

When Good DNA Goes Bad

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Cybergenetics

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DNA mixture evidence

The Washington Post

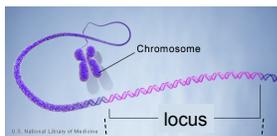
Virginia reevaluates DNA evidence in 375 cases

July 16, 2011

“Mixture cases are their own little nightmare,” says William Vosburgh, director of the D.C. police’s crime lab. “It gets really tricky in a hurry.”

“If you show 10 colleagues a mixture, you will probably end up with 10 different answers”
Dr. Peter Gill, Human Identification E-Symposium, 2005

A person's genotype



mother allele

ACGT repeated word

father allele

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

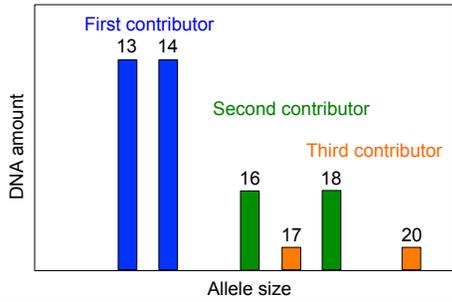
An **allele** is the number of repeated words.

A **genotype** at a locus is a pair of alleles.
8, 9

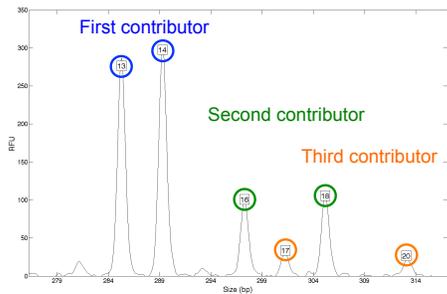
Many alleles allow for many many allele pairs. A person's genotype is relatively unique.

M. W. Perlin. "DNA identification science," In: Wecht CH, editor. *Forensic Sciences*. Albany, NY: LexisNexis® Matthew Bender®; 2012; Chapter 37C.

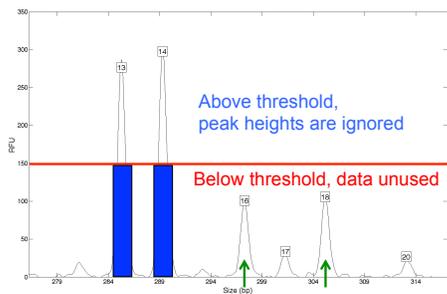
DNA mixture genotypes



Good DNA evidence data

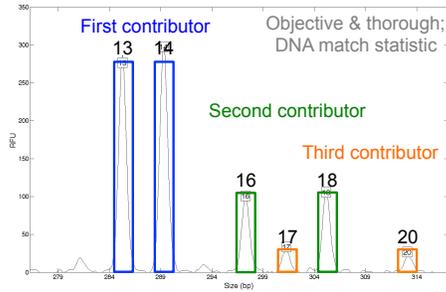


Misinterpreted, data goes bad



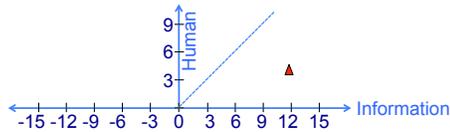
Perlin MW, Legler MM, Spencer CE, Smith JL, Allan WP, Belrose JL, Duceman BW. "Validating TrueAllele® DNA mixture interpretation." *Journal of Forensic Sciences*. 2011;56(6):1430-47.

TrueAllele solves mixtures



Commonwealth v. Lyons

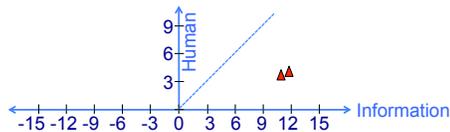
Location: Eastern United States
 Crime: Murder
 Evidence: Sweatshirt
 True information: 12
 Human guess: 4
 Reason: Degraded mixture
 Outcome: Death penalty



M. W. Perlin, "The Blairsville slaying and the dawn of DNA computing," in *Death Needs Answers: The Cold-Blooded Murder of Dr. John Yelenic*, A. Niapas, New Kensington, PA: Grelin Press, 2012.

Commonwealth v. Foley

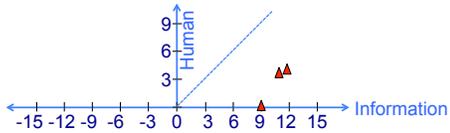
Location: Eastern United States
 Crime: Murder
 Evidence: Victim's fingernails
 True information: 11
 Human guess: 4
 Reason: Minor 7% DNA mixture
 Outcome: Life in prison



M. W. Perlin & J. Galloway, "Computer DNA evidence interpretation in the Real IRA Massereene terrorist attack," *Evidence Technology Magazine*. 2012;10(3):20-23.

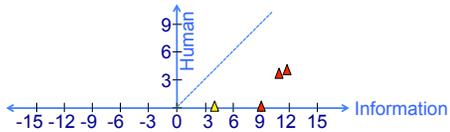
The Queen v. Shivers

Location: Northern Ireland
Crime: Murder, terror
Evidence: Mobile phone
True information: 9
Human guess: 0 (inconclusive)
Reason: Low DNA amount
Outcome: 25 years in prison



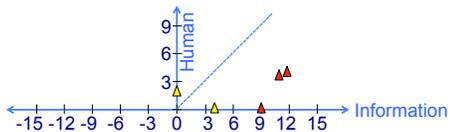
State v. Diggins

Location: Southern United States
Crime: Rape
Evidence: Tampon string
True information: 4
Human guess: 0 (inconclusive)
Reason: Low DNA amount
Outcome: Still serving life sentence

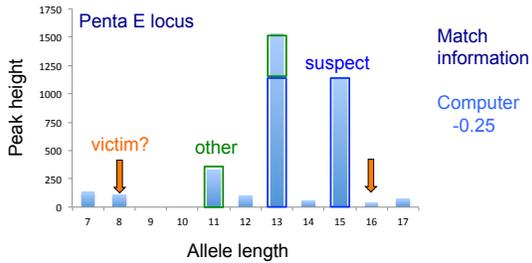


Commonwealth v. Doe

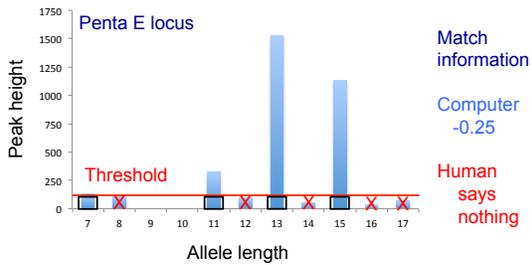
Location: Eastern United States
Crime: Rape
Evidence: Glove
True information: 0
Human guess: 2
Reason: Three person mixture
Outcome: Charges were dropped



Quantitative interpretation: accurately excludes



Human misinterpretation can falsely implicate

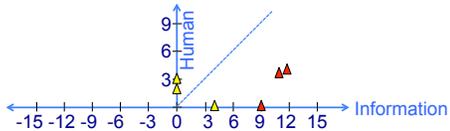


Computer reinterpretation, charges were dropped

information	human	computer
suspect	2	18
other	2	18
victim	2	0

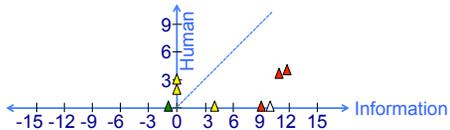
Commonwealth v. Brown

Location: Eastern United States
Crime: Rape
Evidence: Underwear
True information: 0
Human guess: 3
Reason: Y-STR not relevant
Outcome: DNA ruled inadmissible



State v. Smith

Location: Western United States
Crime: Assault with weapon
Evidence: Gun
True information: -1
Human guess: 0 (inconclusive)
Reason: Mixture
Outcome: Still in prison



M. W. Perlin, "Investigative DNA databases that preserve identification information,"
American Academy of Forensic Sciences 64th Annual Meeting, Atlanta, GA, 2012.

DNA database exoneration?



Computer-inferred
evidence genotype

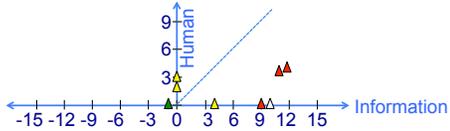
Post-conviction test
Information < 0

The right person?
Information ~ 9

10 million offenders
Can't use CODIS –
Good data gone bad

TrueAllele v. People

- Good DNA data can make identifications
- Computer can determine true information
- Human review does not always correlate
- And then, *good DNA data goes bad*



More information

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Cybergenetics

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