Commonwealth of Pennsylvania v. Kevin James Foley

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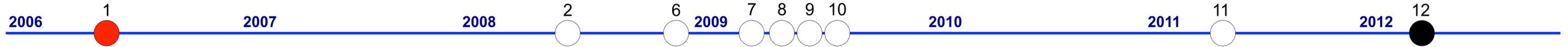
1. MURDER

Blairsville dentist Dr. John Yelenic was murdered in his home, about an hour east of Pittsburgh, PA. Dr. Yelenic, who was living alone at the time, had exsanguinated onto his living room floor. On the coffee table, splattered with his blood, was the unsigned divorce document from his estranged wife, Michelle. She was living with her boyfriend, Pennsylvania state trooper Kevin Foley.

John Yelenic's fingernails had DNA that tied trooper Foley to the crime, with a match statistic of 13,000. Prior to Mr. Foley's February 2008 preliminary hearing, his defense lawyer Richard Galloway said that the DNA did not rule out other suspects, because there was a one in 13,000 chance it came from someone else. Moreover, said his lawyer, DNA often identifies suspects to the exclusion of billions or trillions of others.

2. COMPUTER

I was intrigued by Mr. Galloway's dismissal of the DNA match statistic. In my research as a scientist at Cybergenetics, a small Pittsburgh DNA technology firm, we had seen that computer interpretation of DNA mixtures usually preserves more identification information than does human review. Validation studies had compared our TrueAllele® computer interpretation method with human expert review of the same DNA data, and typically showed a million-fold improvement in the match statistic. In the Foley case, that factor of a million could correct a 13,000 statistic into the billions, a level that the defense would find compelling.

Cybergenetics put the electronic DNA mixture data into its TrueAllele machine, asking the computer to solve the problem, and help identify the unknown contributor. The computer worked on our questions over a weekend. On Monday morning, I reviewed the results and phoned prosecutor Anthony Krastek with the TrueAllele answer. The DNA under Dr. Yelenic's fingernails matched Kevin Foley with a statistic in the hundreds of billions. Further calculations would later refine this number to 189 billion.

3. DNA

A person's DNA is packaged into 23 chromosome pairs, with one copy inherited from each parent. The DNA sentence at a chromosome location (or, "locus"), is called an "allele" (see figure below). Except for the female (X) and male (Y) chromosomes, a person has two alleles (one from each parent) at every genetic locus. A person's allele pair at a locus is called a "genotype".
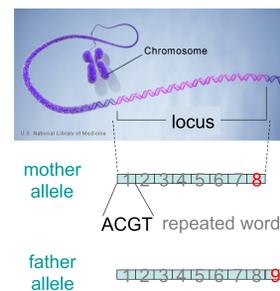
4. MIXTURES

A person's genotype is comprised of two alleles at a genetic locus. This allele pair shows up in the DNA data as one or two peaks (the two alleles could be the same). Peak size (x-axis) indicates the allele, while peak height (y-axis) is related to the quantity of allele present. A DNA mixture combines allele pairs from each contributor to the evidence. Nature adds up these allele pair DNA molecules in proportion to their contribution to produce a data pattern (see the D7S820 locus figure, shown to the right).

Computer interpretation of a DNA mixture is easy to understand. The computer tries out virtually every possible allele pair for the DNA contributors, adding them up in various proportions. Those genotypes (and their amounts) that better explain the data have a greater likelihood of being true. Sophisticated methods like TrueAllele consider many other variables, and also determine the uncertainty of every variable. After many thousands of computer proposals and comparisons, a genotype is developed for every contributor at each tested genetic locus. This evidence genotype provides the probability of each allele pair. The computer-inferred genotype is completely objective, because no knowledge of any suspect is used in its determination.

## 5. LAW

The scientific basis of informative DNA match statistics is the likelihood ratio (LR). The LR is a number that tells us how much more probable a match between evidence and a person is than mere coincidence. The mathematics of the LR helps ensure that this match number removes prejudices unrelated to the evidence.

In Pennsylvania, the product rule became a precedent for DNA evidence in the Commonwealth vs. Blasioli rape case. In 1996, the Superior Court held in its Blasioli decision that the product rule was generally accepted within the scientific community, and that statistical evidence derived from that method was admissible. The Pennsylvania Supreme Court affirmed that determination in 1998. While new human or computer methods for calculating product rule LRs for DNA match may arise, the foundational product rule itself is not novel under Pennsylvania case law.
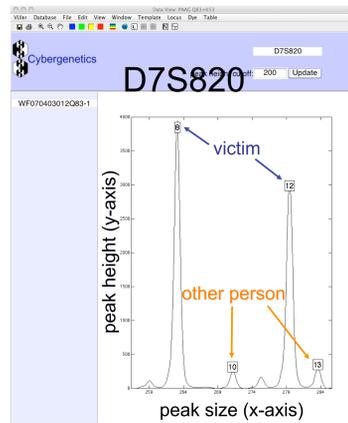
6. CHALLENGE

Foley's defense team challenged the TrueAllele computer interpretation. They claimed that the approach (which employs the product rule) was novel science, and thus Judge Martin should first determine its reliability before the findings could be admitted as evidence. The prosecution disagreed, maintaining that the product rule was not novel in Pennsylvania. Regardless, a pretrial hearing was held to determine (a) whether an admissibility hearing was actually needed, and (b) if it was necessary, whether TrueAllele was sufficiently reliable to allow the 189 billion DNA match statistic to be heard by the jury. Since TrueAllele had never before been used or challenged in court, we had to explain to the judge why it was scientifically reliable.

7. RELIABILITY

Prosecutor Krastek began the hearing by asking me about the principles of DNA mixture interpretation. Fundamentally, all interpretation methods, whether done by man or machine, operate in the same way. First, a genotype is inferred from the DNA data, by comparing hypothesized models with the data in order to determine the probabilities of each genotype explanation. Then, this evidence genotype (as a probability distribution) is compared to a reference genotype (e.g., Kevin Foley), relative to a population, to calculate a DNA match statistic.

The reason why people lose information is the all-or-none "threshold" that human analysts apply to DNA data in order to simplify mixture interpretation. To explain the impact of thresholds, I showed a pure black and white (high contrast) photograph of a face; we could see that the person was a young man – and little else. I then showed the judge the original image with all its shades of gray restored, revealing the face of a young Jimmy Stewart, as he looked in his classic film "It's a Wonderful Life". It was visually apparent that using more of the data can retain far more information.

8. ADMISSIBILITY

On March 2nd, President Judge Martin issued his opinion on the TrueAllele methodology. He wrote that, "it is recognized that there is more information available which more conservative approaches do not consider. Therefore, it seems logical that the scientific community would work towards including that unused data to arrive at a more accurate finding." Citing materials presented at the hearing, Judge Martin ruled that "based on a review of the evidence, the court finds that Dr. Perlin's methodology is admissible pursuant to the Frye rule and Rule 702." The TrueAllele DNA match results would be heard at the Foley trial.

9. TRIAL

Mr. Galloway's cross-examination revisited much of the same pretrial hearing terrain. I explained to the jury that the different reported match statistics resulted from how different methods used the data. The defense attorney protested that, with precise methods, the same data should give the same answer.

I replied that when a scientist examines a microscope slide with the naked eye (like the weak "inclusion" method), they can only see so far. Using a magnifying glass (i.e., "subtraction" method) on the same slide, they will see more. And, with a microscope (the computer's "addition" approach) they would see even more. "The information is there," I said. "The question is what is the resolution of the instrument that you are using to make the observation."

"Are you uncomfortable with what the FBI does?" asked Mr. Galloway. "No," I replied. "But if you are a doctor trying to diagnose bacterial disease, sometimes you need a microscope. ... I would be more comfortable using a higher precision instrument to make a diagnosis that might be more informative – same slide, same data – just a more precise approach."

10. VERDICT

On the morning of March 18th, state trooper Kevin Foley testified in his own defense. That afternoon, the prosecution and the defense made their closing arguments. "John Yelenic provided the most eloquent and poignant evidence in this case," said prosecutor Krastek. "He managed to reach out and scratch his assailant," capturing the murderer's DNA under his fingernails. The jury deliberated, and that night convicted Mr. Foley of first-degree murder.

11. APPEAL

Kevin Foley appealed his conviction to the Pennsylvania Superior Court. On March 29, 2011, appearing before an appeals court in Pittsburgh, appellate prosecutor William Stoycos explained why TrueAllele was reliable.

The Superior Court affirmed Judge Martin's ruling later that year. The court noted that scientific studies of TrueAllele's reliability had been "published in peer-reviewed journals; thus, their contents were reviewed by other scholars in the field." TrueAllele was new, but not "novel".

On February 15th of this year, the Superior Court published its Foley decision, establishing a statewide TrueAllele precedent throughout the Commonwealth of Pennsylvania.

12. IMPACT

Commonwealth v. Foley is a landmark case in the history of DNA evidence. For the first time, an advanced statistical computing method for interpreting DNA mixtures was:

1. used as evidence for a criminal case
2. admitted into evidence after admissibility challenge
3. introduced as evidence in a trial
4. upheld as reliable evidence by an appellate court
5. established as a statewide precedent

Dr. John Yelenic was brutally and tragically murdered, but the trial that convicted his killer bequeathed to society a powerful truth-seeking technology for bringing criminals to justice.

BOOK CHAPTER

This poster is drawn from my book chapter **The Blairsville Slaying and the Dawn of DNA Computing** in Andrea Niapis forthcoming book *Death Needs Answers: The Cold-Blooded Murder of Dr. John Yelenic*, Grelin Press, 2012.

The chapter can be downloaded from Cybergenetics web site at:
http://www.cybgen.com/information/publication/page.shtml

Visit Cybergenetics website for news, papers and presentations:
http://www.cybgen.com/information

Visit Cybergenetics ISHI booth #401 to see a computer demonstration of TrueAllele® Casework.

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