THE MISMATCH BETWEEN TWENTY-FIRST-CENTURY FORENSIC EVIDENCE AND OUR ANTIQUATED CRIMINAL JUSTICE SYSTEM

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ABSTRACT

The shortcomings of forensic evidence in the criminal justice system are now well known. But most scholarly attention has concentrated on "first-generation" forensic techniques such as hair or pattern analysis, bite marks, firearms, and ballistics. Moreover, most of the attention has centered on the investigative process, specifically the collection and analysis of evidence. This Essay turns the critical lens on scientific evidence in a different direction. It focuses on "second-generation" technologies—such as location tracking, biometrics, digital forensics, and other database-driven techniques, and it scrutinizes the adjudicative system—the "bail to jail" stream—rather than the investigative process. Ultimately, this Essay argues that almost every aspect of the adversarial process, as currently conceived, is ill-suited to ensuring the integrity of high-tech evidence. Specifically, the adversarial model demands individualized rather than collective inquiries, embraces secrecy rather than transparency, and privileges viva voce evidence over other forms of fact-gathering. Furthermore, it heavily depends upon the skill of counsel and in-court confrontation rather than out-of-court oversight and structural reform to address problems related to evidentiary integrity, and

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adopts rigid rules of finality grounded in part on an assumption that proof is always inconclusive. This Essay concludes that the eighteenth-century model of justice may be ill-suited to twenty-first-century evidence, and offers recommendations for a more reliable factfinding system.

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I. INTRODUCTION

In April 2013, two bombs exploded at the Boston Marathon, riveting the attention of the entire country.[1] In the days following, the nation watched as the search for the suspects unfolded in real-time, culminating in the death of one suspect, Tamerlan Tsarnaev, and the arrest of the other, his brother Dzhokhar. The pursuit of the Tsarnaev brothers was a showcase of twenty-first-century policing tools. The investigation included digital images from public cameras, biometric facial recognition software, searches of social media accounts such as the Russian equivalent of Facebook and Twitter, cell phone location-tracking technology, and DNA sampling.[2] Of course, this list reflects only that which was reported by the media—likely much more went on behind the scenes.

Given the seriousness of the crimes, it is only natural that the Boston

1. *See* Katherine Q. Seelye, William K. Rashbaum & Michael Cooper, *2nd Bombing Suspect Caught After Frenzied Hunt Paralyzes Boston*, N.Y. TIMES (Apr. 20, 2013), http://www.nytimes.com/2013/04/20/us/boston-marathon-bombings.html (detailing the manhunt for the Boston Marathon bombing suspects).

2. Globe Staff, *102 Hours in Pursuit of Marathon Suspects*, BOS. GLOBE (Apr. 28, 2013), http://www.bostonglobe.com/metro/2013/04/28/bombreconstruct/VbSZhzHm35yR88EVmVdbDM/story.html.

investigation utilized state-of-the-art policing techniques. But make no mistake about it: high-tech proof of this kind has become commonplace in everyday criminal cases. Police investigations tend to remain secret until a suspect is placed under arrest, and technologies used for investigative purposes may never see the light of a courtroom or even discovery packet, but consider a snapshot of a few public facts. In 2011, cell phone carriers responded to roughly 1.3 million law enforcement requests for consumers' cell phone records.[3] In the first six months of 2013, U.S. legal authorities submitted to Google over 10,000 requests for user data and over 21,000 requests for user account information in connection with domestic criminal investigations.[4] And of course the national DNA database contains well over 10 million samples[5] and is only growing, especially after the Supreme Court's ruling in *Maryland v. King*.[6]

The digitization of evidence is a popular topic of discussion among criminal procedure scholars. Much ink,[7] some of it mine,[8] has been spilled

3. Eric Lichtblau, *More Demands on Cell Carriers in Surveillance*, N.Y. TIMES (July 8, 2012), http://www.nytimes.com/2012/07/09/us/cell-carriers-see-uptick-in-requests-to-aid-surveillance.html?pagewanted=all&_r=0.

4. User Data Requests, GOOGLE TRANSPARENCY REP., http://www.google.com/transparencyreport/userdatarequests/US/?metric=targets (last visited Feb. 15, 2014). Apple has apparently received so many requests by law enforcement agencies to unlock cell phones that it has a waiting list. Declan McCullagh, *Apple Deluged by Police Demands to Decrypt iPhones*, CNET (May 10, 2013), http://news.cnet.com/8301-13578_3-57583843-38/apple-deluged-by-police-demands-to-decrypt-iphones/.

5. *National DNA Index Statistics*, FED. BUREAU INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/ndis-statistics (last visited Feb. 15, 2014).

6. Maryland v. King, 133 S. Ct. 1958, 1980 (2013) (holding that officers may constitutionally take and analyze an arrestee's DNA when the arrest is "supported by probable cause to hold for a serious offense and they bring the suspect to the station to be detained in custody").

7. *See, e.g.*, CHRISTOPHER SLOBOGIN, PRIVACY AT RISK 169–80, 201–03 (2007) (evaluating current authorization standards for transaction surveillance and criticizing recent congressional legislation as inadequate and unclear); Orin S. Kerr, *The Fourth Amendment and New Technologies: Constitutional Myths and the Case for Caution*, 102 MICH. L. REV. 801, 805, 857–87 (2004) (arguing that, despite popular views of the Fourth Amendment to the contrary, legislatures rather than courts possess greater institutional capabilities to prescribe rules governing privacy and new technologies); Katherine J. Strandburg, *Home, Home on the Web and Other Fourth Amendment Implications of Technosocial Change*, 70 MD. L. REV. 614, 622, 650–79 (2011) (arguing that the Fourth Amendment "requires that conceptions of the home and office be extended to encompass certain digital social contexts").

8. *See generally, e.g.*, Erin Murphy, *The Politics of Privacy in the Criminal Justice System: Information Disclosure, the Fourth Amendment, and Statutory Law Enforcement Exemptions*, 111 MICH. L. REV. 485 (2013) (examining the operation of federal privacy statutes with respect to law enforcement and the Fourth Amendment); Erin Murphy, *The Case Against the Case for Third-Party Doctrine: A Response to Epstein and Kerr*, 24 BERKELEY TECH. L.J. 1239 (2009) (critiquing Richard Epstein's and Orin Kerr's criticisms of Fourth Amendment third-party doctrine); Erin Murphy, *Paradigms of Restraint*, 57 DUKE L.J. 1321 (2008) (arguing that understandings of restraint fail to account for privacy concerns posed by surveillance technologies).

in an effort to conceptualize Fourth and Fifth Amendment doctrines for the technological age. But the inquiry in this Essay is different: it aims to think about high-tech evidence as it affects the adjudicative system and factfinding processes, rather than investigative methods. Namely, this Essay focuses on how the procedural and evidentiary rules used to determine culpability interact with this new form of evidence.

Of course, many of the applicable rules—covering topics like discovery, plea bargaining, and postconviction processes—are highly localized to particular jurisdictions. To be clear, it is not an objective of this Essay to provide a comprehensive survey of these rules in each area. Rather, this Essay uses constitutional and federal rules of evidence and criminal procedure as a foundation from which to examine adjudicative processes more generally. Accordingly, not every assertion will be true for every jurisdiction, but it is worth observing that no jurisdiction follows rules that fully address the criticisms raised in this Essay. In the end, the aim of the Essay is less to promote the reform of a specific code than it is to surface the latent conflict between our traditional rules of adversarial process and twenty-first-century scientific evidence.

The Essay proceeds in two parts: The first part defines the kind of high-tech evidence at issue and describes how it differs from conventional forms of evidence like eyewitness testimony, confessions, or even older forms of physical forensic evidence. The second part walks through seven stages of the adjudicatory process and explains why the rules governing each of these stages are ill-suited to the needs of new evidentiary forms. To be sure, much of what this Essay reports is not novel—many people have written about these issues in isolation. Instead, the chief goal of this Essay is to build a complete picture of a system that fails, deeply and pervasively, to adeptly handle this kind of evidence.

II. SECOND-GENERATION EVIDENCE

In an earlier article titled *The New Forensics*,[9] I grappled with the problem of safeguarding the integrity of new, high-tech forms of evidence. That piece coined the phrase "second generation forensic evidence" to refer to information gleaned from cell-site location and global position system ("GPS") tracking methods, biometric systems such as facial recognition and DNA, and other kinds of data mining, including those that draw from social media websites and search engines. *The New Forensics* attempted to

9. Erin Murphy, *The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence*, 95 CALIF. L. REV. 721, 726–31 (2007).

define the class characteristics of this new category of evidence in comparison to earlier forms of physical evidence.[10]

For purposes of this Essay, three features of second-generation or "2G" evidence, as identified in *The New Forensics*, are important:

(1) 2G evidence is *database-dependent*. In other words, unlike conventional evidence, which is specific to an incident, 2G evidence relies upon large-scale collections of data to obtain or provide meaning to evidence.

(2) 2G evidence is developed fully or in part with the aid of *private sector* entities. In other words, 2G evidence is generated not just with public sector or government goals in mind, but also to benefit private, for-profit, and proprietary interests.

(3) 2G evidence is *technologically and mechanically sophisticated*. It requires complex and sophisticated knowledge and instrumentation to understand or interpret it.

To illustrate these three points, consider the example of location-tracking data gleaned by law enforcement from a cell phone GPS unit. As to the *database-dependency*, tracking an individual requires large databases of several kinds—for instance, one containing the records of cell phone users that can then be searched and mined for information, and another compiling the underlying geophysical architecture that gives meaning to that information. In other words, one database says where your cell phone has been as a function of signals, and another database assigns meaning to those signals by overlaying them on a geographic map. As to the *private sector* influence, private interests have been the primary force in developing commercial location-tracking capacities. These interests may emanate from the cell phone companies that make physical instruments and transmit signals, the creators of mapping software, and even the contractors that translate for the commercial sector government satellite technology initially developed for military use.[11] As to *technological and mechanical sophistication*, GPS location data is obviously complex—the ordinary person does not know exactly how cell phones get their map information, or how they know where to put a little blue dot on a map, or what information is kept and stored by which companies. The average intelligent person may look at the little blue dot and think "that's where I am" or "that

10. *Id.*

11. *See* Ian Herbert, *Where We Are with Location Tracking: A Look at the Current Technology and the Implications on Fourth Amendment Jurisprudence*, 16 BERKELEY J. CRIM. L. 442, 469–76 (2011) (describing the origins of various satellite technologies).

is *not* where I am." But that person will probably be unable to fix any error directly, explain that Google Maps thinks the user is driving in the middle of a lake due to a signal delay caused by atmospheric conditions, or discover that the receiver made a measurement mistake.[12]

Although the above example involves GPS technologies, the same fundamental characteristics define an array of new technological evidence, ranging from facial recognition techniques to license plate scanners to EZ-Pass or FasTrak payment systems to DNA testing. Each of these technologies is database-dependent, developed through public-private partnering, and highly mechanically and intellectually sophisticated.

Significantly, these characteristics place 2G evidence in sharp contrast with conventional evidence. Traditional forms of evidence such as eyewitness testimony, confessions, and even first-generation or "1G" forensic sciences like fiber or ballistics analysis tend not to possess these traits. They rely on individualized rather than aggregate data, have no nexus to private-sector development, and lack mechanical and intellectual sophistication.[13] Why does this matter? It matters because, in several important respects, the adversarial rules underlying the criminal justice system assume that evidence possesses 1G characteristics. Stated another way, the system assumes that evidence is individualized to a particular suspect, handled largely by publicly employed and accountable actors like prosecutors and police, and intuitively accessible and understandable by laypeople. But as the next part explains, this conflict between the nature of evidence as imagined by the adjudicative system and the actual traits of 2G evidence thwarts the system's capacity to safeguard the accuracy and integrity of the factfinding process.

III. THE PROBLEMS IN THE PROCESS

There are seven important stages of the adjudicative process that falter with respect to high-tech or 2G evidence. In separate sections below, this Essay addresses each of them: (A) evidence collection and preservation, (B) discovery, (C) the provision of assistance of counsel, (D) confrontation, (E) plea bargaining, (F) the presentation of evidence at trial, and (G) the rules governing postconviction proceedings. Each section addresses how the conventional rules fail, and offers cursory thoughts about alternative regimes.

12. *Id.* at 475 (describing that "GPS is not 100 percent accurate because of clock errors, atmosphere delay or receiver measurement errors"); *id.* (referring to a Federal Aviation Administration report that found its signal was off roughly 5 percent of the time).

13. Murphy, *supra* note 9, at 726–31.

A. EVIDENCE COLLECTION AND PRESERVATION

To begin, consider the rules governing the collection and preservation of evidence. Typically, a defendant has virtually no right to have particular evidence collected and preserved. Instead, these tasks fall largely within the purview of the government, as a corollary to its burden of proof and persuasion. In fact, the notion that the building of the government's case is entirely its own prerogative is so strong that in *Old Chief v. United States* the Supreme Court enshrined it as a quasi-constitutional right of the *state*.[14]

Consistent with this view, the Court has defined the scope of the defendant's right to demand collection and preservation of evidence in extremely narrow terms that defer almost entirely to government discretion. For instance, the Supreme Court in *Arizona v. Youngblood*[15] announced a parsimonious standard for what, in the Court's words, "might loosely be called the area of constitutionally guaranteed access to evidence."[16] In that case—notorious because the defendant was later exonerated by DNA testing[17]—Youngblood argued that his right to due process was violated by the state's failure to properly preserve semen samples from the victim's clothes and body.[18] Youngblood's second complaint, less often studied by proceduralists, was that due process was further violated by the state's failure to conduct a timely examination.[19] In other words, he argued that had the state immediately tested the samples it collected, it could have found exculpatory evidence.

Rejecting both claims, the Supreme Court held that the Constitution only forbids failure to collect or preserve evidence when done in *bad faith*.[20] Bad faith, moreover, should be judged by the "police's knowledge

14. Old Chief v. United States, 519 U.S. 172, 186–89 (1997) (describing the "familiar, standard rule that the prosecution is entitled to prove its case by evidence of its own choice").

15. Arizona v. Youngblood, 488 U.S. 51 (1988).

16. *Id.* at 55 (quoting United States v. Valenzuela-Bernal, 458 U.S. 858, 867 (1982)) (internal quotation marks omitted).

17. *Know the Cases: Larry Youngblood*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Larry_Youngblood.php (last visited Oct. 17, 2013) ("In 2000, upon request from his attorneys, the police department tested the degraded evidence using new, sophisticated DNA technology. Those results exonerated Youngblood, and he was released from prison in August 2000. The district attorney's office dismissed the charges against Larry Youngblood that year.").

18. *Youngblood*, 488 U.S. at 52.

19. *Id.* at 54, 58.

20. *Id.* at 58. In reaching its conclusion, the Court extended holdings from cases involving the state's failure to preserve DUI breath samples and the state's deportation of defendant's witnesses. *Id.* at 56–57 (citing California v. Trombetta, 467 U.S. 479 (1984) and United States v. Lovasco, 431 U.S. 783 (1977)).

of the exculpatory value of the evidence at the time it was lost or destroyed."[21] This narrow standard, as applied by courts, has excused almost every decision not to collect or preserve evidence. Proof of bad faith requires more than just, "That is the knife used at the scene—nah, we do not need to collect it." Instead, bad faith requires a showing more like, "There is the bloody knife! Wipe that off so that we can use it to cut our sandwiches for lunch."[22]

By limiting situations meriting redress to only those involving bad faith, *Youngblood* had to deliberately distinguish preservation and collection of evidence from the well-established disclosure rules articulated in *Brady v. Maryland*.[23] The *Brady* rule recognizes a constitutional violation, without any showing of bad faith, in the withholding of material exculpatory evidence.[24] Thus, to find that the destruction of clothing and intimate swabs was constitutional, the Court in *Youngblood* had to rule that the evidence was *not* material exculpatory evidence. As a result, even if a defendant has a constitutional right to exculpatory evidence, that right extends only to evidence that appears to be exculpatory *on its face*; it affords no basis for a claim to collect or preserve certain evidence.

Importantly, Y*oungblood* is not simply a product of its time. Although that case was decided in 1988, at the cusp of the technological era, the Court affirmed its principles as recently as 2004, when it decided per curiam in *Illinois v. Fisher*[25] that destruction of evidence, even in the face of a pending discovery request in an open case delayed due to the defendant's flight, did not violate due process.

Youngblood is emblematic of the disconnect between conventional views of the factfinding process and the reality of 2G evidence today. The justifications given in *Youngblood* for not imposing a more rigorous standard were two-fold. First, the Court feared the "treacherous task of divining the import of materials whose contents are unknown and, very

21. *Id.* at 56 n.* (comparing Napue v. Illinois, 360 U.S. 264, 269 (1959)).

22. *See* Cynthia E. Jones, *Evidence Destroyed, Innocence Lost: The Preservation of Biological Evidence Under Innocence Protection Statutes*, 42 AM. CRIM. L. REV. 1239, 1246, 1247 n.43 (2005) (describing the *Youngblood* standard as "an almost insurmountable burden" and noting *Guzman v. State*, 868 So. 2d 498, 509 (Fla. 2003), in which the government did not act in bad faith even though it defied local procedural rules and destroyed evidence without written authorization).

23. *Youngblood*, 488 U.S. at 55 (discussing Brady v. Maryland, 373 U.S. 83 (1963)).

24. Brady v. Maryland, 373 U.S. 83, 87 (1963) ("[T]he suppression by the prosecution of evidence favorable to an accused upon request violates due process where the evidence is material either to guilt or to punishment, irrespective of the good faith or bad faith of the prosecution.").

25. Illinois v. Fisher, 540 U.S. 544, 545–46, 548 (2004).

often, disputed."[26] And second, the Court was reluctant to impose an absolute duty to preserve and maintain material evidence given the volume of things that could have "conceivable evidentiary significance in a particular prosecution."[27] In other words, it was simply too administratively unworkable to impose a standard of evidence collection on the government. When there is so much evidence from which to choose, it is impossible to discern precisely which evidence might be important or why, and collection of every item of imaginable value simply is not feasible.

So what is wrong with this standard today? Everything. In 1980, it might have made sense to think that police officers could have trouble identifying every conceivably useful piece of evidence. It might have been logical to think they would not have the wherewithal to conduct exhaustive tests and that, even if tested, the results would be marginally useful at best. To be sure, there may have been instances in which the state's failure to get a statement from a witness or to preserve a particular piece of evidence placed a defendant at a disadvantage, but these cases were justly viewed as atypical. The missing evidence, while important, probably did not provide wholly dispositive proof of the defendant's guilt or innocence. Moreover, such evidence was perhaps less likely to be uniquely within the control of the government; defendants and their counsel often had fairly equal access to witnesses or evidence related to the incident that investigators had overlooked.

But we know that this is not the case today. Failure to secure a digital image before it is erased or to preserve a sweat-soaked baseball cap may be the difference between accurate and wrongful accusation, conviction, and acquittal. Moreover, much of 2G evidence is ephemeral and uniquely accessible to first responders to a crime scene. Video surveillance tapes run on loops that automatically erase, and biological evidence can degrade or be compromised rather quickly. Even 2G proof in more enduring forms—like deleted text messages or electronic toll payment systems—may be more readily obtained by law enforcement than by defense counsel, who often must wait until formal charging or the setting of a trial date to leverage the subpoena power and who also lack the coercive authority of police.

Yet evidence collection and preservation continues to be left almost entirely to the discretion of police. Perhaps as a result, the rate of

26. *Youngblood*, 488 U.S. at 58 n.6 (quoting California v. Trombetta, 467 U.S. 479, 486 (1984)) (internal quotation marks omitted).

27. *Id*. at 58.

collection, submission, and analysis of crime scene evidence is abysmally low. According to one recent study, homicide is the only offense for which physical evidence is routinely collected, submitted to crime laboratories, and examined.[28] Even for serious offenses such as burglary, aggravated assault, or robbery, the study found that evidence is submitted to crime laboratories in fewer than 15 percent of cases and examined by laboratories in fewer than 10 percent of cases.[29] These low rates of evidence examination are particularity disturbing in light of other studies that show that paying closer attention to crime scenes leads to both greater evidence collection and more closed cases.[30]

In addition, the reasons for which we might have previously raised the standard to "bad faith" for law enforcement actors in their evidence-collecting roles no longer hold as much water today. In the past, we may have assumed that law enforcement officers had little formal training in evidence collection, were responding to scenes primarily to resolve confrontations, and had competing responsibilities that might pull them away from devoting meticulous attention to a scene. When evidence collection was such a tertiary responsibility, the "malfeasance/accident" frame fits.

In contrast, today there are, or ought to be, dedicated crime scene investigators tasked and trained for that responsibility alone. They should operate outside of the "exigencies of law enforcement" model, and instead within a professional structure that places constitutional importance on

28. JOSEPH PETERSON ET AL., THE ROLE AND IMPACT OF FORENSIC EVIDENCE IN THE CRIMINAL JUSTICE PROCESS 8 (2010), *available at* https://www.ncjrs.gov/pdffiles1/nij/grants/231977.pdf (comparing rates of evidence submission and evidence examination for different types of crimes). *See also* TOM MCEWEN, THE ROLE AND IMPACT OF FORENSIC EVIDENCE IN THE CRIMINAL JUSTICE SYSTEM 48 (2011), *available at* https://www.ncjrs.gov/pdffiles1/nij/grants/236474.pdf (reporting similarly low rates of collection, submission, and analysis).

29. PETERSON ET AL., *supra* note 28, at 8.

30. *See id.* at 8 ("Post-arrest, the predictive power of forensic evidence varied by crime type and criminal justice outcome. Lab examined evidence was a significant predictor of case charges for aggravated assault and rape. Forensic evidence also was associated with sentence length for assault and homicide."); MCEWEN, *supra* note 28, at 41–49, 92, 102 (reporting on a study of Denver and two other major cities and finding greater likelihood of closing cases and lengthier sentences when forensic evidence is part of the case); KEVIN J. STROM ET AL., THE 2007 SURVEY OF LAW ENFORCEMENT EVIDENCE PROCESSING § 3-2 (2009), *available at* https://www.ncjrs.gov/pdffiles1/nij/grants/228415.pdf (reviewing the role of law enforcement in processing and analyzing forensic evidence); JOHN K. ROMAN ET AL., URBAN INST., THE DNA FIELD EXPERIMENT: COST-EFFECTIVENESS ANALYSIS OF THE USE OF DNA IN THE INVESTIGATION OF HIGH-VOLUME CRIMES 4 (2008), *available at* http://www.urban.org/UploadedPDF/411697_dna_field_experiment.pdf (finding that suspects were "identified in 31 percent of cases where biological evidence was present and analyzed," compared to being identified in 12 percent of cases "where the biological evidence was collected but not tested").

their competence. But even in the absence of dedicated crime scene investigators, today's ordinary beat officer can recognize the value of 2G evidence. Recall, after all, the pervasive prosecutorial complaints about the "CSI Effect,"[31] which suggests that even ordinary jurors know how important 2G evidence can be to the accurate resolution of factual disputes. In such a world, a police officer's determination about what to collect and preserve requires far less wading into "treacherous" subjective waters.

Lastly, whereas in the past storing and processing evidence might have necessitated special attention, those tasks should be routine for modern police departments. Police departments should adopt practices and protocols for the most recurring and fundamental forms of 2G evidence, so that all officers know that checking for certain materials is as standard as canvassing for witnesses. It is simply absurd to suggest that, in the twenty-first century, police have no duty to collect and preserve a rape kit after an allegation of sexual assault or to save the images from a security camera located at the scene.

Relatedly, the obligation of law enforcement agencies to collect and preserve evidence should also carry the obligation of timely testing. This point arises again with respect to rules governing discovery and plea bargaining, but it suffices here to say that currently there is essentially *no* right for defendants to have collected evidence analyzed or tested, much less in a timely fashion. In the DNA context, studies have shown that very little evidence is tested when it is most needed: during pretrial bargaining and discovery phases.[32] Instead, evidence is often only tested once the case is imminently approaching trial, whereupon the prosecutor frantically calls the laboratory to seek expedited examination.

As a result, two injustices occur. The first is that defendants may endure public accusation, pretrial detention, or even conviction when timely testing of scientific evidence could have exculpated them. That is what happened to a Florida man named Cody Davis.[33] Davis was misidentified as a robber and found guilty at trial. Four months later, when the state finally got around to testing evidence collected in the case, he was

31. *See* Simon A. Cole & Rachel Dioso-Villa, *CSI and Its Effects: Media, Juries, and the Burden of Proof*, 41 NEW ENG. L. REV. 435, 441–42 (2007) (defining the CSI Effect as the belief that shifts from circumstantial evidence to scientific, forensic evidence in American crime-drama television shows may affect jury decisionmaking).

32. PETERSON ET AL., *supra* note 28, at 122 ("Consequently, it is clear that criminal justice officials external to the laboratory screen much of the forensic evidence and have a major influence on evidence examination priorities and practices.").

33. *Know the Cases: Cody Davis*, INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Cody_Davis.php (last visited Feb. 15, 2014).

exonerated postconviction.[34] Timely testing of evidence would have not only prevented Davis's wrongful incarceration and conviction, but it also might have pointed law enforcement in the direction of the actual perpetrator.

The second injustice arises even when evidence inculpates a defendant. If defense counsel does not receive notice of scientific results or proposed testimony in a timely fashion, a meaningful challenge of such evidence is effectively precluded. As the next subpart discusses at greater length, all too often discovery rules fail to impose an affirmative duty on the government to disclose all of the results of expert testing, or limit disclosure to threadbare recitations of evidence intended for use by the government or "material" to the defense.[35]

The next subpart deals more directly with these latter concerns, yet imagine for a moment an alternative regime. Suppose we acknowledged the incredibly important and often dispositive role played by physical evidence in the 2G world. Suppose we told police departments that, at a minimum, they are required to seek, collect, and preserve such evidence,[36] and to do so *promptly* when there is a reasonable indication that the evidence might be beneficial to the factfinding process. Suppose we required that such evidence be tested in a timely manner, as well as imposing affirmative duties to disclose the results of *all* testing. And add to that an affirmative right for defendants to access and test evidence, in confidence, themselves.[37]

Some states have begun to undertake just these kinds of reforms.[38] Nevertheless, evidence collection and retention policies tend to vary widely, and enforcement of existing rules can be spotty.[39] For instance, a decade or so ago the majority of states, along with the federal government, enacted innocence protection statutes, but those laws have several

34. *Id.*

35. *See infra* Parts III.B–.C.

36. *See, e.g.*, Norman C. Bay, *Old Blood, Bad Blood, and* Youngblood*: Due Process, Lost Evidence, and the Limits of Bad Faith*, 86 WASH. U. L. REV. 241, 242, 311 (2008) (proposing abandonment of the *Youngblood* standard).

37. *Cf.* Daniel Givelber, *Meaningless Acquittals, Meaningful Convictions: Do We Reliably Acquit the Innocent?*, 49 RUTGERS L. REV. 1317, 1376–77 (1997) ("[T]he defendant's 'right' to DNA testing, assuming suitable samples have been preserved, is contingent upon a court's willingness to order the testing. Some courts believe that it is beyond their authority to issue such an order. Other courts require a very significant showing prior to granting such a request." (footnotes omitted)).

38. Jones, *supra* note 22, at 1242–46 (describing state evidence management policies but noting that they are inconsistently implemented).

39. *Id.*

limitations.[40] In essence, they are meant to give *convicted* offenders access to DNA testing. As a result, these laws tend to apply only to biological evidence rather than all high-tech evidence.[41] It also means that they focus largely on postconviction testing and less commonly bestow robust pretrial rights that would prevent false convictions from occurring in the first place. Only a perverse system would empower convicted offenders with greater rights to access and test evidence than those awaiting trial, and yet that is precisely what our present system does.

Moreover, none of the innocence protection statutes impose an obligation to *collect* evidence, and they range in comprehensiveness when it comes to preservation. As one commentator notes, "the majority of these statutes do not impose an effective duty on the government to preserve all biological evidence," and even those that do impose a duty have inadequate "statutory provisions to enforce the duty if evidence is intentionally destroyed."[42] Lastly, some jurisdictions have tried to require defendants to waive their rights for DNA testing as part of a plea bargain.[43] Given that the overwhelming majority of cases are resolved by plea agreement, such efforts may defeat statutory protections. On a brighter note, however, the federal government has taken steps to tie funding to shoring up preservation practices,[44] which itself may push jurisdictions to adopt more careful policies.

Of course, even if collection, preservation, and timely testing of 2G evidence were mandatory, there would remain problems with regard to the next step of the criminal adjudicative process. Accordingly, we turn now to the rules of discovery.

B. THE RULES OF DISCOVERY

Discovery is, of course, a highly localized practice as a matter of both rule and custom. But one principle tends to persevere, which is that discovery rules tend to be far narrower in criminal cases than in civil ones.[45] Indeed, under the federal rules, as in many jurisdictions,[46] criminal

40. *See id.* at 1249, 1251–52 (describing the common provisions of innocence protection statutes).

41. *See, e.g.*, Innocence Protection Act of 2004, 18 U.S.C. § 3600 (2012) (enumerating rules for DNA testing in certain circumstances). *See also* Jones, *supra* note 22, at 1248–49, 1251–52 (discussing federal and state DNA testing statutes).

42. Jones, *supra* note 22, at 1252.

43. *Id.* at 1269.

44. *Id.* at 1257.

45. *Compare* FED. R. CRIM. P. 16 (requiring, upon defense request, inspection and copying of testing results, known to the government, in their control, and material to the defense, along with a

discovery tends to be highly circumscribed as a matter of both constitutional law and criminal procedure.

As a matter of constitutional law, as recently as 2002 the Supreme Court in *United States v Ruiz*[47] made clear that there is no general right to discovery. Instead, there are only tailored rules that require the handing over of certain kinds of information. Most notably, *Brady* requires that material exculpatory evidence must be disclosed to the defense,[48] and *Giglio v. United States*[49] mandates that the government disclose material impeachment for key government witnesses.

On the procedural side, the Federal Jencks Act requires that certain statements by a witness be disclosed after the witness's testimony,[50] and of course, Federal Rule of Criminal Procedure 16 spells out certain provisions for discovery of tangible items and scientific reports.[51] But the rules pertaining to discovery of physical evidence, testing reports, and proposed expert testimony are remarkably stingy.[52] First, all disclosure requirements are triggered only upon request, rather than presumed automatic.[53] Second, rather than require the government to hand over a comprehensive list of all physical items seized and tests performed, the rules mandate only that the government disclose that which it intends to use at trial, comes from the defendant, or is "material to preparing the defense."[54] This standard further

summary of expert testimony it intends to introduce at trial), *with* FED. R. CIV. P. 26 (providing for extensive, early disclosure of any expert it "may" use at trial, along with signed written report with "complete" statement of opinions and underlying reasoning, exhibits, qualifications, prior testimony and compensation, and referencing procedures for deposing witnesses pretrial). *See generally* John G. Douglass, *Balancing Hearsay and Criminal Discovery*, 68 FORDHAM L. REV. 2097 (2000) (noting strictness of criminal discovery, especially when compared to civil discovery, regarding disclosure of statements); H. Lee Sarokin & William E. Zuckerman, *Presumed Innocent? Restrictions on Criminal Discovery in Federal Court Belie This Presumption*, 43 RUTGERS L. REV. 1089 (1991) (comparing the breadth of discovery granted in civil cases with the severely limited discovery in criminal cases).

46. *See* Jenny Roberts, *Too Little, Too Late: Ineffective Assistance of Counsel, the Duty to Investigate, and Pretrial Discovery in Criminal Cases*, 31 FORDHAM URB. L.J. 1097, 1098–99 (2004) ("Around one-third of the states have relatively broad discovery rules or statutes, modeled on American Bar Association standards. But about a dozen states follow the highly restrictive federal rule, which is premised in part on the idea that a defendant should not be entitled to witness names or statements for pretrial investigation, but rather only for cross-examination purposes should the case ever get to that stage. The remaining states fall between the two models." (footnotes omitted)).

47. United States v. Ruiz, 536 U.S. 622, 633 (2002).

48. Brady v. Maryland, 373 U.S. 83, 87 (1963).

49. Giglio v. United States, 405 U.S. 150, 153–54 (1972).

50. 18 U.S.C. § 3500 (2012).

51. FED R. CRIM. P. 16.

52. FED R. CRIM. P. 16(a)(1)(E)–(G).

53. *Id.* ("Upon a defendant's request . . . .").

54. FED R. CRIM. P. 16(a)(1)(E)–(F).

designates the prosecutor as the gatekeeper of evidence critical to the defense, which is simply an invitation for error given its adversarial role.[55] And even the most generous prosecutors may have trouble making these determinations, because typically they are not privy to the specific defense theory until opening statements at trial. Moreover, the Supreme Court has suggested that this language is defined with reference to the government's case-in-chief; in other words, that a defendant is entitled only to discovery that would shield the defendant against the government's proof, but not to discovery pertinent to an affirmative defense or other "sword" claim asserted by the defense alone.[56] Accordingly, even if the prosecution knows a homicide defendant intends to proceed on a theory of self-defense, say, it arguably need not disclose the existence of physical evidence that might support that claim.

In fact, the criminal disclosure rules are surprisingly thin when compared to their civil counterparts. The general civil discovery rule requires disclosure "without awaiting a discovery request," and "within 14 days" of the initial conference.[57] Expert reports must provide: "complete statement[s]" rather than mere summaries; all "exhibits" the witness intends to use; detailed qualification information, including ten years' publication history and four years' expert testimony history; and compensation information.[58] Disclosure must be made at least ninety days before the trial,[59] and there is a right to "depose any person, who has been identified as an expert whose opinions may be presented at trial."[60] In contrast, many criminal procedure rules—like those governing the federal courts—are so stingy that it is not uncommon for counsel in a standard felony case to proceed to trial with nothing more than a short hearsay police report disclosed at a bail hearing, a handful of pages containing the results of expert testing, and the names of witnesses as gleaned from the

55. This kind of standard in the context of the *Brady* obligation has proved unworkable. *See, e.g.*, Bennett L. Gershman, *Litigating* Brady v. Maryland*: Games Prosecutors Play*, 57 CASE W. RES. L. REV. 531, 531 (2007) ("[A]s interpreted by the judiciary, *Brady* actually invites prosecutors to bend, if not break, the rules, and many prosecutors have become adept at *Brady* gamesmanship to avoid compliance." (footnote omitted)); United States v. Olsen, 737 F.3d 625 (9th Cir. 2013) (Kozinski, J., dissenting from order denying petition for rehearing en banc) ("There is an epidemic of *Brady* violations abroad in the land. Only judges can put a stop to it.").

56. *See, e.g.*, United States v. Armstrong, 517 U.S. 456, 462 (1996) ("[W]e conclude that in the context of Rule 16 'the defendant's defense' means the defendant's response to the Government's case in chief.").

57. FED. R. CIV. P. 26(a)(1)(A), (C).

58. FED. R. CIV. P. 26(a)(2)(B).

59. FED. R. CIV. P. 26(a)(2)(D)(i).

60. FED. R. CIV. P. 26(b)(4).

voir dire process.[61] There is no right to extensive discovery of expert materials, or to depose the government's expert witnesses in advance of trial. Indeed, several key disclosure requirements (such as the *Jencks* rule discussed earlier) are not even triggered until the trial begins, and even those that impose earlier disclosure may not formally materialize until well after arrest, such as at a suspect's postindictment arraignment.

Why, if trial is not to be by ambush, are such restrictive regimes tolerated? The chief reasons given for highly circumscribed criminal discovery are the pervasive fear of witness obstruction and defense manipulation of evidence.[62] In short, the more information that defendants have in advance of trial, the more they can work outside of the judicial system to eliminate or opportunistically shape the evidence at trial. But while those theories may make sense with regard to ordinary evidence, they are not as persuasive when it comes to 2G evidence.

Threadbare discovery rules for 2G evidence confound the accuracy goals of the adversarial process in numerous ways and for little to no benefit. On the "no benefit" side, there is less reason to worry that defendants will kneecap the Verizon representative or destroy a digital record. That is because the intermediaries that control 2G information are less susceptible to intimidation, and the information is often preserved by a source outside of the control of defendants. In other words, defendants may delete their Facebook page, but Mark Zuckerberg still retains his copies. Moreover, although defendants may tailor their defenses to fit scientific evidence, they are less likely to have the ability to outright alter or manipulate the scientific evidence in order to obstruct justice.

On the "accuracy" side, late and skimpy disclosure of complicated 2G evidence thwarts the defendant's ability to meaningfully understand and challenge such evidence. As the next subpart explains in greater detail, counsel already face significant hurdles in comprehending and independently assessing the value of 2G evidence. Those obstacles can be rendered impenetrable when presented with unrealistic expectations about the timing of test results. It is hard enough to digest the late-breaking

61. John G. Douglass, *Fatal Attraction? The Uneasy Courtship of* Brady *and Plea Bargaining*, 50 EMORY L.J. 437, 453–54 (2001) (describing the "gaps" in Rule 16, particularly that it exempts police reports and witness statements until testimony at trial, and noting that roughly half of states do not require disclosure of witness names). *But see* Sarokin & Zuckerman, *supra* note 45, at 1108 & n.91 (identifying some states as pioneers in broadening discovery).

62. Sarokin & Zuckerman, *supra* note 45, at 1089 ("The rationale for restricting or delaying the turnover of information to criminal defendants and their counsel is primarily the fear of witness intimidation or tampering, and the possibility that the testimony of defense witnesses or the defendant might be altered to accommodate information received from the government.").

discovery of a prior statement or newly surfaced witness on the eve of trial, but it is virtually impossible to know how to begin addressing a DNA report or digital record received the day before opening arguments. Digesting such information takes time, careful attention, and often professional tutoring—none of which is readily available a week prior to trial.[63]

In addition, in some cases, 2G evidence rests exclusively in the hands of the state. Consider biometric samples like DNA or fingerprint images, or even digital recordings retrieved from a camera at the scene. If defendants are to review, inspect, and test such evidence, they need the state's permission. In some cases, the state simply will not give it. For example, in most states, defendants have no right to run profiles in DNA databases.[64] In other cases, the state may give permission to test, but then seek to use those efforts against the defendant—such as by telling the jury that the defendant had the opportunity to test the evidence independently and did so, but found nothing different from the state's experts.[65] That places innocent defendants in an odd position—they want to verify that the accuracy of seemingly (and, from their perspective, inexplicably) inculpatory evidence yet they have no way of knowing where a mistake may have occurred. Moreover, any effort they exert to conduct an investigation comes at the risk of helping dig their own graves. Maybe their independent tests will replicate the government's inculpatory results—not because they are guilty, but because the problem occurred upstream, such as through contamination in collection or examination. Should defendants risk putting the final nail in their own coffins?

In addition, the private-sector nature of 2G evidence often leaves defense counsel incapable of accessing as complete a record as needed to

63. *See* Murphy, *supra* note 9, at 772 ("In short, second-generation experts are likely to be more scarce than their first-generation counterparts, and even when available, they are likely to be stretched thin and demand costly fees.").

64. Ethan Bronner, *Lawyers, Saying DNA Cleared Inmate, Pursue Access to DNA Data*, N.Y. TIMES (Jan. 3, 2013), http://www.nytimes.com/2013/01/04/us/lawyers-saying-dna-cleared-inmate-pursue-access-to-data.html?_r=0 (reporting that only nine states allow defendants access to DNA databases). *See also* Pope v. Commonwealth, 729 S.E.2d 751, 767 (Va. Ct. App. 2012) (affirming denial of posttrial motion for the results generated when the lab ran the crime scene sample in the national DNA database, because the defendant could not demonstrate that they were exculpatory); Birts v. State, 2012 Ark. 348 (upholding exclusion of trace DNA and fingerprint evidence found at crime scene that did not match the defendant, because it did not provide a "direct connection" to an alternative perpetrator).

65. *See* Erin Murphy, *Inferences, Arguments, and Second Generation Forensic Evidence*, 59 HASTINGS L.J. 1047, 1050–54 (2008) (illustrating a variety of contexts in which the government uses opportunity to test against the defendant).

mount an effective challenge. Although records held by private companies are susceptible to subpoenas, 2G evidence is often kept in repositories far outside of the defendant's jurisdictional reach for compulsory process. Private companies may also have their own powerful legal teams, which may fight back if counsel attempts to get information about the maintenance or development of a private-sector device or technology.[66] In contrast, the government, as the customer of these entities, has greater leverage to force disclosure in some (though not all) cases. It can simply condition use of certain material—for instance, DNA test kits or instrumentation—on compliance with requests for disclosure. In other cases, the government may have worked closely with the entity to develop or implement the disputed technology.[67]

Whatever the merits of the current discovery regime for traditional forms of evidence, discovery of scientific evidence ought not to be a game of cat and mouse. Nor should discovery of scientific evidence be left within the discretion of the government, which can determine whether to disclose evidence as "material" and whether to withhold or perhaps never analyze it at all. Comprehensive discovery of 2G proof at the earliest stages of litigation benefits justice by affording defendants an opportunity to address and challenge such evidence intelligently, and it runs few of the risks otherwise attending early disclosure.

The preferred approach would mimic the civil justice system of extensive pretrial disclosures and depositions. Such a regime would also encourage under-resourced defendants to make full use of government-employed laboratory personnel, which would arguably drive down the costs of defendants seeking their own experts. It might further help shift the government laboratory environment toward a more neutral culture of science rather than the highly partisan atmosphere pervasive now.[68]

66. Murphy, *supra* note 9, at 750 (discussing litigation over disclosure of primer sequences used for DNA testing).

67. *See, e.g.*, Rachel Gray, *City Police Embrace Tech with CopDots*, MARIETTA DAILY J. (Nov. 17, 2013), http://mdjonline.com/view/full_story/24070101/article-City-police-embrace--tech-with-CopDots? (describing a "new partnership between local police and a national technology company" that equips police with instruments to identify stolen property).

68. *See* NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES 183–91 (2009) [hereinafter NAS REPORT] (recommending that law enforcement and prosecutors no longer control crime laboratories); Jennifer L. Mnookin et al., *The Need for a Research Culture in the Forensic Sciences*, 58 UCLA L. REV. 725, 744–60 (2011) (noting the absence of an institutional check on the expertise of crime laboratories). *But see* Jennifer E. Laurin, *Remapping the Path Forward: Toward a Systemic View of Forensic Science Reform and Oversight*, 91 TEX. L. REV. 1051, 1111–12 (2013) (concluding that more research should be undertaken before reorganizing crime laboratories as independent entities).

In addition, a robust high-tech discovery right should kick in immediately, when evidence is still fresh and before plea bargaining is likely to occur. It should provide defendants equal and *confidential* access to evidence. Officials might even contemplate moving the repository of evidence from the police department to a truly neutral forum, such as the courthouse or independent forensic laboratory, where each party could examine it at-will and in confidence.

These are all significant changes. But even simple adjustments might go a long way toward improving how courts receive and use 2G evidence. Take the common government complaint that comprehensive disclosure is too cumbersome in 2G cases—that they cannot provide stacks of protocols, accreditation documentation, analyst curriculum vitae, validation studies, and so on to every criminal defendant. That objection is credible only because the criminal system has tended to resist modernization, even as the civil system (long accustomed to voluminous disclosure) embraces electronic filing systems.[69] The state could easily manage a duty to make these extensive underlying essential materials—which do not vary from case-to-case—available online for download. For instance, either a prosecutor's or laboratory's office website could post current protocols for commonly recurring forms of evidence, along with historical materials, since cases tend to take time wending their way through the system. To the extent that some information needs safeguarding, a password protection system might be deployed. By way of example, some labs already embrace a version of this with regard to DNA. Indeed, in the wake of a recent scandal in New York City,[70] the city's medical examiner's office began posting its protocols and accreditation certificates on its website,[71] and its city council enacted legislation requiring that a wide variety of material be made available in this way.[72]

69. *But see* United States v. O'Keefe, 537 F. Supp. 2d 14, 23 (D.D.C. 2008) (finding guidance in rules of civil procedure, which address the appropriateness of a particular format of disclosure, to impose a burden in criminal cases to disclose electronically stored information in a "reasonably usable" form).

70. *See generally* Joseph Goldstein, *Mishandling of DNA Evidence Is Found in Over 50 Cases at Crime Lab*, N.Y. TIMES (Jan. 31, 2013), http://www.nytimes.com/2013/02/01/nyregion/more-dna-problems-found-in-new-york-city-crime-lab.html?adxnnl=1&adxnnlx=1382262162-RLHKra0M2jIVHpFUi7Scqw (describing two-year review process of 800 cases handled by technician that "overlooked DNA evidence on items from at least 26 rape kits" and "misplaced 16 pieces of evidence, returning them to the wrong rape kits").

71. *Technical Manuals*, N.Y.C. OFF. CHIEF MED. EXAMINER, http://www.nyc.gov/html/ocme/html/fbio/Manuals.shtml (last visited Feb. 15, 2014).

72. N.Y.C., N.Y., ADMIN. CODE §§ 17-207, 17-208 (adopted Sept. 12, 2013); Chester Soria, *Council Approves New Oversight of Medical Examiner's Office*, GOTHAM GAZETTE (Sept. 13, 2013), http://www.gothamgazette.com/index.php/government/4580-council-approves-new-oversight-of-

The only real impediment to such an approach might stem from one particular characteristic of 2G evidence: the proprietary nature of some of the technology. Naturally, Google or Facebook will refuse to disclose its search algorithm or business secrets about how it collects, stores, or maintains data, and it has no reason to accede to government requests for such information. Even some other technology companies may decline to make public the data underlying proprietary chemical reactions or instrumentation, although they are perhaps more likely to accede to demands from their intended customer base. To be sure, these are difficult cases and each deserves recognition and careful consideration. Nevertheless, we are so far from grappling with the hard cases that it makes no sense to let them derail any effort to make meaningful inroads on easier situations. Until every public laboratory publicly posts its testing protocols, it seems silly to worry about how to deal with Google.

C. ASSISTANCE OF COUNSEL AND EXPERT ASSISTANCE

Even with respect to 1G forensic evidence, concerns surrounding the standards for assistance of counsel and expert assistance—*Gideon v. Wainwright*[73] and *Ake v. Oklahoma*[74] issues, in short—have long troubled criminal justice scholars and practitioners. Problems in the provision of defense services have been well documented, and include lack of adequate resources, training, and questions regarding the overall competence of defense counsel with respect to scientific methods.[75] With respect to expert assistance, just as *Youngblood* conceptualizes evidence collection and preservation in terms ill-suited to today, so does *Ake* represent an outdated idea about the role of experts in criminal trials. *Ake*, the last major constitutional ruling on the rights of indigent defendants to expert assistance, found that, in capital cases, indigent defendants have a due process right to access psychiatric experts if they make a preliminary showing that sanity would be at issue at trial.[76] It therefore provides indirect support for the right to expert assistance across a range of

medical-examiners-office.

73. Gideon v. Wainwright, 372 U.S. 335, 344–45 (1963) (holding that indigent criminal defendants are guaranteed the right to counsel under the Sixth and Fourteenth Amendments).

74. Ake v. Oklahoma, 470 U.S. 68, 74 (1985) (holding that the Fourteenth Amendment imposes a duty upon states to provide access to a psychiatric examination when indigent criminal defendants have "made a preliminary showing that [their] sanity at the time of the offense is likely to be a significant factor at trial").

75. *See, e.g.*, Jennifer M. Allen, *Free for All a Free for All: The Supreme Court's Abdication of Duty in Failing to Establish Standards for Indigent Defense*, 27 LAW & INEQ. 365, 392–98 (2009) (documenting problems with the *Ake* standard).

76. *Ake*, 470 U.S. at 74.

contemporary forensic disciplines, although leaves unresolved how strong the entitlement is outside the context of a capital case.

In *Ake*, the Supreme Court found that "a criminal trial is fundamentally unfair if the State proceeds against an indigent defendant without making certain that he has access to the raw materials integral to the building of an effective defense."[77] Recognizing the "pivotal role that psychiatry has come to play in criminal proceedings,"[78] the Court found a defendant's access to such evidence essential after applying the *Mathews v. Eldridge* balancing test and weighing the private interest, government interest, and benefit of added procedural safeguards.[79] The Court downplayed the State's interest in not assuming the burden of expert provision, noting that "a State may not legitimately assert an interest in maintenance of a strategic advantage over the defense, if the result of that advantage is to cast a pall on the accuracy of the verdict obtained."[80]

However, the Court also observed that mental condition is "not necessarily at issue in every criminal case" and thus imposed a requirement of case-by-case findings of necessity.[81] For psychiatric experts, such a finding makes sense: in the absence of a history of mental health problems or documented issues arising at the time of the offense, an expert seems unnecessary. But in other contexts, this requirement may prove a formidable hurdle. Indeed, the introduction of this ad hoc determination has caused the greatest trouble for indigent criminal defendants with regard to other forms of expert assistance.

Although the opinion in *Ake* contains sweeping language, its implementation has been far less generous. Most jurisdictions require defense counsel to petition the court for funds to secure an expert. But defendants often have difficulty explaining to courts either why an expert is needed, or why such assistance is justified absent advice (from the very expert sought) about potential problems with the evidence.[82] The weak

77. *Id.* at 77.

78. *Id.* at 79.

79. *Id.* at 77 (citing Mathews v. Eldridge, 424 U.S. 319, 335 (1976)). The Supreme Court later repudiated the *Mathews* test in criminal proceedings. Medina v. California, 505 U.S. 437, 445 (1992). *Medina* expressly left *Ake* standing as good law, but without any clear doctrinal footing. *Id.* at 444–45. *See also* Paul C. Giannelli, Ake v. Oklahoma*: The Right to Expert Assistance in a Post*-Daubert*, Post-DNA World*, 89 CORNELL L. REV. 1305, 1364–65 (2004) ("In effect, *Medina* severed *Ake* from its moorings, leaving it a virtual orphan.").

80. *Ake*, 470 U.S. at 79.

81. *Id.* at 82–83.

82. *See* Giannelli, *supra* note 79, at 1380–82 (criticizing various formulations of *Ake* as "a formidable and unjustifiable obstacle to the appointment of experts").

market for defense experts, exacerbated by this strict judicial oversight of both access and compensation, in turn diminishes the number and quality of available options even in the event that counsel's request is granted. Moreover, any single case may contain evidence requiring an assortment of expertise—say, DNA results and GPS data—each of which could benefit from at least cursory review by someone trained in that particular field. Yet convincing a court to fund several exploratory experts can prove an uphill battle. As a result of these obstacles, along with other factors, defense expert assistance is still episodic and occasional.[83]

Ake's vision of the role of experts—as only occasionally relevant, easily justified by reference to external evidence, and drawn from a broad and established pool—little fits the 2G criminal justice model. Yet, the need for expert assistance is perhaps greatest with respect to 2G evidence. To the extent that 1G evidence proves formidable for lawyers, 2G evidence is downright impenetrable. Counsel often carry crushing caseloads that leave them little time for deciphering complex evidence, and they may lack the scientific sophistication to comprehend the issues on their own.[84] Even if resourced, they may not have a clear pool of experts to draw upon, or may become simply too awestruck or confounded by the seeming certainty of the evidence to challenge it.[85] Think of the lawyer confronted with a DNA match, a report finding that a document found on a laptop was made at a certain date and time, or cell phone data locating the defendant at a certain location. If such evidence is just one aspect of one in hundreds of cases, the attorney is more likely to work around it, either factually or by encouraging a plea, than to seek help understanding it. As a result, 2G evidence may be received without any meaningful scrutiny, and defendants faced with 2G proof may simply be pressured into accepting a plea in the face of "irrefutable" evidence.[86]

Interestingly, the criminal justice system's refusal to acknowledge the special power and probativeness of 2G proof—and its attendant need for

83. *Id.* at 1312–13 (citing studies attesting that courts "have often taken a restrictive approach to the right of expert assistance").

84. *See* Murphy, *supra* note 9, at 770–72 ("Many lawyers will reasonably conclude that it requires too great an effort, and reaps too little a reward, to study such evidence in the hopes of uncovering a flawed methodological approach.").

85. *Id.* at 770–71 ("And the more technically complex the evidentiary form, the more likely it becomes that even a well-meaning attorney may be incapable of comprehending the science regardless of the effort she expends.").

86. *Id.* at 770–71 ("Given the rigor of second-generation techniques, defense attorneys, like judges, may find themselves susceptible to the temptation simply to trust the integrity of the evidence, thus making the case seem insurmountable or 'open-and-shut.'").

special rules of assistance for counsel—is not simply an inevitable feature of our adversarial mode of litigation. In *Little v. Streater*,[87] the Supreme Court ruled that an indigent putative father in a paternity dispute was entitled to state-sponsored blood tests. Citing the "accuracy, reliability, dependability—even infallibility—of the test,"[88] and the heightened need for such evidence when the factual dispute involves an intimate activity that rarely has witnesses,[89] the Court performed the *Mathews* test and concluded that state-funded testing was required.

Streater thus contrasts nicely with *Ake* in a manner that illuminates a possible road for reimagining expert assistance in a 2G world.[90] Whereas *Ake* still views expert evidence as contingently valuable, *Streater* understands it as universally necessary. In other words, the blood test could be viewed as a prototypical form of 2G evidence—highly probative, objectively reliable scientific testing that can often definitively resolve a factual dispute. As such, *Streater* insists that blood tests be made accessible to every indigent defendant, not just those who make a preliminary showing that they may not be the father. A structural, systemic approach to expert assistance in criminal cases would likewise recognize this unqualified entitlement. It would conceive of 2G evidence as important, pervasive, and necessarily complex, thus justifying assistance wherever presented, without relying on case-by-case assessments of need.

Many solutions for reinvigorating expert assistance have been proposed, ranging from greater funding to specialized training.[91] All of these solutions, if implemented, would go far to address some of the most pressing concerns. But this Essay focuses on one promising and lesser studied approach that deserves closer attention and replication, and that posits a systemic rather than individualized solution: the development of dedicated, roving 2G-evidence defense advisors. Incidentally, while this solution focuses on defendants because the government typically has ready access to government experts, the same model might also benefit those states in which prosecutorial power or laboratory resources are less concentrated.

87. Little v. Streater, 452 U.S. 1, 16–17 (1981).

88. *Id.* at 6 (internal quotation marks omitted).

89. *Id.* at 8.

90. *Streater* also arguably provides grounds for counsel in a criminal case to argue for the right to access and to test collected items for biological evidence, although it does not seem to be widely cited for that entitlement.

91. Murphy, *supra* note 9, at 776.

North Carolina currently employs such a model.[92] It has created a statewide Forensic Resource Counsel to "assist North Carolina public defenders and private appointed counsel in understanding and if appropriate, challenging the forensic evidence in their cases."[93] Rather than seek leave of court, counsel can contact an experienced attorney with background in local practices, who can serve as advisor, referral system, and triage analyst.[94] North Carolina's office has further developed a variety of resources to aid attorneys, including an expert database and motions bank, training modules and materials, tips and guides for hiring and examining experts, protocols and other documentation from the state laboratory, and a blog that provides a forum for discussion.[95] Such an office could also maintain transcript databases, advocate for defense interests with regard to forensic priorities in the state legislature, serve as a liaison to state laboratories, and coordinate efforts across jurisdictions on matters such as *Daubert*[96] or *Frye*[97] challenges. And if resources present a problem, consider that North Carolina's office is presently staffed only by one full-time attorney,[98] along with the savings from dollars otherwise spent on outside, nonsalaried expert assistance.

In sum, the challenges of 2G evidence render the old model of the lawyer-client as a single unit, perhaps aided by an expert assigned on a case-by-case basis, obsolete. This singular notion must give way to more innovative structures that appreciate the complexity and depth of evidence today. Not every attorney will be an expert in every scientific field, and attorneys will likely have a variety of cases with a smattering of different methods. In light of real concerns about the availability of resources for indigent defendants, who cannot always contract for services themselves, the North Carolina model has much to offer.

92. *See* FORENSIC RESOURCES: N.C. OFF. INDIGENT DEF. SERVICES, http://www.ncids.com/forensic/ (last visited Feb. 15, 2014) (providing online resources regarding forensic science evidence).

93. *Id.*

94. *Id.* (providing contact information for Resource counsel, along with directory of experts organized by specialty, prior transcripts, and guides to procuring and harnessing expert testimony).

95. *Id.*

96. Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 589, 592–95 (1993) (holding that the district court serves as a "gatekeeper" in determining the admissibility of scientific evidence, and establishing a four-part test for the reliability of the proffered evidence).

97. Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923) (holding that scientific evidence is admissible only when the technique is generally accepted as reliable in the scientific community).

98. *See Contact Us*, FORENSIC RESOURCES: N.C. OFF. INDIGENT DEF. SERVICES, http://www.ncids.com/forensic/contact.shtml (last visited Feb. 15, 2014) (listing one attorney as the sole contact for the Forensic Resource Counsel).

D. THE CONFRONTATION CLAUSE

The Supreme Court's recent revival of the Confrontation Clause has electrified the field of forensic evidence. As scholars know, one strain of constitutional cases concerns the admission of results produced by scientific testing. In *Melendez-Diaz v. Massachusetts*,[99] the Court launched its opening salvo, ruling that an affidavit attesting to the results of drug analysis constituted "testimonial" hearsay. *Bullcoming v. New Mexico*[100] took the next step, holding that the live testimony of an analyst who had no direct involvement with the testing violated the Confrontation Clause. Then, in *Williams v. Illinois*, a highly fractured opinion, the Court upheld indirect admission of test results via a testifying expert with no direct relationship to the underlying tests, but who relied on those results to generate her own relevant conclusions.[101]

Strengthening confrontation of scientific evidence can hardly be criticized as a negative step. But, significantly, the raging debate in the Supreme Court about ensuring the integrity of evidence regarding scientific tests focuses entirely on the value of in-court testimony by knowledgeable experts. To be sure, examination of experts who completed the forensic tests at issue is a valuable means of checking the reliability of that evidence. But, for two reasons, true confrontation of 2G scientific evidence requires more than live cross-examination of an expert witness. First, although conventional evidence tends to be highly individualized and thus well-suited to tailored in-court challenges, 2G evidence is not. Second, vesting the trial with primary responsibility for safeguarding scientific evidence ignores the reality that very few cases ever go to trial.

To the first point, David Sklanksy's article *Hearsay's Last Hurrah* rightly points out that the revival of the Confrontation Clause, particularly in its forensic evidence incarnation, overly fetishizes trial and face-to-face confrontation as the primary means of challenging faulty evidence.[102] Critics of the *Crawford* doctrine[103] do not like direct confrontation because they view it as unnecessary and resource-intensive. After all, how are we supposed to bring all those drug analysts to court and why would we bother

99. Melendez-Diaz v. Massachusetts, 557 U.S. 305, 310–11 (2009).

100. Bullcoming v. New Mexico, 131 S. Ct. 2705, 2710 (2011).

101. Williams v. Illinois, 132 S. Ct. 2221, 2227–28 (2012).

102. David Alan Sklansky, *Hearsay's Last Hurrah*, 2009 SUP. CT. REV. 1, 7 (arguing that a meaningful Confrontation Clause "would require recognizing that the kind of 'confrontation' a criminal defendant needs and deserves may in many cases have little to do with excluding hearsay evidence—or, for that matter, with sitting in court and watching a witness testify, on direct and then on cross-examination").

103. Crawford v. Washington, 541 U.S. 36, 54–56, 68 (2004).

when we all know what they are going to say anyway? But *Crawford*'s champions should also ask themselves whether a showdown in court is really the best way to thoroughly examine 2G evidence. All signs suggest that the answer is no.

Assessing the reliability of 2G evidence requires a more structural, systemic approach to oversight. Such an approach, however, is difficult to achieve even if we liberalize the strict discovery and relevance standards governing criminal trials. Cross-examination considers the questioning of the forensic analyst as the critical moment of attack, often circumscribing the scope of permissible inquiry to that which is directly related to the case or examination at hand. As a result, cross-examination almost always misses the problems with 2G evidence, which rarely surface in a smoking-gun-in-this-forensic-report kind of way. Scandal after scandal has surfaced in newspapers and investigative reports, detailing an astonishing array of interpretive errors, sample switches, and acts of overt malfeasance with regard to forensic analysis.[104] Yet notice that in only the rarest of cases did cross-examination unearth these problems, and for understandable reasons—only rarely is a single case defective on its face.

Unfortunately, the Supreme Court has consistently ducked constitutional concerns about database maintenance or the systemic integrity of evidence.[105] Consider *Herring v. United States*,[106] in which the Court, save Justice Ginsburg, downplayed the significance of the lousy maintenance of an arrest warrant database.[107] More recently, the decision in *Maryland v. King*,[108] which upheld DNA databasing of arrestees, accepted the adequacy of threadbare laws regulating DNA databases in the face of evidence of unorthodox uses and notwithstanding significant questions of quality assurance or actual security.[109] As presently interpreted, it appears

104. *See generally* William C. Thompson, *Forensic DNA Evidence: The Myth of Infallibility*, *in* GENETIC EXPLANATIONS: SENSE AND NONSENSE 227 (Sheldon Krimsky & Jeremy Gruber eds., 2013) ("[E]rrors in DNA testing occur regularly and that DNA evidence has falsely incriminated innocent people, causing false convictions."); 4 DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY § 31:15 (2012) (listing fifteen laboratories involved in DNA-related scandals).

105. *See* Erin Murphy, *Databases, Doctrine & Constitutional Criminal Procedure*, 37 FORDHAM URB. L.J. 803, 821 (2010) ("[T]he Supreme Court has paid scant (and inconsistent) heed to the peculiar features of databasing or to what special concerns might inform the investigations conducted or evidence collected from them.").

106. *See* Herring v. United States, 555 U.S. 135, 137–38 (2009).

107. *See also* Florence v. Bd. of Chosen Freeholders, 132 S. Ct. 1510, 1513–14 (2012) (similarly unconcerned with database error).

108. Maryland v. King, 133 S. Ct. 1958, 1979–80 (2013).

109. *See id.* (dismissing the threats to security and privacy).

that the Constitution does not care about the integrity of 2G evidence in every case, but only in any one specific case. Yet when it comes to 2G proof, the adjudicative system cannot truly safeguard evidentiary integrity while maintaining such a narrow, case-specific view of disclosure and examination. Even though it is all but impossible to discern in any single case whether a 2G technique is in some way flawed, our discovery and expert examination rules continue to insist upon a narrow perspective as the only one that is relevant.

Given that the 2G problem of junk science in the criminal system is less a problem with bad science than it is a problem of good science executed badly, the system should support thorough inquiries into performance, not just scientific validity. What if, for example, the system stopped relying so heavily on individual lawyers and trials to ferret out malfeasance? What if instead of the current emphasis on scientific legitimacy in the form of *Daubert* and *Frye* hearings, for which courts will tolerate days of testimony regarding the development of a scientific theory or methodology, the rules instead focused on assuring the existence of structural *quality control* mechanisms?

This kind of shift could be achieved by adopting new rules that empower lawyers to obtain reliability hearings that address execution, not just methodology, and by amplifying the right to discovery to include things such as an analyst's historical error reports, proficiency test results, and other performance evaluations. Imagine redefining the qualification of experts so that they would be asked relevant questions not only about their qualifications but also about actual performance.

A more radical restructuring would interpret confrontation rights (perhaps bolstered by compulsory process) as extending outside the courtroom and beyond a single case—a kind of collective confrontation right to transparency and accountability standards in forensic analysis. Suppose that the proponents of forensic evidence had to offer evidence not just of its accuracy in a specific case, but of the structural features in place to ensure accuracy across cases—such as procedures for surfacing and correcting mistakes and their rate of utilization. Under such a regime, entities lacking sufficient quality control measures simply would not be qualified to give evidence.

In other words, courts might embrace an oversight system that focuses less on the happenings in a particular case and more on systemic and structural interventions. By way of a thought experiment, imagine that a jurisdiction precluded evidence from facilities that did not meet clinical-

laboratory level quality control thresholds. Oversight entities might undertake random unannounced inspections to ensure lab compliance with strict quality assurance standards. Inspectors could assign scores for performance, so that any entity not awarded the highest marks might be tracked and receive further surprise visits to check for improvement. The facility might be required to post its score, along with detailed reports from these surprise inspections, on a public website, so that consumers, including prosecutors and police, would know which labs could be counted on as reliable and efficient. Organizations might retain a supervisor certified in quality assurance, who would watch over line workers and ensure proper procedures were followed.

Such a system would not just create powerful incentives for audited organizations to perform to the highest of standards, but it would also generate greater transparency for consumers of these services to make educated judgments about the entities. If such a system sounds infeasible, or unrealistic, or too intrusive, then notice that it is exactly the one that New York City already uses to safeguard the integrity of its 24,000 restaurants, each of which must pass rigorous food safety and handling standards and publicize inspection results.[110] Why should the integrity of sandwiches matter so much more than the integrity of criminal evidence? Why is it unthinkable that health inspectors should be limited to asking only "was *my* meal delicious?" or "did I find any roaches in *my* soup*?*" even as the criminal justice system effectively does just that for forensic evidence.

Finally, it must again be acknowledged that, as with many issues regarding 2G evidence, private companies present a vexing problem in implementing measures intended to enhance transparency. Take the GPS location example from Part II. Before 2000, GPS satellite feeds were divided between military and civilian services, and the government introduced intentional errors in the civilian feed so that this powerful new information would not be used against U.S. interests.[111] To compensate, private companies developed technological workarounds aimed at improving accuracy.[112] As a result, if defendants wanted to fully challenge a GPS feed's accuracy, they would need not only information about the government's satellite feed, but also information about the private

110. *Restaurant Inspection Results (Letter Grades)*, N.Y.C. DEPARTMENT HEALTH & MENTAL HYGIENE, http://www.nyc.gov/html/doh/html/services/restaurant-inspection.shtml (last visited Feb. 15, 2014) (describing New York City's restaurant inspection program).

111. Herbert, *supra* note 11, at 473–74.

112. *Id.*

provider's workaround. Yet, of course, private companies would be unlikely to voluntarily disclose such information, and for those whose primary client base is not law enforcement, there is little incentive to do so. Mandated disclosure of such information might even be beyond the reach of subpoenas or judicial processes. To the extent that private, proprietary information may be at stake, radical transparency may require accommodations—such as gag orders, conditionally admitted evidence, or restrictive disclosure. Again, however, even if these kinds of special considerations attend some evidentiary forms, that alone should not deter efforts to reform the ways in which more commonplace evidence is confronted.

E. PLEA BARGAINING

Even the most robust discovery and confrontation regimes will have little impact on the overwhelming majority of cases so long as those entitlements do not materialize until a case is set for trial. That is because, of course, plea bargains dominate the disposition of cases—reaching up to 95 percent in some jurisdictions.[113] Yet plea bargaining rights, like discovery and confrontation rights, remain lodged in earlier conceptions about the nature of evidence. Defendants have virtually no constitutional discovery or confrontation rights during the plea bargaining process,[114] and even statutory or administrative rights may not inhere prior to plea negotiations.[115] As one scholar observed, "For practical purposes, there is no such thing as a 'Motion for Pre-Plea Discovery.'"[116] And although judges may grant individual requests for disclosure beyond that prescribed by the rules, such instances are atypical.[117]

113. LINDSEY DEVERS, BUREAU OF JUSTICE ASSISTANCE, PLEA AND CHARGE BARGAINING, RESEARCH SUMMARY 1 (2011), https://www.bja.gov/Publications/PleaBargainingResearchSummary.pdf.

114. Douglass, *supra* note 61, at 454–55 ("It is quite typical, for example, for prosecutors to delay disclosure of *Brady* material relating to the impeachment of government witnesses—so-called '*Giglio* material'—until the eve of trial." (footnote omitted)).

115. *Id.* at 454, 455 n.75 (describing the "unregulated sequencing of discovery and plea discussions" as "contribut[ing] to the information deficit that confronts defendants considering a proposed plea agreement").

116. *Id.* at 455 (noting that court orders "specifying the timing and sequence of some categories of discovery" as "the exception rather than the rule").

117. *See, e.g.*, Robert Hardaway, Dustin D. Berger & Andrea Defield, *E-Discovery's Threat to Civil Litigation: Reevaluting Rule 26 for the Digital Age*, 63 RUTGERS L. REV. 521, 523 (2011) (observing that "the defining judicial view of criminal discovery in the United States was set forth by the eminent American jurist Learned Hand, who stated that, in criminal cases, '[The Court's right to grant discovery] is said to lie in discretion, and perhaps it does, but no judge of this court has granted it, and I hope none ever will.'" (alteration in original)). *See generally Discovery and Access to Evidence*, 42 GEO. L.J. ANN. REV. CRIM. PROC. 370, 392–96 (2013) (reviewing case law on discovery).

In some respects, the foundational assumption animating plea bargaining is that defendants know whether and of what they are culpable, and can therefore choose to take responsibility without knowing what evidence the government holds in its hands. Accordingly, "bargaining in the dark" may be defensible in cases comprising only ordinary evidence, such as human witnesses whose lives and well-being may be disrupted by investigation or the prospect of a criminal trial. It may also make sense when evidence indicates, but does not strongly resolve, questions of guilt, because haggling over the value of evidence is precisely the point of a criminal trial.

But this model of bargaining is less defensible as regards cases containing sophisticated 2G evidence. That is so partly because bargaining is more like a subtle dance than a meeting of the minds regarding actual culpability—less about what precisely the defendant did than about meeting a constellation of other goals. The overbreadth of criminal law, coupled with the wide range of available penalties, often means that the negotiation process is less about alighting on a fair approximation for the culpable behavior than about striking an agreement among actors preoccupied with efficiency goals. Some might argue that those goals are paramount with regard to 2G evidence, which can be expensive or time-consuming to test. But that is precisely why disclosure prior to bargaining is important: because there is too great an incentive to ignore such evidence otherwise.

Prosecutors, for rational reasons, are often themselves unaware of physical evidence or find themselves at the mercy of backlogged labs, able to jump the line only when a case is ready for trial. Consider that studies show a remarkable amount of collected but untested forensic evidence.[118] As a result, the government may wholly ignore the existence of 2G evidence in bargaining prior to trial, without offending the Constitution or procedural rules of many localities. In stark terms, this means that the government could seek a plea deal from a defendant in a rape case without disclosing that a rape kit was performed and semen recovered or even tested. It likewise means that defendants could face the dilemma of rejecting an attractive offer without adequate time to verify that exculpatory evidence—such as electronic toll records, public cameras, or GPS trackers—corroborated their version of the events. Even a prosecutor who expressly adopts a policy of offering deals "too good to refuse" in

118. *See* PETERSON ET AL., *supra* note 28, at 8–9 (finding that most forensic evidence goes untested).

order to avoid testing and bring down backlogs offends no clear right of defendants, who may, at that point in the case, lack not only the right to test evidence independently but even the right to know whether it exists or to issue subpoenas to find it independently.

Lack of awareness and access to evidence puts defendants at a grave disadvantage when considering how to proceed in a case. And while this is true as regards every instance of bargaining, it is less defensible with respect to cases involving 2G evidence given its high probative value and low risk of enabling obstruction or manipulation. Under the current regime, innocent defendants may enter plea negotiations unaware of potentially exculpatory physical evidence in support of their defense. Even a defendant who knows of such evidence and wishes to examine it independently may need to forego an attractive plea offer in order to access the material. In some cases, the system might even encourage the most inefficient approach of pleading now and examining forensic evidence later; that is because many innocence protection statutes afford defendants with a more robust right to access and test forensic material after conviction.[119]

A system truly committed to the exculpatory use of forensic evidence would ensure that both parties have early and full access to such evidence for testing and examination purposes. It would view sophisticated technological evidence as a boon to justice, and give each party the ability to subject such evidence to the fullest scrutiny imaginable prior to disposition—in whatever manner—of cases. Such an approach might not even disrupt the plea rate too terribly. Although more empirical work needs to be done,[120] the precise interplay between the plea rate and forensic evidence remains unclear—perhaps shrouded in part by the degree to which such evidence is likely to remain undisclosed at the time of plea. Preliminary studies indicate the variable impact that physical evidence has on a case.[121] For instance, robbery cases are roughly twice as likely to settle by plea if there is physical evidence in the case,[122] whereas physical

119. *See, e.g.*, People v. Gill, 965 N.Y.S.2d 329, 331–32 (N.Y. Crim. Ct. 2013) (upholding the denial of defendant's testing request as outside the scope of *Brady* as well as a right bestowed postconviction).

120. PETERSON ET AL., *supra* note 28, at 15–16 (collecting studies with varying outcomes and concluding "there is little agreement about the importance of evidence and little knowledge about the importance that various kinds of evidence play in decisions to charge or to seek or accept a plea").

121. *Id.* at 10 ("[T]he impact of forensic evidence in prosecutors' decisions to take cases to trial vs. offering pleas needs review, as well as the role played by forensic evidence in negotiating pleas and offering charge/sentence bargains.").

122. *Id.* at 7 ("Unlike the other crimes included in this study, robberies were notable for having the highest percent of cases adjudicated through trial. A significantly higher percent of cases with crime scene evidence (68%) was resolved through plea compared to cases without evidence (36%).").

evidence seems to have a negligible effect on the plea rate for offenses such as burglary and homicide,[123] which have especially high and low plea rates, respectively.[124] On the contrary, aggravated assault cases appear more likely to proceed to trial when there is forensic evidence.[125]

The Supreme Court has shown greater interest recently in regulating some aspects of the plea negotiation process,[126] recognizing the central role played by plea agreements in the criminal justice system. What remains is to accord 2G forensic evidence a greater role in the plea process given its probative power. Even if the government carries no obligation to timely test physical evidence, then at the very least it should be required prior to the entry of a plea to disclose the existence of all physical evidence collected in the case and the results of any testing, along with making such evidence available for independent testing. To be sure, resource constraints and uncertainty may inhibit defendants from testing evidence at the preplea stage as much as they do at the pretrial stage,[127] but at least those defendants seeking to examine the evidence would not need to rely on a prosecutor's goodwill or court's sympathy in order to do so.

F. PRESENTATION OF EVIDENCE

In general, the criminal trial is conceived as a spectacle in which the factfinder serves as a passive observer to a parade of motions, witnesses, and evidence. This model may fit a conventional narrative structure well enough—"here is the government's version, now here is the defendant's, peppered with cross-examination to help build a narrative theory." But scientific and 2G evidence is complicated for both jurors and judges to comprehend, and when contested, it presents a challenge to the patterns set by these old routines.

123. *Id.* at 4–5 (concluding that "the presence of physical evidence had little effect on mode of case disposition" in burglary charges and that "forensic evidence was not significant" for homicide cases).

124. *Id.* (concluding that 95 percent of burglary convictions and roughly 35 percent of homicide convictions were resolved through plea bargaining). It is easy to speculate that these disparate rates in part reflect differences in the severity of the punishment for each offense, as well as the remaining range of defenses even in the presence of forensic evidence.

125. *Id.* at 4 ("[T]he presence of physical evidence in an [aggravated assault] case increased significantly the likelihood that the case would be resolved through trial.").

126. *See, e.g.*, Lafler v. Cooper, 132 S. Ct. 1376, 1391 (2012) (holding that defendant was prejudiced by counsel's ineffective advice to reject plea deal and go to trial); Missouri v. Frye, 132 S. Ct. 1399, 1408 (2012) (holding that "defense counsel has the duty to communicate formal offers from the prosecution to accept a plea on terms and conditions that may be favorable to the accused"); Padilla v. Kentucky, 559 U.S. 356, 368–69 (2010) (holding that counsel provided ineffective assistance by failing to advise defendant that his guilty plea made him subject to automatic deportation).

127. *See supra* Part III.B.

That is, presentation of sophisticated technological evidence poses vexing problems for lawyers constrained by evidentiary and procedural rules that structure the jury experience a certain way. Such evidence creates evidentiary challenges, such as how to go about authenticating emails and text messages or determining whether a GPS map is a demonstrative aid or substantive evidence. But 2G evidence also causes procedural irritations. Concerns about how to present complex scientific concepts on direct examination may be easily enough accommodated by, for example, allowing experts to de facto teach a mini-class rather than follow conventional open-ended questioning structure. But other problems are more stubborn—such as how to transmit a complete picture of contested evidence when the opposing party typically must wait to call its expert until after the other side has finished presenting its case.

There are numerous suggestions for addressing these problems. Some scholars view the best solution as discarding juries altogether or devising expert juror panels,[128] both of which encounter constitutional hurdles in our regime.[129] But less radical revisions to current processes—all well within the court's power to control the presentation and flow of evidence—might achieve many of the most basic goals for improving comprehension and retention. To begin, many courts already accept one obvious modification to traditional practice by allowing jurors to ask questions and take notes during testimony.[130] Judges also rightly may tinker with the presentation of evidence, override the conventional models of direct/open question and cross-examination/leading question, and allow greater narrative flexibility. Although courts may at times run the risk of unduly bolstering experts by empowering them with the authority to "lecture" the jury, proper restraint—as enforced by the court—helps to ensure that experts do not overstep their bounds. Courts might also consider disrupting the typical flow of a case in order to allow each side to present expert witnesses temporally proximate to one another and to allow such experts to engage in more direct dialogue with one another and the jury. Each of these suggestions seems well within the general authority of the court to control

128. Jennifer L. Mnookin, *Expert Evidence, Partisanship, and Epistemic Competence*, 73 BROOK. L. REV. 1009, 1020 (2008) (recounting history of proposals to discard juries and devise expert jury panels and noting that "[e]ach of these solutions has been suggested before" and "will no doubt be suggested again").

129. U.S. CONST. amend. VI ("In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed . . . .").

130. *See, e.g.*, Sara Gordon, *Through the Eyes of Jurors: The Use of Schemas in the Application of "Plain-Language" Jury Instructions*, 64 HASTINGS L.J. 643, 645 n.3 (noting suggested reforms for improving juror comprehension).

the presentation of evidence.[131]

The well-known Australian practice of "hot-tubbing," or "concurrent evidence," offers one model for receiving evidence in the above manner.[132] One expert describes the process as follows:

> The procedure involves the parties' experts giving evidence in the presence of each other after all the lay evidence on both sides has been given. The experts are sworn in and sit in the witness box or a suitably large table which is treated notionally as the witness box. . . . A day or so previously, each expert will have filed a brief summary of his or her position in the light of all the evidence so far. In the box the plaintiff's expert will give a brief oral exposition, typically for ten minutes or so. Then the defendant's expert will ask the plaintiff's expert questions, that is to say directly, without the intervention of counsel. Then the process is reversed. In effect a brief colloquium takes place. Finally each expert gives a brief summary. When all this is completed, counsel cross-examine and re-examine in the conventional way.[133]

Critics may charge that this practice is ill-suited to the American system, which is aggressively adversarial.[134] And, to be clear, such collaborative inquiry certainly departs from the ideals of the criminal justice system.

But apart from these concerns, the major obstacle to implementing such a practice for criminal justice is the dearth of opposing experts to put in the hot tub.[135] Although precise data is unavailable, studies of both *Ake*'s impact and the factors underlying wrongful conviction suggest that robust adversarial challenges are not happening even in cases that proceed to trial.[136] Thus, although such reforms might enhance the quality of evidence in cases in which competing experts exist, that only applies to a small

131. *See* FED. R. EVID. 611 ("The court should exercise reasonable control over the mode and order of examining witnesses and presenting evidence . . . .").

132. Frances P. Kao et al., *Into the Hot Tub . . . A Practical Guide to Alternative Expert Witness Procedures in International Arbitration*, 44 INT'L LAW. 1035, 1037–38 (2010) (defining "hot-tubbing" as when the parties' experts give evidence at the same time).

133. Peter Heerey, *Recent Australian Developments*, 23 CIV. JUST. Q. 386, 390–91 (2004). *See also* Megan A. Yarnall, Comment, *Dueling Scientific Experts: Is Australia's Hot Tub Method a Viable Solution for the American Judiciary?*, 88 OR. L. REV. 311, 323–24 (2009) (quoting Heerey, *supra*, and discussing Australia's hot tub method).

134. Kao et al., *supra* note 132, at 1038.

135. Murphy, *supra* note 9, at 753.

136. *See, e.g.*, Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1, 2 (2009) (reporting that 60 percent of innocent defendants had trials in which forensic analysts called by the prosecution provided invalid testimony, and in only a few cases was such evidence challenged in any way); Allen, *supra* note 75, at 387–98 (arguing that *Ake* has provided insufficient legal and systemic standards for lower courts with respect to expert witnesses).

fraction of cases.

Instead, it seems that more subtle efforts to reform the reception and order of evidence offer the better route toward improving evidentiary quality, with one additional caveat. As the National Academy of Sciences report entitled *Strengthening Forensic Science* observed, there is no standardized language to describe the significance of forensic results, which has a "profound effect on how the trier of fact in a criminal or civil matter perceives and evaluates scientific evidence."[137] Accordingly, the words that analysts choose to convey the import of their findings, and the understanding that jurors attach to those words, can vary dramatically even when the underlying results do not differ. One modest suggestion to improve the factfinder's comprehension of sophisticated evidence, which due to its database dependence is often related in complex probabilistic statements, might be to devise a standard terminology for conveying such information.[138] Such standardization, like the language constituting the *Miranda* warnings[139] or the reasonable doubt standard,[140] might eventually even garner status in popular culture and thus come to take on a universal significance. Although there may be challenges in devising a kind of sliding scale of significance, it seems a realistic undertaking worthy of serious consideration.

G. SUFFICIENCY OF EVIDENCE, APPELLATE ADJUDICATION, AND POSTCONVICTION REVIEW

The final areas of concern arise with regard to the legal standards for sufficiency of evidence, appellate adjudication, and postconviction review. Though these areas are rife with arcane and complex procedural rules beyond the scope of this Essay, they nonetheless merit a brief word.

As to evidentiary sufficiency, Andrea Roth's recent article *Defying*

137. NAS REPORT, *supra* note 68, at 21.

138. *Id.* ("The terminology used in reporting and testifying about the results of forensic science investigations must be standardized.").

139. The canonical example of *Miranda* warning is one that informs suspects that they have "the right to remain silent." *See* Miranda v. Arizona, 384 U.S. 436, 454 (1966) (reviewing a police manual that instructs officers to inform suspects of the incriminating significance of their refusal to talk).

140. The model jury instructions in California provide a common example of the reasonable doubt standard:

> Reasonable doubt is . . . not a mere possible doubt; because everything relating to human affairs is open to some possible or imaginary doubt. It is that state of the case which, after the entire comparison and consideration of all the evidence, leaves the minds of the jurors in that condition that they cannot say they feel an abiding conviction of the truth of the charge.

CAL. JURY INSTR.—CRIM. § 2.90 (West 2014).

DNA identifies both the problem and its potential solution.[141] Historically, sufficiency standards heavily deferred to the jury as factfinder and ultimate judge of credibility, which respects the uncertain and ambiguous nature of ordinary evidence. Moreover, the Constitution precludes entering a judgment as a matter of law in favor of the prosecution,[142] and so practically speaking sufficiency rules were limited to judicial findings that the government wholly failed to introduce evidence of some material element or charge.[143]

2G evidence, however, carries a patina of scientific certainty that can render jury judgments inconsistent with the evidence unseemly and potentially constitutionally infirm. By way of example, Roth cites the notorious case of the paternity suit against Charlie Chaplin, in which a California appeals court upheld a verdict finding Chaplin the father notwithstanding scientific evidence to the contrary.[144] According to Roth, allowing a jury to defy virtually certain evidence of innocence both undermines the credibility of the system and violates individual rights.[145] She accordingly canvasses the options for entering judgments as a matter of law when a verdict flies in the face of seemingly certain scientific proof,[146] and ultimately advocates for reformed standards that account for and privilege the value of scientific evidence in a manner that does not offend the presumption of innocence or the burden of proof.[147]

Sufficiency law is only the first of a series of postconviction conflicts between legal standards founded upon an assumption that all evidence is contingent and 2G evidence, which has enhanced probative power. Related issues arise with respect to appellate adjudication and postconviction review of cases involving scientific evidence. Postconviction procedures that hinge on scientific evidence tend to present two major kinds of

141. Andrea Roth, *Defying DNA: Rethinking the Role of the Jury in an Age of Scientific Proof of Innocence*, 93 B.U. L. REV. 1643, 1644 (2013) (proposing "changes to sufficiency law that would foreclose convictions in the face of evidence difficult to reconcile with guilt, while also ensuring that judges do not place science on an epistemic pedestal or intrude upon the jury's role as voice and conscience of the community").

142. U.S. CONST. amend. VI. *See also* Roth, *supra* note 141, at 1691 ("[C]urrent constitutional doctrine forbids a directed verdict of guilt.").

143. Roth, *supra* note 141, at 1646 (noting that "our sufficiency law actually *encourages* deference to verdicts," and the few "cases that do involve a successful motion for judgment of acquittal or sufficiency challenge on appeal typically involve a prosecutor failing to present any evidence whatsoever on an essential element of the charged offense, or a weak, purely circumstantial case").

144. *Id.* at 1664–71 (discussing Berry v. Chaplin, 169 P.2d 442, 450 (Cal. Dist. Ct. App. 1946)).

145. *Id.*

146. *Id.* at 1693–98.

147. *Id.* at. 1697–98.

problems. First, they introduce another round of discovery and access-to-testing issues, with the added impediment of the presumed finality of the initial judgment. Second, they may present courts with the conundrum of changed circumstances in the form of evolving standards of scientific knowledge, or generate conflicts between objectively knowable scientific facts and the ways in which those facts were handled in earlier proceedings.

As to the first point, the discovery issues that arise in the pretrial context are simply magnified in the postconviction stage. Consider that postconviction proceedings currently are not mandatory under the Constitution.[148] It should be unsurprising, then, that there are no due process rights to counsel or to funds for investigation, to have evidence preserved, or to even gain access to preserved evidence.[149] Moreover, even if evidence is tested by a defendant and revealed to be exculpatory, numerous procedural bars may prevent the reopening of a closed case. Arguments of actual innocence have uncertain independent constitutional standing and can be difficult to mount,[150] habeas corpus typically requires a constitutional claim alleging some kind of attorney misconduct, and the "newly discovered evidence" or "motion for new trial" rules often impose significant procedural hurdles such as short time bars.[151] And, needless to say, the state generally has no affirmative obligation to reopen old cases or

148. *Id.* at 1663.

149. *See, e.g.*, Dist. Attorney's Office for the Third Judicial Dist. v. Osborne, 557 U.S. 52, 73–75 (2009) (refusing to recognize constitutional right to access, test, and initiate postconviction proceedings pursuant to DNA-based actual innocence claim). *See generally* Aviva Orenstein, *Facing the Unfaceable: Dealing with Prosecutorial Denial in Postconviction Cases of Actual Innocence*, 48 SAN DIEGO L. REV. 401 (2011) (describing various dimensions of the problem of prosecutorial reluctance to aid in the reopening of cases).

150. *See, e.g.*, House v. Bell, 547 U.S. 518, 536–37 (2006) (stating that under actual innocence exception to procedural bar rule, habeas petitioners "asserting innocence as a gateway to defaulted claims must establish that, in light of new evidence, it is more likely than not that no reasonable juror would have found petitioner guilty beyond a reasonable doubt" (internal quotation marks omitted)); Herrera v. Collins, 506 U.S. 390, 400 (1993) ("Claims of actual innocence based on newly discovered evidence have never been held to state a ground for federal habeas relief absent an independent constitutional violation occurring in the underlying state criminal proceeding."); Brandon L. Garrett, *Claiming Innocence*, 92 MINN. L. REV. 1629, 1635–36 (2008) ("Incomplete recognition of claims of innocence in the states occurred in the shadow of the Supreme Court's reluctance to recognize a constitutional claim of innocence.").

151. *See* Garrett, *supra* note 150, at 1671–72 ("The state statutes making available new trial motions based on newly discovered evidence of innocence typically also contain statutes of limitations, . . . [ranging] from a mere twenty-one days to three years . . . ."). *See also* Bruce A. Green & Ellen Yaroshefsky, *Prosecutorial Discretion and Post-Conviction Evidence of Innocence*, 6 OHIO ST. J. CRIM. L. 467, 484–85 (2009) (canvassing standards); Caitlin Plummer & Imran Syed, *"Shifted Science" and Post-Conviction Relief*, 8 STAN. J. C.R. & C.L. 259, 279 (2012) ("[T]he basis for a collateral appeal is generally very narrow, and it is unclear if new science would suffice to make a claim.").

notify convicts in the event that technology presents a new opportunity to reexamine evidence.[152]

As to the second point, postconviction proceedings typically occur many years after the initial trial, and thus may arise at a time when more sophisticated tests or improved scientific knowledge are available. Even if scientific knowledge remains unchanged, trial counsel or the witnesses may have failed to accurately convey such technical material to the court in the initial proceeding. If so, the record might contain objective errors apparent to appellate counsel or the bench itself. Yet, appellate and postconviction courts are often ill-situated or ill-prepared to notice and correct factual errors of this kind.

Such problems have arisen in numerous contexts. For instance, does a court have the ability or duty to take judicial notice of an announced scientific advance or publicized scandal calling into question the integrity of evidence before the court on appeal? What standard of "scientific certainty" should be applied before such notice is appropriate?[153] How should changes in scientific knowledge be treated on collateral attack of a conviction when 2G evidence based on state-of-the-art technology can be undermined, enhanced, or changed with the passage of time? Should courts differentiate between advances that allow old evidence to be tested in new ways versus advances that simply call into question the legitimacy of old proof?[154] What if the record contains a material inaccuracy—say, uncorrected testimony that states an erroneous numerical probability or faulty testing process? Must a court on postconviction review pretend as though "two plus two equals five" if that is what entered unchallenged on

152. Of course, both federal and state government officials have voluntarily assumed that obligation in a number of contexts, most notably with respect to DNA testing. *See, e.g.*, Jack Nicas, *Flawed Evidence Under a Microscope*, WALL ST. J. (July 18, 2013), http://online.wsj.com/news/articles/SB10001424127887324263404578614161262653152 (describing DOJ's efforts to voluntarily re-examine, using DNA testing, over 2000 cases in which FBI experts offered microscopic hair analysis evidence, as well as a "rare move" to directly notify defendants of discrepancies and to waive procedural bars to subsequent challenges); *Old Arson Cases in Texas Being Reviewed by New Panel*, INS. J. (Oct. 23, 2013), http://www.insurancejournal.com/news/southcentral/2013/10/23/309026.htm (describing efforts to reopen arson convictions likely founded upon faulty testimony, in light of evolving standards of fire science).

153. *See* Christopher Onstott, *Judicial Notice and the Law's "Scientific" Search for Truth*, 40 AKRON L. REV. 465, 487–91 (2007) (suggesting a new standard for courts in taking judicial notice of scientific and technical principles).

154. *See* Jessica Gabel & Margaret Wilkinson, *"Good" Science Gone Bad: How the Criminal Justice System Can Redress the Impact of Flawed Forensics*, 59 HASTINGS L.J. 1001, 1021 (2008) ("Characterizing a recently discredited forensic technique as newly discovered evidence raises the issue of when a technique is sufficiently discredited to constitute new evidence.").

the record below?

These kinds of concerns arose in the 1G era, but lacked both the volume and salience that now attends a world in which evidence has gone 2G. And, as with the other rules attacked by this Essay, although strict principles of finality or reluctance to embrace evolving scientific knowledge may have made sense with reference to the often contingent and contestable nature of 1G evidence, it no longer suits the decisive nature of its 2G counterpart. But the special value of 2G evidence requires reconsideration of these foundational ideas.[155]

To be sure, legal actors have grappled clumsily with efforts to accommodate scientifically certain evidence that contradicts otherwise final factual findings. Such initiatives, while in many cases effective, nonetheless tend to be discretionary and occasional. They include structural efforts like conviction integrity units that deliberately re-examine old cases,[156] development of specialized tribunals devoted to processing innocence claims,[157] the passage of legislation geared to affording defendants the right to access and analyze old evidence with new tests,[158] or even the legislative provision of writs specifically responding to the discovery of new scientific evidence or techniques.[159] Remedial efforts also encompass case-specific attempts to correct mistakes, such as the Third Circuit's recent ruling that a defendant convicted on now-known faulty forensic evidence must be given an opportunity to investigate and reopen his case using the latest scientific knowledge.[160]

155. *See, e.g.*, Brandon L. Garrett, Essay, *DNA and Due Process*, 78 FORDHAM L. REV. 2919, 2921 (2010) ("Traditional postconviction law emphasized leaving final convictions undisturbed because, over time, courts could not reliably revisit facts, as witnesses' memories faded and physical evidence degraded. DNA testing made it possible to reopen cold cases decades after a trial and obtain remarkably accurate scientific evidence concerning identity.").

156. *See, e.g.*, *About Us*, TEX. FORENSIC SCI. COMMISSION, http://www.fsc.state.tx.us/about/ (last visited Feb. 15, 2014) (describing the creation of a state commission to investigate complaints regarding forensic evidence).

157. *See* Myrna S. Raeder, *Postconviction Claims of Innocence*, CRIM. JUST., Fall 2009, at 14, 25 (noting the creation of postconviction tribunals in North Carolina, the United Kingdom, and Canada).

158. *See* Garrett, *supra* note 150, at 1673–74 ("In addition to these efforts at the state level, the federal Innocence Protection Act provides for post-conviction DNA testing in federal criminal cases, and a companion statute, the Justice for All Act, provides financial incentives to the states to make available post-conviction DNA testing." (footnote omitted)).

159. *See, e.g.*, TEX. CRIM. PROC. CODE ANN. art. 11.073 (West 2014) (adding route for relief for cases in which the scientific evidence "was not available" to be offered at trial or "contradicts scientific evidence relied on by the state at trial," among other things); ARK. CODE ANN. § 16-112-201 (West 2014) (providing an avenue of collateral relief where "[s]cientific evidence not available at trial establishes the petitioner's actual innocence," among other requirements).

160. Han Tak Lee v. Glunt, 667 F.3d 397, 407–08 (3d Cir. 2012) (ordering discovery and hearing on claim in arson case on grounds that "[i]f Lee's expert's independent analysis of the fire scene

But these happenstance solutions simply demonstrate that our rules of finality poorly comport with forms of 2G evidence that can be particularly probative of guilt or innocence. Piecemeal redress is a poor substitute for a holistic set of reforms that gives a defendant the power and authority to access, test, and introduce 2G evidence—whenever the technology is invented that can do so—in support of a claim of actual innocence founded in highly probative scientific fact.

IV. CONCLUSION

Twenty-first-century evidence is rapidly calling into question our conventional models of criminal adjudication, which embed many outdated assumptions about the players and proof in the criminal justice system. As currently configured, our system privileges viva voce evidence over other forms of fact-gathering, heavily depends upon the skill of counsel and in-court confrontation rather than out-of-court oversight and structural reform, prefers individualized treatment to collective action, embraces secrecy over transparency, and chooses finality at all costs. As a result, it is destined to court either scandal or injustice, and perhaps both. This Essay has endeavored to paint a comprehensive picture of the scope of the problem, and even set out some paths for reform. Though some suggestions are ambitious and challenge our structural assumptions in profound ways, others simply require a slight shift in resources or a little ingenuity. Whatever reforms are ultimately implemented, the time to recognize the special probative value of 2G evidence is overdue, as new forms of evidence offer better ways to resolve criminal cases. Accordingly, our system should adapt to the needs of this important type of evidence rather than forcing it to fit an antiquated model of factfinding.

evidence—applying principles from new developments in fire science—shows that the fire expert testimony at Lee's trial was fundamentally unreliable, then Lee will be entitled to federal habeas relief on his due process claim").