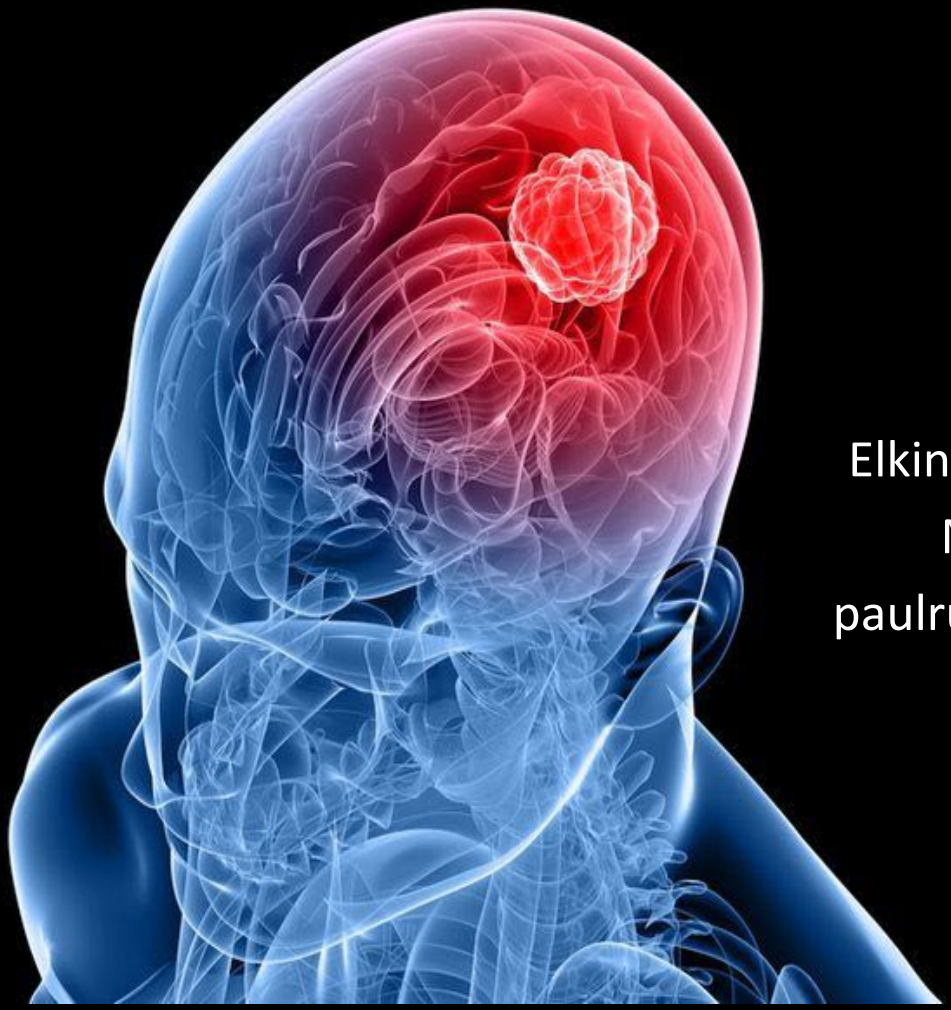
The Cognitive Bias Virus: How it Infects Our Cases



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Madrid, Spain

March 11, 2004

7:37 AM


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PROTECCION CIVIL


52-11-04


BRANDON MAYFIELD

A Review of the FBI's Handling of the Brandon Mayfield Case

UNCLASSIFIED EXECUTIVE SUMMARY

Office of the Inspector General
Oversight and Review Division
January 2006

PCAST, “Report to the President & Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods” at 31 (Sept 2016)

Definition:

“ways in which human perceptions and judgments can be shaped by factors other than those relevant to the decision at hand”

Includes:

1) Confirmation Bias

2) Avoidance of Cognitive Dissonance

3) Contextual Bias

5 FP Analysts Mean Yrs of Experience: 17

3: Not a match

1: Insufficient Info

1: Match

Dror et al., “Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications,” Forensic Science Int’l 156, 74-78 (2006)

SOURCES OF BIAS

Dror, I., "Cognitive Neuroscience in Forensic Science: Understanding and Utilizing the Human Element," Phil. Trans. R. Soc. B 370 (2015)

CONTEXTUAL BIAS: DEFINED

"[W]hen decision-makers are influenced by exposure to extraneous information that is not necessary to make the decision at hand."

-- Reese, "Techniques for Mitigating Cognitive Biases in Fingerprint Identification," 59 UCLA L.Rev. 1252, 1260 (2012)

"Task-irrelevant information" or

"Domain-irrelevant information"

CONTEXTUAL BIAS: UNCONSCIOUS AND UNAVOIDABLE

"a natural and automatic feature of human cognition that can occur in the absence of self-interest and operate without conscious awareness."

-- Kassin et al., "The Forensic Confirmation Bias: Problems, Perspectives, and Proposed Solutions," J. of Applied Research in Memory & Cognition 2, 42-52 at 44 (2013).

"Cognitive biases affect all examiners, not just 'bad apples.'"

-- Dror & Cole, "The Vision in 'Blind' Justice: Expert Perception, Judgment, and Visual Cognition in Forensic Pattern Recognition," Psychonomic Bull. & Rev. 17, 161-167 at 162 (2010).

CONTEXTUAL BIAS: INCREASED RISK

Risk is greater when . . .

(a) Analysis involves subjectivity

(b) Underlying Data is Ambiguous

What forensic disciplines have a high risk of contextual bias contamination?

- Fingerprint Analysis
- Tire tread analysis
- Shoe Print Analysis
- Ballistics Comparison
- Toolmark Analysis
- K-9 Tracking / Identification
- Blood spatter analysis
- Handwriting Analysis
- Bitemark Analysis
- Arson Analysis
- Complex DNA (mixed or small quantity)
- Hair / Fiber Analysis
- Forensic Pathology
- Drug Recognition
- Field Sobriety Testing

EMERGING RESEARCH ON IMPACT ON FORENSICS

10 years ago: “practically no studies at all”

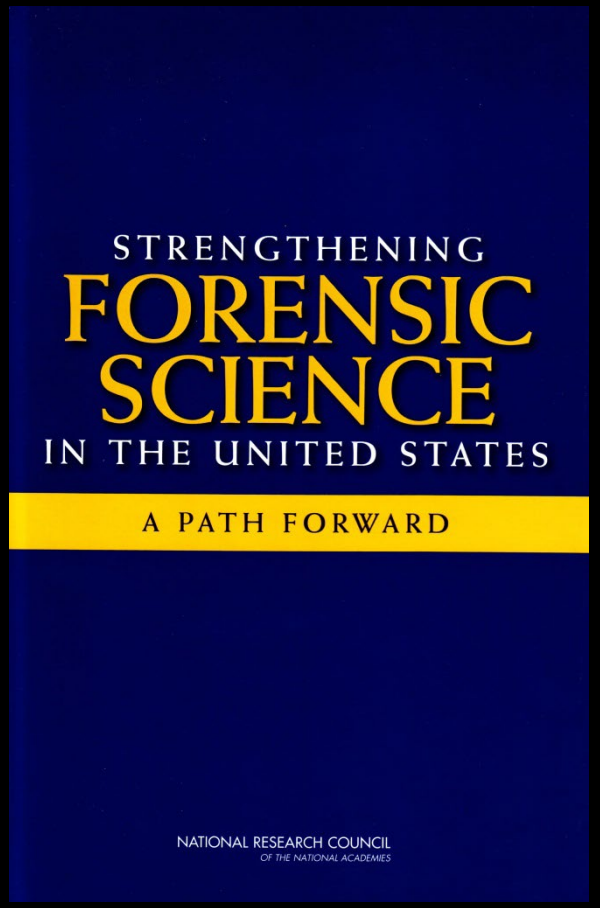
last 5 years: over 50 published papers; 35 different researchers

“there is still a lot of work to do in understanding and properly using the human element in forensic science.”

Dror, I., “Cognitive Neuroscience in Forensic Science: Understanding and Utilizing the Human Element,” Phil. Trans. R. Soc. B 370 (2015)

“The forensic science disciplines are just beginning to become aware of contextual bias and the danger it poses. The traps that can be created by such biases can be very subtle, and typically one is not aware that his or her judgment is being affected.”

--p. 185 (2009)



SWGFAST

Scientific Working Group on Friction Ridge Analysis, Study and Technology

Document #14

Standard for the Application of Blind Verification of Friction Ridge Examinations

(Latent/Tenprint)

1. **Preamble**

1.1. SWGFAST recognizes the importance and significance of establishing quality assurance (QA) protocols and procedures for friction ridge examination. Blind verification may be implemented as part of these QA protocols and procedures.

1.2. As used in friction ridge examination, blind verification is the independent examination of one or more friction ridge impressions by another competent examiner (hereafter referred to as the blind verifier). The blind verifier is provided with no, or limited, contextual information, and has no expectation or knowledge of the determinations or conclusions of the original examiner. Blind verification can be used at any step of the Analysis, Comparison, and Evaluation (ACE) process.

1.3. The aim of incorporating a blind verification process into a QA system is to test the reproducibility of the determinations or conclusions made at any step during Analysis, Comparison, Evaluation, and Verification (ACE-V). This is accomplished by performing another examination in an environment that minimizes the influences of any context information that might lead to invalid results.

Issued, 2/11/11

http://www.swgfast.org/documents/blind-verification/121124_Blind-Verification_2.0.pdf

NATIONAL COMMISSION ON FORENSIC SCIENCE

NIST National Institute of Standards and Technology

Ensuring That Forensic Analysis is Based Upon Task-Relevant Information

Type of Work Product: Views Document Issued by Human Factors Subcommittee

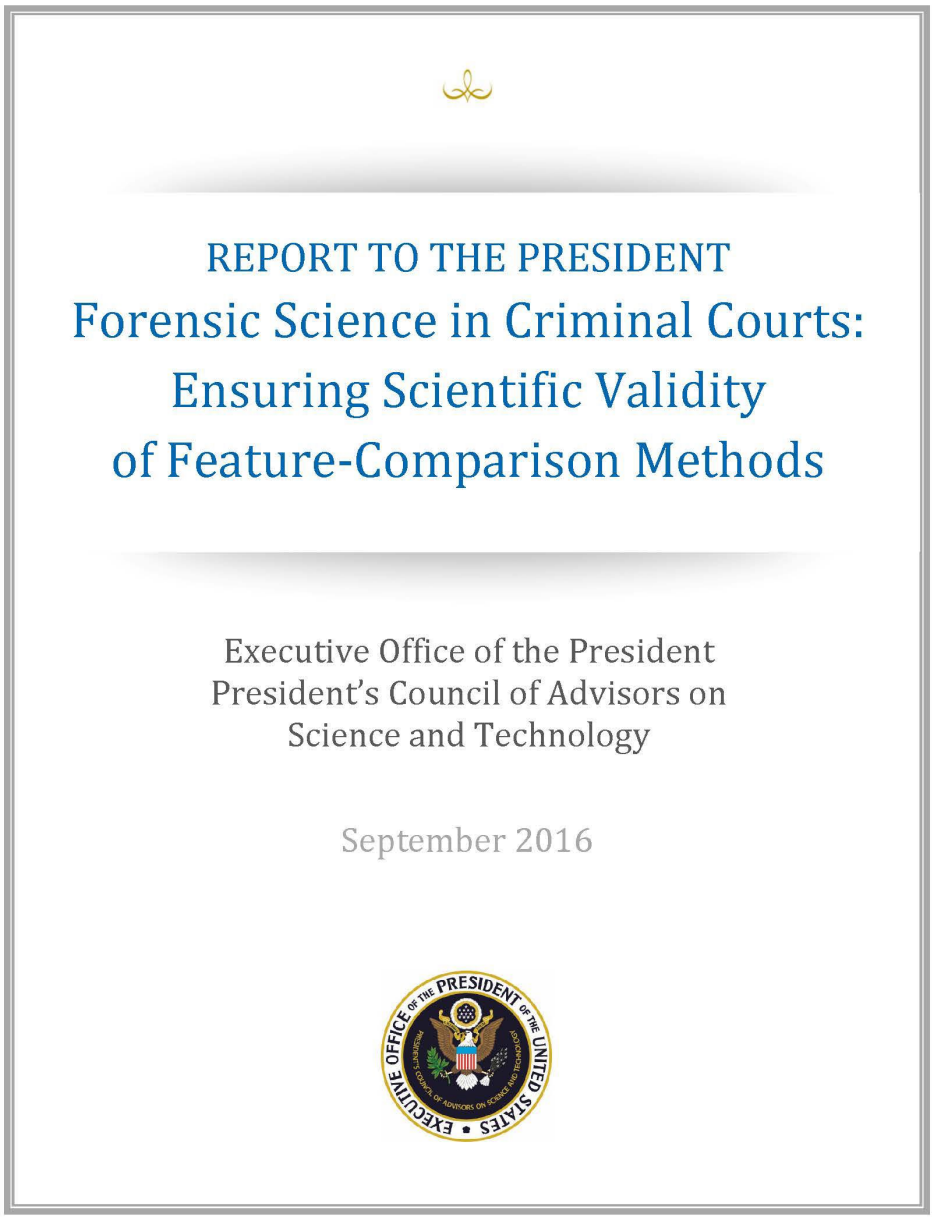
Statement of the Issue:

What is the proper evidentiary basis for a forensic science opinion? In other words, what facts should forensic scientists consider and what facts should they not consider when drawing conclusions from physical evidence? These are questions of fundamental importance to forensic science. The need for clear answers has become increasingly important as forensic scientists are being called on to address the problem of contextual bias.

It is the view of the National Commission on Forensic Science that:

1. Forensic scientists should rely solely on task-relevant information when performing forensic analyses.
2. The standards and guidelines for forensic practice being developed by the Organization of Scientific Area Committees (OSAC) should specify what types of information are task-relevant and task-irrelevant for common forensic tasks.
3. Forensic laboratories should take appropriate steps to avoid exposing analysts to task-irrelevant information through the use of context management procedures.

-- NCFS voted to adopt on 12/8/15
(https://www.justice.gov/ncfs/file/641676/download)



"Studies have shown that cognitive bias may be a serious issue in forensic science." (p. 31)

Proposals to Mitigate (p. 32):
-- manage flow of info w/i crime lab to reduce exposure to task-irrelevant info

-- work in linear fashion

Re: latent print analysis (p. 102):
-- though method is "foundationally sound," "there are a number of important issues related to its validity as applied, incl. (a) confirmation bias; and (b) contextual bias

SUBJECTIVITY: INTER-EXAMINER CONSISTENCY

Table 2
The number of minutiae observed by each examiner for each latent mark (inter-observer). The minimum number per latent mark ('Min'), the maximum number per latent mark ('Max'), the standard deviation ('SD') and the range of minutiae observed for each latent mark (presented on the bottom row).

	Analysis of the latent marks									
	A	B	C	D	E	F	G	H	I	J
	22	9	15	8	9	3	8	11	7	10
	21	11	25	7	10	9	9	10	6	5
	19	9	18	10	7	9	15	19	6	6
	21	21	29	14	12	9	8	9	4	8
	17	16	15	11	16	9	7	12	5	5
	20	14	22	9	10	7	13	18	7	9
	22	17	15	10	10	8	11	24	8	11
	9	9	19	6	9	8	18	16	9	10
	30	15	25	10	12	12	19	22	12	17
	25	13	18	13	12	10	13	15	7	10
Min	9	9	15	6	7	3	7	9	4	5
Max	30	21	29	14	16	12	19	24	12	17
Mean	20.1	13.4	20.1	9.8	10.7	8.4	12.1	15.6	7.1	9.1
SD	5.49	4.01	4.93	2.49	2.45	2.32	4.25	5.15	2.23	3.54
Range	21	12	14	8	9	9	12	15	8	12

Dror et al., "Cognitive issues in fingerprint analysis: Inter- and intra-expert consistency and the effect of a 'target' comparison," Forensic Science Int'l 208 (2011), 10-17

SUBJECTIVITY: INTRA-EXAMINER CONSISTENCY

Analysis of the latent marks

	A	B	C	D	E	F	G	H	I	J
	22	9	15	8	9	3	8	11	7	10
	21	11	25	7	10	9	9	10	6	5
	19	9	18	10	7	9	15	19	6	6
	21	21	29	14	12	9	8	9	4	8
	17	16	15	11	16	9	7	12	5	5
	20	14	22	9	10	7	13	18	7	9
	22	17	15	10	10	8	11	24	8	11
	9	9	19	6	9	8	18	16	9	10
	30	15	25	10	12	12	19	22	12	17
	25	13	18	13	12	10	13	15	7	10
Min	9	9	15	6	7	3	7	9	4	5
Max	30	21	29	14	16	12	19	24	12	17
Mean	20.1	13.4	20.1	9.8	10.7	8.4	12.1	15.6	7.1	9.1
SD	5.49	4.01	4.93	2.49	2.45	2.32	4.25	5.15	2.23	3.54
Range	21	12	14	8	9	9	12	15	8	12

Within-expert experimental design examines intra-observer effects, comparing an examiner's responses at one time to their own responses at another time, thus controlling for individual differences (see Dror and Charlton [8,9]). The study reported

that the number of minutiae participants observed was influenced by decision thresholds, e.g., "participants tended to avoid returning 15 points" (p. 7).[4] Categorical perception makes people perceive information according to psychological categories rather than by

Dror et al., "Cognitive issues in fingerprint analysis: Inter- and intra-expert consistency and the effect of a 'target' comparison," Forensic Science Int'l 208 (2011), 10-17

AFIS MATCHES: FREE OF CONTEXTUAL BIAS?

JOURNAL OF FORENSIC SCIENCES

J Forensic Sci, March 2012, Vol. 57, No. 2
doi: 10.1111/j.1556-4029.2011.02013.x
Available online at: onlinelibrary.wiley.com

PAPER

GENERAL

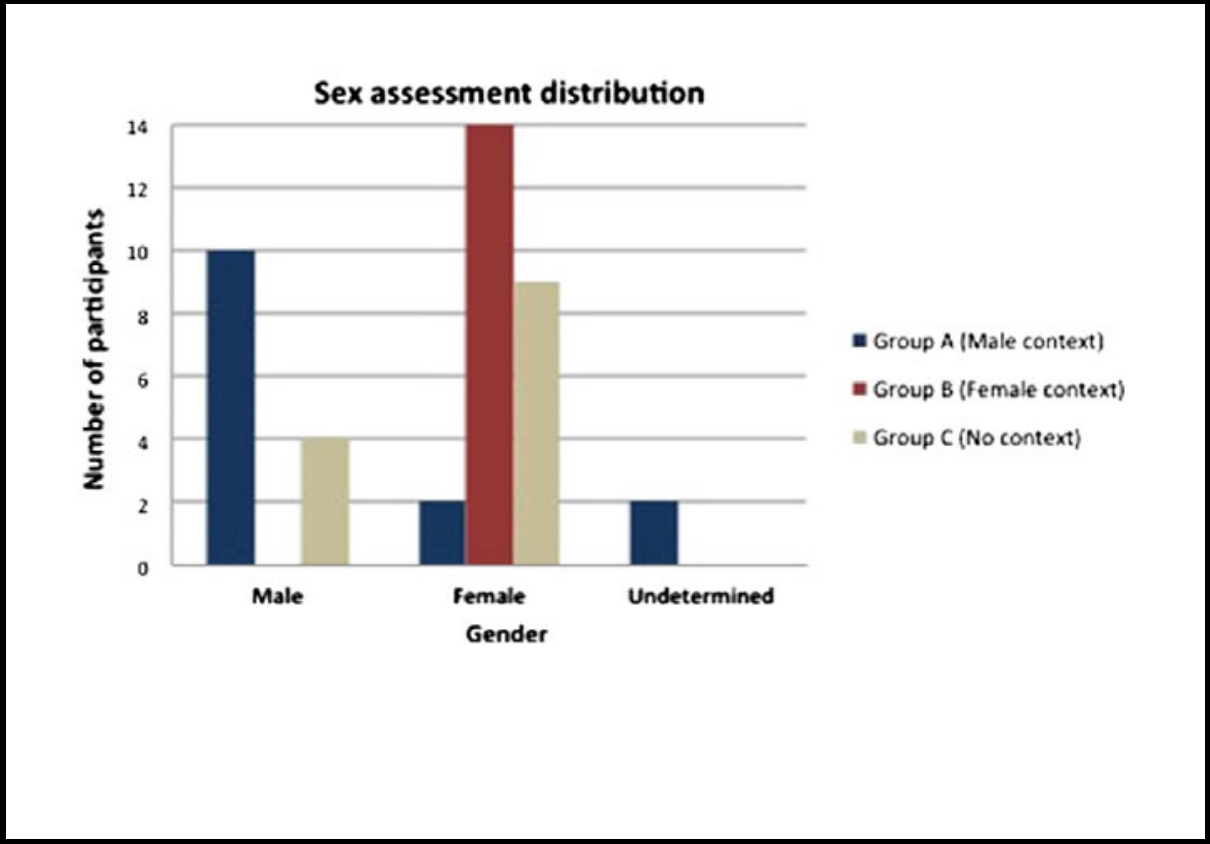
Itiel E. Dror,[1,2] *Ph.D.; Kasey Wertheim,*[3] *M.B.A.; Peter Fraser-Mackenzie,*[2,4] *Ph.D.; and Jeff Walajtys,*[3] *B.A.*

The Impact of Human–Technology Cooperation and Distributed Cognition in Forensic Science: Biasing Effects of AFIS Contextual Information on Human Experts*

ABSTRACT: Experts play a critical role in forensic decision making, even when cognition is offloaded and distributed between human and machine. In this paper, we investigated the impact of using Automated Fingerprint Identification Systems (AFIS) on human decision makers. We provided 3680 AFIS lists (a total of 55,200 comparisons) to 23 latent fingerprint examiners as part of their normal casework. We manipulated the position of the matching print in the AFIS list. The data showed that latent fingerprint examiners were affected by the position of the matching print in terms of false exclusions and false inconclusives. Furthermore, the data showed that false identification errors were more likely at the top of the list and that such errors occurred even when the correct match was present further down the list. These effects need to be studied and considered carefully, so as to optimize human decision making when using technologies such as AFIS.

STUDIES IN OTHER FIELDS: FORENSIC ANTHROPOLOGY

Group A (14): male context
Group B (14): female context
Group C (13): No context [control]



Nakhaeizadeh, S., Dror, I. E. & Morgan, R. (2014). Cognitive bias in forensic anthropology: Visual assessments of skeletal remains is susceptible to confirmation bias. Science & Justice, 54 (3), 208–214

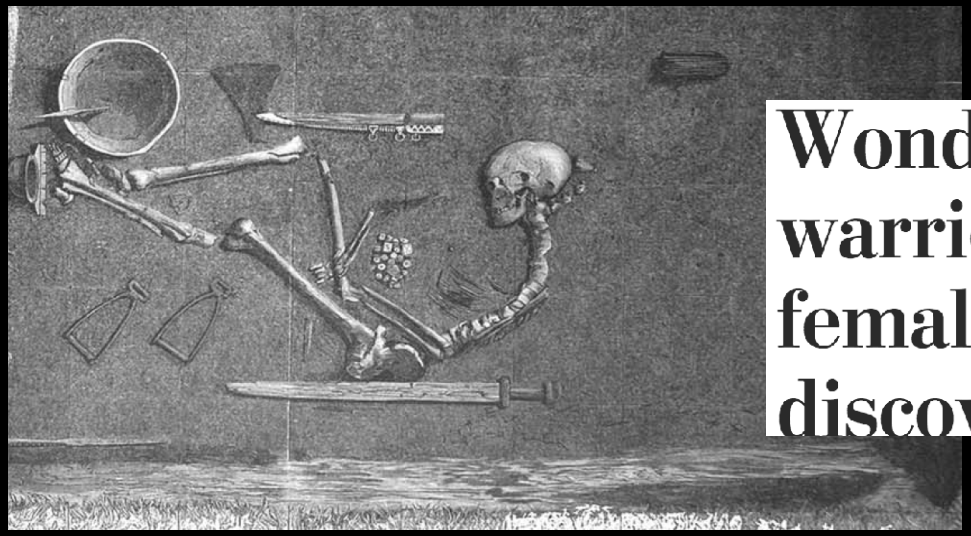
The New York Times

A Female Viking Warrior?

Viking warrior discovered in Sweden was a woman, researchers confirm

Scientists had long assumed the skeleton belonged to a man

INDEPENDENT



Wonder Woman lived: Viking warrior skeleton identified as female, 128 years after its discovery

The Washington Post

Iconic Viking grave belonged to a female warrior

CNN

STUDIES IN OTHER FIELDS: DNA MIXTURE

Science and Justice 51 (2011) 204–208

Contents lists available at SciVerse ScienceDirect

d scrutiny. However,
xtual bias. Because of
vity and bias on DNA
g that DNA mixture
ere asked for their
roduced inconsistent
laboratory's pre-trial
nave influenced the
information in DNA

Mixture Case (Georgia):

-- Case Analysts “could not exclude” suspect; co-D testified against suspect

-- 17 independent DNA analysts w/o biasing info:

- 1 “could not exclude”
- 4 “inconclusive”
- 12 “exclude”

STUDIES IN OTHER FIELDS: BLOOD SPATTER ANALYSIS

Taylor et al., "The Reliability of Pattern Classification in Bloodstain Pattern Analysis, Part 1: Bloodstain Patterns on Rigid Non-absorbent Surfaces," J. Forensic Sciences, 61, 922-927 (2016)

Taylor et al., "The Reliability of Pattern Classification in Bloodstain Pattern Analysis—PART 2: Bloodstain Patterns on Fabric Surfaces," J. Forensic Sciences, 61, 1461-1466 (2016)

Exposure to irrelevant info pointing away from correct judgment:

-- Error rates nearly doubled

-- Decrease in correct judgments

STUDIES IN OTHER FIELDS: ARSON ANALYSIS

Bieber, P., "Measuring the Impact of Cognitivie Bias in Fire Investigation, Science, & Technology," (2012), available at http://truthinjustice.org/Cognative_Bias_ARP.pdf

STUDIES IN OTHER FIELDS: FORENSIC PATHOLOGY

Oliver, W.R., “Effects of history and context on forensic pathologist interpretation of photographs of patterned injury of the skin,” J. Forensic Sciences (2017)

W/o history/context:

-- low level of agreement on diagnosis of injury

-- low level of confidence in diagnosis

W/ history/context increased

-- increase in both consensus and confidence

CONTEXTUAL BIAS / RACIAL BIAS

Received: 26 November 2020 | Revised: 11 February 2021 | Accepted: 11 February 2021

DOI: 10.1111/1556-4029.14697

JOURNAL OF FORENSIC SCIENCES

PAPER

General

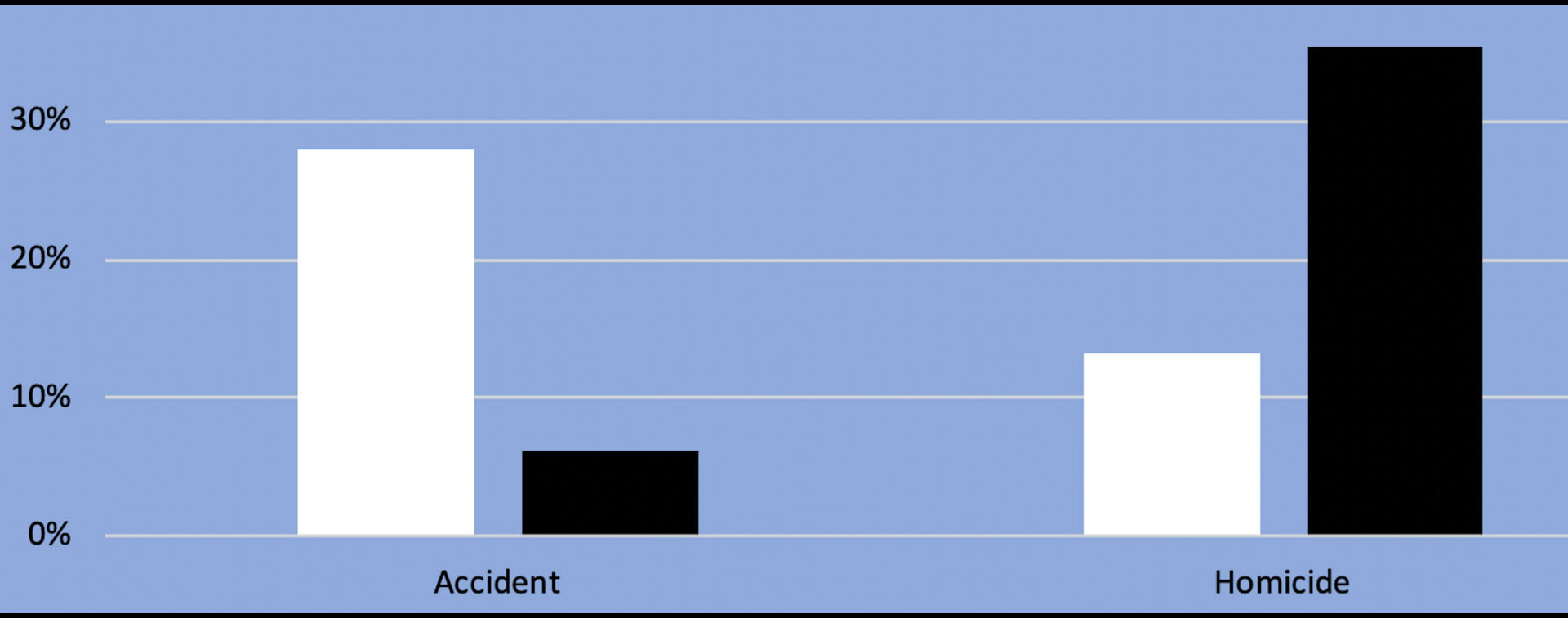
Cognitive bias in forensic pathology decisions

Itiel Dror PhD[1] | Judy Melinek MD[2] | Jonathan L. Arden MD[3] | Jeff Kukucka PhD[4] | Sarah Hawkins JD[5] | Joye Carter MD, PhD[6] | Daniel S. Atherton MD[7]

https://onlinelibrary.wiley.com/doi/epdf/10.1111/1556-4029.14697

133 Forensic Pathologists

- 78: Undetermined
- 23: Accident
- 32: Homicide



Black child: 5 x more likely to conclude homicide

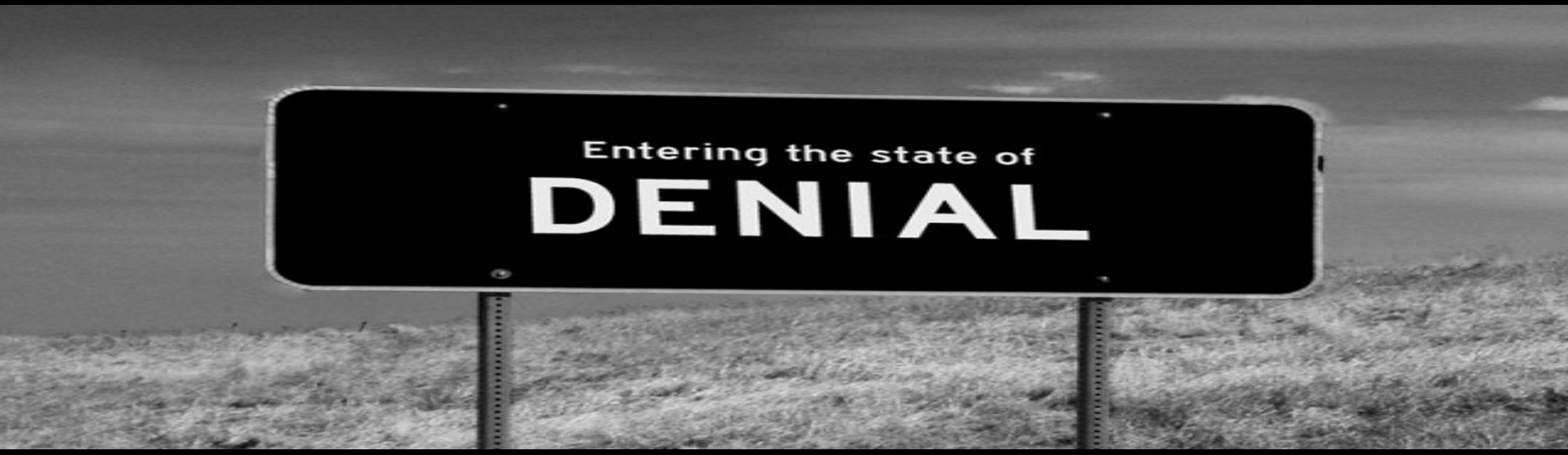
White child: 2x more likely to conclude accident

Race / Gender Bias in Latent Print Analysis

Smalarz, L., et al., “The perfect match: Do criminal stereotypes bias forensic evidence analysis?”, 40 Law and Human Behavior 420 – 429 (2016)

- Child molestation v. Identity Theft
- Suspect characteristics: sex, race, age, religion

- Participants most often perceived the fingerprints to match when the suspect fit the criminal stereotype, even though the prints did not actually match



The Work is Boring without the Details

Because of our Expertise, we can see the evidence more clearly and not be affected by irrelevant information

Because we know about contextual bias, we can ignore the irrelevant information

THE PARADOX OF EXPERTISE

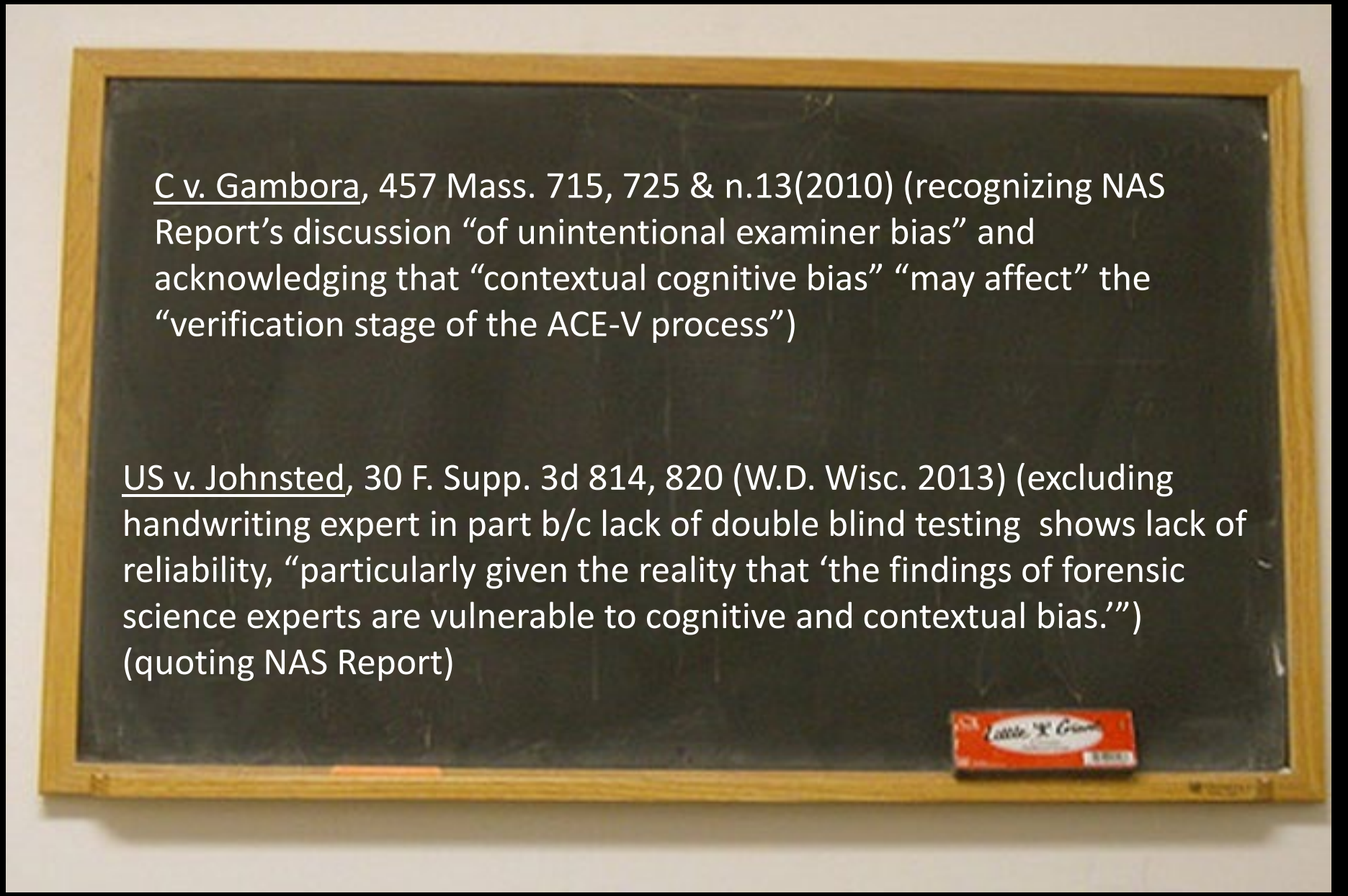
FEATURE FILMS ARE THE RE-

SULT OF YEARS OF SCIENTI-

FIC STUDY COMBINED WITH

THE EXPERIENCES OF YEARS.

LITIGATING CONTEXTUAL BIAS: In 2017 . . .



C v. Gambora, 457 Mass. 715, 725 & n.13(2010) (recognizing NAS Report's discussion "of unintentional examiner bias" and acknowledging that "contextual cognitive bias" "may affect" the "verification stage of the ACE-V process")

US v. Johnsted, 30 F. Supp. 3d 814, 820 (W.D. Wisc. 2013) (excluding handwriting expert in part b/c lack of double blind testing shows lack of reliability, "particularly given the reality that 'the findings of forensic science experts are vulnerable to cognitive and contextual bias.'") (quoting NAS Report)

SINCE 2017 . . .

- US v. Simmons, 2018 U.S. Dist. LEXIS 18606 (E.D. Va . Jan. 12, 2018) (rejecting cognitive bias challenge to firearm toolmark examiner because bias is "question of weight and credibility, rather than admissibility in the Court's role as gatekeeper")

- US v Wells, 2019 U.S. Dist. LEXIS 118915 (Alaska D. Ct. July 7, 2019) (precluding defense digital evidence expert from testifying about confirmation by government expert because defense expert not qualified in field of cognitive bias, but permitting defense psychologist to testify about confirmation bias)

- US v Bonds, 922 F.3d 343, 345-346 (7th Cir. 2019) (trial judge did not err in precluding defense from elicitng evidence about error in Brandon Mayfield case but noting PCAST Report "provides the defense bar with paths to cross-examine witnesses who used the ACE-V approach" about confirmation and contextual bias)

- Commonwealth v. Wardsworth, 482 Mass. 454, 477 (2019) (noting that allowing police officer to testify, before showing surveillance video to jury, that people in video are dressed similarly to defendants "risked creating a cognitive bias before the jurors saw the footage for the first time" and citing Itiel Dror's work)

LITIGATING CONTEXTUAL BIAS

-- Discovery Requests

-- Hire Experts

- In the Field: Avoid Biasing Info!
- Cognitive Psychologists

-- Move for Court Orders for Non-Biasing Procedures

-- Daubert / Frye Challenges

-- Request for Jury Instructions

-- Implications for Harmless Error Analysis?

CHANGE YOUR LANGUAGE

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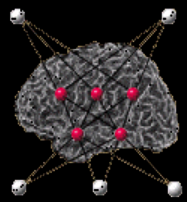

Cognitive Consultants International Ltd

Itiel Dror

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&

Cognitive Consultants International (CCI)

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CONTEXTUAL BIAS EXPERTS

Professor Simon Cole – UC Irvine

Professor William Thompson – UC Irvine

Professor Jeffrey Kukucka – Towson University

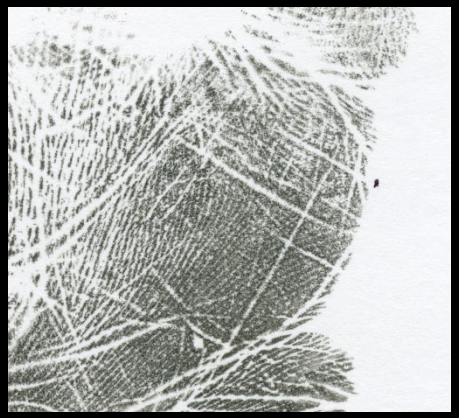
Professor Samuel Sommers – Tufts University

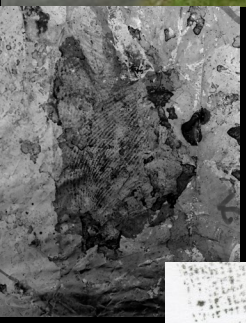
Professor Saul Kassin – John Jay College

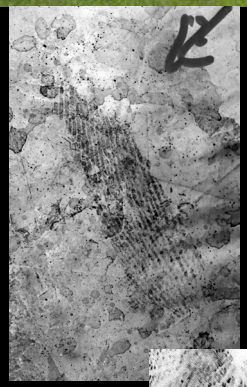
Professor Jonathan “Jay” Koehler – Northwestern University (doesn’t want to testify)

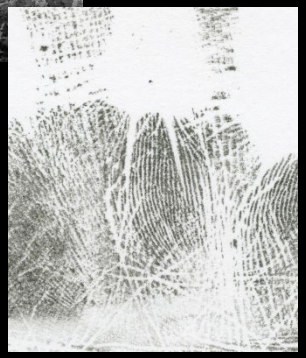
Professor Thomas Busey – Indiana University

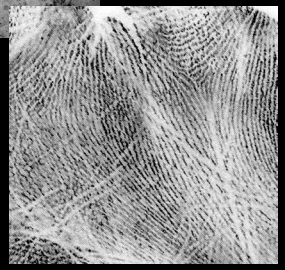
Ralph & Lyn Haber -- http://www.humanfactorsconsultants.com/











-- Funds for Latent Print Expert

-- Discovery Motion:

a) State's experts – name, address, CV, reports, opinions
b) Entire Case file, incl. notes, measurements, photos, etc.
b) All Info provided experts, incl from police and DA, written and oral

-- Conditional Opposition to ReAnalysis in Mass.

a) blind-examiner
b) no exposure to task-irrelevant info
c) document all communications / work
d) follow linear sequential unmasking

-- Funds for Cognitive Bias Expert

-- Funds for Blind Examiners

-- Daubert Motion to Exclude

-- Cross-Ex of Experts in Other Fields on Avoiding Cog Bias & Credentials of our Expert

-- Cross-Ex of State's LP Examiners on Exposure to Biasing Info / Failure to do LSU

-- Trial Testimony of Cognitive Bias Expert


A LOOK IN
THE MIRROR