

## **TOWARD A MORE EFFECTIVE USE AND UNDERSTANDING OF FORENSIC EVIDENCE IN COURTS OF LAW: DEVELOPING STRATEGIES FOR THE SCIENTIFIC EDUCATION OF LEGAL PRACTITIONERS**

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With the widespread use of forensic DNA technology in the 1990's, the use of forensic evidence in criminal and civil cases in courts of law reached unprecedented levels. Arguably, the forensic DNA revolution paved the way for popular culture to capture the attention of the general public, leading to what many have referred to as the CSI effect.<sup>1</sup> Due to the CSI effect, prosecutors often worried that juries would not convict if DNA evidence, or for that matter any type of forensic evidence, was not part of the prosecution's case.<sup>2</sup> Although this unprecedented use of forensic science in courts of law has led to greater scrutiny by many legal scholars,<sup>3</sup> the perceived infallibility of DNA evidence and, often by extension other forms of physical evidence, can potentially lead to the overzealous use of forensic evidence and to the disregard of vital limitations of its use by legal practitioners.

The issue has been acknowledged by both the National Academy of Sciences (NAS) and the short-lived National Commission on Forensic Science (NCFS). In *Strengthening Forensic Science in the United States: A Path Forward*,<sup>4</sup> the NAS acknowledged the potential for lawyers and judges to misuse forensic-based evidence. One of the recommendations included in the report encouraged supporting law school administrators and judicial education organizations to establish continuing education programs about forensic science for lawyers and judges.<sup>5</sup> This was affirmed in 2015 when the NCFS recognized the recommendations made by the NAS and stated that funding from the Attorney General should be allocated to create such

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<sup>1</sup> See generally John Alldrege, *The "CSI Effect" and Its Potential Impact on Juror Decisions*, 3 THEMIS: RESEARCH J. OF JUST. STUD. AND FORENSIC SCI. 114 (2015).

<sup>2</sup> Rebecca M. Hayes-Smith & Lora M. Levett, *Jury's Still Out: How Television and Crime Show Viewing Influences Jurors' Evaluations of Evidence*, 7 APPLIED PSYCHOL. IN CRIM. JUST. 29 (2011).

<sup>3</sup> See Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1 (2009); Jonathan J. Koehler, *Forensics or Fauxrensicis? Ascertaining Accuracy in the Forensic Sciences*, 49 ARIZ. ST. L. J. 1369 (2017); Keith A. Findley, *Reforming the 'Science' in Forensic Science*, WIS. LAW. (2015), <https://www.wisbar.org/NewsPublications/WisconsinLawyer/Pages/Article.aspx?Volume=88&Issue=10&ArticleID=24435>.

<sup>4</sup> COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY., NAT'L RESEARCH COUNCIL, *STRENGTHENING FORENSIC SCI. IN THE UNITED STATES: A PATH FORWARD* 4 (2009).

<sup>5</sup> *Id.* at 239.

curriculums for teaching.<sup>6</sup> The notion of teaching legal professionals about forensic science is not novel to these reports, as this concept was discussed by Daéid *et al.* in 1998.<sup>7</sup> Daéid's recommendations were somewhat pedestrian, ranging from traditional lectures, tutorials, multi-media teaching, and practical exercises in case preparation and presentation, such as mock trials.<sup>8</sup> As will be discussed, many of Daéid's recommendations have been implemented since 1998, but these kinds of approaches, though useful, are sporadic and do not solve the systemic problem. The necessity for large-scale change should prompt a more focused examination of current efforts in scientific education for legal practitioners.

The potential for the misuse or lack of understanding of forensic science arises when the users of the discipline do not understand the theoretical underpinnings applicable to forensic science. Properly trained forensic scientists operate in a world of uncertain measurements and statistics, while lawyers often seek "yes" or "no" answers even if the true answer may not be so black and white. Scientific proof is often quantitative and objective while legal proof is qualitative and subjective. Additionally, the judge's role as "gatekeeper" for the admissibility of scientific and technical evidence defined in the *Daubert*<sup>9</sup> decision shows how vital it is that judges understand the intricacies of the scientific process. The problem occurs when lawyers and judges do not have the background to appreciate these differences.

## Current Efforts

### *Law School Curricula, Programs, and Initiatives*

Some law schools have attempted to integrate coursework related to forensic science into their curricula. These courses, however, are often electives or are provided as short courses or workshops. For example, Harvard University School of Law offered a seminar in the fall 2013 that provided instruction on the relationship between courts and forensic science, the scientific method, trial conduct, and evidence rules.<sup>10</sup> An excerpt from the description for this course is highlighted below:

<sup>6</sup> Memorandum from the Nat'l Comm'n on Forensic Sci., Nat'l Inst. of Standards & Tech., to the Attorney General, Forensic Science Curriculum Development (Dec. 8, 2015), <https://www.justice.gov/archives/nfs/page/file/818206/download>.

<sup>7</sup> Niamh Nic Daéid & James Thorpe, *Letter to the Editor: Teaching lawyers about forensic science*, 100 FORENSIC SCI. INT'L 149 (1999).

<sup>8</sup> *Id.* at 151.

<sup>9</sup> 509 U.S. 579 (1993).

<sup>10</sup> Course Catalog, *Law and Forensic Science*, HARV. L. SCH., <https://hls.harvard.edu/academics/curriculum/catalog/index.html?o=66175> (last visited Nov. 30, 2018).

While scientific proof may be based on group data, courtroom testimony purports to draw conclusions about individuals. While scientific conclusions may be tentative, evolving, courtroom testimony requires the decision maker to come to a decision.<sup>11</sup>

This reiterates a point that was previously made: courtrooms operate in a black or white manner while scientific testimony can sometimes be gray due to measurement uncertainty, or ambiguous or inconclusive results. This is a frustration that is felt by forensic scientists, which could be improved with better education and communication between forensic scientists and attorneys.

As useful as these courses may be, it is not likely that these types of courses would cover the philosophy and process of science, which is foundationally the background needed for legal professionals to understand scientific conclusions. A few examples of creative academic programs, however, do exist to help bridge the science and law gap.

Syracuse University offers a distinctive joint JD/MS degree in Forensic Science which can be completed in three years.<sup>12</sup> This program is highly customizable, allowing students to choose a scientific specialty.<sup>13</sup> For students interested in a career in forensic science, a previous degree in a natural science may be necessary to satisfy requirements to work in a laboratory setting. West Virginia University offers an advanced law degree (LL.M) in Forensic Justice.<sup>14</sup> This program is based online and is designed to provide the background necessary to understand scientific evidence.<sup>15</sup> The program's website claims that the program is "*designed to prepare lawyers to work in and out of the courtroom with expert witnesses, crime scene investigators, and DNA and other scientifically gathered evidence.*"<sup>16</sup>

Stetson University houses The National Clearinghouse for Science and Technology (NCSTL) and has provided online and on-site training for many years to a wide variety of criminal justice constituencies including lawyers, investigators, and forensic scientists.<sup>17</sup> On-demand webinars, which are part of a Capital Litigation Initiative, are available to prosecutors and defense

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<sup>11</sup> *Id.*

<sup>12</sup> *Joint MS/JD in Forensic Science and Law*, SYRACUSE UNIV. COLL. OF ARTS AND SCI., FORENSIC & NAT'L SEC. SCI. INST., <http://forensics.syr.edu/graduate/msjd.html> (last visited Nov. 30, 2018).

<sup>13</sup> *Id.*

<sup>14</sup> *Online LL.M in Forensic Justice*, W. VA. UNIV. COLL. OF L., <https://www.law.wvu.edu/home/llm/online-llm-forensic-justice> (last visited Nov. 30, 2018).

<sup>15</sup> *Id.*

<sup>16</sup> *Id.* (emphasis added).

<sup>17</sup> NAT'L CLEARINGHOUSE FOR SCI., TECH., AND THE L., [www.ncstl.org](http://www.ncstl.org) (last visited Nov. 30, 2018).

attorneys who wish to learn more about forensic science.<sup>18</sup> Examples of topics range from the general (*Crime Scene Essentials*, *Crime Laboratory Essentials*) to the specific (*Toxicology Essentials: Emphasis Opioids*, *Challenges in Fire Analysis and Document Examination*).<sup>19</sup> An online course titled *Forensic Science Course for Capital Litigators – Self Study* is also available as part of the initiative.<sup>20</sup> Continuing education credit hours are available for members of the Florida Bar who take the course.<sup>21</sup> This specific program is funded by a grant from the Bureau of Justice Assistance, which is a component of the Department of Justice’s Office of Justice Programs. NCSTL also offers a variety of other resources that can be helpful to attorneys and legal professionals. A “Forensic Sources on the Web” page offers links to many forensic science-based websites including those of forensic science professional organizations and web resources related to specific forensic topics.<sup>22</sup>

Other law schools have a history of hosting various conferences, seminars, and workshops to help educate law students and legal professionals on forensic science-related topics. One successful annual event is the *Prescriptions for Criminal Justice Forensic Science Conference* held at the Louis Stein Center for Law and Ethics at Fordham University School of Law.<sup>23</sup> This conference is co-sponsored by the American Bar Association’s Criminal Justice Section and is an opportunity for defense attorneys and prosecutors to interact with scientists to discuss the topics of current interest related to forensic science.<sup>24</sup> The ninth annual event, held in spring 2018, included topics such as the use of statistical analysis in forensic science and developments in firearms examination, fingerprints, and handwriting analysis.<sup>25</sup>

In most cases, these conferences are one-time events often organized around a particular theme. In 2018, the University of Virginia School of Law marked the 25<sup>th</sup> anniversary of the *Daubert*<sup>26</sup> decision by hosting a *Forensics*,

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<sup>18</sup> *Capital Litigation Initiative: Crime Scene to Courtroom Forensic Training Webinars*, NAT’L CLEARINGHOUSE FOR SCI., TECH., AND THE L., <http://www.ncstl.org/education/Crime%20Scene%20to%20Courtroom%20Forensics%20Webinars> (last visited Nov. 30, 2018).

<sup>19</sup> *Id.*

<sup>20</sup> *Forensic Science Course for Capital Litigators-Self Study*, NAT’L CLEARINGHOUSE FOR SCI., TECH., AND THE L., <http://www.ncstl.org/education/Forensic-Science-for-Capital-Litigators-Course-Introduction--2014> (last visited Nov. 30, 2018).

<sup>21</sup> *Id.*

<sup>22</sup> *Forensic Resources on the Web*, NAT’L CLEARINGHOUSE FOR SCI., TECH., AND THE L., <http://www.ncstl.org/resources/FindingForensicResources#4> (last visited Nov. 30, 2018).

<sup>23</sup> *Forensics Conference*, A.B.A., [https://www.americanbar.org/groups/criminal\\_justice/events\\_cle/forensics2018.html](https://www.americanbar.org/groups/criminal_justice/events_cle/forensics2018.html) (last visited Nov. 30, 2018).

<sup>24</sup> *Id.*

<sup>25</sup> *Id.*

<sup>26</sup> *See Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

*Statistics, and Law* conference.<sup>27</sup> As the title suggests, the conference focused on the current and future use of statistics in forensic science.<sup>28</sup> Often, these conferences focus more on public policy than on science. For instance, in 2009 the Sandra Day O'Connor School of Law at Arizona State University hosted a *Forensic Science for the 21<sup>st</sup> Century*<sup>29</sup> interdisciplinary conference, bringing together law professors, Justices, and crime laboratory supervisors and directors to address the field of forensic science in the context of the NAS report.<sup>30</sup>

### ***Initiatives through Associations and Professional Organizations***

Several professional organizations and associations in both the legal and scientific realms have developed programs and initiatives to help foster scientific competency in legal professionals. Many of these are well-designed and are of great benefit to practicing attorneys and in some cases judges. A short review of several of these are given below.

#### *American Bar Association (ABA)*

Two notable sections of the ABA dealing with scientific issues affecting legal practice are the Judicial Division and Criminal Justice Section. Within the Criminal Justice Section, the *Science, Technology, and Forensics Committee* works closely to observe and assess the current issues in the field of science and technology that affect the practice of law.<sup>31</sup> By researching current issues, the ABA ensures that the information being published in their webinars and taught in continuing legal education (CLE) courses is relevant and applicable to current practices. This committee also develops policies and projects to improve and resolve current issues in scientific fields related to the judicial system—specifically, they have explored changes in forensic science and how forensic evidence is presented in court rooms after the NAS Report<sup>32</sup> and the 2016 President's Council of Advisors on Science and

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<sup>27</sup> Mike Fox, *Conference To Focus on Evolution of Forensic Evidence*, UNIV. OF VA. SCH. OF L. (Mar. 5, 2018), <https://content.law.virginia.edu/news/201803/conference-focus-evolution-forensic-evidence>.

<sup>28</sup> *Id.*

<sup>29</sup> *Forensic Science for the 21st Century*, THE NAT'L ACAD. OF SCI. REP. & BEYOND, <http://lst.law.asu.edu/FS09/index.html> (last visited Nov. 30, 2018).

<sup>30</sup> COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY., NAT'L RESEARCH COUNCIL, *supra* note 4.

<sup>31</sup> *Criminal Justice Section, Professional Development Division: Science Technology and Forensics Committee*, A.B.A., [https://www.americanbar.org/groups/criminal\\_justice/committees/professional\\_development/](https://www.americanbar.org/groups/criminal_justice/committees/professional_development/) (last visited Dec. 26, 2018).

<sup>32</sup> *See supra* note 4.

Technology (PCAST) report.<sup>33</sup> Another important role of the ABA is to develop ethical standards for law practitioners on how to approach forensic evidence and testimony in court. Similarly, the Judicial Division of the ABA develops guidelines for law practitioners on the admissibility of forensic evidence, researching facts about science related to a case, and providing consulting scientists for active cases.<sup>34</sup>

#### *National Forensic Science Training Center (NFSTC)*

In conjunction with Florida International University, the NFSTC provides vast information, training, and workshops regarding forensic science. Currently, the center specializes in online courses directed toward forensic science professionals, particularly those involved in training, but some offerings could be helpful to legal professionals. For instance, NFSTC has developed a web-based resource called *Forensic Science Simplified*<sup>35</sup> helpful to anyone involved in the criminal justice system but who are not scientists. *Forensic Science Simplified* provides short and precise information about each common discipline of forensic science including relevant principles, terminology, and methodology.<sup>36</sup> In addition, the NFSTC website offers access to *Principles of Forensic DNA for Officers of the Court*<sup>37</sup> which is designed specifically for attorneys and judges who wish to learn about forensic DNA technology. The program is available online or on CD-ROM through the National Criminal Justice Reference Service.

#### *Forensic Technology Center of Excellence (FTCoE)*

The National Institute of Justice Forensic Technology Center of Excellence offers webinar series in many forensic science disciplines including anthropology, biology and DNA, controlled substances, crime scene investigation, impression and pattern evidence, pathology and

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<sup>33</sup> Exec. Office of the President, President's Council of Advisors on Sci. and Tech., *Report to the President, Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*, THE WHITE HOUSE (Sept. 2016), [https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast\\_forensic\\_science\\_report\\_final.pdf](https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf).

<sup>34</sup> *Criminal Justice Section: Science Technology and Forensics Committee*, A.B.A., <http://apps.americanbar.org/dch/committee.cfm?com=CR102999> (last visited Nov. 30, 2018); *Judicial Division*, A.B.A., <https://www.americanbar.org/groups/judicial.html> (last visited Nov. 30, 2018).

<sup>35</sup> Fla. Int'l Univ., *Forensic Science Simplified*, NAT'L FORENSIC SCI. TECH. CTR., <https://www.nfstc.org/products/forensic-science-simplified/> (last visited Nov. 30, 2018).

<sup>36</sup> *Id.*

<sup>37</sup> Fla. Int'l Univ., *Principles of Forensic DNA for Officers of the Court*, NAT'L FORENSIC SCI. TECH. CTR., <https://www.nfstc.org/service/forensics-training/free-online-training/> (last visited Nov. 30, 2018).

medicolegal death investigation, toxicology, and trace evidence.<sup>38</sup> These seminars offer information on the limitations of various forensic evidence, public health perspectives (for controlled substances and toxicology), and practitioner and researcher perspectives on adoption of advanced technologies.<sup>39</sup>

#### *National Association of Criminal Defense Lawyers (NACDL)*

The NACDL has published reviews of literature dealing with specific forensic science topics in order to make these references easily accessible to members.<sup>40</sup> The association also offers CLE self-study programming on many categories, one of which is titled *Forensic Science and the Law*.<sup>41</sup> Through the purchase of an audio CD or video DVD on a series of modules titled *Making Sense of Science*, attorneys can earn CLE credit.<sup>42</sup> Many other forensic science themed modules are also available.<sup>43</sup>

#### *Arizona Forensic Science Academy*

The Arizona Forensic Science Academy (hereinafter “Academy”), created by the Maricopa County criminal justice and forensic science communities at the suggestion of the Arizona Forensic Science Advisory Committee in 2011, was designed in response to the NAS report in 2009 to encourage forensic science training for legal professionals.<sup>44</sup> The Academy is the first of its kind and offers on-site instruction. Defense attorneys and prosecutors are trained together in hopes of developing comparable scientific literacy between the two groups.<sup>45</sup> The Academy initially offered both a basic and an advanced forensic science course.<sup>46</sup> The basic course, taught by local forensic science professionals, is essentially a survey course covering a litany of forensic science topics and features visits to local and state forensic science laboratories.<sup>47</sup> These visits presented demonstrations on how certain

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<sup>38</sup> Forensic Tech. Ctr. of Excellence, *Resources*, NAT’L INST. OF JUST., <https://forensiccoe.org/allresources/> (last visited Nov. 30, 2018).

<sup>39</sup> *Id.*

<sup>40</sup> *Resource Center*, NAT’L ASS’N OF CRIM. DEF. LAW., <https://www.nacdl.org/resourcecenter/ForensicResources/> (last visited Nov. 30, 2018).

<sup>41</sup> *Forensic Science and the Law*, NAT’L ASS’N OF CRIM. DEF. LAW., <https://members.nacdl.org/forensic-science-and-the-law-products> (last visited Dec. 26, 2018).

<sup>42</sup> *Id.*

<sup>43</sup> *Id.*

<sup>44</sup> Marea Beeman, *The Arizona Forensic Science Academy: A Model Training Program for Prosecutors and Criminal Defense Lawyers*, THE JUST. MGMT. INST. 3 (2013), [http://www.jmijustice.org/wp-content/uploads/2014/04/Model-Training-Program-article\\_Jan-25-2013.pdf](http://www.jmijustice.org/wp-content/uploads/2014/04/Model-Training-Program-article_Jan-25-2013.pdf).

<sup>45</sup> *Id.* at 3.

<sup>46</sup> *Id.* at 3, 7.

<sup>47</sup> *Id.* at 6.

forensic science examinations are conducted with the hope that attorneys would develop a better appreciation of the strengths and limitations of typical crime laboratory protocols.<sup>48</sup> In addition, it seeks to provide a familiarity between attorneys and scientists with the hope of establishing better working relationships between the two professions. An advanced course was developed at the suggestion of attendees from the basics course and offered presentations from national experts in three areas: firearms identification, DNA testimony, and fingerprints. State prosecution and defense organizations covered tuition, the cost of books, and other course expenses for attendees.<sup>49</sup> The Academy later expanded into providing a lecture series on more specific topics including a lecture on *Statistical Interpretation Software for Friction Ridge Skin Impression Comparisons* presented by members of the United States Army Criminal Investigation Laboratory held in fall 2017.<sup>50</sup> Revenue generated from tuition from previous courses is used to bring national experts to the Academy.<sup>51</sup>

#### *American Chemical Society (ACS)*

The ACS has created three courses for lawyers to learn about the forensic analysis of drugs including the underlying theoretical principles on how instrumental methods such as gas chromatography and mass spectrometry work.<sup>52</sup> These courses are hands-on, allowing lawyers to work on the actual instrumentation used to perform these types of examinations.<sup>53</sup> The training provided will help lawyers make their own scientific conclusions based on analytical data, better preparing them for courtroom examination of experts testifying on drug and alcohol cases.<sup>54</sup> One of the courses focuses exclusively on the analysis of biological fluids such as blood, urine, and oral fluid for drugs of abuse.<sup>55</sup> It is a three-day course with one day dedicated to actual instrumental analysis and two days to pharmacology, pharmacokinetics, and pharmacodynamics.<sup>56</sup> In addition to other criteria, successful completion of all three courses (including the Forensic Chromatography course twice) can lead to the *ACS Forensic Lawyer-Scientist Designation* recognized by the Chemistry and the Law Division of the ACS.<sup>57</sup>

<sup>48</sup> *Id.* at 6-7.

<sup>49</sup> *Id.* at 5-7.

<sup>50</sup> *Beeman, supra*, note 44, at 7.

<sup>51</sup> *Id.* at 5.

<sup>52</sup> *Hands-On Forensic Chromatography Course*, AM. CHEMICAL SOC., <http://www.forensicchromatography.com/> (last visited Nov. 30, 2018).

<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

<sup>55</sup> *Id.*

<sup>56</sup> *Id.*

<sup>57</sup> *Lawyer-Scientist*, AM. CHEMICAL SOC., <http://www.forensicchromatography.com/lawyer-scientist/> (last visited Nov. 30, 2018).



### *National Courts and Sciences Institute (NCSI)*

NCSI is committed to enhancing the courts' ability to resolve complex cases involving scientific and technical evidence through education of judges on scientific principles and training judges to be scientific resources for their jurisdiction.<sup>58</sup> These so-called "Resource Judges" are expected to design judicial educational programs in their jurisdictions after certification in a particular scientific program.<sup>59</sup> One such program is a sixty-hour training in Molecular and Comparative Forensics.<sup>60</sup> This program is designed to create Resource Judges in "*emerging, trace evidence and portable forensic sciences and in technologies that are relevant to work of the courts.*"<sup>61</sup> NCSI hopes to create sixty such judges by 2019.<sup>62</sup>

### *Federal Judicial Center (FJC)*

The FJC published a Reference Manual on Scientific Evidence in collaboration with the National Research Council.<sup>63</sup> The manual is designed to help judges deal with complex scientific and technical issues in court.<sup>64</sup> The topics covered are not limited to forensic disciplines.<sup>65</sup>

### *International Efforts*

The need for scientific education for legal professionals has been recognized not only in the United States, but also internationally. Standard South African education curricula for legal professionals does not include information about forensic science or forensic evidence.<sup>66</sup> A course titled Essential DNA Evidence™ was developed as an introduction to forensic DNA evidence, DNA interpretation, and report writing and testimony.<sup>67</sup> The implementation of this course has shown that legal professionals in South

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<sup>58</sup> NAT'L CTS. & SCI. INST., <https://www.courtsandsciences.org/> (last visited Dec. 26, 2018).

<sup>59</sup> *Molecular and Comparative Forensics*, NAT'L CTS. & SCI. INST., <https://www.courtsandsciences.org/resource-judge-certification-in-molecular-and-comparative-forensics> (last visited Nov. 30, 2018).

<sup>60</sup> *Id.*

<sup>61</sup> *Id.* (emphasis added).

<sup>62</sup> *Id.*

<sup>63</sup> *Reference Manual on Scientific Evidence, Third Edition*, FED. JUD. CTR., <https://www.fjc.gov/content/reference-manual-scientific-evidence-third-edition-1> (last visited Nov. 30, 2018).

<sup>64</sup> *Id.*

<sup>65</sup> *Id.*

<sup>66</sup> Annelize van der Merwe, Arnold Greyling, & Antonel Olckers, *Training of Legal Professionals in DNA Evidence*, 4 FORENSIC SCI. INT'L: GENETICS SUPPLEMENT SERIES e85–e86 (2013).

<sup>67</sup> *Id.*

Africa, when given appropriate training, can incorporate scientific concepts into their arguments, allowing for a more effective and efficient legal process.<sup>68</sup> The United Kingdom has taken a different approach. First, they identified important aspects of forensic science and the legal process and addressed the changing environment surrounding forensic science evidence in the courts. As of 2015, the new Criminal Procedure Rules in the United Kingdom have led to better communication between forensic scientists and legal professionals by emphasizing the need for full pre-trial disclosure.<sup>69</sup> This new legal mandate has also been instrumental in creating more effective and efficient trials.<sup>70</sup> These two countries highlight both aspects of the efforts to improve communication and understanding between science and the law—scientists helping to educate legal professionals and laws changing to improve collaboration.

### **Recommendations to Advance the Scientific Education of Legal Professionals**

#### ***Fostering Partnerships between FEPAC-Accredited Forensic Science Programs and ABA accredited Law Schools***

Programmatic accreditation in forensic science is available through the Forensic Science Educational Programs Accreditation Commission (FEPAC).<sup>71</sup> As of June 2018, twenty-four undergraduate and nineteen graduate academic forensic science programs, both in the United States and abroad, are accredited by FEPAC.<sup>72</sup> Relationships between ABA accredited law schools and FEPAC-accredited forensic science programs should be developed and maintained in order to provide all students with exposure to law and forensic science topics. This would be mutually beneficial to both programs by providing insight into each other's disciplines. Schools should work to foster a collegial respect between future scientists and lawyers, so that this attitude will make its way into the profession. A workable model does exist at Duquesne University which offers a Master of Science in Forensic Science and Law.<sup>73</sup> The program, which is geared toward science

<sup>68</sup> *Id.*

<sup>69</sup> Paul Roberts, *Paradigms of forensic science and legal process: a critical diagnosis*, PHIL. TRANSACTIONS OF THE ROYAL SOCIETY B: BIOLOGICAL SCI., 1, 1, 9 (2015), <https://royalsocietypublishing.org/doi/pdf/10.1098/rstb.2014.0256>.

<sup>70</sup> *Id.* at 9.

<sup>71</sup> FORENSIC SCI. EDUC. PROGRAMS ACCREDITATION COMM'N, <http://www.fepac-edu.org/> (last visited Dec. 26, 2018).

<sup>72</sup> *Accredited Universities*, FORENSIC SCI. EDUC. PROGRAMS ACCREDITATION COMM'N, <http://www.fepac-edu.org/accredited-universities> (last updated June 29, 2018).

<sup>73</sup> *The Master of Science Program in Forensic Science and Law*, DUQ. U. BAYER SCH. OF NAT. & ENVTL. SCI., <https://www.duq.edu/academics/schools/natural-and-environmental-sciences/academic-programs/forensic-science-and-law/about-the-ms-in-forensic-science-and-law> (last visited Nov. 30, 2018).

students wishing to enter a career in forensic science, does utilize faculty from the University's Law School to provide program students with in-depth instruction on legal aspects important to forensic science.<sup>74</sup> In addition, the school's Cyril H. Wecht Institute of Forensic Science and Law (named after the long-time medical examiner from the city of Pittsburgh), which in addition to offering forensic science training for cost to practicing attorneys, offers several multidisciplinary programs that are of interest to both students from the science-based master's program and the University's law school.<sup>75</sup> The programs are free to anyone from the Duquesne University community.<sup>76</sup>

### ***Changes in Law School Curricula and Requirement***

Law schools have been criticized for not developing practical and problem-solving skills in its graduates, and scholars have called for the reform of law school curricula.<sup>77</sup> Particularly for those students interested in a career in litigation or criminal law, instruction designed to teach forensic science basics and terminology should be required. This should not simply be instruction in a survey of forensic science disciplines (although this is important), but rather strong emphasis should be placed on how science works, the scientific concept of proof, and how science differs from law. It is only through knowledge of the philosophy of science<sup>78</sup> that the practical skill of understanding the true meaning of scientific data and report conclusions can be interpreted correctly.

Perhaps a more achievable improvement is for law students to incorporate the use of forensic evidence in mock case scenarios where forensic science students (ideally from a FEPAC partnered graduate program) can analyze simulated evidence, issue reports, and testify in the exercise. Law students could have the opportunity to learn how to develop a meaningful direct and cross examination by working with and learning from forensic science graduate students. During post-mock case discussion, the two parties may

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<sup>74</sup> *Id.*

<sup>75</sup> *Our Mission*, DUQ. U. CYRIL H. WECHT INST. OF FORENSIC SCI. AND L., <https://www.duq.edu/about/centers-and-institutes/cyril-h-wecht-institute-of-forensic-science-and-law/mission> (last visited Dec. 26, 2018).

<sup>76</sup> *Registration and Fees*, DUQ. U. CYRIL H. WECHT INST. OF FORENSIC SCI. AND L. <http://www.duq.edu/about/centers-and-institutes/cyril-h-wecht-institute-of-forensic-science-and-law/registration-and-fees> (last visited Nov. 30, 2018).

<sup>77</sup> See Karen Sloan, *Reality's Knocking: The Ivory Tower Gives Way to the Real World's Demands*, 32 THE NAT'L L. J. 1, 2 (2009); R. Michael Cassidy, *Reforming the Law School Curriculum from the Top Down*, 64 J. OF LEGAL EDUC. 428, 430, 433 (2015).

<sup>78</sup> See generally Peter Machamer, *Philosophy of Science: An Overview for Educators*, 7 SCI. & EDUC. (1998) (The philosophy of science is concerned with the methods that scientists use in discovery, and to elaborate and confirm theories. Also, the philosophy of science is concerned with the effects of science on the activities and interests of nonscientists and nonscientific institutions and practices that are part of society - past and present).

collaborate to improve the line of questioning by making it more efficient and collaborate on ways to make scientific testimony more impactful.

Relationships with actual crime labs, either through an internship or shadowing program, can also be developed in order to expose future lawyers to basic principles in science and increase their knowledge of scientific methodology and practice. At a minimum, periodic trips to local crime laboratories (perhaps as part of a judicial clerkship, summer clerkship with a law firm, or legal externship) could be made so that students could observe how a crime laboratory works, aiding in their understanding of the methodology and quality control procedures employed in the analysis of physical evidence.

### ***Law school Certificate in Forensic Science***

In order to increase understanding of forensic science, the creation of a forensic science certificate program for law school students has been suggested.<sup>79</sup> Such a certificate could be combined with the requirements for a J.D. and can consist of required and elective courses. Required courses could deal with forensic “fundamentals” such as standards for evidence admissibility in court, chain of custody issues, contextual bias, and expert witness report writing and testimony. Elective courses could cover the broad scope of forensic science disciplines. Toward the end of the certificate program, a cumulative academic or capstone experience can help integrate all course aspects. Such an experience can be in the form of a final paper dealing with a topic of interest to both lawyers and scientists. The content of courses could be developed through collaboration between law and forensic science academicians, practitioners of law and forensic science, FEPAC, and the ABA.

### ***Promoting the Study of Criminal Law in STEM Students***

According to data provided by the Law School Admission Council (LSAC), approximately six percent of applicants to ABA accredited law schools were undergraduate science, technology, engineering, and mathematics (STEM) majors in academic year 2017-2018.<sup>80</sup> While approximately six percent is a surprisingly low number, only a small fraction of those individuals will likely go into criminal law. The vast majority of STEM majors who pursue law degrees are likely to end up in specialties such as patent, regulatory, or environmental law, where scientific expertise is, at a

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<sup>79</sup> Robert M. Sanger, *The Forensic Community Can Educate Lawyers, Judges*, FORENSIC MAG. (June 23, 2017, 11:03 AM), <https://www.forensicmag.com/article/2017/06/forensic-community-can-educate-lawyers-judges>.

<sup>80</sup> *Applicants by Major: 2017-2018*, L. SCH. ADMISSION COUNCIL, [https://www.lsac.org/sites/default/files/media/2017-18\\_applicants-major.pdf](https://www.lsac.org/sites/default/files/media/2017-18_applicants-major.pdf) (last visited Nov. 30, 2018).

minimum, helpful. In addition, out of the six percent of STEM majors, none had reported a major in forensic science which is astounding considering that there were applicants with majors in fields such as forestry, botany, and zoology.<sup>81</sup> The benefit of having lawyers and judges with STEM backgrounds in criminal and civil litigation, where scientific evidence is paramount, is self-evident. In order to attract individuals with STEM backgrounds to a career in law, several recommendations should be considered.

First, law schools should continue the trend of allowing the Graduate Record Examination (GRE) to substitute for the Law School Admission Test (LSAT) given that many graduate programs in the STEM fields require the GRE. For applicants with STEM backgrounds who are considering a wide range of career choices, where both graduate and law schools are options, one less standardized examination could persuade at least some to consider law school. Some law schools have already begun to accept the GRE in lieu of the LSAT in order to attract students of diverse academic backgrounds. The University of Arizona College of Law was the first law school in the United States to accept the GRE beginning in 2016<sup>82</sup> followed later by Brooklyn, BYU, Cardoza, Chicago-Kent, Columbia, Florida State, Georgetown, Harvard, Hawaii, Northwestern, St. John's, Wake Forest, and Washington University in St. Louis.<sup>83</sup>

Law schools may also consider reducing the application cost for admission. If the cost of an application fee to a law school is \$100 per school, then individuals may limit the number of schools they apply to considering that the cost incurred will simply increase with each application. Fee waivers could remove this problem.

Law school admissions should also consider a lower GPA threshold for applicants with STEM degrees. It has been reported that STEM majors routinely leave college with a lower GPA than students from other majors. In a study of more than 5,000 graduates of an unnamed elite liberal arts college in the northeast from 2001 to 2009, students graduating with degrees in biology, chemistry, and mathematics had GPAs that were in the bottom five of all programs.<sup>84</sup> If, in fact, GPAs from different disciplines do not

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<sup>81</sup> *Id.*

<sup>82</sup> Susan Svrluga, *Harvard Law School will no longer require the LSAT for admission*, THE WASH. POST (Mar. 9, 2017), [https://www.washingtonpost.com/news/grade-point/wp/2017/03/08/harvard-law-school-will-no-longer-require-the-lsat-for-admission/?noredirect=on&utm\\_term=.66cdf30c94a4](https://www.washingtonpost.com/news/grade-point/wp/2017/03/08/harvard-law-school-will-no-longer-require-the-lsat-for-admission/?noredirect=on&utm_term=.66cdf30c94a4).

<sup>83</sup> Kathryn Rubino, *Another Law School Will Let You In Without Taking The LSAT- If You Qualify*, ABOVE THE LAW, (Apr. 27, 2018, 6:15 PM), <https://abovethelaw.com/2018/04/another-law-school-will-let-you-in-without-taking-the-lsat-if-you-qualify/?rf=1>.

<sup>84</sup> See Lynn O'Shaughnessy, *5 hardest and easiest college majors by GPA's*, CBS NEWS: MONEY WATCH (Apr. 15, 2010, 7:03p.m.), <https://www.cbsnews.com/news/5-hardest-and-easiest-college-majors-by-gpas/> (citing Kevin Rask, *Attrition in STEM Fields at a Liberal Arts*

equate due to the difficulty in coursework, then a more flexible standard for GPAs of STEM students may increase their enrollment into law schools.

Deferral programs may also help. Harvard Law School began a Junior Deferral Program in 2013 in which any junior-level undergraduate student would receive early acceptance to the law program.<sup>85</sup> Students may use the deferral period to explore their “broad interests before returning to the classroom.”<sup>86</sup> With incentives, these types of programs may make the option of law school more attractive. Harvard’s deferral program does not require the two years of work experience to be relevant to a specific discipline; however, schools wishing to create Junior Deferral Programs attractive to STEM majors should consider requiring relevant work experience and aiding students in the job searching process. Significant assistance throughout the job searching process, as well as providing industry connections and networking opportunities to STEM students interested in the deferral program, would act as enrollment incentives.

### ***Joint MSFS/JD and LLM Programs***

Following the model of combined Ph.D./MD programs developed for clinicians wishing to be trained as researchers in disciplines relevant to medicine, joint Master of Science in Forensic Science/Juris Doctor (MSFS/JD) degrees, similar to the program previously described at Syracuse University,<sup>87</sup> would help to recruit students with strong science backgrounds to pursue careers in law (particularly those interested in being trial attorneys). Unlike the program at Syracuse University, which is open to students from non-STEM disciplines, only students with undergraduate degrees in the natural or physical sciences would be eligible for enrollment. Upon the completion of the joint-degree program, students would receive a Master of Science degree and a Juris Doctorate. This program would include instruction in the typical forensic science disciplines as well as statistics and law instruction sufficient for graduates of the program to become Bar-Certified. Law curricula in the program should highlight the admissibility, reliability, and limitations of scientific evidence typically not emphasized in current JD programs alone. By having a solid foundation in both disciplines, one with such a degree would more effectively utilize forensic science in the courtroom than traditionally trained lawyers.

In addition to MSFS/JD programs, law schools should consider offering multi-disciplinary post-graduate academic degrees in the sciences to be

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*College: The Importance of Grades and Pre-Collegiate Preferences*, 29 ECON. OF EDUC. REV. 885, 892 (2010).

<sup>85</sup> *Junior Deferral Program*, HARV. L. SCH., <https://hls.harvard.edu/dept/jdadmissions/apply-to-harvard-law-school/the-application-process/junior-deferral-program/#faq-5-3> (last visited Nov. 30, 2018).

<sup>86</sup> *Id.*

<sup>87</sup> *Joint MS/JD in Forensic Science and Law*, *supra* note 12.

completed after obtaining a JD degree. As mentioned earlier in this paper, West Virginia University offers a novel online LL.M degree in Forensic Studies, which could be used as a model for the development of additional programs.<sup>88</sup> With the incorporation of a laboratory component, perhaps similar to the program designed for lawyers from the American Chemical Society previously described, and more in-person instruction and training, this degree could be advantageous for practicing lawyers with JD degrees. Though LL.M degrees are often considered an academic degree, this type of LL.M program would serve to enhance the knowledge of individuals who wish to continue law practice. An advanced degree through this type of program would strengthen current practitioners' knowledge of scientific methodology and data interpretation, making them more effective in communication and examination of expert witnesses.

### ***Assistance from Accredited Forensic Science Academic Programs***

FEPAC-accredited forensic science programs typically have faculty with long-term experience in forensic science, many as former practitioners. Partnerships could be created between legal groups such as the local bar association and nearby FEPAC-accredited forensic science programs. Forensic science faculty could offer continuing education training in the form of workshops or seminars to help enhance the scientific knowledge-base of legal professionals. Workshops and seminars can be used as continuing legal education credits as long as they are approved for credit by the governing state continuing legal education board. Events can be recorded or made available through webcasts to legal professionals in order to facilitate learning-at-a-distance in situations where law practices, court houses, and prosecutors' offices may be remote or otherwise unable to access a FEPAC-accredited academic institution. Given that no FEPAC-accredited programs currently exist in either the Pacific or Mountain time zones, distance learning will likely be the only way for legal practitioners in the western half of the United States to obtain training offered by FEPAC-accredited programs.

In addition, FEPAC-accredited programs should appoint a scientific liaison to the local legal community to provide assistance on matters such as data interpretation in laboratory reports. This liaison would not be a typical consultant that would be retained by an attorney with the potential for expert testimony, but simply would be available to provide understanding and clarification of the scientific evidence at issue in a particular case. FEPAC requires that all accredited programs provide service to the forensic science community. As stated in Standard 3.10 of the FEPAC accreditation standards:

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<sup>88</sup> *Online LL.M in Forensic Justice*, *supra* note 14.

The program shall provide service to the forensic science profession and to the community through some combination of communication, collaboration, consultation, technical assistance, continuing education programs, and any other means it may have for sharing the program's professional knowledge and competence. The purpose of this involvement is to provide opportunities for faculty and students to contribute to the advancement of the field of forensic science and to maintain program currency and credibility with practitioners and forensic science laboratory administrators.<sup>89</sup>

FEPAC should strongly consider augmenting this standard to somehow include service to the legal community as at least an option toward fulfillment of this standard. The notion of a scientific liaison is supported by the concurring opinion of Justice Breyer in *General Electric Company v. Joiner*,<sup>90</sup> a decision that affirmed the gatekeeping role of the judge in *Daubert*.<sup>91</sup> In his opinion, Justice Breyer cited an *amici curiae* brief submitted by the New England Journal of Medicine on behalf of neither petitioner nor respondents in the *Joiner* case. In speaking of the judge's gatekeeping role, the *amici curiae* brief stated:

[A] judge could better fulfill this gatekeeper function if he or she had help from scientists. Judges should be strongly encouraged to make greater use of their inherent authority . . . to appoint experts . . . . Reputable experts could be recommended to courts by established scientific organizations, such as the National Academy of Sciences or the American Association for the Advancement of Science.<sup>92</sup>

Perhaps this rationale can be applied to the use of faculty from FEPAC-accredited programs who could provide a similar function to the any legal practitioner.

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<sup>89</sup> *Accreditation Standards* § 3.10, FORENSIC SCI. EDUC. PROGRAMS ACCREDITATION COMM'N. (last revised 2017), <http://www.fepac-edu.org/sites/default/files/FEPAC%20Standards%2002122017%20v3.pdf>.

<sup>90</sup> *Cf. Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 147, 149-50 (1997) (Breyer, J., concurring) (appointing special masters and specially trained law clerks when dealing with complicated scientific or technical evidence furthers the court's gatekeeping role).

<sup>91</sup> *See Daubert v. Merrell Dow Pharm. Inc.*, 509 U.S. 579, 597 (1993).

<sup>92</sup> *Gen. Elec. Co.*, 522 U.S. at 149-50 (Breyer, J., concurring) (quoting amici brief by New England Journal of Medicine).



### ***Assistance from the Jurisprudence Section of the American Academy of Forensic Sciences***

The American Academy of Forensic Sciences (AAFS) is the largest member forensic science organization in the world. It is an umbrella organization made up of eleven separate sections each representing a separate discipline.<sup>93</sup> The Jurisprudence Section of the AAFS is composed of lawyers and judges, and requires a law degree and a license in good standing to practice law in order to obtain at least associate membership.<sup>94</sup> Currently, the Jurisprudence Section conducts the majority of their business at the week-long annual AAFS meeting held every February in various cities throughout the United States. CLE credits are available for legal professionals who attend the meeting and attendees have the opportunity to register for workshops and special sessions, and to attend poster and platform presentations offered by any section of the Academy. This provides attorneys and judges the opportunity to interact with individuals from the other sections, most of which are composed of scientists. There are a myriad of learning opportunities, several of which are interdisciplinary, allowing attendees with different backgrounds to engage and learn from each other.<sup>95</sup> Law organizations and professional groups should develop outreach strategies to recruit attorneys and judges to not only attend, but to become a member of the Jurisprudence Section. Similarly, the aforementioned groups should also consider the implementation of incentives, such as travel grants or scholarships, to offset the cost of attending the annual meeting. Considering that there are less than 250 members of the Jurisprudence Section of an approximately 7,000-member professional organization, AAFS remains an underutilized resource for attorneys and judges wishing to learn more about forensic science.<sup>96</sup>

### ***Requirements to Continuing Legal Education (CLE) Training***

Continuing legal education is required for practicing legal professionals; however, these credits can be taken in a variety of areas and disciplines. It is not unreasonable for attorneys that often deal with forensic evidence to have

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<sup>93</sup> *About AAFS*, AM. ACAD. OF FORENSIC SCI., <https://www.aafs.org/about-aafs/> (last visited Dec. 26, 2018).

<sup>94</sup> *American Academy of Forensic Sciences Policy and Procedure Manual* § 2.3.6, AM. ACAD. OF FORENSIC SCI. (Aug. 2018), [https://www.aafs.org/wp-content/uploads/2018MasterPPM\\_August.pdf](https://www.aafs.org/wp-content/uploads/2018MasterPPM_August.pdf).

<sup>95</sup> *See generally 69<sup>th</sup> Annual Scientific Meeting Our Future Reflects Our Past: The Evolution of Forensic Science*, AM. ACAD. OF FORENSIC SCI. 16, 175 (2017), <https://www.aafs.org/wp-content/uploads/2017FinalProgram.pdf>.

<sup>96</sup> *Membership Statistics*, AM. ACAD. OF FORENSIC SCI. (last updated Sep. 25, 2018), <https://webdata.aafs.org/aafsweb/reports/SectionStatistics.aspx>.

mandates for a portion of required CLE credits to be in the area of scientific understanding. In addition, consideration of required training should be given in the area of contextual or cognitive bias as it relates to forensic practice. Attorneys need to be aware of the potential tendencies of forensic scientists to be influenced by non-scientific factors such as an investigator's view of a case and perceived guilt of suspects. In addition, knowledge of the results of past forensic analyses could influence the interpretation of latter testing.<sup>97</sup> Workplace pressure often associated with forensic science practice can also play a role.<sup>98</sup>

Contextual bias is of particular concern in areas of forensic science where independent subjective judgment is employed in the comparison of evidentiary samples (taken from crime scenes and where the origin or source of the sample is not known; e.g. fingerprint found at a crime scene) with known exemplars (the origin or source of the sample is known; e.g. fingerprint of a known individual).<sup>99</sup> Flawed decision-making could lead to overstatements of results and incorrect interpretations. Both of which can have dire consequences in a legal proceeding.<sup>100</sup>

It is vital that lawyers and judges be educated on how to recognize faulty methodology that may allow a biased result to be entered as testimony. Legal professionals should be introduced to common bias-mitigating techniques employed by forensic scientists, such as linear sequential unmasking, so that they may be able to recognize the potential for contextual bias in an analytical scheme and perhaps prevent flawed testimony.<sup>101</sup>

### ***Development of Working Group***

The creation of a federal government-sponsored working group to improve the collaboration between forensic scientists and law practitioners would also be helpful. This working group could be created through a federal

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<sup>97</sup> See Sarah V. Stevenage & Alice Bennett, *A biased opinion: Demonstration of cognitive bias on a fingerprint matching task through knowledge of DNA test results*, 276 FORENSIC SCI. INT'L 93, 103 (2017).

<sup>98</sup> Amy M. Jeanguenat & Itiel Dror, *Human Factors Effecting Forensic Decision Making: Workplace Stress and Well-being*, 63 J. FORENSIC SCI. 258, 260 (2018).

<sup>99</sup> See Itiel E. Dror & Greg Hampikian, *Subjectivity and bias in forensic DNA mixture interpretation*, 51 SCI. & JUST. 204, 205 (2011); Itiel E. Dror, Christophe Champod, Glenn Langenburg, David Charlton, Heloise Hunt, & Robert Rosenthal, *Cognitive issues in fingerprint analysis: Inter- and intr-expert consistency of a 'target' comparison*, 208 FORENSIC SCI. INT'L 10 (2011).

<sup>100</sup> See Gary Edmond, Jason M. Tangen, Rachel A. Searston, & Itiel E. Dror, *Contextual bias and cross-contamination in the forensic sciences: the corrosive implications for investigations, plea bargains, trials and appeals*, 14 L., PROBABILITY & RISK 1, 3 (2015).

<sup>101</sup> See Glenn Langenburg, *Addressing potential observer effects in forensic science: a perspective from a forensic scientist who uses linear sequential unmasking techniques*, 49 AUSTL. J. FORENSIC SCI. 548, 548 (2017) (explaining linear sequential unmasking as contextual information regarding an investigation which is released in a sequential "need to know" fashion limiting unnecessary variables from consideration).

entity such as the National Institute of Justice and be charged with helping to improve the use of forensic evidence in United States courts as well as to bolster the forensic science education of criminal lawyers and judges. In fact, this was attempted by the National Commission on Forensic Science, which created a subcommittee dealing specifically with training on science and law in 2015.<sup>102</sup> The *Training on Science and Law Subcommittee* was unique in its attempt to establish national training programs for legal professionals to study scientific disciplines and programs for scientists to study law.<sup>103</sup>

The subcommittee did propose the idea of a national forensic science curriculum for the education of officers of court and members of law enforcement. In order to be perceived as neutral and favoring neither prosecutors nor defense attorneys, the subcommittee proposed that the specifics of the curriculum be developed by entities such as the National Institute of Standards and Technology (NIST), the Organization of Scientific Area Committees (OSAC), the American Association for the Advancement of Science (AAAS), and the National Academy of Sciences (NAS).<sup>104</sup> Topics to be included in the curriculum included the law governing expert opinion and scientific and technical evidence, probability and statistics, the strengths and limitations in the analysis of forensic evidence, quality assurance and laboratory management, forensic service provider accreditation and certification, and issues related to contextual bias.<sup>105</sup> Unfortunately, this curriculum never came to pass because the charter for the National Commission on Forensic Science was not renewed in 2017.<sup>106</sup>

Alternatively, the proposed government entity in the United States could be modeled off of the existing International Association of Law and Forensic Sciences which is housed in Egypt. The Egyptian Association includes judges, police officers, lawyers, and forensic science experts who work together to advocate for high professional standards and discuss issues in their respective disciplines.<sup>107</sup> Furthermore, a working group could be developed through the Legal Resource Committee, which is part of the Organization of Scientific Area Committees for Forensic Science (OSAC).<sup>108</sup> In 2014, the National Institute of Standards and Technology announced the creation of discipline-specific subcommittees charged with identifying high

<sup>102</sup> Nat'l Comm'n on Forensic Sci., *Training on Science and Law*, U.S. DEP'T JUST., <https://www.justice.gov/archives/nfcs/training-science-and-law> (last visited Nov. 30, 2018).

<sup>103</sup> *Id.*

<sup>104</sup> Nat'l Comm'n on Forensic Sci., *Forensic Science Curriculum Development*, NAT'L INST. OF STANDARDS & TECH., <https://www.justice.gov/archives/nfcs/file/795351/download> (last visited Nov. 30, 2018).

<sup>105</sup> *Id.*

<sup>106</sup> Nat'l Comm'n on Forensic Sci., U.S. DEP'T JUST., <https://www.justice.gov/archives/nfcs> (last visited Dec. 26, 2018).

<sup>107</sup> The Int'l Ass'n of L. and Forensic Sci., *About Us*, INT'L ASS'N L. FORENSIC SCI., <http://ialfs.org/index.html> (last visited Nov. 30, 2018).

<sup>108</sup> OSAC *Organizational Structure*, NAT'L INST. OF STANDARDS & TECH. (June 20, 2017), <https://www.nist.gov/topics/forensic-science/osac-organizational-structure>.

quality standard practices for the examination and analysis of different types of scientific evidence.<sup>109</sup> Approved standard procedures are eventually reviewed by the Legal Resource Committee to determine any possible legal implication.<sup>110</sup> Although the concern of the working group would not be identifying best practices in scientific analyses (which admittedly limits the potential for its development though the OSAC structure), it nonetheless may be the easiest way to implement the working group given that the OSAC infrastructure is already in place.

One issue that this working group could improve on is the use of forensic evidence in United States courts to develop standardized laboratory reports for various forensic science disciplines. The creation of discipline-specific standardized laboratory reports would assist legal professionals in understanding scientific results and conclusions. The implementation of a standard template would make it easier for lawyers to locate key information and maximize their ability to utilize the findings. Furthermore, by making terminology more consistent both within and across disciplines, confusion in the interpretation of results would be minimized. Providing lawyers the tools to better understand reported data will help them more effectively build a case and make an impact in the courtroom.

### *Peer Assistance*

Members of the legal community with STEM educational backgrounds should be encouraged to participate in the education of their peers. Law firms and agencies who have lawyers with STEM backgrounds may wish to incentivize these individuals to conduct in-house workshops in order to improve the firm or agency's general understanding of science-related topics and thus serving as a vital resource for their fellow practitioners. Lawyers with a scientific background may be able to help non-scientists to understand terminology and methodology typical to the field without completing rigorous external coursework or programs.

### **Final Thoughts**

The importance of judges, prosecutors, and defense attorneys having a strong, or at least a workable, knowledge-base in science, and in particular forensic science, cannot be overstated. The situation has particular importance for cross examination. Given that a scientific witness is being asked to testify by one side likely because the witness will offer testimony that is favorable to that side, scrutiny of the scientific merits of the testimony will probably not occur under direct examination. In most cases, it will be

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<sup>109</sup> *Id.*

<sup>110</sup> *Legal Resource Committee*, NAT'L INST. OF STANDARDS & TECH., <https://www.nist.gov/topics/forensic-science/legal-resource-committee> (last updated Dec. 17, 2018).

left to cross examination to do the probing necessary to ensure that the testimony given is scientifically sound and that the conclusions reached are scientifically permissible. Without a sufficient knowledge-base, cross examination may not be fruitful in exposing scientifically indefensible statements. Given that most forensic science service providers are administered by public sector entities such as the police or district attorney's offices, it is essential that the defense bar gain the knowledge needed. This is not an endorsement for defense attorneys to use this knowledge to create circuitous and superfluous arguments to try and damage sound scientific testimony, but rather to provide the best mechanism to ensure that scientifically indefensible statements made in reports and in testimony are exposed. If defense attorneys had adequate scientific preparation it may not have been necessary for the Department of Justice, Federal Bureau of Investigations (FBI), the Innocence Project, and the National Association of Criminal Defense Lawyers to collaboratively conduct a review of over 2,000 cases prior to the year 2000, in which FBI forensic hair examiners testified in court on the results of microscopic hair comparisons.<sup>111</sup> This review led to the stunning announcement by the FBI in 2015 that erroneous statements were made by hair examiners in at least ninety-percent of the trial transcripts examined.<sup>112</sup> In most cases, examiners strongly overstated the probative value of hairs, which appeared under a microscope to look so morphologically similar that a common source was inferred.<sup>113</sup> It is not known how many, if any, of these examiners underwent a rigorous cross examination regarding these statements or if admissibility hearings regarding hair evidence were requested. Furthermore, judges with adequate scientific training will be less inclined to accept challenged scientific evidence based simply on precedent rather than an independent judgement made through a scientific knowledge-base.

Scientific competency in officers of the court could prevent disagreements between lawyers and scientific witnesses as to language used in testimony. In no case is this more evident than when an attorney asks a scientific witness if they made their conclusion(s) "*beyond a reasonable degree of scientific certainty.*" This time-honored phrase is often asked by attorneys because they believe it will give some measure of assurance to members of the jury that they can trust the testimony given by the expert. The term "reasonable" is used in a great many legal contexts such as the standard of proof needed for conviction (proof beyond a *reasonable* doubt) or determining a threshold of "reasonableness" for the police to obtain a judicial warrant.<sup>114</sup> The problem for scientists, however, is that the phrase has no scientific meaning.

<sup>111</sup> See David Kaye, *Ultracrepidarianism in Forensic Science: The Hair Evidence Debacle*, 72 WASH. & LEE L. REV. ONLINE 227, 241 (2015).

<sup>112</sup> *Id.* at 243.

<sup>113</sup> *Id.* at 253.

<sup>114</sup> See *Vernonia Sch. Dist. 47J v. Acton*, 515 U.S. 646, 653 (1995) ("[R]easonableness generally requires the obtaining of a judicial warrant[.]").

As mentioned previously in this article, scientific proof is objective and quantifiable, often statistically. Scientists often determine a confidence interval for measurements, but never determine certainty (although the term “uncertainty” is often associated with dispersion of measurement). In fact, the *Daubert* court pointed out that it *would be unreasonable to conclude that the subject of scientific testimony must be “known” to a certainty*.<sup>115</sup> From a scientific perspective, therefore, the term “reasonable degree” is nebulous. The phrase can be so misleading and confusing that the National Commission of Forensic Science strongly recommended its disuse.<sup>116</sup> Given the subjective nature of legal adjudication, it is perfectly reasonable from a legal perspective for an attorney to ask this question. If attorneys, however, understood science, they would at least better understand the scientific view and perhaps look to find an alternative.

Hopefully, this article made the case for the need to advance scientific knowledge in legal practitioners. Given the efforts currently being made by academia and professional organizations, the need is at least recognized. The article outlined several recommendations of varying degrees of feasibility that could help alleviate or lessen the problem. Ultimately, knowledge and competent understanding of science is central to improving the communication between lawyers and scientists, which is for the betterment of the legal system as a whole. Scientists who regularly engage with the legal process also have a duty of being converse with legal principles.

Implementation of even one of the recommended courses of action stated above, especially those geared towards aspiring practitioners, has the potential to impact the criminal justice system for years to come. Changes in the education and training of the younger generation of legal professionals will help to continually benefit the legal process as those newcomers advance in their careers. By forming ties and promoting quality education of fundamentals in forensic science for legal professionals, the civil and criminal justice systems will be better able to serve their purposes.

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<sup>115</sup> See *Daubert v. Merrell Dow Pharm. Inc.*, 509 U.S. 579, 590 (1993).

<sup>116</sup> *Views of the Commission Use of the Term “Reasonable Scientific Certainty”*, NAT’L COMM’N ON FORENSIC SCI. (2016), <https://www.justice.gov/archives/nfcs/page/file/1004481/download>.

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