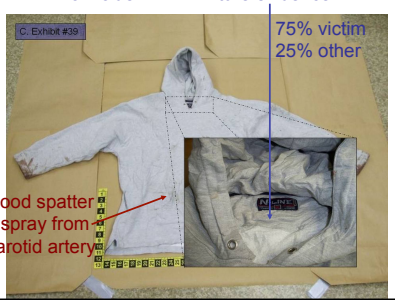
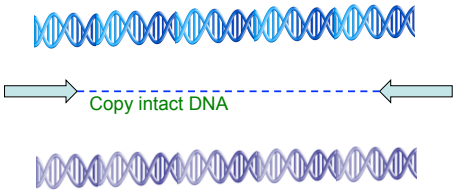
## Commonwealth v. Lyons

homicide: DNA mixture evidence

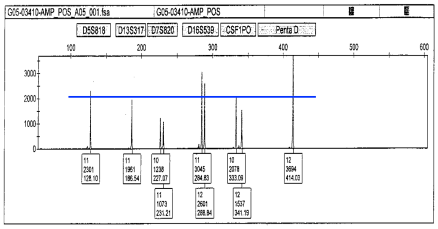



## DNA molecule

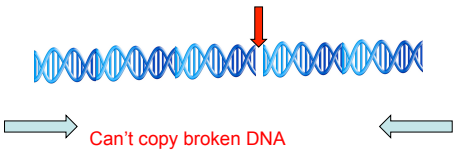
## Copy DNA



## Normal DNA signal



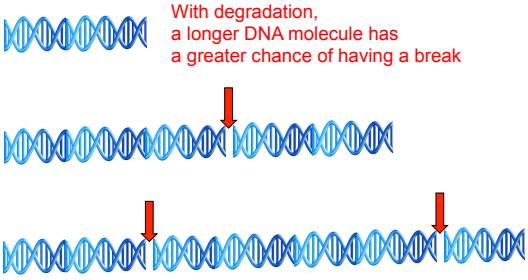

## Degraded DNA



Can't copy broken DNA

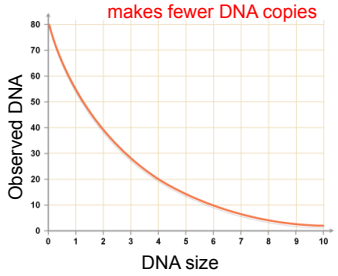
## Longer molecules copy less

With degradation,
a longer DNA molecule has
a greater chance of having a break

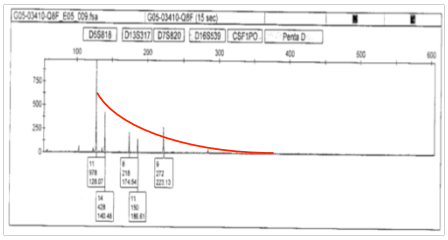


## DNA decay curve

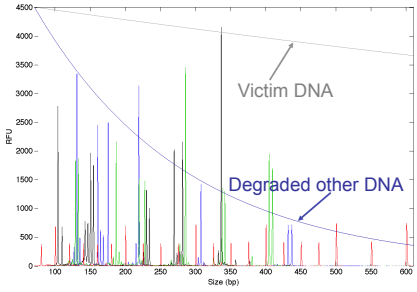
With degradation,
a longer DNA molecule
makes fewer DNA copies




## Degraded DNA signal



## Degraded DNA Mixture



# Computer Interpretation of Quantitative DNA Evidence

**Commonwealth v. Lyons**
**June, 2011**
**Reading, PA**

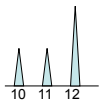
**Mark W Perlin, PhD, MD, PhD**
**Cybergenetics, Pittsburgh, PA**

Cybergenetics



## DNA evidence interpretation

Evidence item → Lab → Evidence data → Infer → Evidence genotype




10, 12 @ 50%
11, 12 @ 30%
12, 12 @ 20%

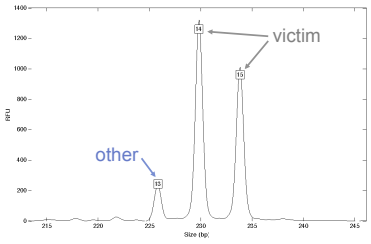
Compare

Known genotype

10, 12

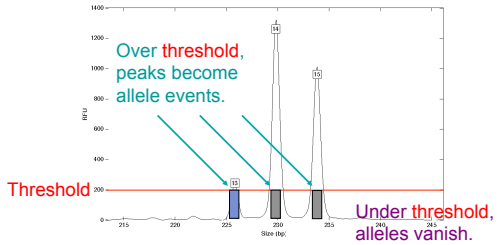
## Computers can use all the data

Quantitative peak heights at locus D8S1179



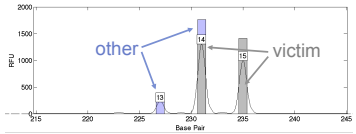
## People may use less of the data

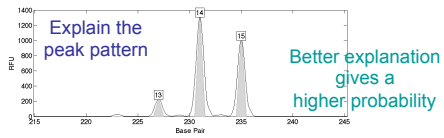
All-or-none allele peaks; ignore victim genotype



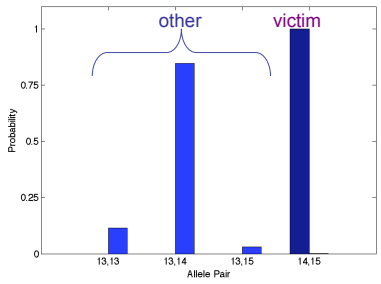

## How the computer thinks

Consider every possible genotype solution



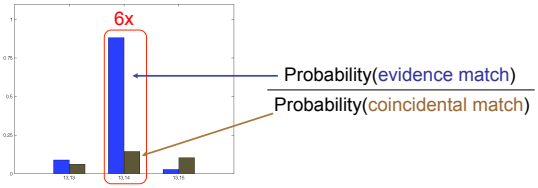




## Evidence genotypes



## DNA match information

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




## Is the suspect in the evidence?

A match between the suspect and the evidence is 9.46 trillion times more probable than coincidence.

Yes, with a reasonable degree of scientific certainty, evidence item Q9 contains DNA from the genotype of suspect item K2.

## Is the victim in the evidence?

A match between the victim and the evidence is 1.27 quintillion times more probable than coincidence.

Yes, with a reasonable degree of scientific certainty, evidence item Q9 contains DNA from the genotype of victim item K1.

## Match statistic comparison

| | |
|---|---|
| Computer | 9,500,000,000,000 |
| Human | 42,000 |