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**THE PEOPLE, Plaintiff and Respondent, v. DENNIS LOUIS NELSON, Defendant
and Appellant.**

S147051

SUPREME COURT OF CALIFORNIA

43 Cal. 4th 1242; 185 P.3d 49; 78 Cal. Rptr. 3d 69; 2008 Cal. LEXIS 6853

June 16, 2008, Filed

SUBSEQUENT HISTORY: Reported at People v. Nelson (Dennis Louis), 2008 Cal. LEXIS 8189 (Cal., June 16, 2008)

US Supreme Court certiorari denied by Nelson v. Cal., 129 S.Ct. 357, 172 L.Ed.2d 219, 2008 U.S. LEXIS 6150 (U.S., Oct. 6, 2008)

PRIOR HISTORY:

Court of Appeal Third Appellate District, No. C047366. Superior Court of Sacramento County, No. 02F06021, Gary S. Mullen, Judge.

People v. Nelson, 142 Cal. App. 4th 696, 48 Cal. Rptr. 3d 399, 2006 Cal. App. LEXIS 1325 (Cal. App. 3d Dist., 2006)

CASE SUMMARY:

PROCEDURAL POSTURE: Defendant was charged for a 1976 murder in 2002, after investigators compared evidence from the murder scene with defendant's deoxyribonucleic acid (DNA) profile on a database and identified him as a possible donor of the evidence. A jury convicted defendant of first degree murder, the Court of Appeal, Third District, California, affirmed the judgment, and defendant sought further review.

OVERVIEW: At trial, the prosecution presented evidence that the odds that a random person unrelated to defendant from the population group that produced odds most favorable to him could have fit the profile of some crime scene evidence were one in 930 sextillion. The California Supreme Court held first that the precharge delay did not violate due process because the justification for the precharge delay outweighed the prejudice defendant suffered from the delay. The delay was investigative delay, nothing else. The police might have had some basis to suspect defendant of the crime shortly after it was committed, but the case was not fully solved until 2002, when the cold hit showed that the evidence came from defendant. The court also concluded that the jury properly heard evidence that it was virtually impossible that anyone other than defendant could have left the crime scene evidence. Use of the product rule in a cold hit case was not the application of a new scientific technique subject to a further Kelly (or Kelly-like) test, and the fact that the match ultimately came about by means of a database search did not deprive the rarity statistic of all relevance under Evid. Code, § 210.

OUTCOME: The court affirmed the judgment of the court of appeal.

CORE TERMS: match, database, probability, profile, product rule, cold, hit, crime scene, rarity, scientific, statistic, murder, odds, random, admissibility, loci, relevance, fair trial, scientific technique, prosecutor, forensic, unjustified, statistical, indictment, admissible, testing, precharge, criminal prosecutions, statute of limitations, prosecutorial

LexisNexis(R) Headnotes***Constitutional Law > Bill of Rights > Fundamental Rights > Criminal Process > Speedy Trial***

[HN1] The speedy trial provisions of U.S. Const., 6th Amend., and Cal. Const., art. I, § 15, cl. 1, do not apply until at least the defendant has been arrested or a charging document has been filed.

Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection***Constitutional Law > Bill of Rights > Fundamental Rights > Criminal Process > Speedy Trial******Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing***

[HN2] Although precharging delay does not implicate speedy trial rights, a defendant is not without recourse if the delay is unjustified and prejudicial. The right of due process protects a criminal defendant's interest in fair adjudication by preventing unjustified delays that weaken the defense through the dimming of memories, the death or disappearance of witnesses, and the loss or destruction of material physical evidence. Accordingly, delay in prosecution that occurs before the accused is arrested or the complaint is filed may constitute a denial of the right to a fair trial and to due process of law under the California and United States Constitutions. A defendant seeking to dismiss a charge on this ground must demonstrate prejudice arising from the delay. The prosecution may offer justification for the delay, and the court considering a motion to dismiss balances the harm to the defendant against the justification for the delay.

Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection***Criminal Law & Procedure > Criminal Offenses > Homicide > Murder > General Overview******Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing******Criminal Law & Procedure > Defenses > Statutes of Limitations***

[HN3] The statute of limitations is usually considered the primary guarantee against bringing overly stale criminal charges, and there is no statute of limitations on murder. Presuming prejudice would be inconsistent with the Legislature's declining to impose a statute of limitations for murder, among the most serious of crimes. To avoid murder charges due to delay, the defendant must affirmatively show prejudice.

Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection***Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing***

[HN4] The law under the California Constitution is at least as favorable for a defendant with regard to what justifies precharge delay as the law under the United States Constitution.

Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection***Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing***

[HN5] The ultimate inquiry in determining a claim based upon due process is whether the defendant will be denied a fair trial. If such deprivation results from unjustified delay by the prosecution coupled with prejudice, it makes no difference whether the delay was deliberately designed to disadvantage the defendant, or whether it was caused by negligence of law enforcement agencies or the prosecution. In both situations, the defendant will be denied his right to a fair trial as a result of governmental conduct. Thus, although delay may have been caused only by the negligence of the government, the prejudice suffered by a defendant may be sufficient when balanced against the reasons for the delay to constitute a denial of due process.

Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection***Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing***

[HN6] Under California law, negligent, as well as purposeful, delay in bringing charges may, when accompanied by a showing of prejudice, violate due process. This does not mean, however, that whether the delay was purposeful or negligent is irrelevant.

Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection***Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing***

[HN7] Whether a precharge delay was negligent or purposeful is relevant to the balancing process. Purposeful delay to

gain an advantage is totally unjustified, and a relatively weak showing of prejudice would suffice to tip the scales towards finding a due process violation. If the delay was merely negligent, a greater showing of prejudice would be required to establish a due process violation.

***Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection
Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing***

[HN8] A court should not second-guess the prosecution's decision regarding whether sufficient evidence exists to warrant bringing charges. The Due Process Clause does not permit courts to abort criminal prosecutions simply because they disagree with a prosecutor's judgment as to when to seek an indictment. Prosecutors are under no duty to file charges as soon as probable cause exists but before they are satisfied they will be able to establish the suspect's guilt beyond a reasonable doubt. Investigative delay is fundamentally unlike delay undertaken by the government solely to gain tactical advantage over an accused because investigative delay is not so one-sided. A prosecutor abides by elementary standards of fair play and decency by refusing to seek indictments until he or she is completely satisfied the defendant should be prosecuted and the office of the prosecutor will be able to promptly establish guilt beyond a reasonable doubt. Indeed, many legitimate reasons exist why the government might delay bringing charges even after it has sufficient evidence to convict.

***Constitutional Law > Bill of Rights > Fundamental Rights > Procedural Due Process > Scope of Protection
Criminal Law & Procedure > Accusatory Instruments > Dismissal > Grounds > Delay in Filing***

[HN9] A court may not find negligence by second-guessing how the state allocates its resources or how law enforcement agencies could have investigated a given case. The necessity of allocating prosecutorial resources may cause delays valid under the Lovasco analysis. Thus, the difficulty in allocating scarce prosecutorial resources (as opposed to clearly intentional or negligent conduct) is a valid justification for delay. It is not enough for a defendant to argue that if the prosecutorial agencies had made his or her case a higher priority or had done things a bit differently they would have solved the case sooner.

Evidence > Testimony > Experts > Kelly-Frye Process

[HN10] The admissibility of expert testimony based on a new scientific technique requires proof of its reliability -- i.e., that the technique is sufficiently established to have gained general acceptance in the particular field to which it belongs. Once an appellate court has affirmed in a published opinion a trial court ruling admitting evidence based on a new scientific technique, the precedent may control future trials, at least until new evidence is presented that reflects a change in the scientific community's attitude.

Evidence > Scientific Evidence > DNA

Evidence > Testimony > Experts > Kelly-Frye Process

[HN11] In a number of respects, deoxyribonucleic acid (DNA) evidence has been subjected to the Kelly test and found admissible.

Evidence > Scientific Evidence > DNA

Evidence > Testimony > Experts > Kelly-Frye Process

[HN12] When a suspect's deoxyribonucleic acid (DNA) sample is compared to a crime scene sample, the product rule has gained general acceptance in the relevant scientific community and therefore meets the Kelly standard for admissibility.

Evidence > Relevance > Relevant Evidence

Evidence > Scientific Evidence > DNA

Evidence > Testimony > Experts > Kelly-Frye Process

[HN13] The product rule reliably shows what it purports to show -- the rarity of the genetic profile in the population group. Accordingly, its admissibility in a cold hit case is a question of relevance, not scientific acceptance, and it is thus not subject to a further Kelly test.

Evidence > Relevance > Relevant Evidence***Evidence > Scientific Evidence > DNA***

[HN14] Although the product rule is not the only available method of statistical analysis in a cold hit case, it is relevant and thus admissible.

Evidence > Scientific Evidence > Daubert Standard***Evidence > Testimony > Experts > Kelly-Frye Process***

[HN15] Nothing in the Kelly test requires that there be one and only one approach to a scientific problem. The question is whether scientists significant in number or expertise publicly oppose a technique as unreliable, not whether some scientists believe there may be an alternative, perhaps even better, technique available.

Evidence > Scientific Evidence > DNA

[HN16] The product rule reliably shows the rarity of a deoxyribonucleic acid (DNA) profile in the relevant population. To this extent, the product rule has already passed the Kelly test.

Evidence > Scientific Evidence > DNA***Evidence > Testimony > Experts > Kelly-Frye Process***

[HN17] Use of the product rule in a cold hit case is not the application of a new scientific technique subject to a further Kelly (or Kelly-like) test.

Evidence > Relevance > Relevant Evidence***Evidence > Testimony > Experts > Kelly-Frye Process***

[HN18] When use of a scientific technique has been found reliable, it is for the trial court, not the scientific community, to determine the relevance of the technique to a criminal prosecution. What is and is not relevant is not appropriately decided by scientists and statisticians. The court is not always in a position to determine what is good science and what is bad science. Questions of relevancy, however, have never been outside of judicial competence. Determining what evidence is and is not relevant is a hallmark responsibility of the trial judge and that responsibility is not appropriately delegated to parties outside the court. Relevancy is a legal issue for courts to answer.

Evidence > Relevance > Relevant Evidence

[HN19] Relevant evidence is evidence having any tendency in reason to prove or disprove any disputed fact that is of consequence to the determination of the action. Evid. Code, § 210. The test of relevance is whether the evidence tends, logically, naturally, and by reasonable inference to establish material facts such as identity, intent, or motive.

Evidence > Relevance > Relevant Evidence***Evidence > Scientific Evidence > DNA***

[HN20] The product rule generates relevant evidence even in a cold hit case.

Evidence > Relevance > Relevant Evidence***Evidence > Scientific Evidence > DNA***

[HN21] It is relevant for a jury to know that most persons of at least major portions of the general population could not have left evidence samples. This remains true even when the suspect is first located through a database search. The database match probability ascertains the probability of a deoxyribonucleic acid (DNA) match from a given database. But the database is not on trial. Only the defendant is. Thus, the question of how probable it is that the defendant, not the database, is the source of the crime scene DNA remains relevant. The rarity statistic addresses this question.

SUMMARY:

CALIFORNIA OFFICIAL REPORTS SUMMARY Defendant was charged for a 1976 murder in 2002, after investigators compared evidence from the murder scene with defendant's deoxyribonucleic acid (DNA) profile on a database and identified him as a possible donor of the evidence. At trial, the prosecution presented evidence that the

odds that a random person unrelated to defendant from the population group that produced odds most favorable to him could have fit the profile of some of the crime scene evidence were one in 930 sextillion. The jury convicted defendant of first degree murder. (Superior Court of Sacramento County, No. 02F06021, Gary S. Mullen, Judge.) The Court of Appeal, Third Dist., No. C047366, affirmed the judgment.

Defendant was charged for a 1976 murder in 2002, after investigators compared evidence from the murder scene with defendant's deoxyribonucleic acid (DNA) profile on a database and identified him as a possible donor of the evidence. At trial, the prosecution presented evidence that the odds that a random person unrelated to defendant from the population group that produced odds most favorable to him could have fit the profile of some of the crime scene evidence were one in 930 sextillion. The jury convicted defendant of first degree murder. (Superior Court of Sacramento County, No. 02F06021, Gary S. Mullen, Judge.) The Court of Appeal, Third Dist., No. C047366, affirmed the judgment.

The Supreme Court affirmed the judgment of the Court of Appeal, holding first that the precharge delay did not violate defendant's fair trial and due process rights under California law, which were at least as favorable for defendant as the law under U.S. Const., 5th Amend. The justification for the precharge delay outweighed the prejudice defendant suffered from the delay. The delay was investigative, nothing else. The police may have had some basis to suspect defendant of the crime shortly after it was committed, but the case was not fully solved until 2002, when a cold hit showed that the evidence came from defendant. The court also concluded that the jury properly heard evidence that it was virtually impossible that anyone other than defendant could have left the evidence found at the crime scene. Use of the "product rule" in a cold hit case was not the application of a new scientific technique subject to a further *Kelly* (or *Kelly*-like) test, and the fact that a match ultimately comes about by means of a database search does not deprive a "rarity statistic" of all relevance under Evid. Code, § 210. (Opinion by Chin, J., expressing the unanimous view of the court.) [*1243]

HEADNOTES CALIFORNIA OFFICIAL REPORTS HEADNOTES

(1) Evidence § 77--DNA--Precharge Delay--Justification--Rarity Statistics.--Where defendant was charged in 2002 for a 1976 murder, the justification for the precharge delay--deoxyribonucleic acid (DNA) testing in 2002 that provided strong new evidence of guilt--outweighed the prejudice defendant suffered from the delay. Accordingly, the delay did not violate defendant's constitutional rights to a fair trial and due process. The jury properly heard evidence that it was virtually impossible that anyone other than defendant could have left the evidence found at the crime scene.

[Erwin et al., Cal. Criminal Defense Practice (2007) ch. 71, § 71.25; 5 Witkin & Epstein, Cal. Criminal Law (3d ed. 2000) Criminal Trial, §§ 281 et seq., 315; 2 Witkin, Cal. Evidence (4th ed. 2000) Demonstrative, Experimental, and Scientific Evidence, § 62.]

(2) Criminal Law § 61--Rights of Accused--Speedy Trial--Precharge Delay.--The speedy trial provisions of U.S. Const., 6th Amend., and Cal. Const., art. I, § 15, cl. 1, do not apply until either the defendant has been arrested or a charging document has been filed.

(3) Constitutional Law § 107--Due Process--Rights in Criminal Prosecutions--Precharge Delay--Prejudice--Justification--California Law.--Although precharging delay does not implicate speedy trial rights, a defendant is not without recourse if the delay is unjustified and prejudicial. The right to due process protects a criminal defendant's interest in fair adjudication by preventing unjustified delays that weaken the defense through the dimming of memories, the death or disappearance of witnesses, and the loss or destruction of material physical evidence. Accordingly, delay in prosecution that occurs before the accused is arrested or the complaint is filed may constitute a denial of the right to a fair trial and to due process of law under the California and United States Constitutions. A defendant seeking to dismiss a charge on this ground must demonstrate prejudice arising from the delay. The prosecution may offer justification for the delay, and the court considering a motion to dismiss balances the

harm to the defendant against the justification for the delay. The law under the California Constitution is at least as favorable for a defendant with regard to what justifies precharge delay as is the law under the United States Constitution.

(4) Criminal Law § 23--Defenses--Statutes of Limitation--Murder--Precharge Delay--Prejudice.--The statute of limitations is usually considered the primary guarantee against bringing overly stale criminal charges, and there is no statute of limitations on murder. Presuming [*1244] prejudice from precharge delay would be inconsistent with the Legislature's declining to impose a statute of limitations for murder, among the most serious of crimes. To avoid murder charges due to delay, the defendant must affirmatively show prejudice.

(5) Constitutional Law § 107--Due Process--Rights in Criminal Prosecutions--Precharge Delay--Justification--Prejudice--Negligence--Balancing Process.--The ultimate inquiry in determining a claim based upon due process violations is whether the defendant will be denied a fair trial. If such deprivation results from unjustified delay by the prosecution coupled with prejudice, it makes no difference whether the delay was deliberately designed to disadvantage the defendant, or whether it was caused by negligence of law enforcement agencies or the prosecution. In both situations, the defendant will be denied his right to a fair trial as a result of government conduct. Thus, although delay may have been caused only by the negligence of the government, the prejudice suffered by a defendant may be sufficient when balanced against the reasons for the delay to constitute a denial of due process. This does not mean, however, that whether the delay was purposeful or negligent is irrelevant. The reason for delay is relevant to the balancing process. Purposeful delay to gain an advantage is totally unjustified, and a relatively weak showing of prejudice would suffice to tip the scales towards finding a due process violation. If the delay was merely negligent, a greater showing of prejudice would be required.

(6) Constitutional Law § 107--Due Process--Rights in Criminal Prosecutions--Precharge Delay.--A court should not second-guess the prosecution's decision regarding whether sufficient evidence exists to warrant bringing charges. The due process clause does not permit courts to abort criminal prosecutions simply because they disagree with a prosecutor's judgment as to when to seek an indictment. Prosecutors are under no duty to file charges as soon as probable cause exists but before they are satisfied they will be able to establish the suspect's guilt beyond a reasonable doubt. Investigative delay is fundamentally unlike delay undertaken by the government solely to gain tactical advantage over an accused, because investigative delay is not so one-sided. A prosecutor abides by elementary standards of fair play and decency by refusing to seek indictments until he or she is completely satisfied the defendant should be prosecuted and the office of the prosecutor will be able to promptly establish guilt beyond a reasonable doubt. Many legitimate reasons exist why the government might delay bringing charges even after it has sufficient evidence to convict.

(7) Constitutional Law § 107--Due Process--Rights in Criminal Prosecutions--Precharge Delay--Justification--Resources.--A court may [*1245] not find negligence by second-guessing how the state allocates its resources or how law enforcement agencies could have investigated a given case. The necessity of allocating prosecutorial resources may cause delays valid under the *Lovasco* analysis. Thus, the difficulty in allocating scarce prosecutorial resources (as opposed to clearly intentional or negligent conduct) is a valid justification for delay. It is not enough for a defendant to argue that if the prosecutorial agencies had made defendant's case a higher priority or had done things a bit differently they would have solved the case sooner.

(8) Evidence § 73--New Scientific Techniques--Admissibility--Tests.--The admissibility of expert testimony based on a new scientific technique requires proof of its reliability--i.e., that the technique is sufficiently established to have gained general acceptance in the particular field to which it belongs. Once an appellate court has affirmed in a published opinion a trial court ruling admitting evidence based on a new scientific technique, the precedent may control future trials, at least until new evidence is presented that reflects a change in the scientific community's attitude.

(9) Evidence § 77--DNA--Admissibility--Product Rule--Cold Hit Cases--Relevance.--In a number of respects,

deoxyribonucleic acid (DNA) evidence has been subjected to the *Kelly* test and found admissible. When a suspect's DNA sample is compared to a crime scene sample, the product rule has gained general acceptance in the relevant scientific community and therefore meets the *Kelly* standard for admissibility. The product rule reliably shows what it purports to show--the rarity of the genetic profile in the population group. Accordingly, its admissibility in a cold hit case is a question of relevance, not scientific acceptance, and it is thus not subject to a further *Kelly* test. Although the product rule is not the only available method of statistical analysis in a cold hit case, it is relevant and thus admissible.

(10) Evidence § 73--New Scientific Techniques--Admissibility--Alternative Approaches.--Nothing in the *Kelly* test requires that there be one and only one approach to a scientific problem. The question is whether scientists significant in number or expertise publicly oppose a technique as unreliable, not whether some scientists believe there may be an alternative, perhaps even better, technique available.

(11) Evidence § 74--Scientific Techniques--Admissibility--Established Reliability--Relevance--Judicial Competence.--When use of a scientific technique has been found reliable, it is for the trial court, not the scientific community, to determine the relevance of the technique to a [*1246] criminal prosecution. Relevancy of evidence is not appropriately decided by scientists and statisticians. The court is not always in a position to determine what is good or bad science; however, questions of relevancy have never been outside of judicial competence. Determining relevancy is a hallmark responsibility of the trial judge and that responsibility is not appropriately delegated to parties outside the court.

(12) Evidence § 22--Admissibility--Relevance.--Relevant evidence is evidence having any tendency in reason to prove or disprove any disputed fact that is of consequence to the determination of the action (Evid. Code, § 210). The test of relevance is whether the evidence tends, logically, naturally, and by reasonable inference to establish material facts such as identity, intent, or motive.

(13) Evidence § 77--DNA--Admissibility--Relevance--Rarity Statistics--Database Search.--It is relevant for a jury to know that most persons of at least major portions of the general population could not have left genetic evidence samples. This remains true even when the suspect is first located through a database search. The database match probability ascertains the probability of a deoxyribonucleic acid (DNA) match from a given database. But the database is not on trial. Only the defendant is. Thus, the question of how probable it is that the defendant, not the database, is the source of the crime scene DNA remains relevant. The "rarity statistic" addresses this question.

COUNSEL: Cara DeVito, under appointment by the Supreme Court, for Defendant and Appellant.

John T. Philipsborn and Linda F. Robertson for California Attorneys for Criminal Justice and California Public Defenders' Association as Amici Curiae on behalf of Defendant and Appellant.

Jennifer Friedman, Public Defender (Los Angeles); and Edward J. Ungvarsky for Los Angeles Public Defender and Public Defender Service for the District of Columbia as Amici Curiae on behalf of Defendant and Appellant.

Bill Lockyer and Edmund G. Brown, Jr., Attorneys General, Robert R. Anderson and Dane R. Gillette, Chief Assistant Attorneys General, Mary Jo Graves and Michael P. Farrell, Assistant Attorneys General, J. Robert Jibson, [*1247] Janet E. Neeley, Enid A. Camps and Judy Kaida, Deputy Attorneys General, for Plaintiff and Respondent.

Bonnie M. Dumanis, District Attorney (San Diego), Catherine Stephenson and James E. Atkins, Deputy District Attorneys, for Office of the District Attorney of San Diego County as Amicus Curiae on behalf of Plaintiff and Respondent.

JUDGES: Opinion by Chin, J., expressing the unanimous view of the court.

OPINION BY: Chin**OPINION**

[***73] [**52] **CHIN, J.**--In 2002, investigators compared evidence from a 1976 murder scene with defendant's deoxyribonucleic acid (DNA) profile and identified defendant as a possible donor of that evidence. He was then tried for and convicted of that murder. The prosecution presented evidence that the odds that a random person unrelated to defendant from the population group that produced odds most favorable to him could have fit the profile of some of the crime scene evidence are one in 930 sextillion (93 followed by 22 zeros). Because the world's total population is only about seven billion (seven followed by nine zeros), this evidence is tantamount to saying that defendant left the evidence at the crime scene. We granted review to decide issues arising from prosecutions following such DNA "cold hits" many years after the crime.

(1) We conclude that the justification for the delay in charging defendant with this 1976 crime--he was not charged until further investigation, specifically the DNA testing in 2002, provided strong new evidence of his guilt--outweighed the prejudice defendant suffered from the delay. Accordingly, the delay did not violate defendant's constitutional rights to a fair trial and due process. We also conclude that the jury properly heard evidence that it was virtually impossible that anyone other than defendant could have left the evidence found at the crime scene.

Accordingly, we affirm the judgment of the Court of Appeal, which reached similar conclusions.

I. FACTS AND PROCEDURAL HISTORY

Because neither party petitioned the Court of Appeal for a rehearing, we take our facts largely from that court's opinion. (*Richmond v. Shasta Community Services Dist.* (2004) 32 Cal.4th 409, 415 [9 Cal. Rptr. 3d 121, 83 P.3d 518]; see Cal. Rules of Court, rule 8.500(c)(2).)

[**53] In the late afternoon of February 23, 1976, Ollie George, a 19-year-old college student, drove her brother's car to a shopping center in Sacramento to [*1248] buy some nylons. Around 5:30 p.m., she told her mother by telephone that the car would not start. Around that time, she was seen at a nearby McDonald's restaurant. Later [***74] the car was found unattended at the shopping center, with the door unlocked and the keys in the ignition. The car contained grocery items, nylons, Ollie's purse, and a partially eaten McDonald's hamburger. Ollie was missing. Her family notified the police that she was missing, and her disappearance was reported in the newspaper and on television. Two people said they had observed Ollie inside a car at the shopping center around the time she disappeared. The hood was open, and a man described as African-American appeared to be working on the engine. One witness said the man was wearing a "watch cap."

Two days later, Ollie's body was found in an unincorporated area of Sacramento County. She had been raped and drowned in mud.

Within a couple of weeks, one of the witnesses saw what he believed to be the same car in which he had seen Ollie around the time she disappeared. He reported the license number to the police. The car was defendant's faded blue Oldsmobile F85. In early March 1976, sheriff's detectives observed defendant and his car in an apartment parking lot. He was wearing a watch cap. He agreed to go to the sheriff's department for an interview. There, he gave a rather confused account of his whereabouts at the time Ollie disappeared. Defendant's mother-in-law said that defendant was at her house sometime between 4:00 and 6:00 p.m. on the day Ollie disappeared, but she also said that defendant never stayed long at her house.

During the investigation, detectives received hundreds of tips, including reports that Ollie, or at least a woman who, like Ollie, was African-American, was seen with a Caucasian male or males. Detectives interviewed over 180 potential witnesses and followed other leads. However, they were unable to develop sufficient evidence to focus the investigation on a specific person. Eventually, the matter became a cold case, that is, unsolved but inactive.

In later years, for unrelated events, defendant was convicted of criminal offenses, including rape and forcible oral copulation, and was sentenced to a lengthy prison term. A biological sample was obtained from him for DNA analysis

and entry into the state convicted offender databank.

In October 2000, the state allocated funds to enable local law enforcement agencies to utilize DNA to solve sexual assault cases that lacked suspects. Sacramento County began hiring and training analysts, a process that takes about a year. At that time, the county had about 1,600 unsolved sexual assault cases. In July 2001, a review of Ollie George's death determined that the case had biological evidence warranting analysis. The case was put in line for [*1249] DNA analysis. The evidence included a vaginal swab, semen stains on Ollie's sweater, and Ollie's hair samples obtained during the autopsy. An analyst used part of a semen stain from the sweater to develop a DNA profile. The state Department of Justice obtained that profile for comparison, by computer, with the state's convicted offender databank. At the time, the databank contained about 184,000 individual profiles. The search resulted in a match with one of the persons in the databank. Defendant was that person, and he was identified as a potential source of the semen stain.

In 2002, with a warrant, detectives obtained oral swabs from defendant, which were analyzed with Ollie's vaginal swab, the semen stains on her sweater, and her hair samples. Defendant's DNA matched the DNA of each of the evidence samples. As a result, defendant was charged with Ollie's first degree murder. Before trial, defendant moved unsuccessfully to have [***75] the matter dismissed due to the delay in charging him with the murder. (This point will be discussed further in pt. II.A., *post.*) At trial, over objection, the prosecution presented evidence that the DNA profile on the vaginal swab would occur at random among unrelated individuals in about one in 950 sextillion African-Americans, one in 130 septillion Caucasians, and one in 930 sextillion Hispanics. There [***54] are 21 zeros in a sextillion and 24 zeros in a septillion. (This evidence will be discussed further in pt. II.B., *post.*)

In view of the DNA evidence, the defense did not deny that defendant had sexual intercourse with Ollie. Rather, the defense claimed that Ollie and defendant had consensual intercourse on the weekend before she disappeared, and that someone else abducted, raped, and murdered her.

The jury convicted defendant of first degree murder, and the trial court sentenced him accordingly. The Court of Appeal affirmed the judgment. We granted defendant's petition for review limited to the following questions: (1) Did the delay in charging defendant violate his state and federal constitutional rights? (2) Does the methodology for assessing the statistical significance of a "cold hit" from a DNA database require proof of general scientific acceptance? (3) How should the statistical significance of a "cold hit" from a DNA database be calculated?

II. DISCUSSION

A. Delay in Bringing Charges

Defendant was charged with Ollie's 1976 murder in 2002. He contends his state and federal constitutional rights to a fair trial and due process were violated because the delay was unjustified and prejudiced his defense. The prosecution contends the delay was justified because it did not have enough [*1250] evidence to bring charges until the 2002 comparison of the crime scene evidence with defendant's DNA resulted in a match. It also contends, and defendant does not deny, that it prosecuted defendant reasonably promptly after it obtained the DNA evidence.

(2) Defendant's state and federal constitutional speedy trial rights (U.S. Const., 6th Amend.; Cal. Const., art. I, § 15, cl. 1) are not implicated in this case. [HN1] Neither applies until at least the defendant has been arrested or a charging document has been filed. (See *People v. Martinez* (2000) 22 Cal.4th 750, 754-755 [94 Cal. Rptr. 2d 381, 996 P.2d 32].) Defendant was not charged with or arrested for this murder until 2002, so his speedy trial rights did not attach until that time. He does not complain of delay after that time.

(3) Defendant complains only of delay between the murder and the time the state first charged him with the crime (hereafter sometimes referred to as precharging delay). [HN2] Although precharging delay does not implicate speedy trial rights, a defendant is not without recourse if the delay is unjustified and prejudicial. "[T]he right of due process protects a criminal defendant's interest in fair adjudication by preventing unjustified delays that weaken the defense through the dimming of memories, the death or disappearance of witnesses, and the loss or destruction of material physical evidence." (*People v. Martinez, supra*, 22 Cal.4th at p. 767.) Accordingly, "[d]elay in prosecution that occurs before the accused is arrested or the complaint is filed may constitute a denial of the right to a fair trial and to due process of law under the state and federal Constitutions. A defendant seeking to dismiss a charge on this ground must demonstrate prejudice arising from the delay. The prosecution may [***76] offer justification for the delay, and the

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court considering a motion to dismiss balances the harm to the defendant against the justification for the delay." (*People v. Catlin* (2001) 26 Cal.4th 81, 107 [109 Cal. Rptr. 2d 31, 26 P.3d 357] (*Catlin*).)

(4) Defendant argues that when the delay is as long as it was here, prejudice should simply be presumed, with no need to show specific prejudice. That has never been the law, and we decline to adopt such a rule here. As we have explained, "[t]he [HN3] statute of limitations is usually considered the primary guarantee against bringing overly stale criminal charges," and there "is no statute of limitations on murder." (*People v. Archerd* (1970) 3 Cal.3d 615, 639 [91 Cal. Rptr. 397, 477 P.2d 421] (*Archerd*).) Presuming prejudice would be inconsistent with the Legislature's declining to impose a statute of limitations for murder, among the most serious of crimes. To avoid murder charges due to delay, the defendant must affirmatively show prejudice.

In this case, defendant did demonstrate some prejudice due to the delay. In a meticulous [**55] opinion, the Court of Appeal considered every basis on which [*1251] defendant claimed prejudice. It discussed the significance of witnesses defendant claimed were unavailable due to the delay and concluded that, although some of the missing witnesses would have provided relevant testimony, the overall prejudice was slight, especially considering the evidence defendant was able to produce at trial. It discussed defendant's other claims of prejudice, including loss of memory, missing photographs, lost or destroyed physical evidence (swabs from the autopsy, degraded DNA samples, fingerprints, hair, and tire tracks), loss of alibi evidence, and unavailable facts for pretrial motions. In each case, the Court of Appeal concluded that the claim of prejudice was either overstated, speculative, or meritless. We have reviewed the Court of Appeal's opinion in this respect and find it thorough and reliable. We agree with its conclusion that "defendant demonstrated some prejudice sufficient to require the prosecution to justify the preaccusation delay, but the prejudice was minimal."

The prejudice to defendant must be balanced against the justification for the delay. The state and federal constitutional standards regarding what justifies delay differ. Regarding the federal constitutional standard, we have stated that "[a] claim based upon the federal Constitution also requires a showing that the delay was undertaken to gain a tactical advantage over the defendant." (*Catlin, supra*, 26 Cal.4th at p. 107; see also *People v. Horning* (2004) 34 Cal.4th 871, 895 [22 Cal. Rptr. 3d 305, 102 P.3d 228].) Defendant argues that the showing that the United States Constitution requires is not quite this onerous. As we explain, the exact standard under that Constitution is not entirely settled. It is clear, however, that [HN4] the law under the California Constitution is at least as favorable for defendant in this regard as the law under the United States Constitution. Accordingly, we can and will apply California law.

In *United States v. Marion* (1971) 404 U.S. 307 [30 L.Ed.2d 468, 92 S.Ct. 455] (*Marion*), the high court held that Sixth Amendment speedy trial rights do not apply before arrest. "Passage of time, whether before or after arrest, may impair memories, cause evidence to be lost, deprive the defendant of witnesses, and otherwise interfere with his ability to defend himself. But this possibility of prejudice at trial is not itself sufficient reason to wrench the Sixth Amendment from its proper context. Possible prejudice is inherent in any delay, however short; it may also weaken the [***77] Government's case." (404 U.S. at pp. 321-322, fn. omitted.) Because of this, the court explained, the applicable statute of limitations is the primary guarantee against delay. (*Id.* at p. 322.) However, the court also explained that "the statute of limitations does not fully define the appellees' rights with respect to the events occurring prior to indictment. Thus, the Government concedes that the Due Process Clause of the Fifth Amendment would require dismissal of the indictment if it were shown at trial that the pre-indictment delay in this case caused substantial prejudice to appellees' rights to a fair trial and that the delay was an [*1252] intentional device to gain tactical advantage over the accused. [Citations.] However, we need not, and could not now, determine when and in what circumstances actual prejudice resulting from pre-accusation delays requires the dismissal of the prosecution. Actual prejudice to the defense of a criminal case may result from the shortest and most necessary delay; and no one suggests that every delay-caused detriment to a defendant's case should abort a criminal prosecution. To accommodate the sound administration of justice to the rights of the defendant to a fair trial will necessarily involve a delicate judgment based on the circumstances of each case. It would be unwise at this juncture to attempt to forecast our decision in such cases." (*Id.* at pp. 324-325, fns. omitted.) The court went on to hold that because the defendants had not shown either prejudice or an intentional delay to gain a tactical advantage, they could not show a due process violation. (*Id.* at pp. 325-326.)

Later, in *United States v. Lovasco* (1977) 431 U.S. 783 [52 L.Ed.2d 752, 97 S.Ct. 2044] (*Lovasco*), the high court

reiterated that "the Due Process Clause has a limited role to play in protecting against oppressive delay." (*Id.* at [**56] p. 789.) It explained that "*Marion*[, *supra*, 404 U.S. 307,] makes clear that proof of prejudice is generally a necessary but not sufficient element of a due process claim, and that the due process inquiry must consider the reasons for the delay as well as the prejudice to the accused." (*Id.* at p. 790.) Regarding justification for the delay, the court stressed that "the Due Process Clause does not permit courts to abort criminal prosecutions simply because they disagree with a prosecutor's judgment as to when to seek an indictment. ... [¶] It requires no extended argument to establish that prosecutors do not deviate from 'fundamental conceptions of justice' when they defer seeking indictments until they have probable cause to believe an accused is guilty It should be equally obvious that prosecutors are under no duty to file charges as soon as probable cause exists but before they are satisfied they will be able to establish the suspect's guilt beyond a reasonable doubt. ... [N]o one's interests would be well served by compelling prosecutors to initiate prosecutions as soon as they are legally entitled to do so. [¶] It might be argued that once the Government has assembled sufficient evidence to prove guilt beyond a reasonable doubt, it should be constitutionally required to file charges promptly, even if its investigation of the entire criminal transaction is not complete. Adopting such a rule, however, would have many of the same consequences as adopting a rule requiring immediate prosecution upon probable cause." (*Id.* at pp. 790-792, fns. omitted.)

The *Lovasco* court went on to explain the many legitimate reasons the government might delay bringing charges even after it has sufficient evidence to convict. (*Lovasco, supra*, 431 U.S. at pp. 792-795.) Because of these reasons, [***78] in its view, "investigative delay is fundamentally unlike delay undertaken by the Government solely 'to gain tactical advantage over the [*1253] accused,' *United States v. Marion*, 404 U.S., at 324, precisely because investigative delay is not so one-sided." (*Id.* at p. 795.) In a footnote at this point, the court added, "In *Marion* we noted with approval that the Government conceded that a 'tactical' delay would violate the Due Process Clause. The Government renews that concession here ... and expands it somewhat by stating: 'A due process violation might also be made out upon a showing of prosecutorial delay incurred in reckless disregard of circumstances, known to the prosecution, suggesting that there existed an appreciable risk that delay would impair the ability to mount an effective defense' " (*Id.* at p. 795, fn. 17, citations omitted.) For these reasons, the court "h[e]ld that to prosecute a defendant following investigative delay does not deprive him of due process, even if his defense might have been somewhat prejudiced by the lapse of time." (*Id.* at p. 796.) The court concluded: "In *Marion* we conceded that we could not determine in the abstract the circumstances in which preaccusation delay would require dismissing prosecutions. 404 U.S., at 324. More than five years later, that statement remains true. Indeed, in the intervening years so few defendants have established that they were prejudiced by delay that neither this Court nor any lower court has had a sustained opportunity to consider the constitutional significance of various reasons for delay. We therefore leave to the lower courts, in the first instance, the task of applying the settled principles of due process that we have discussed to the particular circumstances of individual cases. We simply hold that in this case the lower courts erred in dismissing the indictment." (*Id.* at pp. 796-797, fn. omitted.)

Thus, *Lovasco, supra*, 431 U.S. 783, and *Marion, supra*, 404 U.S. 307, indicated that delay undertaken to gain a tactical advantage over the accused, or delay incurred in reckless disregard of circumstances known to the prosecution suggesting that delay might prejudice the defense, would violate due process if the defendant demonstrates prejudice. Additionally, they appeared to leave open the possibility that delay might be unjustified in other circumstances as well. Later, however, the high court said that *Lovasco* had "articulated" that due process claims based on delay in instituting criminal proceedings "can prevail *only* upon a showing that the Government [**57] delayed seeking an indictment in a deliberate attempt to gain an unfair tactical advantage over the defendant or in reckless disregard of its probable prejudicial impact upon the defendant's ability to defend against the charges." (*United States v. \$ 8,850* (1983) 461 U.S. 555, 563 [76 L.Ed.2d 143, 103 S.Ct. 2005], italics added.) Later still, the court said that "the Fifth Amendment requires the dismissal of an indictment, even if it is brought within the statute of limitations, if the defendant can prove that the Government's delay in bringing the indictment was a deliberate device to gain an advantage over him and that it caused him actual prejudice in presenting his defense." (*United States v. Gouveia* (1984) 467 U.S. 180, 192 [81 L.Ed.2d 146, 104 S.Ct. 2292].) This last statement is consistent with what we said in *Catlin, supra*, 26 [*1254] Cal.4th at page 107, although some of the high court's earlier cases suggest the test might be somewhat less onerous.

The law regarding justification for the delay developed differently under state law. An early case that is factually similar [***79] to this one is *Archerd, supra*, 3 Cal.3d 615. In *Archerd*, the defendant was charged with three counts of murder

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by insulin poisoning 11 years after the first victim died. We rejected the defendant's argument that the delay violated his due process rights. We said that for delay to violate due process, there must have been no legitimate reason for the delay, and it must have prejudiced the defendant. (*Id.* at p. 640.)

Regarding delay, we said, "If the government deliberately utilizes delay to strengthen its position by weakening that of the defense or otherwise impairs a defendant's right to a fair trial, an inordinate pre-indictment delay may be shown to be prejudicial. A prosecutor is entitled to reasonable time in which to investigate an offense for the purpose of determining whether a prosecution is warranted and also in preparation of a case for submission to the grand jury. [Citations.] The delay must be purposeful, oppressive, and even 'smack of deliberate obstruction on the part of the government,' before relief will be granted. [Citations.]" (*Archerd, supra*, 3 Cal.3d at p. 640.) We found that the delay in that case was justified. At the time of the first charged murder in 1956, "the police suspected defendant of murder but they were unable to prove it, because at that time all of the medical authority was of the opinion that the cause of death could not be established as due to a criminal agency." (*Id.* at p. 641.) Only developing medical and forensic techniques and additional suspicious deaths permitted the state to collect sufficient evidence to warrant charging the defendant 11 years later. (*Id.* at pp. 641-643; see *Catlin, supra*, 26 Cal.4th at p. 109.) In denying relief to the defendant, we noted that "[t]he delay was neither unreasonable, arbitrary, oppressive [n]or vexatious and was not deliberately caused to harass defendant." (*Archerd, supra*, at p. 643.)

A subsequent Court of Appeal decision expanded the circumstances in which delay could be found unjustified. (*Penney v. Superior Court* (1972) 28 Cal.App.3d 941 [105 Cal. Rptr. 162] (*Penney*)). In *Penney*, murder charges were brought several years after the victim's death, and the defendant argued that the delay violated his due process rights. The appellate court concluded that "[t]he requirement of a legitimate reason for the prosecutorial delay cannot be met simply by showing an absence of deliberate, purposeful or oppressive police conduct. A 'legitimate reason' logically requires something more than the absence of governmental bad faith. Negligence on the part of police officers in gathering evidence or in putting the case together for presentation to the district attorney, or incompetency on the part of the district attorney in evaluating a case for possible prosecution can hardly be considered a valid police purpose justifying a lengthy delay which results in the [*1255] deprivation of a right to a fair trial." (*Penney, supra*, at p. 953.) The court remanded the matter to the trial court to conduct further hearings in light of the test it stated. (*Id.* at pp. 954-955.)

[**58] (5) In *People v. Hannon* (1977) 19 Cal.3d 588, 610-611, footnote 12 [138 Cal. Rptr. 885, 564 P.2d 1203], we noted that "the *Penney* interpretation of the due process issue conflicts with the requirement of intentional delay set forth in *Archerd* and *Marion*," but we expressed no opinion on the question. We next took up the question in *Scherling v. Superior Court* (1978) 22 Cal.3d 493 [149 Cal. Rptr. 597, 585 P.2d 219] (*Scherling*). In *Scherling*, we found [***80] that because the defendant had not shown prejudice, we did not have to determine whether the delay was justified. (*Id.* at p. 506.) But we also stated that we did "not intend to imply that only a deliberate delay by the prosecution for the purpose of prejudicing the defense may justify a conclusion that a defendant has been deprived of due process. [HN5] The ultimate inquiry in determining a claim based upon due process is whether the defendant will be denied a fair trial. If such deprivation results from unjustified delay by the prosecution coupled with prejudice, it makes no difference whether the delay was deliberately designed to disadvantage the defendant, or whether it was caused by negligence of law enforcement agencies or the prosecution. In both situations, the defendant will be denied his right to a fair trial as a result of government conduct. (See *Penney v. Superior Court* [supra], 28 Cal.App.3d 941, 950 [105 Cal. Rptr. 162].) Thus, although delay may have been caused only by the negligence of the government, the prejudice suffered by a defendant may be sufficient when balanced against the reasons for the delay to constitute a denial of due process." (*Id.* at p. 507.)

In the years since *Scherling, supra*, 22 Cal.3d 493, was decided, this court has not again spoken on the point, but a number of Court of Appeal decisions have concluded that negligent, as well as purposeful, delay may be unjustified. (*People v. Dunn-Gonzalez* (1996) 47 Cal.App.4th 899, 911 [55 Cal. Rptr. 2d 404]; *People v. Hartman* (1985) 170 Cal.App.3d 572, 581 [216 Cal. Rptr. 641]; *People v. Pellegrino* (1978) 86 Cal.App.3d 776, 780 [150 Cal. Rptr. 486].)

Accordingly, [HN6] under California law, negligent, as well as purposeful, delay in bringing charges may, when accompanied by a showing of prejudice, violate due process. This does not mean, however, that whether the delay was purposeful or negligent is irrelevant. In *Scherling, supra*, 22 Cal.3d at pages 506-507, we said that because the

"defendant was not prejudiced by the delay, we need not determine whether the delay was justified, particularly since there was no evidence that the delay in prosecution was for the purpose of weakening the defense." In *Catlin*, we found the justification for the delay outweighed the defendant's weak showing of prejudice, but we also observed [*1256] "that there was no evidence that the delay was undertaken in order to gain an advantage over defendant" (*Catlin, supra*, 26 Cal.4th at pp. 109-110.) As these observations imply, [HN7] whether the delay was negligent or purposeful is relevant to the balancing process. Purposeful delay to gain an advantage is totally unjustified, and a relatively weak showing of prejudice would suffice to tip the scales towards finding a due process violation. If the delay was merely negligent, a greater showing of prejudice would be required to establish a due process violation.

(6) In this case, the justification for the delay was strong. The delay was investigative delay, nothing else. The police may have had some basis to suspect defendant of the crime shortly after it was committed in 1976. But law enforcement agencies did not fully solve this case until 2002, when a comparison of defendant's DNA with the crime scene evidence resulted in a match, i.e., until the cold hit showed that the evidence came from defendant. Only at that point did the prosecution believe it had sufficient evidence to charge defendant. [HN8] A court should not second-guess the prosecution's decision regarding whether sufficient evidence exists to warrant bringing charges. "The due process clause does not permit courts to [***81] abort criminal prosecutions simply because they disagree with a prosecutor's judgment as to when to seek an indictment. ... Prosecutors are under no duty to file charges as soon as [**59] probable cause exists but before they are satisfied they will be able to establish the suspect's guilt beyond a reasonable doubt. ... Investigative delay is fundamentally unlike delay undertaken by the government solely to gain tactical advantage over an accused because investigative delay is not so one-sided. A prosecutor abides by elementary standards of fair play and decency by refusing to seek indictments until he or she is completely satisfied the defendant should be prosecuted and the office of the prosecutor will be able to promptly establish guilt beyond a reasonable doubt." (*People v. Dunn-Gonzalez, supra*, 47 Cal.App.4th at pp. 914-915, citing *Lovasco, supra*, 431 U.S. at pp. 790-796; see also *Catlin, supra*, 26 Cal.4th at p. 109 [quoting much of this same language].) Indeed, as explained in *Lovasco, supra*, 431 U.S. at pages 792-795, many legitimate reasons exist why the government might delay bringing charges even after it has sufficient evidence to convict.

(7) Defendant argues that the DNA technology used here existed years before law enforcement agencies made the comparison in this case and that, therefore, the comparison could have, and should have, been made sooner than it actually was. Thus, he argues, the state's failure to make the comparison until 2002 was negligent. We disagree. [HN9] A court may not find negligence by second-guessing how the state allocates its resources or how law enforcement agencies could have investigated a given case. "[T]he necessity of allocating prosecutorial resources may cause delays valid under the *Lovasco* analysis. [Citation.] Thus, the difficulty in allocating scarce [*1257] prosecutorial resources (as opposed to clearly intentional or negligent conduct) [is] a valid justification for delay" (*People v. Dunn-Gonzalez, supra*, 47 Cal.App.4th at p. 915.) It is not enough for a defendant to argue that if the prosecutorial agencies had made his or her case a higher priority or had done things a bit differently they would have solved the case sooner.

In this case, balancing the prejudice defendant has demonstrated against the strong justification for the delay, we find no due process violation. We agree with the Court of Appeal's summary: "[T]he delay was not for the purpose of gaining an advantage over the defendant. [Citation.] Indeed, the record does not even establish prosecutorial negligence. The delay was the result of insufficient evidence to identify defendant as a suspect and the limits of forensic technology. [Citations.] When the forensic technology became available to identify defendant as a suspect and to establish his guilt, the prosecution proceeded with promptness. Without question, the justification for the delay outweighed defendant's showing of prejudice."

B. Admissibility of the DNA Evidence

Defendant contends the court erred in admitting the DNA evidence. Specifically, he contends the evidence regarding the odds that the crime scene evidence could have come from some other person was inadmissible because the statistical method used to calculate those odds has not achieved general scientific acceptance under the standard stated in *People v. Leahy* (1994) 8 Cal.4th 587 [34 Cal. Rptr. 2d 663, 882 P.2d 321] and *People v. Kelly* (1976) 17 Cal.3d 24 [130 Cal. Rptr. 144, 549 P.2d 1240] (sometimes referred to as the *Kelly* test).

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[***82] 1. Background

(8) As relevant here, the *Kelly* test can be summarized as follows: [HN10] The "admissibility of expert testimony based on 'a new scientific technique' requires proof of its reliability--i.e., that the technique is 'sufficiently established to have gained general acceptance in the particular field to which it belongs" ' [citation]." (*People v. Venegas* (1998) 18 Cal.4th 47, 76 [74 Cal. Rptr. 2d 262, 954 P.2d 525], quoting *People v. Kelly, supra*, 17 Cal.3d at p. 30.) Once an appellate court has affirmed in a published opinion a trial court ruling admitting evidence based on a new scientific technique, the precedent may control future trials, at least until new evidence is presented that reflects a change in the scientific community's attitude. (*People v. Venegas, supra*, at p. 76.) (9) [HN11] In a number of respects, [**60] DNA evidence has been subjected to the *Kelly* test and found admissible. Accordingly, a body of law already exists regarding such evidence.

Forensic DNA analysis is a comparison of a person's genetic structure with crime scene samples to determine whether the person's structure matches that [*1258] of the crime scene sample such that the person could have donated the sample. We have explained the comparison process in detail. (*People v. Venegas, supra*, 18 Cal.4th at pp. 58-60.) The Court of Appeal opinion in this case contains an apt summary: "With the exception of red blood cells, every cell in the human body has a nucleus containing the person's genetic code in the form of DNA. ... DNA consists of two parallel spiral sides, a double helix, composed of repeated sequences of phosphate and sugar. The sides are connected by a series of rungs, with each rung consisting of a pair of chemical components called bases. ... There are four types of bases--adenine (A), cytosine (C), guanine (G), and thymine (T). A will pair only with T, and C will pair only with G. ... There are over three billion base pairs in a person's DNA. ... [¶] Except for identical twins, no two persons have identical DNA. ... This makes DNA valuable for forensic purposes. However, there is no practical way of sequencing all three billion base pairs. ... Accordingly, forensic scientists test particular regions called loci that are known to be polymorphic, i.e., variable from person to person. ... Scientists have identified loci where a particular pattern of base pairs is repeated successively for numbers of times that vary from person to person. ... These repetitions are referred to as alleles. ... These alleles can be measured and compared to determine whether a suspect sample matches an evidentiary biological sample at each of the loci tested. ..." (Citations omitted.)

The Court of Appeal explained, "The initial use of DNA for forensic purposes involved what is called restriction fragment length polymorphism (RFLP)." But RFLP testing is now obsolete. In this case, the testing was done by utilizing what is called "polymerase chain reaction" testing using "short tandem repeats" (PCR-STR). PCR-STR testing has many advantages over RFLP testing. It can test a far smaller sample than RFLP testing requires. It is less susceptible to sample degradation. It is simpler and less time consuming. Additionally, as the Court of Appeal also explained, "With the ability to compare numerous loci, the discrimination power of PCR-STR testing is extremely high."

Once a match is found, the next question is the statistical significance of the match. (See *People v. Wilson* (2006) 38 Cal.4th 1237, 1242 [45 Cal. Rptr. 3d 73, 136 P.3d 864].) This case involves that question. [***83] When a suspect's sample is compared to the crime scene evidence, and a match is found, "the DNA profile of the matched samples is compared to the DNA profiles of other available DNA samples in a relevant population database or databases in order to determine the statistical probability of finding the matched DNA profile in a person selected at random from the population or populations to which the perpetrator of the crime might have belonged." (*People v. Soto* (1999) 21 Cal.4th 512, 518 [88 Cal. Rptr. 2d 34, 981 P.2d 958].) "Experts calculate the odds or percentages--usually stated as one in some number-- [*1259] that a random person from the relevant population would have a similar match." (*People v. Wilson, supra*, at p. 1239.)

Experts use a statistical method called the "product rule" to calculate the rarity of the sample in the relevant population. We explained this method in detail in *People v. Soto, supra*, 21 Cal.4th at pages 524-525. As the Court of Appeal summarized it, "The frequency with which each measured allele appears in the relevant population is estimated through the use of population databases. ... The frequencies at each tested locus are multiplied together to generate a probability statistic reflecting the overall frequency of the complete multilocus profile. ... The result reflects the frequency with which the complete profile is expected to appear in the population. ... The result is sometimes expressed as the probability that the DNA of a person selected at random from the relevant population [**61] would match the evidentiary sample at all tested loci. ..." (Citations omitted.)

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The product rule was used to calculate the astronomical odds presented in this case. In order to reach these odds, the criminalist compared 15 loci and found a match at each one. It is now settled that [HN12] when a suspect's sample is compared to a crime scene sample, the product rule "has gained general acceptance in the relevant scientific community and therefore meets the *Kelly* standard for admissibility." (*People v. Soto, supra*, 21 Cal.4th at p. 541.)

Defendant does not challenge the validity of the product rule to calculate the relevant odds when a suspect's DNA sample is compared to the crime scene evidence. But he contends that the situation here is different. Here, the match did not come about by comparing a suspect's profile with the crime scene sample but by a cold hit from a database. Cases like this are sometimes called "trawl cases" because the match was discovered by searching a database of previously obtained DNA samples. (4 Faigman et al., *Modern Scientific Evidence* (2006) *Objections to DNA evidence--Presenting incriminating DNA results--Should match probabilities be excluded?--The effect of a database search*, § 32:11, p. 110 (hereafter *Modern Scientific Evidence*.) In this case, a database containing about 184,000 DNA profiles was searched to see if any matched the crime scene sample. Defendant's profile came back a tentative match. His complete profile was then compared with the crime scene evidence, resulting in a confirmatory match. The product rule then established the odds the jury heard. Defendant contends use of the product rule in this case is a new scientific technique that must, but does not, pass the *Kelly* test.

This contention gives rise to two questions. First is whether use of the product rule to calculate the odds in a cold hit (or trawl) case is a new scientific technique subject to the *Kelly* test. As we explain, it is already [*1260] established that [HN13] the product rule reliably shows what it purports to show--the rarity of the genetic profile in the population group. Accordingly, its admissibility [***84] in a cold hit case is a question of relevance, not scientific acceptance, and it is thus not subject to a further *Kelly* test. This conclusion causes us to go on to the second question: Whether the odds calculated by the product rule are relevant, and thus admissible, in a cold hit case. As we further explain, [HN14] although the product rule is not the *only* available method of statistical analysis in a cold hit case, it is relevant and thus admissible.

2. Whether Use of the Product Rule in a Cold Hit Case Is Subject to the Kelly Test

If use of the product rule in a cold hit case is a new scientific technique, it must pass the *Kelly* test, i.e., it must have gained general acceptance in the field to which it belongs. (*People v. Venegas, supra*, 18 Cal.4th at p. 76.) Defendant argues that it is a new scientific technique subject to the *Kelly* test and that it fails the test.

Defendant agrees that using the product rule to calculate the random match probability makes sense when comparing one suspect's profile with the crime scene evidence because, as he explains, the random match probability "estimates the chance that any *single*, random person drawn from the relevant population would have the same DNA profile as that of the unknown person whose DNA was found at the crime scene." But he contends that a match made in a cold hit through a database search is different. He argues as follows: When a single suspect is compared to the crime scene evidence, "the basic question ('What is the probability or chance that a person selected *at random* from the relevant population would have a DNA profile matching that of the evidentiary sample'), is appropriate because the authorities already have reason to suspect one particular person's DNA profile will match the evidence sample DNA profile before the two profiles are compared. [¶] But that same question presupposes the probability statistic involves a *randomly-selected* person. It thus cannot be posed in a 'cold hit' case, for in such cases the only reason authorities have come to suspect one particular person is because they already know his DNA profile [***62] matches that of the crime scene evidence. In fact, they already compared the DNA profiles of tens of thousands (if not hundreds of thousands), of other persons, in order to find him. [¶] In other words, in a 'cold hit' case the suspect is never 'randomly' selected from the general population." Thus, when a suspect is found by a search of a large DNA database, the chance of a coincidental match is increased because "a single genetic profile (from the crime scene evidence) is compared to the very large number of profiles in these databases." [*1261]

To decide this question, the trial court in this case judicially noticed a lengthy evidentiary hearing conducted in a different criminal case. Accordingly, the Court of Appeal and this court have similarly judicially noticed that record. (See Evid. Code, §§ 452, subd. (d), 459.) A number of experts testified at the hearing. As the Court of Appeal summarized, the witnesses "included Dr. Ranajit Chakraborty, a renowned expert in human population genetics (see *People v. Soto, supra*, 21 Cal.4th at p. 527, fn. 20); Dr. George Sensabaugh, Jr., a forensic biologist and biochemical

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geneticist who is an expert in the forensic use of DNA (see *People v. Pizarro* (2003) 110 Cal.App.4th 530, 589 [3 Cal. Rptr. 3d 21]; *People v. Axell* [(1991) 235 Cal.App.3d 836, 849 [1 Cal. Rptr. 2d 411]]); Gary Sims, who has a master of public health degree with a specialty in forensic science and is director of the case work section of the Department of Justice laboratory; Dr. Dan E. Krane, an associate professor of biological science [***85] at Wright State University; Dr. Norah Rudin, a forensic DNA consultant; and Dr. Laurence Mueller, an ecologist and population geneticist who has frequently appeared as a defense witness at *Kelly* hearings (see, e.g., *People v. Soto, supra*, 21 Cal.4th at p. 529; *People v. Venegas, supra*, 18 Cal.4th at p. 72; *People v. Pizarro, supra*, 110 Cal.App.4th at p. 595; *People v. Smith* (2003) 107 Cal.App.4th 646, 662 [132 Cal. Rptr. 2d 230].)"

This record indicated that, in a cold hit case, four different methods for calculating the statistical significance of a match have been suggested. The Court of Appeal opinion in this case, as well as an opinion from the highest court in the District of Columbia that also addressed this precise issue, discussed the four methods. (See *U.S. v. Jenkins* (D.C. 2005) 887 A.2d 1013, 1019-1020 (*Jenkins*.) One method is the random match probability calculated by use of the product rule. The issue before us is whether this approach is admissible in a cold hit case.

A second method, as the Court of Appeal explained, "was suggested by the National Research Council in 1992. (Nat. Research Council, DNA Technology in Forensic Science (1992) (hereafter NRC-1).) ... The NRC-1 report suggested that in a databank search, one set of loci could be used to screen and identify a suspect and then a different set of loci could be used to confirm a match. Statistical analysis using the product rule would be done on the second set of loci." This approach would obviously use fewer loci to calculate the odds than when all of the loci are considered, which would result in shorter odds; the loci used in the screening process would be ignored in the statistical evaluation. This approach would give a result that is reliable, although one that might be unnecessarily conservative. Because no one questions its reliability, and the only disagreement is whether a different, less conservative, approach (using *all* of the loci in calculating the odds under the product rule) is also valid, we do not discuss this approach further. (See also [*1262] *Jenkins, supra*, 887 A.2d at p. 1022, fn. 17 [not addressing this approach because it "is no longer accepted or followed by the relevant scientific community"].)

The third method was suggested in the 1996 report of the National Research Council. (Nat. Research Council, The Evaluation of Forensic DNA Evidence (1996) (hereafter 1996 NRC Report).) As the Court of Appeal explained, under this approach, "the expected frequency of the profile could be calculated through use of the product rule, and the result could then be multiplied by the number of profiles in the databank. The result would be the expected frequency of the profile in a sample the size of the databank and thus the random chance of finding a match in [***63] a sample of that size. The result may be significant when few loci are tested and the discriminatory power of the testing is limited, but the significance tends to disappear when many loci are tested." (See 1996 NRC Rep., *supra*, at pp. 7, 40, 161.)¹ [***86] The *Jenkins* court called this method the "database match probability" because it gives the probability of a match from the database. (*Jenkins, supra*, 887 A.2d at p. 1020.)

¹ As the Court of Appeal explained, the databank here contained about 184,000 profiles. Even if the numbers of this case were divided by 184,000, the resulting numbers would still be astronomical. The odds for Hispanics, the group producing odds most favorable to defendant, would then be about one in five followed by 18 zeros. We agree with the Court of Appeal that "it seems most unlikely that the difference would be significant to the jury."

Indeed, some courts have suggested that, when the odds are like those here, it might be appropriate for the expert to testify that, except for identical twins or maybe close relatives, "it can be concluded to a reasonable scientific certainty that the evidence sample and the defendant sample came from the same person." (*People v. Johnson* (2006) 139 Cal.App.4th 1135, 1146, fn. 10 [43 Cal. Rptr. 3d 587], quoting *Young v. State* (2005) 388 Md. 99 [879 A.2d 44, 56]; see also *People v. Wilson, supra*, 38 Cal.4th at pp. 1248-1249; *People v. Barney* (1992) 8 Cal.App.4th 798, 817 [10 Cal. Rptr. 2d 731].)

An example might help explain this third method. Assume the product rule calculated random match odds of one in 1,000,000. If a single suspect were compared and a match found, the result would be surprising unless the suspect were the actual donor of the evidence. But if a database of 100,000 were searched, the odds--or database match

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probability--would be about one in 10 that a match would be found even if the actual donor were not in the database. Thus, a match would be less surprising. If the database had a million profiles, at least one match would be expected even if the actual donor was not in the databank. The *Jenkins* court noted that "[i]t is unclear whether the 1996 recommendation advocates the presentation of database match probability alone, or a combination of database match probability and the rarity statistic (which is the same as the random match probability). The FBI's DNA Advisory Board suggests that the 1996 recommendation of the [*1263] National Research Council is best read to require a presentation of both the database match probability and the rarity statistic." (*Jenkins, supra*, 887 A.2d at p. 1020.)

The fourth method is variously referred to as the "Balding-Donnelly" approach, after Professors David Balding and Peter Donnelly, who advocate it (see *Jenkins, supra*, 887 A.2d at pp. 1019-1020), or the use of a "Bayesian formula," named for the Reverend Thomas Bayes, who created the formula in the 19th century. The *Jenkins* court explained that "[i]nstead of focusing on the probability of obtaining a match, Balding-Donnelly focuses on the elimination of other profiles during the search. In their analysis, a match becomes *more significant* with larger database searches. They posit that in obtaining a match in a database search, one simultaneously eliminates other profiles as being the source of the sample. This elimination of known persons increases the chances that the identified individual is the actual source of the sample DNA. In Balding and Donnelly's model, there is a slightly greater probability that the person identified is the source of the DNA than that expressed by the random match probability." (*Jenkins, supra*, at p. 1020, italics added.) Thus, this method would result in evidence slightly more favorable to the prosecution than would use of the product rule. The Court of Appeal criticized the Bayesian method as inherently confusing, difficult to explain to a jury, and possibly misleading. Neither party has sought to admit evidence using this method, and it was not used in this case. Accordingly, we, like the *Jenkins* court, express no opinion on whether it would be admissible. (See *Jenkins, supra*, 887 A.2d at p. 1025, fn. 19.)

(10) Thus, when a suspect is first found by means of a cold hit from a database search, additional methods can be used to calculate the significance of a match that do not exist when a sole suspect is compared to the crime scene evidence. The record in this case suggests some disagreement among experts as to which of these methods is the best, i.e., the most probative, way to judge the significance [***87] of a cold hit. But the question [**64] before us is not what technique is "best," but whether use of the product rule in a cold hit case is permissible. As the Court of Appeal in this case noted, "[n]othing [HN15] in the *Kelly* test requires that there be one and only one approach to a scientific problem. The question is whether scientists significant in number or expertise publicly oppose a technique as unreliable, not whether some scientists believe there may be an alternative, perhaps even better, technique available." It is already settled that [HN16] the product rule reliably shows the rarity of the profile in the relevant population. (*People v. Soto, supra*, 21 Cal.4th 512.) To this extent, the product rule has already passed the *Kelly* test.

The Court of Appeal in this case and other courts that have considered this question have concluded that [HN17] use of the product rule in a cold hit case is not [*1264] the application of a new scientific technique subject to a further *Kelly* (or *Kelly*-like) test. (*People v. Johnson, supra*, 139 Cal.App.4th at pp. 1148-1155; *Jenkins, supra*, 887 A.2d at pp. 1022-1024 [interpreting its own version of the *Kelly* test].) We agree. *Jenkins* explained its reasoning: "At the heart of this debate is a disagreement over the competing questions to be asked, not the methodologies used to answer those questions. The rarity statistic, the database match probability, and the Balding-Donnelly approach each answer unique and potentially relevant questions. More importantly, there is no controversy in the relevant scientific community as to the accuracy of the various formulas. In other words, the math that underlies the calculations is not being questioned. Each approach to expressing significance of a cold hit DNA match accurately answers the question it seeks to address. The rarity statistic accurately expresses how rare a genetic profile is in a given society. Database match probability accurately expresses the probability of obtaining a cold hit from a search of a particular database. Balding-Donnelly accurately expresses the probability that the person identified through the cold hit is the actual source of the DNA [***88] in light of the fact that a known quantity of potential suspects was eliminated through the database search. These competing schools of thought do not question or challenge the validity of the computations and mathematics relied upon by the others. Instead, the arguments raised by each of the proponents simply state that their formulation is more probative, not more correct. Thus, the debate ... is one of relevancy, not methodology" (*Jenkins, supra*, 887

A.2d at pp. 1022-1023, fn. omitted.)

As the *Jenkins* court further noted, "There still exists controversy as to the appropriateness of the use of the rarity statistic, database match probability, or Balding-Donnelly calculation in a cold hit DNA match. This debate, however, still does not address the mathematics or methodology of the various computations. The argument ... is to the relevancy of the statistics, not the soundness of the calculation. ... [¶] The rarity statistic, the database match probability, and the Balding-Donnelly formulation do not purport to address the same issue. In reality, each formula answers a distinctly different question that may be of concern in a cold hit case. ... [T]he rarity statistic simply answers the question: 'How rare is this specific combination of genetic material'? The database match probability answers the question: 'What is the chance/probability of obtaining a match by searching this particular database'? And the Balding-Donnelly calculation answers the question: 'What is the chance/probability that the person identified is the source of the sample in [*1265] light of the fact that all other persons in the database search were eliminated?' [2] [Fn. omitted.] None of the questions are the same; more importantly, none of the answers are mutually exclusive. [**65] [¶] The debate that exists is solely concerned with which number--rarity, database match probability, Balding-Donnelly, or some combination of the above--is most relevant in signifying the importance of a cold hit." (*Jenkins, supra*, 887 A.2d at pp. 1024-1025.)

2 The record in this case does not make clear whether the search that resulted in the cold hit was of the entire database, and thus everyone but defendant was eliminated, or whether, as defendant contends, the search continued only until a match was found, and the entire database was not searched. This uncertainty might implicate the validity of using the Balding-Donnelly approach, but that approach was not used in this case. The uncertainty is not relevant to whether the product rule was properly used in this case. Accordingly, we will assume that the search did not necessarily exclude everyone in the database but only those searched until the cold hit was found.

(11) The Court of Appeal here said much the same thing in discussing the record of this case: "The expert testimony presented to the trial court established that to the extent there is a debate, it is over relevance rather than reliability. Most of the experts who testified agreed that the rarity of the DNA profile in the population is a relevant question. Dr. Mueller, the defense expert, did not disagree that the unmodified product rule establishes rarity in the population, but said he does not find that to be the interesting question. It was apparent that he was referring to relevance and not reliability. [¶] The issue [under the *Kelly* test] is reliability. (*People v. Soto, supra*, 21 Cal.4th at p. 519.) The court does not determine whether the technique is reliable as a matter of scientific fact; rather, the court defers to the scientific community and considers whether the technique is generally accepted as reliable in the scientific community. (*Ibid.*)" But [HN18] when, as here, use of the product rule has been found reliable, "it was for the trial court, not the scientific community, to determine the relevance of the technique to this criminal prosecution."

Relevancy is a legal issue for courts to answer. We agree with *Jenkins* that "[w]hat is and is not relevant is not appropriately decided by scientists and statisticians. This court recognizes that as jurists we are not always in a position to determine what is good science and what is bad science. ... Questions of relevancy, however, have never been outside of judicial competence. Determining what evidence is and is not relevant is a hallmark responsibility of the trial judge and that responsibility is not appropriately delegated to parties outside the court." (*Jenkins, supra*, 887 A.2d at p. 1025.)

For these reasons, we conclude that the admissibility of the calculation derived from the product rule in this case turns on the legal question whether it is relevant. We now consider that question. [*1266]

3. Whether Evidence Obtained by Use of the Product Rule Is Relevant in a Cold Hit Case

(12) " [HN19] Relevant evidence is evidence 'having any tendency in reason to prove or disprove any disputed fact that is of consequence to the determination of the action.' (Evid. Code, § 210.) 'The test of relevance is whether the evidence tends, 'logically, naturally, and by reasonable inference' to establish material facts such as identity, intent, or motive." ' " (*People v. Wilson, supra*, 38 Cal.4th at p. 1245.) Under this [***89] test, [HN20] the product rule generates relevant evidence even in a cold hit case.

It is certainly correct that, as one treatise that discussed this question put it, "the picture is more complicated when the

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defendant has been located through a database search" (Modern Scientific Evidence, *supra*, § 32:11, p. 111.) The *Jenkins* court recognized this circumstance. It explained that in a non-cold-hit case, the number derived from the product rule "represents two concepts: (1) the frequency with which a particular DNA profile would be expected to appear in a population of unrelated people, in other words, how rare is this DNA profile ('rarity statistic'), and (2) the probability of finding a match by randomly selecting one profile from a population of unrelated people, the so-called 'random match probability.' " (*Jenkins, supra*, 887 A.2d at p. 1018.)

The court explained that the government had conceded "that in a cold hit case, the product rule derived number no longer accurately represents the probability of finding a matching profile by chance. The fact that many profiles have been searched increases the probability of finding a match." (*Jenkins, supra*, 887 A.2d at p. 1018, fn. omitted.) The footnote in the middle of this quotation elaborated: "In other words, the product rule number no longer accurately expresses the random match 'probability.' That same product rule number, however, still accurately expresses the *rarity* of the DNA profile. Random match probability and rarity, while [**66] both identical numbers, represent two distinct and separate concepts. Only one of those concepts is affected by a database search: the random match probability." (*Id.* at p. 1018, fn. 7.) The court noted that "the 'database match probability' [the approach suggested in the 1996 NRC Report] more accurately represents the chance of finding a cold hit match" and "can overcome the 'ascertainment bias' of database searches. 'Ascertainment bias' is a term used to describe the bias that exists when one searches for something rare in a set database." (*Id.* at pp. 1018-1019.)

Although the product rule no longer represents the random match probability in a cold hit case, the *Jenkins* court ultimately agreed with the government's argument "that regardless of the database search, the rarity statistic is [**1267] still accurately calculated and appropriately considered in assessing the significance of a cold hit. ... [W]hile a database search changes the probability of obtaining a match, it does not change how rare the existence of that specific profile is in society as a whole. ... This rarity is ... both consistent and relevant regardless of the fact that [the defendant's] identification is the product of a database search." (*Jenkins, supra*, 887 A.2d at p. 1019.)

(13) In a non-cold-hit case, we said that "[i]t is [HN21] relevant for the jury to know that most persons of at least major portions of the general population could not have left the evidence samples." (*People v. Wilson, supra*, 38 Cal.4th at p. 1245.) We agree with other courts that have considered the question (the Court of Appeal in this case; *People v. Johnson, supra*, 139 Cal.App.4th 1135; and *Jenkins, supra*, 887 A.2d 1013) that this remains true even when the suspect is first located through a database search. The database match probability ascertains the probability of a match from a given database. "But the database is not on trial. Only the defendant is." (Modern Scientific Evidence, *supra*, § 32:11, pp. 118-119.) Thus, the question of how probable it is that the *defendant*, not the database, is the source of the crime scene DNA remains relevant. (*Id.* at p. 119.) The rarity statistic addresses this question.

[**90] Defendant was a potential suspect shortly after Ollie George was murdered in 1976. If modern DNA technology and statistical methods had existed then, law enforcement authorities might have compared his DNA to the crime scene DNA and applied the product rule to obtain the same results ultimately obtained after the database search that actually occurred. The relevance and admissibility of the results obtained in that fashion would be beyond question today. The fact that the match ultimately came about by means of a database search does not deprive the rarity statistic of all relevance. It remains relevant for the jury to learn how rare this particular DNA profile is within the relevant populations and hence how likely it is that someone other than defendant was the source of the crime scene evidence.³

³ The conclusion that statistics derived from the product rule are admissible in a cold hit case does not mean that they are the *only* statistics that are relevant and admissible. The database match probability statistic might *also* be admissible. As explained (see fn. 1, *ante*), it is unlikely the database match probability statistic would have been significant to the jury in this case given the size of even that number. But in a different case, if the database were large enough and the odds shorter than those here, the database match probability statistic might also be probative. Nothing we say prohibits its admission.

Accordingly, the trial court correctly admitted the evidence, and the Court of Appeal correctly upheld that admission. [**1268]

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III. CONCLUSION

We affirm the judgment of the Court of Appeal.

George, C. J., Kennard, J., Baxter, J., Werdegar, J., Moreno, J., and Corrigan, J., concurred.