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Techniques for Mitigating Cognitive Biases in Fingerprint Identification

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ABSTRACT

Since the U.S. Supreme Court's holdings in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* and *Kumho Tire Co. v. Carmichael*, which articulated that judges have a gatekeeping responsibility to ensure that all expert testimony is sufficiently reliable, academic critics have reviewed forensic science evidence with greater scrutiny. While fingerprint identification has historically been touted as infallible, recent empirical research has revealed that this is far from the case. Fingerprint examiners do make mistakes—some of which can be attributed to a set of inherently human cognitive biases that we all share. Scholars have increasingly studied the role that cognitive biases can play in fingerprint examiner decisionmaking. Until now, however, scant attention has been paid to ways in which these biases can be mitigated. In this Comment, I contribute to filling that void by identifying and examining debiasing techniques that could be used to combat cognitive biases in the fingerprint identification domain, as well as by suggesting ways in which these techniques could potentially be implemented in forensic science laboratories.

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INTRODUCTION

The depiction of forensic science in television shows such as *CSI: Crime Scene Investigation*, *NCIS: Naval Criminal Investigative Service*, and *Without a Trace* has become a pop culture phenomenon. *CSI: Crime Scene Investigation*, for example, was for a time the most popular television series in the world, and Nielsen data indicate that there has been enormous exposure to the show's franchise.[1] However, popular television shows' portrayals of forensic science are overwhelmingly inaccurate.[2] The viewer generally comes away with the sense that forensic science is foolproof.[3] Unfortunately, this is far from the case.

In fact, academic critics have recently begun to realize that there may be "surprisingly little science in some of what is called forensic science."[4] Since the U.S. Supreme Court's holdings in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[5] and *Kumho Tire Co. v. Carmichael*,[6] which articulated that judges have a gatekeeping responsibility to ensure that all expert testimony is sufficiently reliable, academic critics have reviewed forensic science evidence with greater scrutiny—and, as a result, many have been surprised to learn how "scientifically weak" some of the forensic science fields are.[7] Indeed, forensic scientists testifying in court have frequently "overstated their degree of knowledge, underreported the chances of error, and suggested greater certainty than is warranted."[8] And, most disturbingly, recent research has revealed that forensic science errors not only have contributed to numerous known wrongful convictions but also may even be among the leading causes of such convictions.[9]

1. *See* Simon A. Cole & Rachel Dioso-Villa, *Investigating the "*CSI *Effect" Effect: Media and Litigation Crisis in Criminal Law*, 61 STAN. L. REV. 1335, 1337 (2009).
2. *See* N.J. Schweitzer & Michael J. Saks, *The* CSI *Effect: Popular Fiction About Forensic Science Affects the Public's Expectations About Real Forensic Science*, 47 JURIMETRICS 357, 358 (2007) ("Of course, *CSI* is only fiction. One forensic scientist estimates that 40% of the 'science' on *CSI* does not exist, and most of the rest is performed in ways that crime lab personnel can only dream about.").
3. *See id.* ("*CSI* is convincing the public that forensic science not only is science, but it is super science.").
4. *Id.* at 359.
5. 509 U.S. 579 (1993).
6. 526 U.S. 137 (1999).
7. *See* Schweitzer & Saks, *supra* note 2, at 359.
8. Jennifer L. Mnookin, *The Courts, the NAS, and the Future of Forensic Science*, 75 BROOK. L. REV. 1209, 1210 (2010).
9. *See* Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1, 2 (2009) (finding that in 60 percent of the DNA exoneration cases analyzed, forensic scientists testifying for the prosecution had provided "testimony with conclusions misstating empirical data or wholly unsupported by empirical data"); *see also* Michael J. Saks & Jonathan

Fingerprint identification, in particular, is a field of forensic science that has long been touted as "infallible."[10] The case of Brandon Mayfield, however, provides an illustration of fingerprint identification errors and their consequences. This case involves perhaps "the most high-profile, embarrassing fingerprint mistake in recent history."[11] Mayfield, an attorney from Portland, Oregon, was falsely linked to a 2004 terrorist bombing in Madrid, Spain.[12] Fingerprint examiners from the Federal Bureau of Investigation (FBI) determined with "100% certain[ty]" that his fingerprints matched fingerprints found at the scene of the bombing.[13] These determinations were in fact erroneous; although Mayfield's fingerprints were extremely similar to those found at the crime scene, the sets of fingerprints did not match each other.[14] In his communications with the authorities, Mayfield was adamant that he was in the United States when the bombing occurred, that he had never been to Spain, and that he did not even have a passport.[15] Regardless, he was forced to spend two weeks in jail as a material witness to the bombing.[16] Only after Spanish authorities located another suspect did the FBI admit to its mistake and release Mayfield.[17] The FBI was "deeply embarrassed" as a result and eventually settled with Mayfield for $2,000,000.[18]

The current state of affairs in forensic science, as exemplified by the Mayfield case, has become so troubling that in 2009, the National Academy of Sciences (NAS) issued a lengthy report recommending substantially increased funding for government regulation and oversight of forensic science.[19] The NAS report also advocated the pursuit of empirical research that would further examine the admissibility of forensic science evidence under *Daubert* and *Kumho Tire*.[20] *Daubert* provided certain guidelines for judges determining whether expert testimony is

J. Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCI. 892, 893 (2005) (finding that out of eighty-six cases analyzed, erroneous forensic science testimony was the second most common contributing factor to wrongful convictions, after erroneous eyewitness identification).

10. *See* FBI, THE SCIENCE OF FINGERPRINTS: CLASSIFICATION AND USES, at iv (1984).
11. Mnookin, *supra* note 8, at 1228.
12. *Id.*
13. *Id.*
14. *See id.* at 1229.
15. *Id.* at 1228.
16. *See* Itiel E. Dror & Simon A. Cole, *The Vision in "Blind" Justice: Expert Perception, Judgment, and Visual Cognition in Forensic Pattern Recognition*, 17 PSYCHONOMIC BULL. & REV. 161, 162 (2010).
17. *See* Mnookin, *supra* note 8, at 1229.
18. *Id.*
19. *See* NAT'L ACAD. OF SCIS., COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY., STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (2009) [hereinafter NAS REPORT].
20. *See id.* at 22–23.

sufficiently reliable and therefore admissible in court, including an invitation "to look at whether the evidence or technique in question has been tested adequately; whether it has a known error rate; whether it has been subject to peer review; and whether it is generally accepted by the relevant scientific community."[21] But as academic critic Jennifer Mnookin has pointed out, there is now "quite simply a lack of empirical evidence establishing that [fingerprint examiners] can actually do what they claim"[22]—which is not only to have the ability to individualize, or to determine that a fingerprint comes from one specific person to the exclusion of all other people in the world, but also to have an error rate of 0 percent.[23] Despite this lack of empirical research, courts have for the most part persisted in admitting forensic science evidence without limitation. Numerous critics have taken this as an indication that courts have thus far failed to take seriously their responsibilities under *Daubert*.[24]

One major problem underlying many fields of forensic science, including fingerprint identification, is that they fail to implement research methods that are characteristically associated with validated research science.[25] Unlike the assertions made by researchers in other fields of science, claims made by forensic scientists are typically neither based on formal data collection nor grounded in research that is subject to peer review and publication standards.[26] Furthermore, unlike other fields of science in which concerted efforts are made to prevent researchers from being exposed to domain-extraneous information,[27] no such procedures are currently

21. Mnookin, *supra* note 8, at 1212.
22. *Id.* at 1225.
23. *See id.* at 1225–26. Consequently, Mnookin has recommended outright exclusion of forensic science evidence in at least some cases until the necessary empirical research has taken place. *See id.* at 1265–74.
24. *See, e.g.*, *id.* at 1212–13.
25. *See id.* at 1210.
26. *See id.*
27. *See, e.g.*, Dan Remenyi et al., *Adding Something of Value to the Body of Theoretical Knowledge?*, *in* THIRD EUROPEAN CONFERENCE ON RESEARCH METHODS FOR BUSINESS AND MANAGEMENT STUDIES 291, 292 (Ann Brown & Dan Remenyi eds., 2004) (stating that in Western science, "[d]ouble blind testing using control groups is the norm"); Joyce Sprafkin & Kenneth D. Gadow, *Double-Blind Versus Open Evaluations of Stimulant Drug Response in Children With Attention-Deficit Hyperactivity Disorder*, 6 J. CHILD & ADOLESCENT PSYCHOPHARMACOLOGY 215, 215 (1996) ("For research psychopharmacologists, placebos and double-blind conditions are sine qua non for the conduct of scientific investigations . . . ."); *see also* D. Michael Risinger & Michael J. Saks, *The* Daubert/Kumho *Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 CALIF. L. REV. 1, 9 (2002) ("[A]wareness of [observer effects] and their solutions is so widespread that concepts such as double-blind and placebo have become household words popularly understood well beyond the laboratory . . . . Forensic science is one of a very few fields that has not yet profited from this 'science of science.'").

in place in many forensic science laboratories.[28] Fingerprint examiners in numerous laboratories are thus consistently exposed to information that is outside of their own domain—that is, outside the scope of whatever information is necessary to conduct their forensic testing.[29] The types of domain-extraneous information that many fingerprint examiners are consistently exposed to include (1) information regarding additional evidence linking a suspect to a crime; (2) information regarding whether the suspect confessed or had an alibi; and (3) other information regarding the suspect, such as details about the suspect's prior convictions or gang affiliations.[30] This is problematic because recent empirical research has shown that exposure to such domain-extraneous information results in cognitive biases that can potentially influence fingerprint examiners' determinations of whether fingerprints match.[31]

Increased attention has recently been given to the role that cognitive biases play in forensic science laboratories. A rapidly growing literature indicates that some of forensic science's shortcomings can be attributed to a set of inherently human cognitive biases that we all share.[32] Until now, however, scant attention has been paid to the ways in which these biases can be mitigated. This Comment thus examines debiasing techniques that could be used to combat cognitive biases in the fingerprint identification domain. It first reviews and examines the few debiasing techniques that have thus far been suggested for use in the fingerprint identification domain (but that have not yet been successfully implemented). It then identifies additional debiasing techniques that have been suggested or implemented in other domains and considers ways in which these additional techniques could potentially be implemented in the fingerprint identification domain.

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28. *See* MJ Saks et al., *Context Effects in Forensic Science: A Review and Application of the Science of Science to Crime Laboratory Practice in the United States*, 43 SCI. & JUST. 77, 85 (2003).
29. *See* Mnookin, *supra* note 8, at 1230.
30. *See id.*
31. *See, e.g.*, Itiel E. Dror et al., *Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications*, 156 FORENSIC SCI. INT'L 74 (2006) [hereinafter Dror et al., *Contextual Information*]; Itiel E. Dror et al., *The Impact of Human-Technology Cooperation and Distributed Cognition in Forensic Science: Biasing Effects of AFIS Contextual Information on Human Experts*, 57 J. FORENSIC SCI. (forthcoming 2012) [hereinafter Dror et al., *Biasing Effects*]; Itiel E. Dror & David Charlton, *Why Experts Make Errors*, 56 J. FORENSIC IDENTIFICATION 600 (2006); Glenn Langenburg et al., *Testing for Potential Contextual Bias Effects During the Verification State of the ACE-V Methodology When Conducting Fingerprint Comparisons*, 54 J. FORENSIC SCI. 571 (2009).
32. For a review of this literature, see generally Dror & Cole, *supra* note 16, and Itiel Dror & Robert Rosenthal, *Meta-Analytically Quantifying the Reliability and Biasability of Forensic Experts*, 53 J. FORENSIC SCI. 900 (2008).

This Comment proceeds as follows. Part I provides a general background of cognitive bias—what it is and how it works. It goes on to discuss ways in which cognitive biases can influence fingerprint examiners' decisionmaking, explaining in the process why these biases can be troublesome. Part II then reviews and examines various debiasing techniques that have been suggested for use in the fingerprint identification domain but that have not yet been systematically implemented. It also identifies several debiasing techniques that have been suggested or implemented in other domains, while focusing on how these techniques could act as countermeasures against cognitive biases in the fingerprint identification domain.

I. COGNITIVE BIAS

Recent empirical research has shown that cognitive biases can influence how fingerprint examiners determine whether fingerprints match.[33] Before exploring ways in which these cognitive biases can be mitigated in the fingerprint identification domain, this Part provides a general background on cognitive bias and how it can influence fingerprint examiners' decisionmaking. In doing so, it explains why these biases are problematic.

A. Cognitive Bias Generally

Research on human cognitive fallibility, pioneered by Amos Tversky and Daniel Kahneman decades ago,[34] has been lauded as "[u]ndeniably[] one of the crowning achievements of modern psychological science."[35] This line of research has arguably been the dominant approach to the study of decisionmaking since the 1970s.[36] Indeed, the profound scientific impact of this research was formally recognized in 2002 when Kahneman was the first Ph.D. psychologist to be awarded a Nobel Prize.[37]

33. *See supra* note 31. For a review of this literature, see generally Dror & Cole, *supra* note 16, and Dror & Rosenthal, *supra* note 32.

34. *See, e.g.*, Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124 (1974).

35. Scott O. Lilienfeld et al., *Giving Debiasing Away: Can Psychological Research on Correcting Cognitive Errors Promote Human Welfare?*, 4 PERSP. ON PSYCHOL. SCI. 390, 390 (2009).

36. *See* Jennifer K. Phillips et al., *Expertise in Judgment and Decision Making: A Case for Training Intuitive Decision Skills*, *in* BLACKWELL HANDBOOK OF JUDGMENT AND DECISION MAKING 297 (Derek J. Koehler & Nigel Harvey eds., 2004).

37. *See All Laureates in Economics*, NOBELPRIZE.ORG, http://nobelprize.org/nobel_prizes/economics/laureates (last visited May 11, 2012).

By demonstrating ways in which human judgment departs sharply from normative principles, Tversky and Kahneman's research indicated that human decisionmaking is not nearly as rational as we would like to believe it to be.[38] Tversky and Kahneman explained these departures from rationality by theorizing that human decisionmaking, while often reasonably accurate, is frequently clouded by heuristics and biases.[39] A plethora of research on cognitive fallibility has since followed, and there is now widespread agreement that heuristics and biases can cause humans to make irrational decisions.[40] Furthermore, as it turns out, even expert decisionmaking is far from immune from the influences of heuristics and biases. Much research on expertise (following in Tversky and Kahneman's heuristics-and-biases tradition) has demonstrated that heuristics and biases can affect experts making decisions within their own areas of expertise.[41] For example, heuristics and biases have been shown to influence expert decisions made by practicing accountants,[42] lawyers,[43] physicians,[44] and, of course, fingerprint examiners.[45]

But what, exactly, are heuristics and biases? A heuristic, first of all, is a strategy that people unconsciously use when they have limited amounts of time and information to make a decision.[46] It is a rule of thumb that simplifies the decisionmaking process under real-world conditions that are complex, uncertain, or ambiguous.[47] Consequently, heuristics are often referred to as "fast and frugal heuristics": They

38. *See* Tversky & Kahneman, *supra* note 34.
39. *See id.*
40. *See, e.g.*, ROBYN M. DAWES, EVERYDAY IRRATIONALITY: HOW PSEUDO-SCIENTISTS, LUNATICS, AND THE REST OF US FAIL TO THINK RATIONALLY (2001); HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT (Thomas Gilovich et al. eds., 2002); RICHARD NISBETT & LEE ROSS, HUMAN INFERENCE: STRATEGIES AND SHORTCOMINGS OF SOCIAL JUDGMENT (1980); Robyn M. Dawes et al., *Clinical Versus Actuarial Judgment*, 243 SCIENCE 1668 (1989); Daniel Kahneman & Amos Tversky, *On the Reality of Cognitive Illusions*, 103 PSYCHOL. REV. 582 (1996).
41. *See generally* Derek J. Koehler et al., *The Calibration of Expert Judgment: Heuristics and Biases Beyond the Laboratory*, *in* HEURISTICS AND BIASES, *supra* note 40, at 686.
42. *See, e.g.*, Stephen K. Asare, *The Auditor's Going-Concern Decision: Interaction of Task Variables and the Sequential Processing of Evidence*, 67 ACCT. REV. 379 (1992); Max H. Bazerman et al., *Why Good Accountants Do Bad Audits*, HARV. BUS. REV., Nov. 2002, at 97.
43. *See, e.g.*, Elizabeth F. Loftus & Willem A. Wagenaar, *Lawyers' Predictions of Success*, 28 JURIMETRICS J. 437 (1988).
44. *See, e.g.*, Hal R. Arkes et al., *Hindsight Bias Among Physicians Weighing the Likelihood of Diagnoses*, 66 J. APPLIED PSYCHOL. 252 (1981); Barbara J. McNeil et al., *On the Elicitation of Preferences for Alternative Therapies*, 306 NEW ENG. J. MED. 1259 (1982).
45. *See supra* note 31.
46. *See* Gerd Gigerenzer, *Fast and Frugal Heuristics: The Tools of Bounded Rationality*, *in* BLACKWELL HANDBOOK OF JUDGMENT AND DECISION MAKING, *supra* note 36, at 62, 63–64.
47. *See id.*

are fast because they help solve the problem within a short amount of time, and they are frugal because they require little information.[48] The current consensus in the psychology community is that the use of heuristics reflects the operation of a chiefly adaptive process—a response to the reality that no decisionmaker ever has both perfect information and an unlimited amount of time at his or her disposal.[49] Indeed, heuristics have many legitimate uses in this world of "bounded rationality"—a world in which humans must routinely operate under time and information constraints.[50] And the use of heuristics can sometimes improve decisionmaking by allowing people to make accurate judgments more quickly.[51] Although heuristics can be helpful, however, they do not guarantee a correct solution. In some situations—especially in ambiguous ones[52]—the misapplication of heuristics leads to cognitive biases that prevent people from making the most rational decisions.[53] The terms "heuristic" and "bias" are often used interchangeably; however, the distinction is that "heuristic" describes a *process* of decisionmaking whereas "bias" describes the *outcome* of this process when the outcome reflects a systematic error in judgment.[54]

Cognitive biases come in many forms, and their classifications are not mutually exclusive. Confirmation bias, for example, is "the tendency to test a hypothesis by looking for instances that confirm it rather than by searching for potentially falsifying instances."[55] It results from a heuristic based on expectation—the natural tendency of human beings to see what they expect to see.[56] Contextual bias, on the other hand, occurs when decisionmakers are influenced by exposure to extraneous information that is not necessary to make the decision at hand.[57] In the

48. *See id.* at 63.
49. *See generally* GERD GIGERENZER & PETER M. TODD, SIMPLE HEURISTICS THAT MAKE US SMART (1999); Gerd Gigerenzer, *Heuristics*, *in* HEURISTICS AND THE LAW 18 (Gerd Gigerenzer & Christoph Engel eds., 2006); James A. Shepperd & Erika J. Koch, *Pitfalls in Teaching Judgment Heuristics*, 32 TEACHING PSYCHOL. 43 (2005).
50. For an overview of the concept of bounded rationality, see Gigerenzer, *supra* note 46, at 65–67.
51. *See* Daniel G. Goldstein & Gerd Gigerenzer, *Models of Ecological Rationality: The Recognition Heuristic*, 109 PSYCHOL. REV. 75 (2002).
52. *See* Risinger & Saks, *supra* note 27, at 26 ("The more ambiguous and ill-defined the stimulus . . . , the more likely one or more observer effects will occur, resulting in an inaccurate result.").
53. *See generally* Tversky & Kahneman, *supra* note 34. It is worth noting, however, that the periodic occurrence of cognitive bias is likely an inevitable part of the decisionmaking process; thus, while cognitive bias is problematic, its occurrence should not be viewed in a wholly negative light.
54. *See* Gigerenzer, *supra* note 49, at 18.
55. Risinger & Saks, *supra* note 27, at 7.
56. *See id.*
57. *See* Itiel E. Dror et al., *When Emotions Get the Better of Us: The Effect of Contextual Top-Down Processing on Matching Fingerprints*, 19 APPLIED COGNITIVE PSYCHOL. 799, 800–01 (2005).

fingerprint identification domain, for instance, fingerprint examiners are influenced by information that is outside the scope of whatever information is necessary to conduct their forensic testing.[58] While confirmation bias results from an expectation-based heuristic, contextual bias results from a suggestion-based heuristic. One can easily imagine how these two biases could build on one another: Domain-extraneous information could *suggest* to the decisionmaker that a certain decision is more correct than another (contextual bias), thus leading the decisionmaker to *expect* that this suggestion will be confirmed (confirmation bias). For example, if a fingerprint examiner is informed that the suspect whose prints he is analyzing has confessed to the crime, this information may suggest to the examiner that the suspect is guilty and may thus lead the examiner to expect that the latent print found at the scene of the crime will match the suspect's print. In addition to confirmation bias and expectation bias, overconfidence bias is yet another type of bias that could affect fingerprint examiners' decisionmaking. Decisionmakers subject to the overconfidence bias have an "inflated belief in the accuracy of their knowledge," resulting in a miscalibration between confidence and accuracy that can hamper judgment.[59] In an effort to avoid the inevitable confusion that would result from an attempt to rigidly classify each of the cognitive biases discussed above, I use the term "observer effects" to describe the judgment errors that result from these biases generally.[60]

B. Effects of Cognitive Bias in the Fingerprint Identification Domain

Building on the understanding of what cognitive bias is and how it works, this Subpart identifies how cognitive biases can influence fingerprint examiners' decisionmaking and why these biases are troublesome. This Comment's focus is not on deliberate falsification of evidence by forensic scientists (although examples of such misconduct certainly do exist[61]); rather, its focus is on ways in which

58. *See* Mnookin, *supra* note 8, at 1230.

59. Catherine Hackett Renner & Michael J. Renner, *But I Thought I Knew That: Using Confidence Estimation as a Debiasing Technique to Improve Classroom Performance*, 15 APPLIED COGNITIVE PSYCHOL. 23, 24 (2001).

60. In an attempt to avoid confusion, a leading article on the effects of cognitive biases on forensic scientists uses the term "observer effects" to describe the judgment errors that result from cognitive biases generally. *See* Risinger & Saks, *supra* note 27, at 16. This Comment, in also employing the term "observer effects," follows Risinger's lead. Risinger notes that additional terms for the same phenomena include "context effects, expectancy effects, cueing, top-down processing, perceptual set, and others." *Id.* at 12.

61. *See* Paul C. Giannelli, *Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs*, 86 N.C. L. REV. 163, 168–69 (2007).

cognitive biases can unconsciously influence capable, experienced, and well-meaning fingerprint examiners.[62] As Itiel Dror has pointed out, unintentional errors due to cognitive biases are, at least arguably, even more problematic than are intentional errors for the following reasons: (1) since cognitive biases affect *all* fingerprint examiners, they are relatively widespread; (2) examiners who actually believe in their erroneous conclusions are more persuasive in court and are thus more dangerous; and (3) little action has been taken to combat cognitive biases because examiners have been reluctant to acknowledge that these biases even exist.[63]

Cognitive biases can affect fingerprint examiners' decisionmaking in various ways. The first example stems from the fact that U.S. forensic science laboratories have historically been framed as "arms of law enforcement."[64] Indeed, such laboratories are normally organized under police agencies and are often even dependent on the police for their budgets.[65] It is therefore not uncommon to find forensic scientists who, for all practical purposes, function as an "arm of the prosecution."[66] Forensic scientists frequently analyze evidence that the prosecution submits, they testify most often on the prosecution's behalf, and they "inevitably become part of the effort to bring an offender to justice."[67] This can potentially lead fingerprint examiners to adopt a "prosecutorial bias," or an expectation that the prosecution's take on the case will be confirmed.[68] This observer effect is troublesome because, ideally, fingerprint examiners would approach each task in a completely objective manner in order to come to the most rational conclusion.

62. Cognitive biases can affect all examiners—not just "bad apples." *See* Jennifer Mnookin, *Excerpt From Transcript of Proceedings: Experts and Forensic Evidence*, 37 SW. U. L. REV. 1009, 1013 (2008). *See generally* William C. Thompson, *Beyond Bad Apples: Analyzing the Role of Forensic Science in Wrongful Convictions*, 37 SW. U. L. REV. 1027 (2008).

63. *See* Dror & Cole, *supra* note 16, at 162.

64. Jennifer L. Mnookin et al., *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 725, 766 (2011).

65. *See* Roger Koppl, *How to Improve Forensic Science*, 20 EUR. J. L. & ECON. 255, 257, 260 (2005) (estimating that about 90 percent of accredited forensic science laboratories in the United States are organized under the police).

66. Risinger & Saks, *supra* note 27, at 19 (quoting James E. Starrs, *The Ethical Obligations of the Forensic Scientist in the Criminal Justice System*, 54 J. ASS'N OFFICIAL ANALYTICAL CHEMISTS 906, 910 (1971)). Risinger notes that Starrs's observation "appears to remain true today." *Id.*

67. *Id.*

68. *Id.*; *see also* Koppl, *supra* note 65, at 257–58 ("Dependence [on police for their budgets] creates a pro-prosecution bias."). Indeed, the NAS Report explicitly notes that "[f]orensic scientists who sit administratively in law enforcement agencies or prosecutors' offices, or who are hired by those units, are subject to a general risk of bias." NAS REPORT, *supra* note 19, at 185.

Second, forensic science laboratory procedure prohibits fingerprint examiners from including probabilistic judgments in their determinations;[69] instead, they are permitted to choose from only three possible options: identification (100 percent match), exclusion (100 percent nonmatch), or inconclusive.[70] This convention essentially forces fingerprint examiners either to (1) assign a 100 percent confidence estimate to a determination, or (2) to determine that they cannot draw a conclusion at all. Optimistically, it is possible that examiners do tend to deem prints inconclusive when they are 95 percent confident that the prints are identifications or exclusions. On the other hand, it is also possible that examiners tend to label prints as identifications or exclusions even when they are actually only 95 percent confident in these determinations. Given the lack of empirical research on this topic, it is unclear which of these alternative scenarios plays out in reality. It is certainly possible, however, that the latter scenario is more accurate; indeed, as has been demonstrated by the Mayfield case and by experiments conducted by Dror and others,[71] fingerprint examiners are not infallible. Moreover, past psychological research has shown that answers that are assigned confidence estimates of 90 percent are typically correct only 75 percent of the time.[72] Thus, the prohibition of probabilistic judgments could very well exacerbate examiners' susceptibility to the overconfidence bias (which results from a miscalibration between confidence and accuracy)[73] by provoking them to assert 100 percent confidence in determinations that may in fact be inaccurate.

Third, fingerprint examiners making the initial determination of whether fingerprints match are consistently exposed to potentially biasing domain-extraneous information, including (1) information regarding additional evidence linking a suspect to a crime; (2) information regarding whether the suspect confessed or had an alibi; and (3) other information regarding the suspect, such as details about the suspect's prior convictions or gang affiliations.[74] In a pair of empirical research studies, Dror and his colleagues demonstrated that exposure to such domain-extraneous information results in cognitive biases that can unconsciously influence fingerprint examiners' determinations of whether fingerprints match.[75] In one

69. *See* Mnookin, *supra* note 8, at 1226.
70. *See id.* at 1218.
71. *See supra* note 31.
72. *See* Baruch Fischhoff et al., *Knowing With Certainty: The Appropriateness of Extreme Confidence*, 3 J. EXPERIMENTAL PSYCHOL.: HUM. PERCEPTION & PERFORMANCE 552, 552–53 (1977).
73. *See* Renner & Renner, *supra* note 59, at 23–24.
74. *See* Mnookin, *supra* note 8, at 1230.
75. *See* Dror et al., *Contextual Information*, *supra* note 31; Dror & Charlton, *supra* note 31.

study, for example, Dror gave five professional fingerprint examiners a matching pair of fingerprints.[76] Unbeknownst to the examiners, each of them received a pair of fingerprints that they themselves had previously concluded to be matches.[77] Furthermore, each examiner had previously testified in court that he or she could say with 100 percent certainty that that particular pair of fingerprints matched. Dror provided strong contextual information suggesting that the pairs did not match, however, by falsely informing the examiners that the fingerprints were from the Mayfield case.[78] Dror then told the examiners to consider only the fingerprints themselves in determining whether the fingerprints matched.[79] After having been exposed to the domain-extraneous information, four out of the five fingerprint examiners contradicted their previous conclusions: Three erroneously concluded that the fingerprints did not match, and one concluded that the fingerprints were inconclusive.[80] Dror later successfully replicated these results in a follow-up study using a larger sample of fingerprint examiners and more commonplace domain-extraneous information (such as "the suspect has an alibi" or "the suspect confessed to the crime").[81] The observer effects Dror has demonstrated are concerning because, as academic critic Michael Risinger has pointed out, forensic scientists are not detectives; unlike detectives, forensic scientists do not collect and consider *all* information.[82] Rather, it is their job to consider *only* whatever information is necessary to conduct their forensic testing.[83] The reason forensic science evidence is admissible in court is not because forensic scientists are better at making conclusions about the significance of domain-extraneous evidence than are detectives or jurors—it is because the law accepts that forensic scientists, by virtue of their expertise, are better at *forensic testing* than are detectives or jurors.[84] Since jurors are already making conclusions about the significance of admissible domain-extraneous evidence, any observer effects that fingerprint examiners experience as a result of this evidence would essentially result in a "double impact" being given to it.[85]

76. Dror et al., *Contextual Information*, *supra* note 31, at 75.
77. *Id.*
78. *See id.* at 76.
79. *Id.*
80. *Id.*
81. *See* Dror & Charlton, *supra* note 31, at 608, 612.
82. Risinger & Saks, *supra* note 27, at 27–28.
83. *See id.* at 28.
84. *See id.*
85. *See id.* at 28–29. For an important statement emphasizing the dangers of potentially biasing domain-extraneous information and the need for a solution, see Dan E. Krane et al., Letter to the Editor,

Fourth, even after the initial fingerprint examiners have made their determinations of whether fingerprints match, subsequent exposure to domain-extraneous information could bias them against later considering that they may have made a mistake and thus reexamining their initial conclusion to look for error.[86] In the Mayfield case, for example, fingerprint examiners found out, apparently after having made their determinations, that Mayfield was a Muslim and that he had previously represented a known terrorist in a child custody dispute.[87] Even if the examiners did not have this contextual information at the time of their initial determinations, their subsequent access to this information may have contributed to their reluctance to reopen the issue even in the face of evidence suggesting the possibility of a mistake, such as the fact that Mayfield insisted that he had never been to Spain.[88]

Fifth, fingerprint examiners engaged in the routine practice of independently verifying an initial examiner's work—which is undoubtedly good practice in theory—are also often exposed to potentially biasing domain-extraneous information.[89] Specifically, when making his or her determination, the verifying examiner is frequently already aware of the fact that he or she is verifying an initial examiner's conclusion, as well as of the results of the initial examiner's conclusion.[90] The verifying examiner often even knows the identity of the initial examiner.[91] In a recent empirical study, Glenn Langenburg demonstrated that this sort of domain-extraneous information can bias the verifying examiner.[92] In the study, several fingerprint examiners compared the same six sets of prints.[93] Examiners in the biasing conditions were informed of purported conclusions that had been made by a fabricated initial fingerprint examiner, whereas examiners in the control group were given no potentially biasing domain-extraneous information.[94] Langenburg found that examiners in the biasing conditions tended to make significantly

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Sequential Unmasking: A Means of Minimizing Observer Effects in Forensic DNA Interpretation, 53 J. FORENSIC SCI. 1006 (2008) (proposing "sequential unmasking" procedures—discussed more fully in Part II, *infra*—as a solution).

86. *See* Mnookin, *supra* note 8, at 1232.
87. *See* OFFICE OF THE INSPECTOR GEN., A REVIEW OF THE FBI'S HANDLING OF THE BRANDON MAYFIELD CASE (2006), *available at* http://www.justice.gov/oig/special/s0601/final.pdf.
88. *See* Mnookin, *supra* note 8, at 1230.
89. *See id.* at 1218.
90. *See id.*
91. *See id.*
92. *See* Langenburg et al., *supra* note 31.
93. *See id.* at 572.
94. *See id.* at 572–73.

more "inconclusive" conclusions than did examiners in the control group.[95] This observer effect is troublesome because it causes the verifying examiner's conclusion to be dependent upon the initial examiner's conclusion, thereby undermining the purpose of the independent verification process. Indeed, in the Mayfield case, at least two verifying fingerprint examiners in the FBI's prestigious fingerprint laboratory, as well as a court-appointed expert, corroborated the erroneous match.[96] Furthermore, one study that examined cases of known fingerprint misidentifications found that over half of the errors had been corroborated by at least one (and sometimes up to three) verifying fingerprint examiner(s).[97]

Sixth, the increasingly common use of Automated Fingerprint Identification Systems (AFIS), relatively new technology that utilizes extensive fingerprint databases, can make important changes in the way fingerprint examiners determine whether fingerprints match.[98] Specifically, it creates new possibilities for biasing fingerprint examiners.[99] The way AFIS works is that fingerprint examiners first receive a ranked list of candidates with possible matching fingerprints, as well as a numerical score for each candidate that reflects the AFIS algorithm's assessment of the prints' similarity.[100] The examiners then screen the suggested fingerprints for those that are plausible and those that are not plausible.[101] After that, the examiners use traditional comparison methods to determine whether the plausible prints match.[102] As Dror and Mnookin have pointed out, this process could potentially bias fingerprint examiners in at least two ways. First, the simple act of deeming a print plausible as a potential match could bias the examiner toward concluding that it actually is a match.[103] Second, the use of the ranking and scoring system could bias the examiner toward concluding that the higher-ranked and -scored candidates are matches.[104] Indeed, in a recent empirical study, Dror found

95. *Id.* at 574.
96. *See* Dror & Cole, *supra* note 16, at 162.
97. *See* Simon A. Cole, *More Than Zero: Accounting for Error in Latent Fingerprint Identification*, 95 J. CRIM. L. & CRIMINOLOGY 985, 1067–69 tbl.1 (2005).
98. *See* Itiel E. Dror & Jennifer L. Mnookin, *The Use of Technology in Human Expert Domains: Challenges and Risks Arising From the Use of Automated Fingerprint Identification Systems in Forensic Science*, 9 LAW, PROBABILITY & RISK 47, 50 (2010).
99. *See id.* at 59.
100. *See id.* at 59–60.
101. *See id.*
102. *See id.*
103. *See id.* at 61.
104. *See id.* at 60. Although it would be appropriate for fingerprint examiners to give the rank and score independent weight if the Automated Fingerprint Identification Systems (AFIS) algorithms accurately reflected the likelihood of an actual match, these algorithms currently have no way of doing so. *See id.* at 60–61.

that the use of a ranking system can in fact bias examiners. Dror provided AFIS lists to fingerprint examiners as part of their routine workloads.[105] Some of the lists contained a matching print, and some did not. For the lists that did contain a matching print, some of the matches were ranked at or near the top of the list, and some were ranked at or near the bottom of the list.[106] Results showed that when the matching print was ranked at or near the bottom of the list, examiners were more likely to determine incorrectly that the comparisons were exclusions or were inconclusive than when the matching print was ranked at or near the top of the list.[107] Results also indicated that when false identifications occurred, they involved prints ranked at or near the top of the list.[108] Thus, the use of the ranking system had biased examiners toward concluding that the higher-ranked candidates were matches—even when the matching print was included but was ranked at or near the bottom of the list.

As AFIS fingerprint databases become increasingly larger, and as the use of AFIS technology becomes more and more widespread, it becomes all the more likely that some of the candidates identified in each AFIS search will have fingerprints that are look-alikes to the fingerprint in question—but that are from different sources.[109] The more similar the fingerprints are, the more challenging the decisionmaking task becomes, and the easier it is for cognitive biases to influence fingerprint examiners' decisionmaking.[110] Part of the reason why so many fingerprint examiners erroneously concluded that Mayfield's fingerprints matched those of the Madrid terrorist was that the sets of fingerprints were extremely similar.[111] A likely reason for such close similarity was the scope of the AFIS databases that were examined, which included millions of fingerprints.[112] Because the increasing use of AFIS technology serves to increasingly exacerbate the cognitive bias problem plaguing fingerprint identification, it is becoming ever more important to identify ways in which debiasing techniques could potentially act as countermeasures against cognitive biases in the fingerprint identification domain.

105. *See* Dror et al., *Biasing Effects*, *supra* note 31, at 3. Note that participants were unaware at the time that they were participating in a study.
106. *See id.*
107. *Id.* at 7.
108. *See id.*
109. *See* Dror & Mnookin, *supra* note 98, at 55–59.
110. *See id.*
111. *See id.* at 58–59.
112. *See id.*

II. DEBIASING TECHNIQUES

"Debiasing" refers to any technique that is designed to prevent or mitigate cognitive bias.[113] Although some debiasing techniques have had "mixed success,"[114] much research has demonstrated that debiasing techniques can indeed be effective in mitigating cognitive bias.[115] As one scholar noted, "there are, indeed, cognitive pills for cognitive ills."[116]

Given the pervasive impact of cognitive biases on human decisionmaking, the practical implications for the use of debiasing techniques are enormous. Unfortunately, however, there is currently a marked disparity between (1) the vast amount of psychological research that has been conducted regarding the impact of heuristics and biases on decisionmaking, and (2) the relative dearth of psychological research regarding debiasing techniques. Indeed, as one scholar has pointed out, "[i]t seems fair to say that psychologists have made far more progress in cataloguing cognitive biases than in finding ways to correct or prevent them."[117] To illustrate this point, a PsycInfo search conducted on November 21, 2011 revealed that the phrases "cognitive bias" or "cognitive biases" yielded 1,946 results, whereas the phrases "debias" or "debiasing" yielded only 164 results.[118] Further exacerbating this problem is the fact that the research on debiasing that does exist tends to be very domain specific. However, since *everyone* is similarly susceptible to cognitive biases,[119] it should certainly be possible to transfer techniques for mitigating these biases across domains.[120]

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113. *See generally* Richard P. Larrick, *Debiasing*, *in* BLACKWELL HANDBOOK OF JUDGMENT AND DECISION MAKING, *supra* note 36, at 316–37.

114. Phillips et al., *supra* note 36, at 298.

115. For a list of debiasing strategies that have been effective in mitigating cognitive bias, see Pat Croskerry, *The Importance of Cognitive Errors in Diagnosis and Strategies to Minimize Them*, 78 ACAD. MED. 775, 776, 779 (2003), and the many sources cited therein.

116. *Id.* at 776.

117. Lilienfeld et al., *supra* note 35, at 391 (citations omitted). For a list of forty-two cognitive biases, see Joachim I. Krueger & David C. Funder, *Towards a Balanced Social Psychology: Causes, Consequences and Cures for the Problem-Seeking Approach to Social Behavior and Cognition*, 27 BEHAV. & BRAIN SCI. 313, 317 tbl.1 (2004).

118. This illustration is borrowed from Lilienfeld et al., *supra* note 35, at 391.

119. For a general overview of how heuristics and biases affect expert decisionmaking across various domains, see Koehler et al., *supra* note 41, and Risinger & Saks, *supra* note 27, at 51 ("When everyone from Nobel Prize winners to average citizens . . . take steps to make sure their judgments are not distorted by extraneous context information, then it is hard to conceive of what it is that makes forensic scientists think they are immune from the same effects.").

120. For a discussion regarding the transfer of critical thinking skills across domains, see generally Diane F. Halpern, *Teaching Critical Thinking for Transfer Across Domains*, 53 AM. PSYCHOLOGIST 449

Barusch Fischhoff, a pioneering researcher in the field of debiasing, suggested that debiasing techniques can be classified according to whether they lay the blame for cognitive biases "at the doorstep of the judge[or] the task."[121] Techniques that blame elements of the *task* focus on correcting flaws in the decisionmaking task itself.[122] Techniques that blame the *judge*—or rather, the decisionmaker (as opposed to the judge ruling in the courtroom)—focus on shifting the decisionmaker's cognitive processing from an automatic, heuristic mode of thinking to a controlled, rule-governed mode of thinking.[123] By allowing the rule-governed mode of thinking to "override" the heuristic mode of thinking, debiasing techniques can potentially mitigate any cognitive biases that might otherwise have resulted.[124]

A. Debiasing the Decisionmaking Task

Academic critics have already suggested at least three debiasing techniques intended to correct flaws in forensic scientists' decisionmaking task: (1) sequential unmasking, (2) evidence lineups, and (3) competitive self-regulation. Additionally, there are at least three other such debiasing techniques that have been advocated for use in other domains and that may be transferable to the fingerprint identification domain: (1) simplifying the decision task, (2) allowing more time to complete the task, and (3) using cognitive feedback. Currently, none of these techniques have been systematically implemented in forensic science laboratories.[125]

1. Sequential Unmasking

As discussed in Part I, the fact that fingerprint examiners in some laboratories are consistently exposed to domain-extraneous information[126] is problematic because exposure to such information can bias fingerprint examiners' determinations of whether fingerprints match.[127] While the FBI Virginia Department of

(1998). Types of debiasing techniques that focus on modifying the decisionmaker's cognitive processing certainly employ these sorts of transferable critical thinking skills.

121. *See* Baruch Fischhoff, *Debiasing*, *in* JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 422, 424 (Daniel Kahneman et al. eds., 2005).

122. *See id.*

123. *See id.*; *see also* Keith E. Stanovich & Richard F. West, *Individual Differences in Reasoning: Implications for the Rationality Debate?*, 23 BEHAV. & BRAIN SCI. 645, 658 (2000). Stanovich and West refer to these two modes of thinking as "System 1" and "System 2," respectively. *See id.*

124. *See* Stanovich & West, *supra* note 123, at 660.

125. *See* Saks et al., *supra* note 28, at 85.

126. *See* Mnookin, *supra* note 8, at 1231.

127. *See supra* note 31.

Forensic Science has established partially blind procedures during the verification phase, this procedure is not in place in the majority of forensic science laboratories—and no such procedures for blinding initial fingerprint examiners are systematically in place.[128] In most other fields of science, in contrast, concerted efforts are typically made to prevent researchers from being exposed to domain-extraneous information; indeed, most research scientists routinely use blind or double-blind experimental procedures (in which persons involved in the experiment are prevented from being exposed to potentially biasing information) in order to prevent cognitive biases from invalidating their experimental results.[129]

Pinpointing this flaw in forensic scientists' decisionmaking task, scholars have proposed a debiasing technique known as "sequential unmasking" to correct it.[130] In a laboratory using sequential unmasking procedures, during both the initial analysis and the verification phase all information would be "unmasked—that is to say revealed—to the examiner in sequence, and only when it is necessary."[131] In that way, forensic scientists would receive only the information they need to conduct their forensic testing when they need it. Any unnecessary exposure to potentially biasing domain-extraneous information would thereby be prevented.

Sequential unmasking could potentially mitigate some of the cognitive biases that influence forensic scientists. Indeed, Dan Krane and his colleagues, who coined the phrase "sequential unmasking," have asserted that this debiasing technique is an "obvious, common sense step" for dealing with a recognized flaw in the task presented to forensic scientists.[132] However, there are some drawbacks to this debiasing technique. First, it may sometimes be difficult to determine what information is actually relevant and at what point the unmasking of relevant information is actually necessary. For example, it is possible that knowledge of what type of

128. *See* Saks et al., *supra* note 28, at 85.
129. *See supra* note 27. In medicine, double-blind studies are considered the gold standard. *See, e.g.*, John Concato et al., *Randomized, Controlled Trials, Observational Studies, and the Hierarchy of Research Designs*, 342 NEW. ENG. J. MED. 1887, 1887 (2000) ("Randomized, controlled trials . . . have become the gold standard [in medicine]."); Ted J. Kaptchuk, *The Double-Blind, Randomized, Placebo-Controlled Trial: Gold Standard or Golden Calf?*, 54 J. CLINICAL EPIDEMIOLOGY 541, 541 (2001) ("Blind assessment ensures that treatment and analysis of outcomes are not colored by prejudice. Without these precautions, according to the standard epidemiological rationale, deliberate subversions (albeit well intentioned) or 'subtle and intangible . . . subconscious' processes will affect the work of even the most conscientious researcher. Assumed to be stripped clean of human bias, the masked [double-blind, randomized, and controlled trial] is accepted as the gold standard . . . ." (alternation in original) (footnote omitted)).
130. *See, e.g.*, Krane et al., *supra* note 85, at 1006.
131. Mnookin, *supra* note 8, at 1231.
132. Krane et al., *supra* note 85, at 1006.

surface from which a latent print was pulled could potentially bias the fingerprint examiner.[133] However, it could be argued that this information can assist the fingerprint examiner in making his or her determination and is thus relevant. While arguably relevant, this information may only be truly necessary when the latent print is particularly smudged, distorted, or otherwise ambiguous. But it is debatable at what point it can be determined that the comparison is difficult enough to warrant the unmasking of additional information—is it virtually at the get-go, or after a full comparison has been attempted and a determination of inconclusive has been made? One can see from this example that decisions regarding sequential unmasking procedures can be quite complicated. While fingerprint examiners may contend that they should be making these decisions for themselves, it is quite likely that many examiners would argue that virtually all information is relevant and push for the unmasking of information at the earliest possible point. In that case, the examiners' decisionmaking task would remain essentially the same. Thus, in order for sequential unmasking to work in practice, it would likely be necessary for forensic science laboratories to hire additional, neutral personnel tasked with making these decisions. This brings us to the second drawback of this debiasing technique: The implementation and routine use of sequential unmasking procedures would almost certainly impose an added cost on forensic science laboratories. Regardless, the potential benefits of sequential unmasking in mitigating some of the cognitive biases that influence forensic scientists could very well outweigh the costs.

2. Evidence Lineups

As I observe above in Part I, it is not uncommon to find forensic scientists who generally act as an "arm of the prosecution." This has the potential to cause fingerprint examiners to adopt a "prosecutorial bias" (an expectation that the prosecution's take on the case is the correct one).[134] Ideally, however, fingerprint examiners would approach each task completely objectively in order to come to the

133. If a fingerprint examiner knows that the latent print has been pulled from a weapon, for example, the examiner may therefore interpret that particular comparison as being especially important. As a result, the overconfident examiner may be biased toward reaching a conclusion and deeming the prints identifications or exclusions; conversely, the underconfident examiner may be biased toward playing it safe and deeming the prints inconclusive.

134. See sources cited in notes 66–68, *supra*; *see also* Mnookin et al., *supra* note 64, at 765–66 ("Forensic laboratories in the United States were, from their outset, framed as arms of law enforcement . . . .").

most rational conclusion. Sequential unmasking alone cannot prevent this base rate expectation.

Michael Risinger and Larry Miller have each separately advocated a debiasing technique involving the use of what Risinger calls "evidence lineups" to correct for prosecutorial bias.[135] In an evidence lineup, a forensic scientist would be given multiple pieces of evidence, one of which is the piece of evidence in question and the rest of which are similar-looking "foils."[136] The forensic scientist would be blind to which piece of evidence is the one in question.[137] The task of a fingerprint examiner in an evidence lineup would be to determine which, if any, of the fingerprints in the evidence lineup match the prints found at the scene of the crime.[138] Since the examiner would know from the structure of the evidence lineup procedure that most of the pieces of evidence in question are not associated with the prosecution's case, the base rate expectation that the prosecution's take on the case will be confirmed should be reduced.[139]

The evidence lineup is intended to achieve basically the same effect as an eyewitness lineup, in which several people are presented to the eyewitness in a lineup in which several people—one of which is the suspect in question and the rest of which are foils—are presented to the eyewitness in a lineup, and the eyewitness is blind to which of the people in the lineup is the suspect in question.[140] Both the eyewitness lineup and the evidence lineup are designed to reduce the expectation that any single suspect or piece of evidence is linked to the crime.[141] Forensic science procedures as they stand now have been likened to "show-ups" in the eyewitness

135. *See* Larry S. Miller, *Bias Among Forensic Document Examiners: A Need for Procedural Change*, 12 J. POLICE SCI. & ADMIN. 407, 410 (1984) [hereinafter Miller, *Forensic Document Examiners*] (proposing for use in the handwriting identification domain—"as in the case of line-ups"—the inclusion of "more than one 'suspect' handwriting sample" that is "pictorially similar to the true 'suspect's' handwriting"); Larry S. Miller, *Procedural Bias in Forensic Science Examinations of Human Hair*, 11 LAW & HUM. BEHAV. 157 (1987) [hereinafter Miller, *Procedural Bias*] (advocating the use of "line-up procedures" in the human hair identification domain); Risinger & Saks, *supra* note 27, at 47–50 (advocating the use of "evidence lineups" in forensic science fields generally). Additionally, the NAS Report, as well as numerous academic critics, have advocated making forensic science laboratories independent from law enforcement. Although not a focus of this Comment, this approach could also succeed in reducing any prosecutorial bias experienced by fingerprint examiners. *See, e.g.*, NAS REPORT, *supra* note 19, at 183–84; Paul C. Giannelli, *The Abuse of Scientific Evidence in Criminal Cases: The Need for Independent Crime Laboratories*, 4 VA. J. SOC. POL'Y & L. 439 (1997); Koppl, *supra* note 65, at 272–73; Mnookin et al., *supra* note 64, at 774–78.

136. Risinger & Saks, *supra* note 27, at 48.

137. *Id.*

138. *Id.*

139. *See id.*

140. *See id.*

141. *See id.*

realm (the defects of which the eyewitness lineup was designed to cure), in which only one suspect shows up to be evaluated by the eyewitness, thus implying to the eyewitness that the correct suspect is in hand.[142]

Miller conducted an empirical study designed to test the efficacy of evidence lineups.[143] In the study, Miller gave four human hair identification cases to each of fourteen students who were enrolled in advanced forensic science college courses and who had been selectively trained in human hair identification techniques.[144] Each participant received two cases submitted in the usual manner, with the inclusion of hair samples from *one* suspect and comparative questioned hair material.[145] Each participant also received two cases submitted using the evidence lineup procedure, including hair samples from *five* suspects and comparative questioned hair material.[146] Miller found that the evidence lineup procedure produced significantly fewer inaccurate conclusions than did the conventional procedure—indicating that evidence lineups can successfully mitigate some of the cognitive biases that influence forensic scientists.[147]

One upside of the evidence lineup procedure is that the increasingly widespread use of AFIS technology could likely facilitate its implementation. As Miller has noted, it is critical in evidence lineups that the foils look similar to the piece of evidence in question.[148] The use of AFIS printouts could make the identification of similar-looking foils quite simple. All that would be necessary would be to have someone other than the fingerprint examiner run an AFIS search on the suspect's fingerprint, select several of the top-ranked prints to be used as foils, and submit these prints to the examiner in an evidence lineup. The examiner would then compare each of the prints in the evidence lineup with the print found at the scene of the crime.

As with sequential unmasking procedures, there is at least one drawback to this debiasing technique: The use of evidence lineups would likely impose some added cost on forensic science laboratories. However, this cost may not be as high as one might initially think. While Risinger suggests the hiring of additional personnel, such as an "Evidence and Quality Control Officer" tasked with the job of identifying and obtaining appropriately similar pieces of evidence to be used as

142. *See id.*
143. *See* Miller, *Procedural Bias*, *supra* note 135.
144. *Id.* at 160.
145. *Id.*
146. *Id.*
147. *See id.* at 160–61.
148. *See id.* at 159, 162.

foils,[149] this likely would not always be necessary given the ease with which similar-looking foils could be identified using AFIS. For laboratories with AFIS technology, fingerprint examiners could simply set aside the first few minutes of their workday to quickly run AFIS searches and prepare evidence lineups for an assigned colleague's daily caseload. Therefore, for these laboratories, the cost of implementing evidence lineup procedures could be quite low (depending on the cost of running the AFIS searches themselves). Moreover, for laboratories that combine evidence lineups with sequential unmasking procedures, the task of preparing the evidence lineups could be assigned to the same neutral personnel tasked with making sequential unmasking decisions. Thus, given that the evidence lineup procedure appears to successfully reduce the effect of cognitive biases and that the procedures may be implemented with potentially little cost, the use of evidence lineups in the fingerprint identification domain may very well result in a net benefit.

3. Competitive Self-Regulation

Most fields of research science utilize "a rule-governed competitive process" in which individual researchers' work is checked by the work of subsequent researchers.[150] In contrast, forensic science utilizes no such competitive process; rather, in most jurisdictions, each forensic science laboratory has a "monopoly" on the evidence it analyzes because no other laboratory is likely to examine that same evidence.[151] Roger Koppl has argued that this monopoly position is problematic because it fails to incentivize the application of rigorous analysis.[152] Moreover, to the extent that cognitive biases can be attributed to lack of sufficient cognitive effort, the monopoly position held by forensic science laboratories may serve to exacerbate the incidence of observer effects generally.[153]

Koppl has proposed to correct this flaw in forensic scientists' decisionmaking task with a debiasing technique he coined "competitive self-regulation."[154] Competitive self-regulation would entail having several forensic science laboratories in each jurisdiction compete with each other.[155] To the extent feasible, some evidence

149. *See id.*
150. Koppl, *supra* note 65, at 256.
151. *Id.* at 257.
152. *See id.* at 267.
153. *See id.* at 259.
154. *Id.* Koppl's proposal for competitive self-regulation is quite extensive and aims to provide solutions for numerous problems plaguing forensic science that are unrelated to bias. My focus here is on the portion of Koppl's proposal that seeks to mitigate bias.
155. *See id.*

would be randomly chosen for duplicate testing at competing laboratories.[156] For example, for a small portion of randomly chosen fingerprints, the same latent fingerprints may be sent to two competing laboratories in the same jurisdiction for analyses. Forensic scientists would not know whether the evidence they are analyzing is subject to duplicate testing; they would be aware only that duplicate testing sometimes randomly takes place.[157] Incentives for the discovery of error would also be necessary,[158] and the incentive system could work as follows. If competing laboratories disagree, there could be an adjudication procedure to determine which laboratory is correct.[159] The correct laboratory would collect two payments: "one for performing the test, and one for discovering the other lab's error."[160] The incorrect laboratory would get nothing.[161] Koppl argues that competitive self-regulation would create a system of checks and balances that incentivizes thorough analysis by forensic scientists.[162] This procedure is thereby expected to act as a countermeasure against cognitive biases, at least to the extent that they can be mitigated by increased cognitive effort.[163]

As with sequential unmasking and evidence lineup procedures, there are drawbacks to this debiasing technique. First, as noted above, competitive self-regulation can only reduce cognitive biases to the extent that they can be attributed to lack of cognitive effort. Since cognitive biases can unconsciously plague even the most capable, experienced, and well-meaning fingerprint examiners,[164] this debiasing technique alone cannot be sufficient. However, it could certainly be useful in mitigating cognitive biases when used together with other debiasing techniques—especially if used with the category of debiasing techniques discussed in Part II.B. The use of these techniques—which focus on shifting the decisionmaker's cognitive processing from an automatic, heuristic mode of thinking to a controlled, rule-governed mode of thinking—requires continued effort on the part of individual fingerprint examiners. Competitive self-regulation could be used as a means of incentivizing the routine use of such debiasing techniques.

A second drawback of competitive self-regulation is that its use may not be feasible in small jurisdictions that do not already have multiple forensic science

156. *See id.*
157. *See id.*
158. *See id.* at 268.
159. *See id.*
160. *See id.*
161. *See id.*
162. *See id.* at 267.
163. *See id.*
164. *See* Thompson, *supra* note 62; *see also* Mnookin, *supra* note 62, at 1013.

laboratories, often because of the high cost of establishing additional laboratories. And for jurisdictions that do have multiple laboratories, the use of duplicate testing would likely increase forensic scientists' caseloads and thereby impose some added cost on forensic science laboratories. Since duplicate testing can be performed at random and only to the extent that it is practically feasible, however, this additional cost need not be prohibitive. Rather, the amount of evidence chosen for duplicate testing can be varied according to the laboratories' budgets. As long as some duplicate testing does randomly take place, competitive self-regulation could still succeed in mitigating cognitive biases. Thus, for jurisdictions that already have more than one forensic science laboratory, the costs of this procedure—which could be made manageable—would likely be outweighed by the procedure's potential benefits.

4. Simplification

Several scholars have advocated the simplification of decisionmaking tasks in order to reduce observer effects.[165] Since biases result from heuristics—which are meant to simplify the decisionmaking process under complex conditions[166]—it makes perfect sense that reducing a task's complexity should be expected to reduce bias. Indeed, the more ambiguous the stimulus, the more difficult the decisionmaking task and the more likely it is that observer effects will occur.[167]

Simplification may well be transferable to the fingerprint identification domain. Fingerprint examiners' decisionmaking task could potentially be simplified by identifying the most difficult fingerprints and either removing them from fingerprint examiners' caseloads entirely or creating a new procedure for them. An example of a new procedure for the most difficult prints is one in which an examiner proceeds with the difficult comparison but is allowed to give an estimate of the probability that it is a comparison or an exclusion. The prints could be used by law enforcement as investigatory evidence. The prints would not, however, be treated as legal evidence. If simplifying the decisionmaking task does serve to reduce bias,

165. *See, e.g.*, Croskerry, *supra* note 115, at 779 (advocating the simplification of cognitive tasks in order to reduce diagnostic errors in the medical domain); Sarah Lichtenstein et al., *Calibration of Probabilities: The State of the Art to 1980*, *in* JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES, *supra* note 121, at 306, 315–18 (providing an overview of how task simplification has been successful in mitigating the overconfidence bias); Ryan P. Radecki & Mitchell A. Medow, *Cognitive Debiasing Through Sparklines in Clinical Data Displays*, *in* AMERICAN MEDICAL INFORMATION ASSOCIATION SYMPOSIUM PROCEEDINGS 1085 (2007).

166. *See* Gigerenzer, *supra* note 46, at 63–64.

167. *See* Risinger & Saks, *supra* note 27.

this procedure should at least reduce the number of biased results submitted as evidence in courtrooms.

Unfortunately, the implementation of this seemingly simple procedure may not be as easy as it seems. First, due to the shortage of empirical research regarding fingerprint examiners' decisionmaking, we may not currently understand the concept of difficulty in the fingerprint identification context well enough to determine which fingerprints are in fact the most difficult. Additional empirical research is likely necessary in order to make these determinations. Second, even if we could make these determinations, both fingerprint examiners and prosecutors may well vehemently oppose this procedure. Fingerprint examiners can be expected to contend that they are perfectly able to come to accurate conclusions for even the most difficult comparisons. And prosecutors will likely be unhappy with any procedure that limits the admissibility of evidence in court. If these hurdles to implementation can be overcome, however, this procedure could be quite worthwhile. Further, if a feasible and inexpensive method for identifying the most difficult prints can be conceived, the simplification procedure could potentially even save forensic science laboratories money by reducing the amount of time fingerprint examiners must spend testifying in court.

5. Increased Time Allocation

At least one scholar in the medical domain has suggested allowing physicians more time to complete decisionmaking tasks in order to reduce observer effects.[168] Since heuristics are used to help solve a problem not only under complex conditions but also within a short amount of time,[169] it is clear that reducing or eliminating a task's time constraints should be expected to mitigate the bias resulting from the use of heuristics. In fact, Dror's empirical study finding that the AFIS ranking system can bias examiners (discussed in Part I.B) also produced the finding that fingerprint examiners were more susceptible to bias—in the direction of making more false identifications—when a comparison was made quickly than when comparison time was longer.[170]

Increased time allocation could potentially be transferred to the fingerprint identification domain by reducing fingerprint examiners' caseloads and thereby allocating more time to complete each comparison. It would likely be necessary

168. *See* Croskerry, *supra* note 115, at 779.
169. *See* Gigerenzer, *supra* note 46, at 63–64.
170. *See* Dror et al., *Biasing Effects*, *supra* note 31.

to hire additional fingerprint examiners to allow for these reduced caseloads, however, which would impose an additional cost on forensic science laboratories. If the additional cost can be managed, increased time allocation could potentially play a part in reducing observer effects experienced by fingerprint examiners.

6. Cognitive Feedback

Part I discusses how fingerprint examiners, in reaching their conclusions, are prohibited from making probabilistic judgments.[171] Instead, they are permitted to choose from only three possible options: identification (100 percent match), exclusion (100 percent nonmatch), or inconclusive.[172] By essentially forcing fingerprint examiners either to assign a 100 percent confidence estimate to their determinations or to decide that no conclusion can be had, this cognitive task could possibly exacerbate examiners' susceptibility to the overconfidence bias—a miscalibration between confidence and accuracy that can hamper judgment.[173]

The cognitive feedback debiasing technique, intended to mitigate the overconfidence bias specifically,[174] could possibly mitigate this potential flaw in fingerprint examiners' decisionmaking task. In this technique, decisionmakers provide a confidence estimate after making each decision. Once their accuracy is determined, decisionmakers are then given cognitive feedback informing them of the discrepancy between their accuracy and their confidence estimate for that particular decision.[175] Given time and repeated cognitive feedback, it is expected that decisionmakers will be able to better calibrate the probability that their decisionmaking will be accurate—thereby mitigating the overconfidence bias.[176]

Empirical research has shown that the use of this debiasing technique in a classroom setting has succeeded in improving student performance.[177] In one study, students who were informed of the difference between their confidence estimates and their accuracy on weekly quizzes experienced both decreased, more accurately calibrated confidence and improved performance on subsequent quizzes.[178] Cognitive feedback has also been recommended for use in the medical domain to improve

171. *See* Mnookin, *supra* note 8, at 1222.
172. *See id.* at 1218.
173. *See, e.g.*, Renner & Renner, *supra* note 59.
174. *See id.* at 24.
175. *See id.*
176. *See id.* at 25.
177. *See id.*
178. *See id.*

calibration of diagnostic judgment.[179] Furthermore, cognitive feedback has been shown to be more successful than performance feedback—feedback concerning *only* the decisionmaker's accuracy (rather than the discrepancy between his or her accuracy and confidence)—in reducing the overconfidence bias. In one empirical study, for example, performance feedback had no effect on decisionmakers' overconfidence, whereas cognitive feedback reduced overconfidence and thereby improved performance.[180]

Cognitive feedback could be integrated into the forensic scientists' decisionmaking task in two ways.[181] The first and more controversial method would involve doing away with the convention that fingerprint examiners must indicate for each decision that they are either 100 percent certain or cannot come to a conclusion. Instead, examiners would first indicate for each case whether they think the prints are identifications or exclusions, and they would then indicate their confidence in the determination (their estimate of the probability that their determination is accurate). Cognitive feedback would later be provided to examiners. In order to provide cognitive feedback, it would be necessary to keep track of each examiner's probability estimate for every determination. If an error is later identified (whether it be discovered by a verifying examiner or through knowledge of a wrongful conviction), the fingerprint examiner (or examiners) responsible for the error would be informed of it and would also be provided with the probability estimate that he or she had made for that particular determination.

The second and less controversial method would not do away with the convention that fingerprint examiners are prohibited from making probability estimates. Rather, this method would take place during ongoing training exercises given at regular intervals. During these training exercises (but not during evaluation of their regular caseload), examiners would be given comparisons and would be asked to indicate for each comparison whether they think the prints are identifications or exclusions, as well as their estimate of the probability that their determination is accurate. After each training exercise, cognitive feedback would be provided to examiners.

Although both of these cognitive feedback methods could potentially mitigate fingerprint examiners' overconfidence and ultimately lead to improved performance by allowing examiners to better calibrate the probability that their

179. *See generally* Pat Croskerry, *The Feedback Sanction*, 7 ACAD. EMERGENCY MED. 1232 (2000).
180. *See* Gregory Schraw et al., *Constraints on the Calibration of Performance*, 18 CONTEMP. EDUC. PSYCHOL. 455 (1993).
181. Note that the two methods described herein are not necessarily mutually exclusive.

decisionmaking will be accurate, the use of each method has strengths and limitations. By abandoning the prohibition on probability estimates, the first method would eliminate the possibility that the cognitive task could exacerbate the overconfidence bias. However, its implementation would require significantly altering the process by which fingerprint examiners conduct their analysis—something that forensic science laboratories would likely be quite resistant to. While the second method would not significantly change the current fingerprint identification procedure and would therefore be easier to implement, by this same virtue it also would not eliminate the possibility that the cognitive task could worsen the overconfidence bias. The second method could, however, be more successful in mitigating what overconfidence does exist because it would allow for cognitive feedback at regular intervals, after each training exercise (whereas the first method would require waiting for an error to be discovered). The second method would also be more cost effective than the first, as it would require neither a departure from the current procedure nor the documentation of each examiner's probability estimate for every determination. Given their potential benefits, the implementation of either method of providing cognitive feedback is certainly worth considering.

B. Debiasing the Decisionmaker

In other domains, numerous debiasing techniques have been suggested that focus not on correcting flaws in the decisionmaking task but rather on shifting the decisionmaker's cognitive processing from an automatic, heuristic mode of thinking to a controlled, rule-governed mode of thinking.[182] Since all decisionmakers are similarly susceptible to cognitive biases, these sorts of debiasing techniques should certainly be transferable across domains.[183] These debiasing techniques, discussed more fully below, include (1) promoting general bias awareness, (2) implementing consider-an-alternative strategies, (3) employing perspective-taking policies, (4) enlisting a devil's advocate, and (5) emphasizing accountability. A positive aspect of this category of debiasing techniques is that their implementation and routine use tend to be significantly simpler and less costly than the implementation of debiasing techniques focused on correcting flaws in the decisionmaking task. Yet none of these techniques have been systematically implemented in forensic science laboratories.

182. *See* Fischhoff, *supra* note 121, at 424; *see also* Stanovich & West, *supra* note 123, at 658.
183. *See* sources cited in note 119, *supra*.

1. General Bias Awareness

Creating general bias awareness is a debiasing technique in which decisionmakers are informed about the existence of cognitive biases and how such biases can affect the decisionmaking process.[184] This basic education process, which has been utilized in numerous domains, generally takes the form of brief, nontechnical, and intensive tutorials in which specific biases are demonstrated to decisionmakers in general terms.[185] The purpose of this technique is to reduce decisionmakers' vulnerability to biases through an improved understanding of underlying decision mechanisms.[186]

When empirically tested, this debiasing technique has had mixed results. Some empirical research has indicated that general bias awareness can decrease decisionmakers' susceptibility to bias. For example, researchers studying the self-serving bias (in which one conflates what is fair with what benefits oneself) as a cause of negotiation impasse found that participants who read a paragraph describing this bias and explaining how it works tended to demonstrate improved judgment in subsequent negotiations.[187] On the other hand, other empirical studies have found that general bias awareness has no effect whatsoever on decisionmakers' tendency to make biased judgments. In one study, for example, researchers studying the effect of the anchoring bias (in which one bases numerical estimates on any number at hand, regardless of its relevance to the pertinent question) on oil and gas judgments made by petroleum engineering students found that giving participants an explanation and description of the bias had no effect on participants' tendency to anchor their judgments.[188]

The question of whether creating general bias awareness can be successful in mitigating cognitive biases is controversial.[189] Hal Arkes, former president of the Society for Judgment and Decisionmaking, has maintained that the use of basic education about cognitive biases in order to mitigate their effect is "absolutely

184. *See, e.g.*, Lutz Kaufmann et al., *Debiasing the Supplier Selection Decision: A Taxonomy and Conceptualization*, 40 INT'L J. PHYSICAL DISTRIBUTION & LOGISTICS MGMT. 792, 804 (2010).

185. *See* Lilienfeld et al., *supra* note 35, at 393.

186. *See* Kaufmann et al., *supra* note 184, at 804.

187. *See* Linda Babcock & George Loewenstein, *Explaining Bargaining Impasse: The Role of Self-Serving Biases*, 11 J. ECON. PERSP. 109, 115 (1997).

188. *See* Matthew B. Welsh et al., *Efficacy of Bias Awareness in Debiasing Oil and Gas Judgments*, *in* PROCEEDINGS OF THE 29TH ANNUAL COGNITIVE SCIENCE SOCIETY 1647, 1652 (Danielle S. McNamara & J. Greg Trafton eds., 2007).

189. *See* Lilienfeld et al., *supra* note 35, at 393 ("[T]he question of whether instruction alone is sufficient to disabuse people of confirmation bias and related errors is controversial.").

worthless" because people are, for the most part, oblivious to the influence of heuristics and biases on their decisionmaking processes.[190] And the general consensus in the psychology community today seems to be that the use of this debiasing technique alone is "largely ineffective."[191] However, some scholars have suggested that it can be used as a first step toward improving the decisionmaking process—an umbrella strategy to complement other, more specific debiasing techniques.[192]

It is possible that the creation of general bias awareness could help mitigate cognitive biases in the fingerprint identification domain when implemented in conjunction with other debiasing techniques. Short one- or two-day workshops given by persons trained in the effects of cognitive biases could instill general bias awareness in fingerprint examiners while also providing a platform for teaching examiners how to employ more specific debiasing techniques. These workshops would likely be cheap and easy to execute, and they could potentially prove to be worthwhile when used in conjunction with other debiasing techniques. It is important to note, however, that the use of this debiasing technique alone is not only likely to be inadequate in mitigating the effects of cognitive biases but could also actually be harmful. Forensic science laboratories, faced with mounting criticism in recent years, could see the implementation of this relatively low-cost and simple technique as an easy way to combat cognitive biases. Once general bias awareness has been created, this could cause laboratory personnel to believe they have sufficiently dealt with the bias problem and therefore to be less open to the use of other debiasing techniques. In sum, whereas the creation of general bias awareness in conjunction with other debiasing techniques could be beneficial, the use of this debiasing technique by itself could prove to be worse than the use of no debiasing techniques at all.

2. Consider-an-Alternative

Fingerprint examiners might also use the consider-an-alternative debiasing technique. A decisionmaker employing this technique actively considers "alternative possibilities, discrepant or inconsistent information, and divergent ways of

190. *See* Hal R. Arkes, *Impediments to Accurate Clinical Judgment and Possible Ways to Minimize Their Impact*, 49 J. CONSULTING & CLINICAL PSYCHOL. 323, 326 (1981).

191. Jane Kennedy, *Debiasing the Curse of Knowledge in Audit Judgment*, 70 ACCT. REV. 249, 254 (1995); *see also* Alafair Burke, *Neutralizing Cognitive Bias: An Invitation to Prosecutors*, 2 N.Y.U. J. L. & LIBERTY 512, 523 (2007) ("[T]he empirical evidence . . . suggests that cognitive bias is stubborn, and that education is an unlikely panacea.").

192. *See, e.g.*, Pat Croskerry, *Cognitive Forcing Strategies in Clinical Decisionmaking*, 41 ANNALS EMERGENCY MED. 110, 114 (2003); Kaufmann et al., *supra* note 184, at 804, 812–13.

framing problems."[193] The purpose of this technique is to reduce biases by encouraging the decisionmaker to consider competing scenarios that he or she may not have considered otherwise.[194] This technique has also been referred to as the "consider-the-opposite" technique,[195] although more recent research has indicated that considering any plausible alternative scenario—not just the opposite scenario—can successfully debias decisionmaking.[196]

Empirical research has found this debiasing technique to be successful across several domains. For example, the consider-an-alternative technique has found success in the mental health domain by reducing the judgmental bias toward predicting negative future events in persons suffering from anxiety.[197] In one study, participants with very high trait anxiety scores made less pessimistic predictions of future events after first generating positive outcomes for each situation.[198] This technique has also improved diagnostic judgment in the medical domain by mitigating the effect of the primacy bias (in which information presented at an early stage has a disproportionate influence on decisionmaking compared to similar information presented later on).[199] The consider-an-alternative technique has also proven effective in mitigating the confirmation bias (the tendency to seek evidence that confirms one's hypothesis and to neglect evidence that disconfirms it).[200] In one study, for example, participants were asked to test the hypothesis that a student in the next room was an extrovert.[201] The participants were given a list of questions, some of which were designed to elicit an expectancy-confirming response (that the student was an extrovert) and some that were designed to elicit an expectancy-disconfirming response (that the student was an introvert).[202] Participants in the control group subsequently preferred to ask expectancy-confirming questions.[203] Participants who were told to consider the possibility that the student

193. Adam D. Galinsky & Thomas Mussweiler, *First Offers as Anchors: The Role of Perspective-Taking and Negotiator Focus*, 81 J. PERSONALITY & SOC. PSYCHOL. 657, 659 (2001).

194. *See id.*

195. *See, e.g.*, Charles G. Lord et al., *Considering the Opposite: A Corrective Strategy for Social Judgment*, 47 J. PERSONALITY & SOC. PSYCHOL. 1231 (1984).

196. *See* Edward R. Hirt & Keith D. Markman, *Multiple Explanation: A Consider-an-Alternative Strategy for Debiasing Judgments*, 69 J. PERSONALITY & SOC. PSYCHOL. 1069 (1995).

197. *See* Bret G. Bentz et al., *Debiasing of Pessimistic Judgments Associated With Anxiety*, 26 J. PSYCHOPATHOLOGY & BEHAV. ASSESSMENT 173 (2004).

198. *See id.*

199. *See* Gregory H. Mumma & Steven B. Wilson, *Procedural Debiasing of Primacy/Anchoring Effects in Clinical-Like Judgments*, 51 J. CLINICAL PSYCHOL. 841 (1995).

200. *See* Lord et al., *supra* note 195.

201. *See id.* at 1238.

202. *See id.*

203. *See id.*

might be an introvert, however, tended subsequently to ask a more balanced variety of expectancy-confirming and expectancy-disconfirming questions.[204]

It is important to note, though, that the consider-an-alternative debiasing technique has been known to backfire.[205] In one study examining the effectiveness of the consider-an-alternative approach in mitigating the hindsight bias (the tendency to see events that have already occurred as being more predictable than they seemed before they took place), participants were told to list either two scenarios or ten scenarios in which an event might have turned out otherwise.[206] As it happened, listing more alternative scenarios actually increased participants' susceptibility to the hindsight bias.[207] The authors surmised that the participants had perceived the task of listing ten alternative scenarios as being subjectively difficult, thereby suggesting that there were not many ways in which the event might have turned out otherwise.[208] This experiment highlights the fact that debiasing techniques may not always have the desired debiasing effect; thus, it will remain important to test whether these techniques effectively mitigate the cognitive biases that fingerprint examiners are prone to experience.

The consider-an-alternative technique could be quite useful in the fingerprint identification domain. For example, if a fingerprint examiner analyzing a latent print finds what he believes to be a minutiae point (a unique feature found within a fingerprint, such as a ridge ending, a bifurcation, or a dot), he could potentially reduce bias by pausing and actively considering the possibility that it could instead be an artifact (random disturbance originating from dirt or from other prints that were on the surface from which the latent print was pulled)—and vice versa. This debiasing technique would be quite simple to implement; it could be taught during the same one- or two-day workshop in which general bias awareness is created. And it could be relatively cheap to incorporate this technique into fingerprint examiners' everyday routine; indeed, it would only cost a few extra moments of examiners' time prior to beginning their analyses. The routine use of this technique by individual examiners could be incentivized through competitive self-regulation (discussed in Part II.A) and it could be further encouraged through the formalized use of the accountability technique discussed below.

204. *See id.*

205. *See* Lawrence J. Sanna et al., *When Debiasing Backfires: Accessible Content and Accessibility Experiences in Debiasing Hindsight*, 28 J. EXPERIMENTAL PSYCHOL.: LEARNING, MEMORY & COGNITION 497 (2002).

206. *See id.* at 498.

207. *See id.* at 498–99.

208. *See id.* at 500–501.

3. Perspective Taking

Another technique that could be used to debias decisionmakers is perspective taking, a technique in which decisionmakers put themselves in the shoes of another person.[209] This involves "actively considering another person's point of view, imagining what the person's life and situation are like, [and] walking a mile in the person's shoes."[210] This technique has been likened to the consider-an-alternative technique;[211] however, perspective taking focuses on the consideration of an alternative point of view rather than an alternative scenario.

As with the consider-an-alternative technique discussed above, empirical research across several domains has found that perspective taking successfully reduces biases. For example, perspective taking has been shown to debias social thought by successfully reducing reliance on outgroup stereotypes.[212] In one study, participants were shown a black and white photograph of an older man sitting on a chair near a newspaper stand.[213] Participants who were asked to write a short narrative essay about a typical day in the man's life, "imagin[ing] . . . you were that person, looking at the world through his eyes and walking through the world in his shoes" subsequently exhibited reduced evidence of stereotyping and outgroup derogation.[214] Perspective taking has also proven to be successful in the negotiation domain by mitigating the anchoring bias.[215] In another study, for example, negotiators who engaged in perspective taking gained a bargaining advantage in that they refused to let the first offer affect the final settlement price.[216] Additionally, domain of supply chain management: It has been suggested that by taking the supplier's perspective, buyers will be able to avoid cognitive biases and come to more rational supplier selection decisions.[217] And in the legal domain, some have suggested that prosecutors should review their case files from the perspective of defense counsel in order to debias and neutralize their decisionmaking.[218]

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209. *See* Adam D. Galinsky & Gillian Ku, *The Effects of Perspective-Taking on Prejudice: The Moderating Role of Self-Evaluation*, 30 PERSONALITY & SOC. PSYCHOL. BULL. 594, 595 (2004).
210. *See id.* at 596.
211. *See* Galinsky & Mussweiler, *supra* note 193, at 660.
212. *See* Adam D. Galinsky & Gordon B. Moskowitz, *Perspective-Taking: Decreasing Stereotype Expression, Stereotype Accessibility, and In-Group Favoritism*, 78 J. PERSONALITY & SOC. PSYCHOL. 708 (2000).
213. *See id.* at 711.
214. *See id.* at 711–12.
215. *See* Galinsky & Mussweiler, *supra* note 193. In the negotiation setting, anchoring bias results in the first offer in a negotiation being a strong predictor of the final settlement price. *Id.*
216. *See id.*
217. *See* Kaufmann et al., *supra* note 184, at 811.
218. *See* Burke, *supra* note 191, at 524.

Perspective taking could be useful as a countermeasure against cognitive bias in the fingerprint identification domain in that it could help mitigate any prosecutorial bias that may influence fingerprint examiners.[219] Fingerprint examiners could utilize the perspective-taking technique by taking a few moments before analyzing each print submitted by the prosecution to actively consider the defense's point of view. For example, if a fingerprint examiner somehow becomes aware before making a prosecution-submitted comparison that the prosecution expects the prints to match, the examiner could simply pause and imagine that the prints had been submitted for analysis by the defense, that the defense's expectations might be quite different, and even that he or she may be expected to testify on the defense's behalf. This debiasing technique would be relatively easy to implement; like the consider-an-alternative technique, perspective taking could be taught to fingerprint examiners during the same one- or two-day workshop in which general bias awareness is created. And it could be inexpensive to incorporate it into their everyday routine because it would take only a few extra moments of each examiner's time prior to making comparisons. Like the consider-an-alternative debiasing technique, the routine use of this technique by individual examiners could be incentivized through competitive self-regulation and could be further encouraged through the formalized use of the accountability technique discussed below.

4. Devil's Advocate

In the devil's advocate debiasing technique, a second party, the "devil's advocate," formally questions and argues against the decisionmaker's initial conclusion.[220] This process is meant to uncover inadequacies and biases in the decisionmaking process.[221] The devil's advocate technique is somewhat similar to the consider-an-alternative technique;[222] however, the devil's advocate technique formalizes the dissent process by bringing in a second person to question the decisionmaker's conclusion.

The vast majority of research examining the devil's advocate technique has been conducted in the corporate-decisionmaking domain. Theodore Herbert and Ralph Estes first theorized that the use of a "corporate devil's advocate"

219. *See supra* notes 64–68 and accompanying text.
220. *See* Theodore T. Herbert & Ralph W. Estes, *Improving Executive Decisions by Formalizing Dissent: The Corporate Devil's Advocate*, 2 ACAD. MGMT. REV. 662, 663–64 (1977).
221. *See id.*
222. *See supra* Subpart II.B.3.

could improve corporate decisionmaking.[223] Empirical research later served to support this theory. For example, in one study, participants deciding on a strategic plan were less biased and were much more successful in predicting the plan's success when they had been exposed to a devil's advocate's critique of the plan.[224] Several subsequent empirical studies also found that the devil's advocate technique was successful in improving corporate decisionmaking.[225] In order for this technique to be most effective, the person acting as devil's advocate should be objective and unemotional.[226]

The devil's advocate technique could be useful in debiasing fingerprint examiners' decisionmaking. Since the use of a devil's advocate is intended to generally expose all biases that have affected the decisionmaking process, this technique could potentially mitigate any and all of the ways in which cognitive biases affect fingerprint examiners' decisionmaking.[227] This technique could be formally incorporated into the verification process that already takes place in many forensic science laboratories. As previously discussed, verifying fingerprint examiners are often informed of the conclusion made by the initial examiner prior to coming to their own conclusion. Their exposure to this domain-extraneous information serves to undermine the purpose of the so-called independent verification process. As an alternative to blinding the verifying examiner to the initial examiner's conclusion, the verifying examiner could be provided with both the initial examiner's conclusion and instructions to identify any aspects of the initial examiner's work with which she disagrees or that she thinks may not be justified. The role of the verifying examiner would thereby be transformed into that of a devil's advocate. By then sharing her findings with the initial examiner, the devil's advocate could help uncover inadequacies and biases in the initial examiner's decisionmaking process. Like the perspective-taking and consider-an-alternative debiasing techniques, the devil's advocate technique could be taught during the same one- or

223. *See* Herbert & Estes, *supra* note 220, at 665–66.

224. *See* Richard A. Cosier, *The Effects of Three Potential Aids for Making Strategic Decisions on Prediction Accuracy*, 22 ORG. BEHAV. & HUM. PERFORMANCE 295 (1978).

225. *See, e.g.*, Richard A. Cosier, *Inquiry Method, Goal Difficulty, and Context Effects on Performance*, 11 DECISION SCI. 1 (1980); Charles R. Schwenk & Richard A. Cosier, *Effects of the Expert, Devil's Advocate, and Dialectical Inquiry Methods on Prediction Performance*, 26 ORG. BEHAV. & HUM. PERFORMANCE 409 (1980) [hereinafter Schwenk & Cosier, *Effects of the Expert*]; Charles R. Schwenk, *Effects of Planning Aids and Presentation Media on Performance and Affective Responses in Strategic Decision-Making*, 30 MGMT. SCI. 263 (1984).

226. *See* Schwenk & Cosier, *Effects of the Expert*, *supra* note 225, at 409.

227. See Part I.B, *supra*, for a discussion of the ways in which cognitive biases can affect fingerprint examiners' decisionmaking.

two-day workshop in which general bias awareness is created. And since this process could potentially take the place of the verification process that already exists in many laboratories, it may not require much additional cost.[228] Prior to this technique's implementation, however, it would be necessary to conduct empirical research to discover whether it is more or less effective in mitigating cognitive biases than simply blinding the verifying examiner to the initial examiner's conclusion. Although this research may be costly, its contribution to our understanding of how fingerprint examiners make decisions could be incredibly meaningful.

5. Accountability

In the accountability debiasing technique, it is made clear that when called upon, the decisionmaker will be required to justify his or her decisions.[229] Accountability reduces bias by encouraging decisionmakers to exert additional cognitive effort.[230] Thus, accountability should mitigate cognitive biases to the extent that they are attributable to insufficient effort.[231]

In a series of empirical studies, Philip Tetlock demonstrated that accountability served to mitigate several types of cognitive biases, including the primacy bias,[232] the overattribution bias,[233] and the overconfidence bias.[234] Additionally, accountability has proven to successfully debias audit judgment in the accounting domain.[235] In one study, for example, M.B.A. students with accounting experience who were told that their responses to a task that tested their audit judgment would be reviewed and "may be selected for a follow-up conference [in which they would] be asked to explain and justify [their] responses" were not influenced by the primacy bias in completing the task—unlike participants in the control group, who were more susceptible to bias and who performed worse on the task.[236]

228. This would depend, of course, on whether the devil's advocate debiasing technique would take more or less time than does the verification process.
229. *See* Phillip E. Tetlock, *Accountability and the Perseverance of First Impressions*, 46 SOC. PSYCHOL. Q. 285, 286 (1983).
230. *See id.*
231. *See id.*
232. *See id.* at 285.
233. *See* Phillip E. Tetlock, *Accountability: A Social Check on the Fundamental Attribution Error*, 48 SOC. PSYCHOL. Q., 227, 227 (1985) (defining overattribution bias as the tendency to attribute all of a person's behavior to one of that person's traits).
234. *See* Phillip E. Tetlock & Jae Il Kim, *Accountability and Judgment Processes in a Personality Prediction Task*, J. PERSONALITY & SOC. PSYCHOL. 700, 700 (1987).
235. *See* Jane Kennedy, *Debiasing Audit Judgment With Accountability: A Framework and Experimental Results*, 31 J. ACCT. RES. 231 (1993).
236. *See id.* at 238, 240–42.

This technique could be especially useful when used in conjunction with the consider-an-alternative technique and the perspective-taking technique. Similarly to competitive self-regulation, it could effectively serve as motivation for fingerprint examiners to actually employ these debiasing techniques consistently, thereby minimizing error. And this technique could be formally incorporated into the devil's advocate procedure. For example, in addition to serving as devil's advocate, the second examiner could also serve as someone to whom the initial examiner is held accountable. Thus, after the second examiner informs the initial examiner of aspects of his work that she disagrees with, the initial examiner must then explain and justify his conclusions to the second examiner[237]—including an explanation of how he utilized the debiasing techniques that he has been taught. Like the other debiasing techniques in this Subpart, the accountability technique could be taught during the same one- or two-day workshop in which general bias awareness is created. Prior to implementation, however, it would be necessary to conduct empirical research to discover whether the accountability technique—together with the devil's advocate technique—more effectively mitigates cognitive biases than simply blinding the verifying examiner to the initial examiner's conclusion. Again, although this research could be costly, it could also be quite worthwhile.

CONCLUSION

While a rapidly growing literature indicates that cognitive biases can account for some of forensic science's shortcomings,[238] until now, scant attention had been paid to ways in which these biases can be mitigated. In examining and identifying debiasing techniques that could be used to combat cognitive biases in the fingerprint identification domain, and in suggesting ways in which these techniques

237. The risk of testifying and being subjected to cross-examination, which fingerprint examiners already face, likely serves as a much weaker form of the accountability debiasing technique than the one suggested in this Comment. Although the prospect of being held accountable for their conclusions via the cross-examination process may successfully debias examiners to some extent, it is likely not a very powerful form of the accountability debiasing technique for at least two reasons: (1) the likelihood of actually being called to testify may be quite slim, and (2) even if the examiner is called to testify, the attorney conducting the cross-examination probably knows very little about fingerprint identification and is thus unlikely to uncover any mistakes that the examiner has made, apart from egregious ones. Likewise, the actual cross-examination process could be likened to the devil's advocate debiasing technique; however, since the attorney acting as the devil's advocate is not a colleague but rather is a layman in the field of fingerprint identification, this process is unlikely to uncover any mistakes that the examiner may have made.

238. For an overview of this literature, see Dror & Cole, *supra* note 16, and Dror & Rosenthal, *supra* note 32.

could potentially be implemented in forensic science laboratories, this Comment contributes to filling that void. Yet the chasm remains deep; indeed, a significant amount of empirical research will be necessary to test the efficacy of each of these debiasing techniques in the fingerprint identification domain. In the meantime, forensic science laboratories, fingerprint examiners, and lawmakers should keep these techniques in mind in pursuing reforms framed around a cognitive understanding of fingerprint examiner decisionmaking.