

# TrueAllele Case Studies

TrueAllele® Workshop  
April, 2013  
Leicestershire, United Kingdom

Mark W Perlin, PhD, MD, PhD  
Cybergenetics, Pittsburgh, PA



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## Murder in McKeesport

October 25, 2008  
Tamir Thomas



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## Biological evidence



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## DNA analysis



PowerPlex® 16 STR

Partial DNA profiles  
obtained for both  
the gun and the cap

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## Human review results



**COUNTY OF ALLEGHENY**  
OFFICE OF THE MEDICAL EXAMINER

1920 PENN AVENUE • PITTSBURGH, PENNSYLVANIA 15222  
PHONE (412) 350-4800 • FAX (412) 350-3861  
EMAIL: [Webmaster@county.allegheny.pa.us](mailto:Webmaster@county.allegheny.pa.us)

DAN ONDRATO  
CHIEF EXECUTIVE

KARL E. WILLIAMS, M.D., M.P.H.  
MEDICAL EXAMINER

Match to Leland Davis

ROBERT M. HUSTON  
LABORATORY DIRECTOR



Black 420  
Caucasian 500  
Hispanic 470

Black 5.7 quadrillion  
Caucasian 9.3 quadrillion  
Hispanic 1.8 quadrillion

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## Prosecutor question



What is the true  
match information  
of the evidence  
to the suspect?

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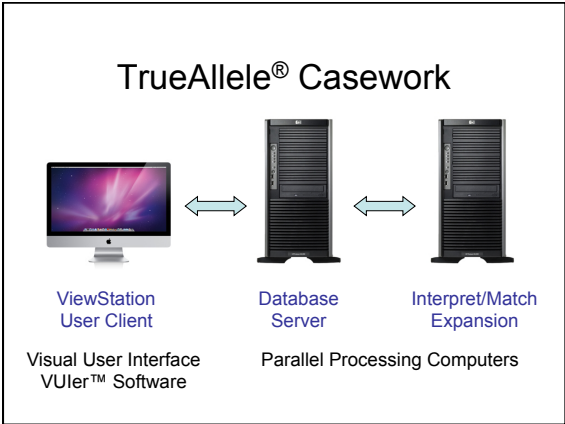
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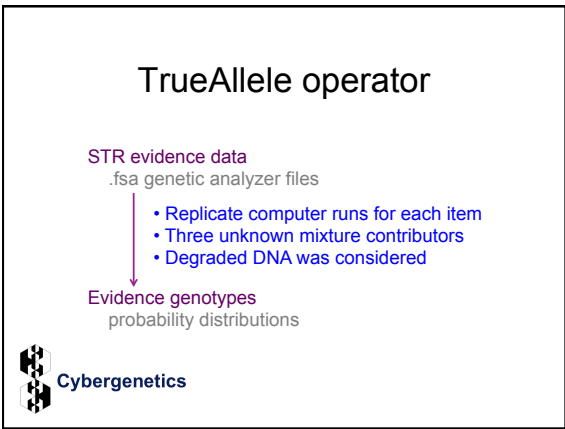
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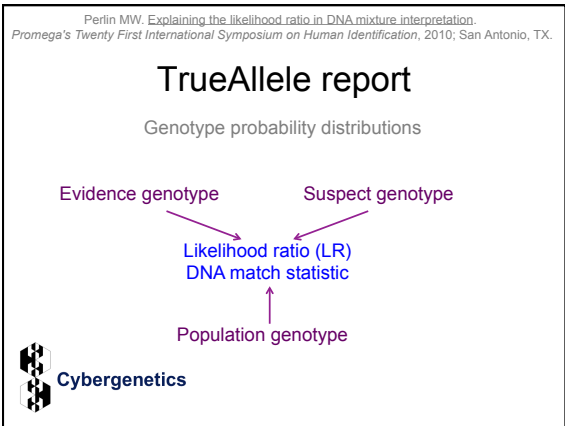
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## TrueAllele DNA match

LR match to Leland Davis



Black	18.6 billion	Black	89 quadrillion
Caucasian	12.1 billion	Caucasian	420 quadrillion
Hispanic	3.37 billion	Hispanic	73.5 quadrillion



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## Trial preparation



- case report
- direct examination
- PowerPoint slides
- background reading
- other questions

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## TrueAllele reports 2 & 3

2. Is Dominick Haynes in the DNA evidence?  
Answer: No – million factor against.

3. Is anyone else in both DNA evidence items?  
Answer: No – Leland Davis is the only one.



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No pretrial admissibility hearing

## TrueAllele precedent

Commonwealth of Pennsylvania v. Kevin James Foley

Superior Court, 2012



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## Computer Interpretation of Quantitative DNA Evidence

Commonwealth v Leland Davis  
August, 2012  
Pittsburgh, Pennsylvania

Mark W Perlin, PhD, MD, PhD  
Cybergenetics, Pittsburgh, PA



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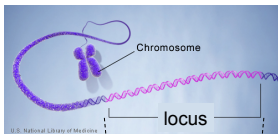
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## DNA genotype



mother allele

ACGT repeated word

father allele

1 2 3 4 5 6 7 8 9

A genetic locus has two DNA sentences, one from each parent.

An **allele** is the number of repeated words.

A **genotype** at a locus is a pair of alleles.

**8, 9**

Many alleles allow for many many allele pairs. A person's genotype is relatively unique.

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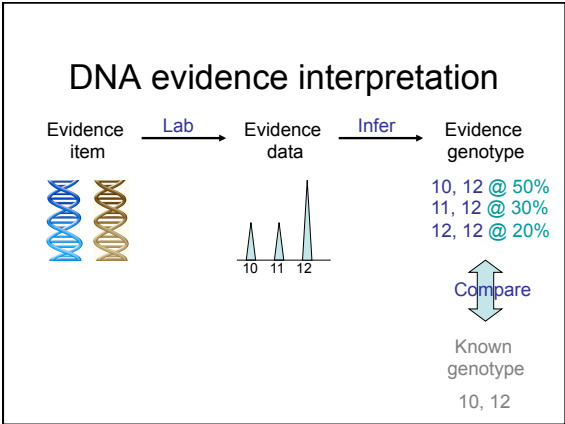
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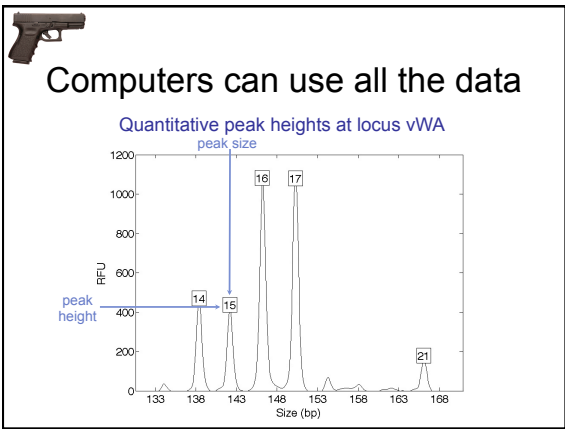
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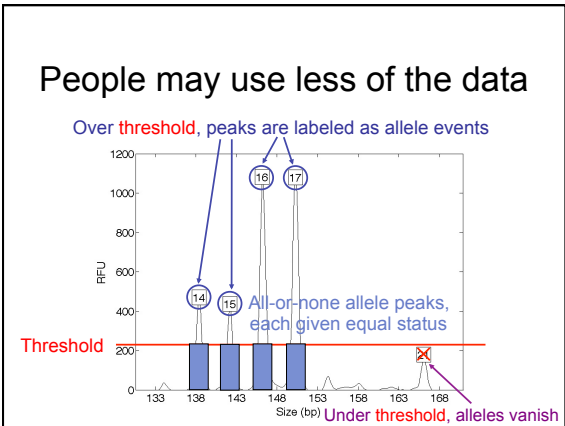
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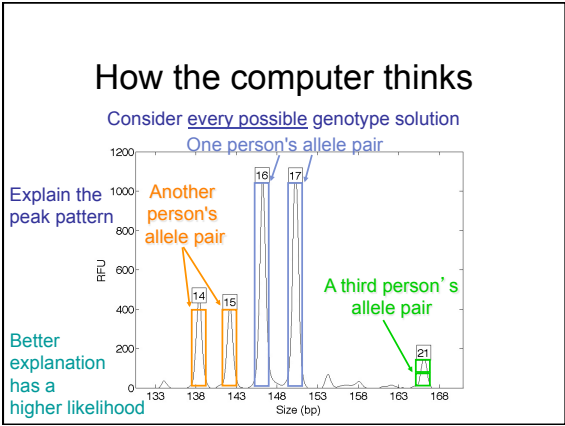
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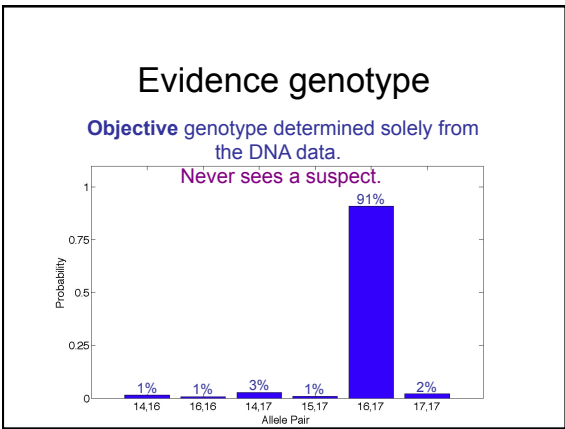
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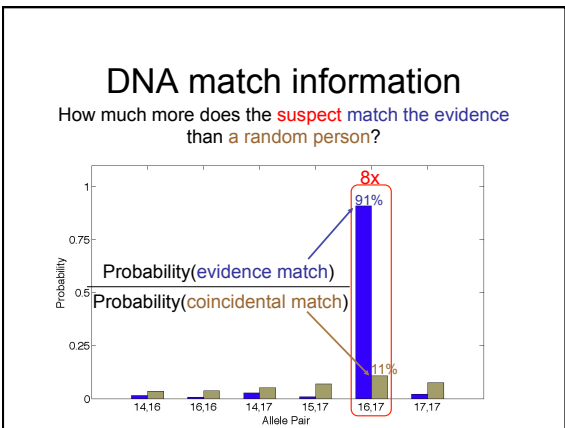
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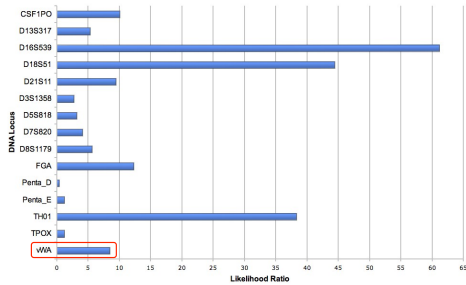
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## Match information at 15 loci




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## Is the suspect in the evidence?

A match between the **handgun** and Leland Davis is:

18.6 billion times more probable than a coincidental match to an unrelated **Black** person

12.1 billion times more probable than a coincidental match to an unrelated **Caucasian** person

3.37 billion times more probable than a coincidental match to an unrelated **Hispanic** person

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## Is the suspect in the evidence?

A match between the **baseball cap** and Leland Davis is:

89 quadrillion times more probable than a coincidental match to an unrelated **Black** person

420 quadrillion times more probable than a coincidental match to an unrelated **Caucasian** person

73.5 quadrillion times more probable than a coincidental match to an unrelated **Hispanic** person

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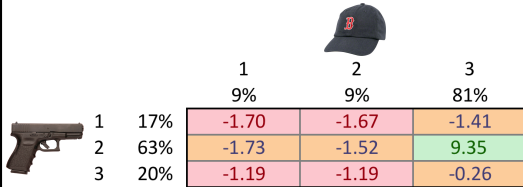
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## Is anyone else in both items of evidence?



There is no indication that any person, other than Leland Davis, contributed their DNA to both items of evidence.

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## Verdict



Leland Davis was convicted of third degree murder and weapons charges in the 2008 McKeesport slaying of Tamir Thomas.

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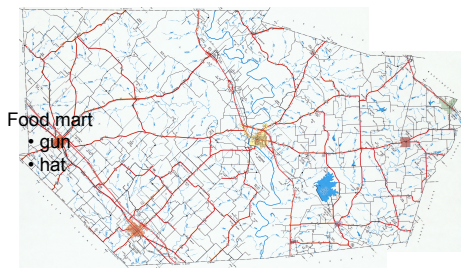
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Perlin MW. DNA mapping the crime scene: do computers dream of electric peaks? *Promega's Twenty Third International Symposium on Human Identification*, 2012; Nashville, TN.

## Gang crime in Bakersfield




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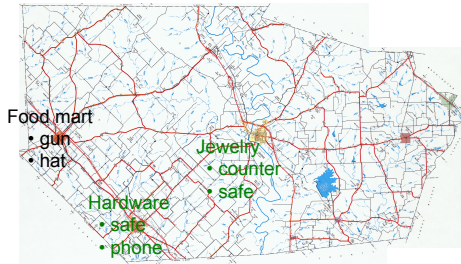
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## Escalation



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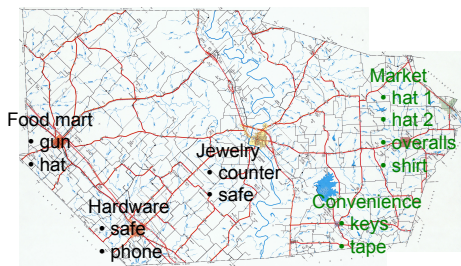
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## Evidence from multiple scenes



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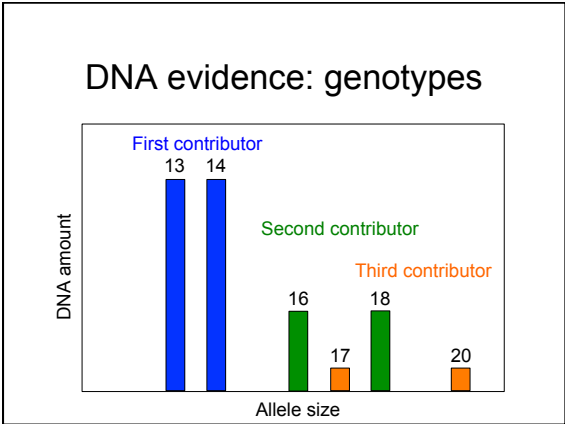
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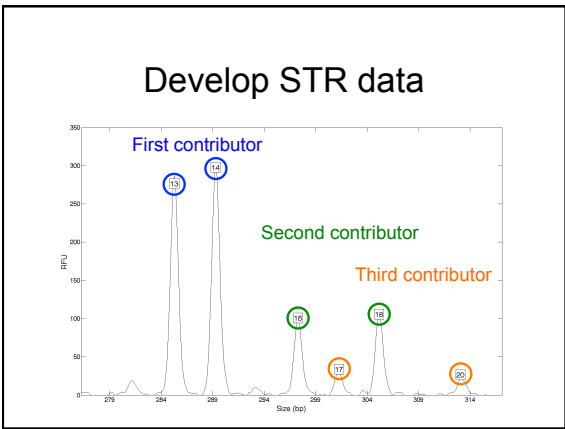
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- ### Laboratory processing
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| <p><b>12 evidence items</b></p> <p><b>Scene 1</b></p> <ul style="list-style-type: none"> <li>• gun</li> <li>• hat</li> </ul> <p><b>Scene 2</b></p> <ul style="list-style-type: none"> <li>• safe</li> <li>• phone</li> </ul> <p><b>Scene 3</b></p> <ul style="list-style-type: none"> <li>• counter</li> <li>• safe</li> </ul> <p><b>Scene 4</b></p> <ul style="list-style-type: none"> <li>• keys</li> <li>• tape</li> </ul> <p><b>Scene 5</b></p> <ul style="list-style-type: none"> <li>• hat 1</li> <li>• hat 2</li> <li>• overalls</li> <li>• shirt</li> </ul> | <p><b>10 reference items</b></p> <p><i>5 victims</i></p> <ul style="list-style-type: none"> <li>• V1</li> <li>• V2</li> <li>• V3</li> <li>• V4</li> <li>• V5</li> </ul> <p><i>5 suspects</i></p> <ul style="list-style-type: none"> <li>• S1</li> <li>• S2</li> <li>• S3</li> <li>• S4</li> <li>• S5</li> </ul> |
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## DNA match questions

log(LR)	Suspect 1	Suspect 2	Suspect 3	Suspect 4	Suspect 5
1. Gun					
1. Hat					
2. Safe					
2. Phone					
3. Counter					
3. Safe					
4. Keys					
4. Tape					
5. Hat 1					
5. Hat 2					
5. Overalls					
5. Shirt					

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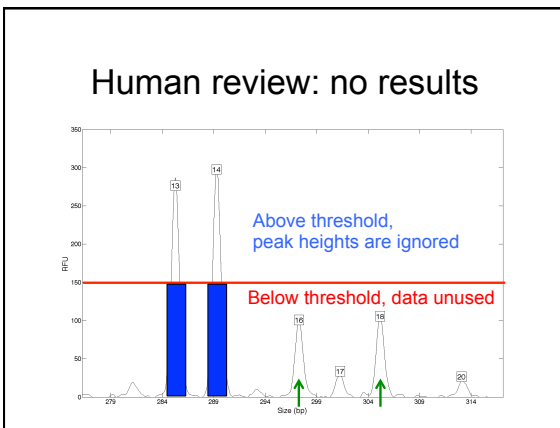
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## Human review: no results




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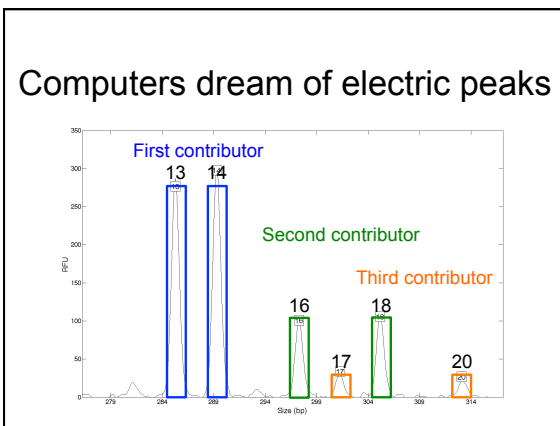
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## Computers dream of electric peaks




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## TrueAllele computes genotypes

For each contributor, at every locus

Allele pair	Probability
16, 18	65%
14, 18	12%
13, 18	10%
18, 20	8%
17, 18	4%

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## TrueAllele match answers

log(LR)	Suspect 1	Suspect 2	Suspect 3	Suspect 4	Suspect 5
1. Gun					4
1. Hat	3				4
2. Safe					
2. Phone					
3. Counter		6			
3. Safe					
4. Keys					
4. Tape					
5. Hat 1					6
5. Hat 2					
5. Overalls					11
5. Shirt					3

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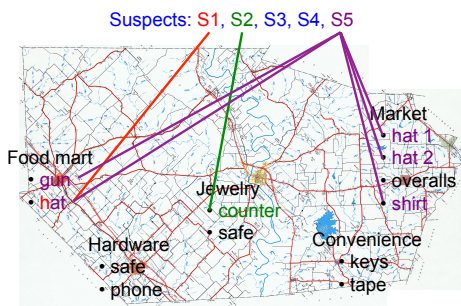
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## DNA mapping the crime scene




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# Computer Interpretation of Quantitative DNA Evidence

People of California v. Charles Lewis Lawton  
and Dupree Donyell Langston  
January, 2013  
Bakersfield, CA

Mark W Perlin, PhD, MD, PhD  
Cybergenetics, Pittsburgh, PA



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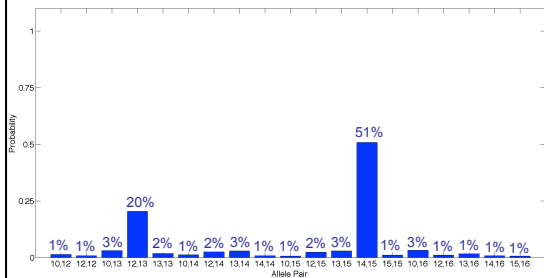
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## Evidence genotype

Objective genotype determined solely from the DNA data.  
Never sees a reference.




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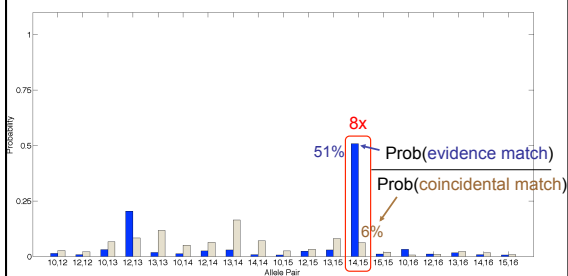
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## DNA match information

How much more does the suspect match the evidence than a random person?




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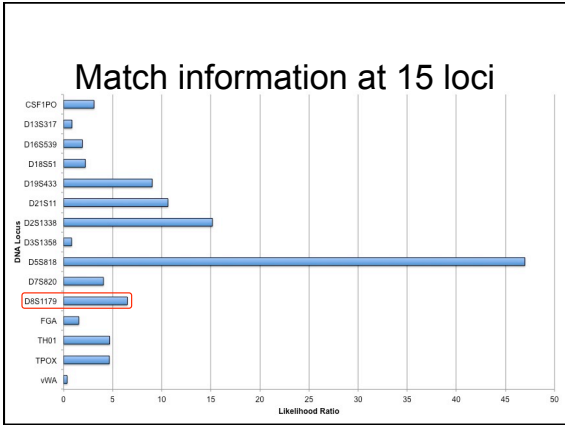
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### Is the suspect in the evidence?

A match between the front counter and Dupree Langston is:

- 553 million times more probable than a coincidental match to an unrelated Black person
- 731 million times more probable than a coincidental match to an unrelated Caucasian person
- 208 million times more probable than a coincidental match to an unrelated Hispanic person

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### Bakersfield, CA: January, 2013

- Pretrial admissibility hearing
- TrueAllele admitted into evidence
- DNA expert match testimony
- Dupree Langston was convicted
- Facing sentence of 70 years in prison

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