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INDEPENDENT CRIME LABORATORIES: THE PROBLEM OF MOTIVATIONAL AND COGNITIVE BIAS

Paul C. Giannelli*

INTRODUCTION

One of the most controversial recommendations in the National Academy of Sciences' report on forensic science, *Strengthening Forensic Science in the United States: A Path Forward* (NAS Report),¹ concerns the removal of crime laboratories from the administrative control of law enforcement agencies.² According to the NAS Report:

The best science is conducted in a scientific setting as opposed to a law enforcement setting. Because forensic scientists often are driven in their work by a need to answer a particular question related to the issues of a particular case, they sometimes face pressure to sacrifice appropriate methodology for the sake of expediency.³

For decades, scholars have commented on the “inbred bias of crime laboratories affiliated with law enforcement agencies”⁴—as have courts,⁵

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¹ NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES, *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009) [hereinafter NAS REPORT]. The report's recommendation for an independent federal entity, the National Institute of Forensic Science, is also controversial. *Id.* at 19–20 (Recommendation 1).

² *Id.* at 24 (Recommendation 4). The report also states: “Scientific and medical assessment conducted in forensic investigations should be independent of law enforcement efforts either to prosecute criminal suspects or even to determine whether a criminal act has indeed been committed. Administratively, this means that forensic scientists should function independently of law enforcement administrators.” *Id.* at 23.

³ *Id.* at 23–24.

⁴ James E. Starrs, *The Seamy Side of Forensic Science: The Mephitic Stain of Fred Salem Zain*, 17 *SCI. SLEUTHING REV.* 1, 8 (1993); see also 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, 441 (1997) (“Too many experts in the criminal justice system manifest a police-prosecution bias, a willingness to shade or distort opinions to support the state's case.”); Randolph N. Jonakait, *Forensic Science: The Need for Regulation*, 4 *HARV. J.L. & TECH.* 109, 160 (1991) (“Another [problem] is the failure of forensic scientists to shield themselves from possible bias.”); Andre A. Moenssens, *Novel Scientific Evidence in Criminal Cases: Some Words of Caution*, 84 *J. CRIM. L. & CRIMINOLOGY* 1, 6 (1993) (stating crime labs “may be so imbued with a pro-police bias that they are willing to circumvent true scientific investigation methods for the sake of ‘making their point.’”); 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) (noting that lab personnel “inevitably become part of the

legislators,⁶ prosecutors,⁷ investigators,⁸ and reporters.⁹ The NAS Report is not the first to acknowledge the problem of bias. The National Academy of Sciences' 1996 DNA Report observed that "[l]aboratory procedures should be designed with safeguards to detect bias and to identify cases of true ambiguity."¹⁰ Similarly, the ABA Standards on DNA Evidence contain a provision on bias.¹¹

The problem of bias in crime laboratories is not unique to the United States. According to a British court:

Forensic scientists may become partisan. The very fact that the police seek their assistance may create a relationship between the police and the forensic scientists. And the adversarial character of the proceedings tends to promote this process. Forensic scientists employed by the government may come to see their function as helping the police.¹²

effort to bring an offender to justice. And as a result, their impartiality is replaced by a viewpoint colored brightly with prosecutorial bias."); *Symposium on Science and the Rules of Legal Procedure*, 101 F.R.D. 599, 642 (1983) (statement of Professor Joseph L. Peterson) (noting the factors that "raise a legitimate issue regarding the objectivity of laboratory personnel").

⁵ See *R v. Ward*, [1993] 96 Crim. App. 1, 68 (U.K.) ("Forensic scientists may become partisan.").

⁶ See Rodney Ellis, Editorial, *Want Tough on Crime? Start by Fixing HPD Lab.*, HOUS. CHRON., Sept. 5, 2004 ("When crime labs are operating within a police department, examiner bias can undermine the integrity of scientific results."). Ellis was a Texas state senator at the time he wrote the editorial. See *id.*

⁷ See Scott Bales, *Turning the Microscope Back on Forensic Scientists*, 26 LITIG. 51, 55 (2000) ("But whether nefarious or innocent, too close a connection between scientists and the law enforcement officers with whom they work creates a real danger of biased testimony."). As an assistant U.S. attorney, Justice Bales served on the team that produced the 1997 I.G. Report on the FBI lab. See *infra* text accompanying notes 38–39. He is now a justice on the Arizona Supreme Court.

⁸ See M.A. Thomson, *Bias and Quality Control in Forensic Science: A Cause for Concern*, 19 J. FORENSIC SCI. 504, 509–10 (1974) ("Is the witness who has his job and salary controlled by the State completely free from pressure, conscious or unconscious, to be entirely impartial?"). Captain Thomson was an Air Force investigator at the time he wrote this article. See *id.* at 504 n.1.

⁹ See Steve Mills et al., *When Labs Falter, Defendants Pay: Bias Toward Prosecution Cited in Illinois Cases*, CHI. TRIB., Oct. 20, 2004, at 1; Ruth Teichroeb, *Crime Labs Too Beholden to Prosecutors, Critics Say*, SEATTLE POST-INTELLIGENCER, July 23, 2004, at A13.

¹⁰ NATIONAL RESEARCH COUNCIL, *THE EVALUATION OF FORENSIC DNA EVIDENCE* 85 (1996). The report adds: "Bias in forensic science usually leads to sins of omission rather than commission. Possibly exculpatory evidence might be ignored or rejected." *Id.* at 84–85.

¹¹ AMERICAN BAR ASSOCIATION, *ABA STANDARDS FOR CRIMINAL JUSTICE: DNA EVIDENCE* 67 (3d ed. 2007) [hereinafter ABA DNA STANDARDS] ("Cognitive bias (e.g., observer effects) occurs because people tend to see what they expect to see, and this typically affects their decision in cases of ambiguity."), available at <http://www.abanet.org/crimjust/standards/dnaevidence.pdf>.

¹² *R v. Ward*, [1993] 96 Crim. App. 1, 68 (U.K.).

One commentator concluded that the miscarriages of justice in Britain constituted “unequivocal evidence that the pro-prosecution orientation of government scientists . . . had not adequately been countered in England.”¹³

Some commentators have proposed independent laboratories as the remedy for this problem,¹⁴ and in 2002, the Illinois Governor’s Commission on Capital Punishment proposed the establishment of an independent state crime laboratory.¹⁵ The Commission majority believed that “the overall quality of forensic services would be improved if the laboratory personnel were truly independent.”¹⁶ In contrast, the Department of Justice¹⁷ and the National District Attorneys Association oppose the NAS recommendation of independent laboratories.¹⁸

This Essay examines the issue of independent crime laboratories. Part I documents the problems that triggered the NAS Report’s recommendation, while Part II explores the counterarguments. Part III examines the NAS

¹³ Ian Freckelton, *Science and the Legal Culture*, 2 EXPERT EVID. 107, 112 (1993); see also David E. Bernstein, *Junk Science in the United States and the Commonwealth*, 21 YALE J. INT’L L. 123, 171 (1996) (“Many reformers in the United Kingdom believe that a large percentage of the problems that have arisen in the forensic science context are attributable to the fact that English forensic science is almost solely the province of the state.”); Paul Roberts, *Forensic Science Evidence After Runciman*, 1994 CRIM. L. REV. 780, 784 (commenting that “forensic scientists who run with the hounds cannot be expected to give a savaged fox the kiss of life”) (citing Russell Stockdale, *Running with the Hounds*, NEW L.J. 772 (June 7, 1991)).

¹⁴ See BARRY SCHECK ET AL., ACTUAL INNOCENCE: FIVE DAYS TO EXECUTION, AND OTHER DISPATCHES FROM THE WRONGLY CONVICTED 257 (2000) (stating laboratories should “function as an independent third force within the criminal justice system”); Giannelli, *supra* note 4, at 457–62 (arguing for labs associated with a medical examiner system); see also Ellis, *supra* note 6 (stating “crime labs should operate as a separate and independent third party force in the criminal justice system”).

¹⁵ REPORT OF THE GOVERNOR’S COMMISSION ON CAPITAL PUNISHMENT 52 (2002), available at http://www.idoc.state.il.us/ccp/ccp/reports/commission_report/chapter_03.pdf [hereinafter CAPITAL PUNISHMENT COMM.] (“An independent state forensic laboratory should be created, operated by civilian personnel, with its own budget, separate from any police agency or supervision.”). The proposal was never adopted.

¹⁶ *Id.*

¹⁷ *Strengthening Forensic Science in the United States: A Path Forward: Hearing Before the Subcomm. on Crime, Terrorism, and Homeland Security of the H. Comm. on the Judiciary*, 111th Cong. 13 (2009) (statement of Kenneth E. Melson, Acting Dir., Bureau of Alcohol, Tobacco, Firearms, and Explosives) (“DOJ also questions whether full independence of laboratories from law enforcement is advisable or feasible. . . . To be separated completely from interaction with investigative partners would likely cause missteps in decision-making that could result in either loss and/or destruction of evidence, or important analyses left undone.”).

¹⁸ National District Attorneys Association, NDAA Comments Provided to the Consortium of Forensic Sciences Regarding the National Academy of Sciences Report [hereinafter NDAA Statement] (“NDAA does not believe, as some have suggested, that all forensic labs must be ‘independent,’ that is, housed outside of a law enforcement or prosecution agency.”).

proposal as well as an alternative approach. Part IV sets forth additional measures that should protect forensic analyses from improper influence.

I. THE PROBLEM

A. Organizational Structure

Crime laboratories are “the oldest and strongest link between science and technology and criminal justice.”¹⁹ In the United States, crime laboratories developed in the 1920s as an adjunct of police departments.²⁰ A survey of approximately three hundred crime laboratories revealed that “[s]eventy-nine percent of all laboratories responding . . . are located within law enforcement/public safety agencies”²¹ and “[f]ifty-seven percent . . . would *only* examine evidence submitted by law enforcement officials.”²² Thus, it is not surprising that police norms would influence the laboratory culture. As one scholar observed: “[T]he police agency controls the formal and informal system of rewards and sanctions for the laboratory examiners.”²³

B. Types of Bias

Commentators have identified both motivational and cognitive bias as a concern in the forensic setting.²⁴ These classifications are not mutually exclusive, and cognitive bias comes in several forms.²⁵

¹⁹ PRESIDENT’S COMM’N ON LAW ENFORCEMENT & ADMIN. OF JUSTICE, THE CHALLENGE OF CRIME IN A FREE SOCIETY 255 (1967).

²⁰ See RICHARD SAFERSTEIN, CRIMINALISTICS: AN INTRODUCTION TO FORENSIC SCIENCE 6 (5th ed. 1995) (“The oldest forensic laboratory in the United States is that of the Los Angeles Police Department, created in 1923 by August Vollmer, a police chief from Berkeley, California.”); John I. Thornton, *Criminalistics—Past, Present and Future*, 11 LEX ET SCIENTIA 1, 23 (1975) (“In 1923, Vollmer served as Chief of Police of the City of Los Angeles for a period of one year. During that time, a crime laboratory was established at his direction.”); see also Bales, *supra* note 7, at 55 (“The tie between crime labs and law enforcement agencies is not inevitable. In part, it is a product of history: rudimentary crime labs were first established near the turn of the century by law enforcement agencies when officials began to recognize the possible application of science to criminal investigations. Since that time, the relationship between labs and law enforcement has flourished because of practical benefits—for example, streamlining tasks such as close and timely communication, the transfer of evidence, and record-keeping.”).

²¹ Joseph L. Peterson et al., *The Capabilities, Uses, and Effects of the Nations’ Criminalistic Laboratories*, 30 J. FORENSIC SCI. 10, 11 (1985).

²² *Id.* at 13.

²³ *Symposium on Science and the Rules of Legal Procedure*, 101 F.R.D. 599, 642 (1983) (statement of Professor Joseph L. Peterson).

²⁴ MIKE REDMAYNE, EXPERT EVIDENCE AND CRIMINAL JUSTICE 14 (2001) (“The psychological literature distinguishes motivational and cognitive bias.”).

²⁵ The leading article on the subject is D. Michael Risinger et al., *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 CAL. L. REV. 1, 12–21 (2002) (describing

1. *Motivational Bias*

Motivational bias “is close to the popular notion of bias (the referee is biased because he wants one side to win).”²⁶ Several notorious examples seem to fit within this category. For example, Fred Zain, who became infamous because of his misconduct at the West Virginia state crime laboratory, routinely reported results that favored the prosecution.²⁷ An investigation by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB), found that, “when in doubt, Zain’s findings would always inculcate the suspect.”²⁸ His replacement as director of serology described Zain as “very pro-prosecution.”²⁹ Zain was such a treasured witness that, even after he left the state to accept a position in a San Antonio crime laboratory, West Virginia prosecutors sent evidence to him for retesting.³⁰ The prosecutors relied on Zain because the remaining West Virginia serologists were incapable, in their view, of reaching the “right” results.³¹

While working at the Oklahoma City Crime Laboratory for nearly twenty years, Joyce Gilchrist repeatedly overstated test results, withheld evidence, and provided critical evidence for the prosecution.³² The Court of Appeals for the Tenth Circuit criticized Gilchrist for “provid[ing] the jury with evidence

several types of cognitive bias, including observer effects, anchoring effects, role effects, conformity effects, and experimenter effects).

²⁶ REDMAYNE, *supra* note 24, at 14.

²⁷ Zain falsified test results in as many as 134 cases from 1979 to 1989. *See In re Investigation of the W.Va. State Police Crime Lab., Serology Div.*, 438 S.E.2d 501, 510–11 (W.Va. 1993). In reviewing a judicial report on Zain’s decade of misconduct, the West Virginia Supreme Court spoke of “shocking and . . . egregious violations” and the “corruption of our legal system.” *Id.* at 508. The judicial inquiry concluded that “as a matter of law, any testimonial or documentary evidence offered by Zain at any time in any criminal prosecution should be deemed invalid, unreliable, and inadmissible.” *Id.* at 520; *see generally* Paul C. Giannelli, *Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs*, 86 N.C. L. REV. 163, 172–74 (2007) (discussing Zain’s conduct).

²⁸ *In re Investigation of W.Va.*, 438 S.E.2d at 512 n.9.

²⁹ *Id.* at 514 n.23.

³⁰ His work in Texas also proved troublesome: “In the case of Gilbert Alejandro, the expert, Fred Zain claimed a DNA match when in fact Zain had never conducted any testing beyond initial inconclusive testing, and final DNA testing conducted after the trial excluded Alejandro.” Brandon L. Garrett, *Judging Innocence*, 108 COLUM. L. REV. 55, 84 n.109 (2008).

³¹ According to Zain’s replacement, “several prosecutors expressed dissatisfaction with the reports they were receiving from serology and specifically requested that the evidence be analyzed by Zain.” *In re Investigation of W. Va.*, 438 S.E.2d at 513 n.16 (referring to deposition of T.S. Smith). “[Serologist] Myers also testified that after he had been unable to find blood on a murder suspect’s jacket, it was sent to Texas, where Zain found a bloodstain which tested consistent with the blood of the victim.” *Id.* at 512. “[Serologist] Bowles also testified that at least twice after Zain left the lab, evidence on which Bowles had been unable to obtain genetic markers was subsequently sent to Texas for testing by Zain, who again was able to identify genetic markers.” *Id.*

³² *See Mitchell v. Gibson*, 262 F.3d 1036, 1064 (10th Cir. 2001).

implicating [a defendant] in the sexual assault of the victim which she knew was rendered false and misleading by evidence withheld from the defense.”³³ As one author commented: “If [Gilchrist] were simply incompetent, her mistakes would have been all over the map. Instead, her mistakes benefited the prosecution.”³⁴

2. *Cognitive Bias: Role Effects*

If the motivation is subconscious, the bias can be classified as a type of cognitive bias called “role effect” bias.³⁵ In short, people’s perception of their role can influence their decisions, especially in cases of ambiguity. “Given what is known about reference group phenomena, the need that people have for social support of attitudes and conduct, and the process of socialization in occupational settings, it strains credulity to believe that these experts do not identify with prosecutors.”³⁶ According to a former laboratory director, “Many forensic scientists at the state police labs . . . saw their role as members of the state’s attorney’s team. ‘They thought they were prosecution witnesses[.]’ . . . ‘They didn’t understand they were just scientists.’”³⁷

In 1997, the Inspector General of the Department of Justice issued a report on the FBI laboratory’s explosives unit.³⁸ This report documented numerous deficiencies, including inaccurate testimony, testimony beyond the competence of examiners, improperly prepared laboratory reports, insufficient documentation of test results, inadequate record management and retention, and failure to resolve serious and credible allegations of incompetence.³⁹ In the

³³ *Id.*; see generally Giannelli, *supra* note 27, 174–82 (discussing Gilchrist’s conduct).

³⁴ MARK FUHRMAN, DEATH AND JUSTICE: AN EXPOSE OF OKLAHOMA’S DEATH ROW MACHINE 223 (2003). Fuhrman also wrote that Gilchrist “appears to have used her lab tests to confirm the detectives’ hunches rather than seek independent scientific results. . . . She treated discovery requests with contempt and kept evidence from the defense. She systematically destroyed evidence at the very time when she knew that much of that evidence might be retested.” *Id.* at 232.

³⁵ See Risinger et al., *supra* note 25, at 18–19.

³⁶ MICHAEL J. SAKS & RICHARD VAN DUIZEND, THE USE OF SCIENTIFIC EVIDENCE IN LITIGATION 53 (1983).

³⁷ Mills et al., *supra* note 9 (quoting Don Plautz, a former director in the Illinois crime lab system); see also Teichroeb, *supra* note 9 (explaining that crime labs are often biased in favor of the prosecution).

³⁸ OFFICE OF INSPECTOR GENERAL, U.S. DEP’T OF JUSTICE, THE FBI LABORATORY: AN INVESTIGATION INTO LABORATORY PRACTICES AND ALLEGED MISCONDUCT IN EXPLOSIVES-RELATED AND OTHER CASES, Executive Summary, pt. I, sec. A (1997), available at <http://www.fas.org/irp/agency/doj/oig/fbilab1/fbil1toc.htm> [hereinafter 1997 I.G. REPORT].

³⁹ *Id.*; see also JOHN F. KELLY & PHILLIP K. WEARNE, TAINING EVIDENCE 2 (1998) (concluding that FBI examiners “had given scientifically flawed, inaccurate, and overstated testimony under oath in court; had altered the lab reports of examiners to give them a pro-prosecutorial slant, and had failed to document tests and examinations from which they drew incriminating conclusions, thus ensuring that their work could never be properly checked”); Bales, *supra* note 7, at 53 (“[T]he [1997 I.G. Report] did contain deeply disturbing findings of inadequate procedures, insufficient

Oklahoma City bombing case, the I.G. Report found that an examiner's conclusion about the identity of the explosive charge was "speculation" and "tilted in such a way as to incriminate the defendants."⁴⁰

3. *Cognitive Bias: Contextual Bias*

Another type of cognitive bias is contextual bias, which occurs when extraneous information influences a decision, typically in cases of ambiguity.⁴¹ When clinical trials for a new drug are conducted, "double blind" procedures are used—i.e., randomized clinical trials. Neither the patient nor the physician knows whether the patient is receiving the new drug or a placebo (the control). Numerous studies have demonstrated that physicians who know that patients are receiving a new drug tend to see positive results, even when there are none.⁴² In short, extraneous knowledge alters our expectations, which in turn affects our perceptions.⁴³

There is no shortage of examples: "[Professor] Peter DeForest has described investigators who responded to inconclusive results by saying to forensic examiners: 'Would it help if I told you we know he's the guy who did it?'"⁴⁴ One laboratory examiner "said she tried not to be swayed by detectives' belief that they had a strong suspect. 'We're all human,' she said. 'I tried not to

supervision, and improper conduct."); *see generally* Giannelli, *supra* note 27, at 195–96 (discussing the 1997 I.G. Report); David Johnston, *F.B.I. Lab Practices Faulted in Oklahoma Bomb Inquiry*, N.Y. TIMES, Jan. 31, 1997, at A1 (discussing poor scientific practices in the investigation of the Oklahoma City bombing).

⁴⁰ 1997 I.G. REPORT, *supra* note 38, at pt. III, sec. F.

⁴¹ REDMAYNE, *supra* note 24, at 15 ("It also appears that extraneous information supporting a hypothesis will affect our judgement of that hypothesis, and of the evidence for it, even when we know we should not take the extraneous information into account.").

⁴² *See* ROBERT J. LEVINE, ETHICS AND REGULATION OF CLINICAL RESEARCH 185 (2d ed. 1986) ("When it is feasible, a double-blind technique is employed. That is, neither the investigator nor the subject knows until the conclusion of the study who is in the treatment or control group. The purpose of double-blinding is to overcome biases on the part of both subjects and investigators . . .").

⁴³ Risinger et al., *supra* note 25, at 45 ("The simplest, most powerful, and most useful procedure to protect against the distorting effects of unstated assumptions, collateral information, and improper expectations and motivations is blind testing. An examiner who has no domain-irrelevant information cannot be influenced by it. An examiner who does not know what conclusion is hoped for or expected of her cannot be affected by those considerations.").

⁴⁴ *See id.* at 39. The psychological literature on lineups provides another illustration. Eyewitnesses with reservations about their identifications often become positive after learning that the person they identified was the prime suspect in the case. *See* REPORT OF THE ABA CRIMINAL JUSTICE SECTION'S AD HOC INNOCENCE COMM. TO ENSURE THE INTEGRITY OF THE CRIMINAL PROCESS, ACHIEVING JUSTICE: FREEING THE INNOCENT, CONVICTING THE GUILTY 37 (Paul C. Giannelli & Myrna Raeder eds., 2006) ("Ideally, the witness should never be told whether he selected the 'right man' so that his confidence is not artificially inflated by the time of trial.").

let it influence me. But I can't say it never does."⁴⁵ Joyce Gilchrist often received detectives' views on suspects before she conducted her examinations.⁴⁶ In another case, an FBI examiner identified a substance as being consistent with an explosive "based in part on the fact that pieces of cut detonation cord had been found in a garbage can outside the suspect's house."⁴⁷

4. Cognitive Bias: Confirmation Bias

Another type of cognitive bias known as "confirmation bias" concerns "the tendency to test a hypothesis by looking for instances that confirm it rather than by searching for potentially falsifying instances."⁴⁸ Confirmation bias played a role in the FBI's misidentification of Brandon Mayfield's fingerprints in the Madrid terrorist train bombing investigation.⁴⁹ According to an FBI review, the "power" of the automated fingerprint correlation "was thought to have influenced the examiner's initial judgment and subsequent examination."⁵⁰ Three other experts, one of whom was court-appointed, also confirmed the initial misidentification.⁵¹ These reviews were not conducted blind—i.e., the reviewer knew that a positive identification had already been made—and thus were subject to the influence of contextual/confirmation bias.⁵²

⁴⁵ Ruth Teichroeb, *Rare Look Inside State Crime Labs Reveals Recurring Problems: 23 Cases in 3 Years Had DNA Test Errors*, SEATTLE POST-INTELLIGENCER, July 22, 2004, at A1 (quoting lab expert Denise Olson).

⁴⁶ See FUHRMAN, *supra* note 34, at 91 ("When Cook and other homicide detectives gave Gilchrist hair samples from a suspect, they would often let her know that this was the person they wanted to arrest.").

⁴⁷ Bales, *supra* note 7, at 55 ("Of course, where the cord was found was irrelevant to the scientific examination of the residue on the knife and to the examiner's conclusions. . . . Based on recommendations by the OIG, the FBI has instructed its examiners not to base forensic conclusions on unstated assumptions or information that is collateral to the examinations performed."); *see also id.* at 52 (The 1997 I.G. Report "concluded that an examiner from the lab's explosives unit had erred by purporting to identify the particular explosives used in the [1993] World Trade Center and Oklahoma City bombings. The error stemmed from the examiner's reliance on information that was tied to suspects but not relevant to his scientific analysis.").

⁴⁸ Risinger et al., *supra* note 25, at 7; *see also* REDMAYNE, *supra* note 24, at 15 ("We tend to look for confirming, rather than disconfirming, evidence; we may judge evidence of better quality if it agrees with our theory, or worse quality if it does not; and our beliefs can persevere even after being discredited.").

⁴⁹ *See* Sara Kershaw, *Spain and U.S. at Odds on Mistaken Terror Arrest*, N.Y. TIMES, June 5, 2004, at A1 (Spanish authorities cleared Brandon Mayfield and matched the fingerprints to an Algerian national).

⁵⁰ Robert B. Stacey, *A Report on the Erroneous Fingerprint Individualization in the Madrid Train Bombing Case*, 54 J. FORENSIC IDENTIFICATION 706, 713 (2004).

⁵¹ *Id.* at 709–11.

⁵² *Id.* at 713.

5. *Cognitive Bias: Reconstructive Effects*

Another type of cognitive bias involves “reconstructive effects.”⁵³ When people rely on their memory, they tend to fill in gaps with what they believe should have occurred. One of the Inspector General’s reports on the FBI laboratory addressed this issue: “[C]ontemporaneous documentation is important to ensure that the case file accurately reflects the work performed on each evidence item that is tested. . . . [S]taff members may be unduly influenced by protocol requirements when relying on memory, and document what they know should have occurred when their recollection is vague.”⁵⁴

6. *Research*

Although the psychological literature on cognitive bias is well developed, research in forensic science has lagged.⁵⁵ One researcher performed a rudimentary experiment involving handwriting comparisons in 1984⁵⁶ and then followed up with a study on hair examinations in 1987.⁵⁷ Although Professor Jonakait mentioned the topic in a 1991 law review article,⁵⁸ the issue was thrust to the forefront when Professor Risinger and his colleagues published an extensive article on the subject in 2002.⁵⁹

As a result of the Mayfield case, British researchers devised a covert experiment to test contextual bias.⁶⁰ Five fingerprint examiners who were unfamiliar with the Mayfield prints were asked by colleagues to compare a crime scene print and suspect print.⁶¹ “They were told that the pair of prints

⁵³ Risinger et al., *supra* note 25, at 15–16 (providing the example of a “forensic scientist who takes poor notes during an examination and prepares a skimpy report, but then goes back to ‘spruce them up’ shortly before trial”).

⁵⁴ OFFICE OF INSPECTOR GENERAL, U.S. DEP’T OF JUSTICE, THE FBI DNA LABORATORY: A REVIEW OF PROTOCOL AND PRACTICE VULNERABILITIES 107 (May 2004), available at <http://www.justice.gov/oig/special/0405/final.pdf>.

⁵⁵ See Elizabeth F. Loftus & Simon A. Cole, Letter to the Editor, *Contaminated Evidence*, 304 SCI. 959, 959 (May 14, 2004) (“[F]orensic scientists remain stubbornly unwilling to confront and control the problem of bias, insisting that it can be overcome through sheer force of will and good intentions.”).

⁵⁶ Larry S. Miller, *Bias Among Forensic Document Examiners: A Need for Procedural Change*, 12 J. POLICE SCI. & ADMIN. 407, 410 (1984) (“The conclusions and opinions reported by the examiners supported the bias hypothesis.”).

⁵⁷ Larry S. Miller, *Procedural Bias in Forensic Science Examinations of Human Hair*, 11 L. & HUM. BEHAV. 157, 161 (1987). In the conventional method of hair examination, the examiner is given hair samples from a known suspect along with a report including information relating to the guilt of the suspect. In the study on hair examinations, the findings “raise some concern regarding the amount of unintentional bias among human hair identification examiners A preconceived conclusion that a questioned hair sample and a known hair sample originated from the same individual may influence the examiner’s opinion when the samples are similar.” *Id.* at 161.

⁵⁸ Jonakait, *supra* note 4, at 160–64.

⁵⁹ Risinger et al., *supra* note 25.

⁶⁰ Itiel E. Dror et al., *Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications*, 156 FORENSIC SCI. INT’L 74, 75–76 (2006).

⁶¹ *Id.* at 75.

was the one that was erroneously matched by the FBI as the Madrid bomber, thus creating an extraneous context that the prints were a non-match.”⁶² The participants were then instructed to ignore this information.⁶³ The prints, in fact, were not from the Mayfield case; they were from cases that each of the participants had previously matched.⁶⁴ Of the five examiners, only one still judged the print to be a match.⁶⁵ The other four changed their opinions; three directly contradicted their prior identifications, and the fourth concluded that there was insufficient data to reach a definite conclusion.⁶⁶ “This is striking given that all five experts had seen the identical fingerprints previously and all had decided that the prints were a sound and definite match.”⁶⁷

A follow-up covert study, which also involved experts, showed that fingerprint examiners could be biased toward a finding of identification if informed that the suspect confessed or toward a finding of exclusion if told that the suspect had an alibi.⁶⁸ Another investigation focused on the effects of emotions on decision making.⁶⁹

Because the research in the forensic field is in its nascent stage,⁷⁰ the NAS Report recommends further investigation of observer bias and other sources of

⁶² *Id.* at 76.

⁶³ *Id.*

⁶⁴ *Id.* at 75.

⁶⁵ *Id.* at 76.

⁶⁶ *Id.*

⁶⁷ *Id.* The authors of the study concluded the “study shows that it is possible to alter identification decisions on the same fingerprint, solely by presenting it in a different context. This does not imply that fingerprint and other forensic identifications are not a science, but it does highlight problems of subjectivity, interpretation, and other psychological and cognitive elements that interact and may distort any scientific inquiries.” *Id.* at 77.

⁶⁸ Itiel E. Dror & David Charlton, *Why Experts Make Errors*, 56 J. FORENSIC IDENTIFICATION 600, 608, 612 (2006); see also Itiel Dror & Robert Rosenthal, *Meta-analytically Quantifying the Reliability and Biasability of Forensic Experts*, 53 J. FORENSIC SCI. 900 *passim* (2008) (discussing a meta-analysis of both studies).

Another study concluded that external information had an effect but that its effects were more pronounced with novices than experts; the latter provided fewer definitive and erroneous judgments. As the researchers acknowledged, however, the examiners knew they were being tested. Glenn Langenburg et al., *Testing for Potential Contextual Bias Effects During the Verification Stage of the ACE-V Methodology When Conducting Fingerprint Comparisons*, 54 J. FORENSIC SCI. 571, 580–81 (2009).

⁶⁹ Itiel Dror et al., *When Emotions Get the Better of Us: The Effect of Contextual Top-Down Processing on Matching Fingerprints*, 19 APPL. COGNIT. PSYCHOL. 799, 806–07 (2005) (“The results of this study demonstrated that emotion and subliminal messages did influence decision making[,]” but not in clear-cut cases).

⁷⁰ For discussion of the research, 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 (2010); see also Bruce Budowle et al., *A Perspective on Errors, Bias, and Interpretation in the Forensic Sciences and Direction for Continuing Advancement*, 54 J. FORENSIC SCI. 798, 803 (2009) (arguing that “[c]omplete ignorance to case specific information exhibits poor judgment and should not be considered”); D.E. Krane et al., Letter to the Editor, *Sequential Unmasking: A Means of Minimizing Observer Effects in Forensic DNA Interpretation*, 53 J. FORENSIC SCI. 1006, 1006 (2008) (“The interpretation of an

human error in forensic examinations.⁷¹ Cognitive bias is most likely a far greater danger than motivational bias precisely because it is a subconscious influence.⁷² Forensic techniques that have a substantial subjective component should be a special concern—e.g., fingerprint identifications,⁷³ firearms (ballistics) identifications,⁷⁴ and handwriting comparisons.⁷⁵

C. *The Prosecutor*

Of course, the police are not the only ones who may influence government experts.⁷⁶ Prosecutors also have pressured experts to slant their testimony.⁷⁷

evidentiary DNA profile should not be influenced by information about a suspect's DNA profile").

⁷¹ NAS REPORT, *supra* note 1, at 24 (Recommendation 5) ("Such programs might include studies to determine the effects of contextual bias in forensic practice (e.g., studies to determine whether and to what extent the results of forensic analyses are influenced by knowledge regarding the background of the suspect and the investigator's theory of the case).").

⁷² See REDMAYNE, *supra* note 24, at 14 ("Cognitive biases are potentially more problematic, for these result from unconscious reasoning strategies that can lead us to unwarranted conclusions."); Dror & Cole, *supra* note 70, at 162 ("Errors committed by well-intentioned experts are more problematic and dangerous . . ."); Risinger et al., *supra* note 25, at 11 (finding cognitive bias "far more pervasive but generally unnoticed" and "a problem in some respects more troublesome and troubling than the intentional misconduct").

⁷³ See *Commonwealth v. Patterson*, 840 N.E.2d 12, 16–17 (Mass. 2005) ("In the evaluation stage, . . . the examiner relies on his subjective judgment to determine whether the quality and quantity of those similarities are sufficient to make an identification, an exclusion, or neither."); Sandy L. Zabell, *Fingerprint Evidence*, 13 J. L. & POL'Y 143, 158 (2005) ("In contrast to the scientifically-based statistical calculations performed by a forensic scientist in analyzing DNA profile frequencies, each fingerprint examiner renders an opinion as to the similarity of friction ridge detail based on his subjective judgment.").

⁷⁴ See *United States v. Glynn*, 578 F. Supp. 2d 567, 571 (S.D.N.Y. 2008) ("[T]he Government did not seriously contest the Court's conclusions that ballistics lacked the rigor of science and that, whatever else it might be, its methodology was too subjective to permit opinions to be stated to 'a reasonable degree of ballistic certainty.'"); *United States v. Monteiro*, 407 F. Supp. 2d 351, 372 (D. Mass. 2006) ("Because an examiner's bottom line opinion as to an identification is largely a subjective one, there is no reliable statistical or scientific methodology which will currently permit the expert to testify that it is a 'match' to an absolute certainty, or to an arbitrary degree of statistical certainty.").

⁷⁵ See *United States v. Starzecpyzel*, 880 F. Supp. 1027, 1048 (S.D.N.Y. 1995) ("Such [overly fine] distinctions are certainly improper in forensic document examination, where it is conceded that conclusions are drawn, in large part, on subjective criteria.").

⁷⁶ ABA Criminal Justice Standards state that "[a] prosecutor who engages an expert for an opinion should respect the independence of the expert and should not seek to dictate the formation of the expert's opinion on the subject. . . . [T]he prosecutor should explain to the expert his or her role in the trial as an impartial expert . . ." ABA STANDARDS FOR CRIMINAL JUSTICE, PROSECUTION FUNCTION AND DEFENSE FUNCTION 58 (Standard 3-3.3(a)) (3d ed. 1993), available at <http://www.abanet.org/crimjust/standards/prosecutionfunction.pdf>. A comparable

For more than a decade, a Texas pathologist worked closely with prosecutors and police “shad[ing] things to follow along with the police theory of the case.”⁷⁸ As the special prosecutor remarked: “If the prosecution theory was that death was caused by a Martian death ray, then that was what [the pathologist] reported.”⁷⁹

In one of Joyce Gilchrist’s cases, an appellate court wrote: “[W]e are greatly disturbed by the implications that the Oklahoma County District Attorney’s Office may have placed undue pressure upon Ms. Gilchrist to give a so-called expert opinion, which was beyond scientific capabilities”⁸⁰ In *Troedel v. Wainwright*,⁸¹ a capital murder case, the court found that a FBI expert shaped his testimony in a way that was “at the very least, . . .

standard applies to defense counsel. *See id.* at 188 (Standard 4-4.4(a)). The commentary to this standard elaborates: “Statements made by physicians, psychiatrists, and other experts about their experiences as witnesses in criminal cases indicate the need for circumspection on the part of lawyers who engage experts. Nothing should be done by a lawyer to cast suspicion on the process of justice by suggesting that the expert color an opinion to favor the interests of the client the lawyer represents.” *Id.* at 189.

⁷⁷ *See generally* Paul C. Giannelli & Kevin C. McMunigal, *Prosecutors, Ethics, and Expert Witnesses*, 76 *FORDHAM L. REV.* 1493, 1520–27 (2007) (discussing the problems associated with prosecutors and experts). Experts often are pressured by attorneys to “push the envelope”—not a surprising occurrence in an adversary system. *See* SCHECK ET AL., *supra* note 14, at 31 (“Most attorneys . . . like to let you know what their opinions of the facts of the case are — irrespective of the scientific conclusions.”) (quoting Dr. Robert Shaler, former head of N.Y.C. Medical Examiner’s DNA unit).

⁷⁸ Roberto Suro, *Ripples of a Pathologist’s Misconduct in Graves and Courts of West Texas*, *N.Y. TIMES*, Nov. 22, 1992, at A22 (quoting Tommy J. Turner, appointed by a state district judge to investigate Dr. Ralph R. Erdmann). “[A]ll the while [Dr. Erdmann] worked in close collaboration with many prosecutors and police officials, some of whom are now prominent in politics.” *Id.*; *see also* Roy Bragg, *Autopsy Record of Pathologist Who Quit Raises Many Eyebrows*, *HOUS. CHRON.*, Mar. 8, 1992, at A1 (Dr. Linda Norton, a former Dallas County assistant medical examiner, stated: “It’s as though there’s some sort of collusion between Dr. Erdmann and the DA.”).

⁷⁹ Richard L. Fricker, *Pathologist’s Plea Adds to Turmoil: Discovery of Possibly Hundreds of Faked Autopsies Helps Defense Challenges*, 79 *A.B.A. J.* 24, 24 (Mar. 1993) (quoting Tommy J. Turner); *see also* Chip Brown, *Pathologist Accused of Falsifying Autopsies, Botching Trial Evidence Forensics*, *L.A. TIMES*, April 12, 1992, at A24 (“[F]ormer Dallas County assistant medical examiner Linda Norton was quoted as saying Erdmann routinely performs ‘made-to-order autopsies that support a police version of a story.’”).

⁸⁰ *McCarty v. State*, 765 P.2d 1215, 1219 (Okla. Crim. App. 1988). There, the court ultimately held that despite these concerns, it “could not conclude . . . that appellant has established the prosecution’s knowing use of false or misleading evidence.” *Id.*; *see also* *Bank of Nova Scotia v. United States*, 487 U.S. 250, 258 (1988) (“The District Court further concluded that one of the prosecutors improperly argued with an expert witness during a recess of the grand jury after the witness gave testimony adverse to the Government.”).

⁸¹ 667 F. Supp. 1456 (S.D. Fla. 1986), *aff’d*, 828 F.2d 670 (11th Cir. 1987).

misleading.”⁸² The expert claimed that the prosecutor had “pushed” him to enhance his testimony, a claim the prosecutor substantiated.⁸³

Consequently, removing the crime laboratory from police control still leaves a problem of prosecutorial influence, albeit perhaps lessened.

II. COUNTERARGUMENTS

There are several criticisms of the proposal for establishing independent laboratories, which are discussed in this Part.

A. *Integration with Police Investigative Function*

A forensic laboratory may play an important role in the early stages of a criminal investigation. As two commentators have noted: “Increasing the laboratory’s geographical or organizational remoteness . . . can limit the effectiveness of the laboratory’s participation in the investigative phases of a case, when its scientific input may have the greatest chance of contributing to justice.”⁸⁴ This argument raises a serious concern. However, homicide

⁸² *Id.* at 1459. The expert’s report of a gunshot residue test concluded that swabs “from the hands of Troedel and Hawkins contained antimony and barium in amounts typically found on the hands of a person who has discharged a firearm or has had his hands in close proximity to a discharging firearm.” *Id.* at 1458. The expert testified in accordance with this report at Hawkins’s trial but enhanced his testimony at Troedel’s trial, where he testified that “Troedel had fired the murder weapon.” *Id.* In contrast, during federal habeas proceedings, the *same* expert testified in a deposition that “he could not, from the results of his tests, determine or say to a scientific certainty who had fired the murder weapon” and “the differences in the amount of barium and antimony on the hands of Troedel and Hawkins were basically insignificant.” *Id.* at 1459. In granting habeas relief, the court “conclude[d] that the opinion Troedel had fired the weapon was known by the prosecution not to be based on the results of the neutron activation analysis tests, or on any scientific certainty or even probability. Thus, the subject testimony was not only misleading, but also was used by the State knowing it to be misleading.” *Id.* at 1459–60.

⁸³ *Id.* at 1459 (“[A]s Mr. Riley candidly admitted in his deposition, he was ‘pushed’ further in his analysis at Troedel’s trial than at Hawkins’ trial. . . . [A]t the . . . evidentiary hearing held before this Court, one of the prosecutors testified that, at Troedel’s trial, after Mr. Riley had rendered his opinion which was contained in his written report, the prosecutor *pushed* to ‘see if more could have been gotten out of this witness.’”).

⁸⁴ Jan S. Bashinski & Joseph L. Peterson, *Forensic Sciences, in* LOCAL GOVERNMENT: POLICE MANAGEMENT 559, 581 (William Geller & Darrel Stephens eds., 4th ed. 2004). Bashinski and Peterson state: “Remoteness also makes the police department less able to direct the efforts of the laboratory toward the cases that the department considers most important” *Id.*; see also Bales, *supra* note 7, at 55 (“[T]he relationship between labs and law enforcement has flourished because of practical benefits—for example, streamlining tasks such as close and timely communication, the transfer of evidence, and record-keeping.”); NDAA Statement, *supra* note 18 (“We believe that laboratories housed within government agencies and whose mission is focused on public safety are likely to be more responsive and accountable to those community needs than those situated otherwise.”).

detectives work closely with medical examiner officials in death investigations, and medical examiner offices are typically independent of the police.

B. *Practicability*

According to a 2005 census, there are now 389 publicly funded crime laboratories in the United States: 210 state or regional laboratories, eighty-four county laboratories, sixty-two municipal laboratories, and thirty-three federal laboratories.⁸⁵ Some of these laboratories are quite small: “The median staff size in 2005 was 16.”⁸⁶ This suggests that some laboratories could probably not exist as an independent entity.

C. *Funding*

Because underfunding of crime laboratories in this country is chronic, resources are always an issue.⁸⁷ The minority report of the Illinois Capital Punishment Commission argued that funding for the state laboratory would be jeopardized if it were separated from the police:

This new agency will have to compete with other, larger agencies for scarce state resources. Retaining the forensic laboratory system as part of the Illinois State Police provides an opportunity for achieving economies of scale and administration, as well as security in funding and accountability that might not otherwise be available for a much smaller, stand-alone agency left to fend for itself.⁸⁸

In contrast, the NAS Report assumed that laboratory independence would protect a laboratory’s budget. According to the report, law enforcement control “leads to significant concerns related to the independence of the laboratory and its budget.”⁸⁹ Under this view, independence would mean “the forensic science laboratories would be able to set their own budget priorities and not have to compete with the parent law enforcement agencies.”⁹⁰

⁸⁵ See MATTHEW R. DUROSE, BUREAU OF JUSTICE STATISTICS, CENSUS OF PUBLICLY FUNDED FORENSIC CRIME LABORATORIES 8 (2005), available at <http://bjs.ojp.usdoj.gov/content/pub/pdf/cpffcl05.pdf>.

⁸⁶ *Id.* at 2.

⁸⁷ See PRESIDENT’S COMMISSION ON LAW ENFORCEMENT AND ADMINISTRATION OF JUSTICE, THE CHALLENGE OF CRIME IN A FREE SOCIETY 255 (1967) (“[T]he great majority of police department laboratories have only minimal equipment and lack highly skilled personnel able to use the modern equipment now being developed”); NATIONAL ADVISORY COMMISSION ON CRIMINAL JUSTICE STANDARDS AND GOALS, REPORT ON POLICE 304 (1974) (“Too many police crime laboratories have been set up on budgets that preclude the recruitment of qualified, professional personnel.”).

⁸⁸ CAPITAL PUNISHMENT COMM., *supra* note 15, at 54.

⁸⁹ NAS REPORT, *supra* note 1, at 183–84.

⁹⁰ *Id.* at 184; see also SCHECK ET AL., *supra* note 14, at 257 (“Crime laboratory budgets should be independent from the police”).

Because of the diversity of crime laboratories and their funding structures, it is almost impossible to predict how funding would be affected if laboratories became independent.

D. Efficacy of Reform

The minority report of the Illinois Capital Punishment Commission also argued that an independent laboratory would not solve the problem of police influence. Because police and prosecutors use crime laboratories far more than defense attorneys do, the minority believed that close relationships were inevitable.⁹¹ There is some merit in this position. Yet there is a difference between working with someone, even extensively, and working with someone who is a superior (or works for a superior) within the same organization.

III. THE NAS PROPOSAL

The NAS Report recommends only that “administrative control” of the laboratory be removed from law enforcement agencies or prosecutors.⁹² The report went on to explain:

Ideally, public forensic science laboratories should be independent of or autonomous within law enforcement agencies. In these contexts, the director would have an equal voice with others in the justice system on matters involving the laboratory and other agencies. The laboratory also would be able to set its own priorities with respect to cases, expenditures, and other important issues.⁹³

In other words, the goal is for a laboratory to have sufficient autonomy to protect the integrity of the laboratory’s findings. As a byproduct of a laboratory controversy,⁹⁴ the Virginia legislature in 2005 made the Division of Forensic Science a separate department under the Secretary of Public Safety.⁹⁵ The

⁹¹ CAPITAL PUNISHMENT COMM., *supra* note 15, at 53 (“The reality is that no matter how ‘independent’ this separate state agency is, the bulk of its work will still be for police agencies and prosecutors. As is true today for the vast majority of cases, the forensic experts will be called to testify by the prosecution and these experts will undoubtedly continue to be subject to cross-examination for that testimonial history. As a result, an ‘independent’ laboratory will be subject to criticism as a ‘police/prosecutor’ lab even if it is not under the direct control and management of a police agency, because of the nature of its day to day work.”).

⁹² NAS REPORT, *supra* note 1, at 24 (“Congress should authorize and appropriate incentive funds . . . for the purpose of removing all public forensic laboratories and facilities from the administrative control of law enforcement agencies or prosecutors’ offices.”).

⁹³ *Id.* at 184.

⁹⁴ See Giannelli, *supra* note 27, at 192–95 (discussing the Earl Washington Jr. case where a mentally retarded man had been convicted of a rape-murder and spent seventeen years in prison, only to be pardoned based on DNA evidence that was erroneously interpreted by experts).

⁹⁵ VA. CODE ANN. § 9.1-1100 (2005) (changing Division of Forensic Science into the Department of Forensic Science). A Forensic Science Board and Scientific

laboratory had previously been under the Department of Criminal Justice Services. Although perhaps not a major change, this reorganization did increase laboratory autonomy.

The American Society of Crime Laboratory Directors proposed a different approach. That organization recommended that crime laboratories should not be removed “from parent agencies if the parent agency is required to document how crime laboratories have scientific autonomy with the freedom to conduct testing and report results without pressure from [external] activity, interest, or influence.”⁹⁶

In sum, the critical issue is for law enforcement and crime laboratories to acknowledge the problem and then to take steps to insulate the laboratory from improper influence.

IV. ADDITIONAL MEASURES

The problems raised by the law enforcement-crime laboratory relationship should also be addressed by the implementation of additional measures,⁹⁷ many of which appear as other recommendations in the NAS Report. As one commentator noted: “To the extent that we are aware of our vulnerability to bias, we may be able to control it. In fact, a feature of good scientific practice is the institution of processes—such as blind testing, the use of precise measurements, standardized procedures, statistical analysis—that control for bias.”⁹⁸

First, case files need to document the laboratory analysis. The lack of bench notes was a significant problem in the laboratory scandals. For example, the Chicago,⁹⁹ Houston,¹⁰⁰ and FBI explosives unit¹⁰¹ investigations all found inadequate documentation in forensic case files.¹⁰²

Advisory Committee were created at the same time. VA. CODE ANN. § 9.1-1109 & 1111 (2005).

⁹⁶ An Open Letter from the American Society of Crime Laboratory Directors to Senator Patrick Leahy Regarding the NAS Report, (March 17, 2009), in FORENSIC MAG. (April/May 2009), available at <http://www.forensicmag.com/articles.asp?pid=269>.

⁹⁷ See *Strengthening Forensic Science in the United States: Hearings Before the Comm. on the Judiciary, U.S. Senate*, 111th Cong., Sept. 9, 2009 (statement of Matthew Redle, County and Prosecuting Attorney, Sheridan County, Wyoming) (discussing the importance of implementing quality control measures in laboratories such as “laboratory accreditation and personnel certification programs . . . ; internal peer review procedures; maintenance of appropriate testing documentation to facilitate internal and external peer review of individual case testing; external and internal performance audits; regular proficiency testing as a check on both personnel and protocol performance; and corrective action procedures when proficiency testing or casework errors are discovered”).

⁹⁸ REDMAYNE, *supra* note 24, at 16 (footnote omitted).

⁹⁹ Letter from Professor George F. Sensabaugh, University of California at Berkeley, to Locke E. Bowman, The MacArthur Justice Center, University of Chicago Law School 5 (Oct. 16, 2003) (on file with author) (“Overall, the documentation of the lab work as described in the three pages of lab notes is inadequate and incomplete. Moreover, the formal lab reports describe results of testing for which there is no record

Second, bench notes should be recorded contemporaneously with the examination. Otherwise, the examiner is subject to “reconstructive effects.”¹⁰³

Third, protocols should address contextual bias by shielding examiners from information that is not germane to the examination.¹⁰⁴

Fourth, comprehensive laboratory reports are necessary.¹⁰⁵ Currently, laboratory reports often are “terse to the point of being indecipherable.”¹⁰⁶ For example, some laboratory reports provide only a brief statement of the results:

in the lab notes. In short, the documentation in this case falls short of accepted scientific standards.”).

¹⁰⁰ See MICHAEL R. BROMWICH, THIRD REPORT OF THE INDEPENDENT INVESTIGATOR FOR THE HOUSTON POLICE DEPARTMENT CRIME LABORATORY AND PROPERTY ROOM 28 (June 30, 2005) (“Among other problems it identified, the 2002 DPS audit found that no such written procedures [for case notes and lab reports] existed and identified numerous deficiencies in the documentation contained in the lab reports.”), available at <http://www.hpdlabinvestigation.org/reports/050630report.pdf>.

¹⁰¹ See 1997 I.G. REPORT, *supra* note 38 (recommending the preparation of adequate case files to support reports); Bales, *supra* note 7, at 57 (noting that one FBI examiner “testified that he had performed certain tests that were not described in his notes”).

¹⁰² See *Law v. State*, 307 S.E.2d 904, 908 (Ga. 1983) (Smith, J., dissenting) (“It is an insult to intelligent people to say that a scientific test was conducted from which absolutely no notes or records survive. . . . A basic principle of scientific testing is that careful records of test procedure and results are to be scrupulously maintained. A scientific test without an accompanying report of the testing environment, number of trials, raw results and analyzed data is in reality no test at all.”).

¹⁰³ See *supra* notes 53–54 and accompanying text.

¹⁰⁴ ABA DNA Standard 16-3.1(a)(v) recommends laboratories “follow procedures designed to minimize bias when interpreting test results.” ABA DNA STANDARDS, *supra* note 11, at 6. Additionally, “[c]ognitive bias (e.g., observer effects) occurs because people tend to see what they *expect* to see, and this typically affects their decisions in cases of ambiguity.” *Id.* at 67. See also NAS REPORT, *supra* note 1, at 26 (Recommendation 8: “Forensic laboratories should establish routine quality assurance and quality control procedures to ensure the accuracy of forensic analyses and the work of forensic practitioners. Quality control procedures should be designed to identify mistakes, fraud, and bias; confirm the continued validity and reliability of standard operating procedures and protocols; ensure that best practices are being followed; and correct procedures and protocols that are found to need improvement.”).

¹⁰⁵ ABA DNA Standard 16-3.3 recommends the use of comprehensive laboratory reports. ABA DNA STANDARDS, *supra* note 11, at 7. The Journal of Forensic Sciences, the official publication of the American Academy of Forensic Sciences, published a symposium on the ethical responsibilities of forensic scientists in 1989. Symposium, *Ethical Conflicts in the Forensic Science*, 34 J. FORENSIC SCI. 717 (1989). One article discussed a number of laboratory reporting practices, including (1) “preparation of reports containing minimal information in order not to give the ‘other side’ ammunition for cross-examination,” (2) “reporting of findings without an interpretation on the assumption that if an interpretation is required it can be provided from the witness box,” and (3) “[o]mitting some significant point from a report to trap an unsuspecting cross-examiner.” Douglas M. Lucas, *The Ethical Responsibilities of the Forensic Scientist: Exploring the Limits*, 34 J. FORENSIC SCI. 719, 724 (1989). Lucas was the Director of the Centre of Forensic Sciences, Ministry of the Solicitor General, Toronto, Ontario. *Id.* at 719.

¹⁰⁶ Bales, *supra* note 7, at 56.

“e.g., ‘The green, brown plant material in item # 1 was identified as marijuana.’”¹⁰⁷ In its recent decision, *Melendez-Diaz v. Massachusetts*,¹⁰⁸ the Supreme Court noted that the report in that case contained

only the bare-bones statement that ‘[t]he substance was found to contain: Cocaine.’ At the time of trial, petitioner did not know what tests the analysts performed, whether those tests were routine, and whether interpreting their results required the exercise of judgment or the use of skills that the analysts may not have possessed.¹⁰⁹

Fred Zain,¹¹⁰ Joyce Gilchrist,¹¹¹ and Pam Fish,¹¹² among others, omitted critical information from their reports.

Fifth, the reporting of test results should be accompanied by an explanation of the significance of any finding.¹¹³ A recent investigation of forensic testimony in DNA exoneration cases revealed that some experts gave misleading testimony by omitting critical information.¹¹⁴

¹⁰⁷ NAS REPORT, *supra* note 1, at 186.

¹⁰⁸ 129 S. Ct. 2527 (2009). The Court held that admission of a laboratory certificate identifying a substance as cocaine, in the absence of an opportunity to cross-examine the analyst, violated the Confrontation Clause. *Id.* at 2532.

¹⁰⁹ *Id.* at 2537 (citations omitted).

¹¹⁰ *In re* Investigation of the W. Va. State Police Crime Lab., Serology Div., 438 S.E.2d 501, 503 (W. Va. 1993) (stating Zain “fail[ed] to report conflicting results” and “fail[ed] to conduct or to report conducting additional testing to resolve conflicting results”).

¹¹¹ *Mitchell v. Gibson*, 262 F.3d 1036, 1064 (10th Cir. 2001) (“Ms. Gilchrist thus provided the jury with evidence implicating Mr. Mitchell in the sexual assault of the victim which she knew was rendered false and misleading by evidence withheld from the defense.”); *McCarty v. State*, 765 P.2d 1215, 1218 (Okla. Crim. App. 1988) (“[T]he forensic report was at best incomplete, and at worst inaccurate and misleading. . . . Gilchrist admitted at trial, however, that she failed to include her conclusion . . . in the forensic report given to Mr. Wilson. This significant omission, whether intentional or inadvertent, resulted in a trial by ambush . . .”) (citations omitted).

¹¹² See SCHECK ET AL., *supra* note 14, at 125 (“Fish’s misleading testimony in the Willis case, which led to the conviction of an innocent man and allowed a predator to continue roaming the streets, shows why the state should have turned over all of Fish’s laboratory notes and data, rather than merely presenting her final report.”).

¹¹³ See FORENSIC ANALYSIS: WEIGHING BULLET LEAD EVIDENCE 110–11 (2004) (“The conclusions in laboratory reports should be expanded to include the limitations of compositional analysis of bullet lead evidence. . . . Moreover, a section of the laboratory report translating the technical conclusions into language that a jury could understand would greatly facilitate the proper use of this evidence in the criminal justice system.”).

¹¹⁴ See Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1 (2009). The study identified several different types of invalid testimony: (1) presenting non-probative evidence as probative, (2) discounting exculpatory evidence, (3) using inaccurate frequencies or statistics, (4) providing a statistic without support, (5) providing non-numerical statements without empirical support, and (6) attributing the source of evidence to the defendant. *Id.* at 16–20.

Sixth, examiners should be prohibited from testifying beyond the laboratory report (unless a supplemental report is issued), a requirement that would protect against overreaching by prosecutors¹¹⁵ and preclude the opportunity for improper embellishments.

Finally, an enforceable code of ethics should be adopted.¹¹⁶

Enforcement of these procedures can be effectuated through accreditation. For example, the American Society of Crime Lab Directors/Laboratory Accreditation Board requires quality assurance programs—i.e., proficiency testing, technical reviews, audits, and corrective action procedures.¹¹⁷ The NAS Report recommends mandatory accreditation of laboratories and the certification of examiners.¹¹⁸

Legal procedures such as full pretrial discovery¹¹⁹ and the availability of defense experts also are important protections.¹²⁰ Not only do they serve due process norms, they also are quality control mechanisms. Laboratory personnel should understand that the required documentation generated by the examination will be turned over to the defense and may be reviewed by defense experts.

CONCLUSION

Law enforcement influence over laboratory decisions is a serious problem. In an ideal world, independent crime laboratories would be the solution. Crime laboratories, however, have historically developed within police agencies, and

¹¹⁵ See *supra* notes 76–83 and accompanying text.

¹¹⁶ See NAS REPORT, *supra* note 1, at 26 (Recommendation 9 urges the establishment of “a national code of ethics for all forensic science disciplines and encourage[s] individual societies to incorporate this national code as part of their professional code of ethics.”).

¹¹⁷ See ASCLD/LAB BYLAWS 1 (2008), available at http://www.asclclab.org/about_us/bylaws.html.

¹¹⁸ NAS REPORT, *supra* note 1, at 25 (Recommendation 7: “Laboratory accreditation and individual certification of forensic science professionals should be mandatory, and all forensic science professionals should have access to a certification process.”).

¹¹⁹ See generally PAUL C. GIANNELLI & EDWARD J. IMWINKELRIED, SCIENTIFIC EVIDENCE 145–211 (4th ed. 2007) (discussing shortcomings of criminal discovery).

¹²⁰ The minority report of the Illinois Capital Punishment Commission believed that instead of an independent lab, a better solution “would be provided by state funding for the creation of a permanent cadre of forensic experts available to defense attorneys for consultation and review of forensic and scientific evidence.” CAPITAL PUNISHMENT COMM., *supra* note 15, at 54. “Such a group of permanently retained experts would provide a ready and consistent resource for information and assistance to defense attorneys (both privately retained and publicly appointed) about complicated areas of science that are not usually taught in law schools or easily understood.” *Id.*; see generally Paul C. Giannelli, *Ake v. Oklahoma: The Right to Expert Assistance in a Post-Daubert, Post-DNA World*, 89 CORNELL L. REV. 1305 (2004) (discussing the need to bolster the right to defense experts).

decades of entrenchment make it difficult to remove laboratories completely from law enforcement control.¹²¹

This does not mean, of course, that the status quo should be preserved. If located within law enforcement agencies, forensic laboratories should be as autonomous as possible and should be run in accordance with scientific norms, including procedures to protect against all types of bias. The NAS Report was not the last messenger. Within months of the report's release, the Supreme Court wrote that "[f]orensic evidence is not uniquely immune from the risk of manipulation."¹²²

¹²¹ See Risinger et al., *supra* note 25, at 43 ("The establishment of freestanding government forensic laboratories, though occasionally advocated, would require such a revolution in thinking and organization, and diminish so many established bureaucratic empires, that it would take a generation of patient lobbying to have a chance of success.") (citation omitted).

¹²² *Commonwealth v. Melendez-Diaz*, 129 S. Ct. 2527, 2536 (2009) (citing the NAS Report).