

# Forensic Genetics

Summer Institute in Statistical Genetics  
University of Washington  
July 27-29, 2020

Sanne Aalbers and Bruce Weir

## Zoom Poll 1: I currently live in

- **A** North or South America.
- **C** Africa.
- **D** Asia.
- **E** Europe.
- **F** Rest of the world.

## Zoom Poll 2: I am a

- A. Forensic science practitioner in the US.
- B. Forensic science practitioner not in the US.
- C. Not a forensic science practitioner.

## Zoom Poll 3: I know most about

- Forensic science.
- Genetics.
- Statistics.
- Something else.

## Zoom Poll 4: I have

- A. Written a report about DNA evidence for an actual case.
- B. Testified about DNA evidence in court.
- C. Both A and B.
- D. Neither A nor B.

## Zoom Poll 5: I use

- A. The FBI Popstats computer package.
- B. The STRmix computer package.
- C. A different commercial computer package.
- D. A different non-commercial computer package.
- E. Two or more of A,B,C,D.
- F. No computer package.

## Zoom Poll 5: I can

- A. Test for Hardy-Weinberg equilibrium.
- B. Use the theta correction.
- C. Perform parentage/missing person calculations.
- D. Use the hierarchy of propositions.
- E. Two or more of A,B,C,D.
- F. None of A,B,C,D.

## South Carolina vs Billy Phillips

On June 3, 2020 the Supreme Court of South Carolina reversed the conviction of Billy Phillips for murder and possession of a weapon during the commission of a violent crime.

“At trial, a DNA analyst testified Phillips could not be excluded as a contributor to a mixture of DNA recovered from two samples taken from the crime scene. The analyst conceded, however, the statistical probability that some other randomly selected and unrelated person also could not be excluded as the person who left the DNA was-for one of the samples-only one in two. In addition, the State failed to explain to the trial court or the jury three fundamental concepts underlying the DNA testimony the analyst gave in this particular case.

<https://cases.justia.com/south-carolina/supreme-court/2020-27978.pdf?ts=1591193134>



# The Crime

“Darius Woods was a well-known drug dealer in Ridgeland, South Carolina. His customers knew him to carry large amounts of cash. On the night of May 18, 2013, two of Woods’ customers Shontay McKeithan and Davonte Freeman found him dead in his house. He was lying on his back with his hands above his head. Someone shot him twice with his own .38 caliber revolver, once in the neck and once in the head. The shot to the head was a contact wound, meaning the muzzle of the pistol was in contact with Woods’ skin when the pistol was fired. Law enforcement officers found the pistol on Woods’ stomach. His jeans pockets had been pulled out as though the killer had stolen his money.”

[op.cit.](#)

## The Suspect

“Several witnesses testified they saw Phillips in the general vicinity of Woods’ house within an hour or so before Freeman found the body. Donte Jenkins testified he, Woods, and Phillips were hanging out at Woods’ house on the evening of the murder. Jenkins left Woods and Phillips alone at Woods’ house at approximately 9:15 p.m. Taylor Cowherd testified she saw Phillips on Woods’ porch between 9:25 and 9:31p.m. Wrenshad AndersonFreeman’s brother-testified he saw Phillips walking to a nearby BP gas station at approximately 9:40 p.m.”

[op.cit.](#)

## The DNA Evidence

“During the State’s investigation, SLED collected DNA “standards” from six people in addition to Phillips. They were Freeman, McKeithan, three officers, and another person later determined not to be involved. SLED forensic analyst Lilly Gallman compared the DNA standards to “touch DNA” samples collected from the scene of the crime and during Woods’ autopsy. Of the touch DNA samples Gallman analyzed, she excluded Phillips as a contributor to all of the samples except two. The first sample already mentioned came from Woods’ right front jeans pocket. The second was taken from the grip of Woods’ gun.”

[op.cit.](#)

## Probative Value - Gun

“In most murder cases, who touched the murder weapon would be extremely important to the question of who committed the murder. In this case, however, Phillips admitted he spent several hours at Woods’ house that day, and he held Woods’ gun to imitate law enforcement officers. Phillips’ own admissions placed him at the scene of the crime, holding the gun. Thus, the probative value of Gallman’s testimony connecting Phillips to the DNA on the gun is minimal.”

[op.cit.](#)

## Probative Value - Pocket

“DNA evidence placing Phillips’ hand inside Woods’ jeans pocketwhere he presumably kept his cash would be pivotal to the State’s ability to convince the jury its theory was correct, and thus prove the primary disputed fact: who murdered Woods. Contrary to the evidence Phillips handled Woods’ gun, there is no known “innocent” reason for Phillips to have his hand in Woods’ pocket. At first glance, therefore, the probative value of the evidence appears high.”

[op.cit.](#)

## Probative Value - Pocket

“This brings us to the heart of Phillips’ objection. While evidence Phillips had his hand in Woods’ pocket could be important to the State in proving its theory of the case, Gallman did not testify the DNA evidence showed Phillips had his hand in Woods’ pocket. Rather, Gallman testified her analysis of the touch DNA sample from Woods’ pocket revealed a mixture of DNA from at least three people. Importantly, Gallman did not testify Phillips was one of those people. In her words, “Phillips cannot be excluded as [a] contributor[] to this mixture.” She testified that one in two people half of the population could have been the person who left the DNA in Woods’ pocket. In other words, even if Gallman’s testimony were clear and readily understood, the best she could do with her DNA analysis was to narrow the identity of the person who had his hand in Woods’ pocket the murderer according to the State’s theory to half of the population. The probative value of Gallman’s testimony connecting Phillips to the DNA in Woods’ jeans pocket is minimal.”

[op.cit.](#)

## Three Fundamental Concepts

“In this case, however, Gallman’s testimonyunlike the straightforward DNA evidence from hair or bodily fluids in Council or Ramseyinvolved three fundamental concepts that are not at all straightforward: ‘touch DNA,’ ‘non-exclusion DNA,’ and ‘random match probability.’ Though these DNA concepts carry with them the same aura of reliability or invincibility, as we will explain, each of them has significant potential to confuse and mislead that was not a factor in the DNA evidence we addressed in Council or Ramsey.”

[op.cit.](#)

# Touch DNA

“ ‘Touch DNA’ developed from advances in DNA technology that now permit analysts to obtain fragments of DNA profiles from skin or other cells collected from surfaces at crime scenes. One very important thing to understand about touch DNA is that in many cases this case included the DNA analyst is not able to obtain a full DNA profile from the ‘touch’ sample. When the profile identifiable from the sample is only a fragment of a full DNA profile, the case becomes less like Council or Ramsey, and the analyst will be less able to identify the perpetrator or exclude any given suspect.”

[op.cit.](#)



## Non-exclusion DNA

“As with touch DNA, courts have identified problems with non-exclusion DNA. As the Kentucky Supreme Court recently stated,

[S]everal courts have held that DNA ‘match’ or ‘non-exclusion’ evidence is inadmissible without reliable accompanying evidence as to the likelihood that the test could or could not exclude other individuals in a given population. Without the accompanying evidence, these courts note ‘the jury have no way to evaluate the meaning of the result.’ ”

[op.cit.](#)

# Random Match Probability

“Random match probability is the likelihood that another randomly chosen person unrelated to the suspect will have a DNA fragment identical to the fragment the analyst found in the touch sample.

...

The Supreme Court of the United States addressed how random match probability creates risk that jurors will confuse it with a statistical probability of guilt, referring to the risk as the 'prosecutor's fallacy.' ”

[op.cit.](#)

## Partial Profile

“In subsequent testimony, Gallman hardly explained that the touch DNA samples revealed only a fragment of a full DNA profile. Gallman referred to the samples not as fragments, but as ‘the swab from the gun’ and ‘the swab from the right front pocket.’

...

The striking omission of a meaningful explanation that the touch samples Gallman obtained in this case revealed only fragments of a full DNA profile left the jury with the incorrect impression Gallman matched Phillips’ DNA standard with a full DNA profile he left behind on the gun and in the pocket.”

[op.cit.](#)

## Prosecutor's Misstatements

“the assistant solicitor made misstatements in her closing argument to the jury. On several occasions she repeated the false statement that if a person does not touch an item he will be excluded. She stated, for example, ‘If you don’t touch it, you are automatically excluded. One hundred percent excluded.’ She also told the jury Gallman found Phillips’ DNA on the gun and in the jeans pocket. She stated, ‘Well, we have his DNA on that gun,’ and ‘We also know that defendant’s DNA is on the murder weapon and inside [Woods’] pocket,’ and ‘Had he not touched the gun or the pocket, his DNA would not be there.’ ”

[op.cit.](#)

## Conclusion

“The State failed to establish the ‘assist the trier of fact’ element, and the probative value of the DNA evidence is substantially outweighed by danger the evidence would confuse the issues and mislead the jury. We reverse Phillips’ convictions and remand for a new trial.

This opinion was written by Justice Few. Justices Kittredge and James concurred. Chief Justice Beatty concurred in result only in a separate opinion in which Justice Hearn concurred.

[op.cit.](#)

## Separate Opinion

“CHIEF JUSTICE BEATTY: Respectfully, I concur in result. While I agree with the conclusion reached by the majority, I disagree with the majority’s reference to a ‘Daubert/Council’ hearing.

...

Based on the foregoing, I concur in the majority’s decision to reverse Phillips’s convictions and remand for a new trial. On remand, if an objection is raised regarding the DNA evidence, I believe the trial judge must hold a hearing in accordance with Council.” HEARN, J., concurs.

[op.cit.](#)

# Relevant Evidence

Rule 401 of the US Federal Rules of Evidence:

“Relevant evidence” means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.

## Breakout Group Task

Designate one of your group to be your spokesperson.

Discuss the South Carolina Supreme Court decision on the Phillips case. Does your group: Strongly agree, Somewhat agree, No opinion, Somewhat disagree, Strongly disagree?

What does your group consider to be the three most important issues facing the use of DNA evidence in 2020?