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The Role of Implicit Racial Bias in Forensic Testimony

Introduction

Since the murders of George Floyd and Breonna Taylor, conversations around racial bias in the criminal justice system have accelerated. Much of the focus has turned to police reform. The potential for racial bias, however, does not end with the initial stop, search, and arrest. Rather, it can be found throughout the criminal justice system, and forensic testimony is one area that does not get nearly enough attention when it comes to implicit racial bias.

Lawyers, judges, and jurors often approach scientific sounding evidence with a predisposition to accept the expert's conclusions, without a critical eye. Experts for the government are often presumed to be neutral and objective witnesses who report the science with no stake in the outcome.

Government experts, however, are susceptible to bias, including implicit racial bias, just like everyone else. These experts who testify in criminal cases may not be reporting "neutral science"; the testimony may be contaminated by implicit racial bias that has colored their conclusions.

Pattern matching methods¹ — for example, analysis of firearms and toolmark impressions, bloodstains, latent prints, hairs, and footwear and tire

impression analysis — are especially problematic. These methods are inherently subjective, meaning that they rely heavily on the examiner's individual judgment rather than any objective standard. Even though the examiner may be analyzing, for example, a bullet from a crime scene, that examiner may also be given "task irrelevant information," such as the name, race, and background of the lead suspect. Knowing that information can predispose the examiner to believe that the bullet was fired from that suspect's gun, leading to a result-driven opinion about whether the marks on the bullet "match" the marks on test fires from the gun. The human eye will see what it wants to see, and, because there are no objective standards by which to measure the marks, the examiner's conclusions may reflect bias in favor of guilt rather than a true determination that the marks are, in fact, the same in appearance or sufficient in number.

Implicit racial bias in forensic testimony cannot be ignored as a primary driver of injustice. This article discusses implicit racial bias, how it can impact forensic testimony, and what can be done about it.

The Presumption of Guilt

The existence of implicit bias is not reasonably subject to debate.² The impact on the criminal justice system is, likewise, beyond debate.³ More than 25 years ago, in *Georgia v. McCollum*, Justice O'Connor wrote in dissent that "[i]t is by now clear that conscious and unconscious racism can affect the way white jurors perceive minority defendants and the facts presented at their trials, perhaps determining the verdict of guilt and innocence."⁴ Even before that,

BY JANIS C. PURACAL

How I Ended Up Here

By Janis C. Puracal

Justice Brennan, in a dissent in *Turner v. Murray*, acknowledged that it is “incontestable that subconscious, as well as express, racial fears and hatreds operate to deny fairness to the person despised.”⁵ Decades later, in 2017, Justice Appel of the Iowa Supreme Court quoted Justices O’Connor and Brennan in a special concurrence recognizing that “we have a long way to go in ensuring fairness to racial minorities in our criminal justice system.”⁶ Justice Appel discussed the scientific and academic literature on implicit bias and urged the use of jury instructions to address implicit bias in criminal cases.⁷

Despite the research on implicit bias and the recognition that a disproportionate number of black and brown people are adversely impacted by the criminal justice system,⁸ studies “find evidence that race continues to influence individuals’ decisionmaking and behavior” within the system.⁹

The unfounded and malevolent association of dark skin with criminality underlies many of the inequities that are pervasive in the justice system.¹⁰ The system is built on the presumption of innocence, which has blinded us to the alternate reality — that there exists an implicit presumption of guilt for some of those who come before it.¹¹

Research has documented the presumption of guilt facing people of color.¹² That presumption comes from decades of dehumanization through false narratives that portray people of color as dangerous, uneducated, and menacing.¹³ This presumption of guilt implicitly shifts the burden to the individual to prove that he or she *is not* any or all of those things.

But the presumption is not always intentional or perceptible, and that makes the burden to expose and rebut it a constantly moving target.

The Research Behind Implicit Racial Bias

Researchers have extensively documented the science of implicit bias (also known as unconscious bias), and courts have commented on the “growing body of social science [that] recognizes the pervasiveness of unconscious racial and ethnic stereotyping and group bias.”¹⁴ Implicit biases are “attitudes or stereotypes that affect our understanding, decisionmaking, and behavior, without our even realizing it.”¹⁵

Implicit bias is to be contrasted with “explicit bias,” which describes

I was a third-year lawyer in Seattle when my older brother, Jason, was wrongfully convicted. He spent nearly two years being slowly starved in a Nicaraguan prison.

He was charged, and ultimately, convicted of international drug trafficking, money laundering, and organized crime. There was no evidence of drugs — not even a single gram was found on Jason’s person or in his truck, home, or office. Bank records confirmed that there were no illegal transfers of money, and the 10 other individuals arrested with him all confirmed that they had never met him.

Despite the lack of evidence, Jason was convicted and sentenced to 22 years in La Modelo, the maximum-security prison just outside Managua that is known for rampant human rights violations, including extreme overcrowding, unsanitary conditions, and a lack of food and medical care.¹ Twenty-two years in that place is a death sentence.

When Jason was arrested, I was a practicing civil litigator at a big firm in Seattle. I had no experience in criminal law, no experience in Nicaraguan law, and spoke no Spanish. But I was not going to let my brother die in that prison.

My family and I assembled a team that spanned three states and two countries. We had a defense team in Nicaragua, international human rights lawyers in Washington D.C., public relations in California, and innocence lawyers in Seattle and San Diego. We knew that the only way to save Jason was to create public pressure through the involvement of the U.S. government and media.

Anyone who reviewed the case could see that Jason was innocent. After all, it was a drug case with no drugs. And yet, I was breaking under the burden to prove that Jason was not a drug dealer — not just in the courtroom, but also with the U.S. legislators, government officials, and communities whose help I needed in advocating for his release. Jason’s dark brown skin,² long curly black hair, and tattoos made him look like the stereotypical image of what our society has been taught to think that a drug dealer would look like, and that stereotype caused palpable hesitation among many of the people to whom I reached out for help.

I spent the first six months of Jason’s case spinning my wheels. Each time I presented the case to U.S. officials (as well as to U.S.-based media outlets), I could see the skepticism in their eyes. They needed affirmative proof of innocence; the lack of any evidence of guilt was not enough.

I learned over time that, as a person of color, Jason bore an unspoken burden of proof. I downplayed our ethnic background. We never mentioned Jason’s race in the media or in meetings with officials. We spent hours culling through family photographs to find pictures of Jason that would be “acceptable” for social media. We worked hard to hide Jason’s long curly black hair and tattoos. But we couldn’t hide his brown skin. And with that brown skin came a presumption of guilt.

That presumption was not something that I could see, hear, or touch, but it became a critical issue that I needed to understand in order to serve my brother as my client and figure out how to reach decisionmakers. There are no easy answers here, and I do not have a “trick” to share. It was a simple realization that broke my heart.

My brother’s story had a happy ending. Jason was exonerated in September 2012, and he returned home to the United States. He walked out of prison with nothing but the clothes on his back and his prison-issued flip flops, and he has since gone to graduate school and started a company that owns several patents on a bio-based epoxy resin for sustainable materials. I am proud to share that he has worked hard to rebuild a life for himself, his wife, and their two sons.

Many other people of color are not so fortunate. Their nightmares in the U.S. criminal justice system continue, day after day, and even across generations.

Notes

1. United States Department of State, Country Reports on Human Rights Practices for 2012, at 4, <https://2009-2017.state.gov/documents/organization/204677.pdf>.

2. My family is of South Indian descent. ■

beliefs that are consciously endorsed such that the actor is aware of taking an action for a particular reason.¹⁶ Historically, conventional wisdom dictated that human behavior was largely under conscious control.¹⁷ Social scientists have since developed an extensive body of research that supports the opposite conclusion.¹⁸ The science behind implicit bias confirms that “actors do not always have conscious, intentional control over the processes of social perception, impression formation, and judgment that motivate their actions.”¹⁹

Social scientists have studied implicit bias over several decades and through various measures and research paradigms.²⁰ The findings “fit well with other research on brain functioning and human judgment.”²¹ The data from these studies confirms that “implicit bias is pervasive (widely held), large in magnitude (as compared to standardized measures of explicit bias), dissociated from explicit biases (which suggests that explicit biases and implicit biases, while related, are separate mental constructs), and predicts certain kinds of real-world behavior.”²²

The predictive value of implicit bias is important.²³ Implicit bias is equally as destructive as explicit bias²⁴ and arguably more difficult to address because the research confirms that implicit biases may contradict firmly held conscious beliefs.²⁵ The fact that implicit biases can still impact a person’s behavior even when adverse to the person’s conscious or stated beliefs should make everyone pause and appreciate the real-world consequences of implicit biases in the criminal justice system. “[E]vidence that implicit attitudes produce discriminatory behavior is already substantial and will continue to accumulate.”²⁶

Implicit bias related to race is built into the country’s culture and its criminal justice system. Biases against people of color are long-standing and deep-seated, but, beginning in the 1980s, the U.S. government doubled-down with myths and stereotypes beyond the already discriminatory practices.²⁷ Racial profiling, mandatory minimums, stop-and-frisk, disparities in crack versus cocaine sentencing, and the ideas of the “super predator” and “crack babies” come easily to mind. The system is still unraveling myth from reality, but these concepts are deep-seated and woven into our culture in ways that impact even the day-to-day for people of color.

Indeed, studies have repeatedly demonstrated that the color of a person’s skin has subconscious effects on “people’s memory for who was holding a deadly razor in a subway scene (Allport & Postman, 1947), people’s evaluation of ambiguously aggressive behavior (Devine, 1989; Duncan, 1976; Sagar & Schofield, 1980), people’s decision to categorize non-weapons as weapons (Payne, 2001), the speed at which people decide to shoot someone holding a weapon (Correll et al., 2002), and the probability that they will shoot at all (Correll et al., 2002; Greenwald et al., 2003).”²⁸

Psychologist Anthony Greenwald explains that implicit bias “shapes conscious thought, which in turn guides judgments and decisions.”²⁹ For example, “[w]hen a Black person does something that is open to alternative interpretations, like reaching into a pocket or a car’s glove compartment, many people — not just police officers — may think first that it’s possibly dangerous. But that wouldn’t happen in viewing a white person do exactly the same action.”³⁰

Much of the current research is focused on the distinction between individuals who are white and those who are Black.³¹ Research confirms that the association of dark skin with criminality “appears to be automatic (*i.e.*, not subject to intentional control).”³²

The Role of Forensic Evidence in Perpetuating the Presumption of Guilt

Understanding racial bias in forensic testimony is crucial. “CSI” and television shows like it create false expectations about forensic evidence. That fallacy may extend further than anyone understands. Most jurors can appreciate that it is at least possible for a police officer to act in a manner that may be fueled by racial bias. But most jurors do not understand that scientific-sounding opinions may not be scientific at all and may, instead, reflect implicit racial bias. Research has repeatedly recognized that juries will place great weight on scientific-sounding evidence, disregarding all other evidence to the contrary.³³ By the time we get to the start of jury deliberations on the fate of a person of color in a case involving subjective forensic evidence, there may be multiple layers of bias at play *and* the stamp of “scientific approval” from a lab. The odds are insurmountable at that point.

The illusion of “science” has long been used to justify the intentional subjugation of people of color.³⁴ The same intentionality may not always be present in forensic testimony, but the criminal justice system is relying no less on pseudo-science to justify the same result. Even though one may intend otherwise, implicit racial bias works its way into the system through forensic opinions.

Historically, those opinions had often been expressed as definitive (in absolute terms) with low, or even zero, error rates, leading many to believe that forensic methods were infallible. Over the past 10 to 15 years, however, there has been a growing skepticism about the presumed efficacy of some forensic sciences, including pattern matching methods.³⁵ Leading scientists around the country have started to weigh in and expose the weaknesses in certain forensic methods, including a lack of scientific validation,³⁶ the absence of objective standards,³⁷ and data from validation studies that has been manipulated to drive error rates down and give the false impression that the methods are near perfect.³⁸

Faulty or misleading forensic evidence has contributed to nearly half of the known DNA exonerations and at least one-quarter of all exonerations to date.³⁹ Insights into the fallibility of forensic methods are rapidly evolving. In the meantime, the deeply held belief that forensic evidence is objective and impartial has led many people down the primrose path to believing that the addition of forensic evidence to a case will cure any bias that may have contaminated the initial suspicion and arrest.

Bias in forensics, however, is well-documented.⁴⁰ For example, the PCAST Report from 2016 recognized that errors in pattern-matching methods arise, in part, because “in certain settings, humans (1) may tend naturally to focus on similarities between samples and discount differences and (2) may also be influenced by extraneous information and external pressures about a case.”⁴¹ As another example, leading researchers recently released a study on cognitive bias in forensic pathology, a community that had (like many forensic practitioners) long denied that bias could impact their decision making.⁴² The authors found that forensic pathologists who took part in the study “*were noticeably affected by medically irrelevant contextual information* (information that should not have any bearing on the decision).”⁴³

There are at least two key concerns about the impact of implicit racial bias on forensic testimony.

First, when the forensic testimony is faulty (whether overstated or just plain wrong), reliance on it opens the door to convictions based solely on racial bias. If the initial suspicion was fueled by the color of the suspect's skin (whether intentionally or unintentionally), the misleading forensic evidence does nothing to confirm the suspicion, but it does have the power to cloak the prosecutor's case in "science" by giving it the appearance of objectivity. If we strip away the misleading forensic evidence, we will certainly find cases where an individual is facing years in prison for no other reason than because he or she looks like what society, or an individual police officer, thinks a dangerous criminal would look like.

Second, analyst discretion in the process itself opens the door to bias, which affects the outcomes of forensic testing. As discussed above, many commonly used forensic methods are subjective, meaning they depend largely on human judgment. The more human judgment involved, the more subjective a method becomes. And with human judgment comes the risk of bias and error. Think of it on a spectrum. At one end of the spectrum are purely objective methods, like weighing an object on a digital scale. At the other end of the spectrum are purely subjective methods, like weighing an object in one's hand. As we move toward the subjective end of the spectrum, we see more human judgment involved, which increases the risk that the examiner's opinion will be tainted by bias and error. Knowing the race of the suspect at the outset can trigger bias that skews the analyst's conclusions toward guilt, even unintentionally.

Making a Change

Race is "psychologically salient."⁴⁴ By virtue of how implicit bias works, "'race cards' are always present and having an effect, even when they are face down or still in the deck."⁴⁵ The impact of race is ubiquitous.

Still, change is slow to come. In some areas, change is lagging because the path forward is not clear.⁴⁶

In other areas, change is lagging because, although people can see the problem in theory, they cannot see the problem in their own space. Attorneys tend to believe that the problem exists for some "other" person — not in this

city, not in this lab, not in this case. Social scientists have written about the "bias blind spot" that leads people to believe "that others are biased but we ourselves are not."⁴⁷ But implicit biases are pervasive, meaning that "everyone possesses them, even people with avowed commitments to impartiality such as judges."⁴⁸ And prosecutors. And police. And forensic examiners. And jurors. And, yes, defense attorneys. It affects each person and is beyond one's conscious understanding and control.⁴⁹ Scientists have explored the factors that make self-reports of neutrality unreliable, including people's false assumptions about their ability to accurately access and understand their own motivations, cognitions and behaviors, and their willingness to report them honestly in the face of clear social norms.⁵⁰

Nonetheless, decision makers want evidence to prove that racial bias is happening *here* before they are willing to act.⁵¹ They want data to show that, in a given case or a given lab, analysts made the decision to turn left when they should have turned right, and that decision was based on race.

The demand for data is not new or unique to forensic reform. People of color are frequently put to the "prove it" test. But the demand for data misses the point.

Several facts are not in dispute. Implicit bias is real.⁵² The presumption of guilt is real.⁵³ People of color are disproportionately affected by the criminal justice system.⁵⁴ The demand for proof of impact in each individual case or each individual lab ignores the reality that implicit bias is *implicit* — meaning silent, tacit, inherent, *unsaid*. It is unreasonable to demand explicit evidence of something that is already understood to be implicit.

The demand for data further ignores the systemic aspects of racism, which is a different category of concern altogether.⁵⁵ Systemic racism results from policies that are race-neutral on their face but produce disparate outcomes. In the forensic context, for example, lab policies that allow discretion in the analysis may be race-neutral on their face, and yet they produce disparate outcomes because discretion allows implicit (or explicit) bias to contaminate the results of the examination.

This reality does not necessarily mean that defense lawyers must, after the fact, presume that bias occurred in every case.⁵⁶ But it does mean that defenders should proactively protect against bias in every case.⁵⁷

Progress Is Possible, but Requires More Than What We Are Doing

Addressing implicit bias in the criminal justice system requires real work. It would be naïve to think that we can address deeply rooted conscious and unconscious bias with band-aid approaches, like a yearly "anti-bias" training, without more.⁵⁸ That type of a "fix" has not been tested to determine efficacy and may give the appearance of productivity without any assurance that it is effective.⁵⁹

The good news is that implicit beliefs and attitudes are malleable,⁶⁰ and research confirms that it is possible to prevent bias from affecting some aspects of decision making. The jury is still out on the best way to effect change, but there are steps that can, and should, be taken.

Some researchers advocate for effortful relearning: "[B]eing aware of potential biases, being motivated to check those biases, and being accountable to a superior (as a jury feels toward a judge) should have some effect on the translation of bias to behavior."⁶¹

Other researchers urge more proactive solutions that can and should be used by forensic practitioners, such as adopting policies to minimize irrelevant contextual information through the use of case managers or procedures like "Linear Sequential Unmasking."⁶²

These "blinding" procedures help eliminate discretion where possible, which leading psychologist Professor Anthony Greenwald says has proven effective in the past:

The classic example of this is when major symphony orchestras in the United States started using blind auditions in the 1970s. This was originally done because musicians thought that the auditions were biased in favor of graduates of certain schools like the Juilliard School. They weren't concerned about gender discrimination.

But as soon as auditions started to be made behind screens so the performer could not be seen, the share of women hired as instrumentalists in major symphony orchestras rose from around 10 percent or 20 percent before 1970 to about 40 percent. This has had a major impact on the rate at

The Injustice of Implicit Racial Bias

By Jason Z. Puracal



Jason Z. Puracal

I grew up with a rough, but largely ambiguous understanding that with my dark brown skin came a presumption of guilt. My father reminded me of it in subtle and not-so-subtle ways. As a teenager, what I saw as adolescent attempts to display my individuality, he saw as risks that I could not afford to take. Don't wear your hair like that; don't dress like that; don't talk like that.

I did not fully understand the implications of what it meant to walk through the world as a person of color until I was wrongfully imprisoned and falsely branded as an international drug dealer.

Beginning in September 2010, I spent 22 months being slowly starved in a Nicaraguan prison. I was charged and convicted of international drug trafficking, money laundering, and organized crime. I had been wrongfully convicted of crimes that I did not commit and sentenced to 22 years in La Modelo, the maximum-security prison in Nicaragua.

I knew that I was innocent, and I was firmly convinced that the police and prosecutors would see it too. I thought it was a simple case of mistaken identity that would be quickly cleared up, but it turned into a two-year nightmare. About one year in, I began to grapple with the reality that I might die in that hellhole.

When I say hellhole, that is exactly what I mean. I spent every day in a 12' x 15' cell with anywhere from 9 to 12 other men. In the corner of each cell was a small hole that all of us used as a toilet, sink, and shower. There was no running water, so each morning at 4:00 a.m., the guards would wake us up to haul five-gallon buckets of water back to the cell. The water had hair, dirt, and insects floating in it, but we had no choice — it was all we had for drinking, bathing, and cooking.

Guards gave us only rice and beans three times per day. Within six months of my incarceration, I lost more than 40 pounds and was struggling with bleeding gums, hair loss, and an assortment of complications from malnutrition. Medical care was nearly nonexistent, but disease was rampant. The entire place was crawling with cockroaches, ants, mosquitos, and blood-sucking ticks. I would not let my dog stay in that place.

The fight to stay alive took a physical toll on my body. The fight to prove that I was *not* a criminal took a mental and emotional toll that was equally destructive.

How do you prove that you are not a criminal? The obvious answer is to point to the lack of evidence against you. However, that was not enough in my case. There was an innate belief that I was guilty. The police and prosecution interpreted everything I did, everything about who I am, as being consistent with guilt.

I originally moved from Seattle to Nicaragua with the Peace Corps. I fell in love with the country and decided to stay after my service ended. At the time of my arrest, I had married a Nicaraguan woman, had a three-year-old son, and was running a successful real estate office overlooking the beach in San Juan del Sur.

When I was arrested, my success became a liability. The police and prosecution could not believe that I had earned it. To them, it was just more evidence that I was a criminal. How else could a dark-skinned man with long hair and tattoos accumulate wealth?

I lived in terror throughout my case. I never knew what the police and prosecution were going to manufacture next to justify the arrest.

I was infuriated when they manufactured "forensic" evidence at

trial. Twice the prosecution offered junk forensic evidence, and twice the judge accepted it without question. First, the prosecution offered a photograph of the screen on a "VaporTracer" machine showing a trace of unknown particulate that the police suggested was cocaine. My defense team was quick to point out that the prosecution had already offered the same photograph for every one of my 10 co-defendants, each time suggesting that the results came from a different search and hoping that the judge would not notice. Second, the prosecution offered a "forensic accountant" who was certain that I had been laundering money through my real estate brokerage because he had never heard of an escrow account and could not understand that the account held client funds in trust for property sales. The judge dismissed any evidence to the contrary, including the testimony of my company accountant and bank records that confirmed the legitimacy of every transaction through the account.

The facts did not matter. The prosecution just kept using the word "forensic" as if it had the magical power to transform nothing into something. It was as if the forensic examiners were granted special truth-telling credibility, whether or not those examiners actually had evidence or could explain the inconsistencies. And it worked.

I could not understand it. I could not understand why these "forensic examiners" were creating lies against me, a person whom they had never met. I could not understand why the police, prosecution, and judge were all so eager to believe it. I could not understand why my factual innocence was not enough to overcome it.

None of it made any sense. Looking back on it now, I know that it did not have to make sense. They believed in the "magic" of forensics because it was consistent with what they already believed to be true. I never stood a chance.

There is an irony to my case that I cannot ignore. While my sister, Janis, was working overtime to downplay my brown skin in the media and in meetings, I was relying on the color of my skin (and all the biases that come with it) as part of my survival in prison. While surrounded by murderers, rapists, and real drug dealers, I learned very quickly how to fit into the pecking order and try to stay out of the way of others. I shaved my head, grew out my beard, and flaunted my tattoos as a strategy to reinforce the biases of other inmates to make them think that I was just as dangerous as they already believed I was. I stayed silent about rumors and traded on biases in order to survive. That was prison.

Now, eight years later, I am living a different reality. The injustice of racism, whether explicit or implicit, has created in me a sense of urgency; an urgency to change my own individual behaviors, an urgency to talk openly about racial justice in my community, and an urgency to participate in understanding the systemic issues that produce inequality.

I do not speak for every person of color, and I am not an expert on all things race-related. My lived experience is one of many. As part of the collective whole, I take seriously my responsibility to understand my own biases and learn how my behavior impacts others.

This emotional work has been, at times, surprising, messy, and uncomfortable. I am constantly having to remind myself that silence upholds injustice.

And when the path forward is particularly murky, I am reminded that the path out of a Nicaraguan prison was not all that clear either.

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which women have become instrumentalists in major symphony orchestras.⁶³

Discretion elimination is possible in many areas of forensic analysis, and Professor Greenwald's example suggests that, even if eliminating racial bias is not the motivating force, reducing discretion produces favorable results.

Let's be clear — the research does not promise that implicit bias can be eliminated altogether. But one can take steps to prevent some biases from translating into behavior.

What Can We Do About It?

Forensic labs, especially law enforcement-run labs, have little incentive to change because courts regularly admit forensic testimony without limitation. Addressing implicit racial bias in forensic testimony will require a culture shift as well as structural changes to forensic labs. These changes will require advocacy from defense attorneys and other criminal justice stakeholders. Below are actions that can directly reduce implicit racial bias in forensic testimony:

1. Auditing Lab Policies to Minimize Contextual Information and Reduce Discretion

Many forensic labs do not have policies to prevent analysts from being exposed to irrelevant contextual information, such as the race and background of the suspect. The methods are, further, highly subjective and allow the individual examiner to exercise considerable discretion. These two factors together open the door to implicit bias.

For example, in firearms and toolmark analysis, the examiner may be given police reports with the name and race of the lead suspect, along with the officer's narrative of the investigation to date. The examiner is likely to review those police reports before examining the bullet or casing found at the crime scene and knows that the officer is attempting to identify the suspect's firearm as the source of the bullet or casing from the scene. Adding to that irrelevant contextual information is the lack of any objective standards in the firearms and toolmark methodology itself. The examiner has complete discretion to declare a match and testify that a bullet or casing at a crime scene came from the defendant's firearm. There is no universal standard that tells the examiner the number of similar marks they need to find between the spent ammunition and the test fire before the examiner can

declare a "match" and opine that the suspect's firearm was the source of the spent ammunition.⁶⁴ There is no universal standard that tells an examiner that a particular mark is unique and discriminating. Indeed, there is nothing objective that prevents an examiner from lowering the threshold to declare a "match" in any particular case.⁶⁵ Giving examiners that level of discretion creates opportunities for implicit bias to infect the results — bias of which the examiner may be unaware, and the defendant may never be able to "prove" in a manner that could overcome the strength of the examiner's opinion of a "match."⁶⁶

Several organizations are attempting to create objective standards in different forensic methods, which will reduce discretion in the analysis.⁶⁷ Unfortunately, none of those standards are binding on any individual lab or examiner.

To address implicit bias in forensics, labs can and should audit their own policies to reduce bias. Labs can adopt policies that minimize contextual information through case managers or procedures like "Linear Sequential Unmasking" (a process that controls the sequence and timing of information to ensure that the examiner makes key analytical judgments, and documents them, before being exposed to relevant, but potentially biasing, information).⁶⁸ They can further revise policies to reduce discretion in the analysis, thereby reducing opportunities for bias. According to Professor Greenwald, when decisions "are made based on predetermined, objective criteria that are rigorously applied, they are much less likely to produce disparities."⁶⁹

For those labs that are unwilling to audit policies and reduce bias, legislators have the authority to act. In Oregon, for example, the secretary of state has authority to audit state agencies, including state-run labs.⁷⁰ To more effectively and efficiently address the needs of forensic labs and the ever-changing nature of science, legislators in all states can establish independent commissions to provide ongoing oversight for labs, including the authority to conduct audits and mandate the use of objective standards.⁷¹

2. Making the Shift to Independent Labs

In 2009, the National Academy of Sciences issued its groundbreaking report that included a recommendation that public forensic labs be removed from law enforcement control.⁷² The reason for the recommendation was to maximize independence in forensic

analysis and reduce other forms of bias in the analysis, including confirmation bias and contextual bias.

Shifting to an independent lab model will help to reduce the risk that implicit bias in the policing phase will bleed into the forensic analysis. Forensic examiners who are on the same "team" as the arresting and investigating officers may be pressured (overtly or more subtly) to confirm initial suspicions.⁷³ When those initial suspicions are based on racial bias, the forensic opinions may be unfairly skewed toward guilt as false inferences and assumptions are fed into the analysis. Indeed, "expectation bias" is a well-known phenomenon that reflects the tendency for experimenters to accept data that agrees with their expectations for the outcome of an experiment, and to disregard or minimize data that appears to conflict with those expectations.⁷⁴

Independence can also help to shift forensic labs toward a "research culture" that prioritizes research-based knowledge, scientific questioning, and consistent efforts to improve methods.⁷⁵ That culture is severely lacking in forensic science.⁷⁶ A research culture encourages a diversity of perspectives from forensic and nonforensic scientists — including statisticians, psychologists, and those with advanced training in hard sciences like biology, physics, and chemistry — who can question methods, expose weaknesses, and advocate for improvements that will reduce discretion and the opportunity for bias.

3. Mandating Root Cause Analysis

Legislators should mandate a specific protocol for root cause analysis in state-run labs based on the knowledge and experience of other disciplines that use root cause analysis to prevent the recurrence of unwanted outcomes.

"Root cause analysis is a process that identifies, in an objective blame-free environment, why an adverse event or near miss occurred."⁷⁷ Outside the context of forensics, in industries like engineering, aviation, and medicine, experts examine adverse events and near-miss situations using a root cause analysis that "focuses on 'how' and 'why' something happened, rather than seeking to assign blame."⁷⁸ Proper root cause analysis allows stakeholders to develop corrective actions that more specifically address the true cause of the adverse event, resulting in more effective and cost-efficient action.

Some states have urged root cause analyses in criminal justice contexts. For example, the New York State Justice Task Force issued recommendations on how

to convene and implement root cause analysis in the criminal justice system to prevent wrongful convictions.⁷⁹

Root cause analysis has also been used in the forensic context. For example, in 2018, the FBI selected a third-party risk management company to analyze the root and cultural causes that contributed to reporting and testimonial errors in microscopic hair comparison analysis across the country.⁸⁰ As another example, the National Commission on Forensic Science recommended that all forensic science service providers and forensic science medical providers adopt protocols for proper root cause analysis.⁸¹ Similarly, the Texas Commission on Forensic Science mandates, and actively trains on, root cause analysis for labs under its purview.⁸²

Root cause analysis can help labs understand where implicit bias may be impacting results and adopt corrective actions to prevent it in the future.

4. Cross-Examining Forensic Examiners on Implicit Bias

Great trial attorneys are constantly assessing biases (in jurors, witnesses, judges, and opposing counsel) and figuring out how to fight them, adapt to them, or use them to a client's advantage. The need to address implicit racial bias requires the same perceptivity and willingness to think creatively.

The research confirms that it is possible to reduce bias, and the recommendations above illustrate steps that can be taken to do so. For those labs that are unwilling to meaningfully address the impact of racial bias, forensic examiners can be confronted on cross-examination, whether at trial or at pretrial hearings on scientific validity. Defense attorneys should avoid the trap of believing that racial bias exists only if there is explicit evidence of racism (e.g., a racial slur). Implicit racial bias exists regardless of intent, and defense attorneys can educate the court and the jury about how that bias contaminates decision-making, *even if we assume that the examiner is still a good and decent person*. Defense attorneys can consider questions related to:

- ❖ the existence of implicit bias, such as:
 - the fact that scientific research confirms the pervasiveness of implicit bias,⁸³
 - the 2009 report by the National Academy of Sciences that encourages labs to recognize bias in forensic analysis and take affirmative steps in response,⁸⁴ and

- the 2016 report by the President's Council of Advisors on Science and Technology that repeats the need for independence in forensic analysis to avoid bias.⁸⁵
- ❖ concrete actions that have been taken in nonforensic areas to actively address and prevent bias from impacting behavior, such as:
 - bias training in jury orientation and jury instructions that some courts have instituted to reduce bias in jurors,⁸⁶
 - the implementation of blind or double-blind procedures in clinical trials, as well as academics, to eliminate discretion and reduce bias,⁸⁷ and
 - the use of techniques that require academic interviewers to consider evidence that supports the opposite conclusion in admissions processes.⁸⁸
- ❖ lab policies that fail to address implicit bias, such as:
 - the lack of any written policy to address implicit bias,
 - the lack of a forum in which examiners are encouraged to discuss and address implicit bias in their work, and
 - specific policies that allow for discretion in the analysis.
- ❖ what the examiner did that may have allowed bias to infect the results, such as:
 - having access to task-irrelevant information about the suspect, including the suspect's race or ethnic background,⁸⁹
 - relying on nonblinded verification or technical review, which can increase confirmation bias and create a self-affirming feedback loop to bolster certainty,⁹⁰
 - discarding or minimizing evidence that supports the opposite conclusion, and
 - lowering the standard to reach an opinion consistent with guilt.
- ❖ what the examiner failed to do to reduce the dangers of bias in that case,⁹¹ such as:
 - failing to implement blind or double-blind analysis,
 - failing to use Linear Sequential Unmasking,
 - failing to follow the scientific method, including testing alternate hypotheses,
 - failing to document and account for inconsistent data, and
 - failing to follow the principle of falsification that requires scientists to determine whether the hypothesis can survive continuing and serious attempts to falsify it.⁹²

Defense attorneys can also address these issues in informal conversations with prosecutors to highlight weaknesses and create a culture where implicit racial bias is confronted just as any other harmful evidence.

Conclusion

Implicit bias in forensic testimony is an undeniable barrier to racial justice and equity. Research confirms the need to act preventatively, rather than waiting for proof of explicit racial bias in any individual case. The demand for concrete evidence of racism in a particular case may fit with the natural desire for proof, but it conflicts with the very phenomenon that the defense seeks to prevent. Implicit bias is *implicit*.

The question is not, where is the evidence of racism? That evidence already exists: (1) decades of research on implicit racial bias; (2) known data on disparate outcomes; and (3) written and unwritten lab policies that expose examiners to irrelevant contextual information, like race, and reveal a worrisome level of individual discretion in many forensic methods.

The question is, given that racial bias can be unintended and can persist hidden from view, what have labs or examiners done to protect their opinions from contamination, just as the labs would protect any other piece of evidence?

A desire for a fairer and more transparent criminal justice system means taking action based on the research and the disproportionate outcomes that paint a very real picture of the presumption of guilt facing black

and brown people. Focusing on the role that forensic testimony plays in perpetrating that presumption is crucial to the pursuit of justice.

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Author's Note: For a more thorough treatment of this topic, see the forthcoming article in volume 58 (2022) of the *Criminal Law Bulletin*.

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Notes

1. Pattern matching methods, also called “feature comparison methods,” are “methods that attempt to determine whether an evidentiary sample (e.g., from a crime scene) is or is not associated with a potential ‘source’ sample (e.g., from a suspect), based on the presence of similar patterns, impressions, or other features in the sample and the source.” PRESIDENT’S COUNCIL OF ADVISORS ON SCI. AND TECH., FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS at 1 (2016), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf [hereinafter PCAST Report]. The PCAST Report discusses examples such

as “the analysis of DNA, hair, latent fingerprints, firearms and spent ammunition, toolmarks and bitemarks, shoeprints and tire tracks, and handwriting.”

2. See, e.g., Jerry Kang & Kristin Lane, *Seeing Through Colorblindness: Implicit Bias and the Law*, 58 UCLA L. REV. 465, 488 (2010) (discussing the notable summaries of predictive validity studies and the meta-analysis of 122 research reports by Greenwald “that included 184 independent samples and 14,900 subjects”). See also *id.* at 504 (addressing critiques).

3. See, e.g., Jerry Kang et al., *Implicit Bias in the Courtroom*, 59 UCLA L. REV. 1124, 1134 (2012); Jennifer Eberhardt et al., *Seeing Black: Race, Crime, and Visual Processing*, 87 J. PERSONALITY & SOC. PSYCHOL. 876 (2004); Radley Balko, *There’s Overwhelming Evidence That the Criminal Justice System Is Racist. Here’s the Proof.*, WASH. POST (June 10, 2020), <https://www.washingtonpost.com/graphics/2020/opinions/systemic-racism-police-evidence-criminal-justice-system/>; Bryan Stevenson, *A Presumption of Guilt, The Legacy of Lynching and How It Still Shapes American Criminal Justice*, N.Y. REV. (July 13, 2017), <https://www.nybooks.com/articles/2017/07/13/presumption-of-guilt/>. See also Samuel R. Gross et al., *Race and Wrongful Convictions in the United States*, National Registry of Exonerations (2017), https://www.law.umich.edu/special/exoneration/Documents/Race_and_Wrongful_Convictions.pdf.

4. 505 U.S. 42, 68 (1992) (citing Developments in the Law — Race and the Criminal Process, 101 HARV. L. REV. 1472, 1559–60 (1988); Douglas Colbert, *Challenging the Challenge: Thirteenth Amendment as a Prohibition Against the Racial Use of Peremptory Challenges*, 76 CORNELL L. REV. 1, 110–12 (1990)) (O’Connor, J., dissenting).

5. 476 U.S. 28, 42 (1986) (Brennan, J., dissenting).

6. *State v. Plain*, 898 N.W.2d 801, 830 (Iowa 2017) (Appel, J., dissenting).

7. *Id.*

8. See, e.g., note 4.

9. R. Richard Banks et al., *Discrimination and Implicit Bias in a Racially Unequal Society*, 94 CALIF. L. REV. 1169, 1170 (2006).

10. A discussion of implicit bias requires an acknowledgment of the many complex stereotypes facing people of color, whether Black, Indian, Asian, Latino, Native American, or otherwise. Some of the stereotypes may overlap and some may be specific to one race or ethnicity. By focusing on dark skin and criminality, I do not suggest that these other aspects of bias are less important, and I do not suggest that the stereotypes facing one race are universally applicable to all people of color.

11. See, e.g., Cynthia Kwei Yung Lee, *Race and Self-Defense: Toward a Normative*

Conception of Reasonableness, 81 MINN. L. REV. 367, 413 (1996) (recognizing “the oft-unstated assumption that Blacks are still on probation — that unlike white men ... Blacks are not necessarily granted a presumption of innocence, competence, or even complete humanity.”).

12. See, e.g., Stevenson, *supra* note 3; Balko, *supra* note 3; Eberhardt, *supra* note 3.

13. Stevenson, *supra* note 3.

14. *Chin v. Runnels*, 343 F. Supp. 2d 891, 906 (N.D. Cal. 2004) (citing Charles Lawrence, *The Id. The Ego, and Equal Protection: Reckoning with Unconscious Racism*, 39 STAN. L. REV. 317 (1987); Mari Matsuda, *Voices of America: Accent, Antidiscrimination Law, and a Jurisprudence for the Last Reconstruction*, 100 YALE L. J. 1329 (1991); Edward M. Chen, *The Judiciary, Diversity, and Justice for All*, 91 CAL. L. REV. 1109, 1119 n.51 (2003)). See also *Commonwealth v. Buckley*, 90 N.E.3d 767, 782 n.4 (2018) (Budd, J., concurring) (“Multiple studies confirm the existence of implicit bias, and that implicit bias predicts real-world behavior. That is, even people who do not believe themselves to harbor implicit bias may in fact act in ways that disfavor people of color.” (citing J. Kang & M. Banaji, M., *Fair Measures: A Behavioral Realist Revision of “Affirmative Action,”* 94 CAL. L. REV. 1063, 1071–1073 (2006)).

15. Kang, *supra* note 3, at 1126 (2012).

16. Anthony G. Greenwald, *Implicit Bias: Scientific Foundations*, 94 CALIF. L. REV. 945, 946 (2006) (“Theories of implicit bias contrast with the ‘naïve’ psychological conception of social behavior, which views human actors as being guided solely by their explicit beliefs and their conscious intentions to act.”).

17. Kang, *supra* note 3, at 1129.

18. *Id.*

19. Greenwald, *supra* note 16, at 946.

20. David L. Faigman et al., *A Matter of Fit: The Law of Discrimination and the Science of Implicit Bias*, 59 HASTINGS L.J. 1389, 1430 (2008). Professor Faigman points out that “empirical evidence of implicit bias comes from studies using multiple methods and paradigms; it is not limited to the [Implicit Association Test],” although the IAT is well-known. *Id.* at 1393 n.24.

21. *Id.* at 1430.

22. Kang, *supra* note 3, at 1130–31 (internal citations omitted).

23. See generally Greenwald, *supra* note 16, at 953.

24. See, e.g., *Hopkins v. Price Waterhouse*, 825 F.2d 458, 469 (D.C. Cir. 1987) (“Unwitting or ingrained bias is no less injurious or worthy of eradication than blatant or calculated discrimination.”). See also Gary Blasi, *Advocacy Against the Stereotype*, 49 UCLA L. REV. 1241, 1274 (2002) (“Racial minorities and others in stereotyped groups suffer silent

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consequences even when, and sometimes it appears especially when, group identity is unmentioned or unmentionable.”)

25. Greenwald, *supra* note 16, at 951 (“Implicit biases are especially intriguing, and also especially problematic, because they can produce behavior that diverges from a person’s avowed or endorsed beliefs or principles.”); Kang, *supra* note 3, at 1129 (Implicit biases “can function automatically, including in ways that the person would not endorse as appropriate if he or she did have conscious awareness.”).

26. Greenwald, *supra* note 16, at 961 (citing T. Andrew Pohlman et al., *Understanding and Using the Implicit Association Test: III. Meta-Analysis of Predictive Validity* (unpublished manuscript) (2005)).

27. See MICHELLE ALEXANDER, *THE NEW JIM CROW* (2012).

28. Eberhardt, *supra* note 3, at 876.

29. Betsy Mason, *Curbing Implicit Bias: What Works and What Doesn’t*, KNOWABLE MAGAZINE (June 4, 2020), <https://knowablemagazine.org/article/mind/2020/how-to-curb-implicit-bias>.

30. *Id.*

31. Eberhardt, *supra* note 3, at 876.

32. *Id.* (citations omitted). See also Kang, *supra* note 3, at 1144.

33. See Brandon L. Garrett et al., *Mock Juror’s Evaluation of Firearm Examiner Testimony*, 44(5) LAW & HUM. BEHAV. 412, 414 (2020), <https://doi.apa.org/doiLanding?doi=10.1037%2F11hb0000423> (collecting studies in different forensic methods).

34. See, e.g., Tim Crowe, *How Science Has Been Abused Through the Ages to Promote Racism*, THE CONVERSATION (November 19, 2015), <https://theconversation.com/how-science-has-been-abused-through-the-ages-to-promote-racism-50629>; Thomas Klikauer & Norman Simms, *The Science of Race and the Racism of Science*, COUNTERPUNCH (October 23, 2020), <https://www.counterpunch.org/2020/10/23/the-science-of-race-and-the-racism-of-science/>.

35. See NAT’L RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (2009), <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf> [hereinafter NAS Report]; PCAST Report, *supra* note 1. See also Aliza B. Kaplan & Janis C. Puracal, *It’s Not a Match: Why the Law Can’t Let Go of Junk Science*, 81 ALBANY L. REV. 895 (2018).

36. See NAS Report, *supra* note 35; PCAST Report, *supra* note 1.

37. *Id.*

38. Itiel E. Dror & Nicholas Scurich, *(Mis)use of Scientific Measurements in Forensic Science*, Forensic Science International: Synergy (2020), <https://doi.org/10.1016/j.fsisyn.2020.08.006>. Cf. Garrett, *supra* note 33.

39. National Registry of Exonerations

(searching database by DNA cases and the contributing factor of faulty/misleading forensic evidence), <https://www.law.umich.edu/special/exoneration/Pages/detail.aspx>.

40. See, e.g., D.M. Risinger et al., *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 CAL. L. REV. 1 (2002); NAS Report, *supra* note 35, at 184; PCAST Report, *supra* note 1, at 31.

41. PCAST Report, *supra* note 1, at 49.

42. Itiel Dror et al., *Cognitive Bias in Forensic Pathology Decision*, 00 J. FORENSIC SCI. 1 (2021).

43. *Id.* at 4 (emphasis in original).

44. Banks, *supra* note 9, at 1170.

45. See also Gary Blasi, *Advocacy Against the Stereotype*, 49 UCLA L. REV. 1241, 1274 (2002).

46. See, e.g., *Plain*, 898 N.W.2d at 832 (discussing differing views on the utility of a jury instruction on implicit bias); *Commonwealth v. Buckley*, 90 N.E.3d 767, 782 (2018) (Budd, J., concurring) (recognizing “how pretextual stops disproportionately affect people of color” and recognizing that “the solution ... is not clear”).

47. Kang, *supra* note 3, at 1173–74 (citing Emily Pronin, *Perception and Misperception of Bias in Human Judgment*, 11 TRENDS COGNITIVE SCI. 37 (2007)).

48. Kirwan Institute, *State of the Science: Implicit Bias Review 2015*, <http://kirwaninstitute.osu.edu/research/understanding-implicit-bias/>. Cf. Kang, *supra* note 3, at 1141–42 (“[T]here is no reason to presume attorney exceptionalism in terms of implicit biases. And if defense attorneys, who might be expected to be less biased than the population, show typical amounts of implicit bias, it would seem odd to presume that prosecutors would somehow be immune.”); *id.* at 1144 (“[G]iven that implicit biases generally influence decisionmaking, there is no reason to presume that citizens become immune to the effects of these biases when they serve in the role of jurors.”).

49. See *id.*

50. See Faigman, *supra* note 20, at 1404–07. See also Kang, *supra* note 2, at 470.

51. Cf. Banks, *supra* note 9, at 1170 (“The ostensible consensus [opposition to bias and discrimination] fractures as one moves from broad statements of principle to specific circumstances. The consensus splinters not so much because of support for bias and discrimination, but rather because there are multiple ways to conceptualize bias and to enact the anti-discrimination principle in the criminal justice context.”).

52. See, *supra* note 14.

53. See, *supra* note 3.

54. See *id.*

55. For an excellent discussion of systemic racism, see The Quattrone Center’s panel on “The Administration of Blind Justice: Criminal Justice Institutions and Racial Bias,” <https://www.youtube.com/watch?v=oM4i-V17Owc&feature=youtu.be>.

56. See generally Kang, *supra* note 2, at 492 (discussing strategies to deal with the problem of bias ex ante versus ex post).

57. *Id.* at 499 (discussing prevention). Professors Kang and Lane discuss action using the general approach of “behavioral realism,” which seeks to use new understandings in the mind and behavioral sciences to advance the law based on more accurate models of human cognition and behavior. For a description of “behavioral realism,” see *id.* at 490.

58. Mason, *supra* note 30 (In an interview, leading psychologist Anthony Greenwald said: “I’m at the moment very skeptical about most of what’s offered under the label of implicit bias training, because the methods being used have not been tested scientifically to indicate that they are effective. And they’re using it without trying to assess whether the training they do is achieving the desired results. I see most implicit bias training as window dressing that looks good both internally to an organization and externally, as if you’re concerned and trying to do something. But it can be deployed without actually achieving anything, which makes it in fact counterproductive.”).

59. *Id.*

60. Nilanjana Dasgupta & Anthony G. Greenwald, *On the Malleability of Automatic Attitudes: Combating Automatic Prejudice with Images of Admired and Disliked Individuals*, 81 J. PERSONALITY AND SOC. PSYCHOL. 800, 801 (2001).

61. Kang, *supra* note 2, at 500.

62. Dror, *supra* note 42, at 5–6.

63. Mason, *supra* note 29.

64. Firearms examiners usually testify that two items “match” when the degree of similarity between the spent ammunition and the test fire exceeds the degree of similarity with respect to the “best known non-match.” The “best known non-match,” however, is based entirely on what that examiner recalls from his or her individual experience.

65. See generally Risinger, *supra* note 40, at 16 (“One well-established effect of expectation, however induced or derived, in the perception tuning process is that decision thresholds shift as a function of expectations. Thus, in response to identical stimuli, a positive decision becomes more likely, and therefore more likely to be a false positive, or less likely, and therefore more

(Continued on page 48)

QC: If you were talking to a group of law students, what would you say to convince them to practice criminal defense and to represent clients of limited means?

NS: I cannot convince anyone to be a public defender. Instead, I can only inspire them to become one. Not everyone can be a public defender. If you want to be a public defender because it is trendy or will get you great trial experience, then pick a different job. Being a public defender is a calling. You have to feel it in your bones. I know many former public defenders who still identify as public defenders. If you know you want to be a public defender, then read every book about indigent defense work and watch every documentary you can. Expand your knowledge base from just the law to other topics such as race, gender, LBGTQAI+, and social justice. Learn about other organizations trying to help the people you want to represent. And take advantage of every opportunity to work at a public defender's office.

CL: It is the best, most satisfying legal career you can imagine! I love being a trial attorney, and I love representing my clients. It is a David and Goliath story. We do not go into this profession because we like to win all the time. Most of the time we do not win. But we enjoy the fight, and we are privileged to fight on behalf of marginalized people who need a good advocate. We get to be really creative and constantly think of ways to outwit the prosecutors and force them to work to take time away from our clients and our clients' families. We are on the right side of history.

QC: What is the most important lesson your clients taught you?

PV: Resilience. My clients come from one of the poorest congressional districts in this country. They are hardworking, they are joyful, they have survived, and they are healing from trauma. This trauma has been visited upon them interpersonally and by all of these systems meant to oppress and suppress them. The thousands of clients I have represented are some of the most beautiful humans I have ever encountered. I am honored, humbled, and grateful that they allow me the privilege of representing them.

NS: The most important lesson my clients have taught is learning not to beat yourself up so you can keep fighting.

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(Continued from page 40)

likely to be a false negative, purely as a consequence of decision thresholds that change as expectation changes.”)

66. Cf. NAS Report, *supra* note 35, at 185 (“The traps created by such [contextual] biases can be very subtle, and typically one is not aware that his or her judgment is being affected.”).

67. See, e.g., Center for Statistics and Applications in Forensic Evidence, <https://forensicstats.org/>. See also Organization of Scientific Area Committees for Forensic Science, <https://www.nist.gov/organization-scientific-area-committees-forensic-science>.

68. See, e.g., Itiel Dror, *Cognitive and Human Factors in Expert Decision Making: Six Fallacies and the Eight Sources of Bias*, 92(12) ANAL. CHEM. 7998 (2020); Glinda Cooper & Vanessa Meterko, *Cognitive Bias Research in Forensic Science: A Systematic Review*, 297 FORENSIC SCI. INTL. 35 (2019).

69. Mason, *supra* note 29.

70. See, e.g., ORS 297.070 (Oregon statute describing auditing authority of secretary of state).

71. The Texas Forensic Science Commission and the New York Commission on Forensic Science are examples of independent commissions that were established by state legislatures.

72. NAS Report, *supra* note 35, at 183.

73. Cf. Risinger, *supra* note 40, at 19 (“Research on conformity shows that people rely on the views of others in order to develop their own conclusions, sometimes to gain additional information, other times merely to be in step with their peers.”).

74. *Id.* at 16.

75. PCAST Report, *supra* note 1, at 32.

76. *Id.*

77. New York State Justice Task Force, Recommendations Regarding Root Cause Analysis, at 2, <http://www.nyjusticetaskforce.com/pdfs/JTF-Root-Cause-Analysis.pdf>.

78. *Id.*

79. *Id.*

80. ABS Group, *Root and Cultural Cause Analysis of Report and Testimony Errors by FBI MHCA Examiners* (2018), <https://vault.fbi.gov/root-cause-analysis-of-microscopic-hair-comparison-analysis/root-cause-analysis-of-microscopic-hair-comparison-analysis-part-01-of-01/view>.

81. National Commission on Forensic Science, Root Cause Analysis in Forensic Science, <https://www.justice.gov/archives/ncfs/page/file/641621/download>. The Department of Justice later decided not to renew the NCFs's charter.

82. See Texas Forensic Science Commission, Annual Report (2015), at 23, <https://www.txcourts.gov/media/1440351/fsc-annual-report-fy2015.pdf>; Texas Forensic Science Commission Analyst and Technician Licensing Examination Basic Information Regarding Examination Content, Scoring, and Syllabus, <https://www.txcourts.gov/media/1442004/licensing-exam-syllabus-07112018.pdf>.

83. See Kang, *supra*, note 3, at 1130–31.

84. NAS Report, *supra* note 35, at 184.

85. PCAST Report, *supra* note 1, at 31.

86. See, e.g., Unconscious Bias Juror Video, U.S. Dist., W.D. Wash., <https://www.wawd.uscourts.gov/jury/unconscious-bias>; Understanding the Effect of Unconscious Bias, Oregon, <https://www.courts.oregon.gov/courts/lane/jury/Pages/Video-Gallery.aspx>; Manual of Model Criminal Jury Instructions, Ninth Circuit, <http://www3.ce9.uscourts.gov/jury-instructions/node/300>.

87. See Risinger, *supra* note 40, at 9.

88. See, e.g., Quinn Capers IV, *Rooting Out Implicit Bias in Admissions*, Association of American Medical Colleges (2019), <https://www.aamc.org/news-insights/insights/rooting-out-implicit-bias-admissions>.

89. Risinger, *supra* note 40, at 31; Dror, *supra* note 68.

90. Kaye N. Ballantyne et al., *Peer Review in Forensic Science*, 277 FORENSIC SCI. INTERNAT'L 66 (2017).

91. Dror, *supra* note 68.

92. Failing to follow the principle of falsification results in confirmation bias because examiners have a natural tendency “to test a hypothesis by looking for instances that confirm it rather than by searching for potentially falsifying instances.” See Risinger, *supra* note 40, at 7. ■

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