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# A Moratorium on the Presentation of DNA Evidence

## **Cover Page Footnote**

Declan Kunkel is a Bachelor of Arts candidate at Yale University. He is grateful for the assistance of Nilakshi Parndigamage, who provided constructive criticism of the manuscript and thankful for the help of David R. Dow, Jeffrey R. Newberry, and Brandon Garrett, who provided research advice. He is also grateful for the resources of Yale Law School.

## **A Moratorium on the Presentation of DNA Evidence**

In recent decades, DNA evidence has become something of a pop-culture phenomenon. It can be found in popular magazines, in children's books, and on television. All too often, DNA evidence is shown as irrefutable fact, a scientific fingerprint that allows for a black-and-white determination of guilt or innocence. Unfortunately, such depictions are inaccurate and dangerous.

On October 12, 2017, the state of Texas executed Robert Lynn Pruett. Warden James Jones carried out the death sentence that Pruett received more than fifteen years earlier for the 1999 murder of prison guard Daniel Nagle.<sup>1</sup> At first glance, the case against Pruett seemed strong. Pruett was serving a ninety-nine-year sentence for a 1995 murder, and Pruett and Nagle often clashed. In fact, one of Nagle's last acts as an officer was to reprimand Pruett. During the trial, one of Pruett's fellow prisoners testified that he saw Pruett kill Nagle. Especially important to the case was the DNA evidence: a lab analyst testified that he found that Pruett's DNA was on the murder weapon. Based on this evidence, the jury convicted Pruett after a weeklong trial and sentenced him to die.<sup>2</sup>

On appeal, however, the evidence used at trial to connect Pruett to the crime was much less convincing. There was an eyewitness, but he was a notorious jailhouse informant and received a reduced sentence in exchange for his testimony. Similarly, while officers found a murder weapon, it was never established that Pruett possessed it. The entire case boiled down to DNA, and even that was inconclusive. During Pruett's appeal, a second lab analyst examined the DNA on the weapon and determined that it could have come from thirty percent of the employees at the jail, and thirty-one percent of the population of the United States.<sup>3</sup> It was unconvincing evidence of guilt. Nonetheless, the scant DNA evidence, along with the inmate testimony, was enough for Pruett to be executed.<sup>4</sup>

Unfortunately, Pruett's case is not unusual, as faulty DNA collection or analysis persists across the entire criminal justice system. Indeed, this paper could have begun with the stories of any number of individuals exactly like Pruett, revealing an ugly truth: while the science behind DNA testing is strong, the gathering and application of DNA evidence is systematically flawed. These weaknesses lead to improper prosecution, provide an opportunity for evidence tampering and, as in Pruett's case, can result in misidentification and wrongful execution. Despite the serious consequences of misapplied DNA evidence, the justice system has not fully examined these issues. This paper attempts to address wrongful convictions by calling for a temporary moratorium on the presentation of DNA evidence at trial, implemented until federal standards are put in place to regulate the presentation of DNA evidence, and until robust studies indicate the prevalence of DNA transfer.<sup>5</sup> This paper will demonstrate that DNA analysis schemes are dangerously flawed and that they allow for various outcomes, ranging from understandable human error to the exploitation of an already unstable system.<sup>6</sup> It will then argue that the current reliance on DNA analysis differs from what its legislative creators intended, and will propose solutions to current problems in DNA testing procedures, including amending jury instructions, minimum prosecution guidelines, and handling standards. A moratorium is the best way to achieve such a holistic review.

### *The Science of DNA*

Before examining issues related to DNA testing, it is necessary to understand what DNA is and how it is used in forensic investigations. DNA is the famous foundational molecule of genetics, the molecular building block of life. In technical terms, DNA stands for deoxyribonucleic acid, a long string of nucleotides—genes—located within almost every cell of the human body.<sup>7</sup> DNA is a set of instructions for human development, determining stature, hair color, and eye color, among other qualities.<sup>8</sup> Experts use DNA when conducting forensic investigations because it contains segments known as short-tandem repeats (STRs).<sup>9</sup> While every person has STRs, each person's

STRs are located in slightly different positions on the DNA strand.<sup>10</sup> An individual's unique arrangement of STRs is known as a genetic profile. Any body fluids or skin cells, for instance, left at a crime scene can be processed to reveal their STR pattern, which can then be compared to an STR sample taken from the suspect.<sup>11</sup> This process is exact because no two people—except identical twins—have exactly the same STR profile.<sup>12</sup>

DNA analysts use several methods to test DNA gathered from a crime scene or from an individual. In the most common approach, known as polymerase chain reaction testing, an analyst uses a machine to replicate and then rinse cells with enzymes to draw out the DNA and separate it into STRs.<sup>13</sup> These STRs are placed on gel plates, which separate the DNA into thirteen bands.<sup>14</sup> A second method, amplified fragment length polymorphism testing, mixes small samples of DNA, called trace DNA, with more powerful enzymes in order to draw out DNA from the smaller number of cells.<sup>15</sup> An analyst then compares the STR bands on the gel plate containing the evidence with an STR plate made from a suspect's DNA. If the genetic material from a crime scene matches a suspect's profile, analysts conclude that the suspect “cannot be excluded,” meaning that he or she may potentially be the source of the DNA—a match.<sup>16</sup> If the gel plates are not identical, the suspect “cannot be included,” meaning that they were not the source of the sample.<sup>17</sup> If the DNA from the crime scene yields fewer than thirteen STRs, it is termed a “partial profile.”<sup>18</sup>

Given the obvious potential for identifying criminals, it was not long after its discovery that DNA testing was applied to forensic science. In the late 1980s, the United States Department of Justice (DOJ) determined DNA testing to be “the most feasible and reliable” method of determining the perpetrator of a crime.<sup>19</sup> Scientists at the DOJ reached this conclusion because DNA testing is “scientifically valid,” meaning that if DNA testing is carried out properly, a scientist can make an accurate identification.<sup>20</sup> If an STR gel plate matches another STR plate, according to the DOJ, the cells must come from the same place.<sup>21</sup> Once lab reports are completed and evidence analyzed, data

is input into the National DNA Index System, which is a shared database among the federal government, the District of Columbia, U.S. territories, and all fifty states.<sup>22</sup>

Since the introduction of DNA evidence, DNA testing has become so firmly rooted in the popular culture that it regularly appears in television shows and movies. Especially prominent on the long-running television drama *Crime Scene Investigation* (popularly known as CSI), DNA evidence is often shown as irrefutable science. This depiction has become embedded in the larger public consciousness, a phenomenon known as the “CSI Effect.”

Unfortunately, even if DNA testing reveals a match or even a partial match, the suspect may be innocent. However, the erroneous match is not due to a scientific error. While the outcome of DNA testing appears absolute, the gathering and application of DNA evidence are dangerously flawed. DNA testing may have a nonexistent scientific error rate, but it has a high human one.

#### *Problems with DNA Forensics*

While testing DNA is relatively precise, our understanding of how DNA interacts with a crime scene is anything but. Evidence is typically collected by amassing samples of genetic material, such as blood and semen, and by “swabbing” the crime scene for less visible material.<sup>23</sup> Such practices are flawed as DNA can transfer from person to person. In one study, researchers found that DNA was transferred from one person to another, and then to a third location, in all tested conditions—including through handshakes.<sup>24</sup> This transfer means that although cells may originate on an individual, that individual may never have been in the location in which his cells are found.<sup>25</sup> The scientists also found that large samples of DNA could remain at a third location for more than two weeks.<sup>26</sup> Trace DNA can linger for years.<sup>27</sup> These DNA remnants allow for a random third party’s DNA to end up as evidence in a crime. The study concludes that DNA transfer is not “well understood,” but makes it “impossible and/or impractical” to “identify with certainty the biological source” of any DNA sample.<sup>28</sup> DNA technology is effective at determining the physical

source of DNA.<sup>29</sup> DNA transfer, however, makes it difficult to guarantee that the source of the DNA—a suspect—was actually present at the location at all, much less at a specific time.

Furthermore, although the science of DNA testing is objective, the standards for comparing forensic STR gel plates to human profiles are not, leading to a situation where human understanding of DNA results is flawed. Henry C. Lee, a noted professor and forensic science expert, wrote that there are “no generally accepted or national standards for determining what constitutes a match.”<sup>30</sup> In short, what looks like a match can depend on who is conducting the analysis. While a scientific result should be empirical, limitations in technology and training often mean that a random analyst determines the result of a DNA test. In fact, two different analysts at two different labs in the same state may draw different conclusions—interpreting the results in two different ways—when analyzing DNA and artifacts while the DNA sample is tested, even if they are using the same technology and have the same education.<sup>31</sup> In one study, seventeen laboratory analysts were shown a sample featuring eleven STR bands and asked to determine if that sample came from the same source as a complete DNA profile.<sup>32</sup> One analyst found that a test profile could not be excluded, four concluded it was inconclusive, and twelve thought that the DNA could be included.<sup>33</sup> While the DOJ was correct in asserting that DNA testing is “scientifically valid,” they problematically assumed that was true for the entire process of DNA analysis.<sup>34</sup> It is not. These varying results demonstrate the legal nuisance that derives from a single scientific starting point. Although testing yields an accurate portrait of an individual’s DNA, whether or not that DNA “matches” another individual profile is currently a matter of judgment.

Additionally, there are few guidelines dictating proper methods for the application of DNA evidence at trial. The rules and laws governing DNA testimony are nearly non-existent, and various legal and professional bodies, each with its own interpretation of regulations, muddy the waters where rules do exist.<sup>35</sup> When prosecutors present DNA evidence in a trial court, they generally do

so by questioning an analyst from the laboratory where the DNA was tested. However, the scientist who testifies is not always the same person who conducted the test.<sup>36</sup> Laboratory analysts are allowed and expected to testify in the place of other laboratory employees.<sup>37</sup> This practice is especially dangerous in light of the fact that two analysts may interpret results differently.

Beyond differences in judgment, various forensic experts, population geneticists, and statisticians disagree on what constitutes a match.<sup>38</sup> Ronald S. Reinstein, presiding judge of the Superior Court of Arizona, reasoned that two different “relevant, reliable, qualitative expert opinion[s]” could reach very different conclusions about the same evidence at trial and would present that evidence in different ways.<sup>39</sup> Many laboratories that conduct DNA testing have separated analysts into two categories: “research” and “experts,” with the former conducting the testing and the latter reporting it at trial.<sup>40</sup> Jonathan Koehler, a behavioral theorist and professor of law at Northwestern University, found this practice to have a “large impact” on a mock jurors’ assessment of guilt or innocence.<sup>41</sup>

Furthermore, while the basic science of DNA testing is the same in all labs, the labs themselves vary widely.<sup>42</sup> Private facilities often feature separate air conditioning systems for each laboratory technician and generally provide sterile and sealed workspaces.<sup>43</sup> Public laboratories, on the other hand, feature analysts working side by side in a large room without any way to prevent contamination.<sup>44</sup> Well-regarded private laboratories have established uniform codes for handling DNA evidence, largely because the Department of Justice requires that they “perform quality DNA tests according to accepted procedures,” a mandate not enforced against public labs.<sup>45</sup> The DOJ forced private labs to standardize “evidence handling, protocol validation, and the documentation of results, proficiency testing, and quality assurance.”<sup>46</sup> Their practices include ventilation requirements and the wearing of rubber gloves.<sup>47</sup> These standards, designed and implemented over a several-year-period, have significantly lowered error rates.<sup>48</sup> Public labs were not held to the same



standard because lawmakers did not want to create a backlog in DNA testing, so only new labs were forced to uphold standards.<sup>49</sup> Setting standards for all labs would lead to a national reduction in errors, and it is clear that the current situation requires such action.

The current practices of DNA analysis also depart from the intention of those who advocated for the use of DNA evidence in the first place. Judges often recognize that the intent of a law is as important as the law itself, meaning that laws should follow the intent of their creators.<sup>50</sup> In the 1989 Senate hearings relating to the admission of DNA evidence into court, Senator Orrin G. Hatch, chairman of the Subcommittee on the Constitution, lauded the “tremendous potential” of “genetic testing as a means of criminal identification.”<sup>51</sup> He and the committee were proud to introduce a method that they hoped would “improve substantially the capabilities of forensic investigators.”<sup>52</sup> Their excitement, however, was based on DNA’s ability to “go much further toward criminal identification...with much more accuracy,” not on the science of DNA testing itself, which had not even been fully developed.<sup>53</sup> Hatch and the committee argued that DNA evidence would be allowed only so long as it was “equal” in collection and sampling, “standard” in testing, and “evenly applied” in court.<sup>54</sup> Hatch stated that his excitement for DNA was because of a belief that DNA could “protect the innocent,” rather than help convict others.<sup>55</sup> He concluded by noting that “...as one who believes that the individual needs protection *from* [emphasis original] the government...I wish to ensure that DNA testing...is conducted in a constitutionally sound matter.”<sup>56</sup> Unfortunately, that reality has not materialized: instead of identifying criminals, current use of DNA evidence leads to the incarceration of innocent people.

Finally, some false matches are also malicious. There have been numerous cases of misconduct, falsifying and planting evidence, and false reports by forensic scientists at state crime labs. In fact, crime labs in North Carolina, Washington, Pennsylvania, Nevada, and California have been investigated and fined for crime lab misconduct.<sup>57</sup> In 1993, West Virginia DNA analyst Fred

Zain was found to have tampered with evidence in 133 cases, including cases where innocent men were wrongfully imprisoned.<sup>58</sup> In 2002, the Houston, Texas Crime Lab closed down after forty-three cases in which employees fabricated evidence in a single year.<sup>59</sup> Policies have not changed since these abuses occurred.<sup>60</sup> While it is often difficult to tamper with physical evidence, a single analyst can change the result of hundreds of cases by intentionally (or accidentally) contaminating a sample of DNA. In light of the lack of standards, testing subjectivity, flawed expert testimony, and ease of contamination, the current application of DNA evidence needs amending.

### *Why a Moratorium on the Presentation of DNA Is the Best Solution*

There are several possible approaches to the current problems with the use of DNA evidence, ranging from maintaining the status quo to temporarily suspending the presentation of DNA evidence, to an all-out moratorium. Each solution is imperfect: If status quo practices continue, additional numbers of innocent people will be incarcerated. An intermediate solution, such as state-level policy change, is likely to take years and will still see a number of innocent people in prison while reforms are carried out. Finally, a moratorium will result in delays and increases in spending because of laboratory renovations. This section will address each potential solution and advocate that, despite potential drawbacks, a moratorium on the presentation of DNA evidence presents the most just way to reform current practices.

Although there are a number of possible solutions, one point is clear: The Supreme Court has held that arbitrary punishments are unconstitutional. In 1972, the United States Supreme Court decided in *Furman v. Georgia* that the death penalty schemes used in the United States were fundamentally arbitrary and thus unconstitutional: The Court should apply the same standard to current DNA prosecution. In *Furman*, Justice Potter Stewart stated that legal systems were fundamentally unfair when they produced a verdict that was akin to “being struck by lightning.”<sup>61</sup> He was writing about the death penalty, a process he found repulsive not because of moral or

scientific qualms but because it was “...so wantonly and freakishly imposed.”<sup>62</sup> The justices writing in the majority in *Furman* were not concerned about the imposition of capital punishment, but rather about convictions of innocent people and the arbitrary application of sentences.

Current methods of gathering, testing, and applying DNA evidence result in arbitrary sentences. While there is little scholarship studying harmful uses of DNA evidence, anecdotes abound. In *Mitchell v. Gibson*, a forensic chemist gave testimony stating that blood and semen stains matched a defendant.<sup>63</sup> A few years later, an independent review board of analysts found that the DNA could not have come from the defendant.<sup>64</sup> In 1986, Jeffrey Pierce was convicted for rape and sodomy and sentenced to fifty-four years in prison based on a contaminated DNA sample.<sup>65</sup> He was exonerated after the FBI investigated misconduct by the lab analyst and discovered the contamination.<sup>66</sup> Although anecdotes are not as reliable as studies, they have served as the basis for moratoriums and panels that debunked dozens of “junk-science” cases throughout the 1980s, 1990s, and 2000s.<sup>67</sup> In those cases, individuals have been found innocent of the crime that forensic evidence “proved” that they committed. DNA testing is simply a new iteration of an old problem. Given that the current practices and techniques used to gather, analyze, and report on DNA evidence are not well understood and our own analysis of DNA is arbitrary, it is clear that practices must be reformed.

One possible reform would be state and local legislation that regulates labs and standardizes courtroom practice. While state and local regulatory agencies could provide much-needed change, the reform process would be slow. In fact, many state legislatures, especially those in the south, only meet for one-hundred days every two years.<sup>68</sup> In such instances, it often takes several sessions for bills to be enacted—if at all. During the multi-year waiting period individuals will be wrongfully convicted.

If the justice system promises equality under the law, then a moratorium on the presentation of DNA evidence is the best solution. Although statistics examining the number of people wrongfully convicted because of DNA evidence are few in number, studies examining overturned convictions demonstrate that individual analysts have contaminated thousands of cases across the country. In one survey of 137 trial transcripts of those wrongfully convicted, eleven (8 percent) of those wrongfully convicted had a prosecution that included faulty trace DNA analysis, DNA transfer, or overly subjective interpretation of test results.<sup>69</sup> That figure likely underreports the percentage of wrongful convictions resulting from misuse of DNA evidence because Innocence Projects, the organizations responsible for many of the sampled exonerations, generally do not pursue cases where there is already tested DNA evidence.<sup>70</sup> Much as Stewart reasoned that those selected for the death penalty were a “capriciously selected random handful” of individuals, those who suffer from errors in DNA testing are similarly struck by lightning: DNA evidence often inflicts irrevocable harm to a defendant’s case.<sup>71</sup> Many prosecutors and DNA advocates slip into a utilitarian view of DNA evidence, implying that a few wrongful convictions are outweighed by incarcerating the guilty. However, as William Blackstone wrote while editing his edition on English Common Law: “... the law holds it better that ten guilty persons escape than that one innocent party suffer.”<sup>72</sup> It is time to give this phrase meaning when it comes to DNA.

The most obvious critique of a moratorium on the presentation of DNA evidence is that such a standstill would delay justice for thousands of accused people in order to enact reforms that could happen at any time. It is true that a moratorium would delay criminal cases. However, current practices already result in a significant delay. In fact, in the current system, trials involving murder and sexual assault crimes already take two or more years to reach the trial court.<sup>73</sup> While a years-long moratorium would increase case processing time, it would also provide a more just outcome in a significant number of cases. Further, while incremental reforms on a state-by-state or county-by-

county basis would lead to favorable outcomes in some instances, such action would only increase the arbitrary nature of DNA evidence: some areas may voluntarily adopt higher standards, while others will continue to do nothing. Finally, legislative change without a moratorium on the presentation of evidence would allow additional wrongful convictions to occur for the sake of expediency as DNA would continue to define cases and convictions. Such an idea is contrary to justice.

As many are already wrongly behind bars—partly as a result of DNA testimony, a failed understanding of DNA transfer, and subjectivity in test results—a moratorium on the presentation of DNA evidence at trial, would continue to allow for post-conviction DNA testing of those already convicted. To address the possible injustice and continue the exoneration of those wrongfully convicted, there could be a special review board to ensure the integrity of post-conviction DNA testing during the moratorium.<sup>74</sup> Appellate litigators could continue to contest previous DNA evidence and could continue to get DNA testing performed in labs across the country. Such appellate action provides an important outlet for the wrongfully convicted, as those already prejudiced by the improper gathering, testing and application of DNA need relief as well. Although there would still be a risk of contamination and malpractice, those already wrongfully convicted have little to lose and a great deal to gain through additional testing.

#### *How a Moratorium Would Help: Solutions to a Complex Problem*

A moratorium on the presentation of DNA evidence would allow for more of the nation's crime labs to be accredited, forcing them to comply with standards. Indeed, the chief reason that accreditation has not occurred in all crime labs is that it would “prolong” the DNA testing process, despite the fact that accreditation takes just over a week.<sup>75</sup> Further, states argue that the \$10,000 to \$15,000 cost of accreditation, plus the cost of any changes required to bring a lab up to compliance, would lead to “rate increases” that would make it impossible to run a crime lab and become certified as accredited at the same time.<sup>76</sup> This claim is dubious at best, because processing a single case of DNA evidence, from collection to presentation in a courtroom, costs \$1400, almost one-

tenth of the cost of the accreditation process.<sup>77</sup> Given that crime labs process thousands of DNA tests per year, even a substantial renovation charge—averaging \$500,000—is only a fraction of annual costs due to testing alone.<sup>78</sup> State and private crime labs run thousands of tests per year. Even if states could not spare the additional money for accreditation, a moratorium would allow for a several-year interval to direct their funds towards ensuring that their labs were practicing at the highest level and ensuring a standard outcome. Accreditation would go a long way towards improving the current use of DNA in criminal proceedings.

While a moratorium on presenting DNA evidence would likely lead to a backlog of DNA evidence, such a backlog would not be exceptional. The number of rape and homicide cases with possible biological evidence that has not been submitted to a laboratory for analysis is already over 221,000.<sup>79</sup> The number of unanalyzed DNA cases reported by state and local crime laboratories is more than 57,000.<sup>80</sup> The total crime cases with possible biological evidence backlogged at forensic laboratories is over 500,000.<sup>81</sup> While the current backlog of DNA evidence is regrettable, it is not a reason to justify continued inaction.

### *Application and Education*

A moratorium on presenting DNA evidence would also allow for a standardized application of DNA testing results in court. Currently, every crime lab reports data in a different way.<sup>82</sup> While the existing Combined DNA Index System (CODIS) database system is better than no system at all, data entered into CODIS can be input in different formats.<sup>83</sup> This structure impedes the ability of lawyers and judges to understand what the reports say and whether the tests were done properly, as they rarely see information presented in a standard format. This variety makes it even more difficult to understand the already complex data. Furthermore, crime labs do not have to report what kinds of tests were carried out; they only have to report that tests were carried out.<sup>84</sup> In these instances, where the specific test results are unavailable, it is difficult for appellate attorneys to make claims about innocence or guilt related to DNA, depriving the client of due process.<sup>85</sup> The current shortcomings of CODIS provide another reason for advocating a moratorium. In 2014, the Federal

Bureau of Investigation released a letter indicating that an expansion of CODIS was necessary, and without a complete moratorium, partial changes would take nearly eighteen months to implement, during which time the database would be difficult to access.<sup>86</sup> The overhaul of the system necessary to standardize entry of data would require temporarily shutting down CODIS, a process that could not be done in stages.<sup>87</sup> While some states have constitutional amendments indicating that defendants have a right to DNA testing during appeals, most states do not.<sup>88</sup> This structure allows for DNA evidence introduced by the prosecution to be used in a trial but makes it difficult for an individual to challenge the tests on appeal. A moratorium on the use of this information would allow the DNA database system to be standardized and become efficient. Such a change would help ensure that both the prosecution and defense have access to the same information in both trial and appellate settings.

During a moratorium on presenting DNA evidence, law enforcement departments, district attorneys, and state attorneys general could also work to make sure that prosecutors have a firm educational foundation in forensic science. Unfortunately, many lawyers, analysts, jurors, and judges do not understand the science behind DNA testing and lack the necessary background to tell whether a DNA match was even determined by objective analysis.<sup>89</sup> In recent years, several studies have found that prosecutor's "self-expressed supposed level of understanding" of DNA evidence "is quite high and thus not justified by their levels of proper understanding."<sup>90</sup> Another study indicated that lawyers, analysts, jurors, and judges had an "uneven approach in DNA education to date," meaning that many received no formal education on DNA litigation, while others were well versed in the scientific literature.<sup>91</sup> It is partly the role of lawyers to prevent miscarriages of justice, and they play a significant role in preventing substandard and poorly tested DNA evidence from being adduced in criminal trials. In order to fulfill this ethical duty, lawyers require both a penetrative understanding of such evidence and the skills necessary to expose potential problems associated

with it. A moratorium is the best way to guarantee that all involved in the presentation of DNA evidence, from the analyst who collects the samples to the jury who uses them to reach a decision, receive the education necessary, and would ensure that presentations of DNA evidence come to a temporary standstill until lawyers have the training necessary to argue cases hinging on it.

A moratorium on the presentation of DNA evidence would also allow for universal changes in jury instructions. Jury instructions are the directives given to a jury by the presiding judge and are compiled from reports submitted by the lawyers. These instructions are designed to help juries better understand complex legal and scientific topics.<sup>92</sup> This process is flawed, not only because jury instructions differ each time, but also because often none of the parties involved necessarily have the formal education that allows them to understand how DNA works, much less explain it. In fact, “trial judges tend to adopt a conservative approach” to jury selection and are “reluctant to deviate from language approved by higher courts,” which in turn look to established law.<sup>93</sup> A moratorium handed down by the Supreme Court or Justice Department would place significant pressure on the legislatures to provide better guidance, which would likely result in change. A moratorium’s halting of the criminal justice system would force state and federal legislators to adopt laws that change jury instructions. While these instructions could be developed without a moratorium on the presentation of DNA evidence, education would be most effective in combination with the other reforms outlined in this paper.

During a moratorium on the presentation of DNA evidence at trial, prosecutors, defense attorneys, and judges could take the time to determine a proper, well managed, and understandable accounting of current practices in DNA evidence. Their program could be utilized nation-wide. A moratorium would provide the time necessary to allow them to agree on a statement that would be read at all trials where DNA evidence is introduced. In one study, conducted on jurors in North Carolina, only 12.85 percent of jurors understood DNA transfer as explained by judges in a



composite instruction.<sup>94</sup> After rewriting of the instructions by prosecutors and defense attorneys, 80 percent of jurors were able to paraphrase the meaning of the statement and expressed a greater understanding of the issues surrounding DNA.<sup>95</sup> Nationwide rollout of such a practice would benefit the justice system and help mitigate criminal cases involving DNA.

### *Science and the CSI Effect*

Perhaps the most important reason for a DNA moratorium is that such an action would dramatically alter the popular conception of DNA evidence. Currently, jurors and judges alike have an unconscious faith in the invulnerability of DNA, more so than for any other type of evidence.<sup>96</sup> This bolstering is called the CSI Effect. The CSI Effect, according to Michael J. Saks, a professor at Arizona State University College of Law, suggests that media programs, such as *CSI*, “wildly exaggerate and glorify forensic science,” a process that “affects the public... by creating greater expectations about forensic science than can be delivered.”<sup>97</sup> Such an effect “burdens the defense by creating exaggerated faith in the capabilities and reliability of the sciences.”<sup>98</sup> Legal scholars Donald Shelton and Kim Young have found that the origins of these expectations “lie in the broader permeation of the changes in our popular culture brought about by...rapid advances in science and information technology...and news.”<sup>99</sup> Shelton and Young conclude that the only way to properly educate the public about DNA evidence is to forcibly adjust court proceedings so that both the media and legal experts can understand that DNA evidence is not always accurate.<sup>100</sup> By amending jury instructions, and better understanding the role of the media in shaping public conceptions of DNA evidence, the judicial system can better account for unconscious bias during proceedings. While the legal system has little hope of influencing media coverage, better accounting for its effects among analysts, lawyers, judges, and jurors would lead to fairer outcomes. A prosecution moratorium would accomplish that goal.

The very act of calling such a moratorium on the presentation of DNA evidence at trial would discourage the general belief that DNA science is infallible. While the CSI Effect is a real phenomenon, the American belief in science extends far beyond cable television. In fact, Bruce Sales and Daniel Shuman, professors of psychology at American University, note that many juries are prone to believe science and scientists simply because they are scientists.<sup>101</sup> Public faith remains even if there are not “objective criteria” or any “demonstrable scientific foundation” to such an expert’s testimony, as in the case of DNA evidence.<sup>102</sup> It is even harder for juries to set aside pro-science bias and adjudicate claims that are partially true, as is the case with faulty DNA evidence.<sup>103</sup> This revelation leads to two conclusions. The first is that juries need assistance in recognizing the flaws in science. By placing a moratorium on the presentation of DNA evidence at trial, courts would elevate national dialogue surrounding DNA evidence. Such a change in the judicial system would undoubtedly generate media coverage and began changing public (and thus jury-member) expectations. Second, a moratorium would allow for the imposition of standards that would decrease the onus placed on a jury. While juries are currently expected to be able to adjudicate between faulty evidence and sound evidence, increasing standards in laboratories and in the courtroom would make discernment almost unnecessary by providing obvious examples of the proper application of DNA evidence. Juries would have a clear idea of what is good and bad DNA analysis, and could clearly identify times when rules were violated.

#### *Counterfactual and Concluding Thoughts*

The principle objection to a moratorium on the presentation of DNA evidence is simply its difficulty. A moratorium would undoubtedly be a difficult undertaking, radically changing the shape of the modern criminal trial. The recommendations presented in this paper would require that all jurors undergo a brief training session, either through amended jury instructions or an additional activity. The moratorium would require that crime labs meet rigorous standards and follow

standard procedures. Nonetheless, simply being difficult is no reason to abstain from correction. A DNA moratorium would provide the time necessary to correct serious systemic issues in gathering and application of DNA evidence, and how that evidence is presented at trial.

Contemporary problems in the gathering, testing, and application of DNA evidence necessitate the imposition of a moratorium on the presentation of DNA evidence. While DNA evidence is undoubtedly a precise and useful tool in criminal prosecution, the lack of clear standards and oversight sacrifice the innocent for the sake of the appearance of a conviction. Those advocating for additional prosecutions using DNA do so not out of bad faith but out of a desire for additional justice. If justice is the goal, then policy-makers and justices must align themselves with a founding principle of the American legal system: that each case must be judged on its own merits. Such an examination requires a rigorous look at multiple stages of the DNA process and a thorough understanding of each step. The current schemes and timeline applied to cases complicate justice and promote haste. While “moratorium” might literally mean “to delay,” in this instance, a delay would expedite justice. The overall goal should be to accelerate our efforts to provide justice. While it might be too late for Robert Pruett, there are many others who can still be saved.

### **ENDNOTES**

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<sup>1</sup> Jolie McCullough, “Texas Executes Robert Pruett, Who Insisted on Innocence in Prison Guard’s Murder,” *The Texas Tribune*, October 12, 2017, accessed March 20, 2018, <https://www.texastribune.org/2017/10/12/texas-executes-robert-pruett-who-insisted-innocence-prison-guards-murd/>.

<sup>2</sup> Nathan J. Robinson, “Texas Should Not Execute Robert Pruett Tonight,” *The New York Times*, October 12, 2017, accessed March 20, 2018, <https://www.nytimes.com/2017/10/12/opinion/texas-robert-pruett-execution.html>.

<sup>3</sup> Though Pruett’s fifteen-year journey through the state and federal appellate systems is beyond the scope of this paper, it deals with many of the issues covered in this course, including junk science, inmate testimony, corrupt prison officials, and lethal justice. Justice Elsa Alcala, of the Texas Court of Criminal Appeals, Texas’s highest criminal court, noted that “[T]his case is riddled with problems.” *Ex parte Pruett*, 458 S.W.3d 537, 539 (Alcala, J., dissenting). For more, *see*: Nathan J.

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Robinson, "The Autobiography of Robert Pruett," *Current Affairs*, October 09, 2017, accessed March 20, 2018, <https://www.currentaffairs.org/2017/10/the-autobiography-of-robert-pruett>.

<sup>4</sup> The DNA tested in Pruett's case was "deemed inconclusive" by the Texas Court of Criminal Appeals, and additional testing could have shown innocence. McCullough, "Texas Executes Robert Pruett."

<sup>5</sup> Review of DNA evidence in an appellate setting could continue unabated.

<sup>6</sup> Due to the considerable expense of reviewing DNA testing procedures, such studies are rarely done. For the most recent work on this subject, *See*: Brandon L. Garrett, "Innocence, Harmless Error, and Federal Wrongful Conviction Law," *Wisconsin Law Review* 2005, 35-111.

<sup>7</sup> John S. Buckleton, Jo-Anne Bright, and Duncan Taylor, eds., *Forensic DNA Evidence Interpretation* (Boca Raton, FL: CRC Press/Taylor & Francis Press, 2016), 2.

<sup>8</sup> *Ibid*, 3.

<sup>9</sup> Erin E. Murphy, *Inside the Cell: The Dark Side of Forensic DNA* (New York, NY: Nation Books, 2015), 7.

<sup>10</sup> Buckleton, Bright, and Taylor, *Forensic DNA Evidence Interpretation*, 3-4.

<sup>11</sup> *Ibid*, 5-6.

<sup>12</sup> Identical twins are generally considered to have identical DNA profiles. *See*: A. J. Jeffreys, V. Wilson, and S. L. Thein, "Individual-specific 'Fingerprints' of Human DNA," *Nature* 316 (July 04, 1985): <https://rdcu.be/MbQ6>. However, some recent studies indicate that certain genetic diseases can cause even identical twins to have different genetic codes. *See*: Biola M. Javierre et al., "Changes in the Pattern of DNA Methylation Associate with Twin Discordance in Systemic Lupus Erythematosus," *Genome Research* 20 (2010): accessed April 21, 2018, doi: 10.1101/gr.100289.109.

<sup>13</sup> Buckleton, Bright, and Taylor, *Forensic DNA Evidence Interpretation*, 3-4.

<sup>14</sup> *Ibid*, 3-6.

<sup>15</sup> K. Hemminki et al., eds., *DNA Adducts: Identification and Biological Significance* (Lyon: International Agency for Research Cancer, 1994), 3.

<sup>16</sup> Buckleton, Bright, and Taylor, *Forensic DNA Evidence Interpretation*, 43.

<sup>17</sup> *Ibid*.

<sup>18</sup> *Ibid*, 31.

<sup>19</sup> United States of America, Department of Justice, Office of Justice Programs: National Institute of Justice, *Solicitation for the Review of External DNA Proficiency Testing*, by Jeremy Travis (Washington, DC: U.S. Government Printing Office, 1995), 1.

<sup>20</sup> *Ibid*.

<sup>21</sup> *Ibid*.

<sup>22</sup> United States of America, Congressional Research Service, Crime Policy, *DNA Testing in Criminal Justice: Background, Current Law, Grants, and Issues*, by Nathan James (Washington, D.C.: Congressional Research Service, Library of Congress, 2012), 5.

<sup>23</sup> Angela L. Williamson, PhD, "Touch DNA: Forensic Collection and Application to Investigations," *Journal of the Association for Crime Scene Reconstruction* 18, no. 1 (September 18, 2011): 1-2, accessed April 8, 2018, <https://www.acsr.org/wp-content/uploads/2012/01/Williamson.pdf>.

<sup>24</sup> Mariya Goray et al., "Secondary DNA Transfer of Biological Substances Under Varying Test Conditions," *Forensic Science International: Genetics* 4, no. 2 (2010): 62, doi:10.1016/j.fsigen.2009.05.001.

<sup>25</sup> *Ibid*, 30.

<sup>26</sup> *Ibid*.

<sup>27</sup> Ibid.

<sup>28</sup> Ibid.

<sup>29</sup> Henry C. Lee et al., “Forensic Applications of DNA Typing: Part 2 Collection and Preservation of DNA Evidence,” *The American Journal of Forensic Medicine and Pathology* 19, no. 1 (March 1998): 11-13,

[https://journals.lww.com/amjforensicmedicine/Abstract/1998/03000/Forensic\\_Applications\\_of\\_DNA\\_Typing\\_Part\\_2.2.aspx](https://journals.lww.com/amjforensicmedicine/Abstract/1998/03000/Forensic_Applications_of_DNA_Typing_Part_2.2.aspx).

<sup>30</sup> Boies, Kimberly Cogdell. “Misuse of DNA Evidence Is Not Always a Harmless Error: DNA Evidence, Prosecutorial Misconduct, and Wrongful Conviction.” *Texas Wesleyan Law Review* 17, no. 4 (2011): 403-40.

<sup>31</sup> Jay D. Aronson and Simon A. Cole, “Science and the Death Penalty: DNA, Innocence, and the Debate over Capital Punishment in the United States,” *Law & Social Inquiry* 34, no. 3 (2009): 613, doi:10.1111/j.1747-4469.2009.01159.x.

<sup>32</sup> Itiel E. Dror and Greg Hampikian, “Subjectivity and Bias in Forensic DNA Mixture Interpretation,” *Science & Justice* 51, no. 4 (2011): 205, doi:10.1016/j.scijus.2011.08.004.

<sup>33</sup> Ibid.

<sup>34</sup> United States of America, Department of Justice, *Solicitation for the Review of External DNA Proficiency Testing*, 1.

<sup>35</sup> The presentation of DNA evidence and testimony is regulated by judicial precedent, federal law, state law, international norms, professional norms, and bar associations. These regulations are often contradictory and confusing. See: John Jackson, “Analysing the New Evidence Scholarship: Towards a New Conception of the Law of Evidence,” *Oxford Journal of Legal Studies* 16, no. 2 (1996): 310, doi:10.1093/ojls/16.2.309.

<sup>36</sup> Brooke Edenfield, “Who Ya Gonna Call? Confusion Reigns After the Supreme Court’s Failure to Define Testimonial and Analyst in *Melendez-Diaz v. Massachusetts*,” *Kansas Law Review*, 2010, 149-50, accessed March 20, 2018, doi:10.17161/1808.20175.

<sup>37</sup> Ibid, 150.

<sup>38</sup> Edward F. Connors, *Convicted by Juries, Exonerated by Science: Case Studies in the Use of DNA Evidence to Establish Innocence after Trial* (Washington, D.C.: U.S. Dept. of Justice, Office of Justice Programs, National Institute of Justice, 1996), xxii.

<sup>39</sup> Ibid.

<sup>40</sup> Jonathan J. Koehler, “Error and Exaggeration in the Presentation of DNA Evidence at Trial,” *Jurimetrics* 34, no. 1, 36-38, accessed April 7, 2018, <http://www.jstor.org/stable/29762319>.

<sup>41</sup> Ibid, 39.

<sup>42</sup> Though there are certainly a number of different ways that DNA testing can be conducted, the basic “science” behind DNA testing, as outlined earlier in the paper, is largely consistent across almost all labs. PCR testing is widely used, and the most common other methods are merely variants on the same approach. See: Lawrence F. Kobilinsky, Thomas F. Liotti, and Jamel Oeser-Sweat, *DNA: Forensic and Legal Applications* (Hoboken, NJ: John Wiley & Sons, 2005).

<sup>43</sup> Public crime laboratories are often poorly funded, and feature workplaces that are ripe for contamination. See: J. Herbie DiFonzo, “The Crimes of Crime Labs,” *Hofstra Law Review* 34, no. 1, 11, accessed April 7, 2018,

[http://heinonline.org/HOL/Page?handle=hein.journals/hoflr34&div=8&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/hoflr34&div=8&g_sent=1&casa_token=&collection=journals).

<sup>44</sup> Ibid, 10.

<sup>45</sup> United States of America, *Postconviction DNA Testing*, 59.

<sup>46</sup> Ibid, 61.

<sup>47</sup> M. Prinz et al., “DNA Commission of the International Society for Forensic Genetics (ISFG): Recommendations Regarding the Role of Forensic Genetics for Disaster Victim Identification (DVI),” *Forensic Science International: Genetics* 1, no. 1 (2007): 3, doi:10.1016/j.fsigen.2006.10.003.

<sup>48</sup> Paul C. Giannelli, “Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs,” 86, no. 1 (2007): 170-171, accessed April 7, 2018, [http://heinonline.org/HOL/Page?handle=hein.journals/nclr86&div=11&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/nclr86&div=11&g_sent=1&casa_token=&collection=journals).

<sup>49</sup> The sourcing for this point comes from several places. *For budgetary information*: United States of America, Bureau of Justice Statistics, Office of Justice Programs, *Census of Publicly Funded Forensic Crime Laboratories, 2002*, by Joseph L. Peterson and Matthew J. Hickman (Washington, DC: United States Department of Justice, Office of Justice Programs, Bureau of Justice Statistics, 2005). *For financials*: Jean E. McEwen, “Forensic DNA Data Banking by State Crime Laboratories,” *American Journal of Human Genetics* 56, no. 6 (June 1995): 1487, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1801115/?page=1>. *For Government Intent and Causality*: Arthur Daemrich, “The Evidence Does Not Speak for Itself: Expert Witnesses and the Organization of DNA-Typing Companies,” *Social Studies of Science* 28, no. 5-6 (October 1, 1998): 743, doi:10.1177/030631298028005004.

<sup>50</sup> Robert W. Bennett and Lawrence Solum, *Constitutional Originalism: A Debate* (Ithaca, NY: Cornell University Press, 2016). While the concept of “originalism” or “textualism” is often framed in a partisan context, such a divide nature does not have to exist. *See*: Lawrence M. Friedman, *A History of American Law* (New York, NY: Simon & Schuster, 2005).

<sup>51</sup> Testimony of Senator Orrin Hatch. United States of America, United States Congress, Committee on the Judiciary, *Hearing before the Subcommittee on the Constitution of the Committee on the Judiciary: United States Senate, One Hundred First Congress, First Session on Genetic Testing as a Means of Criminal Investigation* (Washington, DC: United States Government Printing Office, 1989), 2.

<sup>52</sup> Ibid.

<sup>53</sup> Ibid.

<sup>54</sup> Testimony of James E. Starrs, United States of America, United States Congress, Committee on the Judiciary, *Hearing before the Subcommittee on the Constitution of the Committee on the Judiciary: United States Senate, One Hundred First Congress, First Session on Genetic Testing as a Means of Criminal Investigation* (Washington, DC: United States Government Printing Office, 1989), 4.

<sup>55</sup> Ibid.

<sup>56</sup> Emphasis from document, Ibid, 3.

<sup>57</sup> Ibid, 625.

<sup>58</sup> *Matter of W. Va. State Police Crime Lab.*, 438 S.E.2d 501, 503 (W. Va. 1993).

<sup>59</sup> Ibid.

<sup>60</sup> Ibid. While physical build specifications had changed, laboratory techniques and oversight had not.

<sup>61</sup> *Furman v. Georgia*, 408 U.S. 238.

<sup>62</sup> Ibid.

<sup>63</sup> Bennett L. Gershman, *Misuse of Scientific Evidence by Prosecutors Forensics Symposium: the Use and Misuse of Forensic Evidence*, page 23,

[http://heinonline.org/HOL/Page?handle=hein.journals/okcu28&div=7&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/okcu28&div=7&g_sent=1&casa_token=&collection=journals).

<sup>64</sup> Ibid.

<sup>65</sup> Ibid, 24.

<sup>66</sup> Ibid, 24.

<sup>67</sup> Anecdotes were used as the basis for commissions and laws excluding faulty forensic evidence. For the complete history of the anti-junk science movement, *see*: Peter W. Huber, *Galileo's Revenge: Junk Science in the Courtroom* (New York, NY: Basic Books, 1991). *and*: Thomas O. McGarity, "Our Science Is Sound Science and Their Science Is Junk Science: Science-Based Strategies for Avoiding Accountability and Responsibility for Risk-Producing Products and Activities," *University of Kansas Law Review* 54, no. 4 (June 2004): accessed April 7, 2018, [http://heinonline.org/HOL/Page?handle=hein.journals/ukalr52&div=30&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/ukalr52&div=30&g_sent=1&casa_token=&collection=journals).

<sup>68</sup> For more information on state legislatures and the delays inherent in them, *see*: Alan Rosenthal, "State Legislative Development: Observations from Three Perspectives," *Legislative Studies Quarterly* 21, no. 2 (1996): 169, doi:10.2307/440178. Further, it is generally accepted that "sessions and session lengths" are shorter in state legislative arenas than in the U.S. Congress, and therefore it takes longer for legislation to develop and pass. *See*: Peverill Squire and Keith E. Hamm, *101 Chambers: Congress, State Legislatures, and the Future of Legislative Studies* (Columbus, OH: Ohio State University Press, 2005), 3.

<sup>69</sup> Brandon L. Garrett and Peter J. Neufeld, "Invalid Forensic Science Testimony and Wrongful Convictions," *Virginia Law Review* 95, no. 1 (March 2009): 63, accessed April 18, 2018, <http://www.jstor.org/stable/pdf/25475240.pdf?refreqid=excelsior:18c098651d9dc6b3ecb5aad365cd9b1>.

<sup>70</sup> Daniel S. Medwed, "Actual Innocents: Considerations in Selecting Cases for a New Innocence Project," *Nebraska Law Review* 81 (2002-2003): 1099, [http://heinonline.org/HOL/Page?handle=hein.journals/nebklr81&div=26&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/nebklr81&div=26&g_sent=1&casa_token=&collection=journals). While Innocence Projects play an important role in our society, they often litigate cases where there is untested DNA evidence available, rather than focus on potential errors in existing DNA analysis. Abbe Smith, "In Praise of the Guilty Project: A Criminal Defense Lawyer's Growing Anxiety About Innocence Projects," *University of Pennsylvania Journal of Law and Social Change*. 13, no. 3 (2009-2010): 323, accessed April 21, 2018, [http://heinonline.org/HOL/Page?handle=hein.journals/hybrid13&div=20&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/hybrid13&div=20&g_sent=1&casa_token=&collection=journals).

<sup>71</sup> *Furman v. Georgia*, 408 U.S. 238.

<sup>72</sup> William Blackstone, *Commentaries on the Laws of England* (Buffalo, NY: William S. Hein & Co, 1992), 352.

<sup>73</sup> Stephen L. Wasby, "Delay as a Due Process Violation," *The Justice System Journal* 19, no. 2 (1997): 235, accessed April 18, 2018, <http://www.jstor.org/stable/27976942>.

<sup>74</sup> The idea of a post-conviction DNA panel is not new. In fact, the Federal Bureau of Investigation studied such a concept in 2000. Though a full discussion of its merits is outside the scope of this essay, a post-conviction review process could ensure that those wrongfully convicted could still get justice while the presentation of evidence at trial was temporarily suspended. *See*: United States of America. Department of Justice. Federal Bureau of Investigation. "Quality Assurance Standards for Forensic DNA Testing Laboratories: DNA Advisory Board." *Forensic Science Communication* 2, no. 3 (2000): 1-14.

<sup>75</sup> Ibid, 12.

<sup>76</sup> J. Shuman, C. Vinson, and S. McKnight, "Evidence of Changes in Protease Sensitivity and Subunit Exchange rate on DNA Binding by C/EBP," *Science* 249, no. 4970 (1990): 772, doi:10.1126/science.2202050.

<sup>77</sup> John K. Roman et al., *The DNA Field Experiment: Cost-Effectiveness Analysis of the Use of DNA in the Investigation of High-Volume Crimes*, report, Justice Policy Center, Urban Institute (Washington, DC: Urban Institute, 2008), 5.

<sup>78</sup> United States of America, Department of Justice, Office of Justice Programs: Bulletin. *Survey of DNA Crime Laboratories*, 2001, by Greg W. Steadman (Washington, DC: Bureau of Justice Statistics), 3.

<sup>79</sup> United States of America, United States Department of Justice, Division of Governmental Studies and Service, *National Forensic DNA Study Report*, by Nicholas P. Lovrich, Travis C. Pratt, Michael J. Gaffney, Charles L. Johnson, Christopher H. Asplen, Lisa H. Hurst, and Timothy M. Schellberg, series 203970 (Washington, DC: U.S. Department of Justice, 2004), 3.

<sup>80</sup> Ibid.

<sup>81</sup> Ibid.

<sup>82</sup> Jianye Ge, Arthur Eisenberg, and Bruce Budowle, "Developing Criteria and Data to Determine Best Options for Expanding the Core CODIS Loci," *Investigative Genetics* 3, no. 1 (2012): 169-170, doi:10.1186/2041-2223-3-1.

<sup>83</sup> United States of America, *Postconviction DNA Testing*, 59.

<sup>84</sup> Ibid.

<sup>85</sup> Ibid, 41.

<sup>86</sup> "Selection and Implementation of Expanded CODIS Core Loci in the United States," Douglas R. Hares to A. Carracedo, Editor-in-Chief, *Forensic Science International: Genetics*, July 2015, in *Forensic Science International: Genetics*, vol. 17 (Quantico, VA: Federal Bureau of Investigation, 2015), 33.

<sup>87</sup> M. Dawn Herkenham, "Retention of Offender DNA Samples Necessary to Ensure and Monitor Quality of Forensic DNA Efforts: Appropriate Safeguards Exist to Protect the DNA Samples from Misuse," *The Journal of Law, Medicine & Ethics* 34, no. 2 (June 1, 2006): 382-383, doi:10.1111/j.1748-720x.2006.00043.x.

<sup>88</sup> Ibid.

<sup>89</sup> Kate Cashman and Terese Henning, "Lawyers and DNA: Issues in Understanding and Challenging the Evidence," *Current Issues in Criminal Justice* 24, no. 1 (2012): 69-84, accessed March 21, 2018, [http://heinonline.org/HOL/Page?handle=hein.journals/cicj24&div=10&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/cicj24&div=10&g_sent=1&casa_token=&collection=journals).

<sup>90</sup> Jan De Keijser and Henk Elffers, "Understanding of Forensic Expert Reports by Judges, Defense Lawyers and Forensic Professionals," *Psychology, Crime & Law* 18, no. 2 (2012): 191, doi:10.1080/10683161003736744.

<sup>91</sup> Cashman and Henning, "Lawyers and DNA: Issues in Understanding and Challenging the Evidence," 79.

<sup>92</sup> Laurence J. Severance, Edith Greene, and Elizabeth F. Loftus, "Toward Criminal Jury Instructions That Jurors Can Understand," *The Journal of Criminal Law and Criminology (1973-)* 75, no. 1 (1984): 199, doi:10.2307/1143210.



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<sup>93</sup> Laurence J. Severance and Elizabeth F. Loftus, "Improving the Ability of Jurors to Comprehend and Apply Criminal Jury Instructions," *Law & Society Review* 17, no. 1 (1982): 154, accessed March 21, 2018, doi:10.2307/3053535.

<sup>94</sup> Walter W. Steele, Jr. and Elizabeth G. Thronburg, "Jury Instructions: a Persistent Failure to Communicate," *North Carolina Law Review* 67 (1989): 90-91, accessed March 21, 2018, [http://heinonline.org/HOL/Page?handle=hein.journals/nclr67&div=14&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/nclr67&div=14&g_sent=1&casa_token=&collection=journals).

<sup>95</sup> Ibid.

<sup>96</sup> N.J. Schweitzer and Michael J. Saks, "The CSI Effect: Popular fiction about Forensic Science Affects the Public's Expectations about Real Forensic Science," *Jurimetrics* 47, no. 3 (2007): 357, accessed March 21, 2018, <http://www.jstor.org/stable/29762978>.

<sup>97</sup> Ibid.

<sup>98</sup> Ibid.

<sup>99</sup> Donald E. Shelton, Kim S. Young, and Gregg Barak, "A Study of Juror Expectations and Demands Concerning Scientific Evidence: Does the CSI Effect Exist," *Vanderbilt Journal of Entertainment and Technological Law* 9, no. 2 (2006): 364, accessed March 21, 2018, [http://heinonline.org/HOL/Page?handle=hein.journals/vanep9&div=17&g\\_sent=1&casa\\_token=&collection=journals](http://heinonline.org/HOL/Page?handle=hein.journals/vanep9&div=17&g_sent=1&casa_token=&collection=journals).

<sup>100</sup> Ibid, 365.

<sup>101</sup> Bruce Dennis Sales and Daniel W. Shuman, *Experts in Court: Reconciling Law, Science, and Professional Knowledge* (Washington, DC: American Psychological Association, 2005), 1.

<sup>102</sup> Ibid.

<sup>103</sup> Jason Schklar and Shari Seidman Diamond, "Juror Reactions to DNA Evidence: Errors and Expectancies.," *Law and Human Behavior* 23, no. 2 (April 1999): 161-162, doi:10.1023/a:1022368801333.