

Some Predictions About Future Trends In Forensic Science

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Increased Emphasis on Research

Increased Emphasis on Expressions of Uncertainty

Controversy over Interpretation Practices

Increasing Emphasis on
Transparency and
Completeness in Report
Writing,

and Consultation on
request with all sides.

Emphasis on Developing
Methods for
communicating results
understandably to non-
specialists without
overstatement or
understatement

New Approaches to Error Management

Increasing Emphasis on Masking Protocols

Increased Emphasis on Research

Doesn't mean every bench analyst must do research, but does mean that every analyst must cooperate in research.

NIJ must show it can be an honest broker funding well-designed research that can show weaknesses as well as strengths.

So far, so good.

Mnookin et al (including forensics people like Barry Fisher Max Houk, Glenn Langenburg, Jay Siegel, Keith Inman, Norah Rudin, and David Stoney) and a few others of us.

The Need for a Research
Culture in the Forensic
Sciences

UCLA Law Review, 2011

with nice added commentary by
Joe Bono

Google “Mnookin Research
Culture” and download for free

Increased Emphasis on Expressions of Uncertainty

Metrology and the
Guide to the
Expression of Uncertainty in
Measurement
(GUM)

Controversy over Interpretation Practices

English/Continental Approaches
(Bayesianism)

vs.

Typical American Approach
(Direct expression of probability
of common source attribution)

Colin Aitken & Franco Taroni

Statistics and the Evaluation of
Evidence for Forensic Scientists

Increasing Emphasis on
Transparency and
Completeness in Report
Writing,

and Consultation on
Request with all sides.

The Role of the Forensic Science

as an honest broker
representing scientific results to
the adversary system
demands this.

Emphasis on Developing
Methods for communicating
results understandably to non-
specialists without
overstatement or
understatement

Graphic/Geometric is better than
formally quantified.

Attend a program on statistical
concepts by Stephen Morgan

Read some of the literature on
“words of estimative probability”
and then judge the defensibility of
various word scales in forensic
disciplines

New Approaches to Error Management

Realization that error is not
synonymous with fault, and that
errors need to be frankly
admitted to be managed
(Medical Model)

James Reason,
Human Error (1990)

Risinger—Whose Fault? (2011)

E-mail

risingmi@shu.edu

and I will send you a copy

Increasing Emphasis on Masking Protocols

Standards for distinguishing domain-irrelevant information, plus masking protocols, that result in no domain irrelevant information at the interpretation stage, and domain relevant information in the least biasing order.

Go to JFS electronic version
and search for
“sequential unmasking”

Level I Propositions:
Offence Level

Level II Propositions—
Activity Level

Level III Propositions—
Source Level

The result provides _____
support for the prosecution's
proposition over the defense
proposition.

There are ways in which I think attempting a demarcation between science and non-science is not helpful, and ways in which it is.

A place where the science/non-science demarcation is surprisingly unhelpful:

Understanding the notion of expertise.

Expertise is best understood by
functional contrast with the
ordinary fact witness.

Fact witnesses are
interchangeable with jurors
except for time and place.

Whenever a witness makes assertions that cannot be accounted for by interchangeability, the witness is performing some sort of expert function.

“Expert” is best
thought of as an
adjective applying to
assertions, not to
witnesses

This universe of expert function
can be divided into two
domains:

Summarizational (Educational)
and
Translational

Summarizational (Educational)
expertise can also be usefully
divided into two species:

Everyday

Technical

Shoe Man

M.O./Argot Expert

Gang Practices
Expert

Elizabeth Loftus

Translational—Takes factual information equally available to expert and jury, and turns it into a conclusion about another non-obvious factual proposition (which we unhelpfully call an “opinion” or sometimes a conclusion.

Translational assertions convert facts equally available to the jury and the expert from a less usable to a more usable form, based on an asserted translation system possessed by the witness but not by the jury.

Translational expertise is most people's normal model, dealing as it does in "conclusions" or "opinions"

Translational assertions convert facts equally available to the jury and the expert from a less usable to a more usable form, based on an asserted translation system possessed by the witness but not by the jury.

Language Translator

There are many potential species of translational system, the most important of which are:

1. experience based
2. research based

In reality, there tends to be an admixture of both in real world applications, but one or the other is usually clearly dominant.

In judging reliability of asserted expertise, the questions to be asked are always the same for all forms

- What is the case specific target issue to which the expertise is directed?
- What is the case-specific claim of expertise?
- What available information bears on a rational belief warrant in regard to the reliability of this specific claim of expertise?
- What is the appropriate standard of certainty for such a belief warrant given the kind of case, the issue involved, the distribution of the burdens of production and persuasion in the case, and the standard of proof involved in regard to the issue upon which the expertise is proffered?

Notice that nothing has yet been said about science. Science is only one form of translational system (but an important one)

However, when answering question three (about the reasons to believe a claim of expertise), we must decide if we are dealing with science or not, because that shapes how we approach that question.

It's not that belief in non-science
experienced-based claims are
not sometimes warranted, but
that they will be warranted (if
they are) in a different way than
the products of science.

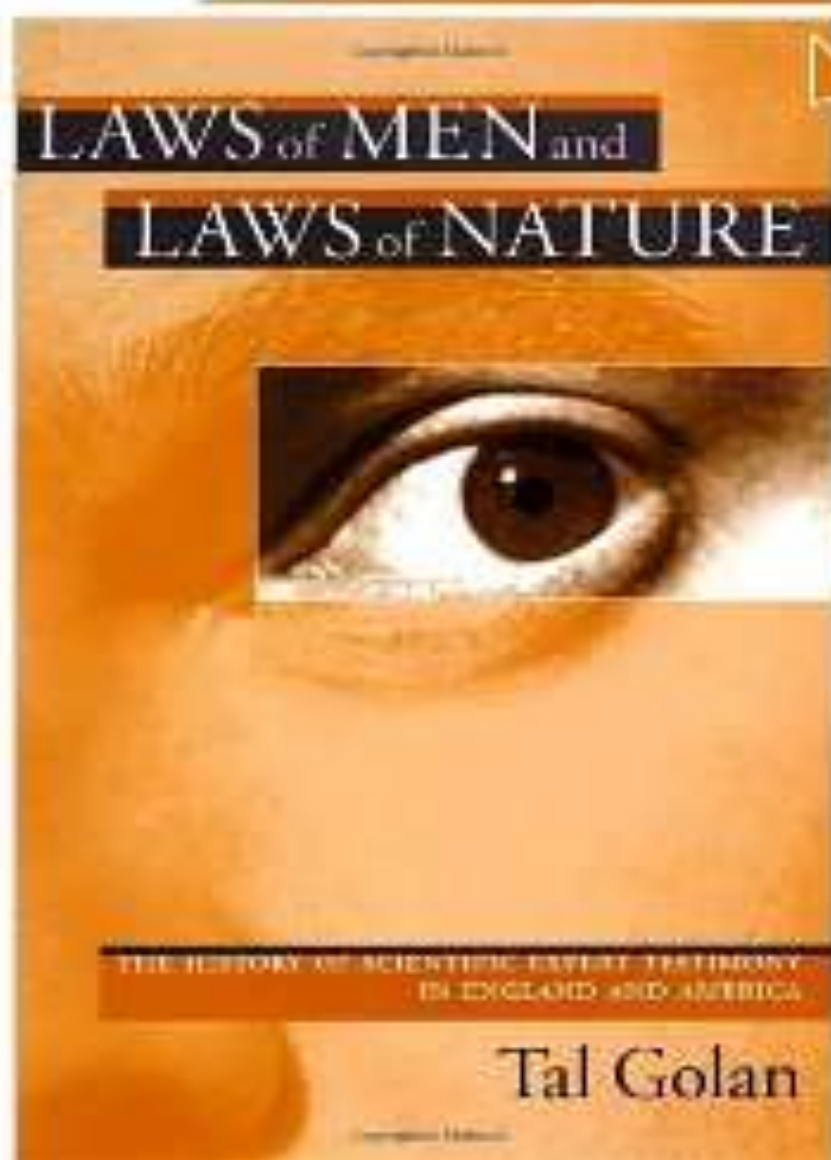
Minimum condition of reliability
for experience-based expertise:

- Unambiguous feedback
for correct results in
normal practice

When this condition is not present, only testing of practitioners by the standards of science can supply the appropriate belief warrant.

So we must now deal with some
sort of approach to the
demarcation problem.

Click to **LOOK INSIDE!**



Frye v. United States

293 F. 1013

(D.C. Circuit, 1923)

‘The rule is that the opinions of experts or skilled witnesses are admissible in evidence in those cases in which the matter of inquiry is such that inexperienced persons are unlikely to prove capable of forming a correct judgment upon it, for the reason that the subject-matter so far partakes of a science, art, or trade as to require a previous habit or experience or study in it, in order to acquire a knowledge of it. When the question involved does not lie within the range of common experience or common knowledge, but requires special experience or special knowledge, then the opinions of witnesses skilled in that particular science, art, or trade to which the question relates are admissible in evidence.’

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence, or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify in the form of an opinion or otherwise.

Daubert v. Merrell Dow Pharmaceuticals, Inc.

509 U.S. 579 (1993)

Weisgram v. Marley,

528 U.S. 440, 442

(2000)

General Electric Co. v. Joiner

532 U.S. 136 (1997)

Kumho Tire Co. v.
Carmichael

526 U.S. 137 (1999)

Most people, including
most judges at all levels,
have never bothered to
actually read *Kumho
Tire v. Carmichael*.

The “Task at Hand”
requirement of
specificity

Typical unread passage:

“AS WE SAID BEFORE,...THE QUESTION BEFORE THE TRIAL COURT WAS *SPECIFIC NOT GENERAL*. THE TRIAL COURT HAD TO DECIDE WHETHER THIS PARTICULAR EXPERT HAD SUFFICIENT SPECIALIZED KNOWLEDGE TO ASSIST THE JURORS “IN DECIDING *THE PARTICULAR ISSUES OF THE CASE*”

This prescribes the “task at hand” approach to expertise.

The issue is not global reliability, but reliability for the application actually involved in the case.

A mandate ignored by virtually every lawyer and every federal judge in the country!

Most people, including
most judges at all levels,
have never bothered to
actually read *Kumho
Tire v. Carmichael*.

The “task specific” approach to judging the reliability of expert assertions is not only mandated by Kumho Tire, it is the only reasonable approach to the question of reliability, even though it requires....

WORK

ONE TASK OR MANY?

- What is the case specific target issue to which the expertise is directed?
- What is the case-specific claim of expertise?
- What available information bears on a rational belief warrant in regard to the reliability of this specific claim of expertise?
- What is the appropriate standard of certainty for such a belief warrant given the kind of case, the issue involved, the distribution of the burdens of production and persuasion in the case, and the standard of proof involved in regard to the issue upon which the expertise is proffered?

“CAN DOCUMENT EXAMINERS RELIABLY IDENTIFY
HANDWRITING AS TO AUTHORSHIP OR ORIGIN?”

VS

“CAN DOCUMENT EXAMINERS RELIABLY DETERMINE IF
A PARTICULAR PERSON WHOSE NAME IS REFLECTED
BY A PUTATIVE SIGNATURE ACTUALLY SIGNED THE
SIGNATURE?”

VS.

“CAN A DOCUMENT EXAMINER USING THE
TECHNIQUES USED, RELIABLY DETERMINE IF A
PARTICULAR PERSON WHOSE NAME IS REFLECTED BY
A PUTATIVE SIGNATURE ACTUALLY SIGNED THE
SIGNATURE UNDER THE CONDITIONS OBTAINING IN
THIS CASE?”

VS

“DID THE DOCUMENT EXAMINER IN THIS CASE
ACCURATELY DETERMINE IF THE SIGNATURE AT
ISSUE WAS A FORGERY?”

“CAN DOCUMENT EXAMINERS RELIABLY IDENTIFY
HANDWRITING AS TO AUTHORSHIP OR ORIGIN?”

VS.

“CAN DOCUMENT EXAMINERS ACCURATELY
DETERMINE THE TRUE WRITER OF A FORGED
SIGNATURE FROM THE FEW LETTERS INVOLVED?”

VS.

“CAN DOCUMENT EXAMINERS ACCURATELY
DETERMINE THE TRUE WRITER OF A FORGED
SIGNATURE FROM THE FEW LETTERS IN THE
SIGNATURE IN THIS CASE UNDER THE
CIRCUMSTANCES INVOLVED IN THIS CASE?”

- What is the case specific target issue to which the expertise is directed?
- What is the case-specific claim of expertise?
- What available information bears on a rational belief warrant in regard to the reliability of this specific claim of expertise?
- What is the appropriate standard of certainty for such a belief warrant given the kind of case, the issue involved, the distribution of the burdens of production and persuasion in the case, and the standard of proof involved in regard to the issue upon which the expertise is proffered?

HAVE TESTS SHOWN THE
RELIABILITY OF THE
EXPERTISE IN REGARD TO
THE PARTICULAR TASK
BEING PERFORMED IN THE
CASE BEFORE THE
COURT?

HAVE PROCEDURES BEEN
ADOPTED TO SCREEN OUT
SUGGESTION AND
EXPECTATION?

(Blind Testing and Line-ups)

IF NOT, THE RESULTS
WOULD NOT SEEM TO BE
THE PRODUCT OF
“RELIABLE METHODS”
RELIABLY APPLIED, AS
REQUIRED BY *KUMHO TIRE*
AND NEW RULE 702

FRE 702 TESTIMONY BY EXPERTS

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if

(1) the testimony is based upon sufficient facts or data,

2) the testimony is the product of reliable principles and methods, and

(3) the witness has applied the principles and methods reliably to the facts of the case.

- What is the case specific target issue to which the expertise is directed?
- What is the case-specific claim of expertise?
- What available information bears on a rational belief warrant in regard to the reliability of this specific claim of expertise?
- What is the appropriate standard of certainty for such a belief warrant given the kind of case, the issue involved, the distribution of the burdens of production and persuasion in the case, and the standard of proof involved in regard to the issue upon which the expertise is proffered?

LOWER STANDARD OF
RELIABILITY FOR
PROSECUTION-
PROFFERED EXPERTISE
THAN FOR OTHER
EXPERTISE?

Land Valuation
Expert
(appraiser)

LOWER STANDARD OF
RELIABILITY FOR
PROSECUTION-
PROFFERED EXPERTISE
THAN FOR OTHER
EXPERTISE?

Science is ...

- An enterprise committed to cognitive rationality by ideology
- Not timebound in its search for answers
- Not (directly) concerned with normative questions beyond cognitive rationality

Science is also

- an enterprise whose individual practitioners may depart substantially from the ideal.
- a social enterprise dependent a complex web of checks and balances for its success over time.

Fundamental Characteristics

- Formal Data
- Reliable Taxonomy
- Generalizations asserting regularities, based on data
- Testing of predictions from generalizations by reference to formal data.

- No Formal Data
- No Testing of Claims
- No Science

Consider fingerprint
identification

(And other forensic identification
specialties)

Additional Considerations:

- Masking (blinding)
- The astrology test

So emphasizing the demarcation between science and non-science too early in analysis may interfere in analyzing expertise in general, and in organizing our approach to the right questions to ask

But some answer to the demarcation problem is necessary to make proper judgments about why to believe a claim of expertise

So the boundary between science and non-science is both irrelevant (to some issues regarding expertise) and centrally relevant (to proper evaluations of belief warrants)

Determining task-specific error rates for forensic science processes is very important.

But if I personally could choose only one reform to undertake, it would not be to do research to tie down task specific error rates under test conditions, it would be to establish appropriate blind testing in actual practice.

Risinger, Saks, Thompson and
Rosenthal,
*Observer Effects in Forensic
Science: Hidden Problems of
Expectation and Suggestion,*
90 Cal. L. Rev. 1
(2002)

Any Information not necessary
to the exercise of one's
expertise will distort results

And the more that information engages emotions and desires, the stronger the distortion will be.

This is one of the best established and supported general propositions of modern cognitive psychology, and has given rise to a great improvement in the methodology of research and application in much of science.

Any process using a human as a perceptor, rater, or interpreter should be “as blind as possible for as long as possible”

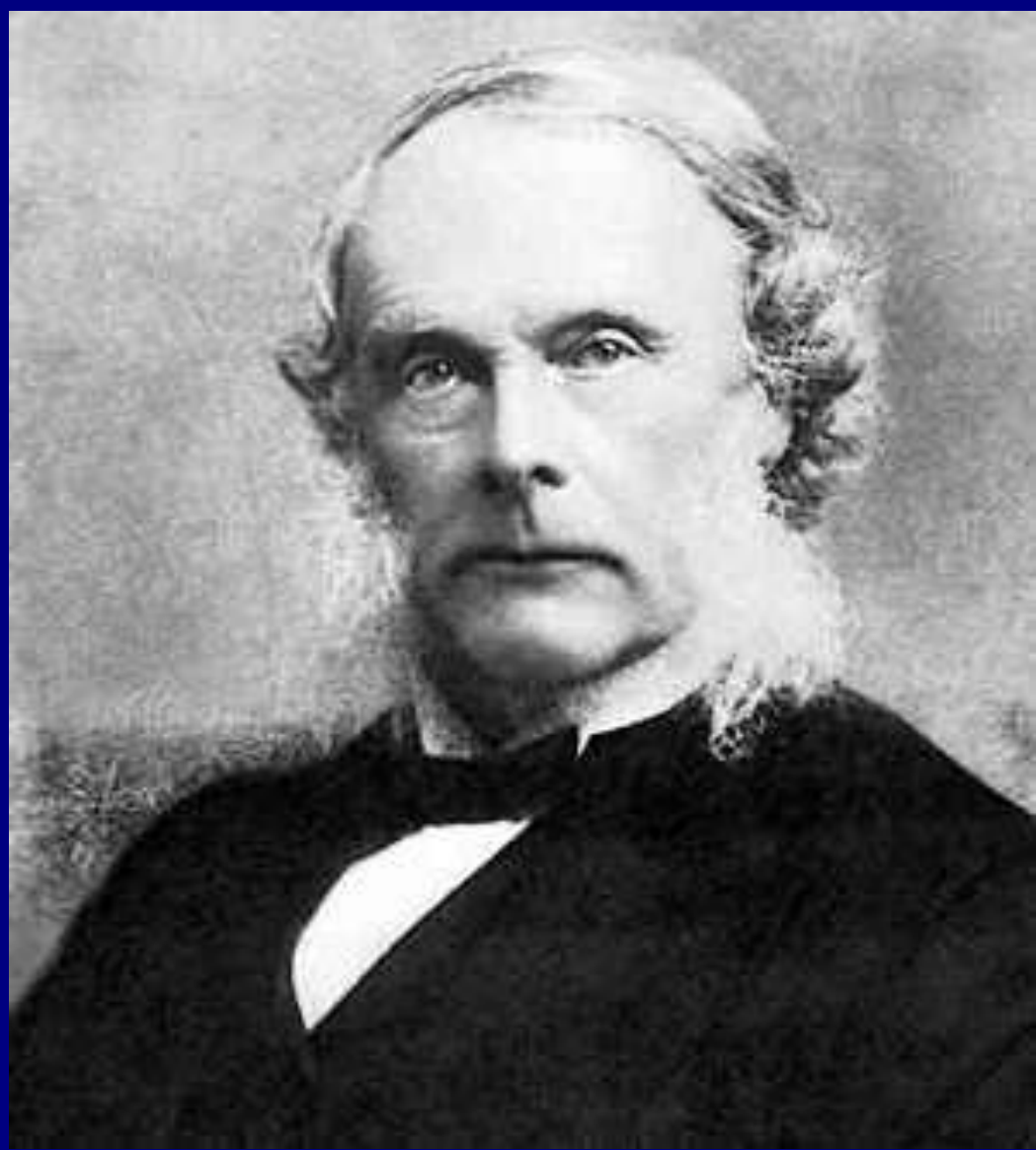
--Robert Rosenthal

No area of forensic science can fulfill this fundamental responsibility without a formal consideration of what constitutes domain-relevant and domain-irrelevant information.

To date, no area has instituted
such a study.

Why?

Think of the response of surgeons in the 1870's to Joseph Lister's message about the need to control microbial infection during surgery.



The usual response by forensic practitioners is that their good faith and their training make them able to resist such distortions.

Thus the data and principles
that have been shown
universally applicable in every
context in which they have been
tested don't apply to them.

Are Forensic Specialists
immune?

Consider the case of Brandon
Mayfield.



Fingerprints: Brandon Mayfield

Merely Anecdotal?

How about this:

Bias Among Forensic Document Examiners: A Need for Procedural Change

Larry S. Miller

12 J. Police Sci. and Admin
407



1984

12 document examiners were divided into two groups of six.

Each group was given materials from a check forgery case in which ground truth was known by reference to other evidence.

One group was given the “request” writing of only one person, which resembled the writing on the check pictorially.

They were further told that there were two witness who had watched the checks signed, and identified that suspect

The second group was given the same request writing, plus request writing from two other persons, and told nothing else.

All six of the examiners in group 2 eliminated all three suspects as the writer of the checks.

Four examiners in group 1 concluded that the “suspect” had written the questioned signatures on the checks.

The fifth examiner reported an “inconclusive” but said that the request exemplars bore indications of disguise

Procedural Bias in Forensic Examinations of Human Hair

Larry S. Miller

11 Law and Human Behavior

157

(1987)

56 hair identification tests were prepared.

Half the tests reflected the usual practice of presenting a known hair from a “suspect” and a single “questioned” hair from the crime scene, and asking if the two “matched”.
(a “show-up”)

The other half of the tests presented five “known” hairs from “suspects” to be compared to the “questioned” hair from the crime scene, and asked if the hair from the scene matched any of the suspects.
(a “line-up”)

In every test, the “crime scene” hair did not come from any of the “suspects,” though the hairs of all the “suspects” were selected to present characteristics not obviously dissimilar to the crime scene hair.

14 qualified examiners were given four tests each, two from each set of test designs

Erroneous declarations of “match” were found in 3.8% of the responses to the “line-up” condition, but in 30.4% of the responses to the “show-up” condition.

Still not convinced?

Visual hair comparison already known to be too unreliable to draw any general conclusion based on studying it?

Consider the Dror et al Study
(2006 Forensic Sci. Int. 74-78)

Five experienced fingerprint examiners were asked by a colleague to evaluate the Mayfield prints after it was known that the FBI had misidentified them

In reality, they were given prints
they themselves had found to
match in actual cases

Itiel Dror et al.

5 yrs earlier	Now
Positive Ident	?
Positive Ident	?
Positive Ident	?
Positive Ident	?
Positive Ident	?

Four of the five came now came
to a different result.

One now said that the latent
was too small and smudged to
reach a conclusion

Itiel Dror et al.

5 yrs earlier	Now
Positive Ident	too smudged to call
Positive Ident	?
Positive Ident	?
Positive Ident	?
Positive Ident	?

And three now concluded that
the latent didn't match the
known, (when they had come to
the opposite conclusion in the
real case)

Itiel Dror et al.

5 yrs earlier	Now
Positive Ident	too smudged to call
Positive Ident	exclusion
Positive Ident	?
Positive Ident	?
Positive Ident	?

Itiel Dror et al.

5 yrs earlier	Now
Positive Ident	too smudged to call
Positive Ident	exclusion
Positive Ident	exclusion
Positive Ident	?
Positive Ident	?

Itiel Dror et al.

5 yrs earlier	Now
Positive Ident	too smudged to call
Positive Ident	exclusion
Positive Ident	exclusion
Positive Ident	exclusion
Positive Ident	?

Itiel Dror et al.

5 yrs earlier	Now
Positive Ident	too smudged to call
Positive Ident	exclusion
Positive Ident	exclusion
Positive Ident	exclusion
Positive Ident	Positive Ident

Think the n is too small?

Think the malleator is too unusual?

How about a replication using more normal context cueing.

Itiel Dror & David Charlton,
Why Experts Make Errors

56 J. Forensic Identification

600

(2006)

6 experienced fingerprint examiners were given eight sets of two prints each by their supervisor.

All of the print pairs given each examiner were from previous cases where that examiner had declared that there was a sufficient basis to declare a match (four each) or an exclusion (four each)

In addition, each of these cases had been rated as to difficulty by the examiner when originally performing the comparison.

In four of the test cases presented (two of previous “match” [one hard, one easy] and two of previous “exclusion,” [one hard, one easy], no context information was provided, merely a request for comparison

In the other four cases (similarly distributed), not uncommon context information was given (“suspect has confessed, etc”).

The test thus resulted in 48
decisions (6 examiners X 8
comparisons each)

Of those 48 decisions, 6 were inconsistent with the previously rendered decision in the actual case. (12.5%)

Two of the six examiners gave results completely consistent with their previous decisions.
The other four did not.

Three of the four remaining examiners changed one decision each, and the other examiner changed three.

Four of the changes were in tests where context information was supplied, and two were in cases where no context information was supplied

Five of the switches were in cases rated as difficult, but the one switch in an easy case (from match to exclusion) was in a case containing context information suggesting exclusion.

Things are complicated by the fact that even domain-relevant information can have a deleterious biasing effect.

For instance, seeing a known specimen before the questioned specimen is characterized can distort the characterization of the questioned specimen to fit the known

See Dror, *Biased Brains*, 116
Police Review 20 (2008)

The best solution:
Sequential Unmasking

(See Risinger et. al; Krane et al.
Krane et al.; Krane et al.;
Thompson et. al.)

Sequential Unmasking allows the complete filtering of domain-irrelevant biasing information and allows domain-relevant information to be presented in its least biasing order.

Just like in physics!

(see Donald Koetke
Senior Research Professor of
Particle Physics, Valparaiso
University,

“A Blind Analysis”

slide show available at

www.physics.valpo.edu/faculty/dkoetke/presentations/Blind_Analysis_1.ppt

A Blind Analysis

You are *not* allowed to peek!

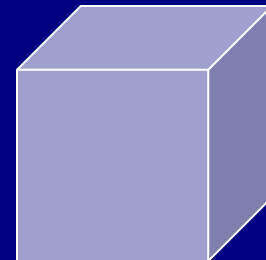
Prof. Donald Koetke

Senior Research Professor of Physics

Valparaiso University

Outline

1. What is a “blind analysis”?
 - What is a “bias”?
 - Does “bias” = “systematic error”?
 - What is the *special* (subtle) bias?
2. What is the history of the blind analysis”?
3. What are examples of “blind analysis” in physics, astronomy, astrophysics, and, ... ?
4. Some thoughts and reflections --



Christopher T. Robertson,

Blind Expertise

85 N.Y.U. L. Rev. 174 (2010)

Why the NAS Report's "wait for
more research" approach is
wrong:

There's already plenty
of research.

That's what this presentation
has been about. There's
already plenty of research both
generally
and specific to forensic science.

Are there alternatives? There may be various approaches to structuring examinations, and other debiasing techniques, that give some protection

But these are always second best and supplemental to masking protocols to filter the biasing information in the first instance.

So again, as for awaiting more
research

You don't have to measure the rate of rainfall to know you should use an umbrella, especially if you want to be sure not to get wet at all.