



Admissibility of Forensic Science

Hon. Dineen Ann Riviezzo

On the Docket

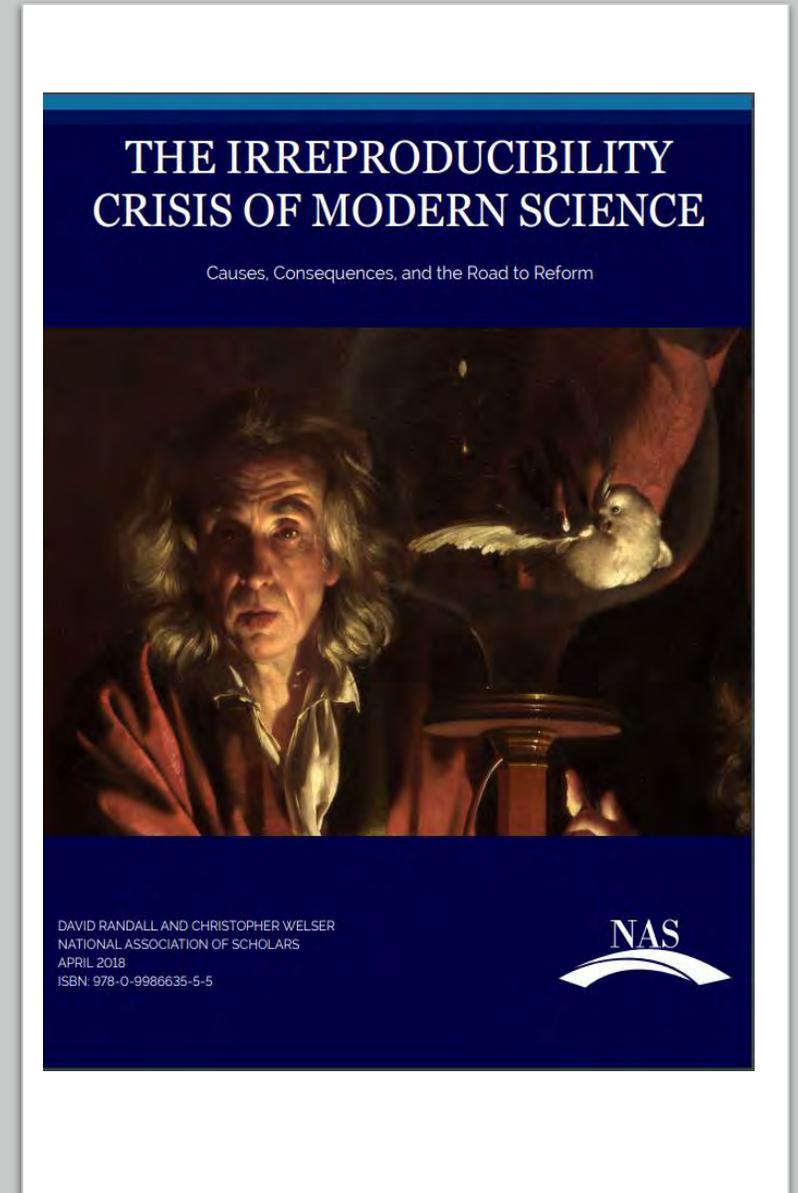
- Which “forensic scientific techniques” have been debunked?
- Which “forensic scientific techniques” are being seriously questioned?
- What’s a judge to do about it?

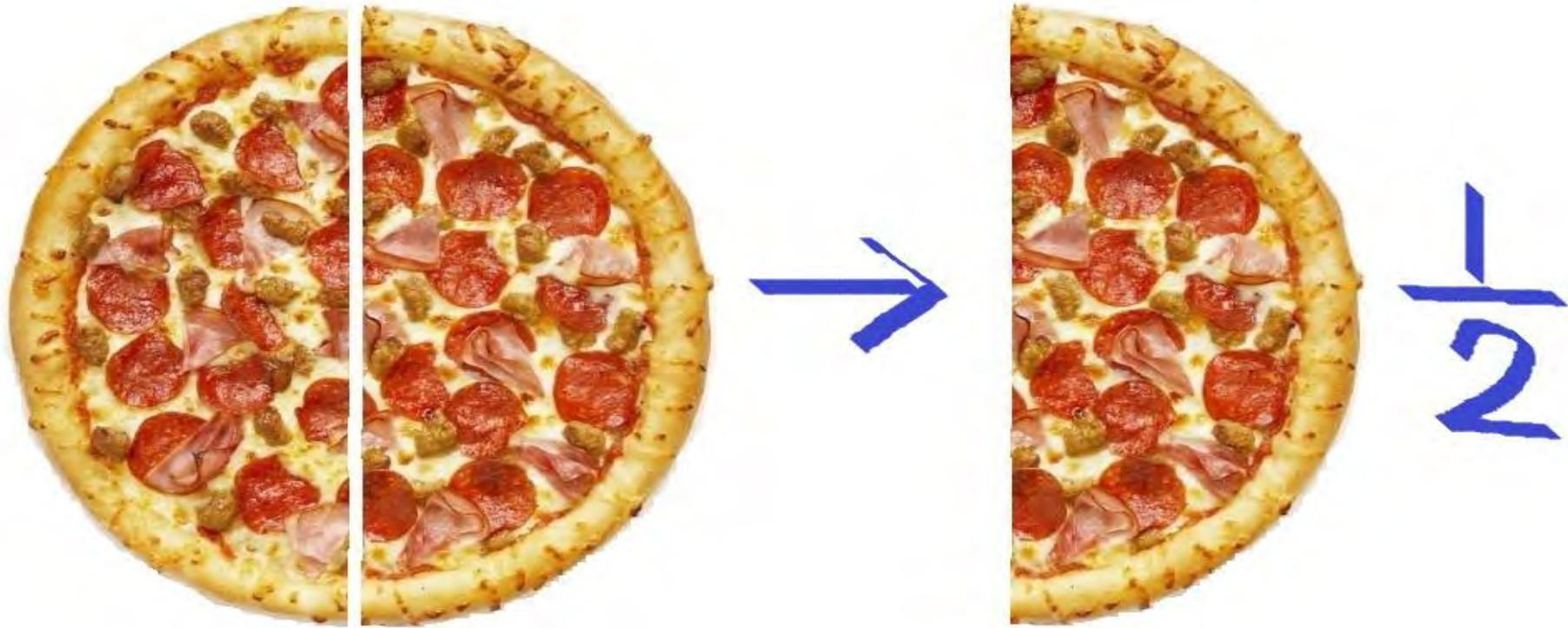


If The Experts Don't Know, How Can We?

The Heart of Science

- Replicability - whether an experiment's results can be obtained in an independent study, by a different investigator with different data.
- Reproducibility - whether different investigators can use the same data, methods, and/or computer code to come up with the same conclusion.

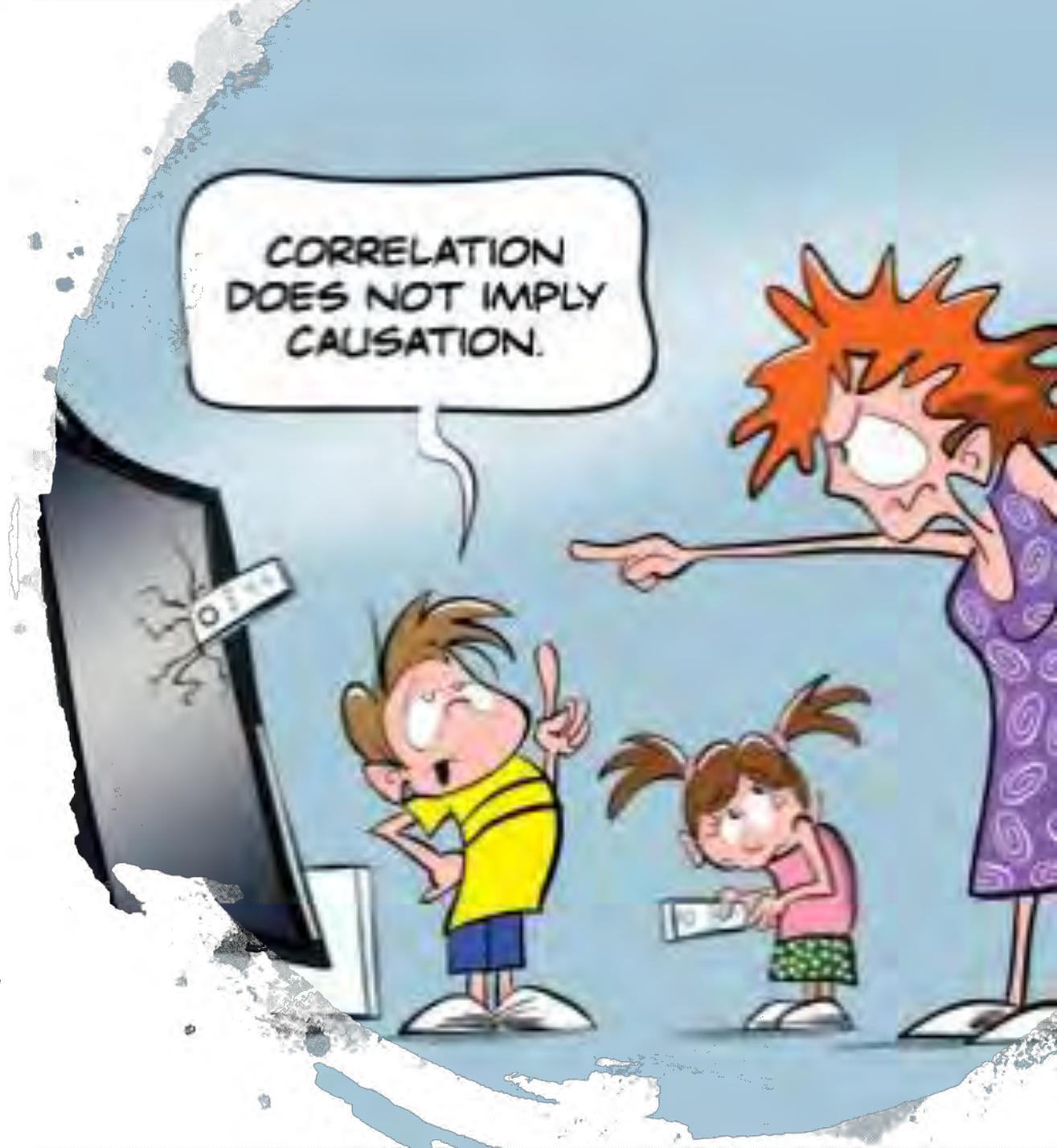




“Half the results published in peer-reviewed scientific journals are probably wrong”

What's the Cause?

- The use of small sample sizes
- Reliance on small numbers of studies
- Prevalence of fishing expeditions to generate new hypotheses for explore unlikely expeditions
- Flexibility in research design
- Intellectual prejudices and conflicts of interest;
- Competition among researchers to produce positive results, especially in fashionable areas of research





Ok, Riviezzo,
why does this
matter?

I'm glad you asked

Let me give you a
concrete example



AMERICAN
COLLEGE *of*
CARDIOLOGY



August 14, 2017: Men and women who engage in light-to-moderate alcohol consumption have a decreased risk of mortality from all-causes and cardiovascular disease

BUT THEN



Harvard Health Publishing
HARVARD MEDICAL SCHOOL

Trusted advice for a healthier life

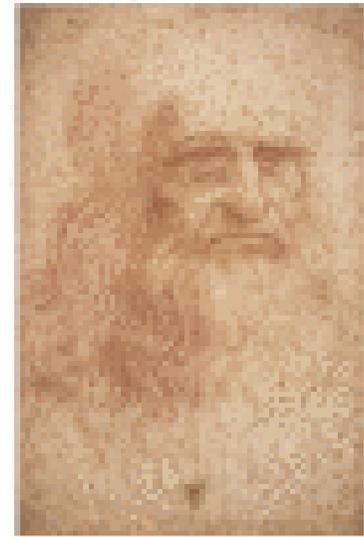
February 19, 2018: The evidence that drinking red wine in particular (or alcohol in general, for that matter) can help you avoid heart disease is pretty weak

AND THEN SIX MONTHS LATER

- Alcohol use is a leading risk factor for global disease burden and causes substantial health loss.
- The risk of all-cause mortality, and of cancers specifically, rises with increasing levels of consumption,
- The level of consumption that minimizes health loss is zero.

August 23, 2018

THE LANCET



ALCOHOL **ALCOHOL** **ALCOHOL** **ALCOHOL** **ALCOHOL**

ALCOHOL USE AND RISK OF ALL-CAUSE MORTALITY AND CANCERS: A SYSTEMATIC REVIEW AND META-ANALYSIS

ALCOHOL USE AND RISK OF ALL-CAUSE MORTALITY AND CANCERS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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THE LANCET



Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

One 5 ounce serving per day



An infant drinks more



STRENGTHENING
**FORENSIC
SCIENCE**
IN THE UNITED STATES

A PATH FORWARD

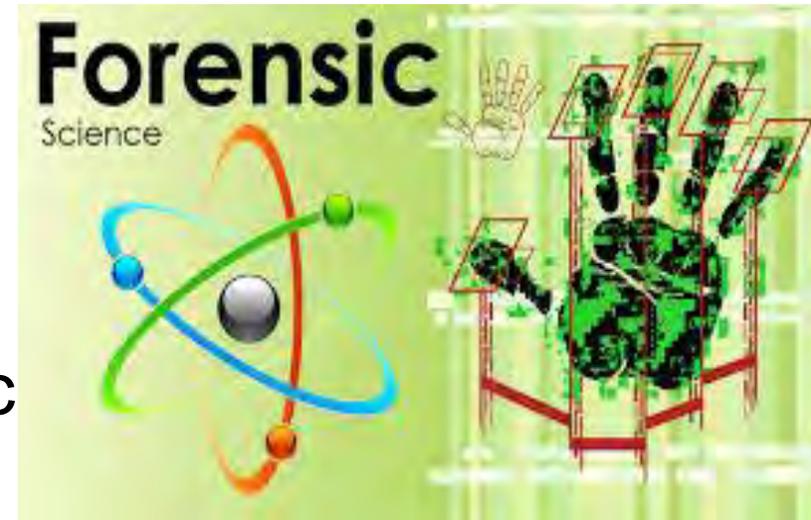
NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

National Academy of Science

- A private, nonprofit society of scholars engaged in scientific and engineering research
- Since 1863, mandated by Congressional Charter to advise the federal government on scientific and technical matters.

In 2009 NAS examined 16 forensic techniques

- “With the exception of nuclear DNA analysis . . . no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source”
- “The simple reality is that the interpretation of forensic evidence is not always based on scientific studies to determine its validity. This is a serious problem. Although research has been done in some disciplines, there is a notable dearth of peer-reviewed, published studies establishing the scientific bases and validity of many forensic methods.”



Results **ROCKED** science and legal communities





REPORT TO THE PRESIDENT
Forensic Science in Criminal Courts:
Ensuring Scientific Validity
of Feature-Comparison Methods

Executive Office of the President
President's Council of Advisors on
Science and Technology

September 2016



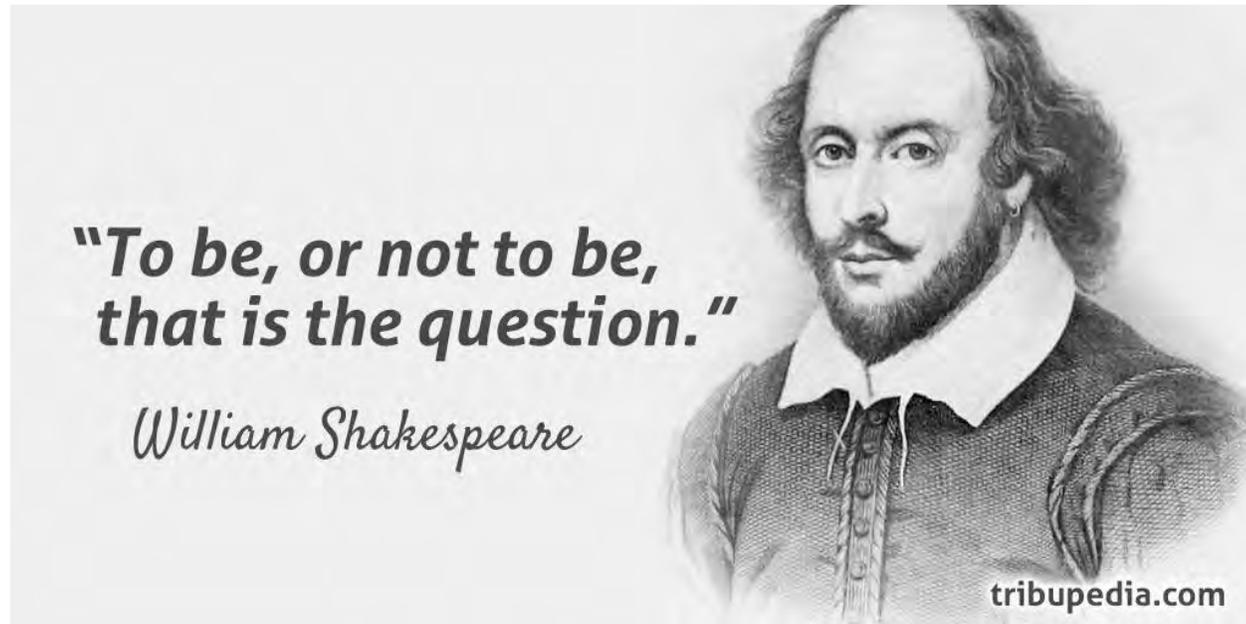
POTUS advisory group of Nation's leading scientists & engineers in consultation with federal judges.

Multi-year study: reviewed > 2000 papers i.e. peer-reviewed journals; solicited specific submissions from the forensic-science community; consulted with FBI, prosecutors, defense bar, labs, criminal justice advocates & other stakeholders.

Scientific Validity of Six Feature Comparison Methods

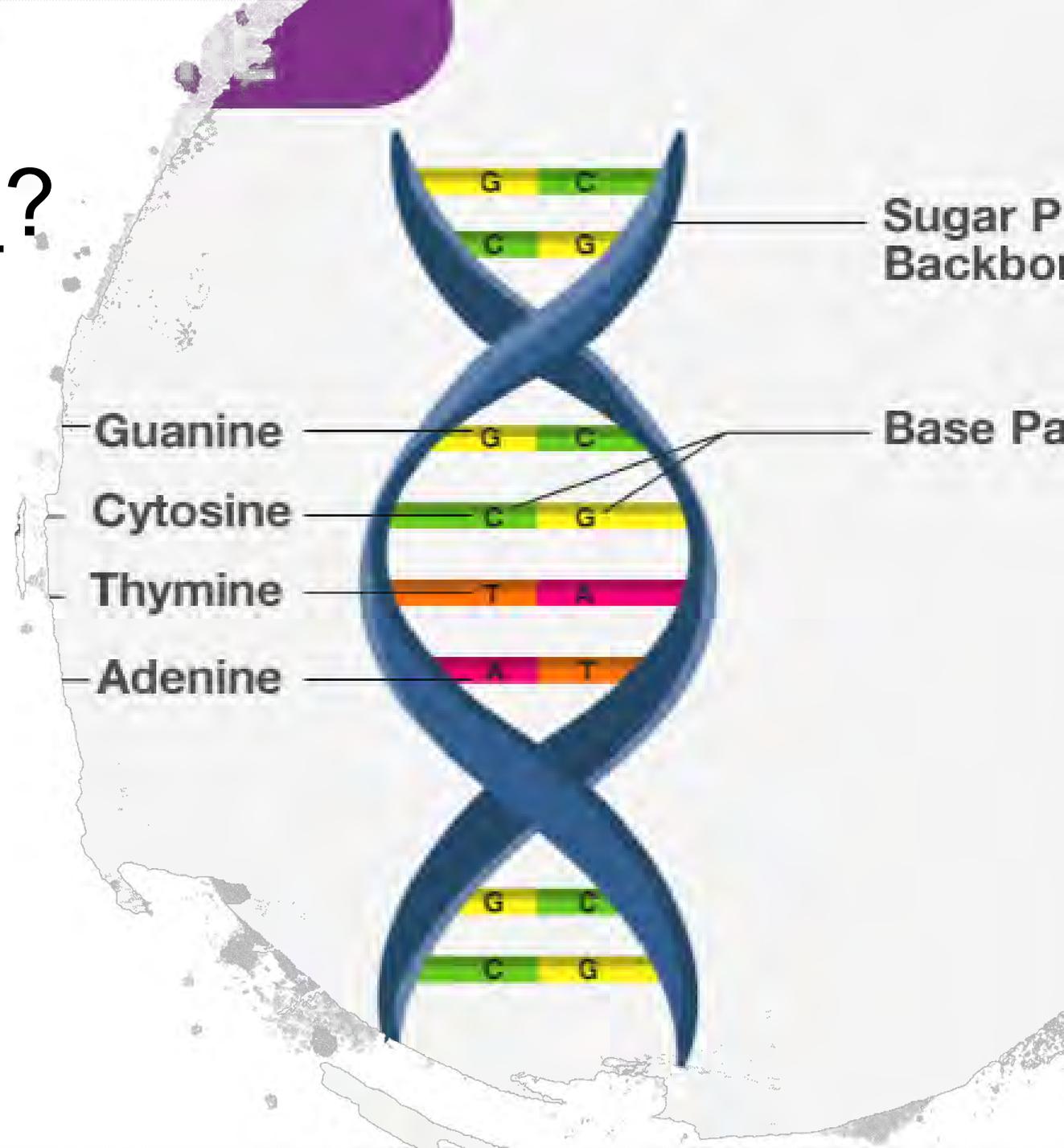
- Foundational Validity (FV) – requires that it be shown, based on empirical studies, that the forensic-science method is repeatable, reproducible and accurate.
- Validity As Applied – method has been reliably applied in practice by a capable expert to the facts of the case.

To Paraphrase Shakespeare . . .
Validity or No Validity, That Is The Question?



Is DNA Analysis Valid?

- Yes
- No
- It depends



DNA Analysis of Single Source and Simple Mixtures (2 individuals)

- **YES**, FV – but improvements needed in proficiency testing

DNA Analysis of Complex-Mixture Samples

- Subjective interpretations of complex DNA mixtures have NOT been established to have FV and are NOT reliable.
- Opines that STRmix and TrueAllele have FV, but only under limited circumstances (3 person mixture in which the minor contributor constitutes at least 20% of the intact DNA mixture and the amount of DNA exceeds minimum method levels).



**Is Hair Analysis
Valid?**

Yes or No

Both committees found no scientific support for the use of hair comparisons

Based largely on 2002 FBI landmark study of 170 samples re-tested with DNA analysis. 1 in 9 hairs came from different sources. 11% error rate.

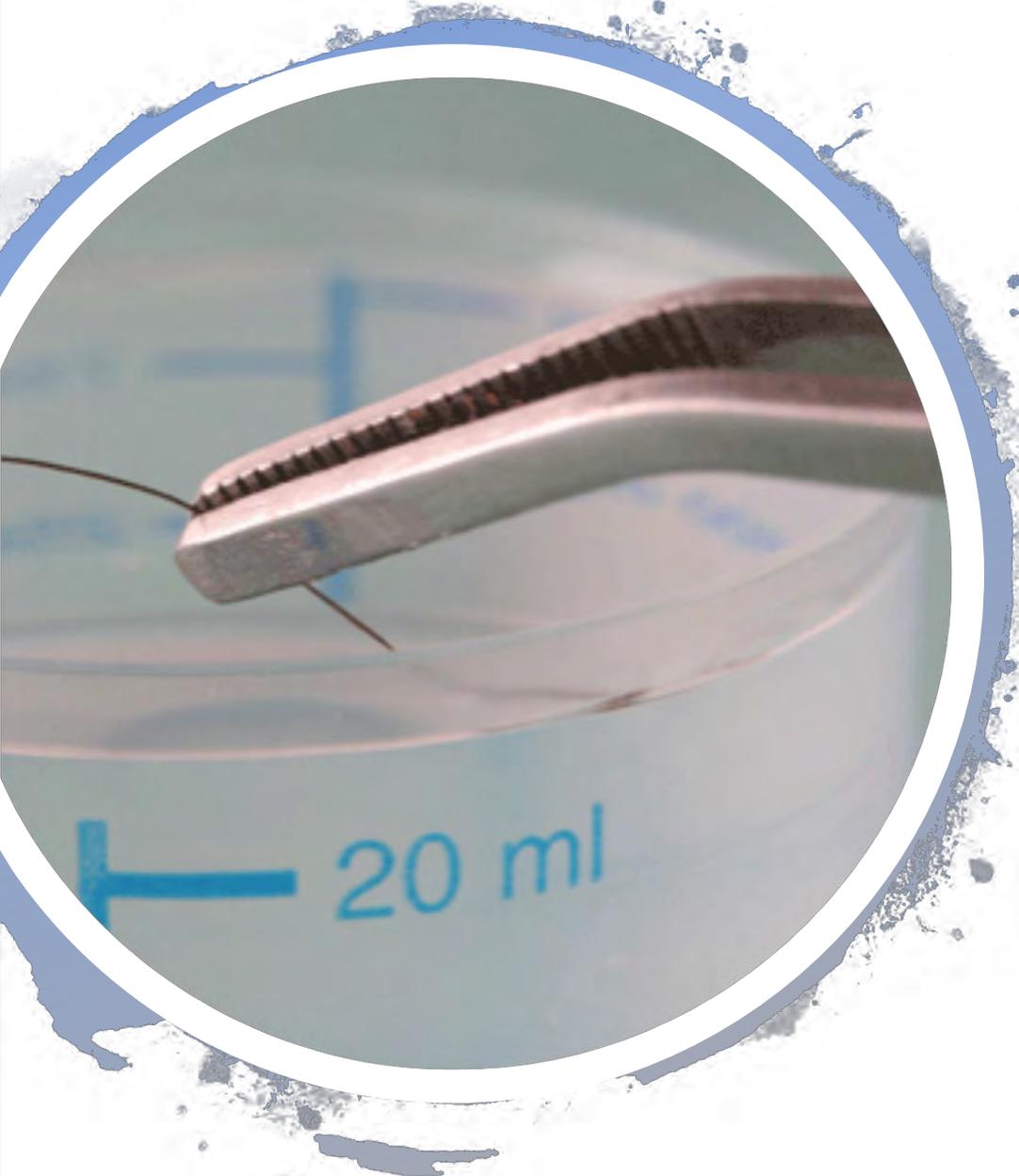
Hair Analysis



And more recently, FBI found 90% error rate in Hair Analysis

April 20, 2015

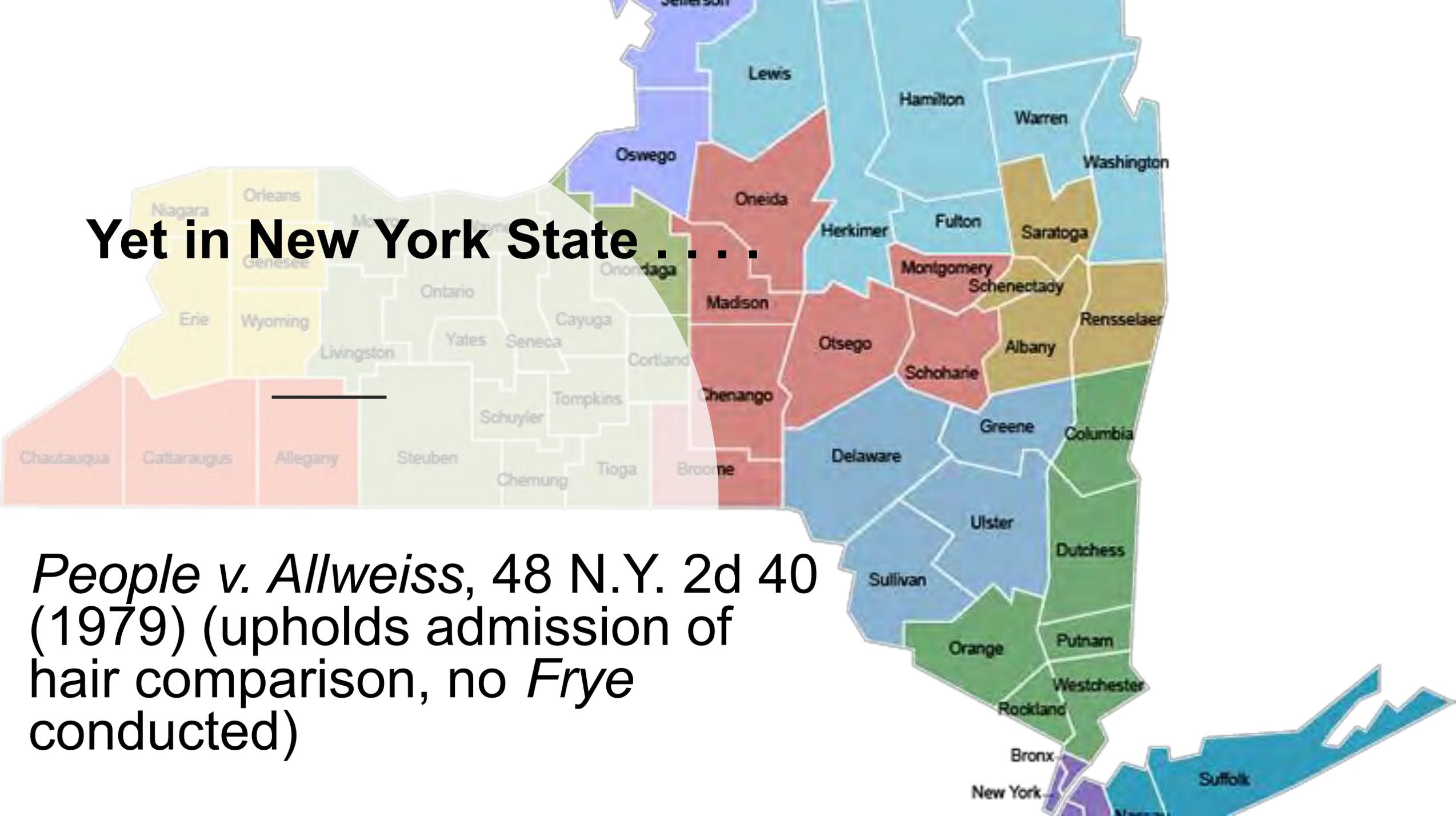
- DOJ, FBI, the Innocence Project, and the NACDL reported that the FBI had concluded that FBI examiners' testimony in at least 90% of trial transcripts analyzed as part of its Microscopic Hair Comparison Analysis Review contained erroneous statements.
- 26 of 28 FBI analysts provided either trial testimony or submitted laboratory reports with erroneous statements.
- The review focuses on cases worked prior to 2000, when mitochondrial DNA testing on hair became routine at the FBI.



- FBI reviewed 500 of nearly 3,000 cases involving microscopic hair analysis.
- In the 268 cases where examiners provided trial testimony, erroneous statements were made in 257 (96%).
- In at least 35 of those cases, Ds received the death penalty and errors were identified in 33 (94%) of those cases. 9 D were already executed and 5 died of other causes while on death row. Capital cases included AZ, CA, FL, IN, MO, OH, OK, PA, TN, and TX.

Yet in New York State

People v. Allweiss, 48 N.Y. 2d 40 (1979) (upholds admission of hair comparison, no *Frye* conducted)





Is fingerprint
comparison
valid?

- Yes
- No
- Maybe

NAS: highly questions even the very assumption that fingerprints are unique along with the validity of the method
ACE-V: Analysis, Comparison, Evaluation, and Verification

PCAST: subjective method that has FV

- however with a substantial false positive rate (in two black box studies as high as 1 in 18 and 1 in 306).
- cautions against confirmation bias, contextual bias and poor proficiency testing in terms of its validity as applied



Is bitemark evidence valid?

- Yes
- No



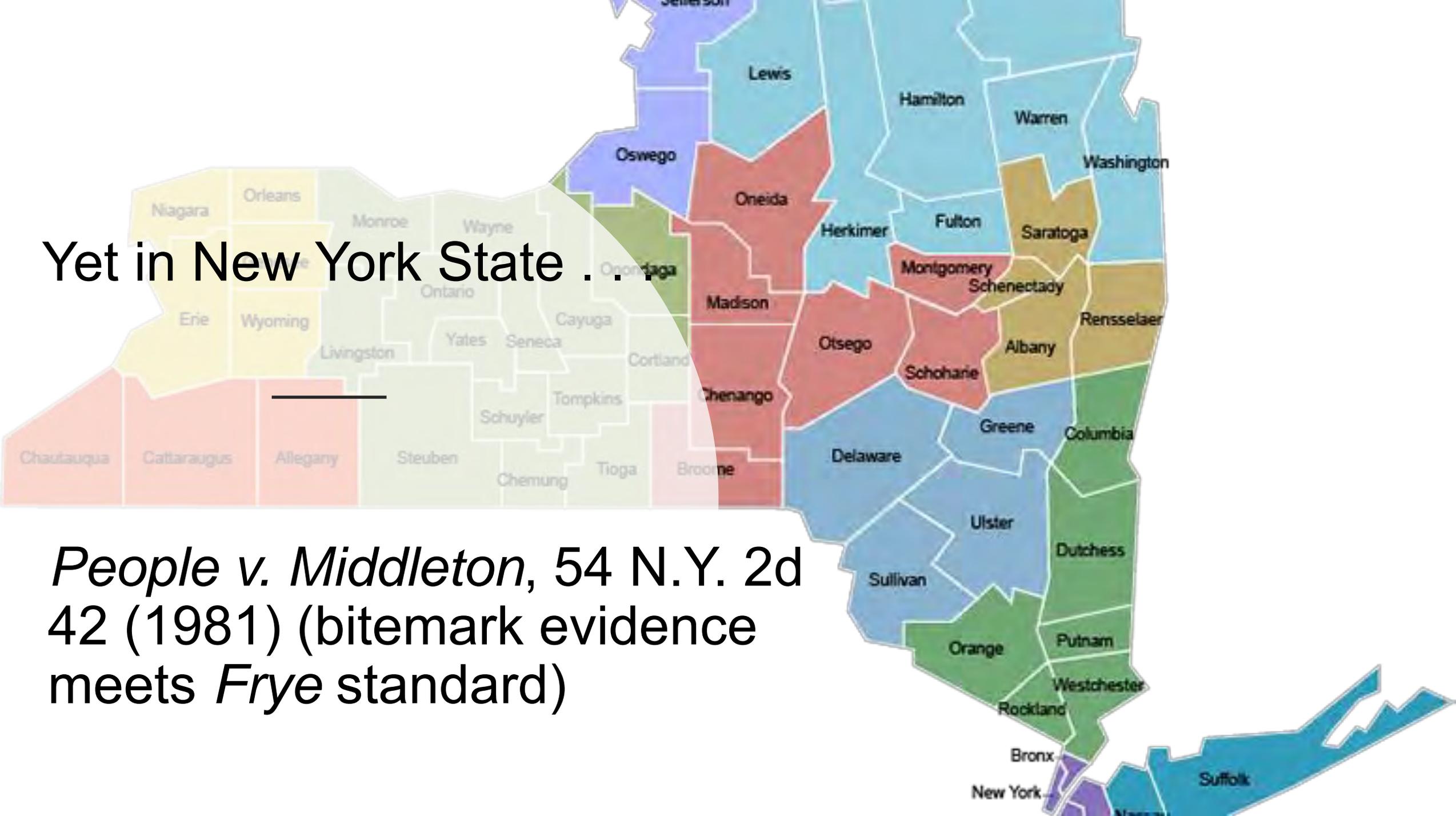
BITEMARK EVIDENCE

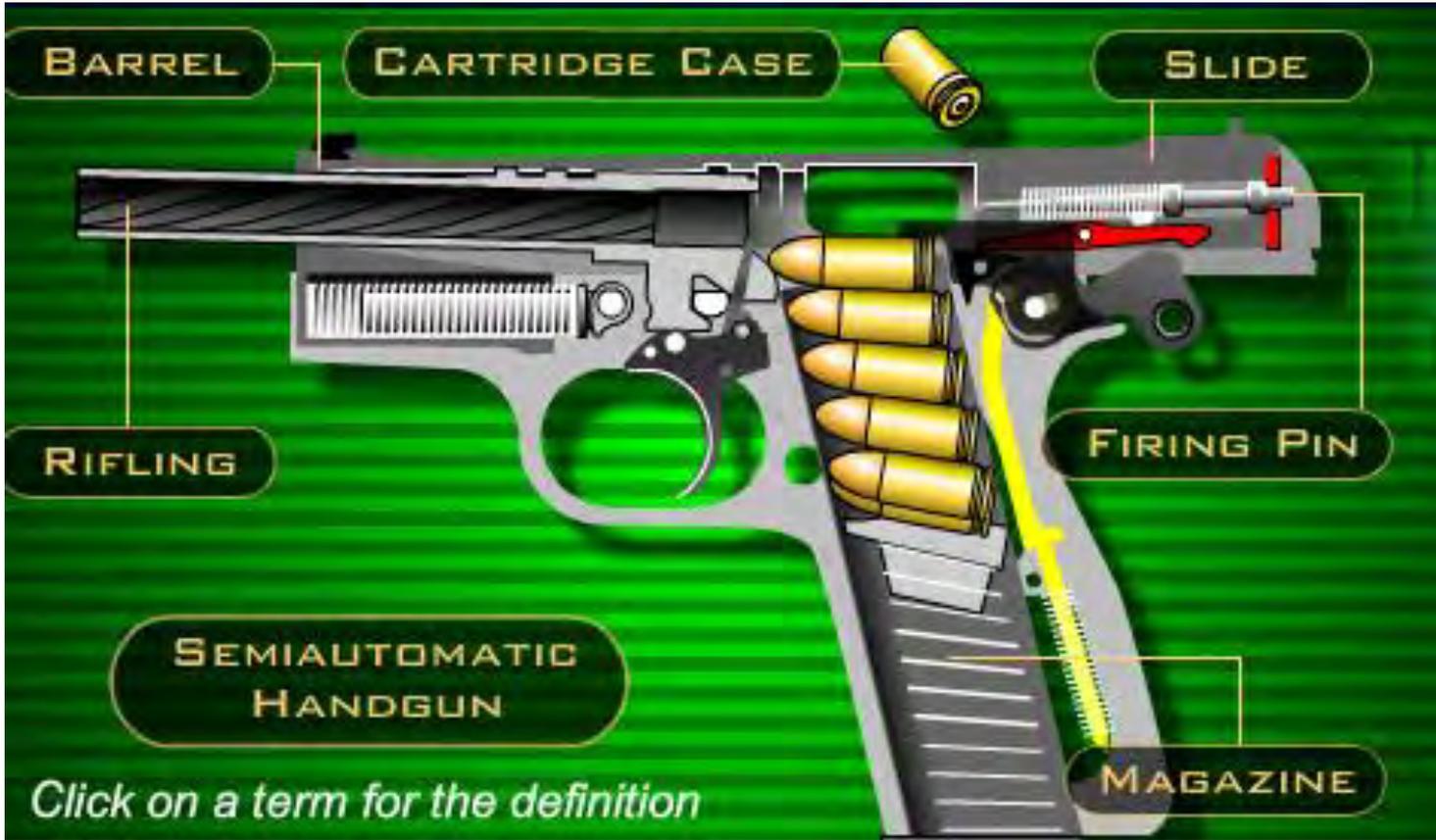
- **NAS**: The committee received no evidence of an existing scientific basis for identifying an individual to the exclusion of all others – bite marks
- **PCAST**– NO FV. Examiners cannot even agree on whether an injury is a bitemark much less its source.



Yet in New York State . . .

People v. Middleton, 54 N.Y. 2d 42 (1981) (bitemark evidence meets *Frye* standard)





Is Firearm Analysis
Valid?

Yes
or
No

Did the ammo come from this gun?



NAS

- There is no consensus regarding the number of individual characteristics needed to make a positive identification
- No data about the variability of individual characteristics or about the validity or reliability of the method
- Since not enough is known about the variabilities among individual tools and guns, we are not able to specify how many points of similarity are necessary for a given level of confidence in the result.
- Sufficient studies have not been done to understand the reliability and repeatability of the methods

Similarly, PCAST

Questions its FV – no comprehensive studies of techniques.

- The only prior study found false positive rate 1 in 46.
- Use in Ct must come with careful scrutiny of examiner's qualifications.





Is footwear or shoeprint
analysis valid?

Yes
or
No

Did the impression come from a specific piece of footwear?

PCAST: No FV – “such associations are unsupported by any meaningful evidence or estimates of their accuracy and thus are not scientifically valid.”

NAS: no consensus regarding the number of individual characteristics needed to make a positive identification, and no data about the variability of class or individual characteristics or about the validity or reliability of the method



Is Handwriting Analysis Valid?

- Yes

- No

Writing Personality Traits

Analytical
Wedged bases
Sorts information

James

Broad minded
Wide e loops
Liberal self

freedom

Concentration
Small writing
Focus on one activity

[*MARCH 19, 2012*]

Cultural refinement
Capital letters mingled
Artistic living

ONCE upon a time

Emotional
Heavy average stroke
Passionate energetic

sensitive

Humor
Wavy upper
Reality contrasts amusing

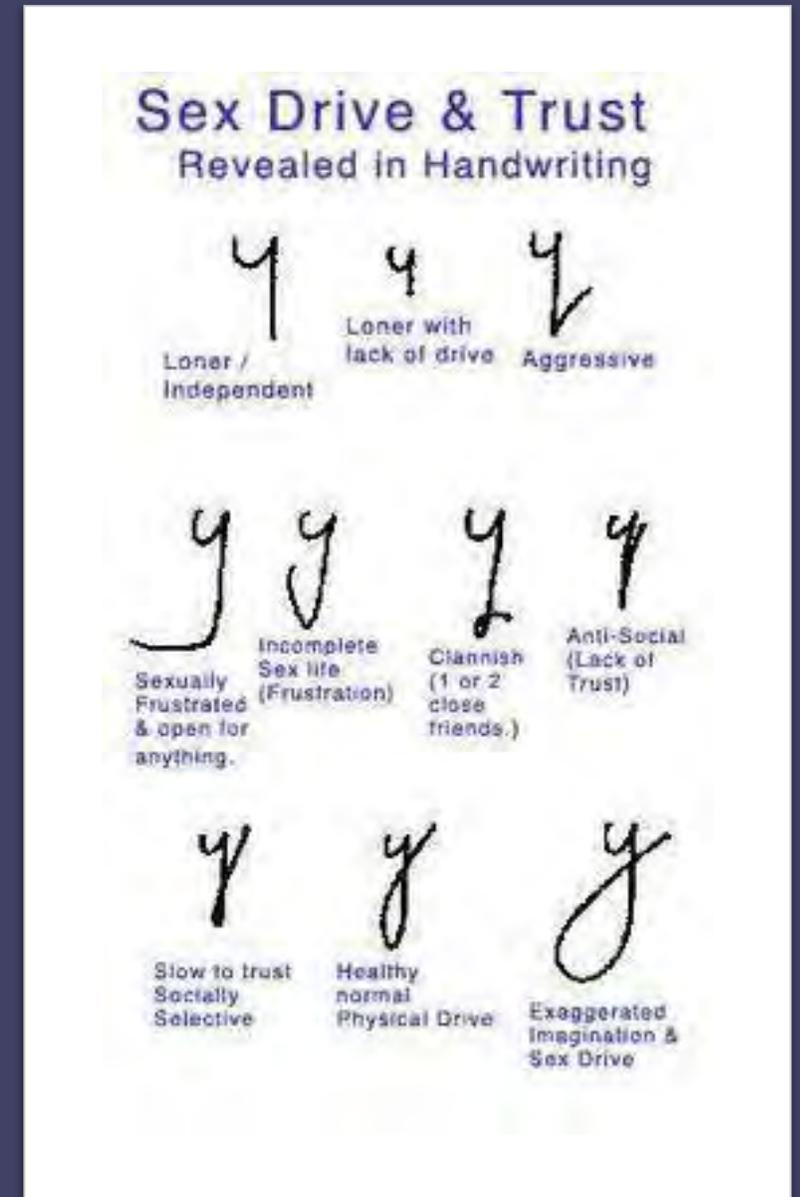
Mississippi

Vanity
Taller t and d stems
High regard for self

tedious

NAS only

- “Although there has been only limited research to quantify the reliability and replicability of the practices used by trained document examiners, the committee agrees that there may be some value in handwriting analysis.”
- The few studies conducted up to 2006 still found error rates from 3.45 to 6.5 %



Blood Spatter Analysis

Yes
or
No



NAS: “in general, the opinions of bloodstain pattern analysts are more subjective than scientific. The uncertainties associated with bloodstain pattern analysis are enormous”

NY TIMES MAGAZINE

(June 3, 2018)

“BLOOD WILL TELL” by Pamela Colloff, describing the conviction of Joe Bryan in Clifton, TX, based almost exclusively on bloodstain-pattern analysis from a non-police “expert,” who only took a 40 hour course.

- No published NYS case indicating that a *Frye* hearing was ever conducted

Other techniques Studied by NAS in 2009



- Fiber evidence and analysis of paints and coatings - based on a solid foundation of chemistry to enable class identification.
- Explosion Analysis - based primarily on well-established chemistry –specifically identifying the type of accelerant used.

Burn patterns & damage characteristics

- “Much more research is needed on variability of burn patterns and damage characteristics and how they are affected by the presence of various accelerants”
- “Despite the paucity of research, some arson investigators continue to make determinations about whether or not a particular fire was set.”
- Many of the rules assumed to indicate use of an accelerant (e.g., “specific char patterns) have been shown not to be true.



NAS Recommendations



Create an independent forensic commission to enhance and improve the reliability of forensic science

National Commission on Forensic Science created in 2013 prosecutors, defense atty's, scientists, judges, academics, forensic laboratories and advocacy groups

Standardization & accreditation of forensic laboratories and medical examiners; training; grants and research; medicolegal death investigation



PCAST's Recommendations to the Judiciary

Federal judges should take into account scientific criteria:

- i. Foundational validity
- ii. Validity as applied

PCAST's Judicial Recommendations

- “When permitting an expert to testify, statements suggesting or implying greater certainty are not scientifically valid and should not be permitted”
- “In particular, courts should never permit scientifically indefensible claims such as: ***zero, vanishingly small, essentially zero, negligible, minimal, or microscopic error rates; 100 percent certainty or proof to a reasonable degree of scientific certainty***; identification *to the exclusion of all other sources*; or a chance of error so remote as to be a “practical impossibility.”



National Commission on Forensic Science

- On March 22, 2016, the Commission recommended the Attorney General ensure that DOJ employees do not use the phrases “to a reasonable degree of scientific certainty” or “to a reasonable degree of [discipline] certainty.”
- On September 6, 2016, the Attorney General instructed DOJ forensic labs not using the expressions “reasonable scientific certainty” or similar terms in their reports or testimony and instructed DOJ prosecutors to abstain from use of these expressions when presenting forensic reports and experts in court unless required by a judge



Three years later, Where are we now?



National Commission on Forensic Science

CONTRACT TERMINATED

By the Attorney General in April 2017.

Read their final report: “Reflecting Back – Looking Toward the Future”, April 11, 2017

<https://www.justice.gov/archives/ncfs/page/file/959356/download>

“Research and Development in Forensic Science for Criminal Justice Purposes” DOJ Grant Applications Due: April 11, 2019

- Refers applicants specifically to 2006 NAS report !!
- DNA and forensic testing; Forensic crime scene analysis; Forensic anthropology and forensic odontology; Bloodstain pattern analysis; Controlled substances; Fire debris analysis and arson scene investigations; Firearms and toolmark identification; Latent print' Shoeprint/tire tread examination; Questioned documents; Trace evidence; Forensic toxicology; Medicolegal death investigations, including forensic pathology
- Fundamental & Basic Reliability; Level of certainty in expert conclusions; Develop “novel” approaches to the use of forensic science in criminal justice

Guess how much
grant money is
expected to be
allocated?

1. 400 million
2. 100 million
3. 24 million



ANSWER

Only 24 million total

With the

Average grant \$340,000



THANK YOU

Hon. Dineen Ann Riviezzo

Kings County Supreme Court

Criminal Term

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