Panel Discussions on

Autopsy of a Crime Lab: Exposing the Flaws in Forensics

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Duke University
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Introduction
Brandon L. Garrett

Scientific evidence has long been central to our understanding of wrongful convictions. The role of science has been two-edged: science has been used to exonerate innocent persons, but improper use of scientific evidence has also often contributed to their wrongful convictions. Forensic evidence, in which scientific or technical practices are used to collect, analyze, and interpret evidence in cases, has long been used in criminal investigations. There is growing public, legal, and scientific awareness, however, that a wide range of forensic practices lack adequate scientific foundations.

I am so grateful to the editors of the Wrongful Convictions Law Review for publishing transcripts of two wonderful panels convened following the publication of my book, *Autopsy of a Crime Lab: Exposing the Flaws in Forensics*, published by University of California Press in 2021. Each panel featured leading scholars whose work bears on how forensics goes wrong and how to get it right.

[1] Edward K. Cheng, Hess Chair in Law, Vanderbilt Law School, Nashville, TN; Erin E. Murphy, Norman Dorsen Professor of Civil Liberties, NYU Law, New York, NY; Dean Jennifer L. Mnookin, Dean and Ralph and Shirley Shapiro Professor of Law, UCLA Law, Los Angeles, CA.

[2] Paul Heaton, Senior Fellow and Academic Director of the Quattrone Center for the Fair Administration of Justice, The University of Pennsylvania Carey Law School, Philadelphia, PA; Maneka Sinha, Assistant Professor of Law, University of Maryland School of Law, Baltimore, MD; Itiel Dror, Senior Cognitive Neuroscience Researcher, University College London, UK.

The first panel, hosted by the Wilson Center for Science and Justice at Duke Law School, which I direct, included Professors Edward Cheng, Erin Murphy, and Dean Jennifer Mnookin. Edward Cheng researches evidence law generally and scientific and expert evidence specifically. He is the co-author of *Modern Scientific Evidence* and he is the co-host of *Excited Utterance*, focusing on evidence law. Erin Murphy researches forensic evidence, technology issues, and forensic DNA typing, and wrote Inside *the Cell: The Dark Side of Forensics DNA* (Nation Books, 2015). Dean Jennifer Mnookin co-authors two scientific evidence treatises and has published leading work on the path forward for forensic science in this country.

The second panel, hosted by the Quattrone Center for the Fair Administration of Justice at the University of Pennsylvania Carey Law School, was moderated by Paul Heaton, the Center's Director. Included in the panel was Dr. Itiel Dror, an expert in the field of expert decision making and bias, with leading publications on the subject of cognitive bias among forensic examiners. Second, Professor Maneka Sinha participated, a longtime public defender at Public Defender Service of DC, where she led the agency's nationally recognized forensic practice group.

Panel Discussion One: Duke Law
25 March 2021

Brandon Garrett: Welcome, everyone. My name is Brandon Garrett. I teach here at Duke Law, I'm really honored to have comments on my new book, *Autopsy of a Crime Lab*. It's about forensic science. And I can't imagine three more exciting friends to have comment on the book, comment on their own work, and talk about how to solve these problems facing forensics evidence in our country and in the world.

The plan is that they're going to each reflect and talk. And I'll respond a little bit, but we really hope that you post questions in the chat because we like to have a panel conversation about these issues. For those of you who are lawyers, law professors, and care about scientific evidence, we hope this will be of interest. If you just like watching CSI shows and want to hear about how it's all fake, we can make sure we correct your misperceptions.

And so first we'll have Professor Ed Cheng sharing his thoughts with us. He's the Hess Chair in Law at Vanderbilt University. His research focuses on this topic—on scientific and expert evidence, the interaction between law and statistics. He's the co-author of *Modern Scientific Evidence*, which is a big, big, big treatise and remarkable resource for lawyers. And he's also the host of *Excited Utterance*, a podcast which I hope that you all tune into; it's a wonderful weekly podcast focusing on evidence.

We have Erin Murphy with us from NYU Law School. Her research also focuses on forensic evidence, but also on technology issues and forensic DNA typing. And speaking of books, Erin wrote a wonderful book back in 2015 called *Inside the Cell: The Dark Side of Forensics DNA*. So yes, even DNA evidence can go wrong. And Erin is also a co-editor of *Modern Scientific Evidence*. She's also working on a highly laborious project to revise a certain Article 213 of the Model Penal Code.

Finally, we also have Dean Jennifer Mnookin, Ralph and Shirley Shapiro Professor of Law and Dean at UCLA School of Law since 2015. Jennifer Mnookin has been working on two scientific evidence treatises, the modern scientific evidence treatise that our other speakers are part of, but also "The new Wigmore." Dean Mnookin is part of the American Academy of Arts and Sciences, is on the board of the Law School Admissions Council. Her work has been cited in I think every leading document on what to do about forensic science in this country, including the 2009 National Academy of Sciences report, which is a critical document in this area that you'll probably be hearing a little bit more about.

So, thank you all so much for tuning in and for watching the recording if you're not watching it live. We'd love to hear from you first. And I'll mute myself. And I'm really grateful again to all of you for your thinking about my book and for sharing your own ideas.

Ed Cheng: Thanks, Brandon. there's much that I agree with in the book. Many of the key reforms that Brandon outlines are part of my own wish list for the future of forensics and would bring forensics in line with modern scientific practice which is long overdue. So, for example, I too would like to see traditional "match" assertions replaced by probabilities and error rates. I'd like to see blind testing, where analysts don't know the desired result and, in fact, whether the sample is a real sample or a test sample. And I'd also like to see the quality controls and standards of our medical laboratories replicated in our crime laboratories.

What I want to focus on today, though, is how we get from today, where there's painfully slow and grudging acknowledgment of forensic science's problems, to somewhere better.

One question evidence scholars have asked a lot recently is why Daubert never quite fulfilled its promise in this area. Why, with so much criticism, have courts continued to admit forensics? The book notes that it might be a pro-prosecution bias or that courts might feel constrained by precedent. But I'm not sure I agree that, as a general matter, this is just a blind imitation of the past. I suspect judges here are often being practical rather than just narrow minded.

Evidence academics tend to naturally think about admissibility. But increasingly, I think this focus on admissibility is a mistake, at least as regard to forensics. Judges are going to be reluctant to flat-out exclude forensic evidence, and they may have good reason, because forensic evidence, even with all its flaws, can still potentially be highly relevant.

Microscopic hair comparison--one of the most maligned forensic methods out there--can exclude people. If you find a straight black hair, it could have come from my head. If it's blond, it didn't. While obviously hair examiners have gone way over the line in overselling their identifications, at the end of the day, a straight black hair rules me in. Now, it doesn't prove I did it, but it makes it somewhat more likely. We might not even know exactly by how much, but the hair comparison has significant evidentiary value. And I suspect courts won't exclude evidence with evidentiary value lightly, even if such evidence is missing things we'd want, like population statistics, error rates, and blinding.

Moreover, if you exclude the forensic evidence, then what? The trial will still happen, just without the forensic evidence. What's left will be a hodgepodge of eyewitness testimony and other

evidence, which might be even less reliable, depending on the case. So, getting judges to exclude forensic evidence will be a significant uphill battle.

That's probably why Daubert has been one gigantic disappointment in this area. If you imposed exclusion globally, forensic labs might produce better evidence. But judges usually rule based on a specific case. And faced with a specific case, judges won't want to throw out potentially useful information. What they will do and have done is try to rein in expert testimony and prevent egregious overselling.

So, on admissibility, I disagree a bit with the book. Exclusion isn't the most fruitful approach. But the book, to Brandon's credit, doesn't fall into the trap of focusing solely or even primarily on admissibility. The book takes a much broader, systemic view of the forensics problem, and there it really shines.

The book takes this systemic view in three ways. First, there's a thread throughout about institutional practices and reforms outside of courts. For example, Brandon talks about how TSA security screeners are subject to random proficiency testing through the introduction of test objects. Every once in a while, you put a gun or drugs in a bag, have it screened, and see whether the screeners detect it.

That makes me wonder--how did TSA get that implemented? I'll bet security screeners originally opposed such testing because it would expose them and it stress them out, much like forensic examiners who oppose testing today. But somehow, TSA made that standard practice.

Another example: Brandon recounts how medical testing laboratories in the '60s and '80s became subject to greater federal regulation when their results were discovered to be unreliable. Was that effort successful, and can we learn from those experiences? Understanding how to pull those regulatory and cultural levers might move us towards more effective reform in forensics.

The book's second important thread involves getting juries to understand the probative value, and perhaps more importantly, the limitations of various forensic techniques. Instead of waiting for judges to save us from bad science, Brandon's empirical research has asked how we can help juries help themselves. A significant finding unknown to me until reading the book was that manipulating experts' language matters little, while telling jurors the actual error rates or statistical results can matter much. So, juries can help themselves with the right information.

Third, Brandon concludes that "judges must rethink their role as gatekeepers." I interpret this as suggesting that judges should reconsider their role as gatekeeper and instead move towards becoming facilitators.

In my view, improved forensics are not necessarily going to come from gatekeeping. Instead, improvements may more fruitfully come from empowering defense attorneys to get needed information and to expose weaknesses in the techniques. The book recommends that judges require more than just bald conclusions, in line with standard evidence doctrine under Rule 705. We could go further. Judges could impose full discovery in criminal cases, and grant defense teams

access to forensic databases, lab procedures, and machines so the defense can effectively do its own testing, as we see with breathalyzers and in a few other places.

With such access, the adversarial process might more reliably do its work. If defense attorneys get this information, and forensic labs get beat up in case or two, they'll have to up their game. And then the defense attorneys will retool, and so on and so forth -- getting us closer to what we want. But none of this can occur if courts allow the forensic labs to basically black box themselves.

So, in sum, Autopsy of a Crime Lab is a delightful read. For those of you who haven't read it so far, it's a very easy read. It provides a lot of food for thought, and most importantly, I think it plots some promising new ways away from admissibility and away from Daubert that are more practical ways of pursuing forensic reform. So thanks a lot, Brandon.

Brandon Garrett: Thank you so much, Ed. So next, Jennifer?

Jennifer Mnookin: Sure. First of all, thanks so much to Brandon and to Duke and to the Wilson Center for the invitation to be here. It's just a delight to get to spend a little while talking about Brandon's terrific new book and also getting to see Erin and Ed and to get to talk turkey about evidence and forensic science. So, it's really a pleasure to be here.

I want to focus on a couple of things I really loved about the book and then also ask a couple of questions. I think one of the tremendous strengths of the book is its synthetic quality. It reviews the entire range of issues around crime labs and some of the challenges around them, from quality assurance limitations to the problems with insufficient focus on cognitive bias to the fact that there isn't proficiency testing or inadequate focus on error detection to the challenges of admissibility, the lack of discovery, the crime scene efforts and some of the problems there.

And so it really gives us the whole soup to nuts range of engagements. And in so doing, it's not just synthetic, but it tells a really powerful story of how this is a pretty systematic set of problems. It's not just an issue in one area, but rather, from beginning to end, forensic science doesn't appear to be operating with a serious focus about making sure that we're doing all that is reasonably possible to ensure both accuracy and validity and to ensure transparency about what we know and what we don't know. So, there's both questions about validity and accuracy, but also whether we're even just being candid systemically about these issues in these problems.

And so, I think its scope is terrific. It's extremely readable. It's got nice anecdotes while being substantially more than a series of stories.

And while there's some anger in it, it's not breathless anger. It's not overdone vitriol. It's frustration at the seriousness of what's at stake here and the limits to what we're doing right, given that there are so many realistic, plausible ways that we could do this better.

Like Ed, I take really no quarrel with the set of policy suggestions at the end. I think they're all not only valuable and important but quite feasible, which makes it even more frustrating that they haven't happened. I guess what I'll focus on here are a couple of places where Brandon's book

got me thinking in ways that were novel and interesting, and then in some places where I wish he might have gone a little bit further in the directions that he does begin to explore.

One of them is around Houston and the Houston crime lab. Houston, in some ways—if there is a hero in the story, the Houston crime lab is the heroic alternative, with Stout, the head of that crime lab, being willing to operate in an extremely different way than most other crime labs. This came out of a series of very significant scandals. And Brandon tells that story well.

And he also describes how the Houston crime lab is working to be substantially both more transparent, putting lots and lots of materials on the web that most labs keep pretty secret. They're also doing blind testing. They're inserting actual blinds into the flow of research. This is something that in the forensic science world many were saying was either impossible or just vastly too difficult or expensive to do in a variety of these areas. And Houston has found a way and has worked to make it part of their standard procedures.

And so, there's really an alternative story here of a crime lab that's taken a variety of these steps, from sequential unmasking to blinding and the like. And so, I was a little bit disappointed that the book didn't explore more whether this was making a difference, really, and how it was working and how it was being received by others. So, I want to both commend Brandon for the focus on this and for showing us a pathway.

But I wish he'd gone a little bit further and deeper there to help us understand, all right, is this actually-- what's different here? They're still, as far as I know, using all of the same forensic techniques that other labs are using. If they're inserting blinds, what kind of results are they giving? Are there errors? How often?

What are we finding there? How are the forensic scientists' sense of their own role changing? Do they do defense work? Do they take on—I assume that they do, but let's explore that a little bit more. And so I guess I would love to hear Brandon talk a little bit more about the Houston experiment, so to speak, how well it's working, what lessons we can draw from it, because if it's working very well. Then there's a very powerful story to say: this is feasible, folks. This is entirely doable, and here's why it matters.

If it's not actually leading to very many changes on the ground, what does that mean? Does that mean that actually they're inserting blinds into firearm identification and the investigators are getting them all right? If so, what do we do with that? So, I would I'd love to see Brandon explore that and tell us a little bit more about what we can learn from that experiment, its power, and its limits.

Two more places along similar lines that I both found the book to be a really thought provoking, but I also found myself eager to hear a little bit more about what he would say—one, and I agree with Ed that admissibility shouldn't be the primary focus. And I think, to Brandon's credit, it really isn't the primary focus in the book.

But there is some sort of puzzle here, which is, why in this forensic science space—why the authority of traditional scientific elites has been so resolutely ignored by other elite parts of the

system? We're in a moment right now where there's a lot of distrust of expertise, where there's a lot of anxiety about truth and whether we have any shared understandings. And so we're at a moment where one might understand distrust of certain kinds of frameworks.

But in the forensic science space, this goes a ways back. So, the National Academy of Sciences report in 2009 was a blockbuster, as Brandon suggests, and really did shock many. It also wasn't what people were initially expecting from the group. When the report first went forward, I think even the co-chairs really expected that they were going to find that there were some issues, there was a lot of underfunding, but they did not expect to find this substantial challenge around validity and the lack of scientific research undergirding techniques that have been used in courts for a very, very long time.

It surprised them. It surprised a great many observers. It didn't surprise a handful of academics who had been working on these issues for some years but had been kind of toiling in the wilderness. I was one among them. We were being ignored. And so it was sort of gratifying to see the National Academy of Sciences find that these were serious, serious concerns.

As Brandon details, the courts didn't do much with this report. Sometimes they ignored it altogether. Often, they gestured to it. They said, oh look, yes, this report. It suggests there's issues. But nonetheless, this evidence is good enough to let the jury hear it and decide what to do with it. So there was a move of a great many judges to vaguely gesture but not really take the import of the report seriously.

The same, largely, has happened with the report that came out years later from the President's Council of Advisors on Science and Technology (PCAST). One of the people who spearheaded that second report was Eric Lander, who now has been nominated to be President Biden's cabinet level science advisor. And Eric Lander really was, I think, quite offended by the degree to which scientific evidence that was being regularly used in court simply wasn't adequately scientific.

He has a history of involvement with these issues that goes back to early DNA cases where he played an influential role. But he was really one of those who spearheaded the PCAST report. The PCAST report, again, found, in essence, that not very much had changed. And Brandon details that, I think, very well, and describes the report and its findings.

The report found that a few kinds of forensic science had had just enough testing to meet foundational validity. That report found, for example, that there was just enough research on fingerprint evidence that actually, at that moment especially, was a contestable claim. But in any event, they put fingerprinting on the side of having just enough actual research to support foundational validity, while suggesting that many other kinds of forensic science that are regularly used did not yet have that and therefore really shouldn't be used, until they did.

Again, courts have largely deflected, sometimes ignoring, sometimes gesturing but explaining away. And other institutional locations where we might have expected people to have to take these reports seriously largely haven't. The Department of Justice didn't much take the report on board, even in the Obama Administration, much less in the Trump Administration that

followed it. Some of what other groups said about the report frankly were just hard to take with a straight face.

Brandon details one episode afterwards where a set of people, including folks within the DOJ, said that the report had failed to consider a great many studies, that if only they looked at them would have gotten them to different results. And so, they said, this report just didn't even look at the right things. And so, the members of PCAST—and I should note that I played a role in chairing a group of lawyers and judges and a couple of deans who were advisory to the PCAST report. So, I want to just note that I'm perhaps not a completely unbiased narrator of this.

But nonetheless, PCAST said, really? We've missed things? We're terribly sorry. Please share them. Tell us what they are. What did we not look at that we should have? We'd be delighted to take a look. And a bit shamefacedly, those who had made this claim had to come back and say, actually, upon a closer second look, there really weren't any studies that we can point to that arguably meet the criteria that you put forward and that you ignored.

And so, I guess what's interesting about this—Brandon compares at a couple of different times in his book—he compares the reception of the recognition of these issues in forensic science to other spaces, like hospitals, like quality assurance in the medical field, like some other National Academy reports that have gotten more attention. And so, I think there's an interesting puzzle about why, in this space, the findings of relatively neutral groups of elite scientists have been so deeply ignored. And I don't think we can just say, well, it's because a lot of judges were former prosecutors, or because some of these things have been used for a long time.

I don't know that I have a complete answer. I might have some ideas about it. I'd be happy to talk about it. But I'd really be interested in hearing what Brandon would say about how to explain why, in this space, there's been a particular ability to ignore these findings, even as the more general concerns about wrongful conviction, which Brandon has played such a leading role in bringing to light and exposing, have become more commonly understood.

So, the challenges with law enforcement more generally, the challenges with our system of justice, and the fact that we make mistakes-- that is so much better understood now, including by the public who watches shows on Netflix and listens to podcasts and reads New Yorker stories. And so, there's a much more deeply understood recognition of some of those limits. And yet in this crime lab forensic science space, there's been really remarkably-- I don't want to say no change because there has been some, but remarkably little change all things considered. And so, I'm curious to hear what Brandon would say about that.

Final question, and I'll conclude here. And this one gets maybe a little bit more technical or in the weeds. Brandon talks in a number of ways about wanting to open up the black box of forensic science and what's going on in crime labs.

And I'd like to press him a little bit on what he means by this because he's a little bit ambiguous in the book along two different dimensions. One of them is about whether there's adequate testing of forensic scientists' ability to reach conclusions accurately. And he argues quite clearly that we need better proficiency tests. He talks about how easy some of the proficiency tests

that we have are and how it's just a very serious problem if we're not giving juries and the public better information about how frequently mistakes are made. And I completely agree with him on that score. And that would be one way of thinking about what opening up the black box means.

On the other hand, sometimes that kind of engagement is still referred to as black box testing, where you're not—actually, you don't care how they're doing it. You just care if they're doing it well. And in forensic science, there's been a rather limited interest in some of these fields about either one, either looking at how well they do it, or looking at whether we can understand what it is that they are actually doing. And here I thought the book wasn't entirely clear.

So if we do imagine a world where we insert blinds into the normal forensic science workflow, and we do it in a sophisticated enough way that they don't know what the blinds are or whether they're being tested or not, if we do other studies, both testing that we know to be tests and inserted into the normal workflow that tests examiners and we find out that they're pretty darn good at what they're doing but they make mistakes but not that often, that we develop some kinds of both false positive and false negative rates for examiners with who've gone through adequate training and have a good deal of experience—but if we still have pretty subjective underlying methods, if these examiners are still really eyeballing things and reaching decisions based on their best judgment and experience, is that enough for you, Brandon? Or would you still have a set of concerns because of the subjectivity of the underlying methodologies that they're using and operating on? And so, I'd love to invite you to give us—to tell us a little bit more about that as well.

Overall, I think this book is much needed. I hope it gets very broad readership. I think it's thoughtful, synthetic, not overstated, a little bit angry but not breathless, and offers the opportunity to bring back greater attention to trying to create a broader national engagement with how to make improvements here that certainly we haven't been able to do since the NAS report and even before. So, congratulations.

Brandon Garrett: Thank you so much. And I hope I have time to talk about some of the questions and topics that you raised because they're really, really interesting ones. But first I want to turn things over to Erin.

Erin Murphy: … It is such a joy and an honor to be here, mainly because I get to celebrate Brandon and this incredible book. … So, I will start by heaping some compliments on the book in hopes that it draws in some of the listeners here to get their hands on it because I think it is important to read. And then I would like to raise a few questions.

So first, the compliments or what I like about this book. It turns out that, like the word compliment itself, all of my praise distills into three "c" words: the book is conversational, comprehensive, and compelling. Let me elaborate on each.

The first thing I really love about the book is its conversational tone. And this is something that is always true about Brandon's work. He is such a clear and a straightforward writer. He takes these complex topics that are very interdisciplinary in nature, and he makes them come alive and become something we are invested in as a real problem of humanity and not just an abstract legal

debate or scientific or doctrinal debate. He really invests his readers with a stake in the story and curiosity about the way forward.

So, for instance, he likens the struggles over including error rates to a child demanding a perfect score on a test, who argues that if you refuse to answer any of the questions you cannot technically have gotten any wrong – an argument I'm not going to tell my kids about. He uses the legendary '76 Judgment of Paris to make a point about a cognitive bias. And possibly my personal favorite—he describes Sandy Levick's work at PDS in the Special Litigation Division as the X-Files of a public defender's office. Which made me regret being a boring old trial lawyer when I could have worked in the X-Files division.

Brandon even builds up anticipation about the release of this 2009 report—this landmark study from the NAS that called into question all these forensic disciplines—by describing the gossipy scene at a AAFS meeting. He has the analysts scurrying around asking, "What does it say?" and "Have you seen it yet?" As though it were the end of The Undoing or the Mueller report or something like that. So, it is such a joy to read this book if for no other reason than because it takes these dry, sometimes even technical issues and makes them come alive.

The second thing I really loved about the book is how comprehensive it is. Many of us who work in forensics tend to specialize, especially because it often requires a scientific or statistical expertise that, for lawyers, can be hard to come by. So, we end up focusing on a single discipline or maybe even an era. Scholars define themselves as the AI person, or the DNA person, or the 1.0 tech person.

But Brandon holds expertise across time and subject, and that breadth and depth of mastery is really critical for the book, because it allows him to use what we've learned in the past to shed light on the future. Many people know his work uncovering the sources of wrongful convictions with respect to the 1.0 methods of pattern-matching discipline like bite, hair, and tool mark, and fire investigations. But this book does not stop there. Brandon is really, as I Jennifer said, doing a soup to nuts of forensics. He is talking about the 1.0 methods. He is bringing in the transition methods like DNA. But he is also looking forward to AI or facial recognition or big data, these other techniques on the horizon. And that's especially important in this moment of time because, as he notes in the book and is so important, databases have transformed forensics. Those are his exact words.

Databases have transformed forensics – *all* of forensics – and so we can no longer think about spent shell casings or latent prints as a 1.0 technology. Because they are also tapping into these big data interfaces, or they are using AI technologies, or they are interfacing with other programs like facial recognition and so on. So, the ability to trace the problems of the past through their revised implementation today, and then carry on to contemplate what this might mean for the future, is critical, and book does it so well.

Lastly, this book is so compelling. It is just a compelling read. And it is compelling in two ways. One is that it compellingly uses the voices of those wrongly accused and incarcerated as a center that holds the narrative. When he writes about Keith Harward or Joseph Buffey or George Rodriguez or Juan McPhaul, when he puts their words down on the page, it really makes the

urgency of these issues feel acute. It makes the problem and the injustices in this field feel very stark and very real and not abstract. And even some of the legal figures—like Judge Rakoff or Peter Stout or Peter Neufeld and Barry Scheck, who founded the Innocence Project—they come through as real people, as humans with ideas trying to fix this broken system and come up with solutions, not just legendary or supernatural figures. And so it makes the book less of an abstract indictment of a system and more of an account of the real challenges of how this system affects human beings and how those human beings can fix it with human tools.

Second, in addition to being narratively compelling, the book makes a compelling case. After cataloging the dire state of forensics from soup-to-nuts, Brandon lays out his blueprint for fixing forensics. Given that others have addressed the eight-point plan that he summarizes in the book, I will simply say that his arguments are convincing -- and move now from giving heaps of praise to raising some of the questions or comments I had so that we can make sure we have enough time for conversation with the group.

I'll start my comments with minor questions, and then move to the bigger picture. First: I couldn't tell exactly where you came out on the National Commission on Forensic Science. Your book addresses the Commission, and you criticize its shuttering at some level. You worry about NIST as a kind of alternative. You note the state commission model and the failure of that model to propagate or the unique success of Texas' commission. You talk about C-SAFE's work, obviously. But it wasn't quite clear whether, if you had President Biden's ear right now, or maybe Eric Lander's ear right now, would you advocate for a National Commission in its former form or in some new form, or would you in fact prefer supporting state commissions as a better model to think through reform, like try to duplicate the Texas Commission.

Second, I really loved how you talked about mass forensic error. I am not sure if this is a familiar term. I liked the framework of thinking of some of these situations, whether discipline-specific, like the hair example that you used throughout the book, or analyst-specific, like the Massachusetts lab or even a couple analysts, say, or a single lab—how to think about these mass failures and what it would mean to unwind them back, not just to prevent them going forward. I appreciate your discussion of laws that allow reopening of cases because of changed evidence, which for a particular discipline could be one solution. But addressing forensic error, not just preventing it prospectively but understanding how to correct it retrospectively, is going to be an increasingly important issue that requires attention.

The third is something that others have touched on, so I will not spend too much time. But I want to note how important it is that your book touches on more than legal interventions and judicial interventions, especially considering (as you do in an entire chapter) the failure of judges to date to do their job. Or the example you give FBI hair analysis manuals as far back as 1984 that said, "don't do this," and yet everyone still did it. So, this raises the question of how much we should just give up on courts. Should reformers admit that courts have not worked, whether through attorneys or judicial actors. And should we instead focus on other venues for reform, whether going straight to labs or straight to the legislative branch. After all, one benefit of the interdisciplinary nature of forensics is it does offer alternative points of intervention not available for more traditional legal issues.

Fourth, your book deftly manages the tension between the exculpatory and inculpatory use of forensic evidence. This is a tension that, as a DNA person, I feel very acutely. In the book, you quote an exoneree saying, "I thank God for DNA," yet the book criticizes the use of forensic techniques including DNA. You talk a lot about the false negative aspect of the Mayfield story, the fingerprint story, or the need to improve crime scene processing, or the need for jurors to hear not just about possibility of inclusion errors but also exclusion errors. In this way, it is hard to have a clear and consistent and comprehensible message about forensics when it can seem, at least to a layperson, that you are saying that it is junk unless it exonerates. It is a difficult line to walk, and to walk clearly: firmly criticizing forensic methods while also acknowledging their value for exculpatory purposes.

Lastly, I kept thinking as I read your book, is this a watershed moment in forensics or not? Is this a turning point? Is this a landmark? Is this something that we're going to look back on as a moment where forensics really changed?

There are a lot of arguments in favor of this moment being a truly transformational moment. Forensic critics have landed a string of blows, including the 2009 NAS report, the PCAST report, the output of the National Commission. We have a massive social uprising for the first time in decades over policing and racial and social justice issues. Policing is recognized as a more political enterprise than it has been for many years. We see legislative efforts to restrict police surveillance technologies like facial recognition or AI. We see greater judicial awareness, in cases like *Carpenter* or *Jones* in which the Court is starting to reckon with technology and how it interfaces with policing. We see a progressive prosecutor movement. Jennifer mentioned Eric Lander having a cabinet appointment. There are a lot of reasons to think we are in a watershed moment.

But then I get clawed back to reality by the fact that there was such sharp resistance to PCAST from Justice appointees—even Obama appointees, not just from Trump and Sessions who obviously kneecapped reform entirely. Or I consider that the *Breathe Act*, the signature platform of the Black Lives Matter movement, does not really say much about forensics. It demands post-conviction DNA access, but it doesn't talk about the stockpiling of 17 million people's DNA in a database. It actually supports more funding for forensics, which I think can be read ambiguously.

And then there is the general the distrust of science and expertise, as Jennifer discussed. We have examples of forensic technologies being used in this unchecked, quite frightening way -- like facial recognition systems, as you detail throughout the book. In these ways, this feels not like a watershed moment but like a familiar moment – the sense that we have been here before, such as when the 2009 report came out, and we thought, "It will all change now because the curtain's been lifted." And yet nothing changes. So, I am hopeful that your book is part of a moment of consequence, rather than a blip in the same old story.

To close, I just want to echo what everyone else has said: this book is an incredible read. It is an essential read for anyone who is practicing in the field of criminal justice in any way. And I thank you for giving us so much to think about as well as bringing us here to do that thinking together.

Brandon Garrett: Thank you. These are really, really great comments. I want to say just a few things about them and then turn to some of the great questions we've been getting on the chat. Thank you all. Thank you, Melissa and the folks at the Wilson Center for putting this event on.

I do have some real optimism about forensics. And maybe I shouldn't. And certainly, in the book I talk about how some new technologies are actually creating more problems and more dangers for error. And I do believe in the things I say in the book and the things I do in the book trying to humanize people. I think that people who work on forensics are really interesting, hard-working people who have challenging jobs. And I do think that there has been a real culture change.

There's a real interesting paper that I'm working on right now where Nick Scurich and I surveyed firearms and tool mark examiners around the country. And you see this cultural divide where there's a group of up-and-coming examiners who welcome statistical approaches, who welcome expressing their conclusions and probabilities and not just saying, it's a source ID or a match, like they used to in the past, and who think that black box studies of the type that Jennifer mentioned are a good thing and there should be more of them.

And you see another half of the group that says that this is all ridiculous. We've been doing this for decades: "These people don't understand what we do; There are a bunch of PhDs who don't understand what real firearms work is; This is all garbage; Leave us alone."

But that's within the community. And I think it is kind of exciting, actually, that there's a real diversity of approaches in some of these communities now. And you see you're starting to see more labs and more people in these communities talk about the need for real research to establish the foundations of their disciplines and a willingness to talk about it in their reports and in court. And that's exciting.

And that said, on the topic of firearms, there's a case my students are working on—an amicus brief where you have a sophisticated e-type examiner from a large lab who says, "Oh, I've read that PCAST report, but that was written by these supposed scientists who really weren't qualified. None of them were firearms examiners. They don't understand what we do. They talked about some study about error rates, which is totally made up. And it doesn't really matter that much because, let me tell you about me. My zero-error rate is my own. And I've never made a mistake. I have a personal error rate of zero. I get proficiency tested—these super easy joke tests. I've never made a mistake in my work. So, I'm sure it's possible for sloppy people to make errors, but I don't. And so, listen to me. And this firearm is a source of identification. It's a match."

And so, kind of the same old testimony but wrapped around some of the more important scientific statements and trying to smother them with personal confidence and self-satisfaction in one's work. So, you read something like that and think, oh God, nothing's changed.

I think that we could say more about the experience in the Houston lab. They're sharing data on their blinds with this group of researchers called CSAFE, the Center for Statistics and Applications of Forensic Evidence, that I'm a part of. They're actually expanding that work to look at the testimony of their examiners in court and reviewing that.

And there's a culture that, yeah, sometimes people make mistakes. To permit a quick answer to what Jennifer was asking about—is it OK to have a black box when we don't know exactly what the person is doing? They're using their experience, their training. They're not measuring anything in particular. They're just using their experience to reach conclusions about evidence.

My view is, if they're accurate—if the TSA person can't tell you what looks funny about some of the images and causes them to think that it's a bomb, but they always catch the bomb, great. We don't care what they're doing as long as they're accurate. However, if they make mistakes, then you have to open the black box. And you have to figure out, well, what was ambiguous about that image that caused you to miss the bomb or to mismatch the firearms or the fingerprint? Then you need to do some root cause [analysis] and figure out what's going on.

And that's the approach at a lab like the HFSC. They're not just testing everyone in the lab to see who makes more errors and report uncertainty. You need to do that. You need to report error rates.

But it's also to figure out, why did this person make mistakes? Are they poorly trained? Or is it more likely that people make errors if the evidence is of low quality and maybe you just don't want to be doing examinations of low-quality evidence? Or is there some other problem? Is the person looking at too many images in one day and they're getting burned out or whatever?

And so I think that—but I agree. There are lots of different uses of black box [studies]. And I talk about black box algorithms and lots of ways that we don't know what's going on. The need to just have work be documented, to have discovery—that's something that judges can do without excluding evidence. The fact that it's OK in many places for lawyers to get a one-page report that often has one line of relevant text which just says, this was identified as that. No documentation, no markings. You don't know how long the person did the work, who worked on it, what they did, what they found. Nothing. It's an embarrassment that that counts as adequate discovery in a criminal case.

I'll take on some of these great questions that have been submitted. One question has come up. Why doesn't the forensics community take on some of this stuff? It shouldn't be up to courts. It shouldn't be up to lawyers like us to solve these problems. You'd think crime labs would want to do something about it.

I don't know if you saw the news. The *Boston Globe* just reported a huge expansion of the inquiry into cases in Massachusetts, multiple times the number of tens of thousands of cases. It's now metastasized into reopening potentially many, many more tens of thousands of cases. So why aren't those labs doing top to bottom regulation and error detection now, now that they know how enormous these problems can become?

I'm curious what some of our guest's thoughts are on this. Why isn't there more self-regulation?

Erin Murphy: I would just jump in and say that it's also really important to recognize that the pressures on labs to process enormous volumes of cases lead to a lot of the type of shortcuts and incentives to cut corners, et cetera.

Brandon Garrett: Yes.

Erin Murphy: There is both a financial component to that, and there's a "how you get ahead by processing cases" component to it. There's a self-interest that "I want to go home" component. There's a lot of components to it.

And that way, I think we have to link forensics directly to mass incarceration. We have to link the volume of cases coming through and the kind of cases they are. Could a lab spend more time carefully looking at a capital case if they were not spending so much time processing cocaine samples? So, I think there is a connection that has not yet been drawn that is important to consider between how forensics are used in the huge volume of actual cases versus in the cases that people most care about.

Jennifer Mnookin: I'll add two quick points to Erin's thoughtful answers. I think one of them is something that you say in the book, Brandon, which is [that the labs are] overworked, [there's] not enough money, and [the personnel don't] even necessarily [have] the degrees or the background to do it themselves. So, it's easy to ignore when it doesn't seem like something that you can easily get hold of and solve when you've got 400-day backlogs, and not enough money, and, besides which, you have maybe an undergraduate science degree yourself, so how would you even go about studying it if you wanted to?

But [for] the second - I do think this is a place where the courts matter. And so even though all three of us in some sense said that we didn't think admissibility should be the focus, fundamentally, the courts have required remarkably little of these fields, maybe some slight language changes like, OK, don't say that you're 100% certain and can never make a mistake. Just say that you are almost completely certain and that it would be shocking if you made a mistake, like take the language down a little bit but really don't require much change.

And since the court is the ultimate audience for these findings—to be sure, 95% of cases plead. Most things don't ever get to the court. But still, the courtroom is kind of the outer boundary for these technologies and their purposes. If there's just no pressure to do something different coming from the courts combined with not really having the background knowledge or expertise to know how, and a shortage of funds, why try to do very hard research projects that, at best, will show that you're almost as good at doing what you do as you've been saying you are?

Ed Cheng: I'd like to highlight the point about how this is a cultural problem. Houston is the model, but the question is how you get from where you are to Houston?

One of the things that I thought was instructive was your historical discussion about medical laboratories. You said it was post-World War II when they started to realize that they had a problem with reliability. And you only get two sets of big legislation in the 1960s and in the 1980s. So, we're talking 40, 50 years before we got our act together on the medical laboratories.

And a lot of that may have a lot to do with generational changes. So actually, what's really interesting is your comment, Brandon, about how there's this new generation of forensic analysts that is comfortable with the statistics and wants to do it in the empirical way. In some ways you have to wait for them to take over and for that cultural change to occur. And the real question will be whether you can accelerate that process. We don't really have 50 years to wait for forensics to change. Here, I think some of the psychological literature, or some of the business literature on how you get an organization to pivot—those resources will provide ideas on how to accelerate institutional change.

Brandon Garrett: I talk about the Army crime lab and how they had a plane crash on an aircraft carrier. And they knew they had a problem. They knew that people on the aircraft carrier were using drugs, and their drug testing program wasn't catching it.

There's another piece of it, which I didn't get into in the book, on federalism and federal legislation and the like. Clinical laboratories and hospitals can't not comply with conditions of Medicaid. And there's so much federal money that goes into the health care system that it's just easier to regulate nationally.

And by the way, there is some work that's in press and coming out soon reporting on some of the Houston crime lab data. And some of it is really interesting. Some of it also speaks to, how often do these algorithms actually give you the print that is the true candidate print? Because that's part of the blind testing. They put the blind print, the one where they have a correct answer, in the database. And sometimes the database doesn't turn it up. That part of the blind testing program is also really interesting too because these labs have no idea how good these databases are.

But I can tell you quickly that what all these studies have been showing in fingerprinting and some of these other pattern disciplines even more so, is that most of the errors are false negatives, false inconclusives, which are really important. And the focus has very much mostly been on false positives. Do you pick an innocent person's print? But the bigger error rates are missing connections or deciding that evidence isn't good enough to work with when, in fact, you could have done something with it.

But there's a lot to be learned from these programs. And hopefully, that will start changing the culture if people realize, oh, this can help us do the work that we need to do in our lab, or it can help us avoid spending $30 million like they've spent so far in Massachusetts. And they're going to spend a lot more. We thought it was—it's already been the biggest audit in the country. It's about to get a lot, lot bigger.

I think we're kind of out of time. We're getting some great questions. Heidi's comment about mission and budget is a really, really important one —that Houston actually controls its budget too because it's an independent crime lab.

And there are a lot of ways [to fund labs]. You have labs where their budgets are tied to fees imposed on indigent people for their DNA testing and the like, but they often can't pay the fee. That's a whole other piece of this that I wish I had had more time to talk about in the book. That you have labs that are in part supported by fees which may be unconstitutional if you're

imposing them on criminal defendants that don't have ability to pay, and that's the funding structure.

And then you have federal grants, which are backlogged grants. And so, you kind of have an incentive to keep up the backlogs so you can keep getting those grants. It's all sorts of horrible problems with the way that we fund the work.

And when you talk to forensic examiners, they talk about the overwhelming pressure that they get from law enforcement to deliver results fast. And then if they get too far behind, then you have law enforcement turning to these really unreliable field kits so that they can do forensic tests themselves. And that's even worse, where you have untrained people trying to run forensics through problematic tools.

But I just am so grateful to be able to share this time with you. It was really great to see you, Erin and Ed and Jennifer. And I wish we could have gone all day.

Panel Discussion Two: Quattrone Center
14 April 2021

Paul Heaton: My name is Paul Heaton. I'm the Academic Director of the Quattrone Center for the Fair Administration of Justice at the University of Pennsylvania Carey Law School. The Quattrone Center is a multi-disciplinary center focused on preventing errors in the criminal justice system. To that end, we're delighted to have an opportunity today to highlight an important new book that was recently released, Autopsy *of a Crime Lab: Exposing the Flaws in Forensics*.

I'm just going to take a moment to introduce our three distinguished panelists. First, Brandon Garrett, the L. Neil Williams, Jr. Professor of Law at Duke University and founder and director of the Wilson Center for Science and Justice at Duke. Brandon also currently serves as the court appointed monitor for the Federal misdemeanor bail reform consent decree in Harris County Texas and is on the leadership team for the Center for Statistics and Applications in Forensic Science (CSAFE). He's a prolific scholar and author of six books, and his work has been cited by courts and legislators, including the US Supreme Court.

Brandon is joined by Dr. Itiel Dror, a senior researcher at University College, London and principal consultant and researcher for Cognitive Consultants International. A world-renowned authority in the field of expert decision making and bias, Itiel has published over 120 peer reviewed scientific articles and done foundational work on judgment and bias in expert decision making, including forensic examiners. He also serves as a court expert (for prosecution as well as defence) and provides training to forensic examiners, judges and lawyers on expert bias.

We're also delighted to welcome Maneka Sinha an assistant professor at the University of Maryland Carey School of Law and Director of Maryland Carey Criminal Defense Clinic. Prior to joining the law school, Maneka spent 10 years at the renowned Public Defender Service of DC, where she served as senior advisor to the agency's director on forensic science issues, led the

agency's nationally recognized forensic practice group, and represented indigent clients charged with serious crimes, including complex homicides and sexual assaults.

Alright, so you know let's turn the time over to you Brandon. Wonderful book; tell us more about it.

Brandon Garrett: Sure. It's great it's great to see you, Paul. Thank you and everyone at the Quattrone Center that made this possible.

I wanted to say a few things about what motivated the book and give everyone a quick tour of it. But I really want to hear from Itiel and Maneka to talk about all the different dimensions to this problem. And if there's anything I wanted the book to do, is to convey the idea that behind something as seemingly as simple as a fingerprint match or a firearms comparison, there are like 12 different ways that the analysis can and sometimes does go wrong. And it's not something I fully appreciated, even when I was studying forensic errors and the well-known cases of people who had been exonerated by DNA. Early on in my career, that was what I was focused on. I had represented DNA exoneration; I represented someone who was convicted based on faulty bite mark testimony; I represented the exonerated [Central Park] five. People didn't focus on it so much, but in the Central Park case there was both hair and soil comparison. And so, I'd certainly seen early on, even before I became an academic, cases where experts overstated evidence and reached totally wrong conclusions in cases of people who are flat-out innocent. But my focus was on what they said on the stand and on their testimony, and overstatement and how they exceeded the boundaries of science; and how they made errors and gave misimpressions to the jury.

But, over time, as I looked into these questions, and certainly, with the benefit of Itiel's work of others, I have a greater appreciation now for the accuracy challenges and serious problems with these disciplines. Not just in whether they have scientific foundations—whether they are reliable, even if done well. Not just with how good a particular expert is. Not just with whether an expert can be biased by all sorts of cognitive factors. But there are quality and scientific validity issues every step of the game, from the moment someone touches evidence at a crime scene to the laboratory to the court room, and that kind of picture of all the different ways, it can go wrong—and how poorly regulated the whole system is—and how little there is in the way of treating crime labs like real labs, like clinical labs—that's the goal of the book.

I think all of us have a much greater appreciation during these difficult times of the fact that false negatives, false positives, and the accuracy of testing really matters.

There was global investment in genetic research, and that's why DNA technology has lots of uses in criminal cases which can be, sometimes quite provocative, quite reliable. [But] no one ever invested in toolmark work, no one ever invested in fingerprints. And what's been so shocking is that there are just a handful of studies that have been reported, to look at how accurate these disciplines are even, though they're used in vast numbers of cases every year.

I start the book by talking about a fingerprint match gone wrong, which is well-known in the fingerprint world, but maybe not so much to the public. When I talk to and survey people, people will assume that fingerprinting is actually even more reliable than DNA. Because [people

think that] DNA reduces information to numbers, but fingerprints "they're just unique patterns; it's like even better than numbers, right?" Fingerprints are unique it's all like a metaphor for individuality: "our fingers are all over this."

But if you look at your fingertips there's tons of information there, but people don't fully appreciate—unless you've tried to unlock an iPhone that works on fingerprints and then you see how frustrating it is—people don't appreciate how little information can be left in a latent print left at a crime scene, because criminals are not trying to purposely leave a really good print.

And in the well-known Brandon Mayfield case, there was a latent print left the scene of a terror bombing in Madrid on a plastic bag that had some unexploded detonators in it in a white van. The police are right to search the suspicious white van. And they find a latent print on this bag, but it was a crinkly bag, and you can see that the from dusting the powder on it, that there's lots of marks from the dust. And there's tons of missing information there. Nevertheless, you can tell it's kind of an arch shape.

And the FBI, trying to assist in this terror investigation runs, it through a huge international database. And that alone is an interesting and important aspect of the case, because there is no way without a gigantic database, that an innocent person halfway across the world would have ever been a suspect. He'd never been to Spain!

And people assume that technology is making forensics more reliable—and it is, and it isn't. But you never would have an innocent person pulled unless you had a huge database with hundreds of millions of candidate prints, and the job of that algorithm is to pick the ones that look most like the latent print from this scene.

And lo and behold, it pulls candidates, and his actually wasn't the first one that the algorithm chose, but the FBI examiner sees his—fourth—and says, "I think that's the one." And [he] marks it up, side by side, which can create a sort of "matchy-matchy"—and looking for similarities creates a circular reasoning effect. More circular reasoning and reinforcement occurred because two other FBI analyst looked at it. One I think was retired, or maybe two were retired, but they're all extremely experienced and they'll agree with each other—they all reinforce each other's conclusions They all said hundred percent identification. And at a time when it wasn't just like CSI and people believed—it it's what FBI and other fingerprint examiners said and were required to say in court—that they were infallible that they had a zero-error rate that they did not make mistakes. That the only people who could ever make a mistake doing fingerprint work were incompetent people or malevolent people—people who are not following the method correctly.

These were three senior experienced people. They *were* following the method correctly. Having three people involved was also like a marker of a really high-profile case. On TV they may have teams of forensic analysts, but in real life you can't expend three people to look at one print. But no cost spared in the Madrid terror case, given its seriousness—and all three of them are wrong!

And Brandon Mayfield said in court, "that's not my print; I've never been to Spain." His lawyer wasn't a fool, and they hired their own defense fingerprint expert who looks over the

markings: "15 points in common" that the FBI had made and says yeah, it's his print. So even the defense expert was swayed by the authoritative weight of these three experience FBI dudes.

And so, four people got it completely wrong.

Spanish authorities linked the print to someone who is an actual known Algerian terrorist suspect, who was in the area. They were monitoring a cell of terrorists and they're like "Okay, we found the one." And even then, the FBI was like, "Oh, no, no; 15 points—we can't be wrong." They flew to Madrid they put up the pictures and they put on this whole dog and pony show for the Spanish authorities, who are kind of like, "what are you talking about—some lawyer in Portland? Doesn't make any sense." [The FBI] eventually drop the charges and apologize to Mayfield.

But no longer can one say that only incompetent, mistaken or malicious fingerprint examiners make mistakes. And it raises the question, how often does this happen. We're starting to learn more about how often this happens now that studies looking at error rates have started to be done.

And for some disciplines there are really quite terrifying error rates, raising the question whether their works ever be allowed in court. For others it's just highly variable, and very experienced people really may have something to their experience they really may make mistakes less. But when they are heavily biased, like in the circumstances in the Mayfield case, they may make terrible mistakes. When you have a lot of missing information, like with the poor print in the Mayfield case, you may make a lot of mistakes. And we don't know any of this, and our jurors are left in the dark.

And labs typically do not provide any meaningful documentation of their work. There's no way, as a lawyer, you can look at what they did and say, "Oh, this is what they marked; this is how long they spent on it, this is this was their process."

Instead, and this is, this is certainly true in Philadelphia, the home of our event today, you know the lab reports that defense lawyers and prosecutors get in Philadelphia are basically a page and a half long, with really only one line it that says, "this fingerprint or this firearm was identified as coming from the source." And the rest of the one and a half pages is the sign-offs and the names and the numbers associated with each piece of evidence. Nothing that is particularly useful—no real documentation of the work product or the process.

And so you have evidence that may or not may not be well collected you have poor documentation of what these people do.

They come into court claiming expertise, but they've never been tested in any meaningful way, so you don't know how good they are at the thing that they say that they are doing. The process they follow may be an ill-defined method, which requires some judgment. That's fine, people can be good at what they do, based on experience and training and judgment, but no one knows how good this particular person is at following their judgment.

And the labs themselves may not have any real testing or auditing or quality control like you would have in any hospital that does a strep test or a Covid test, where there are all sorts of quality controls in place to make sure that terrible tragic mistakes don't occur.

And finally, judges don't insist that any of this happen, even in states like North Carolina where there's a reliability rule, the Daubert rule in full force. Judges are supposed to be looking at whether an expert is doing something reliable and is following reliable method and is applying it reliably. But they don't ask any of these questions about where's the documentation? where's the data? And they've just given the prosecution side evidence a pass.

There's an article I wrote in the University of Pennsylvania Law Review with Greg Mitchell saying that expertise should be defined by proficiency. We shouldn't let someone be a self-professed expert. You just don't let someone come to court and say I'm an expert because what I do is expert. There should be objective evidence that the person is actually good at what they claim to be doing.

And we insist on that in all sorts of disciplines that really matter to us, but somehow, in criminal cases, where real life and liberty are at stake, there's rarely a battle of the experts. The Defense rarely has any resources from the Court to hire their own expert and you have a self-professed expert.

One last example of why it matters to actually know how good experts are and to test them outside of criminal cases. There are other people who have difficult jobs, who have to stare at screens all day and reach really important conclusions. One type of job, which is a little foreign to us right now, because it's been so long since most of us have been near an airport, is TSA screeners. They look at screens looking for patterns, just like fingerprint examiners and firearms and tool marks examiners. And it's tedious and people get angry if they take too long, because their luggage gets held up and they miss their flights, and so they don't have that much time to look at the screen. And it's really, really important.

Well, they do blind testing and when the TSA a ran bombs as a test that through the conveyors, maybe six or seven years ago, 95% of the bombs went undetected, and they realized they had a serious problem. They totally redid their training, but there was a leadership turnover at TSA. It was a scandal, like some of the lab scandals we're seeing across the country right now. But they didn't figure, “Okay, we caught a problem we're done.

They did repeat blind testing, and the next time they had more like 70% of the bombs detected, which was better, but still really concerning. And so, they didn't rest on their laurels; they've continued to try to make improvements and improve their training and to do this type of blind testing.

Our crime labs, for the most part, do not, with rare exceptions. One of the important rare exceptions, which I highlight in the book as a sort of global model, is the Houston Forensic Science Center, which actually does blind testing, so that you know something about how good the work is and you catch errors when it's a test and when no one's life is at stake and when you can fix the problem without any harm to individuals. So, I talked to them,

I really want to hear from you and hear your questions. But thank you all. It's a treat to get to share *Autopsy of a Crime Lab* with you all today.

Paul Heaton: Thanks. I know there's so much in the book, and so it's hard to compress it into a very short summary. Oof the things that I really appreciated about the book is it has a nice blend of discussing the development and the history of some of these techniques, some of the scholarship that has developed that helps us understand sources of error, and then also stories like the Brandon Mayfield case—individual cases of real people, and how you know these errors affect them, and so I want to take some time with our other panelists to just explore a few of those dimensions.

Maneka, you of course have had had an opportunity at PDS, to be able to see firsthand how some of the problems that Brandon writes about manifest in real cases. I'm wondering if you could describe for our audience a particularly memorable case where you see some forensics errors and maybe some of the lessons that we take about system design from that case.

Maneka Sinha: Oh absolutely. Paul. Before I get into the meat of the answer, I just want to thank Brandon and you and everyone at the Quattrone Center for having me and having this important discussion about these issues.

Absolutely, and I agree with you about the book. It does a really nice job of laying out, both the evolution and the research, but also the real practical impacts of faulty forensics in cases. And the point I want to emphasize is that it's real. I mean as a public defender, I saw it regularly; and everyone who is still practicing as a defense lawyer sees it regularly.

So, I have a few examples, but I actually want to focus on one that is it more optimistic, and ties in some of the recommendations that Brandon makes in the book, and shows us how, when implemented, you can actually have just results.

And so, the case I'm thinking of is a burglary case, that turned on fingerprint evidence. That was the key, if not the only, evidence in the case. The case was happening, I want to say in 2017 or 2018, so just a couple of years after the landmark PCAST [3] report was issued, highlighting flaws in a bunch of these different disciplines.

I was involved in the case, assisting the supervision of that issue. And what the lawyer who was trying the case was able to do was to expose a lot of the issues that Brandon describes, both as issues within the fingerprint discipline, but also as things that the jurors need to know to really understand the flaws with the discipline.

So, she cross-examined the examiner on what the PCAST report found, and in particular, error rates. And so, sort of dispelling the jurors' notion that fingerprint evidence is incredibly

[3] President's Council of Advisors on Science and Technology, *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*. (Executive Office of the President, September, 2016), online: https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf.

reliable. And sometimes jurors feel, as Brandon said, and it is in the book, that it's even more reliable than DNA. So, she really sort of was deliberately charting that out—charting out the subjectivity of the discipline; charting out all of the concerns raised in the report; charting out the lack of real scientific training of the examiner; charting out the bias that can infect the decision making.

And ultimately, what happened was that the client was acquitted, and it was primarily based on that very thorough deliberate cross-examination that exposed those flaws. And it gave the jury a real sense of what the fallibility was, and sort of dispelled the notion of infallibility.

And I really want to emphasize that had this happen in a different jurisdiction where all of the work that goes into that might not have happened, or had it happened in a situation where that cross-examination wasn't allowed, wasn't permitted, and that litigation hadn't been done beforehand, that client would absolutely have been convicted.

And so that's an example, about the real-world application of how not only these flaws really exist and they're happening on a daily basis, around the country, but also on how some of the things that that the book talks about really can improve the way people perceive that evidence and lead to more just outcomes. So that's a good example, although there are many more.

Paul Heaton: Yeah, thanks. I think that's a that's a really interesting example, and I think it kind of highlights the importance of research and education. I know Itiel, you've been very involved in serving as an expert and trying to educate lawyers and judges on these topics, and also doing some of the foundational research.

Brandon has this nice analogy in the book. As the Judgment of Paris was for the wine world, where it created a sea change and how we understand the kind of wine, experts, and the quality of wines,[4] so too with some of the work that you've done, a similar type thing, but with respect to forensic science and forensic examiners. I'm wondering if maybe you could just pick a favorite study that you've done. If you want to talk about fingerprints, or another discipline you just described the study for our audience and help us understand a little bit better how this research can feed into the sort of insights that Maneka is describing that ultimately can, hopefully, help better educate jurors and judges.

Dr. Itiel Dror: I can tell you very briefly about a new study, but first I want to set the background to the problems, because the problems are big and they are depressing.

If we look at error-rate studies that were mentioned, they [fingerprint analysts] used to say zero error rate and that they were infallible. And now they have new studies, giving in many domains very small error-rates, but all studies were faulty and bring misleading and inaccurate error rates. So, they moved from zero to 0.1 or whatever, but for example, they don't include the evidence that appears in a real casework. So, if you look at fingerprinting or other error rate studies, every examiner will tell you that in real casework they get latent prints that are low quality and the correct result of the comparison is inconclusive. So, you have a pair of fingerprint marks, where

[4] In a 1976 blind tasting, the wine world was shocked to find that California wines were preferred to French wines.

the correct result is inconclusive, but they don't include this type of inconclusive evidence in the error rate studies. And then, in the error rate studies if examiners say that the decision is inconclusive, they don't count it as an error (even though there are no inconclusive test items). They don't calculate their potential error. Some studies even count inconclusive decisions as a correct response.

And when do they say its inconclusive? It's when it's a difficult match or exclusion. So they say inconclusive and they can't be wrong. And if you compare the rate of "inconclusive" in these error rate studies, it is much, much higher than you get in real cases. And in some error studies you get 20, 30, 50, 80% of the time they say inconclusive…and I can go on and on. Nick Scurich and I have papers on this. [5]

So even the error rate studies that are used now, and it's good that we're having them rather than saying we have zero with no data, they are inaccurate and are misleading the courts. Now, you have to remember that we're lucky if we're even discussing error rates in court, because most of the cases are plea bargained. If 90 to 95% of cases are plea bargained, then the forensic experts are not questioned in court. The forensic experts—most of them work for the police or even for the D.A.'s office, although there are exceptions like the Houston Forensic Science Center, but most of them work for the police. They get a plea bargain. Some of them don't want to study error rates properly. And I don't blame them because it's an adversarial legal system, right? They don't want it used against them—"it will damage their reputation". They don't see their own bias, because of the bias blind spot. And I can go on and on, but I'll stop here and talk about the latest study, but this is some of the background of denial of the bias and fighting it.

You said in fingerprint and DNA [studies], yes, there is good news. Yes, Brandon, we need an autopsy of the crime lab. And things have moved forward in the fingerprinting and in many forensic domains. But you have to remember that in the forensic domain, we don't know the ground truth.

I'm now doing an autopsy of a plane crash; I'm a part of an international expert team; I'm looking at the pilot error and bias. I'm also investigating a number of police shootings [as to] whether the police were biased in their decisions. The point is that in the plane crash, we have a plane that crashed; in the police cases we have a dead body—they shot someone. When a forensic examiner makes a mistake, we don't know [that] she made a mistake, because we don't know the ground truth and it is most often plea bargained. We don't have that problem in aviation and police shooting or in the medical domain, where errors are more apparent.

Now the forensic science domain—I don't want to sound too depressing—it has moved forward. And the book, The Autopsy of a Crime Lab really exposes this.

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[5] Dror, I. E. & Scurich, N. (2020). (Mis)use of scientific measurements in forensic science. Forensic Science International: Synergy, 2, 333-338, online: https://reader.elsevier.com/reader/sd/pii/S2589871X20300553?token=BCEA8C75217D51B848DFAB19C92897C0492B3622EFAFEFA82FB1E0A9AED4C7423346C7E8D66D259876EB5D53A6011734&originRegion=eu-west-1&originCreation=20210917081133.

But one domain, and this is where I'm going to very briefly talk about a new study, about an important forensic domain that has managed to avoid all of this, is forensic pathology. The forensic pathologists said, "we are different, we are medical doctors, we need to know everything." And they have resisted taking measurements to acknowledge bias or accept bias. And I say to them, "okay, you are not like fingerprint or DNA examiners, you are medical doctors." But doctors acknowledge their bias. It's well documented in dozens and dozens of articles how biases impact medical decision making, even medical devices.

So they [forensic pathologists] have fought it and blocked me and others from collecting data. And now at last, a first paper has come out, just a few weeks ago, it's an open access available to everyone, in the Journal of Forensic Science,[6] and it has two very different data sets. Briefly, one is death certificates. We were able to get every death certificate in the state of Nevada for over 10 years. We have 200,000 death certificates.

We examined the children's death certificates and compared black and white kids, and found that [for] black kids, relative to white kids, the death certificate is going to determine homicide as manner of death much more, whereas white kids—accidental.

And, as we say in the paper, it could be that actually black children relative to white children, are more [likely to die from homicide] than white children.

But that gives you a base rate expectation, because this could have been in the past, or may change in the future, but when you see in case after case after case that black babies [die from] homicide and the white babies are associated with accident, it perpetuates a bias. So these data are about decisions in real cases.

But then we supplemented it. We did research with 133 experts, people who often signed death certificate. We gave them exactly the same case: a child; who supposedly died as a result of an accident; and all the medical information was identical between the two groups. In one group we said the child is black and was brought to the hospital by the mother's boyfriend. And for the group, we said the child was white and brought by the grandmother.

And you won't believe this *huge* effect. White kid, grandmother, they accept its an accident. Black kid, bought by the mother's boyfriend, no, it's homicide. You can read the paper.[7] So this new study is the first ever study and examine bias in pathology, but the big news is not the data, the big news is the response of the forensic pathology community and their professional organization, the National Association of Medical Examiners (NAME). They have had a campaign of complaints and letters attacking the paper and personally the authors (four of which are forensic pathologists). We got nine letters to the Editor; [8] one of them, signed by over 50

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[6] Dror, I. E., Melinek, J., Arden, J. L. Kukucka, J., Hawkins, S., Carter, J. & Atherton, D. S. (2021). Cognitive Bias in Forensic Pathology Decisions. Journal of Forensic Sciences, 66 (5), 1751-1757, online: https://onlinelibrary.wiley.com/doi/10.1111/1556-4029.14697.

[7] *Ibid.*

[8] See all the Letters & Responses, including a Preface by the Editor: Peat, M.A. (2021), JFS Editor-in-Chief Preface. Journal of Forensic Sciences, online:

forensic pathologists. They've requested that the paper be retracted. There are also complaints against my co-authors and also against me to my university, saying I'm a disgrace and embarrassment to science and the university.

And this is the problem. This is why the *Autopsy of a Crime Lab* book is so critical, because to solve the problem, we need to acknowledge bias, we need to put things on the table. And this is the biggest problem in forensic science and in the criminal justice system. The system has to acknowledge mistakes and improve. And if it doesn't do it, things don't get any better. And this, I think, is what is really important. And this last research is one more kind of nail in the coffin of forensic pathologists not willing to take it on.

And I do have to say that I am sympathetic. In the adversarial system, if you acknowledge error or bias, they're going to cross-examine you about it, and use it against you—you give ammunition to the other side. So the fundamental systemic problem [is that] an adversarial system is not scientific; it's anti scientific. I have much more to say but I'll shut up to give time for discussion.

Paul Heaton: Yeah. I'd like to just draw out this theme a little bit more. I appreciate you pointing to that maybe part of the solution here is just admitting there's a problem. But I think in the book in your comments, Maneka, you've actually written about how the DOJ continues to defend publicly things like pattern evidence that don't have scientific basis. So, I'd be interested in the panels' thoughts. Other than acknowledging the problem, how do we address the resistance, or the reluctance of experts and, in some cases, prosecutors to recognize the possibility of it. Is it the judges' responsibility? Should we be doing more research? Who ought to be acting here?

Maneka Sinha: I'm happy to start answering that question. I think the answer is all of those things, right? I think the judges have fallen over, and the judges need to step up, and Brandon talks about that in the book, about revisiting their role as gatekeepers.

I think the research that was never done needs to be done, and disciplines that have been deemed as unreliable or unvalidated, we need to stop using them until if and when there is research that supports their validity. In terms of the prosecutors, what has their reaction been, and we absolutely need to confront that problem. Because on their end, I would suspect that there's multiple reasons for the reticence to acknowledge the fallibility of some of these disciplines, and one is the obvious one that Itiel just mentioned, which is it's going to jeopardize their ability to secure convictions, as Brandon has laid out in the book.

Forensics has been a superb tool for prosecutors in law enforcement, for decades, if not much longer, and acknowledging the problems with the disciplines, is going to inhibit their ability to prosecute cases, and that's one of the main things that needs to be confronted.

But I do think that it's more than just that. I think that there's nuance to the problem with prosecutors. The reluctance to acknowledge some of this and Itiel can speak to this better, appears to be a cognitive dissonance. Like, it's hard to embrace the fact that you're using faulty evidence.

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https://onlinelibrary.wiley.com/doi/epdf/10.1111/1556-4029.14844.

It's hard to embrace that perhaps you're using unreliable evidence and data to put people in prison for a long time. That's a difficult thing for one to grapple with.

And I really want to just piggyback on the point he made earlier, that it really is a nuanced problem because it's a systems problem, a systemic problem. We have allowed the evolution, of not just a forensic system, but of a criminal legal system overall, that's hugely punitive and oppressive, and as he describes, adversarial. And until we reckon with that, until there's sort of recognition of that, we are desensitized to the ways in which it is punitive, and the way in which forensics increases the punitive nature of it, we're not going to see real solutions.

And that's why my initial answer to the question is all of those things—the research, the quality control, the proficiency testing, the judges as actors. I don't think it's one singular solution. It's all of those things and the regulation that Brandon describes.

And to just fold in the question that was in the Q and A, how have prosecutors responded—if the person who wrote the question hasn't read the book yet, I encourage you to do so, because it lays out their responses to the key moments in the evolution in history of forensics really well. And there's been a pattern of pushback, a pattern of unwillingness to acknowledge the research as it's being conducted, over and over again. And key moments being even before the 2009 report [9] came out. And then, when it came out, even before the 2016 PCAST report came out, and then after it came out. Unwillingness to acknowledge the findings, unwillingness to dig deeper, unwillingness to provide research. Just blanket pushback. So that's a starting point to my answer. But I do want to let other folks jump in and add other layers.

Dr. Itiel Dror: There are two problems. One of the criminal justice system and one is forensic science. So, I'm not going to solve the criminal justice system. I'll just say that the judges and the Department of Justice are mainly ex-prosecutors, so they have a huge bias in the system, because it's rare to have people who were public defenders work in the DOJ. So, (a) the system is very prosecution [oriented], and (b), we have massive plea bargaining, so how can we talk about justice in the system?

But let me focus very quickly on the forensic science domain. I think [we have to consider] two things. First of all, context management. We need to make sure that not only the forensic domains that are not valid don't get to court, but if a forensic examiner is exposed to task irrelevant biasing information, then they cannot testify, and they cannot do the case. That will end the problem. They cannot talk to the detectives and get the "background story" that they don't need to know.

Research shows that in 42% of the formal submission forms in fingerprinting the United States, tell the fingerprint examiner if the suspect has a criminal record.

The minute a forensic examiner is exposed whether a suspect confessed, had a criminal record—that's it—they cannot testify, and they cannot work on the evidence. That's number one—

[9] National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (Washington, DC: National Academies Press, 2009) [*NAS*].

to make sure that [the system is] minimally biased by not allowing testimony of experts who are exposed to biasing, task irrelevant information.

And two, independence. We need to give the forensic examiners independence of mind. They need to work separate from the DA and the police. Rather than a tightly knit group of forensic examiners, police, the DA, the science needs to be as independent as possible from law enforcement and the DA. I believe we have in the United States a number of crime labs that are not part of the police but are part of the DA! This is totally not good for proper science. And we'll improve science, and we want science to be used in the criminal justice system, and not as it is now, [where] it's misused and abused.

Brandon Garrett: I don't want us to leave defense lawyers off the hook, either. Because when you read transcripts of forensic expert testimony, including in cases where mistakes were absolutely made and an innocent person went to prison—you know those transcripts are often not very long, because the defense lawyer asked no questions. And there are glaring mistakes just on the face of the trial record. And the defense lawyer says nothing. There cross-examination is like a page long, and you know. It's just an embarrassment.

Dr. Itiel Dror: Brandon, let me ask a question in the middle, it goes back to balance. I don't appear a lot in court, but in the USA, I have worked for the defence and the prosecution. The public defender had to argue for every cent of my hourly rate, and I had to wait six months to get paid. The prosecution—they just say a number— and a week later, I get paid. So, there are no equal resources for the defense and the prosecution. And that's hard for the defense to bring up a proper defense.

Brandon Garrett: It is. And I have a new paper with Chris Mitchell talking about how it is more effective—there's this myth that cross-examination, that's the way to test things out in the courtroom. But the defense needs access to its own expert.

And, and we know that it's not trivial, in some disciplines, the degree to which, [with] another set of eyes the person may form a conclusion entirely about the evidence. But even apart from someone looking at the evidence and saying, "Oh, wait a minute, I don't think these bullets or casings came from the same weapon" — we've had a lot of wait-a-minutes like that in the DC lab recently. We've had lots of different people come to completely different conclusions around the same evidence, so this is a pressing problem.

But even if the defense expert doesn't think anything different in terms of the evidence, to have someone else explain the method and the limitations is enormously impactful to jurors. It's not just cross, it's a separate expert saying, "Look, these are the boundaries of the discipline." And that's a methods-only expert. And that person doesn't have to be a retired latent fingerprint examiner. That person could be a statistician or cognitive neuroscientist like Itiel, explaining where there have been important trials. Where, for example, my friend Karen Kafadar, one of the leadership of CSAFE, has testified as a statistician, saying, like, "I've ever looked at hairs under a microscope—that's not really what we do as statisticians, but I can tell you something about how one can arrive at frequencies." And [she can] talk about probabilities. To do that, you have to have information about probabilities, and you can't make it up. It's no more basic than that. It's

sort of Statistics 101, but she did a wonderful job in a case in Massachusetts explaining Statistics 101 and the judge was like, "Oh really? So, like we actually don't know like how common or rare it is to have any particular characteristics in hairs?" But no, we don't – there have never been any statistics underlying this field and, therefore, like as a leading statistician I will tell you that you can't say stuff about probabilities if you have no statistics. And that was really, really powerful testimony, and it didn't take someone from within the discipline to do it.

But you know indigent defendants don't have good rights to get experts, and judges routinely deny funding for expert testimony. Defense lawyers are overworked and so maybe it's no surprise—it's not just laziness that they don't meet with the expert, and they don't ask for the discovery, even if it is available. Then again, when they ask, judges often say, "No—you can't get the records of this person's proficiency test that's not relevant. You can't get discovery regarding quality issues in the lab. How could that possibly be relevant, what's going on in the lab in general, and not in this person's case."

Then, when we have major scandals erupt like in Massachusetts—they are just reopening another 70,000 cases—and then it is almost seems like, "Oh wait a minute, maybe quality issues in the lab were relevant, maybe we should have let defense lawyers inquire into larger quality issues."

But when they have asked, they've been shut down by judges and they never have the resources to launch those type of inquiries.

And there's a larger problem, which is that in our courts like we don't do systemic, really, in criminal cases. It's very hard to bring a class action. But when labs have quality issues, when they don't block out task relevant information, like Itiel was talking about, when they don't do blind proficiency testing, when they don't insist on good documentation, when they have a method that's poorly defined and so it's not clear what any particular examiner is doing. You can have an accredited lab that has all those problems, because accreditation is just sort of a bare minimum of paperwork and procedure.

When we don't do good quality control in labs, it looks like a mass tort, and you know, there may be tens of thousands, hundreds of thousands of cases affected.

And yet in the labs, it's not like they even necessarily have a list. Like when the FBI did its audit of hair cases, it's not like they're like, "Oh, let's put the list of all the cases that our FBI analysts testified in, and pull all those cases." There was not even a list.

There isn't just basic information kept, going back, particularly: who worked on what cases, was the person convicted, what was the work done so that we can audit it, and so.

Even just that basic retrospective and, of course, so many labs have gone through changes, including due to scandals, so there may not be records of the prior incarnation of the lab, or the prior incarnation before that.

So, to have lists of cases, so that you can reopen them if there's a problem.

To have routine testing, so that you know when there's a problem.

So that you can have remedies in the courts that judges can look at the 10,000 cases, or the 1000 cases if there's a problem, and look at them as a group, and figure out, "Okay, we need to resentence everyone, because we can no longer convict them, based on the presence of drugs. The drug testing program in this lab was contaminated."

There's just no procedure for any of that. And so, even when errors come to light, there's often very little in the way of justice for people who are affected by forensic errors, because we just don't have a system that acts like a system.

Paul Heaton: Yeah, we've done some recent work at the Quattrone Center about roadside drug test and finding which cases have that type of evidence is very difficult.

I wanted to turn our attention to one of the audience questions which I think kind of connects with our discussion.

The audience member points out that despite the challenges that we've highlighted, there are some areas where DOJ has acknowledged problems (in the book you talk some about hair microscopy, fire and arson) where there's been some progress. Why is it that in some areas, it seems like we're able to go further in terms of advancing understanding and rejecting flawed forensics? Are there lessons that we might take from those experiences that we could apply to some of these other disciplines?

Brandon Garrett: A lot of positive things have happened. We've focused a lot on the negative, but I think it's a pretty exciting thing, Itiel, that you're talking to labs around the world that is no longer a taboo topic to talk about cognitive bias, and that there's this openness, there's this receptivity cases like maybe high-profile cases.

Cases like the Brandon Mayfield case may have cemented the idea that, "Oh wait a minute, cognitive bias matters, and we need to think about precautions," And in the UK, the forensic science regulators guidance on cognitive bias—no document like that existed a few years ago.

We do have more labs at least experimenting and trying out blinding or blind verification, if not blind proficiency testing like the program at the at the HFSC [Houston Forensic Science Center].

We have much more cautious language being rolled out in some of these disciplines, and the DOJ has issued these uniform standards. I think there are real problems with that uniform language, and it doesn't go very far, but it's a start to at least be thinking about what experts should be permitted to say in court, given the boundaries of their discipline.

You know, when I first started looking at the trial testimony of forensic experts who testified in DNA exoneration cases, I had labs calling me saying, "Oh, can you send me the transcript because we don't. We don't ever look at those things." Like it wasn't a routine part of supervision to read what your experts are saying in court.

And so there has been some really important cultural change. There are now some black box studies being done to look at accuracy issues in disciplines and there's an openness to even report on some of that as part of your reporting, for your work. Like, "Okay, like I'm an examiner, but the examiners in my discipline are not infallible; we're not superhuman; this is the uncertainty associated with the measurement."

It's sort of laughable that in the past there was no uncertainty associated with measurement. I mean there's uncertainty associated with using a tape measure. I'm certainly terrible with measuring furniture—like I never get it right. Like a ruler—there's uncertainty in any kind of instrument. There's uncertainty and you report it; you take it into account; you know that you better order a couch that's plus or minus a few inches because you're just not so great at eyeballing where you left the tape measure on the on the curved couch or whatever.

And so I really do think that there's much better efforts at scientific literacy at law schools and in the bar for continuing legal education. There are a lot of great people that have been working hard on these issues, and I don't want this to be a downer of an event, because there's a lot of really interesting important work being done.

Folks at PDS in DC have won important victories in the courtroom; we now have lengthy opinions from judges that are citing to Itiel's work; there are citing to black box studies; you have judges actually talking about methods and inconclusives, and false positives and negatives in their opinions, and it really does look different than it did a decade ago.

Paul Heaton: Other thoughts from the other panelists on that issue - lessons from the areas where we've made some progress?

Dr. Itiel Dror: I definitely agree there's been a huge progress in many forensic domains, an openness, so I agree with that. I would say that sometimes it's an old book with the new cover or putting lipstick on a pig. So they don't say I "individualize" the fingerprint but that it is a match. However, what is important is that the fingerprint examiner looks the juror in the eye and says, "I've been doing it for 20 years and I'm very confident." That's very persuasive.

Things have changed – but limited. Even the black box studies nowadays, they move from zero error rate to 0.01 error rate or stuff like that—ignoring the fact that if you give the *same* prints to the *same* examiner twice, 10% of the time they reach a different conclusion. [10]

However, I do agree, excluding the forensic pathologist that are in denial and fighting, that there has been a huge change. A paper by Brain Found and other looking back show basically no papers, no discussions, no conference presentations on error or bias, and starting around 2005, and then with the NAS,[11] the number of studies talking about error-rate management and bias is growing. Change is happening, yes it slow; it's painful, but this is the nature of change. [12] And let

[10] B.T. Ulery, R.A. Hicklin, J. Buscaglia, M.A. Roberts J. (2012). Repeatability and reproducibility of decisions by latent fingerprint examiners. PLoS, 7, e32800.

[11] *NAS, supra* at note 9.

[12] See the current debate about bias at *supra* at note 8.

me tell you, as someone who works in the military and medical domains, they also have a big, big problems to change, and it takes a long time to change the culture—and forensic science, if I had to rank it relative to the medical domain and the military, they are changing with the speed of light. With the change in the forensic science, there is still a way to go, but it has been great compared to the military and the medical where changes take more time. So, we're in a good trajectory, but I think we need to continue to push and everyone needs to contribute to move forward.

But I'm not optimistic in my nature, I'm not pessimistic either, I'm realistic. So, I think that cup really is half full and half empty right now.

Paul Heaton: Well, maybe to finish us off because we've mentioned a variety of issues and problems, I want to just do kind of a prioritization question for each of the panelists. So, let's imagine that someone was to hand you $5 million today and say spend it, however you want to, to improve validity of science in the courtroom. What would you want to do? Is it more foundational studies like what Itiel is doing? Is it better research to practice? Do we need more standard settings organizations? How would you think about deploying resources to improve the process? Where would your priorities be?

Maneka Sinha: I'm happy to start.

So, I think a couple of things. The first is to really take note of Itiel's first point, which is that when we look at progress, yeah, of course there's absolutely been progress. I think Mayfield was a watershed moment and it led to a lot of positive change.

But when we peel back the layers as we look at progress, we have to make sure it's substantive progress, not, as he described, lipstick on a pig. It has to be substantive, not band-aid fixes. And so as I started out by saying, I think we need to do all the things. But if you gave me all the money to do all the things, I would say immediately stop use and disallow use of unvalidated forensic disciplines in criminal cases, until foundational validity is established. That's a bare minimum. There are more and more wrongful convictions every year, and so for me that's a fundamental change that needs to be made.

Because all the other things we're talking about, things like standards bodies, things like quality control—those are back-end fixes, right? We need the front-end fix first. So that's where I would start. Those are good things—we do want standards, we do want quality control, we want all of those things as well. But before we have fundamental validity established in everything that we're trying to use to earn a conviction, we stop until we get there. That's what I would start by saying.

Brandon Garrett: I would spend the $5 million dollars on pilot programs to provide the resources to do blind validation testing.

But I don't know if I see that as retrospective. Catching errors as they happen in real time? That's really important, and in some ways, it addresses questions of validity better than black box studies. It's better to catch errors in the real case flow of people, that may reflect issues at multiple stages of what a lab is doing.

If I was going to be a federal grant program to crime labs, rather than backlog elimination grants, which also give labs incentives to keep up the backlog, so they can keep getting the grants, I'd rather have a quality and testing grant program. It could be the Brandon Mayfield Laboratory Improvement Grant program, that we could add to the Coverdale and Bloodsworth grants, we could have the Brandon Mayfield federal quality improvement Program.

Dr. Itiel Dror: Did you say 5 million or 50 million; I didn't hear. But, regardless of the amount of money, there is money out there. It's a matter of priority of what is important. And for that we need public and political pleasure, and the judges pressuring the forensic scientist to improve and to do a proper job.

So, it's a matter of pressure to cause forensic examiners and the forensic community to do a proper job. And many times, for forensic examiners, when you show them a problem, they say, "The court accepts it." And they don't care anymore, because with acceptance by the court they are happy. What we need is pressure by the courts, politician, and the public to improve the criminal justice system.

We all know the criminal justice system is not working well, or as well as it should, and forensic science is supposed to be the highlight, the bit of sunshine in the gray sky of the criminal justice system, to help put the criminal justice system on a better course. And science can do that, forensic science can do that. We need just to push this forward.

Brandon Garrett: Also, if you're talking about money, right now Massachusetts has spent over $30 million so far unwinding two horrific lab scandals that no one caught for years, because there was not even minimal quality control at their drug labs.

Drug testing involves chemical assays. There's certainly some interpretation, because you don't have pure cocaine that seized every time, but this is work that's in large part, involving equipment and chemical essays. And nevertheless, quality control was so poor at those labs that you had people who were using the drugs, and not even testing it, and no one knew any different. They thought they were really efficient lab chemists; their reports will come out so quickly. And it's been enormously expensive to unwind the tens and tens of thousands of cases that were tainted by lab misconduct. And people sometimes say it's a bad apple, but it was bad apples, and you know what they do to barrels. And that's what happened in Massachusetts.

We're seeing some of the same concerns in DC right now. Where you have a lab where people can be altering conclusions in firearms case, and saying "Oh well, maybe it's actually inconclusive; we can't be wrong if it's inconclusive." It may take some time, and some real expense, to unwind the number of cases that may have been affected by a culture where clearly, forensic conclusions are malleable and subject to influence, and that's not that's not science. There may have been terrible injustices. As a result, that's going to be expensive.

It's expensive when these problems metastasize, and an ounce of prevention can prevent millions and millions of dollars in cure. And many, many people who spend many years of their lives in prison for crimes they didn't commit.

Dr. Itiel Dror: Brandon, then you agree that what we need is an autopsy of a crime lab.

Maneka Sinha: I just want to add one thing to Brandon's point that he just made. The DC lab is theoretically an independent lab; it is an independent lab. And one thing that he touched upon that we haven't said explicitly, but that the thread that's woven through all of this, is culture change.

And it's a culture change on two fronts. One from what Itiel was talking about, from the crime lab being separated from law enforcement, but also from forensic scientists of getting into mainstream research, science culture, that sort of embraces the stake as part of science. Because, regardless of how independent a lab is, if the forensic scientists in the lab aren't bred with that culture from the ground up, we'll keep seeing the problems that Brandon's describing that are pervading the DC lab right now, which is an independent lab. So, I just wanted to flag that.

Paul Heaton: I actually think that idea of changing the culture is a great way to finish up.