

# Combining DNA Evidence for Greater Match Information

American Academy of Forensic Sciences  
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Atlanta, GA

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Cybergenetics

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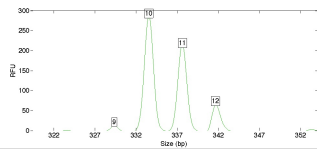
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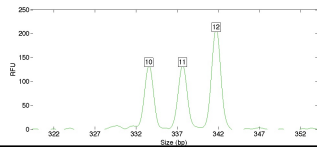
## Two DNA Mixture Samples

CSF locus in PowerPlex 16 kit

Sample 1



Sample 2



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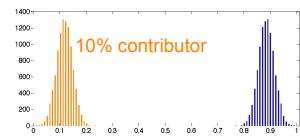
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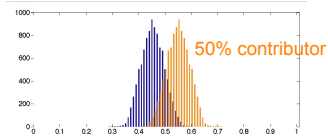
## DNA Mixture Separation

Determine mixture weights of each sample

Sample 1



Sample 2



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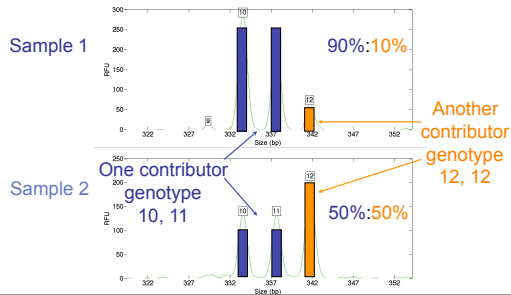
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MW Perlin, MM Legler, CE Spencer, JL Smith, WP Allan, JL Belrose, BW Duceaman.  
Validating TrueAllele® DNA mixture interpretation. Journal of Forensic Sciences, 2011.

## Joint Likelihood Function

Jointly explain data of multiple experiments



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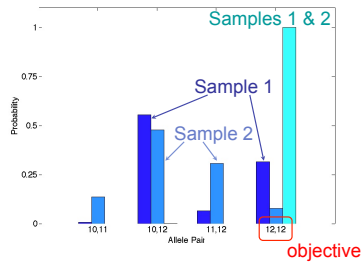
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## Probabilistic Genotype

Thoroughly examine all genotype explanations of the data, assessing the likelihood of each one



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### DNA Match Information

Sample 1 -  $10^{9.9}$

Sample 2 -  $10^{9.0}$

Samples 1 & 2  
 $10^{18.9}$

Marker	Sample 1	Sample 2	Match
AMELO	1	10	100
CSF1PO	1	10	100
D1S3017	1	10	100
D16S033	1	10	100
D18S51	1	10	100
DE1811	1	10	100
D2S1328	1	10	100
D2S1318	1	10	100
D7S920	1	10	100
D8S1179	1	10	100
FGA	1	10	100
Power_D	1	10	100
Power_E	1	10	100
TH01	1	10	100
TPOX	1	10	100
VWA	1	10	100

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## Massereene Barracks Attack

March 7, 2009 in Antrim, Northern Ireland



Homicide victims



Patrick Azimkar Mark Quinsey

Real Irish Republican Army claimed responsibility

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## Abandoned Burned Car



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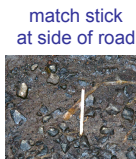
## Touch DNA Evidence



passenger side safety belt buckle



cell phone in center console



match stick at side of road

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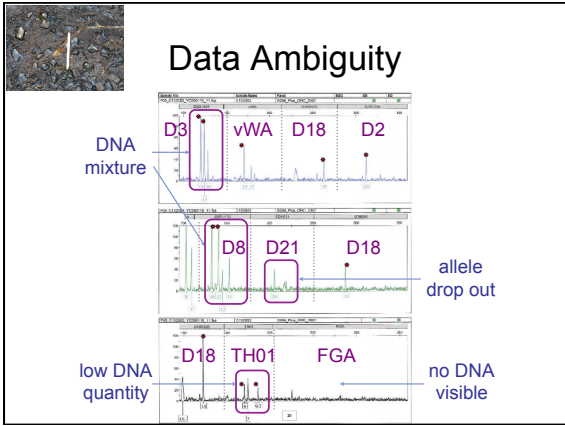
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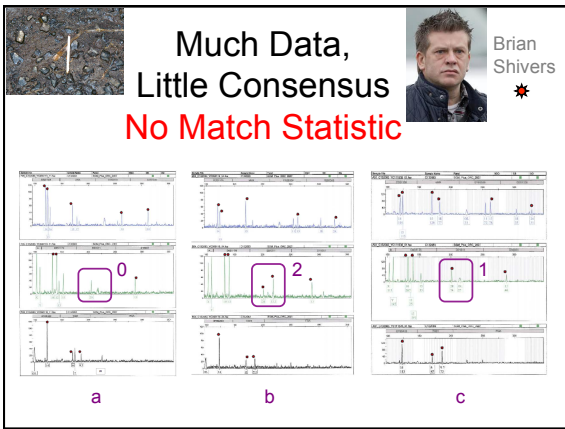
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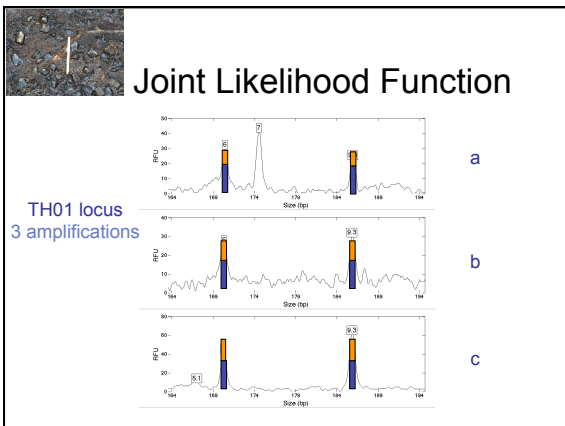
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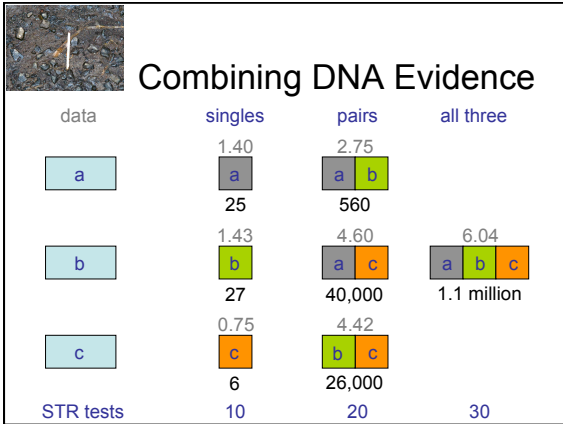
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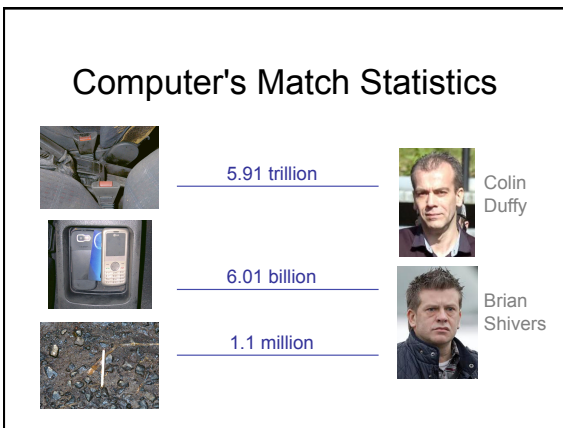
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### Admissibility Ruling

December 1, 2011  
The Honorable Mr. Justice Hart

18 page ruling on TrueAllele, concluding:

I am satisfied that the stage has now been reached in the case of this system where it can be regarded as being reliable and accepted, and I am satisfied that Dr Perlin has given his evidence in a credible and reliable fashion. In the light of these conclusions I can see **no basis on which I could properly exercise my discretion ... to exclude this evidence**, and I therefore **admit it in evidence**.

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# THE HUFFINGTON POST

UNITED KINGDOM 

## DNA Techniques Used In Massereene Conviction Could Pave Way For Future Trials



Photo: David J. Phillip / AP Photo / Getty Images

A pioneering method of genetic analysis could have major implications in future UK trials after helping to deliver a conviction in the Massereene Baracks murder case.

The high-profile case in Antrim saw a pioneering method of analysing genetic samples recovered from a crime scene accepted in a British courtroom for the very first time, opening the way for its use in future trials.

The computer-based statistical technique has emerged as an alternative to the long-established human review process in the last decade.

The True Allele casework system, developed by American scientist Dr Mark Perlin, has been used to examine samples containing mixed DNA traces when traditional lab analysis failed to identify a clear genetic profile of an individual.

After interpreting the sample, Dr Perlin's computer programme derives a likelihood ratio on whether the profile obtained matches a suspect or victim.

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## E Pluribus Unum

Out of many experiments, one informative solution



Cybergenetics

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