

# DNA Profiling and its Impact on Forensic Science

*John A. DeMarr PI performs forensic investigations using every scientific method available, including DNA profiling.*

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-- Forensic science today takes [DNA profiling](#) as a given, both to establish identity, and to establish family relationships between individuals. Despite that, the technique is a very recent discovery, dating back only to 1984, when Dr. (as of 1994, Sir) Alec Jeffreys, a professor of genetics at the University of Leicester, discovered the existence of every person's unique genetic profile when considering the results of an unrelated DNA experiment.

Although all humans share well over 99.9% of their DNA (i.e. the DNA that makes Homo sapiens), there is enough difference between the DNA of different individuals to constitute a unique identifying profile. As these DNA profiles are (almost) as unique as fingerprints, they are often referred to as "DNA fingerprints". The exception to the rule is identical twins, who share the exact same DNA (and, thus, DNA profile), but who do not share the same fingerprints.

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We perform forensic investigations using every scientific method available, including DNA profiling. If you believe that a DNA investigation could be of help to you in a case, call 877-433-6277.”

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A common misconception is that DNA profiling and full genome sequencing are the same thing. They aren't: nearly 20 years elapsed between Sir Alec's discovery and the first complete sequencing of the human genome. DNA profiling seeks to identify a person; it does not delve into the specifics of that person's genetic information. For example, while DNA fingerprinting can establish whether person X had been in place Y, it wouldn't be able to determine whether person X has blue eyes.

Rather than mapping a person's entire genome, DNA profiling is based on the comparison of sections of individuals' DNA.

The pieces of DNA employed are known as variable number tandem repeats (VNTRs), which occur in such a variety of patterns that the possibility of two individuals (who are not identical twins) sharing the same pattern is close to nil. The DNA testing techniques currently in use compare the VNTRs in



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20 different locations within the genome. Probability theory shows that there are nearly a quintillion (10<sup>18</sup> or 1,000,000,000,000,000,000) possible combinations of these VNTRs, while there are only 7.5 billion (7.5 x 10<sup>9</sup>) humans on the planet. Empirical reality has shown, however, that false DNA matches can occur. That, combined with the 12 million identical twins on Earth, makes the real (as opposed to the mathematical) probability of two people sharing the same DNA fingerprint impossible to calculate.

A great deal of technical progress has separated Sir Alec's discovery and the current state of forensic science, with its ever-evolving methods for testing subjects' DNA. The original method used was cumbersome, and required a large number of DNA samples. As anyone who watches crime dramas today knows, a simple hair now suffices to create a DNA profile. (There is a caveat there: the hair root must be attached to the hair being investigated. A hair swept up from a barber shop floor generally does not contain any nuclear DNA.) Forensic techniques have advanced by leaps and bounds since the discovery of DNA fingerprints. The science is such that DNA profiling has been commercialized: one has but to send in a single buccal swab to receive a report on one's genetic ancestry by mail.

Sir Alec's technique was first used, not in a crime investigation, but in an immigration case, where it established the parentage of a young boy. The first major application of DNA profiling in a crime investigation came in the case of the rape and murder of teenage girls in Leicestershire, the first in 1983 and the second in 1986. DNA profiling had two key impacts on the investigation: the incompatibility of the DNA of a prime suspect with semen found at the crime scenes exonerated Richard Buckland (a 17 year old youth with learning disabilities), and mass DNA screening led to the conviction of Colin Pitchfork for both crimes. Pitchfork was the first person in history to have been convicted based on DNA evidence, and that conviction, along with the exoneration of an innocent suspect who otherwise would have been convicted, negated any doubts about DNA profiling revolutionizing forensic investigation.

DNA databases for forensic purposes around the globe. In the United States, the database is known as the Combined DNA Index System (CODIS), which is maintained on national, state and local levels. By itself, California has the third largest DNA database in the world. Over 9 million offender profiles are currently part of the US system.

The surreptitious collection of DNA samples (as from a person's garbage) is considered legal without a warrant in the United States. The underlying legal argument is based on the principle that a person has no expectation of privacy once his garbage leaves his property. Privacy advocates have taken issue with this position, arguing that there is no practical way to avoid abandoning one's DNA in public, and that its collection by law enforcement is done without the knowledge (and often the consent) of the subject.

To appreciate just how DNA testing has revolutionized forensic science, consider one simple fact: prior to the mid-1980s, there was no definite way to establish paternity, and attempts to do so had to rely on such weak and circumstantial factors as blood type. Today, questions of paternity can be resolved by a pair of buccal swabs. Even prenatal paternity tests are a possibility today. There can be little question that DNA profiling has been the most important breakthrough in forensic science of the past fifty years. Like all revolutionary breakthroughs with all-pervading consequences, DNA profiling has also become to be taken for granted, and as though it had always existed.

[John A. DeMarr PI](#) performs [forensic investigations](#) using every scientific method available, including DNA profiling. If you believe that a DNA investigation could be of help to you in a case, please call our office at 877-433-6277 for a free consultation and quote.

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