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Observer Effects in DNA Profiling

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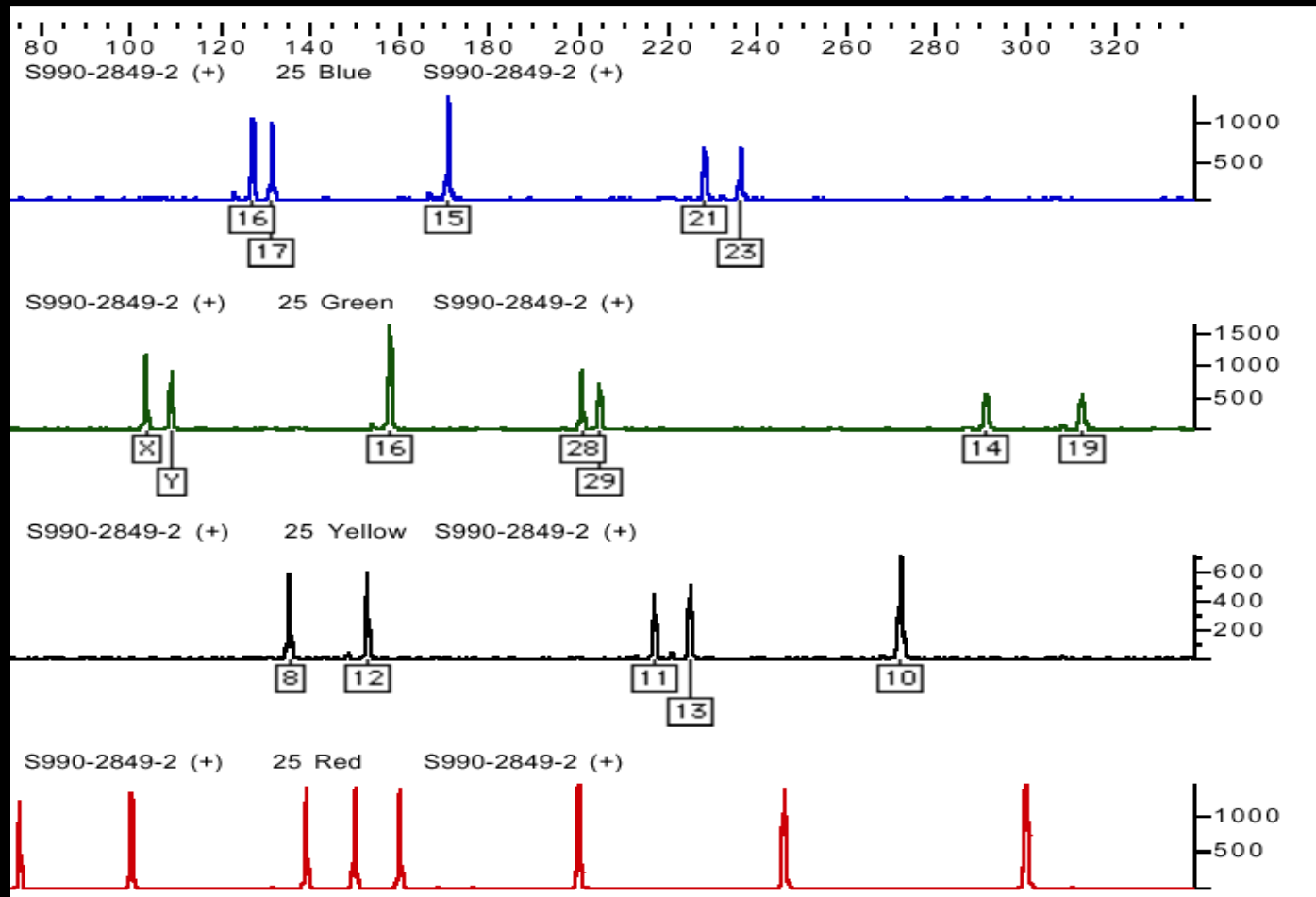
Observer effects in DNA profiling

Dan E. Krane, Wright State University, Dayton, OH

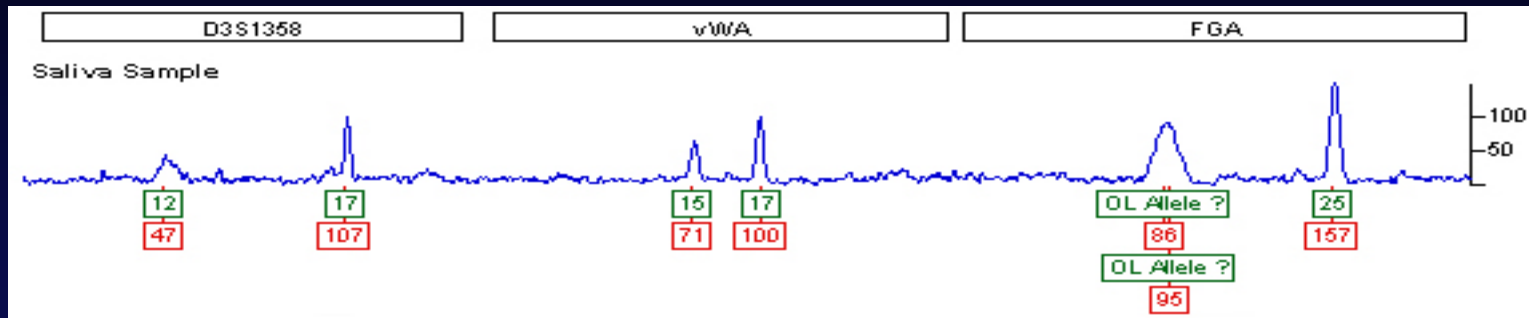
Forensic DNA Profiling Video Series

Forensic Bioinformatics
(www.bioforensics.com)

Doesn't someone either match or not?



Opportunities for subjective interpretation?



Can "Tom" be excluded?

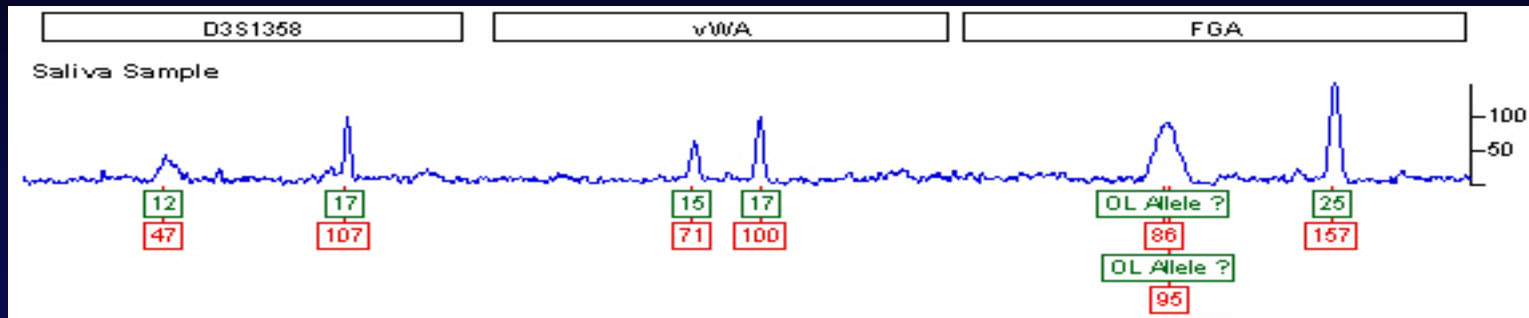
Suspect
Tom

D3
17, 17

vWA
15, 17

FGA
25, 25

Opportunities for subjective interpretation?



Can "Tom" be excluded?

Suspect
Tom

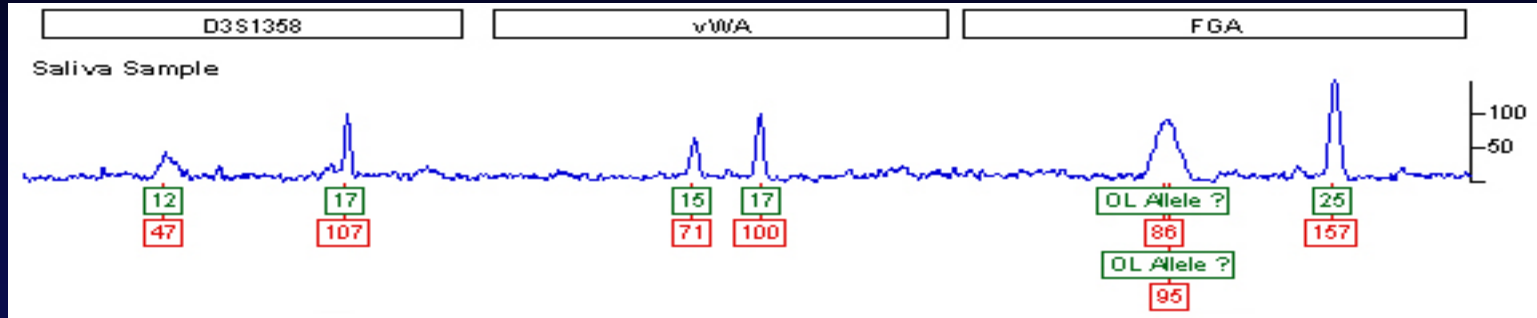
D3
17, 17

vWA
15, 17

FGA
25, 25

No – the additional peaks at D3 and FGA are "technical artifacts."

Opportunities for subjective interpretation?



Can "Dick" be excluded?

Suspect

D3

vWA

FGA

Tom

17, 17

15, 17

25, 25

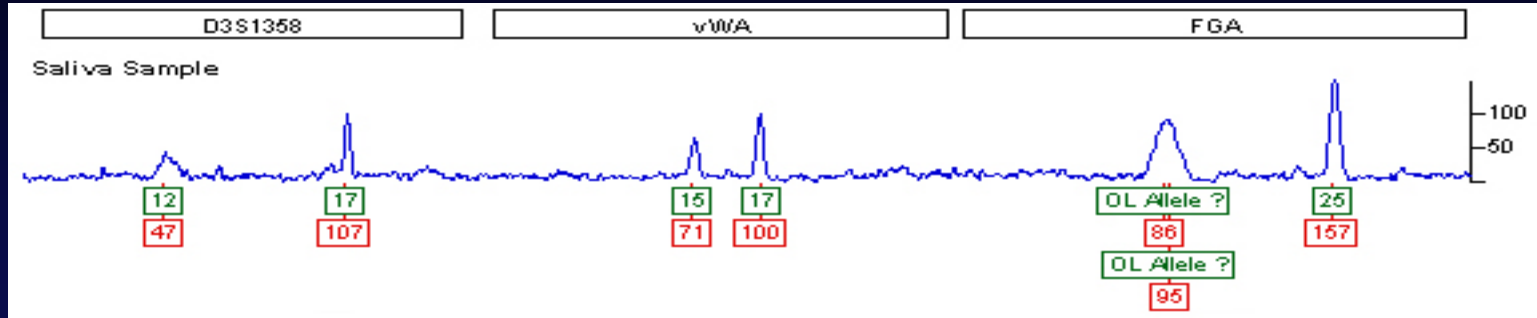
Dick

12, 17

15, 17

20, 25

Opportunities for subjective interpretation?

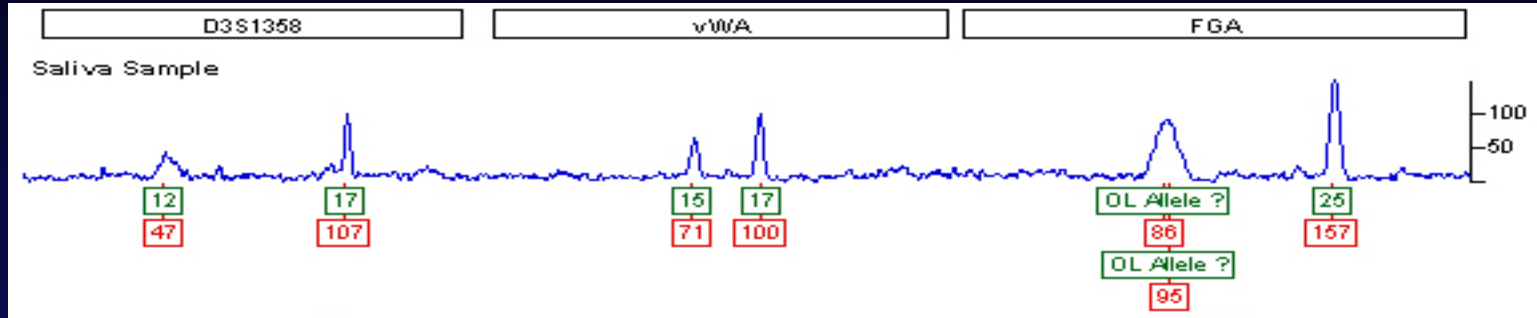


Can "Dick" be excluded?

<u>Suspect</u>	<u>D3</u>	<u>vWA</u>	<u>FGA</u>
Tom	17, 17	15, 17	25, 25
Dick	12, 17	15, 17	20, 25

No – stochastic effects explain the peak height disparity at D3; the blob at FGA masks a 20 allele.

Opportunities for subjective interpretation?

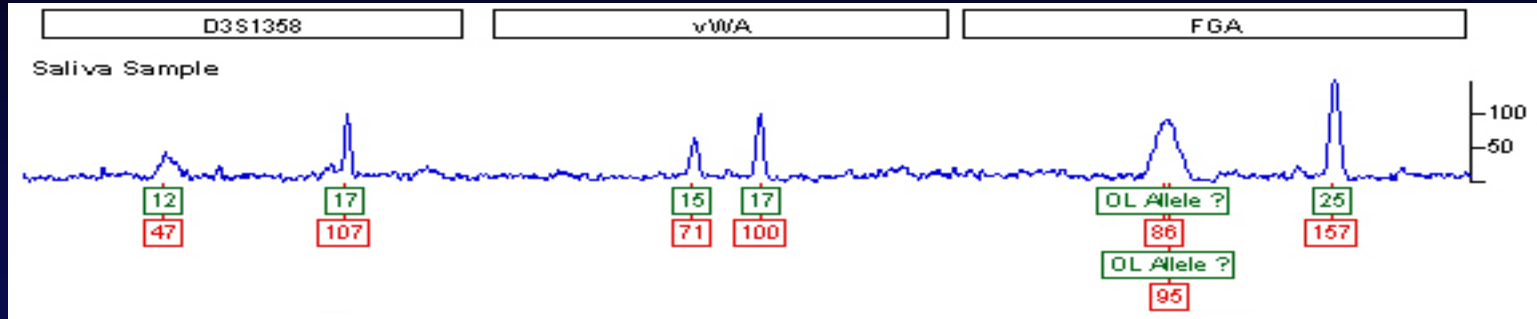


Can "Harry" be excluded?

<u>Suspect</u>	<u>D3</u>	<u>vWA</u>	<u>FGA</u>
Tom	17, 17	15, 17	25, 25
Dick	12, 17	15, 17	20, 25
Harry	14, 17	15, 17	20, 25

No – the 14 allele at D3 may be missing due to "allelic drop out;" the blob at FGA masks a 20 allele.

Opportunities for subjective interpretation?



Can "Sally" be excluded?

<u>Suspect</u>	<u>D3</u>	<u>vWA</u>	<u>FGA</u>
Tom	17, 17	15, 17	25, 25
Dick	12, 17	15, 17	20, 25
Harry	14, 17	15, 17	20, 25
Sally	12, 17	15, 15	20, 22

No -- there must be a second contributor; degradation explains the "missing" FGA allele.

Observer effects, aka context effect

- – *the tendency to interpret data in a manner consistent with expectations or prior theories (sometimes called “examiner bias”)*

AIBC

2314



Observer effects, aka context effect

- – *the tendency to interpret data in a manner consistent with expectations or prior theories (sometimes called “examiner bias”)*
- Most influential when:
 - Data being evaluated are ambiguous or subject to alternate interpretations
 - Analyst is motivated to find a particular result

Analyst often have strong expectations about the data

DNA Lab Notes (*Commonwealth v. Davis*)

- *"I asked how they got their suspect. He is a convicted rapist and the MO matches the former rape...The suspect was recently released from prison and works in the same building as the victim...She was afraid of him. Also his demeanor was suspicious when they brought him in for questioning...He also fits the general description of the man witnesses saw leaving the area on the night they think she died...So, I said, you basically have nothing to connect him directly with the murder (unless we find his DNA). He said yes."*

Analyst often have strong expectations about the data

DNA Lab Notes

– “Suspect-known crip gang member--keeps ‘skating’ on charges-never serves time. This robbery he gets hit in head with bar stool--left blood trail. Miller [deputy DA] wants to connect this guy to scene w/DNA ...”

Analyst often have strong expectations about the data

DNA Lab Notes

– “Suspect-known crip gang member--keeps ‘skating’ on charges-never serves time. This robbery he gets hit in head with bar stool--left blood trail. Miller [deputy DA] wants to connect this guy to scene w/DNA ...”

“Death penalty case! Need to eliminate Item #57 [name of individual] as a possible suspect”

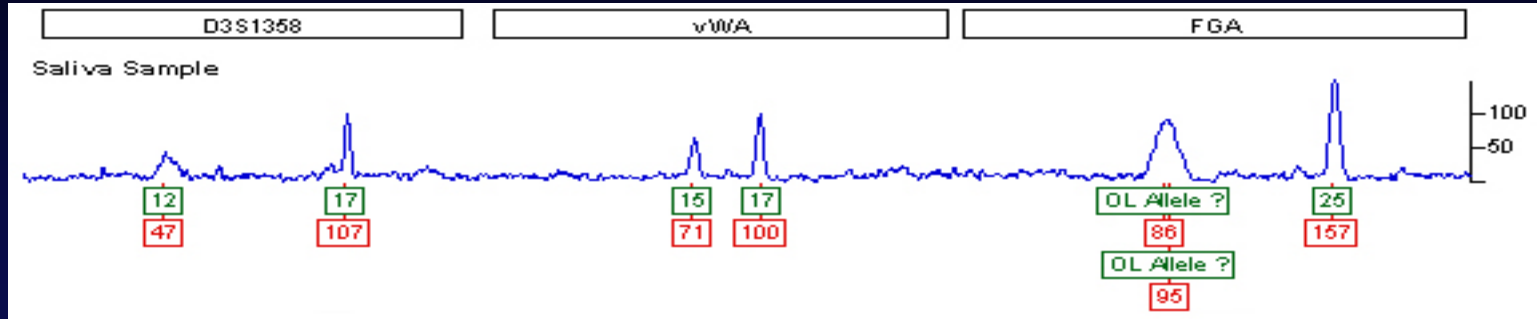
Analysts' expectations may lead them to:

- Resolve ambiguous data in a manner consistent with expectations
- Miss or disregard evidence of problems
- Miss or disregard alternative interpretations of the data
- Thereby undermining the scientific validity of conclusions
 - *See, Risinger, Saks, Thompson, & Rosenthal, The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion. 93 California Law Review 1 (2002).*

Sequential unmasking: a remedy for context effects

- Simply interpret evidence with no knowledge of reference samples
- Minimizes subjectivity of interpretations
- Forces analysts to be truly conservative in their interpretations

Opportunities for subjective interpretation?

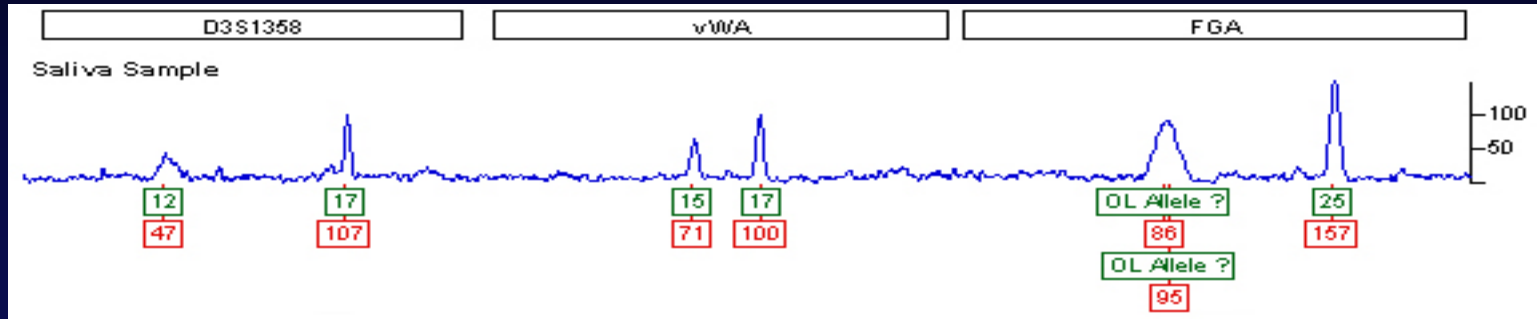


Can "Sally" be excluded?

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Harry	14, 17	15, 17	20, 25
Sally	12, 17	15, 15	20, 22

No -- there must be a second contributor; degradation explains the "missing" FGA allele.

Opportunities for subjective interpretation?



Who can be excluded?

"Suspect-known crip gang member--keeps 'skating' on charges--never serves time. This robbery he gets hit in head with bar stool--left blood trail. Miller [deputy DA] wants to connect this guy to scene w/DNA"

Sequential unmasking: a remedy for context effects

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- Forces analysts to be truly conservative in their interpretations

Sequential unmasking: a remedy for context effects

- Simply interpret evidence with no knowledge of reference samples
- Minimizes subjectivity of interpretations
- Forces analysts to be truly conservative in their interpretations
- Is it possible to do this for *all* forensic science?

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