Forensic Statistics: Paradigm or Vortex?

Simon A. Cole

University of California, Irvine

Follow this and additional works at: https://lib.dr.iastate.edu/csafe_conf

Part of the Forensic Science and Technology Commons

Recommended Citation

https://lib.dr.iastate.edu/csafe_conf/15

This Presentation is brought to you for free and open access by the Center for Statistics and Applications in Forensic Evidence at Iowa State University Digital Repository. It has been accepted for inclusion in CSAFE Presentations and Proceedings by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
Forensic Statistics: Paradigm or Vortex?

Summer School

University of Lausanne
Faculty of Law, Criminal Justice & Public Administration

September 11, 2018

Simon A. Cole
Department of Criminology, Law & Society
Newkirk Center for Science & Society
Center for Statistical Applications of Forensic Evidence
University of California, Irvine
Forensic science “under siege” (Pyrek 2007)

- “serious deficiencies”
- “wide variability in capacity, oversight, staffing, certification, and accreditation”
- “lack mandatory and enforceable standards, founded on rigorous research and testing”
- “lack strong ties to our research universities and national science assets”
Forensic reforms

• Accreditation
• Certification
• Standards
• Validation studies
• Discovery reform
• Anti-bias measures
• Intervention of an academic discipline
Which discipline?

• Biology?
• Chemistry?
• Engineering?
• Psychology?
  – Human factors, bias, training, innate abilities
• Statistics
  – How and why has statistics emerged as the panacea for forensic science?

Standards Coordination Office. The previous SWG experience of Susan Ballou (SWGDE, SWGMAT, SWGDRUG), John Butler (SWGDAM), and Barbara Guttman (SWGDE) was helpful in understanding benefits and limitations of previous approaches to creating guidance documents for forensic science.

Some common themes that emerged from the NOI responses include (1) the benefit of membership being weighted towards practitioners who understand the problems they are facing yet including representatives of the private sector and academia (especially statisticians) to provide fresh ideas and perspectives with a goal of strengthening the scientific rigor underpinning current and future forensic science protocols, (2) the need to engage professional
3. Membership
Each SAC Subcommittee will have a maximum of twenty (20) Members. The appointment of additional Members requires FSSB approval. The target distribution of Membership is as follows:

- 70 percent practitioners
- 20 percent federal practitioners
- 30 percent state and local practitioners
- 20 percent civil and other practitioners
- 20 percent researchers and scientists which may include statisticians, measurement scientists, and accreditation and certification specialists
- 10 percent research and development technology partners and providers.
# Table 5. OSAC initial membership for SAC Biology/DNA committee and Wildlife Forensics subcommittee. Recent participants in SWGDAM activities are highlighted in yellow.

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>George Henry, Jr., Ph.D.</td>
<td>Georgia Bureau of Investigation Division of Forensic Sciences</td>
</tr>
<tr>
<td>Kimberly Murka</td>
<td>Las Vegas Metropolitan Police Department</td>
</tr>
<tr>
<td>Robyn Ragdale, Ph.D.</td>
<td>Florida Department of Law Enforcement</td>
</tr>
<tr>
<td>Katherine Moore</td>
<td>U.S. National Marine &amp; Atmospheric Administration, Naval Marine Fisheries Service</td>
</tr>
<tr>
<td>Angela DeMauro</td>
<td>Alabama Department of Forensic Sciences</td>
</tr>
<tr>
<td>Deedra Hawk</td>
<td>Wyoming Game and Fish Department Wildlife Forensic &amp; Fish Health Laboratory</td>
</tr>
<tr>
<td>John Butler, Ph.D.</td>
<td>National Institute of Standards and Technology</td>
</tr>
<tr>
<td>Thomas Caffery, Ph.D.</td>
<td>Federal Bureau of Investigation</td>
</tr>
<tr>
<td>Robin Cotton, Ph.D.</td>
<td>Boston University School of Medicine Biomedical Forensic Sciences Program</td>
</tr>
<tr>
<td>Philip Darienston, Ph.D.</td>
<td>University of Denver</td>
</tr>
<tr>
<td>Antonio Passad, Ph.D.</td>
<td>National Institute of Standards and Technology</td>
</tr>
<tr>
<td>Suze Weik, Ph.D.</td>
<td>University of Washington</td>
</tr>
</tbody>
</table>

## SciArea Committee for Biology/DNA

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA/Northwest Fisheries Science Center/Forensics Laboratory</td>
<td>NASA/Northwest Fisheries Science Center/Forensics Laboratory</td>
</tr>
<tr>
<td>NOAA</td>
<td>NOAA Fisheries Science Center/Forensics Laboratory</td>
</tr>
<tr>
<td>U.S. Fish and Wildlife Service</td>
<td>U.S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>University of Florida</td>
<td>University of Florida</td>
</tr>
<tr>
<td>Michigan State University</td>
<td>Michigan State University</td>
</tr>
<tr>
<td>NOAA National Marine Fisheries Service</td>
<td>NOAA National Marine Fisheries Service</td>
</tr>
<tr>
<td>U.S. Fish &amp; Wildlife Service National Fish &amp; Wildlife Forensics Laboratory</td>
<td>U.S. Fish &amp; Wildlife Service National Fish &amp; Wildlife Forensics Laboratory</td>
</tr>
<tr>
<td>Wyoming Game &amp; Fish Department</td>
<td>Wyoming Game &amp; Fish Department</td>
</tr>
<tr>
<td>University of New Haven (Connecticut)</td>
<td>University of New Haven (Connecticut)</td>
</tr>
<tr>
<td>Smitheson Institution</td>
<td>Smitheson Institution</td>
</tr>
</tbody>
</table>

## DNA Analysis 2 Subcommittee

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robyn Ragdale, Ph.D.</td>
<td>Florida Department of Law Enforcement</td>
</tr>
<tr>
<td>Todd Bills</td>
<td>Bureau of Alcohol, Tobacco, Firearms and Explosives Laboratory</td>
</tr>
<tr>
<td>Susannah Keil</td>
<td>FBI Laboratory</td>
</tr>
<tr>
<td>Timothy McMahon, Ph.D.</td>
<td>Armed Forces DNA Identification Laboratory</td>
</tr>
<tr>
<td>Joel Sutton</td>
<td>Defense Forensic Science Center - USAF</td>
</tr>
<tr>
<td>Rebekah Kay</td>
<td>Utah Bureau of Forensic Services</td>
</tr>
<tr>
<td>Jeff Nye</td>
<td>Michigan Department of State Police Forensic Science Division</td>
</tr>
<tr>
<td>Margaret (Peg) Schwartz, Ph.D.</td>
<td>Vermont Forensic Laboratory</td>
</tr>
<tr>
<td>Carl Sobierowski</td>
<td>Indiana State Police Laboratory</td>
</tr>
<tr>
<td>Lisa Marie Brewer</td>
<td>Glendale (California) Police Department</td>
</tr>
<tr>
<td>Kathleen Corrado, Ph.D.</td>
<td>Onondaga County (New York) Center for Forensic Sciences</td>
</tr>
<tr>
<td>Bill Gartside</td>
<td>San Bernardino County (California) Sheriff's Department</td>
</tr>
<tr>
<td>Shawn Montpetit</td>
<td>San Diego Police Department Cine Laboratory</td>
</tr>
<tr>
<td>Mike Wilkin, Ph.D.</td>
<td>John Jay College of Criminal Justice</td>
</tr>
<tr>
<td>Michael Codie, Ph.D.</td>
<td>NIST Applied Genetics Group</td>
</tr>
<tr>
<td>Catherine Grigas, Ph.D.</td>
<td>Boston University School of Medicine</td>
</tr>
<tr>
<td>Charlotte Word, Ph.D.</td>
<td>Self Employed as a Private Consultant</td>
</tr>
<tr>
<td>Christian Westring, Ph.D.</td>
<td>NMS Labs</td>
</tr>
<tr>
<td>Julie French</td>
<td>GE Healthcare Human Identity Division</td>
</tr>
<tr>
<td>Sandy Zabel, Ph.D.</td>
<td>Northwestern University</td>
</tr>
</tbody>
</table>

## Wildlife Forensics Subcommittee

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOAA</td>
<td>NOAA National Marine Fisheries Service</td>
</tr>
<tr>
<td>U.S. Fish &amp; Wildlife Service</td>
<td>U.S. Fish &amp; Wildlife Service</td>
</tr>
<tr>
<td>University of Florida</td>
<td>University of Florida</td>
</tr>
<tr>
<td>Michigan State University</td>
<td>Michigan State University</td>
</tr>
<tr>
<td>NOAA National Marine Fisheries Service</td>
<td>NOAA National Marine Fisheries Service</td>
</tr>
<tr>
<td>UC Davis Veterinary Genetics Laboratory (VGL-Forensics)</td>
<td>UC Davis Veterinary Genetics Laboratory (VGL-Forensics)</td>
</tr>
<tr>
<td>National Forensic Science Center</td>
<td>National Forensic Science Center</td>
</tr>
<tr>
<td>University of New Haven (Connecticut)</td>
<td>University of New Haven (Connecticut)</td>
</tr>
<tr>
<td>Smitheson Institution</td>
<td>Smitheson Institution</td>
</tr>
</tbody>
</table>
DOJ Asks for Suggestions to Improve Forensic Science

As reported previously in Forensic Magazine, the NCFS was created out of the recommendations of the 2009 National Academy of Sciences report entitled “Strengthening Forensic Science in the United States: A Path Forward.” The report’s wide-ranging criticisms led to the NCFS’s directing a further look into the claims. OSAC then took those directions and implemented them, through a membership of various committees that mixed together forensic science practitioners with statisticians and academics. OSAC continues to do that work, with a series of major meetings last month that continued their look at various forensic sub-disciplines.
General Overarching Recommendations

The following are four recommendations that are offered to inform the principles and implementation of the FSDR process.

1. Fully Integrate Statisticians into the Entire FSDR. The strongest recommendation we offer is to include independent statisticians who are trained in probabilistic reasoning, methodological design, sampling techniques, quality control, and statistical inference in all phases of the design and implementation of the FSDR. This effort is needed to ensure that the FSDR meets the standards of the scientific community. This substantive expertise will be
Why statistics?

- Expertise lies in the reporting and interpretation of forensic evidence, or making inferences from forensic evidence
History/sociology of Science

• Understand making of scientific knowledge as a social process
• Contrast with, e.g., philosophy of science
• Among best-known concepts: paradigm (Kuhn)
  – Scientists work within intellectual structures and frameworks
Sociology of forensic science

Forensic culture as epistemic culture: The sociology of forensic science

Simon A. Cole
Department of Criminology, Law & Society, University of California, Irvine, CA 92697-7848, USA

<table>
<thead>
<tr>
<th>Social Dimension</th>
<th>Research Science</th>
<th>Forensic science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-frame</td>
<td>Open-ended</td>
<td>Limited</td>
</tr>
<tr>
<td>Data</td>
<td>Intentionally collected/generated (in most cases); in principle, unlimited</td>
<td>Adventitiously produced; inherently limited</td>
</tr>
<tr>
<td>Knowledge claims</td>
<td>General</td>
<td>Specific</td>
</tr>
<tr>
<td>Product</td>
<td>Papers and other scientific communications</td>
<td>Reports, affidavits, testimony</td>
</tr>
<tr>
<td>Reward structure</td>
<td>Prestige</td>
<td>Bureaucratic</td>
</tr>
<tr>
<td>Productivity goals</td>
<td>Volume and impact</td>
<td>Volume and speed</td>
</tr>
<tr>
<td>Accountability mechanisms</td>
<td>Scholarly peer review</td>
<td>Legal adversarialism</td>
</tr>
<tr>
<td>Audience</td>
<td>Peer scientists, ‘core set’</td>
<td>Legal actors, the state</td>
</tr>
<tr>
<td>Reporting of results</td>
<td>Conservative, statistical, ambiguous</td>
<td>Ambitious, colloquial, unambiguous</td>
</tr>
<tr>
<td>Data sharing</td>
<td>Unlimited, in principle</td>
<td>Treated warily, sometimes prohibited by legal actors</td>
</tr>
<tr>
<td>Research agenda</td>
<td>Driven by ‘research programmes’, ‘paradigms’</td>
<td>Driven by demands of courts, law enforcement, and the state</td>
</tr>
<tr>
<td>Valid feedback</td>
<td>Sometimes</td>
<td>Rarely</td>
</tr>
</tbody>
</table>
Common advice to make forensic science more “scientific”

• Modeled on (usually academic) research scientists
  – Falsificationism
  – Hypothesis testing
  – Organized skepticism
When did expert evidence become statistical?

- Dreyfus Affair (France 1894)
- Questioned document
- Poincare uses Bayesian approach to refute Bertillon’s mathematical report

Locard tripartite rule – fingerprinting (1912)

<table>
<thead>
<tr>
<th>Corresponding friction ridge details</th>
<th>Justifiable conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8</td>
<td>Cannot identify</td>
</tr>
<tr>
<td>8-12</td>
<td>Probable identification</td>
</tr>
<tr>
<td>&gt; 12</td>
<td>Identification</td>
</tr>
</tbody>
</table>

- Arguably a probabilistic understanding of fingerprint evidence that was subsequently lost in the discipline.
A problem in forensic science

BY D. V. LINDLEY

Department of Statistics and Computer Science,
University College London

gesting the suspect was at the scene of the crime? An example, to which we will refer throughout
the paper, occurs with window glass when breakage takes place on forcibly entering a building.
Measurements are made of the refractive indices of the pieces of glass at the scene and of the
fragments of window glass found on the suspect’s clothing. Because of the small sizes of some
of the fragments the measurements are subject to error. In this paper a solution to this identity
problem is obtained and some interesting features of it discussed.

3. Probabilities of wrong judgements

We next consider how these results might be used in presenting evidence in a court of law.
Throughout the discussion we suppose that the events of guilt and identity are the same.
Let $G = I$ denote the event that the defendant is guilty and let $E$ denote the total evidence
presented apart from that on the glass fragments, $X$ and $Y$. The final odds are

$$
\frac{p(G | X, Y, E)}{p(\overline{G} | X, Y, E)} = \frac{p(X, Y | G, E) \cdot p(G | E)}{p(X, Y | \overline{G}, E) \cdot p(\overline{G} | E)} = \frac{p(X, Y | I) \cdot p(G | E)}{p(X, Y | \overline{I}) \cdot p(\overline{G} | E)}.
$$
Lindley’s approach

1. Likelihood ratio
2. Bayes theorem
Tenets of forensic statistics

- All evidence is probabilistic
- All evidence can be characterized by a LR
- All evidence can be integrated into a case decision using Bayes theorem
Denial of probability: fingerprints

• Fingerprint evidence is non-probabilistic
  – Vanderkolk (1993)

• “Dactyloscopy is a domain separate from criminalistics. The information is certain; a fingerprint can only be from one person.”

“any member, officer or certified latent print examiner who provides oral or written reports, or gives testimony of possible, probable, or likely friction ridge identification shall be deemed to be engaged in conduct unbecoming such member, officer, or certified latent print examiner.”
  – IAI Resolution VII (1979) [amended by Resolution V (1980)]
Implications for forensic science

• All evidence must be characterized probabilistically
• Probably through a LR
• Forensic analysts should not testify to posterior odds
Forensic statistics

• Over the next ~30 years, “forensic statistics” become recognizable subdiscipline
  – Not quite “statistics” and not quite “forensic science”
• Conferences, journals, and other markers of academic legitimacy
  – 1990 – 1st International Conference on Forensic Statistics (Edinburgh)
    • 83 attendees
  – 2017 – 10th International Conference on Forensic Inference and Statistics (Minneapolis)
    • 148 attendees
Forensic Statistics as paradigm?

Reasons why

• Virtually unanimous agreement on core principles
  – E.g., probabilistic nature of evidence, LR, Bayesian approach

• Working out of puzzles within the paradigm
  – What prior odds should be assumed in particular cases?
  – How do you calculate a LR for a fiendishly complex DNA mixture?

Caveats

• Did not really enact a revolution upon some other paradigm
  – Filled “unoccupied” intellectual space
  – Only adversary is non-probabilistic approach
Bayesian approach

• LR should be distinguished from “Bayesian” approach
• LR is used in “Bayes theorem”
• But you can use LR without using a “Bayesian approach”
• Well suited for single events in which you cannot run repeated trials
• Good at combining heterogeneous evidence
• Subjective probabilities ok
• Arguably very well suited for legal problems
• Reputation for punctiliousness
• Dogmatic quality
  – Religion jokes
Likelihood ratio

• “the likelihood ratio remains the only probabilistic method endorsed for use by expert forensic scientists”

“The logical approach”

8) The logical approach to evaluating evidence implicit in the foregoing points has come to be known as the “Bayesian approach”. The ideas behind this approach are not novel. Indeed, they were first applied to resolving a serious miscarriage of justice in the Dreyfus case in 1908.
"The logical approach"

...ing methods and techniques from such disciplines for use in legal contexts. There is no evidence that does not require an evaluation, nor should there be, at least in the legal area, different ways to think about evidence. It is thus emphasised here that evidence evaluation is indifferent to the field...

1 For a practical example of this, see a discussion by Thompson et al. (2003) on the effect that a false positive may have on the value of DNA evidence.

2 "There cannot be two different ways of thinking about evidence. There can only be one logical approach which is not limited to particular "subject matter"." (Robertson & Vignaux, 1998, p. 159)

---

Inadequacies of posterior probabilities for the assessment of scientific evidence

F. Tarone1
Ecole des Sciences Criminelles, Institut de Police Scientifique, The University of Lausanne, BCH, 1015 Lausanne-Dorigny, Switzerland

AND

A. Biedermann2
Ecole des Sciences Criminelles, Institut de Police Scientifique, The University of Lausanne, BCH, 1015 Lausanne-Dorigny, Switzerland

1...
Forensic statistics as paradigm

• An odd sort of paradigm
• Complete success within the disciplinary community
• No real resistance from other scientific disciplinary communities
• Utter lack of success at penetrating practice or law
The appeal of forensic statistics

• Coherent
• Universal
• Consistent across domains
• Logical
• Doesn’t even require data (though it would be nice)
• “Generally accepted”
  – Paradigm?
Forensic statistics in practice c. 2010

• Netherlands Forensic Institute
• Swedish National Laboratory
• UK Forensic Science Service
  – Closure announced 2010

2.3 Evaluation of forensic science findings in court uses probability as a measure of uncertainty. This is based upon the findings, associated data and expert knowledge, case specific propositions and conditioning information.
Developments in the US

• 2009 – National Research Council (NRC) report
• 2013 – Launch of National Commission on Forensic Science (NCFS) and NIST Organization of Scientific Area Committees (OSAC)
• 2014 – Launch of NIST Center for Statistical Applications in Forensic Evidence (CSAFE)
A probabilistic revolution on the horizon?

• And so, we can expect a probabilistic revolution in which all forensic evidence is characterized in terms of probability, using a unified, coherent likelihood ratio approach (with Lausanne as its intellectual center?) that is shared across disciplines and jurisdictions
Structural Obstacles

• Education
  – Labor pool
    • Task differentiation?
• Adversarialism
• Communication
  – Lay comprehension
    • Fact-finders
    • Legal professionals
• Practitioner resistance
• Data sources
• Statistical models
Internal obstacles (or self-inflicted wounds)

• In-fighting
• Attacks on LR approach as “European”
• Tendency of an academic community to focus on difficult, cutting-edge problems
• Disagreements over issues at the margins
  – Setting prior odds
  – Precision of LR
  – Use without data
Special issue on measuring and reporting the precision of forensic likelihood ratios: Introduction to the debate

Geoffrey Stewart Morrison

Morrison & Enzinger, Independent Forensic Consultants, Vancouver, British Columbia, Canada, and Corvallis, Oregon, United States of America
Department of Linguistics, University of Alberta, Edmonton, Alberta, Canada
NIST Experts Urge Caution in Use of Courtroom Evidence Presentation Method

Use of 'Likelihood Ratio' not consistently supported by scientific reasoning approach, authors state.

October 12, 2017

Two experts at the National Institute of Standards and Technology (NIST) are calling into question a method of presenting evidence in courtrooms, arguing that it risks allowing personal preference to creep into expert testimony and potentially distorts evidence for a jury.

The method involves the use of Likelihood Ratio (LR), a statistical tool that gives...
... breakdown (external)?

Likelihood Ratio as Weight of Forensic Evidence: A Metrological Perspective

Steven P. Lund  
steven.lund@nist.gov

Hari Iyer  
hari@nist.gov

Statistical Engineering Division, Information Technology Laboratory,  
National Institute of Standards and Technology, Gaithersburg, MD 20899, USA

Abstract

Lindley (1977) laid the groundwork for a statistical treatment of evaluating the weight of evidence in forensic science based on a subjective Bayesian formulation of the problem. He noted that the decision maker (DM) need only multiply her likelihood ratio (LR) for the evidence (Lindley simply called it the factor multiplying odds).

In this article we provide a rebuttal against the possible perception that a single number, such as the LR, can provide an objective or definitive weight of evidence. We argue that presenting a probabilistic interpretation of evidence in the form of a LR would require an extensive uncertainty characterization. We illustrate the concepts of a Lattice of Assumptions and an Uncertainty Pyramid as tools for evaluating the uncertainty attributable to the choice of assumptions used during analysis under the constraint that any assumptions are judged to be consistent with available empirical information. When such analyses are considered untenable, we argue the LR simply should not be considered amenable to measurement by one person on behalf of another and alternative presentations of evidence should be pursued. In our view, forensic experts should not feel it is their duty to provide a steadfast interpretation. Rather, a forensic expert should assist DMs form their own interpretations from a clear understanding of the relevant, objective, and demonstrable information. We hope this article will help clarify distinctions between personal interpretations and transferable information and inspire those in the forensic science community to carefully consider principles of measurement science when establishing their professional communication practices.
Figure 5: Ranges of LR values corresponding to the choices of different assumptions for $F$ from the assumptions lattice combined with choices for $G_0$. Solid lines show the range of LR values when $F$ is obtained by kernel density estimation. Dashed lines correspond to range of LR values when using the Jump estimate of $F$. 
Responses


  L&I used in court 11 days after publication

Many decimal digits. L&I seem keen to demand a level of perfection of anyone using LRs that is in stark contrast with the quiet acceptance of out-dated practices that abandon logic, such as categorical conclusions. This is where L&I hit a nerve because their
The jury comprehension test: a delaying tactic?

Likelihood ratio approach

- Can juries understand likelihood ratios
- Innumeracy
- Susceptibility to logical fallacies
  - E.g., prosecutor’s fallacy
  - Defense attorney’s fallacy
- Jury comprehension demanded

Current approach

- Ambiguity around “match”
  - Defendant only possible source?
  - Defendant a member of a group of possible sources?
    - How many?
- Ambiguity around “identification”
  - Defendant only possible source?
  - Defendant a member of a group of possible sources?
    - How many?
    - Historical and vernacular meaning of word “identification”
- Jury comprehension not demanded
DEPARTMENT OF JUSTICE
APPROVED UNIFORM LANGUAGE FOR TESTIMONY AND REPORTS
FOR THE FORENSIC LATENT PRINT DISCIPLINE

Application

This document applies to Department of Justice examiners who are authorized to prepare reports and provide expert witness testimony regarding the forensic examination of latent print evidence.

Purpose and Scope

The Uniform Language for Testimony and Reports is a quality assurance measure designed to standardize the expression of appropriate consensus language for use by Department examiners.
U.S. News: Sessions Scuttles Forensics Team


ProQuest document link

ABSTRACT (ENGLISH)

Forensic science has come under heightened scrutiny since a 2009 report by the National Academy of Sciences that concluded many widely used forensic techniques were unreliable. The recommendations of the panel included the creation of a working group.

Under Mr. Hunt’s direction, the new Forensic Science Working Group will create a program to monitor the accuracy of forensic testimony and assess the need for more personnel and equipment in crime labs. The National District Attorneys Association called those efforts “important steps to ensure consistent application of forensic science in the courtroom.”
Uniform Language for Testimony and Reporting (ULTRs)

To address this problem, the FBI is close to finalizing new internal standards for testimony and reporting—which they’re calling “Approved Scientific Standards for Testimony and Reports,” or ASSTR. These documents, designed for almost all forensic disciplines currently practiced by the FBI, will clearly define what statements are supported by existing science. This will guide our lab examiners when they draft reports and take the witness stand, thereby reducing the risk of testimonial overstatement.

We recognize this is no simple task, and we want to make sure we do this review in a deliberate, thoughtful and transparent way. Therefore, at the next meeting of the National Commission on Forensic Science, scheduled for the third week of March, the Justice Department will present a framework for the review and invite feedback from the broader forensic community. We hope this effort will serve as a model for demonstrating our commitment to strengthening forensic science, now and in the future.

JUSTICE NEWS

Deputy Attorney General Sally Q. Yates Delivers Remarks During the 68th Annual Scientific Meeting Hosted by the American Academy of Forensic Science

Las Vegas, NV ~ Wednesday, February 24, 2016
Latent print ULTR

• First approved ULTR published
• One of only 2 specific projects mentioned as agenda for Forensic Science Working Group, Aug. 2017
• The first of only 4 specific “plans to advance forensic science” mentioned by DAG Rosenstein at AAFS, Jan. 2018
Substantive Issues

• “‘Source identification’ is an examiner’s conclusion that two friction ridge skin impressions originated from the same source.”

• Categorical reporting

• Viewed as scientifically unsupportable by numerous scholars, including forensic scientists and statisticians, and official reports (NRC, NIST/NIJ, Fingerprint Inquiry, PCAST, AAAS)
Basis of categorical report

• This conclusion is an examiner's decision that the observed friction ridge skin features are in sufficient correspondence such that the examiner would not expect to see the same arrangement of features repeated in an impression that came from a different source and insufficient friction ridge skin features in disagreement to conclude that the impressions came from different sources.

• The basis for a “source identification” conclusion is an examiner's decision that the observed corresponding friction ridge skin features provide extremely strong support for the proposition that the two impressions came from the same source and extremely weak support for the proposition that the two impressions came from different sources.

• A source identification is a statement of an examiner's belief (an inductive inference) that the probability that the two impressions were made by different sources is so small that it is negligible.
Basis of categorical report

• So “basis” of non-probabilistic statement is a probabilistic statement (?!)

• Report that the probability prints came from different sources is 0, but the basis for this is that the probability is not 0, but rather is “negligible”
Rounding probability down to 0

- What is justification?
- Why is rounded value preferable for fact-finder consumption than “true” value?
- Why is rounding being done in the direction favorable to the state?
Forensic statisticians’ view of rounding

In legal applications, inference statements by scientists are often used by other participants of the criminal justice system. It thus seems sensible to require that probabilities reported by scientists correspond to their actual personal beliefs. This view can be supported on a number of other grounds, including common sense, ethics, epistemology, and legal requirements that experts do not testify beyond their realm of expertise. We have shown here that this notion can further be supported by a formal analysis using the device of a proper scoring rule. It is useful in this context for clarifying the belief-type interpretation of probability and to convince expert probability assessors that they should take interest in reporting their actual beliefs.

It is thus in the scientist’s interest to report his actual belief. The reader can readily verify that, for any reported value of different
Turning decision theory on its head

- This conclusion is an examiner's decision that the observed friction ridge skin features are in sufficient correspondence such that the examiner would not expect to see the same arrangement of features repeated in an impression that came from a different source and insufficient friction ridge skin features in disagreement to conclude that the impressions came from different sources.
- The basis for a “source identification” conclusion is an examiner's decision that the observed corresponding friction ridge skin features provide extremely strong support for the proposition that the two impressions came from the same source and extremely weak support for the proposition that the two impressions came from different sources.
False concessions

- Prohibition of statements
- Has appearance of a concession or responding to criticisms
- But leaves *testimony and reporting* logically unchanged
To the exclusion of all other (TTEOAS)

“The defendant is the source of the print.”

vs.

“The defendant is the source of the print to the exclusion of all other sources.”

• What ever made anyone think these two statements were different?

• Why has this claim persisted for so long?
Comment on TTEOAS

Other commentators have already noted that the mere removal of the words “to the exclusion of all others” does not remove their implication and that the implication is inappropriate. If a statement is made that “two friction ridge prints originated from the same source”, then *de facto*, they could not have been made by any other source. By using the exact same language in the proposed allowable language and unallowable language with the exception of those few words, unnecessary confusion may be introduced, as the two phrases say the exact same thing, with the exception that in one the exclusion of all others is explicitly stated, and in the other, it is merely implied.

— Friction Ridge Subcommittee of the Organization of Scientific Area Committees, Comment on FR Doc # N/A.
100% certainty

Two prints come from the same source.

vs.

Two prints come from the same source with 100% certainty.
Individualization

• Banned, but “identification” can be used
• But the terms are synonymous
Synonymous

• When forensic examiners “mean that the items being compared share a common source . . . the examiner will typically assert that he or she has ‘identified’ a questioned item as originating from a known source.”
An analysis

**Reasoning**
- Probability
- Decision

**Report**
- DOJ
  - Non-probability
- Conclusion

**H&I**
- Bayesian
- Validation

- Uncertainty pyramid + assumptions lattice
- Raw data

DOJ

H&I
What is Forensic Statistics?

• Paradigm
• Academic community
• Tool for:
  – Forensic practitioners to communicate with
  – Consumers of forensic evidence (e.g., courts) to be communicated with
• Strong attachment to non-probabilistic communication remains