicscience.org >.

(53)Houston Chronicle. "Garner: Independent Forensics Lab on its Way to Becoming Model." 6 11 2014. Ed. Dr. Daniel Garner. 2015 <http://www.chron.com/opinion/outlook/article/Garner-Independent-forensics-lab-on-way-to-5876592.php>.

(54)Garner, Daniel. "SWGDE Business Meeting." Houston, 1 2015.

(55)—. "Scientific Neutrality in Expert Witness Testimony." 67th Annual Scientific Meeting. Ed. Charlotte J. Word. Orlando, 2015.

(56)Dept. of Commerce- NIST. "Federal Register." Vers. 78. 27 9 2013. GPO.gov. 2014 <http://www.gpo.gov/fdsys/pkg/FR-2013-09-27/pdf/2013-23617.pdf >.

(57)SWGDE. "Response to Notice of Inquiry- Federal Register." 2013. SWGDE.org. 2014 <https://www.swgde.org/documents/Current%20Documents/DME%20Response%20to%20NIST >.

(58)—. "NIST Presents an Infrastructure Plan to Strengthen Forensic Science Committees." 7 2 2014. NIST.gov. Ed. Linda Joy. 2014 <http://www.nist.gov/forensics/osacplan.cfm >.