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INTRODUCTION: SYMPOSIUM ON "FORENSICS, STATISTICS, AND LAW" MONDAY, MARCH 26. 2018 UNIVERSITY OF VIRGINIA SCHOOL OF LAW

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Twenty-five years ago, the U.S. Supreme Court ruled in *Daubert v. Merrell Dow Pharmaceuticals Inc.*, that federal judges must conduct a scientific gatekeeping inquiry before admitting expert evidence.[1] That ruling reshaped how judges evaluate scientific and expert evidence. In 2000, Federal Rule of Evidence 702 was revised to comport with the *Daubert* ruling and many state courts adopted either the *Daubert* rule or the Federal Rule 702.[2] The *Daubert* ruling coincided with a surge in scientific research relevant to criminal cases, including the development of modern DNA testing that both exonerated hundreds of individuals and provided more accurate evidence of guilt.[3] At the same time, the scientific community

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[1] 509 U.S. 579 (1993).

[2] FED. R. EVID. 702; *see* Brandon L. Garrett & M. Chris Fabricant, *The Myth of the Reliability Test,* 86 FORDHAM L. REV. 1559 (2018) (summarizing state expert evidence rules).

[3] Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 Va. L. Rev. 1 (2009).

increasingly raised questions concerning the validity of non-DNA forensic techniques, and called for basic scientific research and statistical rigor.[4]

This volume explores the challenges and the changes in the law, research, and in the practice of forensic science in the years since *Daubert* was decided. The Virginia Journal of Criminal Law convened experts in forensics, statistics and the law for a conference at the University of Virginia School of Law on March 26, 2018.[5] The conference was sponsored and made possible by the Center for Statistics and Forensic Evidence (CSAFE) collaboration, extending across four universities, including the University of Virginia, at which researchers have been working with generous support from the National Institute of Standards and Technology (NIST) to research these questions.

The conference began with remarks describing both how leading scientific commissions have pointed out real shortcomings in the use of forensic evidence in the courtroom and how researchers are beginning to address those shortcomings. First, Professor Karen Kafadar, who served on the committee that authored the landmark 2009 National Academy of Sciences report on the path forward for forensic science, described the importance of statistics to forensic science. Statistics is the science of analyzing data and characterizing uncertainties. Professor Kafadar summarized: "statistics means never having to say you're certain." That work has been integral to helping us become far more certain about modern DNA testing, chemistry and spectroscopy. However, statistical analysis has uncovered real uncertainty as well, disclosing severe limitations in techniques used in forensics, such as in the bullet-lead investigation which

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[4] *See* NAT'L ACAD. OF SCIS., STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (Nat'l Acad. Press 2009); EXECUTIVE OFFICE OF THE PRESIDENT, PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY, FORENSIC SCIENCE IN CRIMINAL COURTS: ENSURING SCIENTIFIC VALIDITY OF FEATURE-COMPARISON METHODS (September 2016) [hereinafter, PCAST Report].

[5] The entire symposium was videotaped and is available for viewing online. University of Virginia School of Law, Videos and Podcasts, at https://content.law.virginia.edu/news/videos-podcasts.

caused that technique to be discontinued as invalid. Professor Kafadar described the projects underway at the University of Virginia that are exploring how to provide better statistical models for forensics and how to better use that evidence in the courtroom.

Second, Sue Ballou, the Program Manager at NIST, and the incoming President of the American Academy of Forensic Science (AAFS), described her career as a forensic analyst and how the field operated without engagement with statistical questions for years, but how both the field and her work came to deeply engage over time with statistics and scientific research. Ballou described how the CSAFE collaboration and the work of NIST researchers have done more to connect science with forensics and to introduce statistical rigor to the research and practice of forensics.

Third, Peter Neufeld described his career, including examples from cases in which he used scientific experts before he co-founded the Innocence Project and began to use DNA testing to free innocent convicts. Neufeld described how he began to work with scientists in the 1990s as part of efforts, culminating in two National Academy of Sciences reports, to set out standards for the forensic use of DNA testing.[6] Neufeld then described more recent efforts to bring that scientific rigor to the traditional forensic disciplines, including at NIST.[7] Neufeld concluded by emphasizing how, with the termination of the National Forensic Science Commission at the Department of Justice, it is more important now than ever for scientists to work with lawyers and forensic scientists to improve evidence used in criminal justice.

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[6] NAT'L RESEARCH COUNCIL, DNA TECHNOLOGY IN FORENSIC SCIENCE (Nat'l Acad. Press 1992); NAT'L RESEARCH COUNCIL, THE EVALUTION OF FORENSIC DNA EVIDENCE (Nat'l Acad. Press 1996).

[7] *Forensic Science Standards Effort Takes Shape as NIST Appoints Scientific Area Committees Members*, Nat'l Inst. Standards & Tech. (last updated Jan. 8, 2018), https://www.nist.gov/news-events/news/2014/09/forensic-science-standards-effort-takes-shape-nist-appoints-scientific-area

Following those introductory remarks, the first panel, moderated by Chris Fabricant, discussed the role of statistics in forensic science. Professor Alicia Carriquiry described the importance of statistics in forensics. After all, while forensics comes in many forms, much of that forensic practice relies on subjective judgments. Many of those judgments do not involve objective measurements of any kind. Carriquiry highlighted how the AFTE Theory of Identification asks firearms examiners to find "sufficient agreement," but without any standard for the sensitivity and specificity of such a conclusion.[8] For a forensic technique to be scientifically valid, Carriquiry emphasized that (1) the similarity between two objects must be measured objectively and precisely, and (2) we must be able to establish the significance of the similarity. Statistics can be invaluable in doing so. Carriquiry described how the CSAFE consortium, funded by NIST in a five-year cooperative agreement, with many diverse collaborators, is addressing that need to provide a validated and quantitative basis for forensic techniques.

Hari Iyer addressed a different question: assuming there is quantified information about forensics, how are those statistics to be presented in court? Iyer described recent work with fellow NIST statistician Steven Lund, arguing that there are real concerns with the proposed use of likelihood ratios to express forensic conclusions, including problems arising from the subjectivity of the decisions that are incorporated into such expressions.

Karen Kafadar, whose remarks are published in this volume, described not only the importance of bringing statistical rigor to forensic sciences, but also training on statistics and educational efforts to encourage future statisticians to examine practical and pressing problems in forensics. Efforts to educate lawyers on statistics, to train undergraduates, and to

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[8] COMMITTEE FOR THE ADVANCEMENT OF THE SCIENCE OF FIREARM & TOOLMARK IDENTIFICATION, THEORY OF IDENTIFICATION AS IT RELATES TO TOOLMARKS: REVISED, 43 AFTE J. 287 (2011).

develop better ways to convey statistical and forensic evidence to jurors, have all been a focus in the UVA CSAFE work.

Judge Jed Rakoff, of the U.S. District Court for the Southern District of New York, delivered the keynote address, which is published in this volume, asking and addressing why it is that judges have not acted as forceful gatekeepers in the area of forensic science. After all, the *Daubert* decision might have been expected to usher in more stringent judicial gatekeeping, and Judge Rakoff noted that judges have done so in civil cases, where expert admissibility issues are often quite contested. In criminal cases, Judge Rakoff highlighted a real judicial reluctance to engage with the limitations of the science presented. One reason, Judge Rakoff suggested, may be that many judges are former prosecutors and had themselves previously presented similar evidence. Indeed, Judge Rakoff was skeptical of explanations having to do with judicial unfamiliarity with science-related questions, noting that judges often carefully engage with technical matters in a wide range of litigation.

Nor did Judge Rakoff think that scientists had failed to address the problems with the reliability of forensics, since in recent years there have been important reports highlighting the need for caution regarding non-DNA forensics. Nevertheless, Judge Rakoff viewed the role of judges as largely ineffective or unwilling gatekeepers. Any efforts to more carefully regulate forensics may need to come from the Government, but Judge Rakoff noted that the National Forensic Science Commission at the Department of Justice, on which he had served and which produced a number of important documents providing guidance and standards on forensics, was discontinued by the current administration in early 2017.[9]

Perhaps, then, it is particular crime labs that must themselves lead the way in adopting safeguards to ensure that accurate forensics are analyzed and presented in criminal cases. The next panel at the symposium discussed the role of statistics in the crime lab. Linda Jackson of the Virginia

[9] See, e.g. NAT'L COMM'N ON FORENSIC SCI., RECOMMENDATIONS TO THE ATTORNEY GENERAL REGARDING PRETRIAL DISCOVERY (Jan. 16, 2016).

Department of Forensic Services described how the lab makes all of its operating procedures available online and works closely with researchers.

Peter Stout of the Houston Forensic Science Center, whose remarks are published in this volume, described a substantial program, the first of its kind in the country, to conduct blind proficiency testing in forensic disciplines. Such testing uses realistic case materials in casework, without disclosing to examiners that it is a test. Stout displayed data concerning proficiency testing in blood alcohol testing which can permit reporting that takes into account the added uncertainty due to examiner error. Stout also described the efforts made to insert blind cases into the flow of work in the lab and how it has been welcomed by employees: the lab made it a game, with Starbucks reward cards for examiners who detect that case materials are in fact a test. The use of blind and routine testing can not only produce information about error rates in various disciplines that can be incorporated into the presentation of results, but it also evaluates the performance and competency of the staff, tests the entire system, and can incentivize greater care in day to day work.

Sharon Kelley described case processing data of fingerprint examiners at HFSC, including data from a paper on how disagreements between examiners were resolved. The paper is a noteworthy collaboration between researchers and crime laboratory staff to study lab data and learn from patterns across cases.[10] Henry Swofford described, in remarks published in this volume, a novel new program called FRState that he developed at the Defense Forensic Lab in order to provide quantitative conclusions regarding fingerprint testing. The algorithm provides a statistic to express the degree of similarity between fingerprints. The goal is to move from categorical and subjective fingerprint conclusions to quantitative expressions of a fingerprint association. The result brings statistics to fingerprint examinations. Swofford noted that the program is available for

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[10] Alicia Rairden, Daniel Murrie, Sharon Kelley, Brandon Garret, & Amy Castillo, *Resolving Latent Conflict: What Happens When Latent Print Examiners Enter the Cage?* (under submission).

free to other laboratories to test and that evidence using the program has already been presented in a criminal trial.[11]

The final panel, moderated by William Thompson, discussed the role of statistics in the courtroom. Professor David Faigman described the need to attend to the connection between general research and individual evidence in criminal cases, as part of a larger question regarding how to associate the general to the individual. David Kaye described several areas in which statistical inferences can be misstated or misleading. A.J. Kramer provided a criminal defense perspective, explaining how judges have been almost entirely indifferent to challenges to unreliable forensic evidence, which has in turn discouraged defense lawyers from even raising challenges. Professor Bobbie Spellman argued, in remarks published in this volume, that to explain forensic evidence to jurors, the goal should not be to train jurors or expect them to be amateur statisticians. Instead, the goal should be to provide jurors with the information they need to reach sound results.

We could not be more grateful to each of the presenters and contributors to this remarkable Symposium. While this may be the first such event at a law school to bring together the forensics, statistics, and legal communities, we hope that it is far from the last. Twenty-five years after *Daubert*, much hard work remains to improve the research, statistics, and the law that governs the forensic science evidence that has become an integral part of our system of criminal justice.

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[11] For a study that examines how lawpersons interpret quantitative evidence presented using FRState, see Brandon L. Garrett, Gregory Mitchell & Nicholas Scurich, *Comparing Categorical and Probabilistic Fingerprint Evidence, Journal of Forensic Sciences* (forthcoming 2018).