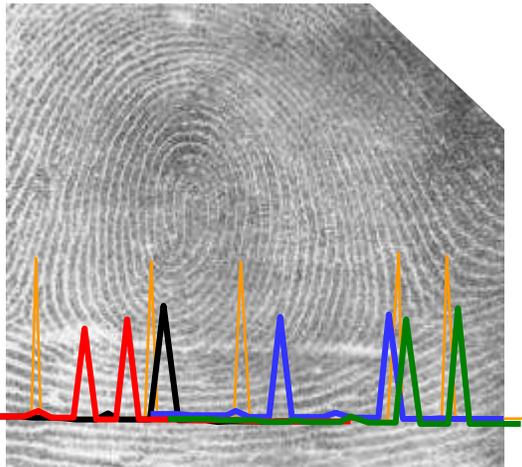


American Academy of Forensic Sciences

February 18, 2017 (New Orleans, LA)



Demolishing Divides: A Discourse on the Dearth of Discipline Differences between DNA and Dactyloscopy



https://en.wikipedia.org/wiki/File:Fingerprint_Whorl.jpg

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

NIST FORENSIC
SCIENCES

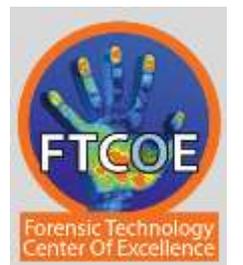
John M. Butler, PhD

NIST

Heidi Eldridge, MS

RTI International

RTI
INTERNATIONAL



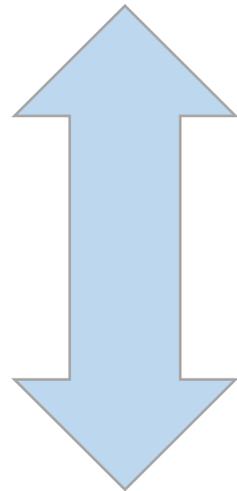
To Better Improve Work in the Present, We Should Try to **Learn from the Past and from Each Other**

AAFS 2016 Last Word Society
LW1: “The Best Forensic Scientist
You’ve Never Heard of: Wilmer
Souder and the Early History of
Forensic Science at the National
Bureau of Standards”



See NIST.gov
story and YouTube video
released recently on
Wilmer Souder and early
history of forensic science

**Forensic Science
in the Past**



**Forensic Science
in the Present**

DNA



**Latent
Prints**

Purpose of this Project and Presentation

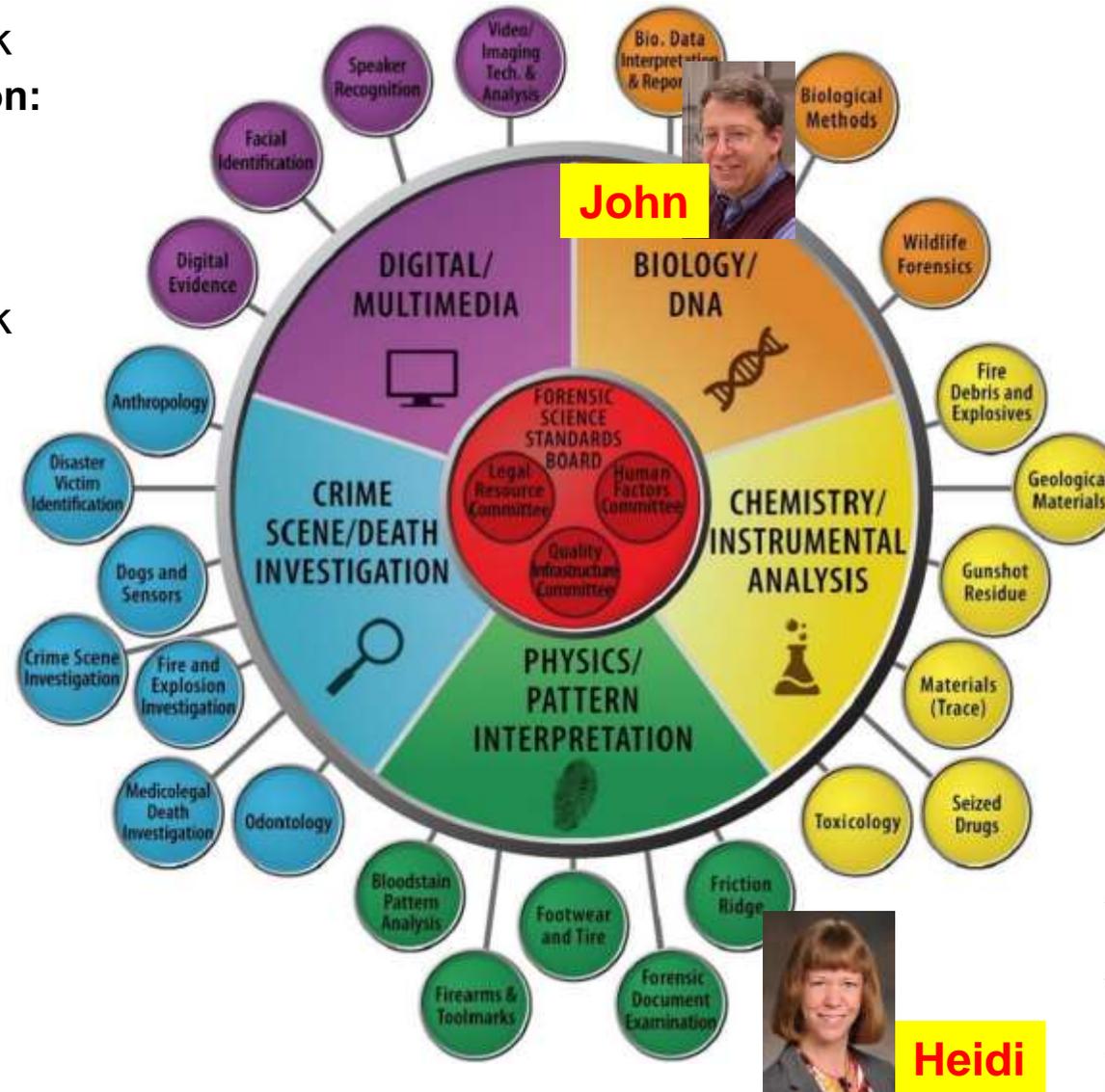
- What OSAC would like to accomplish is to constructively bring together **best practices across disciplines** to strengthen the entire field of forensic science → this will require dialogue across disciplines
- What are **some things we can learn from each other?**
 - Do similar challenges exist in multiple forensic disciplines?
 - Can we harness the approaches and successes that have been tried in different disciplines but may be unknown to each other?
 - Can we go beyond intra-discipline understanding of challenges to inter-discipline appreciation for potential solutions to improve the entire field?
- Major difficulties with this desire are **differences in language and sometimes culture** between disciplines

Beginning a Conversation Across Forensic Disciplines...

AAFS 2014 Jurisprudence Talk E26: “DNA Mixture Interpretation: History, Challenges, Statistical Approaches, and Solutions”

AAFS 2015 Jurisprudence Talk F37: “Why DNA Interpretation Has Become More Challenging in Recent Years”

AAFS 2017 YFSF Talk S2: “The Issues and Challenges with Forensic DNA Analysis”



AAFS 2017 Workshop W1: “Behind the Curtain: Understanding the Basic Science and Testimony of Latent Prints”

AAFS 2016 Workshop W12: “Development of a Reasonable Minimum Documentation Standard for Latent Prints”

AAFS 2014 Jurisprudence Talk E6: “Latent Print Testimony: What Lawyers Should Know to Ask and Examiners Should Know How to Answer”

PCAST Report

Released September 20, 2016

Do you have data to support your claims?

Provides comments on:

5.1 **DNA** (single-source and simple-mixtures)

5.2 Complex **DNA** Mixtures

5.3 Bitemark Analysis

5.4 **Latent Fingerprint** Analysis

5.5 Firearms Analysis

5.6 Footwear Analysis

5.7 Hair Analysis

Provides recommendations to **NIST** and OSTP (§6), FBI Laboratory (§7), Attorney General (§8), and the Judiciary (§9)


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





Bits of Wisdom from Professor Paul L. Kirk

Presented to the California Association of Criminalists and published as “The Ontogeny of Criminalistics” in **June 1963** *Journal of Criminal Law and Criminology* 54(2): 235-238

- “With all of the progress that has been made in this field, ... **progress has been technical rather than fundamental**, practical rather than theoretical, transient rather than permanent. ... In short, **there exists in the field of criminalistics a serious deficiency in basic theory and principles**, as contrasted with the large assortment of effective technical procedures.”
- “The real aim of all forensic science is **to establish individuality, or to approach it as closely as the present state of the science allows.**”



Bits of Wisdom from Professor Paul L. Kirk

Presented to the California Association of Criminalists and published as “The Ontogeny of Criminalistics” in **June 1963** *Journal of Criminal Law and Criminology* 54(2): 235-238

- “Whether licensing, certification, or some other indication attesting a person’s competence is adopted ultimately, **there is at present no method of assuring the quality of practice by any individual** except as the courts qualify him as an expert witness. As every witness knows, this process is not immune to error, nor is it uniform from jurisdiction to jurisdiction, or even from one court to another. **There is great need for serious consideration of this problem, and for application of more uniform criteria of qualification.**”



Bits of Wisdom from Professor Paul L. Kirk

Presented to the California Association of Criminalists and published as “The Ontogeny of Criminalistics” in **June 1963** *Journal of Criminal Law and Criminology* 54(2): 235-238

- “The most important objective of all is still receiving the least attention, viz., the interpretative. ... **Application of theories of probability to evidence interpretation remain inadequate for the need.** Related statistical studies have been limited and unsatisfactory for the most part. Thus, **most “expert testimony” is purely opinion testimony.**”
- *Quite similar to what the PCAST report would emphasize 53 years later: **Do you have data to support your claims?***



Bits of Wisdom from Professor Paul L. Kirk

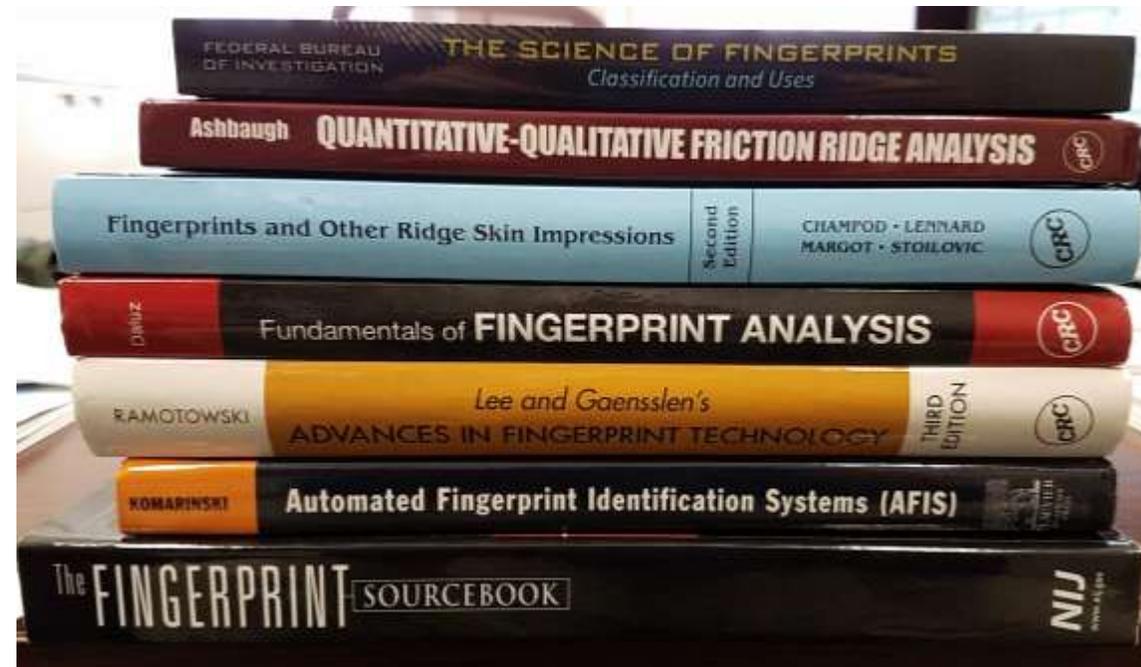
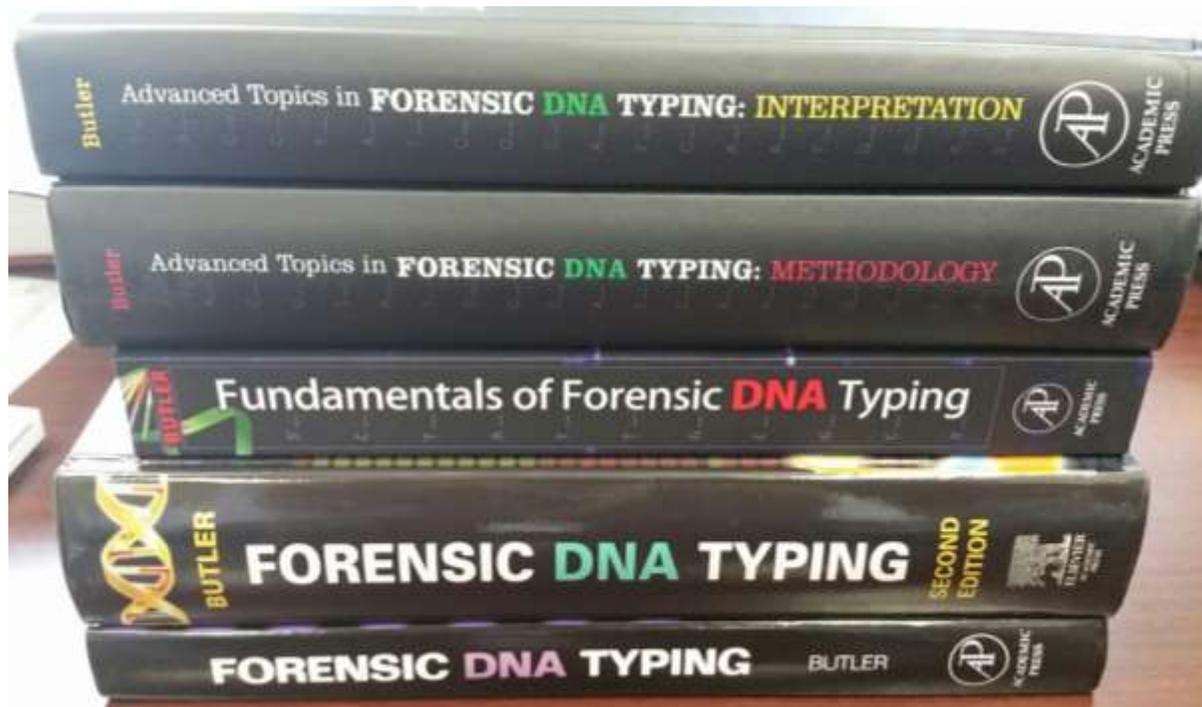
Presented to the California Association of Criminalists and published as “The Ontogeny of Criminalistics” in **June 1963** *Journal of Criminal Law and Criminology* 54(2): 235-238

- “Where is criminalistics, forensic science, or whatever it may be called, going? **Is it not time to make a serious effort to define a goal, so that we may all talk about the same thing and move in similar directions**, in order that the field will command greater respect, and generate more pride in its accomplishments?”

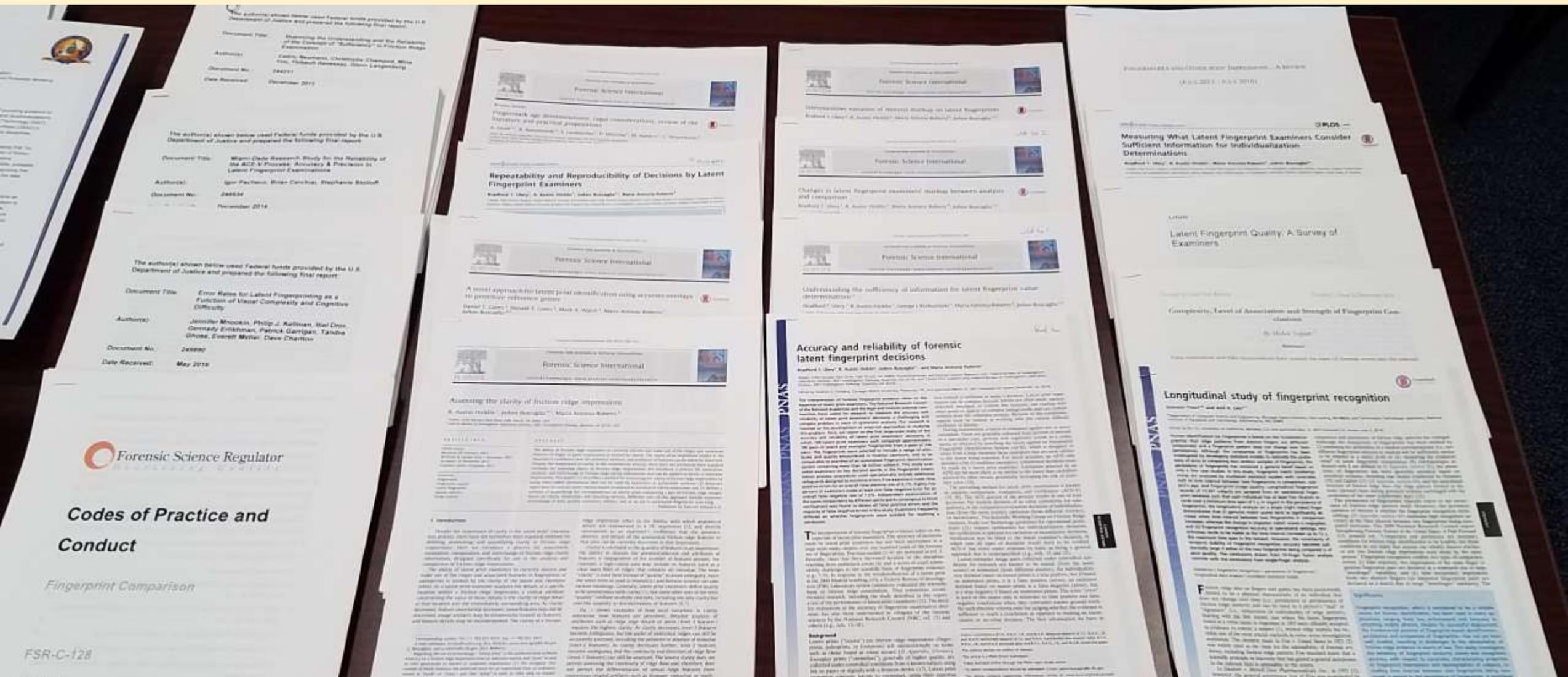
Examination of Written Material on the Subjects

Forensic DNA Analysis

Latent Fingerprint Analysis

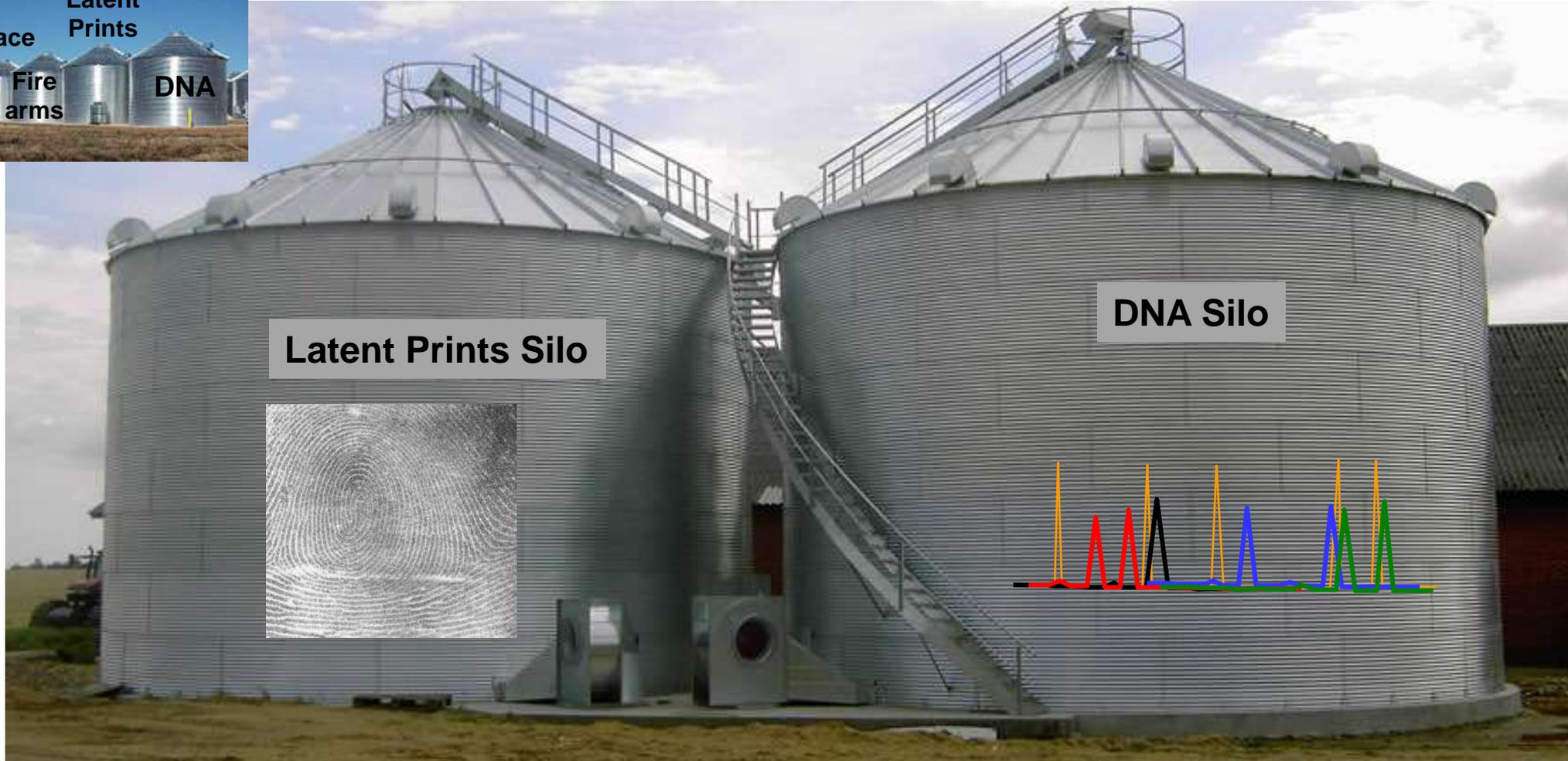


A Growing Literature Covers Fingerprint Analysis...



Recent FBI “black box” and “white box” studies were praised by the PCAST Report

Silos Usually Exist Between Disciplines in Forensic Laboratories



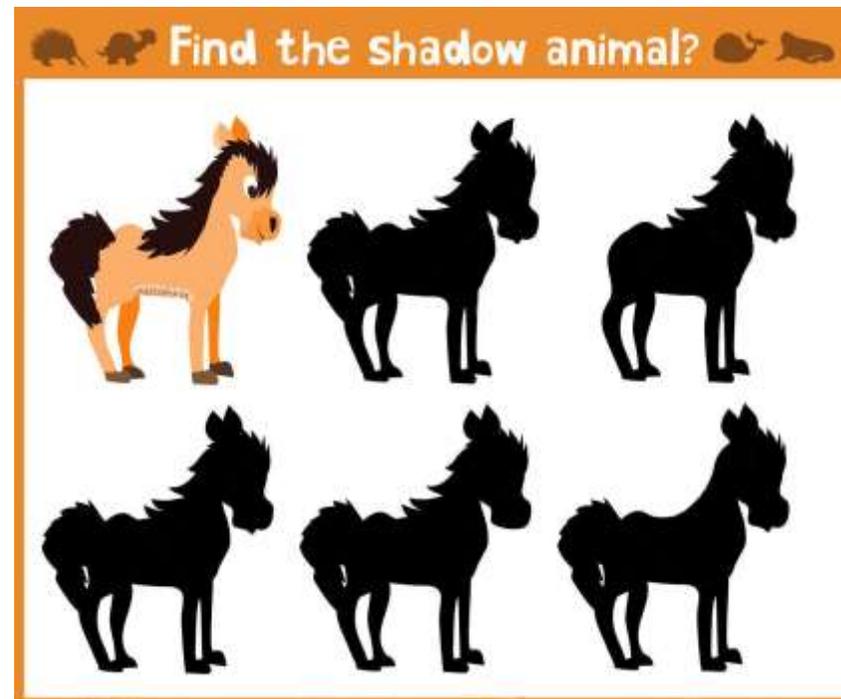
How different are we, really?

- How many disciplines are in your lab?
- How many people talk to someone in another discipline daily?
- How many are jealous of another discipline?
- How many feel like their discipline is the “most scientific”?



How do you reach your conclusions?

- Look at an unknown
- Look at a known
- Look for similarities
- Look for dissimilarities
- Separate signal from noise
- Consider the amount of similarity observed
- Consider the rarity of the data in a relevant population
- Determine if the weight of the evidence is strong enough to report an association or an identification

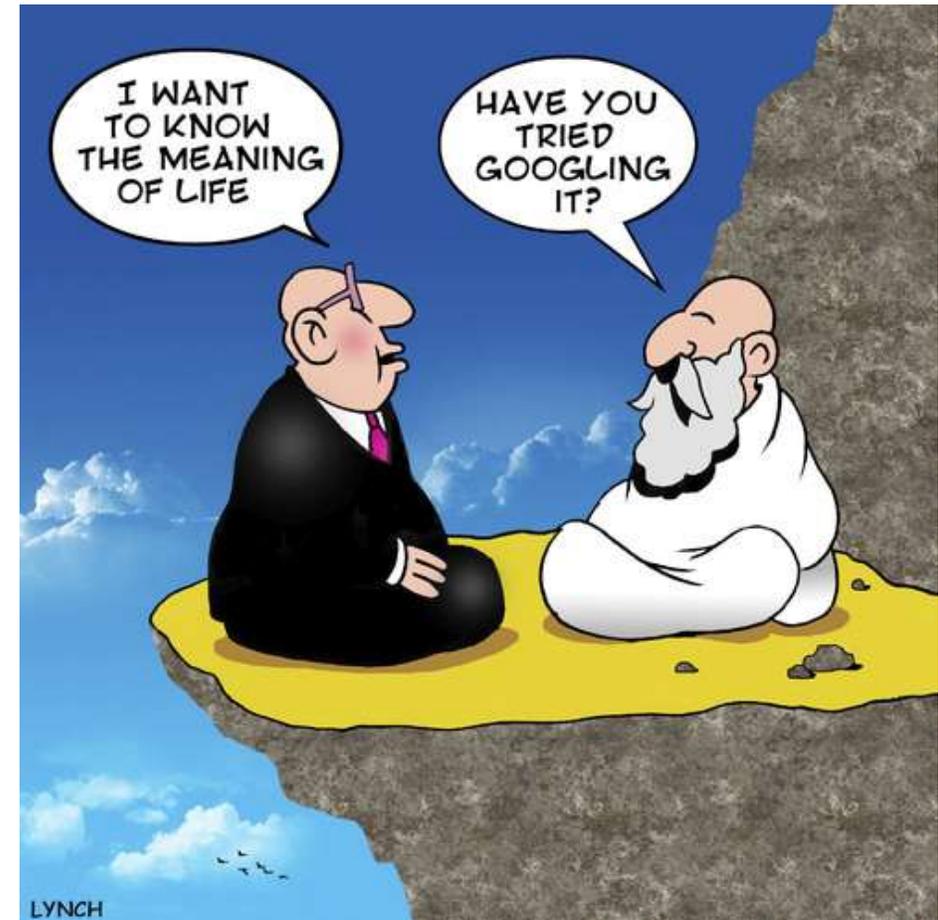


One Discipline's Struggles Can Be Another's Solution

- Low-template DNA – gathering data from multiple tests of the same sample and determining which alleles (features) to use based on duplicated observations
- Consensus feature set – gathering data from multiple analysts on the same latent print and determining which features to use based on consensus decisions (duplicated observations)
- Case manager to separate questions of bias
- Reporting language for presenting statistical conclusions

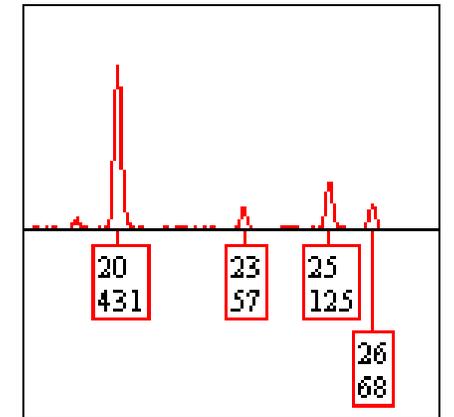
What questions do you most struggle with?

- How much is enough?
- What is real, and what is artefact?
- How certain is my conclusion?
- What's the chance of an error?
- How should I present my results?



The gold standards! Well...

- When the evidence is clear and complete, sure
- But when the evidence is degraded or mixed...
 - More interpretation needed
 - Higher chance for error
 - Higher chance for influence of bias
 - More exposure to criticism
 - Less certainty in results



Touch Evidence
(>2-person, low-level,
complex mixtures
perhaps involving
relatives)

Deposition

What factors affect the quality of deposited evidence?

- Donor quality
 - Shedders versus Secretors
- Substrate
 - Rough or smooth, porous or non-porous
- Environmental conditions
 - Heat, humidity, weather exposure
- Collection methods
 - Technique, tools, contamination issues



Detection

Do we miss evidence that could have been used?

Latents

- What is a true feature?
- Can electronically darken ridges, but also darkens noise
- May call a latent “not of value” that another analyst would identify
- Any thresholds are operational and arbitrary

DNA

- What is a true allele?
- Can increase sensitivity of PCR, but also increases noise
- Analysts may differ on what they would attempt to interpret
- Stochastic thresholds can vary from lab to lab (based on validation data)

Description

This is the most involved section because it is where the most interpretation is involved

- Documentation
- Databases
- Dissemination

Danger areas – when interpretation increases

- Allelic drop-in/drop-out, stutter, false minutiae, double-taps
- Variability between examiners

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"He makes a good point, but who's this Will Robinson?"

Dialogue and Discussion across Disciplines



Some Important Points

- Each discipline is on a different trajectory and timeline – a different spot in their own history – some are further along in facing the challenges – those that are further along could share something with those coming behind them to bring these “lagging” disciplines up to speed faster
- But this fact is not appreciated or even unknown unless you start having detailed discussions across the disciplines

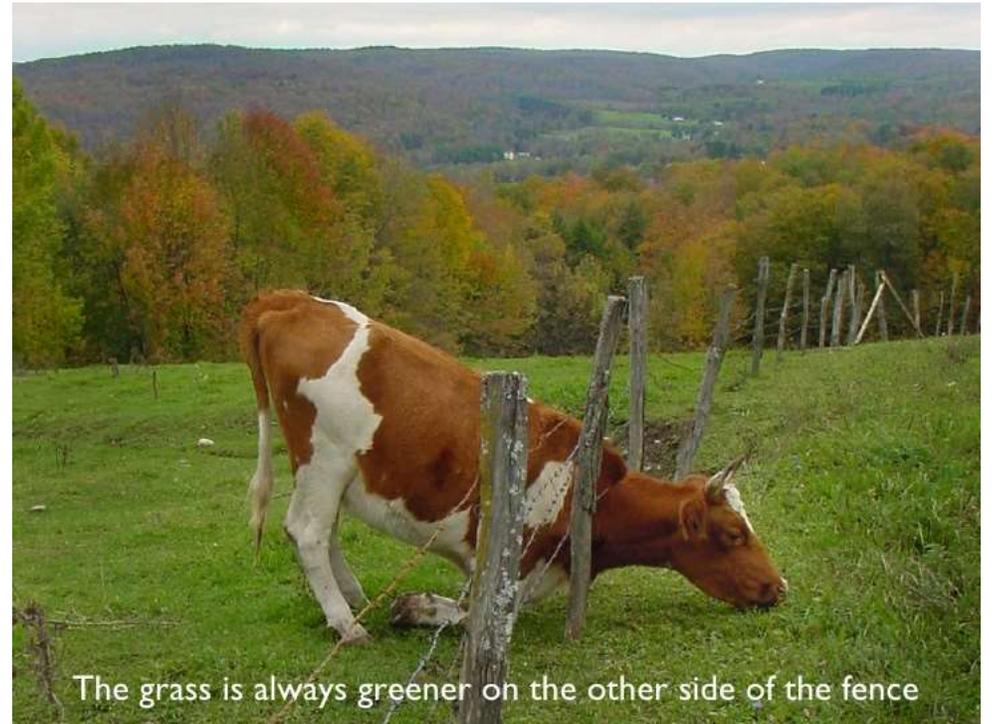
Which field seems to have progressed further?

Example	DNA	Latents
Expressing statistical results	X	
Conducting sophisticated database searches		X
Coping with large databases		X
Reporting language	?	?
Coping with low quality data	?	?

The grass isn't greener on the other side – it's greener where you water it...



http://3.bp.blogspot.com/-IZAv32VPW3l/Toutlyx6BfI/AAAAAAAAAgM/yKbPccUnQAc/s1600/grass%2Bgreener%2Bfence%2BiStock_000011126842Small-resized-600.jpg



<https://image.slidesharecdn.com/agigeorantpeterbatty-090926130136-phpapp01/95/agi-georant-the-grass-is-always-greener-in-defence-of-the-ordnance-survey-13-728.jpg?cb=1253970145>

FORENSIC SCIENCE
ERROR MANAGEMENT

INTERNATIONAL
FORENSICS SYMPOSIUM

July 24-28, 2017 @NIST, Gaithersburg, MD



**July 24-28 @NIST,
Gaithersburg, MD**

Technical Tracks

- Crime Scene
- Death Investigation
- Human Factors
- Legal Factors
- Quality Assurance
- Laboratory Management
- Criminalistics
- Digital Evidence

go.usa.gov/x9yEK

Or search for “NIST 2017 forensic error management”



NIST National Institute of
Standards and Technology
U.S. Department of Commerce

Acknowledgments

- Supported through the NIJ's FTCoE, award number 2016-MU-BX-K110
- RTI
- NIST
- OSAC Colleagues

Contact information

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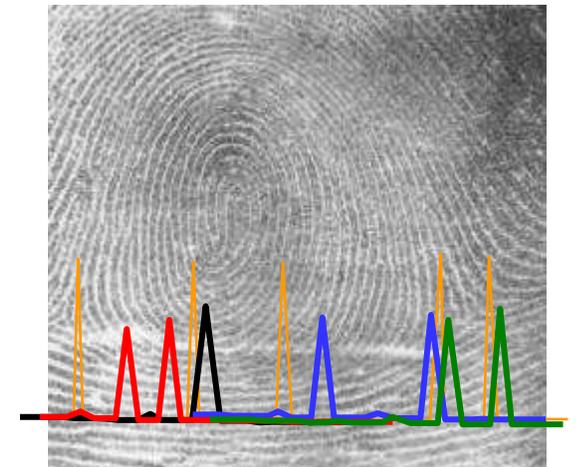
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https://en.wikipedia.org/wiki/File:Fingerprint_Whorl.jpg