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Is DNA Evidence Relevant?

By

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There is one thing unique about this article, at least for me: I am sure I am wrong, but I am not sure why. It might seem like a waste of time to write an article to get an answer, when I could just ask one of my friends who is a DNA expert. But I am certain that anything I can see, can also be seen by many others who would also be interested in seeing answers.

Logical Relevance

As I understand it, the relevance of DNA evidence can be expressed syllogistically like this:²

Major premise: if DNA found at the crime scene at time $t1$ matches DNA taken from the defendant at time $t2$, this proves defendant was at the crime scene.

Minor premise: defendant's DNA taken at time $t2$ matches the DNA found at the crime scene at time $t1$.

Conclusion: defendant was at the crime scene.

The reason I have emphasized the times of the DNA samples is because there is an underlying assumption here; namely, that a person's DNA does not change over time!

So my question: is this true?

A Tale of Two Twins

What first got me interested in this topic was the common statement that "identical twins have identical DNA."³ In the small, rural high school that I attended, we had two sets of identical twins: Francis and Melvyn Arquette and Gene and Glen Smith. The Arquette twins lived in the country and rode the bus to school while the Smith twins lived in town near my home.

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² Compare, Koehler, Error and Exaggeration in The Presentation of DNA Evidence at Trial, 34 *Jurimetrics* 21 (1993); Imwinkelried & Kaye, DNA Typing: Emerging or Neglected Issues, 76 *Wash.L.Rev.* 413 (2001) 415 (mentioning character evidence but not relevance) 462 (discusses logical relevance but seems unaware of the time problem).

³ Mnookin, *People v. Castro*: Challenging The Forensic Use of DNA Evidence, 3 *Scholarly Perspectives* 75, 84 (2007); Lempert, Some Caveats Concerning DNA as Criminal Identification Evidence: With Thanks to Reverend Bayes, 13 *Cardozo L.Rev.* 303, 314, 336 (1991).

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I and most other kids who lived in town could tell the difference between Gene and Glen Smith even when we saw only one of them, but we could not tell the difference between the Arquette twins even when they stood side by side. The reverse was true of our friends from the country.

Another way we told the Smith twins apart is that they had different personalities. Scientists have found that twins become more and more different as life goes on even when they grow up together because different experiences lead to different personalities, but it might also be due to gene mutations arising after conception.⁴

It appears that the differences in the appearance of identical twins stems from the fact that while they have identical DNA when they first separate, even *in utero*, their DNA begins to alter due to mistranscriptions, damage from environmental impacts, and other effects.⁵

“Junk” DNA

The first company that pushed DNA testing claimed to use “junk” DNA because it had no apparent function.⁶ In fact, these make up 8-9% of the human genome.⁷ And contrary to the company, they perform regulatory functions within the cells and are critical in shaping development as they regulate how genes perform.⁸ I am not sure what inference to draw from this— so I leave it to the reader.

Other Evidence That A Person’s DNA Changes Over Time

⁴ Kollipara, How Twins Go Their Own Way, 183 Sci.News 13 (June 29, 2013).

⁵ Saey, The Difference Makers, 191 Sci.News 22, 24 (May 27, 2017)(so-called “jumping genes” or “transposons” are what makes identical twins differ after the embryo splits). See also, Gaino, Letter to The Editor, 307 Sci.Amer. 10 (2012)(commenting that authors of prior article misrepresent the degree of similarity to be expected between the brains of identical twins in explaining the source of genetic variation between them)

⁶ Mnookin, *People v. Castro*: Challenging The Forensic Use of DNA Evidence, 3 Scholarly Perspectives 75, 82 (2007).

⁷ Hall, Journey to the Genetic Interior, 307 Sci.Amer. 80 (2012).

⁸ Ibid.; Ehrenberg, Evolution’s Evolution, 175 Sci.News. 21, 22 (2009); Ast, The Alternative Genome, 292 Sci.Amer. 58, 61 (2005); Saey, Sequel to Human Genome Released, 182 Sci.News 11 (2012)(most of the human genome appears to be engaged in regulating gene activity); Reed, The Gene Team, LSA Magazine 46, 49 (Fall 2015)(non-coding portions of DNA, long called “junk”, now turn out to regulated the coding portions of DNA).

Readers not convinced by my twin evidence, may be by these other sources of mutated DNA:⁹

- **Random Mutations**¹⁰
- **Genetic Predisposition**¹¹
- **Exposure to Radiation**¹²
- **Use of Tobacco**¹³
- **Dietary Choices**¹⁴
- **Aging**¹⁵
- **Mistranscription**¹⁶

Implications

If I am wrong, judges and lawyers can go as they have in the past. But if I am right, they need to consider the possibility that a person's DNA has changed. While it seems unlikely that an innocent person's DNA will change to show guilt¹⁷, it seems possible that a guilty person's DNA will change to show innocence; for example, when a suspect has aged since the time of the crime.

Final Query

⁹ A large portion of the energy we use each day goes to maintenance and repair of mistakes in the DNA that may cause disease. Ast, *The Alternative Genome*, 292 *Sci.Amer.* 58, 63 (2005).

¹⁰ Pollard, *What Makes Us Human*, 300 *Sci.Amer.* 44 (2009); Mindell, *Evolution in The Everyday World*, 30 *Sci.Amer.* 82, 84 (2009)(some stretches of DNA mutate with sufficient regularity to serve as "molecular clocks").

¹¹ Willyard, *How Do Tumors Grow?*, 305 *Sci.Amer.* 32 (2011).

¹² Willyard, *How Do Tumors Grow?*, 305 *Sci.Amer.* 32 (2011).

¹³ Gordon, *Up In Fumes*, 31 *UCLA Magazine* 36 (January 2020); Willyard, *How Do Tumors Grow?*, 305 *Sci.Amer.* 32 (2011)(exposure to cigarette smoke); Ehrenberg, *Cigarettes Cause Telltale DNA Damage*, 190 *Sci. News* 14 (2016)(a pack-a-day for one year leads to 150 mutations per year on average).

¹⁴ Willyard, *How Do Tumors Grow?*, 305 *Sci.Amer.* 32 (2011).

¹⁵ Millius, *Aging's Wild Side*, 190 *Sci. News* 26, 27 (2016); Sinclair & Guarente, *Unlocking The Secret of Longevity Genes*, 294 *Sci.Amer.* 48, 49 (2006)(aging is really just the wearing out over time of the body's normal maintenance and repair mechanisms). See also, Imwinkelreid & Kaye, *DNA Typing: Emerging or Neglected Issues*, 76 *Wash.L.Rev.* 413, 472 (2001).

¹⁶ Markin, Laramay & Skakuji, *The Power of Spheres*, 322 *Sci.Amer.* S-4 (2020).

¹⁷ Except, perhaps among family members.

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Since 99.5% of a person's genetic code is identical to that of every other person's, this do not leave very much to be used for DNA identification;¹⁸ does this make it more likely that mutations will hit them

¹⁸ Barry, Seeking Genetic Fate, 176 Sci.News 16 (2009).