Does the Cold Nose Know--The Unscientific Myth of the Dog Scent Lineup

Andrew E. Taslitz

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**Articles**

Does the Cold Nose Know? The Unscientific Myth of the Dog Scent Lineup

*by*

Andrew E. Taslitz

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Does the Cold Nose Know? The Unscientific Myth of the Dog Scent Lineup

by
ANDREW E. TASLITZ*

Murderers and robbers have been, ere now, convicted, and suffered death under such evidence, and men have said that the finger of God was in it.

—Sir Walter Scott

Is the “finger of God” really behind a dog’s identification of a criminal suspect? A deep human faith in the purity and accuracy of the dog has long said so. This faith in the “inerrant inspiration” of the dog’s nose has led to the dog’s rapidly expanding use in locating avalanche victims, finding lost children, detecting bombs, locating drugs, and tracking escapees. But the most controversial use of the canine olfactory sense remains the dog scent lineup.

In a “dog scent lineup” a dog sniffs an object imbued with a scent known to be from a wrongdoer and then sniffs a line of either objects or people. If the dog “alerts” — that is, barks at, sniffs and paws at, sits near, or mouths a suspect, or an object touched by a suspect — the “alert,” in the form of an alleged match of the object’s scent with that of the suspect, is admitted as substantive evidence that the person identified committed the crime.

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4. Annotation, Dog Scent Discrimination Lineups, 63 A.L.R.4TH 143 (1988 & Supp. 1989). This annotation distinguishes between a “people lineup,” in which the dog identifies the person in a line whose scent the dog determines matches that of an object, and an “inanimate object” lineup, in which a dog uses its scent to identify one object in a line of many objects and determines that it matches that of a particular person. Id. at 144.
For example, a witness sees a murder committed, and although the murderer's face is hidden by shadow, his hat falls off as he escapes. The police have a witness who can identify the murderer's hat but not the murderer himself. An extensive investigation is conducted and, based purely on circumstantial evidence, a group of suspects is assembled into a line. A trained dog sniffs the hat, sniffs each person in the line, and then barks at suspect number three. Literally upon the "nod of [the] dog's head," the suspect is convicted and sentenced to death.7

This illustrative scenario is based on reality. Since the first such reported dog scent lineup took place during the 1920s,8 thousands have been conducted in the United States.9 Individuals have been convicted of robbery,10 rape,11 and even murder12 when the primary evidence identifying them as the culprit was a dog scent lineup identification.13 Indeed, lineups conducted as many as twenty-one months after the crime14 and in which there was significant evidence that the lineups were not reliable have resulted in convictions.15 Some of those convicted were sentenced to life imprisonment or even death.16


7. See State v. Roscoe, 145 Ariz. 212, 700 P.2d 1312 (1984) (death penalty), cert. denied, 471 U.S. 1094 (1985). Roscoe still awaits on death row. Although he has exhausted his rights on direct appeal, a collateral attack on his conviction still is pending, thus delaying his execution. See infra note 153 (discussing Roscoe's fate in greater detail). Cf. Roberts v. State, 298 Md. 261, 469 A.2d 442 (1983) (defendant convicted of rape and sentenced to 50 years imprisonment based on a dog's selection of the defendant in a lineup in which the animal scented a cap worn by the rapist; the victim was unable to confirm this identification).


14. United States v. McNiece, 558 F. Supp. 612, 617 n.6 (E.D.N.Y. 1983); see also Gates, 680 F.2d at 1119 (more than eight months' delay); Epperly, 224 Va. at 220-22, 226-27, 233, 294 S.E.2d at 884-86, 889-90, 893 (13 to 14 days' delay, incorrectly described by the court as an 11-day delay).


Scent lineups have proven surprisingly resistant to legal challenges, surviving attacks on the dog's accuracy\(^\text{17}\) and the suggestiveness of the procedure,\(^\text{18}\) as well as allegations that the lineup violated the accused's constitutional right to confront the witnesses against him.\(^\text{19}\) This resilience is the result of the courts' persistent use of standards that are used to determine the admissibility of more traditional forms of dog identification evidence such as tracking and narcotics detection. In borrowing these standards the courts not only are relying on standards that are themselves ill-reasoned but also are drawing inappropriate analogies between dog scent lineups and other forms of dog identification evidence. The courts' irrational handling of scent lineups also reflects the judiciary's fundamental failure to recognize the mythic qualities of the supposedly infallible dog's power and to understand the role science plays in the law of evidence.

This Article seeks to address these judicial failures. The Article begins in Part I with a discussion of the role of myth in the law of evidence, with emphasis on the mythic dog. The biology and psychology of scenting are explored in Part II, which introduces the scientific nature of dog scent evidence and describes the differences between scent lineups and other types of dog scent evidence. Part III examines the possible evidentiary objections to scent lineups. Part IV considers "full disclosure" to the jury of the relevant scientific data as an alternative to the exclusion of potentially prejudicial and unreliable lineup evidence. Finally, the Article concludes that scientific research is in too early a stage to justify admitting scent lineups as identification evidence in criminal trials, and even if scientific research eventually supports the use of scent lineups, there are numerous alternative approaches to the screening and presentation of such evidence that must be followed to ensure that defendants receive fair trials.

\(^{17}\) See, e.g., McNiece, 558 F. Supp. 612; Roscoe, 145 Ariz. 212, 700 P.2d 1312; Epperly, 224 Va. 214, 294 S.E.2d 882. But see Ramos v. State, 496 So. 2d 121 (Fla. 1986) (first degree murder conviction reversed because there was insufficient evidence that scent lineups are an accurate method for proving identity and because the particular lineup involved was conducted in an unfair manner).


I. The Mythic Infallibility of the Dog

A. Why Myth Matters

Historians understand "myth" to be a unifying concept and recognize that human behavior often is shaped more by perceptions than by objective reality. The concept of myth also is useful in the law of evidence precisely because myth focuses on the perceptions of people. Classifying an idea as a "myth" is not necessarily pejorative. A myth is a "large, controlling image that gives philosophical meaning to the facts of ordinary life; that is, which has organizing value for experience." A myth makes abstract ideas concrete and organizes reality by means of generalizations; generalizations that often are charged with emotion. Myths need not necessarily be grand or fit a "scholarly typology," and consequently images of cowboys and movie stars are as much a part of American mythology as the beliefs in manifest destiny or the classless society.

While myths are often an important part of the social fabric and a way of tying people together by common values and beliefs, "there is, of course, always a danger of illusion, a danger that in ordering one's vision of reality, the myth may predetermine the categories of perception, rendering one blind to things that do not fit the mental image." This danger of blindness is precisely why myths must be

20. This "mythic" view of history is discussed in depth in, among other sources, MYTH AND SOUTHERN HISTORY: THE OLD SOUTH (P. Gerster & N. Cords 2d ed. 1989) [hereinafter MYTH AND SOUTHERN HISTORY]; J. ROBERTSON, AMERICAN MYTH, AMERICAN REALITY (1980).
21. Tindall, Mythology: A New Frontier in Southern History, in MYTH AND SOUTHERN HISTORY, supra note 20, at 2 (quoting Schorer, The Necessity for Myth in MYTH AND MYTHMAKING 355 (H. Murray ed. 1960)). Professor Robertson has similarly, if more simply, defined "myths" as:
the patterns—of behavior, of belief, and of perception—which people have in common. . . . [M]yths are often couched in good stories, very often told of heroes and heroines.

But the "truth" about a people, the "truth" about America and Americans, resides both in American myths and in American realities. The myths are part of the world we live in; so were they part of our grandparents' world. If we would understand our world, or anyone else's, we must understand its myths as well as—indeed as part of—its realities.

J. ROBERTSON, supra note 20, at xv-xvi.
22. See Tindall, supra note 21, at 2.
identified when they become a part of a judicial proceeding in a courtroom. In this setting there are two particular dangers: first, a jury may reach a decision that is based substantially on the unexamined assumptions, images, and feelings that constitute the myth; second, a judge, who after all is a member of our myth-laden society, may be so influenced by the myth that he makes critical evidentiary rulings based more on those views than on any reasoned, probing, analytical effort at divining reality.27

Although neither legal scholars nor the courts expressly have recognized “myth” as a general concept, the importance of exposing specific, individual myths has been the implicit or explicit subject of recent litigation and scholarly commentary. For example, some courts now admit evidence of child sexual abuse accommodation syndrome as a way of rebutting certain myths about sexually abused children, notably that “true” victims immediately report the crime to an adult.28 Similarly, some courts permit psychologists to testify about the weaknesses of eyewitness identifications to challenge the myth that witnesses expressing certainty about identifications are highly reliable.29

When employed in the evidentiary context, a myth as an idea is a particularly powerful analytical tool because of the absence of a more concrete, “scientific” way to approach many evidentiary issues. Controlled research on the psychology of juries and judges is in its infancy.30 Moreover, given the infinite variety of types of evidence and the expense of psychological research, it is improbable that empirical data soon will be amassed regarding the likely effects of each possible piece of evidence on jury members. Myths therefore provide an alternative, or at least a supplement, to psychological research, for evidence identified as imbued with mythic qualities probably will be overvalued, misunderstood, and misused by jurors. Such


29. See, e.g., United States v. Downing, 753 F.2d 1224 (3d Cir. 1985) (discussing the problem of preconceptions regarding eyewitness testimony without explicitly describing the problem as one of “myth”); People v. McDonald, 37 Cal. 3d 351, 690 P.2d 709, 208 Cal. Rptr. 236 (1984) (same).

evidence must be excluded, or special efforts must be made to control the wayward jury.

How can myths be identified? Myths by their nature permeate literature, history, television, movies, and many other forms of popular culture. Moreover, because law deals with human perceptions and misperceptions as well as struggles and compromise, case law often reflects the substance, or is the result, of myths. Identifying myths, therefore, requires only a sensitivity to the concept and a willingness to search in the daily life of our society.

Such a search through the work and literature of artists, historians, writers, police, dog trainers, movie buffs, and judges leaves little doubt of the existence of a belief in the "mythic infallibility" of the dog's nose.

31. See J. Campbell, supra note 24; Myth and Southern History, supra note 20; J. Robertson, supra note 20.
32. See Massaro, supra note 27, at 398, 404, 413 (trial judge's remarks illustrated judicial acceptance of rape myths).
33. "All of us are aware of our myths. They are part of the world we live in." J. Robertson, supra note 20, at xv. Being aware of our myths does not necessarily mean consciously aware. Thus part of the work of historians specializing in the mythic perspective is to identify myths explicitly by finding them in literature, history, and art. Historians then confront us with what we subconsciously knew all along. See id. at xv-xvii, 351.

The United States Supreme Court, while not speaking in terms of a "mythic perspective" on the law, also has inquired into the teachings of history, literature, and philosophy in an attempt to divine fundamental Western values and preconceptions. See Coy v. Iowa, 487 U.S. 1012 (1988). In Coy, the Court cited Roman history, Shakespeare, and other "quotations from antiquity," as well as the words of former President Eisenhower and modern colloquialisms, to demonstrate the existence of the basic "human feeling" that face-to-face confrontation with accusers is necessary for fairness. Id. at 1015-19; cf. Gregg v. Georgia, 428 U.S. 153, 173, 176-82 (1976) (Court survey of history, jury verdicts, and legislation in a search for "objective indicia that reflect the public attitude" toward the death penalty). Interestingly, the Court in Coy and Gregg did not require the taking of expert testimony on history and philosophy. Similarly, the process of identifying a myth that is suggested by this Article assumes that the courts will not look to expert testimony, for courts are well-equipped to find "social" or "legislative" facts (facts involved in deciding questions of law or policy) without the taking of testimony. See Davis, An Approach to Problems of Evidence in the Administrative Process, 55 Harv. L. Rev. 364, 402 (1942) (defining "legislative" facts). The parties may seek to inform the courts' judgment by filing "Brandeis"-type briefs, but the taking of expert testimony on the question of myth generally would be time-consuming and unnecessary, particularly because a myth, even more so than other legislative facts, involves the courts in a very traditional role: using history and philosophy to craft and apply legal rules. Cf. Monahan & Walker, Social Authority: Obtaining, Evaluating, and Establishing Social Science in Law, 134 U. Pa. L. Rev. 477, 510-12 (1986) (recommending that courts rely solely upon briefs and independent judicial investigation when using social science research as authority on questions of law or policy). Of course, exceptions might be made to this general rule when a court finds the relevant research on the myth complex, the assistance of the lawyers incomplete, and the time for making a decision brief. See id.
B. The Myth of the Dog

The "loyalty and utter fidelity" of the dog has been an article of faith in Western culture. Homer's *Odyssey* tells of Odysseus' dog, Argus, an aged canine who, though parted from his master some twenty years, struggled to rise and greet the returning Odysseus. The animal died making the effort. In the Congress of the United States, a Senator publicly praised the "one absolutely unselfish friend that man can have in this selfish world, the one that never deserts him, the one that never proves ungrateful or treacherous, his dog." And Mark Twain, some ten years after this senate speech, wrote in *Pudd'nhead Wilson*: "If you pick up a starving dog and make him prosperous, he will not bite you. That is the principal difference between a dog and a man."

The myth of the dog as it now exists in our legal proceedings was developed out of a combination of the ancient human love of the canine and the centuries of tales of dogs' great scenting feats.

34. Asimov, Preface to *HOUND DUNNIT* at viii (I. Asimov, M. Greenberg & C. Waugh ed. 1987). Professor Asimov provides an excellent summary of several of the tales of canine affection noted below. See also infra notes 35-65 and accompanying text.


36. Asimov, supra note 34, at viii. The Senator continued:

A man's dog stands by him in prosperity and in poverty, in health and in sickness. He will sleep on the cold ground where the wintry winds blow and the snow drives fiercely, if only he may be near his master's side. He will kiss the hand that has no food to offer, he will lick the sores and wounds that come in encounter with the roughness of the world. He guards the sleep of his pauper master as if he were a prince.

When all other friends desert, he remains. When riches take wings and reputation falls to pieces, he is as constant in his love as the sun in its journey through the heavens.

If misfortune drives the master forth an outcast in the world, friendless and homeless, the faithful dog asks no higher privilege than that of accompanying him to guard against danger, to fight against his enemies.

And when the last of all comes, and death takes the master in its embrace, and his body is laid away in the cold ground, no matter if all other friends pursue their way, there by the graveside will the noble dog be found, his head between his paws, his eyes sad, but open in alert watchfulness, faithful and true, even in death.


38. See infra text accompanying notes 39-65. This Article centers on the development of the myth in Western, English-speaking societies, but the myth has force in other cultures.
Many of the tales of canine scenting prowess are true; some simply are legend. Yet by the modern age, dogs have acquired a mythic image of an infallibly sensitive nose that will unerringly lead to evildoers.

The earliest known report of the canine as detective dates from 300-272 B.C. Two men had murdered a slave and fled, leaving the slave's dog, the sole eyewitness, by the body. The King, passing by on a royal progress, ordered the body buried and took the dog in as his own. After some time passed, the dog accompanied his new master on a review of his troops. As two of the soldiers marched past, the animal flew at them in a rage. "'No further evidence was needed, for, in order to escape from the dog, the criminals confessed their guilt.'" 39

Another well known tale of the dog's prowess in sniffing out the guilty comes from Sir Walter Scott, writing in the nineteenth century about the twelfth century crusades. In Blair v. Commonwealth, 40 the court summarized Scott's tale:

In "The Talisman" it is related that in the joint crusade of Richard I of England and Phillip II of France, Roswell, the hound, pulled from the saddle Conrade, Marquis of Montserrat, thus mutely accusing him of the theft of the banner of England. Phillip defended the Marquis with the remark, "'Surely the word of a knight and a prince should bear him out against the barking of a cur.'" To which Richard replied, "'Royal brother, recollect that the Almighty who gave the dog to be companion of our pleasures and our toils, both invested him a nature noble and incapable of deceit. He forgets neither friend nor foe; remembers, and with accuracy, both benefit and injury. He hath a share of man's intelligence, but no share of man's falsehood. You may bribe a soldier to slay a man with his sword, or a witness to take his life by false accusation; but you cannot make a hound tear his benefactor; he is the friend of man save when man justly incurs his enmity. Dress yonder Marquis in what peacock robes you will, disguise his appearance, alter his com-

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40. 181 Ky. 218, 204 S.W. 67 (1918).
plexion with drugs and washes, and hide himself amidst a hundred men, I will yet pawn my sceptre that the hound detects him, and expresses his resentment as you have this day beheld.”

The almost mystic qualities with which history and literature long have painted the dog continue to the modern day. Thus, in the stories of Arthur Conan Doyle, the dog was portrayed as possessing an uncanny talent for finding evildoers. And Rin-Tin-Tin, of course, never failed to find the wrongdoer or the wounded, missing child.

The belief in the dog's infallibility arises not only from fictional accounts, but also from real life experiences including the widespread use of dogs in hunting slaves, tracking down fugitives, and hunting game. Dogs also have found dead bodies, victims of crime, and earthquake victims.

Particular examples of these uses of the dog's nose have fortified the dog's image in the American psyche as an unerring best friend of humans. A well-known non-fictional example is the 1977 tracking of James Earl Ray, the convicted killer of Dr. Martin Luther King, Jr. Ray was able to escape from the Brushy Mountain State Penitentiary in Petros, Tennessee, by eluding armed guards and circumventing an electrified fence, but he could not escape the noses of two

41. *Id.* at 220-21, 204 S.W. at 68 (quoting W. Scott, *supra* note 1). Sir Walter Scott's story retains its appeal for the modern audience. *See, e.g.*, People v. McPherson, 85 Mich. App. 341, 346-47, 271 N.W.2d 228, 230-31 (1978) (although finding dog tracking evidence is insufficient alone to support a conviction, the court cited Scott's story for the proposition that dog scent evidence "has been held in high esteem for centuries"); Buck v. State, 138 P.2d 115, 123 (Okla. Crim. App. 1943) (relying on Sir Walter Scott's story as being equally a tribute to "Old Boston," thus justifying the admission of "Old Boston's" tracking efforts at trial).

42. "Whether it's in real life or in the movies, the escaping con usually has the head start, but just until the law brings in the dogs." 20/20: *Tracking the Tracker* (ABC television broadcast, Oct. 3, 1985) [hereinafter *Tracking the Tracker*] (voice of Geraldo Rivera).

43. A. Doyle, *The Sign of the Four*, in SHERLOCK HOLMES: THE LONG STORIES 187 (Galley Press 1987) ("I know a dog that would follow that scent to the world's end. If a pack can track a trailed herring across a shire, how far can a specially-trained hound follow so pungent a smell as this?"); B. Lowe, HUNTING THE CLEAN BOOT: THE WORKING BLOODHOUND 203 (1981) ("for olfactory scenting the bloodhound is everything that authors, such as Conan Doyle, have implied . . . ."). (quoting Chief Inspector Wilkinson of the Metropolitan Police Dog Training Establishment at Keston, Kent).

44. "What do we know about dogs, you know? . . . Lassie, Rin Tin Tin—we think dogs can do everything, and dogs are so friendly and sweet . . . ." *Tracking the Tracker*, *supra* note 42 (voice of Geraldo Rivera).


48. *Id.* at 12, 63, 65.

bloodhounds. The hounds led their handlers straight to Ray, who had covered himself with leaves to avoid his pursuers.\textsuperscript{50}

The best known modern use of the dog's olfactory talents, however, probably has been in drug trafficking. Dogs are responsible for seizures of drugs worth hundreds of millions of dollars. In Miami from 1973 through 1975, for example, a single golden retriever, Trep, sniffed out sixty-three million dollars worth of drugs, resulting in the conviction of twenty drug dealers.\textsuperscript{51} These stories regularly are reinforced in the popular consciousness as they find their way into newspapers across the country.\textsuperscript{52}

The use of dogs to locate drugs is a recent phenomenon.\textsuperscript{53} The use of dogs' scenting abilities in ferreting out criminal activity, however, is not an entirely new idea. In a use that closely parallels the use of dogs in drug trafficking cases, canines were used during Prohibition to track down moonshiners. One famous team, Pete, a massive bulldog, and his partner, Snake Thompson, captured more moonshiners and destroyed more stills than any other enforcement team. Pete was so successful that a "contract," which luckily failed, once was taken out on the dog's life.\textsuperscript{54} Similarly, dog-sniffing abilities have been employed in the detection of explosives. Man-dog explosive detection teams save thousands of police personnel hours and many lives each year.\textsuperscript{55} Again, these stories often are recounted in newspapers.\textsuperscript{56}

While each of these instances of the dog's scenting prowess has contributed to the canine's mythic stature, the greatest canine mythology has surrounded a single breed: the bloodhound. The hound

\textsuperscript{50} Id.
\textsuperscript{51} Id. at 71.
\textsuperscript{52} E.g., Use of Drug Sniffing Dogs Challenged, Wash. Post, May 6, 1990, at D1, col. 2 (drug-detecting dogs used to search cars); Stepped-Up Drug War to Focus on S.D. Border, L.A. Times, Jan. 26, 1990, at A18, col. 1 (San Diego County ed.) (Administration plans to assign additional teams of drug-sniffing dogs to protect the U.S.-Mexican border).
\textsuperscript{53} The U.S. Customs Service did not begin using dogs as drug-detectors until 1970. Note, Dog Sniff Searches and United States v. Thomas, 19 Loy. L.A.L. Rev. 1097, 1099 n.16 (1986); see also United States v. Solis, 536 F.2d 880, 882 (9th Cir. 1976) (the "recent proliferation of crimes involving the transportation of drugs ... has led naturally to the training and use of dogs ... to detect the presence of such contraband").
\textsuperscript{54} S. CHAPMAN, supra note 39, at 73-74.
\textsuperscript{55} Id. at 32-33; Crowley, Putting Some Teeth Into the Law, POLICE MAG., July 1982, at 61, 63-64. Interestingly, explosives-detection training requires each dog to select the one canister containing explosives from among many, a task that might be characterized as a type of inanimate scent discrimination object lineup. See id. at 61, 64.
\textsuperscript{56} Wanted: Lost Bomb Used in Airport Security, Chicago Trib., Apr. 30, 1990, at C9, col. 1 (dog located half-pound package of explosives planted in luggage); Stalled Talks Delay Airport Detectors, San Francisco Chron., Mar. 29, 1990, at A4, col. 6 (describing dogs as 95% effective in detecting explosives at airports).
not only has been described as “an almost mystical breed, destined for moments of truth,” 57 but its nose unqualifiedly has been declared “two million times as sensitive as a human’s.” 58 Many have dubbed the hound “unerring” 59 and tell amazing stories of the hound’s successes. 60 This image too has reached the public mind, as one commentator has noted:

[Amongst the uninformed he was and is sometimes regarded as a ferocious monster endowed with miraculous scenting attributes; capable of pursuing his victim successfully under any conditions till caught, when he would certainly tear him limb from limb. This may probably be accounted for partly by his name, which is calculated to inspire awe and partly by recollections of slave hunting tales in Uncle Tom’s Cabin. 61

In a 1968 statement, the American Bar Association recognized the risk that a jury will be swayed by a “superstitious faith” in the bloodhound’s accuracy. 62 This same faith or “superstitious awe” occasionally has been noted in the cases. 63 The best summary, however,

58. Id. at 64. The following quote, if somewhat sarcastic, nevertheless captures well the popular image of the bloodhound:

Over all, the bloodhound boasts superior skill, To scent, to view, to turn and boldly kill—His fellows’ vain alarms rejects with scorn, True to his master’s voices and learned horn; His nostrils oft, if ancient fame sings true, Traced the sly felon thro’ the tainted dew; Once sniff’d, he follows with unaltered aim, Nor odours lure him from his chosen game; Deep mouthed, he thunders and inflamed he views, Springs on relentless and to death pursues.

McWhorter, The Bloodhound as a Witness, 54 Am. L. Rev. 109, 117 (1920) (quoting an anonymous poem).

59. E.g., B. Lowe, supra note 43, at 11 (quoting Nimrod, Horse and the Hound (1842)) (noting that the bloodhound “‘possessed the property of unerringly tracing the scent he was laid upon, amongst a hundred others’”).

60. Roger Caras, an ABC network correspondent who has hosted “Pets and Wildlife,” a radio program, tells one such story:

I once helped the New York City police run tests in Central Park with a State Police bloodhound. They wanted to see if the dog could be used in the city environment. Following a trail laid down by a detective, the hound ran right through four softball games and across an area known as the Sheep Meadow. The evening before, 55,000 had attended a rock concert in that field. The dog was able to sort out that one trail out of the lingering 55,000 scents and stay with it.

Caras, supra note 57, at 63.

61. B. Lowe, supra note 43, at 12 (quoting Edwin Brough). Brough discussed the popular perception of bloodhounds as slave hunters. The reality is that foxhounds of the country, sometimes crossed with the Cuban mastiff (nicknamed the “Cuban bloodhound”)—not true bloodhounds—generally were used in hunting slaves. Id.


63. E.g., People v. Perryman, 89 Mich. App. 516, 524, 280 N.W.2d 579, 582 (1979); accord, Cook v. State, 374 A.2d 264, 270 (Del. 1977) (speaking in terms of “the undue prejudice such evidence has upon the jury,” a fear that the court recognized but that did not persuade the court to exclude dog tracking evidence from criminal trials).
of the popular view of the dog's nose and of the connection between
that view and the law of evidence comes from Wigmore:

[I]n actual usage, evidence of the conduct of animals is apt to be
highly misleading, to the danger of innocent men. Amidst the pop-
ular excitement attendant upon a murder and the chase of the sus-
pect, all the facts upon which the trustworthiness of the inference
rests are apt to be distorted . . . Moreover, the very limited nature
of the inference possible is apt to be overestimated—a consequence
dangerous when the jurors are moved by local prejudice . . . . The
hesitation shown in some courts to the use of this evidence is due
to the risks of its misuse by the jury, for in some regions of our
country the mysteriously accurate operation of the dogs' senses has
given rise to a superstitious faith in the dogs' inerrant inspiration,
and this gross popular creed might in a jury mislead them into giv-
ing excessive credit to the evidence of the dogs' itinerary.64

Despite Wigmore's well-known views and the occasional citation of
this passage in the case law,65 for the most part the courts either ig-
gnore the myth, deny its existence, or uncritically accept its truth. The
result has been that courts often have judged, with little justification,
the accuracy of dog scenting evidence by unique standards not ap-
plied to analogous types of evidence. This unique treatment has led
courts to accept arguably unreliable evidence in drug detection, track-
ing, and scent lineup cases without serious inquiry into the wisdom
of doing so. This Article argues that this unique treatment stems from
the impact of canine mythic infallibility on the courts, a subject to
which this Article now turns.

C. How Judges Apply the Myth

(1) The Narcotics Cases

In cases involving dog sniffing for narcotics it is particularly
evident that the courts often accept the mythic dog with an almost
superstitious faith. The myth so completely has dominated the ju-
dicial psyche in those cases that the courts either assume the reli-
bility of the sniff or address the question cursorily; the dog is the
clear and consistent winner. The courts' failure is due to more than
sloppy reasoning; the mythic underpinnings of the cases are revealed
in the grand language chosen to describe the dog's olfactory sen-
sibilities.

In United States v. Waltzer,66 for example, Kane, a federal De-
partment of Enforcement Agency narcotics detector dog, alerted

64. 1A J. WIGMORE, EVIDENCE § 177, at 1852 (1983).
agents to a suspect’s luggage at an airport and the alert resulted in
the suspect’s arrest. A later search of the suspect’s luggage revealed
cocaine. The district court denied the defendant’s motion to suppress
the cocaine and the court of appeals affirmed, concluding that canine
identification is a discriminating and, “in cases such as Kane,” a
reliable method of identifying packages containing narcotics. But
a dog is not necessarily either discriminating or reliable. The ap-
pellate court briefly addressed Kane’s accuracy by simply noting that
he had a “perfect record.” Similarly, Judge Oakes in his concurring
opinion described the prosecution’s key witness as “the able, canny
canine Kane, with the perfect record—all hits and no misses.”69 Es-
entially, the sniff itself was sufficient to establish probable cause
for the arrest.

The reference to Kane’s “perfect record” was meaningless, how-
ever, because the court failed to ask any questions about Kane’s re-
liability or skill beyond noting his “perfect record.” For example,
what was Kane’s earlier scenting experience? Had he previously alerted
to known quantities of cocaine or only to other drugs? Did “perfect”
mean that he had been tested and correct twice, a figure of little
value, or had he been correct on hundreds of occasions? Further-
more, were the circumstances of the search in any way suggestive,70
or were there “handler cues”71 that might have caused Kane to iden-
tify certain persons even though Kane did not himself recognize the
scents of cocaine? The facts of United States v. Young72 illustrate that
asking these kinds of questions is critical to identifying those dog
sniffs that deserve to be relied upon.

In Young, Kane broke his “perfect record” when he erroneously
alerted to narcotics at the defendant’s apartment. The defendant
sought to suppress evidence of firearms found during the search on
the ground that Kane’s unreliable sniff was inadequate to establish
probable cause for the arrest.73 Specifically, the defendant argued
that dog sniffs of apartments are less reliable than sniffs of luggage;

67. Id. at 372-73.
68. Id. at 371.
69. Id. at 374 (Oakes, J., concurring).
70. For example, did the luggage contain cheese or meat, scents that might attract the
dog’s attention? Was the luggage so different in appearance from the other pieces of luggage
that the dog may have chosen it based on sight, not scent? See generally infra notes 471-
548 and accompanying text.
71. “Handler cues” are the conscious or subconscious handler suggestions to the dog
that the dog should identify a particular person or object. See infra notes 205-208 and
accompanying text.
73. Id. at 741.
that there are physical differences between a sniff in a small, confined area and a sniff at the entrance of an apartment; and that a search warrant therefore must provide, at the very least, a detailed account of the searching dog’s track record with respect to apartments and homes. The investigating agent’s search warrant affidavit in Young stated only that Kane was successful in two similar incidents but did not state how many times Kane had failed.

In dicta, the appellate court suggested that it might agree with the defendant’s argument. The court characterized Kane’s sniff as an “arguably unreliable, or at least unsubstantiated, technique.” The court skirted the issue, however, by affirming the defendant’s conviction on the theory that the search was supported by probable cause even without the dog’s erroneous signal.

Other courts have displayed even less sensitivity to the question of accuracy. In Doe v. Renfrow, a school system’s administrators conducted a mass sniffing expedition to uncover student drug use. The dog alerted to fifty students but only seventeen were found in possession of drugs, an accuracy rate of thirty-four percent. The plaintiff brought suit against school officials for allegedly violating her fourth amendment rights. Although the dog’s accuracy rate during the search was very low, the court concluded that the alerts established reasonable cause to believe that the students identified were concealing narcotics. The court praised the nose of the dog: “It is well known that a patrol dog is endowed by nature with qualities of hearing and smell that appear to be superior to those of humans.” The court declared that the dog’s “keen olfactory sense” had “led naturally” to the training of dogs to detect contraband, a task that the court concluded without explanation was similar to the traditional use of dogs in search and rescue missions. Consequently, the court found that the conduct of a properly trained dog can “standing alone” provide the basis for reasonable, and even probable, cause.

Significantly, the court in Renfrow never addressed the dog’s accuracy rate before the search, a matter clearly relevant to probable cause. Nor did it consider that tracking human scent, as is done in

74. Id. at 756.
75. Id.
76. Id. at 758.
77. Id. at 756.
79. Id. at 1025.
80. Id. at 1026 (quoting United States v. Solis, 536 F.2d 880, 882 (9th Cir. 1976)).
81. Id.
search and rescue missions, may be different from tracking drugs, a difference that potentially requires an independent scientific inquiry whether dogs are better or worse at tracking contraband than tracking humans. Finally, the court failed to address in any depth whether the dog had been "properly trained" and it completely ignored the non-discriminating nature of this particular dog's training. The dog apparently reacted to the plaintiff primarily because that morning she had been playing with one of her dogs who was in heat.

The United States Supreme Court has contributed to the lower courts' willingness to assume that a dog's alert to narcotics is inherently reliable. Although the Court in reality has addressed reliability questions only tangentially or in dicta, lower courts have viewed the Court's comments on the question as authoritative statements on the subject. Three cases in particular have guided the lower courts.

In *United States v. Chadwick*, a marijuana detection dog signaled the presence of marijuana inside a footlocker. Although the Court declared the subsequent opening of the locker and inspection of its interior unlawful because the police had not first obtained a warrant, the Court suggested that had the police asked, a warrant unquestionably would have issued based solely on the dog's alert.

A plurality of the Court made similar assumptions regarding the reliability of canine sniffing in *Florida v. Royer*. *Royer* involved a suspected drug courier who was questioned in an airport concourse and then required to accompany the police forty feet to an office, where he consented to a search of his suitcases. The Court held that the consent was the fruit of an arrest without probable cause. In emphasizing that the police had less intrusive means than searching the suitcases to confirm their suspicions, the Court noted that:

The courts are not strangers to the use of trained dogs to detect the presence of controlled substances in luggage. There is no in-

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82. While the court found "no fault with the school administrators using . . . the senses of properly trained outside personnel and dogs," *id.* at 1027, the only indirect reference to the dog's training was that the dog's trainer, Ms. Little, had "vast experience" and ran a legitimate enterprise. *Id.* at 1026.
83. *See id.* at 1017.
84. *See infra* notes 87-94 and accompanying text.
85. *See infra* notes 89, 92.
86. *See infra* notes 89, 92.
88. *See id.* at 15.
89. 460 U.S. 491 (1983); *see also* United States v. Knox, 839 F.2d 285, 291, 294 n.4 (6th Cir. 1988) ("[U]nder Royer, the positive reaction of the Narcotics Unit dog alone would have established probable cause to not only search defendants' luggage, but to arrest them immediately."). *cert. denied*, 109 S. Ct. 1742 (1989).
dication here that this means was not feasible and available. If it had been used, Royer and his luggage could have been momentarily detained while this investigative procedure was carried out . . . A negative result would have freed Royer in short order; a positive result would have resulted in his justifiable arrest on probable cause.90

Finally, in United States v. Place,91 the Court held that a dog sniff is not a "search" within the meaning of the fourth amendment and does not, therefore, require probable cause. In doing so, the Court assumed that a sniff is a discriminate, accurate method for disclosing the presence or absence of narcotics.92 The Court, however, reversed Place's conviction on another ground. Two DEA agents had a reasonable, articulable suspicion that when Place deplaned at LaGuardia airport, he carried narcotics. Although that suspicion justified a brief detention that was limited in scope and designed to investigate circumstances surrounding that suspicion, the Court held that the officers went beyond such limited detention by moving Place's luggage to Kennedy airport in order to conduct the dog sniff, thereby delaying the luggage for ninety minutes.93 In reaching this conclusion, the court relied upon Royer and suggested that a better solution would have been to bring the dog to LaGuardia for a brief sniff, thus minimizing the intrusion while enabling the officers to confirm their suspicions.94 Once again, the Court's implied assumption was that the sniff itself would be highly reliable.

One final point should be noted. The myth has not been completely monolithic and a few cases have challenged the assumption of the dog's infallibility.95 These cases, however, have done little more than flag the issue, and have offered no serious, coherent method

90. Royer, 460 U.S. at 505-06 (emphasis added).
92. Id. at 707; see also United States v. Brown, 731 F.2d 1491, 1492 n.1 (11th Cir. 1984) (citing Place for the proposition that the "Supreme Court has assumed that dog-snoif tests are highly reliable").
93. Id. at 709-10.
94. Id. at 709.
95. See, e.g., United States v. Fernandez, 772 F.2d 495, 497-98 & n.2 (9th Cir. 1985) (noting in dicta that, because there was no evidence of "Marc the Narc's" reliability, the court was unable to determine whether the dog's "hit" established probable cause to search luggage for narcotics); Horton v. Goose Creek Indep. School Dist., 693 F.2d 524, 525 (5th Cir. 1982) (remand for trial court to evaluate dog's reliability before determining whether an alert gave rise to reasonable suspicion), cert. denied, 463 U.S. 1207 (1983); cf. People v. Mayberry, 31 Cal. 3d 335, 342, 644 P.2d 810, 814, 182 Cal. Rptr. 617, 621 (1982) (cautioning that adequate demonstration of a narcotic detector dog's training and experience is necessary before its reaction to an object may be admitted into evidence). See generally Annotation, Use of Trained Dog to Detect Narcotics or Drugs as Unreasonable Search in Violation of Fourth Amendment, 31 A.L.R. Fed. 931 (1986 & Supp. 1989) (collecting cases).
for resolution. The courts have made a more serious, if equally flawed, effort to address the problem in the dog-tracking cases.96

(2) Tracking the Truth

a. The Dog as Sui Generis

In concluding that a dog's sniff is not a search, the United States Supreme Court in *United States v. Place* declared that the canine sniff is "sui generis."97 This same conclusion—that a dog's sniff is unique—had been reached before by courts deciding a very different question: what foundation is necessary before evidence of canine tracking may be admitted as proof of a defendant's guilt?98 In answering this question the majority of courts have required a showing:

(1) [T]hat . . . [the dogs] are of pure blood, and of a stock characterized by acuteness of scent and power of discrimination; (2) that they possess these qualities, and have been accustomed and trained to pursue the human track; (3) that they have been found by experience reliable in such pursuit; (4) and that in the particular case they were put on the trail of the guilty party, which was pursued and followed under such circumstances and in such way as to afford substantial assurance, or permit a reasonable inference, of identification.99

Modern statements of the rule sometimes delete the requirement that the dogs be of a particular breed but add requirements that the handler be proven qualified to use the dog and that the trail not be so stale or contaminated as to be beyond the dog's ability to follow.100

Whichever variant of the test is used, the courts often require little in the way of foundation to pass it.101 The courts offer minimal,

96. See infra notes 97-132 and accompanying text.
101. See, e.g., State v. Streper, 113 Idaho 662, 667, 747 P.2d 71, 76 (1987) (foundational requirements met when two dogs had only 75% and 80% success rates respectively, and the tracking was done three to five hours after the crime with no inquiry into possible changes in the trail during that period or into the general ability of dogs to track after the passage of a significant period of time); State v. Harris, 25 Or. App. 71, 77, 547 P.2d 1394, 1398 (1976) (tracking within 48 hours of crime not "stale").
if any, discussion of what controlled experimentation should be used to determine the general accuracy of dogs in tracking or to determine the factors that may explain why dogs are sometimes wrong.  

Dogs with tracking records far from perfect frequently are deemed reliable. Even these less-than-perfect tracking records are misleading, since they apparently are based on the number of times that a dog who is instructed to track actually finds a "match." The courts do not mention the number of times that a false "match" is made, nor do they describe experiments that would determine the reliability of the particular dog's scenting abilities. Ultimately, reliability questions often turn on the conclusory testimony of the dog's handler, an individual who is not required to have academic training in canine psychology or any other related discipline. Furthermore, discussions regarding trail "staleness" are cursory and fail to address important physics issues, for example, the rate at which human scent may dissipate in hot, dry weather, as opposed to rainy, windy weather. Indeed, many courts reject the notion that tracking should be a scientific process, the accuracy of which can be appreciated only by understanding the nature of scent and the biology and motivation of the dog. Moreover, the courts are not worried about erroneous tracking, because they deem it a danger largely eliminated by the "corroboration requirement."

The "corroboration requirement" is a rule articulated by the courts in most states requiring that dog tracking evidence be corroborated by other evidence before a conviction based on that tracking evidence can be sustained. The meaning of this requirement is

102. See infra cases cited at notes 103-132. The absence of such a discussion is truly remarkable because scientific research, however skimpy, has been available at least since the 1920s. See infra text accompanying notes 363-372.


104. See supra cases cited at notes 100-101, 103.


106. M. Pearsall & H. Verbruggen, M.D., supra note 3, at 35-44 (summarizing the effects of air temperature and humidity on a dog's ability to follow a track).

107. See People v. Craig, 86 Cal. App. 3d 905, 915-16, 150 Cal. Rptr. 676, 682-83 (1978) (rejecting the need to prove the demonstrable scientific reliability of dog tracking); Wilson, 180 Conn. at 481, 487-89, 429 A.2d at 934-35 (1980) (effectively ignoring the defendant's claim that no scientific basis had been proved to support a state trooper's testimony as to the accuracy of his tracking dog).

unclear in states where courts declare that tracking evidence is "cumulative only" and must be corroborated by other "direct" evidence of identity. Such language suggests that tracking evidence only will be admitted if there is independent evidence that, standing alone, could support the defendant’s conviction. Other cases, however, clearly hold that the "other evidence" required for corroboration may be circumstantial and need not be sufficient to establish a defendant’s guilt. In effect, these latter cases hold that tracking evidence is more than merely "cumulative," thus permitting a court to send the question of the wrongdoer’s identity to the jury in a case in which otherwise there would be insufficient evidence to do so. In practice, this interpretation of the rule has meant that little "other evidence" is necessary to support a conviction.

109. Michaux, 360 Pa.-Super. at 458, 520 A.2d at 1180 (quoting State v. Loucks, 98 Wash. 2d 563, 567, 656 P.2d 480, 482 (1983)). "Cumulative evidence" is "[a]dditional or corroborative evidence to the same point. That which goes to prove what has already been established by other evidence." Black’s Law Dictionary 343 (5th ed. 1979) (emphasis added). By describing tracking evidence as "cumulative only," therefore, courts apparently are saying that the guilty party’s identity already has been shown. Tracking merely offers additional support to the existing proof of identity.

110. People v. Perryman, 89 Mich. App. 516, 524, 280 N.W.2d 579, 583 (1979); accord Loucks, 98 Wash. 2d at 567, 656 P.2d at 482 (1983) (noting that a large majority of jurisdictions permit dog tracking evidence "only after other evidence has been introduced clearly connecting the accused with . . . the crime") (emphasis added). But see State v. Ellis, 48 Wash. App. 333, 335, 738 P.2d 1085, 1087 (1987) (rejecting the assertion that Loucks required that the "other evidence" produced must be sufficient by itself to convict the accused).

111. See supra cases cited at note 110; see also State v. Cheatham, 458 S.W.2d 336 (Mo. 1970) (tracking evidence was insufficient to support a robbery conviction where circumstantial evidence of the defendant’s presence near the crime scene and association with an accomplice did not, standing alone, link defendant with the crime).

112. People v. Malgren, 139 Cal. App. 3d 234, 239, 188 Cal. Rptr. 569, 573 (1983) (corroborating evidence can be circumstantial); Ellis, 48 Wash. App. at 335, 738 P.2d at 1087 ("other evidence" need not itself be sufficient to convict).

113. This logic follows from the rationales of these cases despite not being articulated clearly in their text. The evidence, other than tracking, need not be sufficient to convict; but once tracking evidence is admitted, if there is sufficient evidence to take the case to the jury, and the jury convicts (a verdict that is upheld on appeal), the tracking evidence is precisely what tips the scales in favor of guilt. Thus the prosecutor’s losing case is turned into a winner. The tracking evidence is, therefore, much more than "merely cumulative" because it serves not as proof of a fact already established, but rather as a necessary step in proving the existence of that fact in the first place. See supra note 109.

114. For example, in Ellis, the police saw two men running from the scene of a burglary, one wearing a brown leather jacket and darker pants, the other wearing a dark top and lighter colored pants. The police pursued, but lost the men. A dog tracked and located one man fitting the description of the first suspect, who wore a brown leather jacket and darker pants. The same dog later tracked the defendant, who wore a rust-colored jacket and dark gray pants and therefore did not fit the second suspect’s description. Despite the defendant’s clothing differing from the description given by the officers, and despite the defendant’s
Moreover, even when the additional evidence offered is more than minimal, the power of the tracking evidence often is undeniable and actually may be the primary reason for the resulting conviction. *People v. Malgren*\(^{115}\) illustrates this proposition. In *Malgren*, two teenagers returned home to find the knobs removed from their front door. A crash came from their parents' bedroom, and they saw someone run out of the house. They called the police, who arrived with a dog that spent thirty-five to forty minutes tracking over about seven-tenths of a mile until he located the defendant in some bushes one hour after the crime. The defendant was out of breath and perspiring, with leaves on his jacket, grass stains on his shoes, and wet trouser legs. Later, both a penlight and pliers whose teeth matched the spacing of marks on the doorknobs were found near the burglarized residence.\(^{116}\) At trial, the defendant testified that he had hitched a ride with a woman, but they had quarreled, and thus he left the car and was walking along the freeway when the dog came after him, forcing him to run into the bushes to escape.\(^{117}\) A jury convicted the defendant of burglary.

On appeal, the defendant argued that, other than the dog's tracking, there was no direct evidence of his guilt. The court rejected his challenge and concluded that the circumstances of the case afforded sufficient "corroborating evidence" including, among other factors, the location where the pliers and penlight had been found and the defendant's sweaty condition.\(^{118}\) Moreover, the court found an additional circumstance showing consciousness of guilt because the jury may have concluded that the defendant lied about how he got into the bushes.\(^{119}\)

In his dissent Justice Feinberg took a very different view.\(^{120}\) He noted that the defendant's location, perspiration, lack of breath, and the leaves on his jacket just as easily could corroborate his alibi as the prosecution's case. After all, if the defendant was fleeing the scene of the crime, why was he only seven-tenths of a mile away one hour after the burglary occurred? Moreover, assuming that the jury

\(^{115}\) Id. at 237, 188 Cal. Rptr. at 571.
\(^{116}\) Id. at 240, 188 Cal. Rptr. at 573.
\(^{117}\) Id.
\(^{118}\) Id. at 233-36, 738 P.2d at 1086-87. On appeal, the court held that there was sufficient evidence to support the conviction. Id. at 336, 738 P.2d at 1087. The dissent sharply disagreed with the majority, concluding that "besides the tracking dog evidence, there is little to support an identification of Ellis as the perpetrator." Id. at 340, 738 P.2d at 1089 (Ringold, J., dissenting.)
\(^{119}\) Id. at 242-47, 188 Cal. Rptr. at 575-78 (Feinberg, J., dissenting).
believed that the defendant lied about how he got in the bushes, did that fact show a consciousness of guilt about a burglary committed an hour earlier at a residence almost a mile away? Furthermore, why did the dog take a full forty minutes to track the seven-tenths of a mile? The prosecution explained that the delay in tracking resulted because the wind had blown the scent around, causing the dog to lose it and forcing the dog to nose around before picking it up again. Justice Feinberg, however, noted that if true this circumstance merely lessened the already questionable reliability of the dog. He cautioned that although the scientific validity of dog tracking evidence has not been demonstrated "even as well as voice-printers," the jury likely would give undue weight to tracking because "evidence gleaned from the efforts of dogs has been part of our folklore for centuries."

Despite his criticisms, Justice Feinberg did not recommend a total ban on admission of tracking evidence. Instead, he agreed with the rest of the court that the tracking evidence had established a reasonable suspicion of the defendant's involvement in the burglary and therefore was relevant in determining the legality of police conduct. Furthermore, although he believed that the case before the court should not have gone to the jury, Justice Feinberg indicated that he would permit a jury to receive tracking evidence if the jury were instructed to view such evidence with caution and there was far greater corroboration than in Malgren.

Indeed, many courts have followed an approach that is similar to Justice Feinberg's proposal. This approach, however, makes two assumptions that may be seriously flawed. Not only does it assume that the "superstitious awe" with which juries view the dog can be overcome merely by an instruction, but also that juries will be supplied with sufficient information to evaluate tracking accuracy fairly.

The view espoused by the Malgren majority—that minimal corroborating evidence is necessary where the traditional five-part track-

121. Id. at 237, 188 Cal. Rptr. at 571.
122. Id. at 246, 188 Cal. Rptr. at 577. The California Supreme Court has rejected the use of voiceprint evidence because of its lack of acceptance in the relevant scientific field. People v. Kelly, 17 Cal. 3d 24, 549 P.2d 1240, 130 Cal. Rptr. 144 (1976).
123. Malgren, 139 Cal. App. 3d at 246, 188 Cal. Rptr. at 577.
124. Id. at 245-246, 188 Cal. Rptr. at 577. Other cases have held that under certain circumstances, tracking evidence may be admitted as a factor tending to establish probable cause even where the evidence is too unreliable to be admitted as proof of guilt at trial. See, e.g., State v. Maya, 126 N.H. 590, 598-99, 493 A.2d 1139, 1145-46 (1983).
125. 139 Cal. App. 3d at 242-47, 188 Cal. Rptr. at 575-78.
126. See infra text accompanying notes 639-642, 675-684; cases collected at Annotation, supra note 98.
127. See infra text accompanying notes 575-627, 664-685.
ing test is met—is the view of the majority of courts that have considered the question. This standard must be credited with offering at least some test of a dog’s accuracy, an accomplishment that generally has eluded the courts in the narcotics cases. Moreover, the majority test is not wholly without teeth; there are indeed cases in which the evidence failed to satisfy the test for admissibility or was found insufficient to support the verdict. These cases, however, tend to be extreme with only the barest evidence of reliability or corroboration. Most importantly, the majority view still lacks a scientific basis for determining when tracking is accurate and it fails to address convincingly the concerns raised by Justice Feinberg and by the courts adopting the minority position.

b. Debunking the Dog

The minority view excludes all dog tracking evidence for reasons similar to those expressed by Justice Feinberg. The seminal case is *Brott v. State*, in which the court expressed concern over the scientific basis for admitting evidence of a bloodhound’s tracking of a trail to a defendant’s home more than twelve hours after a burglary. The sun had been shining steadily on the trail for that time, and “perhaps hundreds” had walked over or paralleled the course of the trail. These circumstances led the court to ponder whether

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128. See cases collected at Annotation, supra note 98.
129. As noted earlier, a few narcotics cases have demanded some showing of reliability but they have not offered clear guidelines on how to make this showing. See cases cited supra note 95. The *People v. Malgren* five-part test at least offers minimal guidance on how to determine scenting accuracy in the context of tracking. See supra notes 115-127 and accompanying text (discussing the *Malgren* five-part test). As discussed throughout the remainder of this Article, however, that guidance is inadequate and surely is ineffective in screening unreliable evidence from the jury.
130. *E.g.*, McDonald v. State, 145 Ark. 581, 583, 224 S.W. 976 (1920) (witness admitted that he did not know much about bloodhounds and could not say whether they followed the trail correctly); O’Quinn v. State, 153 Ga. App. 467, 470, 265 S.E.2d 824, 825 (1980) (error to admit sheriff’s testimony where he had not trained dogs, was not their handler, and the dogs had not been put on the tracks at the scene of the crime nor followed the tracks to the defendant); Pedigo v. Commonwealth, 103 Ky. 41, 51, 44 S.W. 143, 146 (1898) (dog not shown to be trained and tested in tracking humans).
131. *See, e.g.*, People v. McPherson, 85 Mich. App. 341, 271 N.W.2d 228 (1978) (no evidence corroborating the tracking, and the fingerprints found at the scene of the crime were not the defendant’s); State v. Loucks, 98 Wash. 2d 563, 656 P.2d 480 (1983) (conviction reversed where fingerprint and blood type evidence at the scene of the crime tended to exculpate the defendant instead of corroborating the tracking of a dog).
132. *See supra* cases cited at notes 130-131.
133. 70 Neb. 395, 97 N.W. 593 (1903).
134. *Id.* at 397, 97 N.W. at 594.
135. *Id.*
the scent had largely dissipated or been contaminated by other persons' scents. The court feared that difficulties in tracking would not deter a hound, who would track as best he could and always follow some scent, even if not the right one. Although the court conceded that the bloodhound frequently may be right, it also concluded that he is frequently wrong. As a consequence of these concerns the court reversed the defendant's conviction. In doing so, the court recognized the power, but challenged the logic, of the mythic dog:

It is a commonly accepted notion that he will start from the place where a crime has been committed, follow for miles the track upon which he has been set, find the culprit, confront him, and mirabile dictu, by accusing bay and mien declare, "Thou art the man." This strange misbelief is with some people apparently incorrigible. It is a delusion which abundant actual experience has failed to dissipate. It lives on from generation to generation. It has still the attractiveness of a fresh creation. "Time writes no wrinkles on its brow." But it is nevertheless a delusion—an evident and obvious delusion. The sleuthhound of fiction is a marvelous dog, but we find nothing quite like him in real life.

Few jurisdictions have followed Brott, and no modern case has done so. Nevertheless, Brott often is cited by majority courts to show recognition of the problems in using tracking evidence that the majority believes to be less serious and more easily rectified than the court did in Brott. Of special significance for this Article, however, is the Iowa Supreme Court's adoption in 1923 of the minority view in State v. Grba. Grba is the first reported case involving both tracking and what was in effect a dog scent lineup, although the actual term "lineup" was not used. In Grba, a sheriff asked seven
or eight men to walk by two bloodhounds who had been tracking
the suspected bomber of a home. The handler did not know whom
the sheriff believed to be the "right man." The hounds alerted to
the defendant, and he subsequently was convicted of the crime. Al-
though there was other evidence linking the defendant to the crime,
the appellate court reversed because "the bloodhound may be right
in what he does, and he may be wholly wrong. How is it possible
to know in any particular case whether he is right or wrong?"143

No other dog scent lineup cases were reported until the 1980s.144
Subsequent cases largely have ignored Grba, and mainly have en-
grafted the majority tracking test onto the analysis of lineups.

The flaws in the majority approach to tracking are most evident
in the dog scent lineup cases. These cases, for the most part, have
applied the majority foundational requirements for tracking to the
arguably very different circumstances of the dog scent lineup.145
This approach exposes the substantial deference that the majority
view gives to dog scenting, because lineups rarely fail the majority
test despite the courts' repeated claims that they recognize the dog's
fallibility.146 Applying the majority tracking test to scent lineups
sometimes causes extreme results that raise serious doubts about the
ability of the tracking test to adequately screen unreliable evidence,
protect against juror misuse of questionable evidence, or ensure the
full disclosure of information necessary for the jury to evaluate such
evidence.147

These extreme results, which include convictions based on poten-
tially suggestive lineups148 and lineups conducted years after the
offenses,149 show a judicial unwillingness to examine the biological and
psychological reasons for misidentification. By doing so, the courts
flatly reject the notion that lineups should be treated like scientific
evidence.150 This rejection perpetuates the image of the dog as sui

143. Id. at 263, 194 N.W. at 259.
144. See infra notes 145-151 and accompanying text; Annotation, supra note 4.
145. E.g., United States v. Gates, 680 F.2d 1117, 1119 (6th Cir. 1982); United States v.
McNiece, 558 F. Supp. 612, 616 n.5 (E.D.N.Y. 1983); State v. Roscoe, 145 Ariz. 212, 220-
146. See supra cases cited at note 145.
147. See infra notes 469-567, 652-685 and accompanying text.
148. See infra text accompanying notes 471-523 for a discussion of suggestive lineups.
149. These lineups are conducted after so long a period of time that common sense
suggests the danger of the scent's dissipation and contamination. See, e.g., Gates, 680 F.2d
1117 (lineup eight months after crime); McNiece, 558 F. Supp. 612 (E.D.N.Y. 1983) (lineup
21 months after crime).
150. Roscoe, 145 Ariz. at 219, 700 P.2d at 1319 (scent lineups are "not bottomed on
any scientific theory").
generis. The result is judicial approval of canine identifications that border on the miraculous and that in effect endorse the dog's mythic infallibility. This endorsement brings the tracking and lineup cases closely in line with the unarticulated assumptions of the narcotics cases.  

The impact of those unarticulated assumptions on both courts and juries is the subject of much of the remainder of this Article.

One interesting wrinkle is worth noting here. Many of the reported cases that raise issues regarding scent lineups involve lineups conducted by a particular handler, John Preston. Since at least 1984, it has been alleged that Preston's testimony is fraudulent because neither he nor his dogs have the training or experience that he claims they possess. Geraldo Rivera presented a supposed exposé of Preston on ABC's 20/20 television program. Although he conceded that dogs have an "extraordinary sense of smell" that has been invaluable in law enforcement, Rivera challenged whether Preston had the formal training that he claimed to have, noted that other dog handlers were of the opinion that Preston's dogs clearly were not "working" and that Preston's claims regarding dogs' scenting prowess were beyond the abilities of any dog, and offered stories of the absurd lengths to which Preston maintained his dog's noses could go (for example, pond-sniffing to uncover evidence hidden beneath the water). The allegations of fraud are not in themselves significant because there is a danger of fraud in every trial, Preston denies the fraud charge,

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151. But see Ramos v. State, 496 So. 2d 121 (Fla. 1986) (the only modern case challenging the assumption of the dog's infallibility in a lineup).
152. Tracking the Tracker, supra note 42.
153. Id. Rivera's allegations soon are to be tested in a case involving what apparently is one of Preston's most impressive achievements. In Roscoe, 145 Ariz. at 218, 700 P.2d at 1318, Preston described the following series of tests during his testimony. First, his dog (Harass II) scented the victim's clothing and then selected the defendant's car from a line of five cars. Second, the dog scented the defendant's clothing and then selected the victim's clothing (thus indicating that the defendant's scent was on that clothing) from a line of five items of clothing. Third, after being put on the defendant's scent, the dog alerted to the victim's-bicycle in a line of five bicycles. Each of these tests was, according to Preston, run blind: Preston was not told in advance which article or location was connected with the crime. Id. Either Preston's dog, at least on this one occasion, demonstrated an impressive talent for scent discrimination, or Preston was in cahoots with local officers who told him in advance which items to select. Defendant Roscoe will soon have an opportunity to prove that the latter version is closer to the truth, since the Arizona Supreme Court, in a collateral attack on the conviction, has remanded the case for a hearing on whether Preston was a "fraud and liar" who was "actually dishonest in the manner in which he investigated the case." State v. Roscoe, No. CR-89-0160-PC, slip op. at 4 (Ariz. Oct. 19, 1989). That hearing is scheduled for late October 1990. Telephone interview with Shari Altendorf, a paralegal on the defense team representing Roscoe (Sept. 10, 1990).
154. Tracking the Tracker, supra note 42.
and he still has strong supporters in both law enforcement and the appellate courts. What is significant, however, is that Preston's credibility, and therefore the prosecution's willingness to use him as a witness, was substantially damaged when in a later unreported case the court ordered, and Preston's dogs failed, a test designed to determine the accuracy of his dogs. That failure serves to underscore the value of employing traditional rules of evidence to evaluate the reliability of dog scent identifications and of actively involving the trial judge in screening out possibly unreliable scientific evidence.

It is important to clarify, however, that neither the alleged failure of dogs in scent lineup cases nor the weaknesses in the courts' analyses necessarily require wholesale rejection of scent lineup evidence. To the contrary, some European researchers maintain that they have designed training and testing procedures that avoid the kinds of errors allegedly made by Preston (for example, using inadequately trained dogs and suggestive lineup procedures), thus bringing strong scientific support to the lineup procedure. An understanding of the research and of many of the legal issues raised by the lineup cases, however, first requires a basic understanding of the biology and psychology of scenting and tracking.

II. The Science of Scenting

Even the briefest review of the scientific principles underlying dog scenting reveals that, contrary to the conclusions of many courts, there are significant scientific differences among the various uses of scenting: tracking, narcotics detection, and scent lineups. These differences make it dangerous to rely upon judicial precedent regarding the reliability of one form of dog scenting when addressing the reliability of another form. Examination of the science of scenting also highlights the courts' failure to adopt a rational approach to any

155. Judge Dean Moxley of Brevard County said of Preston:
I think dogs can do a lot of things that people at the outset say they can't do and they don't try. For instance, pick an arbitrary time figure—just, dog [sic] can't track after 24 hours, or dogs can't track on pavement, or dogs can't track a person on a bicycle. But they never tried it, and Mr. Preston has tried it, and he is relating things that he observed.

Tracking the Tracker, supra note 42. More recently, the Supreme Court of Virginia declared that Preston "demonstrated the reliability of his dog's talents." Epperly v. Booker, 235 Va. 35, 41 n.1, 366 S.E.2d 62, 65 n.1 (1988).

156. Tracking the Tracker, supra note 42.

form of dog scenting—"rational" meaning an approach that maximizes the likelihood of admitting only reliable scent evidence that is useful to the jury. Finally, examination of the science of scenting suggests tentative guidelines for the design of fair dog scent lineups. Before addressing any of these matters, however, it is important first to consider the threshold question: How sensitive is the dog's nose?

A. The Dog's Nose

The dog's nose maximizes the area available for exposure of chemical receptor cells to the air. Large supports called turbinate bones form scroll-like passages that permit the air to come into contact with millions more cells than would be the case were the nasal passages simply straight tubes.

The total number of olfactory cells varies with the dog's size but in all breeds the number is far greater than in man. Thus, the German Sheep Dog has 220 million such cells compared to man's five million. Laid out, these cells cover an area in the dog's head that is about the size of the skin on his body, compared to humans, whose equivalent area of exposure of olfactory cells to air is the size of a postage stamp. Moreover, almost one-eighth of the canine brain is devoted to olfaction while the human olfactory lobes comprise a much smaller percentage of total brain size.

The effect of the vast number of canine olfactory cells is open to dispute. Some researchers claim that the result is a canine olfactory acuity—the ability to detect extremely small concentrations of odorous material—between one-hundred thousand and one-hundred million times greater than man's. Others claim that there is little difference in acuity but a great difference in the ability to discriminate among odors. Whichever view is accurate—and recent data

159. Id.
161. Id.
164. Id. at 13. An example illustrates the magnitude of this conclusion. If a gram of butyric acid evaporated evenly throughout a ten-story building, a man standing in one of the rooms would barely be able to perceive the acid. However, if a gram of butyric were diluted to fill the air above the entire city of Hamburg, the dog described by these researchers still could perceive the acid at an altitude of three hundred feet. Id.; see also M. Pearsall & H. Verbruggen, M.D., supra note 3, at 5.
165. W. Syrotuck, supra note 160, at 13; Moulton, Ashton & Eayrs, Studies in Olfactory Acuity: Relative Detectability of n-Aliphatic Acids by the Dog, 8 Animal Behav. No. 3-4,
suggest that the truth is somewhere between the two extremes—there is little doubt that the dog can detect minute traces of certain odors and has olfactory sensibilities far superior to humans. The accuracy of those sensibilities depends to a great extent, however, on the concept of "scent complexes" or "scent groups."

B. Scent Groups

Dogs distinguish among human scents by recognizing the group of odors specific to each individual. Thus, a person's scent is a composite odor in which no single odor necessarily predominates. The dog's olfactory sensitivity is such that minute quantities of a substance may contribute to this scent group even if, standing alone, the trace substance could not be detected by the dog.

An experiment by Neuhaus, a well-known researcher on canine scenting whose experiments during the 1950s included the first precise measurements of canine acuity, illustrates this concept. Neuhaus found that a dog could distinguish between a base mixture of four aliphatic acids and a second identical mixture in which only one aspect was changed—a fifth aliphatic acid, caproic acid, was added, but in a concentration too small for the dog to detect were he smelling the caproic acid alone. Neuhaus then repeated the experiment with a base of four completely different chemicals but again added

117 (1960). The theory is that each olfactory cilia responds to one specific odor so that more cilia means more sensory information and thus a greater ability to distinguish differences among odors. See M. Pearsall & H. Verbruggen, M.D., supra note 3, at 11.

166. Specifically, this data suggests lower levels of the dog's sensitivity between ten and one hundred times greater than man's. W. Syrotuck, supra note 160, at 13-15.

167. Id. at 15.

168. See infra notes 169-173 and accompanying text.

169. See S. Bryson, supra note 3, at 94. See generally, W. McCartney, Olfaction and Odours: An Oosphresiological Essay (1968) (which contains detailed summaries of many of the classic experiments on dog scenting acuity and ability to discriminate among odors). It is important to note that this "composite odor" theory and, indeed all the other theories described in Part II of this Article reflect the prevailing descriptions in the literature of what it is that dogs scent and how they do so. Some critics maintain, however, that scientific research on canine olfaction is so primitive that we do not have any idea what it is that dogs scent, in sharp contrast, for example, to the unquestioned understanding that what dogs see is varying wavelengths of electromagnetic radiation ("light"). E.g., R. Lubow, War Animals 143 (1977) (research has not approached a "comprehensive theory of odor perception"). If these critics are right, of course, that simply strengthens the ultimate conclusion of this Article: dog scent lineups should not be admitted as evidence of guilt at criminal trials because science has yet to develop a clear understanding of what it is that dogs scent, much less how accurate they are at doing so.

170. See S. Bryson, supra note 3, at 94.

171. W. McCartney, supra note 169, at 28.
caproic acid to this new base to create a second mixture. This time, the dog could distinguish the new base from the base plus caproic acid only when the caproic acid was added in a concentration higher than that necessary for the dog to detect the caproic acid standing alone.\footnote{172}

Researchers also have applied the concept of scent groups when analyzing potential sources of suggestiveness in dog scent lineups.\footnote{173} The concept of scent groups also must be kept in mind in order fully to understand what it is that a dog follows when he traces "ground scent" and how that differs from what a dog follows when he traces "air scent."

C. Ground, Air, and Track Scents

Ground scent results from a person walking through a vegetated area.\footnote{174} Each footstep physically disturbs the soil, releasing moisture and the vapors of soil ingredients.\footnote{175} Plant life also is killed, releasing odorous vegetative fluids.\footnote{176} Moreover, the soil contains hundreds of species of bacteria that decompose the dead plant cells and vegetative fluids released by the footstep.\footnote{177} The decomposition creates additional odorous by-products.\footnote{178} Thus, each footstep creates an odorous vapor more intense than that of the ground surrounding the footstep.\footnote{179} This vapor can last for a substantial period of time depending on the life span of the bacteria, which in turn varies according to air temperature, humidity, type of soil surface, and other factors.\footnote{180}

Air or "airborne" scent is windborne human body odor.\footnote{181} Body odor comes from a variety of sources: sweat and sebaceous gland secretions, cells shed by the respiratory and genito-urinary tracts,

\begin{itemize}
  \item \footnote{172} S. Bryson, \textit{supra} note 3, at 94; W. McCartney, \textit{supra} note 169, at 29.
  \item \footnote{173} See, e.g., F. BuYtendieke, \textit{The Mind of the Dog} 99-100 (1973).
  \item \footnote{174} See B. Lowe, \textit{supra} note 43 at 66, 149, 209; W. Syrotuck, \textit{supra} note 160, at 53-70. Some writers refer to "ground scent" as "track scent." G. Johnson, \textit{Tracking Dog Theory and Method} 23 (1977). The term "ground" scent is clearer because a dog often "tracks" scents that include more than just the odors of crushed vegetation. \textit{See infra} text accompanying notes 181-204.
  \item \footnote{175} W. Syrotuck, \textit{supra} note 160, at 53.
  \item \footnote{176} \textit{Id.} at 53, 58.
  \item \footnote{177} \textit{Id.}
  \item \footnote{178} \textit{Id.} at 53-54, 58-59.
  \item \footnote{179} \textit{Id.} at 54. The relative strengths of vegetative and human scents will, of course, vary with the passage of time. \textit{Id.} at 55-69.
  \item \footnote{180} \textit{Id.} at 57-69.
  \item \footnote{181} G. Johnson, \textit{supra} note 174, at 25; B. Lowe, \textit{supra} note 43, at 209. Vegetative ground scent also may be carried by the wind. G. Johnson, \textit{supra} note 174, at 23-25.
\end{itemize}
gaseous secretions such as the odor of garlic on an individual’s breath, toiletries, clothes, shoes, and bacteria.\textsuperscript{182}

The bacterial source of airborne scent is the most important\textsuperscript{183} because bacterial action on dead human skin cells in the environment of skin secretions creates odorous by-products that increase the individuality of each person’s odor.\textsuperscript{184} Moreover, the survival time of the scent created by the bacteria depends, like the survival time of ground scent, upon a variety of conditions, including air temperature and humidity.\textsuperscript{185} Air temperature and humidity also affect the length of time during which the bacteria-created scent is released by altering the life-span of the bacteria and, therefore, the time period during which a dog can track a person based on that person’s body odor.\textsuperscript{186}

The bacteria-created and other components of human body odor are transmitted by skin “rafts,” cornflake-shaped skin flakes approximately fourteen microns in size.\textsuperscript{187} On average, each flake carries four microbes and may consist of one or more cells.\textsuperscript{188} Forty thousand such cells are shed by the body each minute.\textsuperscript{189} Each raft is surrounded by a vapor cloud and leaves the body in an upward movement of rapid hot body air currents.\textsuperscript{190} The raft’s vapor or scent cloud will last as long as the active microbes on the raft last.\textsuperscript{191} The airborne rafts constitute “air scent.”\textsuperscript{192} But many such rafts eventually fall to the ground, some close to or on the vegetative footstep path created by the tracklayer.\textsuperscript{193} The odor of these rafts combines with the ground scent to create what, for purposes of this Article, we will call “track scent.”\textsuperscript{194}

\textsuperscript{182} Compare W. Syrotuck, supra note 160, at 23-36 (human scent comes from a basic odor that is typical of each individual and that can be varied somewhat by emotions, toiletries, clothing, and diet) with M. Pearsall & H. Verbruggen, M.D., supra note 3, at 13-19 (human scent is made up of particulate components, including skin oils and particles, perspiration, and a gaseous component).

\textsuperscript{183} W. Syrotuck, supra note 160, at 32-34.

\textsuperscript{184} Id. at 31-34, 36.

\textsuperscript{185} See id. at 32-43, 59.

\textsuperscript{186} See id. at 32-35, 48, 59-69.

\textsuperscript{187} Id. at 37; see also M. Pearsall & H. Verbruggen, M.D., supra note 3, at 14-15 (using the surgical term “scurf” to describe human body rafts).

\textsuperscript{188} W. Syrotuck, supra note 160, at 37.

\textsuperscript{189} Id.

\textsuperscript{190} Id. at 37-41.

\textsuperscript{191} Id. at 38-39.

\textsuperscript{192} Id. at 48-54.

\textsuperscript{193} Id. at 54-56, 71-74.

\textsuperscript{194} See id. at 67-68 (discussing the “combined vapors” of vegetative and raft scents). The term “track scent” is used here as a shorthand reference to distinguish the combining of human and vegetative scents from any discussion of those scents individually.
D. Time and Psychology: Two Factors Affecting Scenting Accuracy

When raft and ground scents combine to form track scent, there is a brief period during which the human raft scent is stronger than the ground scent. \(^{195}\) Raft scent, however, falls off rapidly while ground scent persists for a much longer period of time. \(^{196}\) Consequently, a dog searching across vegetation cannot follow a particular human's scent for a long period of time. \(^{197}\) There is substantial agreement that while the human scent is fresh, a properly trained dog can discriminate among the odors of different humans, \(^{198}\) but that once the human odor fades the dog can no longer so discriminate. \(^{199}\) Nevertheless, the dog still can distinguish one human trail from another because of differences in the intensity of each track. \(^{200}\) Varying levels of intensity arise when the tracks are laid at different times as well as when the weights and foot sizes of the tracklayers differ. \(^{201}\)

Glen R. Johnson's experiments illustrate these concepts. He found that dogs easily were able to distinguish between two tracklayers laying track in an "X" pattern when the track was only thirty minutes old. \(^{202}\) This was true even when the weights of the tracklayers were substantially identical. \(^{203}\) The dogs also were successful in distinguishing between tracklayers of different weights where the track was three hours old. The dogs were unsuccessful, however, on the older track when the weights of the tracklayers were substantially identical. Essentially, the experiment illustrates that the dogs were following the older track based solely on differences in ground scent intensity, not differences in human body odor. \(^{204}\)

The accuracy of a dog's scent work also may be affected by a broad range of psychological factors, some of which are unique to

\(^{195}\) G. Johnson, supra note 174, at 51; W. Syrotuck, supra note 160, at 61.

\(^{196}\) Id.


\(^{198}\) See, e.g., G. Johnson, supra note 174, at 46-47. But see L. Brisbin, Jr. & S. Austad, Testing the Individual Odor Theory of Canine Olfaction (1989) (unpublished manuscript on file with the author of this Article). Brisbin and Austad challenge the "prevailing" theory of scent, which assumes that rafts embody a unique scent for each human. They argue instead that each person may have a unique scent for each portion of the body (for example a unique "elbow" scent) but that there is no single, unique scent characteristic of each person regardless of where on the person's body the scent is emitted.

\(^{199}\) G. Johnson, supra note 174, at 39-55; W. Syrotuck, supra note 160, at 78.


\(^{201}\) See W. Syrotuck, supra note 160, at 53-54 and infra notes 202-204 and accompanying text.

\(^{202}\) G. Johnson, supra note 174, at 43-44.

\(^{203}\) Id. at 46-47.

\(^{204}\) Id. at 47-48.
particular types of scent work.\textsuperscript{205} One factor common to all scent work, however, is the existence of "minimal cues."\textsuperscript{206} These are subconscious muscular twitches by the handler that suggest whom or what the handler wants the dog to identify or muscular twitches by the tracklayer or the suspect that attract the dog's attention to a particular person in a lineup.\textsuperscript{207} The cues cannot be consciously controlled.\textsuperscript{208}

E. The Types of Scenting Dogs

Each scenting dog can be classified, based on the dog's orientation toward ground scent, air scent, or a combination thereof, as fitting into one of three types: the tracking dog, the trailing dog, or the air scent or "point source" dog.\textsuperscript{209}

A tracking dog is oriented toward vegetative vapors.\textsuperscript{210} Although such a dog often can and will discriminate among human raft odors, that ability is short-lived and weak because of the dog's focus on vegetation.\textsuperscript{211} Tracking dogs will not vary from the tracklayer's footsteps.\textsuperscript{212} Moreover, the vegetative vapor upon which the dogs rely is often so similar to surrounding scents that the dog may be working hard yet end up following the wrong trail.\textsuperscript{213} Nevertheless, these dogs are preferred for tracking competitions because the relatively longer life of vegetative scent enables the dogs to follow fairly old tracks.\textsuperscript{214}

Trailing dogs have a stronger orientation to the rafts that have fallen to the ground on or near the tracklayer's route.\textsuperscript{215} Because of wind and other conditions, the rafts may fall near, but not precisely on, the tracklayer's path so that the trailing dog will vary somewhat from the tracklayer's footsteps.\textsuperscript{216} Moreover, because trailing dogs

\textsuperscript{205} See infra text accompanying notes 519-549 (surveying the unique psychological factors present in dog scent lineups); see also Craig, \textit{The Dog as a Detective}, SCI. MONTHLY January 1924, at 45 (discussing psychological factors in both tracking and scent lineups).

\textsuperscript{206} F. BuYtEndUk, supra note 173, at 90 ("[A] well-trained dog very readily responds to any signs unconsciously given by its master."); Craig, supra note 205, at 43-47 ("minimal movements," such as subconscious jerks of a leash by a handler or fearful reactions by a suspect).

\textsuperscript{207} Craig, supra note 205, at 44-47; see F. BuYtEndUk, supra note 173, at 81, 86, 99.

\textsuperscript{208} F. BuYtEndUk, supra note 173, at 81.

\textsuperscript{209} W. Syrotuck, supra note 160, at 71-75.

\textsuperscript{210} Id. at 71, 75-76, 78.

\textsuperscript{211} Id. at 78.

\textsuperscript{212} G. Johnson, supra note 174, at 26; W. Syrotuck, supra note 160, at 71-72.

\textsuperscript{213} W. Syrotuck, supra note 160, at 76.

\textsuperscript{214} G. Johnson, supra note 174, at 21, 23, 26.

\textsuperscript{215} W. Syrotuck, supra note 160, at 71.

\textsuperscript{216} G. Johnson, supra note 174, at 26-29; W. Syrotuck, supra note 160, at 71, 73, 76-77.
focus on both human and vegetative scents, such dogs sometimes inadvertently focus on the often predominant vegetative scent.\textsuperscript{217} Careful training by a highly skilled handler, however, often can prevent this problem.\textsuperscript{218}

Air-scenting dogs are oriented primarily to airborne rafts, often ignoring ground scent entirely.\textsuperscript{219} They may draw on the human raft portion of ground scent if that portion is compatible with the air scent.\textsuperscript{220} Air-scenting dogs follow increasing levels of human odor intensity until reaching the source of the odor and, therefore, often are called “point source” dogs.\textsuperscript{221}

Point source dogs can be used either for “detection” or “discrimination.”\textsuperscript{222} “Detection” merely requires a dog to react when a particular substance is present but does not require the dog to distinguish that substance from other similar substances.\textsuperscript{223} “Discrimination” by contrast requires a dog to tell apart similar substances.\textsuperscript{224} As applied to the tracking of human scent, a point source detector dog is trained to react to the presence of any human.\textsuperscript{225} An avalanche victim locator dog is an example.\textsuperscript{226} A point source discriminator dog, on the other hand, is trained to react only to the scent of the particular human being tracked.\textsuperscript{227}

The difference is important because, for example, searching for plane crash survivors requires a dog who will react to any person’s presence (a “point source detector dog’’), but tracking humans fleeing from the scene of a crime requires a dog who only will react to a scent matching one at the crime scene (a “point source discriminator dog’’); a dog who reacts to the scent of humans not present at the crime scene (a “detector”) may incorrectly “identify” a person as the wrongdoer.\textsuperscript{228}

“Detection” and “discrimination” also are important concepts when dealing with dogs trained to locate substances instead of people. For example, narcotics detector dogs often are trained to react to a broad range of illegal substances but not to distinguish between

\textsuperscript{217} W. SYROTUCK, supra note 160, at 76.
\textsuperscript{218} Id.
\textsuperscript{219} Id. at 75-77.
\textsuperscript{220} Id. at 76.
\textsuperscript{221} Id. at 79-81.
\textsuperscript{222} Id.
\textsuperscript{223} See id. at 81-82.
\textsuperscript{224} See id. at 80-82.
\textsuperscript{225} See id.
\textsuperscript{226} Id. at 80.
\textsuperscript{227} Id.
\textsuperscript{228} See id. at 81-83.
marijuana and morphine. This training for "detection" instead of discrimination is critical because police generally seek a dog who will react to all illegal substances, not one who finds heroin but ignores crack.

These distinctions among the types of dogs are important because using a dog trained for one purpose to accomplish another may lead to misidentification.

F. Recognizing the Science Behind Scent Lineups: A Tool for Crafting Fair Lineup Procedures

This brief review of the science of scenting permits certain tentative distinctions to be drawn among tracking, narcotics detection, and scent lineups. These distinctions in turn suggest certain minimal requirements for a fair scent lineup.

First, scent lineups require discrimination, not merely detection. The discrimination must be among scents within the particular class of human body odors. Consequently, dogs trained only in detection will not offer trustworthy identifications in lineups. Furthermore, dogs trained to discriminate among non-human scents also may not be reliable for lineups. Accordingly, the worst type of dog to use in a lineup would be an animal trained to detect non-human scents, the most obvious example being the narcotics detector dog. Similarly, tracking dogs, because of their focus on non-human scents, should not be used in lineups. Trailing dogs, while somewhat better than trackers, are also unreliable because they may mistakenly follow the vegetative rather than the human scent. Human discriminating point source dogs offer the most reliable results, although for reasons noted below even point source dogs are not ideal for lineup identifications.

Second, lineups often take place after a much greater lapse in time between the crime and the scenting than is the case with a track-

229. Id. at 81.
230. Id. at 81-82. It also is useful to remember that the distinctions among "tracking," "trailing," and "air scenting" dogs are not relevant in narcotics detection because neither vegetative scent nor human scent is being sought but rather only the scent of the illegal substance. See id. at 79-83. Because narcotics detector dogs are trained to locate narcotics odor and to follow increasing levels of that odor's intensity until reaching the source of the odor, however, such dogs often are called "single element" point source dogs. See id. at 79-80. The phrase "single element" apparently is intended to emphasize that the dogs are trained to detect only narcotics (not necessarily only one type of narcotic) but not other substances, such as natural gas or explosives. Id.
231. See id. at 82 ("The dog must distinguish between the criminal and non-criminal . . . . This must be treated with caution as vegetative vapour trained dogs may point out the wrong person.").
232. See supra text accompanying notes 229-231; infra text accompanying note 540.
ing. Special care, therefore, must be taken only to conduct lineups within the time limits that controlled experiments have indicated a particular scenting dog can still successfully differentiate the wrong-doer's scent from those of others.

Third, a dog's ability to track someone despite "crossed lines" should not be taken as proof that the dog can select matching scents in a lineup. "Crossed lines" result when numerous persons walk across the tracklayer's earlier laid path. The dog's ability to select the correct path after a significant lapse in time, such as three hours, shows only that he can distinguish among differing intensities of scents, not that he can distinguish accurately among different human scents of similar intensity.

Fourth, even a tracking or trailing dog who has demonstrated an apparent ability, at least under certain conditions, to distinguish among human scents of the same intensity cannot necessarily be trusted to perform accurately in a lineup. Because dogs generally react to odor groups rather than individual odors, elimination of key odors from a scent group creates a whole new challenge for the dog. Thus a dog who has proven his ability to distinguish among different combinations of ground and human scent will not necessarily be accurate in distinguishing among human scent groups alone. Use of air scenting dogs, therefore, is preferable because they focus on human scent only. Ultimately, however, dogs are most trustworthy when they are trained for a single specific scenting task. This is particularly true in the case of dogs used in scent lineups because unique scenting problems face a dog employed in a lineup circumstance. Consequently, the best candidate for performing lineups is a dog

233. Compare S. Bryson, supra note 3, at 226-27 (suggesting, depending upon the conditions, upper time limits for successful tracking from a few hours to 30 hours) with United States v. Gates, 680 F.2d 1117 (6th Cir. 1982) (eight-month delay between crime and scent lineup).

234. See infra text accompanying notes 383-390 for a discussion of the maximum permissible time lag between the crime and the scent lineup.


237. See supra text accompanying notes 168-173.

238. See W. Syrotuck, supra note 160, at 81-82 (emphasizing the importance of using dogs with different types of training to perform different scenting tasks); Hepper, The Discrimination of Human Odour by the Dog, 17 Perception 549, 550 (1988) (dogs were specifically trained for the task that they were called upon to perform in an experiment); Letter from Brigadier Jan de Bruin to Andrew E. Taslitz (June 26, 1989) [hereinafter Letter II] (on file at the Hastings Law Journal office) (recommending the use in scent lineups of only dogs specially trained for that task).

239. See infra text accompanying notes 514-544.
specially trained for lineup identifications and shown to have a proven track record of reliably identifying defendants in lineups. Although a dog specially trained for lineups but also trained in other scenting tasks is not nearly as ideal as an exclusive lineup specialist, such a dog is by far preferable to a dog trained for tracking or trailing but not for lineups.

Fifth, lineups must be "blind," that is, conducted by a handler who not only has no idea whom the police suspect, but also has insufficient information regarding the case to form his own opinion as to who is the probable wrongdoer. Without such "blindness," even a highly skilled and unquestionably honest handler will convey "minimal cues" that will reduce the likelihood of an accurate identification.240

Sixth, lineup participants themselves may convey "minimal cues" that may affect the dog's performance.241 Consequently, either object lineups should be used or human lineups must be designed to block the dog from seeing lineup participants.

Finally, unique psychological factors—which will be discussed in a later section of this Article—may affect a dog's performance in a lineup.242 Special controls therefore must be designed to minimize or eliminate the effects of these factors.243

III. Evidentiary Objections to Dog Scent Lineups

The answers to two questions guide much of the law of evidence, particularly the law governing scientific evidence. First, what impact will this evidence have on the jury? Second, how trustworthy is this evidence?244 The first question requires the court to consider such

240. See supra notes 206-208 and accompanying text.
241. Craig, supra note 205, at 46.
242. See infra text accompanying notes 514-544.
243. Several of these seven suggestions already have been adopted in the Netherlands. See infra text accompanying notes 522-548.
matters as whether the evidence will inflame the jurors' passions so that they will decide the case based on their emotions, not based on reason; whether jurors can and will give the evidence its appropriate weight; and whether, if given appropriate instructions, they can and will use the evidence only for its proper purposes. The second question is related to the first, in the sense that courts are less afraid that juries will misuse evidence when that evidence is known to be highly trustworthy.

This Article began by examining the myth of canine infallibility because that myth offers guidance in determining what impact scent lineup evidence will have on juries. The Article next examined the scientific understanding of what it is that dogs scent and how they do so because science sheds light on the trustworthiness of scent lineups. The question of trustworthiness—and ways to improve trustworthiness—is addressed in greater detail below, detail that cannot be understood without the scientific background summarized in Part II of this Article.

Myth and science thus provide a framework for examining the host of potential evidentiary and constitutional objections to scent lineups that are addressed below.

A. The Frye Rule

(1) Are Scent Lineups "Scientific" Evidence?

The classic test for the admissibility of scientific evidence was articulated in Frye v. United States:

Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

245. E.g., M. GRAHAM, EVIDENCE: TEXT, RULES, ILLUSTRATIONS AND PROBLEMS: THE COMMENTARY METHOD 20, 22 (1983) (noting concerns that a jury may decide based on "sympathy, hatred, contempt, retribution, or horror" or may overvalue the probative worth of particular evidence); infra notes 675-684 and accompanying text (discussing using jury instructions to control the weight jurors give evidence).
246. See infra notes 247-283, 409-450 and accompanying text.
247. 293 F. 1013 (D.C. Cir. 1923).
248. Id. at 1014.
Recently, there has been much dispute over whether the Frye test makes sense.\textsuperscript{249} The test has been attacked as too vague and difficult to apply, as too conservative, and as too liberal.\textsuperscript{250} Whatever the merits of the test, it remains an obstacle to admissibility of evidence in many jurisdictions,\textsuperscript{251} and in many other jurisdictions the Frye general acceptance requirement is still a factor that guides the court’s admissibility decision.\textsuperscript{252}

Frye only applies, however, to “scientific” evidence.\textsuperscript{253} The courts’ failure to address adequately or, for that matter, to address at all the threshold question of what constitutes scientific evidence has led the courts to apply Frye in some cases but not in others, without a reasoned basis for distinguishing among them.\textsuperscript{254} The courts have found it particularly difficult to address the application of Frye to two types of dog scenting evidence: tracking and lineups.

a. The Tracking Analogy

In \textit{People v. Craig},\textsuperscript{255} the court at least implicitly confronted the threshold question of whether tracking is “scientific” evidence within the meaning of Frye. Defendant Craig appealed his robbery conviction on the ground that dog tracking evidence was improperly admitted at trial, in violation of the Frye standard. The court of appeals rejected Craig’s challenge and concluded that Frye governs inanimate scientific techniques but not the ability of a properly trained animal to utilize a “subjective, innate capability.”\textsuperscript{256} The court reasoned that, with inanimate scientific techniques, one piece of testing apparatus is essentially the same as another. Since each dog has different abilities, however, those special abilities must be demonstrated on an individual basis.\textsuperscript{257} The court found such a showing based on the testimony of Robert Outman, a dog trainer who had trained both


\textsuperscript{252} E.g., United States v. Downing, 753 F.2d 1224, 1238 (3d Cir. 1985).

\textsuperscript{253} Giannelli, \textit{supra} note 250, at 1219; McCord, \textit{supra} note 30, at 1181, 1189.

\textsuperscript{254} \textit{supra} note 253, at 1181-89.

\textsuperscript{255} 86 Cal. App. 3d 905, 150 Cal. Rptr. 676 (1978).

\textsuperscript{256} Id. at 916, 150 Cal. Rptr. at 682.

\textsuperscript{257} Id. at 915, 150 Cal. Rptr. at 682.
Bobby, the dog involved in the case, and Bobby's handler. Because Outman testified that Bobby had a one hundred percent accuracy record in training and in four actual cases, the court held that there was ample proof of reliability to justify admitting the results of Bobby's tracking.\(^{258}\)

The *Craig* court's conclusion that the *Frye* test does not apply to expert testimony when the testimony's value depends in part on the proper training of a subjective, innate ability directly contradicts earlier California case law. Thus, for example, the California courts have applied *Frye* to testimony by voice identification experts, who often partly base their opinion that two voices are identical on an aural comparison; each expert listens to two voices and concludes, with his trained ear, that the voices sound alike.\(^{259}\) Obviously, the value of the expert's opinion turns both on his subjective, innate ability to distinguish among similar voices and on the proper training of that ability. There is no conceptual difference between the voice identification and tracking cases, even though one depends upon the training of a human ability and the other upon that of a canine.

Examining the purposes behind the *Frye* standard makes this point clearer. *Frye* is designed to screen out expert evidence that the jury cannot properly evaluate. The jury's inability to evaluate certain evidence usually is a result of its tendency to be "overawed" by certain types of experts.\(^{260}\) Such evidence will be admitted under *Frye*

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258. *Id.* at 916-17, 150 Cal. Rptr. 682-83.
259. People v. Kelly, 17 Cal. 3d 24, 29, 549 P.2d 1240, 1243, 130 Cal. Rptr. 144, 147 (1976); accord R. Lempert & S. Saltzburg, A Modern Approach to Evidence: Text, Problems, Transcripts and Cases 969 (2d ed. 1983). A voice identification expert also bases his opinion on a visual examination of a "spectrogram," which is a graphic representation of each human voice plotted by time, frequency, and intensity. *Kelly*, 17 Cal. 3d at 29, 549 P.2d at 1243, 130 Cal. Rptr. at 147. Although the expert's opinion thus turns in part on purportedly objective data (the spectrogram), he offers his opinion to a specified level of certainty because of the combination of this data with his subjective belief that, to his "trained ear," the two voices sound alike. Consequently, if his trained ear is not effective in matching voices, the expressed level of certainty of his opinion is subject to attack, and indeed, if the spectrogram itself is inconclusive, the exercise of his trained ear may be the factor that raises his opinion from uncertainty whether two voices match to a clear declaration that they are from the same person. Additionally, the spectrogram is not as "objective" as it may first appear because no scale governs the examiner's determination that the graphic representations of the voices look alike. See Lewis, *The Element of Subjectivity in Interpretation of Test Results*, in Scientific and Expert Evidence 429 (E. Imwinkelried 2d ed. 1981) ("The nadir of unstructured subjectivity may be the recently developed technology popularly known as voiceprint . . . . The interpretation [of the voiceprint] is an individual reaction on the examiner's part, which borders on the intuitive and is not susceptible to objective verification.")
260. *See Ex Parte Hinton*, 548 So. 2d 562, 569 (Ala. 1989) (polygraph results inadmissible because of danger that jury will be "overawed"), *cert. denied*, 110 S. Ct. 419 (1989); State
only if there is an independent guarantee of trustworthiness. *Frye* provides that guarantee by ensuring review of the evidence’s accuracy by a “minimal reserve” of unbiased experts.261 The need for such a review exists whenever the jury is likely to be overawed by the expert and does not depend on whether the expert’s opinion relates to the use of inanimate instruments that are substantially identical in every case or animate instruments such as dogs, the reliability of which may vary with the particular instrument being used.

A hypothetical situation illustrates this point. If, as was the case in *Craig*, jurors with preconceived notions of canine infallibility listen to a dog trainer testify that his particular dog is one hundred percent accurate, the jury likely will give that testimony tremendous weight. This result, however, is only acceptable if the testimony is supported by scientific research showing that at least some dogs are capable of nearly perfect discrimination among human scents. If scientific experimentation in fact reveals that dogs are inaccurate at scent discrimination, and some researchers indeed have made this claim,262 a jury verdict based largely on the dog trainer’s testimony would be based on misleading evidence. Applying *Frye* in such circumstances would minimize this danger because the trainer’s testimony would be admitted only after proof that a substantial segment of the scientific community accepts the reliability of the dog’s ability to discriminate among human scents.

Looked at from yet another perspective, *Craig* makes a different logical error in concluding that the fact that the law requires each dog’s abilities to be demonstrated on an individual basis renders dog-scenting evidence “non-scientific.” To the contrary, this individualized inquiry into whether a scientific instrument is in proper working order is common to, and an essential part of, the legal concepts governing admissibility of “scientific” evidence. The accuracy of any scientific test depends on the validity of both the underlying scientific principles and the instrument applying those principles, as well as on the calibration and testing of the instrument to ensure that it is in proper working order.263 Thus, the accuracy of dog scent discrimi-

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262. See infra text accompanying notes 363-372, 382 and accompanying text.

263. See infra text accompanying notes 451-456.
nation depends upon the accuracy of the underlying scientific principle that human scents are unique.\textsuperscript{264} Moreover, dogs, as the instruments, must be shown to be capable of discriminating among these scents. In each case the particular dog must be proven to be properly trained, that is, "calibrated," and his individual ability to discriminate accurately among human scents must have been tested on the occasion in question.\textsuperscript{265} A "calibration" requirement, therefore, helps to ensure that application of a scientific technique on a particular occasion is accurate. It does not, however, alter the essential nature of that technique as scientific or remove the necessity for an initial inquiry into whether the technique and the principles on which it is based are valid.

b. The Lineup Cases

\textit{Craig}'s logic—that \textit{Frye} does not govern techniques that rely on the subjective, innate capabilities of animals—would, if accepted, bar \textit{Frye}'s application to all dog scenting feats, including dog scent lineups. Indeed, some lineup cases have rejected \textit{Frye}'s application although they have done so based on a very different theory than that articulated in \textit{Craig}.

\textit{State v. Roscoe}\textsuperscript{266} is one such case. In \textit{Roscoe}, the appellate court affirmed the trial court's admission of scent lineup evidence over the defendant's objection that the evidence was not generally accepted among members of the scientific community.\textsuperscript{267} Surprisingly, the appellate court reasoned that, since it did not consider scent lineup evidence to be scientifically based, proof of its acceptance by the scientific community was not necessary in order for the evidence to be admitted. The court noted that "it was not the theories of Newton, Einstein or Freud which gave the evidence weight"\textsuperscript{268} because no one knows how or why the dog did what it did. The court concluded that the jury's verdict need not be based on scientific principles, but instead could be based on the credentials and integrity of the dog's handler, John Preston, and the "simple idea" that, when

\begin{itemize}
  \item \textsuperscript{264} See infra text accompanying notes 328-338.
  \item \textsuperscript{265} See infra text accompanying notes 451-456.
  \item \textsuperscript{266} 145 Ariz. 212, 700 P.2d 1312 (1984), cert. denied, 471 U.S. 1094 (1985).
  \item \textsuperscript{267} More specifically, the defendant argued that two claims were not generally accepted: (1) the claim that trained dogs can perform scent identification lineups in addition to tracking; and (2) the claim that such dogs can either track or identify after a long hiatus between the time the scent is laid down on the scene and the time at which the dog is put on the scent. \textit{Id.} at 218-19, 700 P.2d at 1318-19.
  \item \textsuperscript{268} \textit{Id.} at 220, 700 P.2d at 1320.
\end{itemize}
properly trained and handled, dogs can discriminate among human
odors.\textsuperscript{269} Moreover, the court suggested that because the handler’s
credentials and integrity were effectively probed and tested, his tes-

The Roscoe court’s conclusion that the jury’s verdict was not
based on what commonly are understood as scientific principles is
plainly wrong. Even if the scientific basis was not explicitly artic-
ulated in the testimony, without the unspoken scientific assumption
that the biology of his dog’s nose somehow enabled it to discriminate
among human scents, the dog handler’s testimony would be com-
pletely irrelevant.\textsuperscript{271} This assumption was given an air of pseudo-sci-
entific validity when Preston claimed that his own observations in
hundreds of cases demonstrated his dog’s reliability. Further, the
implication of scientific infallibility crept in when Preston was al-

\begin{quote}
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\end{quote}
norance of scientific principles and lack of sufficient scientific and experimental proof is precisely what Frye seeks to guard against. In fact, as two well-known commentators on the law of evidence have noted, this particular concern of Frye is especially important in criminal cases. According to Andre A. Moenssens and Fred E. Inbau:

In criminal cases, where an individual's freedom is at stake, courts certainly ought to be very cautious in admitting evidence based upon insufficiently tested or verified premises, especially when the evidence seeks to establish the ultimate issue in the case—the identification of the accused as the perpetrator of the offense. It would appear that when this is the issue, there may be occasions when the more exacting general acceptance test of Frye, despite its deficiencies, should be followed.273

This comment is directly relevant to scent lineups, which often are the only direct evidence of the perpetrator's identity. The courts therefore must be "very cautious" in admitting such evidence, a caution well served by the application of Frye.

c. Juror Inability to Evaluate Lineup Evidence Fairly

Even if it is conceded that scent lineups are not based on any scientific theory as that term is commonly understood, Frye should apply whenever jurors are likely to be in awe of expert evidence.

It is highly likely that jurors will be overawed by dog scenting evidence. Psychology, however, offers little to support or refute this conclusion, since the existing psychological studies regarding the effect of expert testimony on juries are scant, confusing, and conflicting.274 Nor should the court's own sense of what will overawe the jury be the guidepost, since such a measure would be subjective and offer little in the way of reasoned guidance to the analysis. Resort to mythology, however, provides an objective standard for resolving the problem of jury overawe.

As discussed throughout this Article, there is no question that the myth of the dog's infallible scenting abilities exists and survives across generations, despite repeated, reasoned attacks. The Roscoe


274. E.g., R. HASTIE, S. PENROD & N. PENNINGTON, INSIDE THE JURY 8 (noting that judicial reluctance to use social science research results regarding juries "derives from the lack of extensive empirical research on some of the legally significant aspects of jury performance"). Compare Massaro, supra note 27, at 444 (noting lack of empirical evidence that jurors are overawed by mental health experts) with Imwinkelried, Critique, supra note 244, at 570 (conceding that there is "meager data" regarding the ability of juries to evaluate expert testimony but summarizing several studies which suggest that sometimes juries can indeed evaluate such evidence properly).
court itself, while rejecting application of the *Frye* standard, nevertheless recognized the existence of the myth and even noted that some states prohibit dog scenting evidence because of a fear that jurors will be misled by "folklore superstitions that attach to bloodhounds and their ability to track."275 The *Roscoe* court further conceded that there is "some likelihood that jurors may give such evidence considerable weight."276 Indeed, to counteract this possibility, the court suggested that demonstrations in the courtroom or on film would be advisable.277 The court further declared that it "would have been better if the trial court had required some independent verification of the dog's abilities."278 Nevertheless, despite the absence of both verification and the recommended demonstrations, the court upheld the admissibility of the lineups in the case before it. It refused to reach the logical conclusion that its own analysis suggested: jurors will view scent lineups as possessing precisely the kind of mythic infallibility that calls for the application of *Frye*.

Furthermore, factors other than the probability that the jury will be overawed suggest that juries are incapable of fairly evaluating dog scent evidence and, consequently, that *Frye* should apply.279

First, only minimal literature currently is available for defense lawyers to use in developing effective cross-examinations. Second, few qualified scientific experts are available to testify on dog scenting and to assist in trial preparation.280

Third, the dog's scenting record often is offered as being perfect or nearly so (for example, the "100% accuracy" rate attributed to the dog in *Craig*)281 while the jury has little information available to challenge that image. Such descriptions reinforce the myth that already has taken hold in the jurors' minds. Fourth, although dog scenting evidence has been used for centuries,282 experimental research, particularly with regard to the accuracy of dog scent lineups,283 still is in its infancy. It therefore may be advisable to keep

275. 145 Ariz. at 220, 700 P.2d at 1320.
276. *Id.* at 221, 700 P.2d at 1321.
277. *Id.*
278. *Id.*
279. The four factors considered below are based on analyses of *Frye*-related questions suggested by Professors Saltzburg and McCord. See McCord, *supra* note 30, at 1188.
280. Professor I. Lehr Brisbin, Jr., a well-known specialist in dog-scenting and research professor at the University of Georgia, has suggested that only a handful of truly qualified experts are available. Professor Brisbin also has bemoaned the dearth of scientific literature and the need for further research. Telephone interview with I. Lehr Brisbin, Jr. (June 1, 1989).
282. See *supra* text accompanying notes 34-64.
283. See *supra* note 280; *infra* text accompanying notes 328-356.
this incomplete and inconclusive scientific picture from the jury.

In short, reliable jury decision-making can be served best, in those jurisdictions still using the Frye test, by Frye's application to scent lineup evidence.

d. The Novelty Question

Once it is understood that dog scent evidence is or should at least be treated as "scientific" evidence, one potential question regarding Frye's application still remains: is such evidence generally, and lineup evidence in particular, sufficiently "novel" that Frye should apply?\(^\text{284}\) The simple answer is that "novelty" should be irrelevant. The rule that Frye governs the admissibility of "novel" scientific evidence apparently has its roots in Professor Giannelli's comprehensive article on Frye.\(^\text{285}\) The novelty requirement is best understood, however, as a simple statement that once a scientific technique is generally accepted, the question is no longer "novel" and need not be relitigated. Thus, if the question has never been litigated, the "novelty" requirement should be no bar to raising Frye. Similarly, even where general acceptance has been demonstrated once in litigation, the "novelty" requirement should not bar relitigation if the scientific community changes its mind when further research reveals that a previously trusted technique no longer is valid.

Although dog scenting evidence has been used in one form or another for centuries, the general acceptance of such evidence rarely

\(^{284}\) Starrs, supra note 260, at 252-53 (noting Frye's "novelty" requirement).

\(^{285}\) Id. at 252-53 (attributing the novelty requirement to Professor Giannelli). Professor Starrs' article provides an excellent critique of the "novelty" requirement. The requirement, he notes, is ill-defined and often presents pointless and time-consuming foundational problems for trial courts. Id. He asks whether "novel" means historically "new" to the scientific world. If so, will historically "old" techniques not be subject to Frye even where scientific research has resulted in rejection of those techniques by most of the scientific community? Id. at 253. Clearly, it would be illogical to answer "yes" to this last question. Similarly, what can guide a court in determining whether a new technique that offers but a "twist" on an old principle is truly "novel"? Moreover, science might accept one use of an old technique but not a new and "novel" use. Surely the courts should not approve an application of the technique where that new application is not yet accepted by the scientific community. Additionally, if Frye does not apply to old techniques, the courts will have to ignore scientific developments revealing that a once valued technique is indeed not trustworthy. Id. at 253. In short, the "novelty" requirement defeats the very purposes of Frye unless the requirement is but a judicial time-saving device; that is, a kind of "judicial notice." Professor Starrs cautions against even this role for the "novelty" rule, rejecting the rule altogether. Accordingly, the only logical meaning for the novelty requirement is that assigned in the text of this Article: to bar relitigation of scientific reliability questions unless new evidence sheds a different light on the inquiry.
has been tested. Consequently, the "novelty" requirement does not bar application of Frye. This conclusion is even stronger, however, regarding scent lineups since such lineups apparently did not enter widespread use until the 1980s. Lineup evidence thus truly is "novel" and therefore at a minimum must survive Frye before being presented to the jury.

(2) Is the Frye Test Met?

Only three cases have addressed, even indirectly, whether scent lineups pass the Frye test. In one such case, United States v. McNiece, the defendant objected to the use of scent lineups because the relevant scientific community generally had not accepted the principle that each person has a unique scent. The court, however, applied a relevancy test in which the Frye general acceptance rule was but one factor, and concluded that the lack of general acceptance was unimportant. The court noted that the jury was likely to perceive the actions of an animate, nonmechanical instrument such as the dog as subject to error. Ignoring the implications of the dog's mythic infallibility, the court concluded that evidence of an object lineup conducted fully twenty-one months after the crime was admissible.

In a second case, United States v. Gates, the court upheld the admission of lineup evidence because the five-factor test for the admissibility of tracking evidence had been passed. The majority never considered Frye. Circuit Judge Kennedy, in a concurring opinion, concluded that the lineup evidence should not have been admitted because no foundation was laid to establish either that scent lineups were reliable or that they were generally accepted as such in the relevant scientific community. Nevertheless, Judge Kennedy concurred in the result, finding that the error was harmless "in light of the overwhelming evidence of appellant's guilt."

Ramos v. State is the only case involving a scent lineup in which a conviction was reversed by an appellate court and remanded.

286. See supra text accompanying notes 255-272.
287. See supra notes 141-144 and accompanying text.
288. See infra text accompanying notes 289-353.
290. Id. at 615.
291. Id. at 615-16.
292. Id. at 615.
293. Id. at 617.
294. 680 F.2d 1117 (6th Cir. 1982).
295. Id. at 1120 (Kennedy, J., concurring).
296. 496 So. 2d 121 (Fla. 1986).
for a new trial because of the prosecution's failure to establish the reliability of the lineup evidence. The Ramos court rejected the prosecution's argument that testimony of a police officer and of the dog's handler was sufficient to establish such reliability. Although the court acknowledged that the United States Supreme Court previously had approved the use of drug sniffer dogs, and that the Supreme Court of Florida itself previously had approved the use of tracker dogs, the court held that tracking and narcotics detection were "not the same" as scent lineups. The court found that the issue of reliability of dog scent lineups was a question of first impression, and therefore, absent adequate proof of the reliability of scent lineups at trial, the defendant's conviction for first degree murder and his subsequent death sentence could not stand. The court, however, did not frame its analysis in terms of the Frye general acceptance requirement, but instead focused on evidence of "reliability."

These cases illustrate that the case law offers little guidance in determining Frye's application to scent lineups. Because analogy to the facts of similar cases is unavailing, whether dog scent lineups meet the Frye test can be determined only by examining the basic definitions of the terms comprising the Frye rule, the methods for proving "general acceptance," and the policies to be served by applying Frye.

First, the "relevant scientific field" must be defined. Many scientific techniques do not fall within any one academic discipline. For example, voiceprint analysis, which seeks to match a known and an unknown voice as coming from the same person "requires knowledge of anatomy, physiology, physics, psychology, and linguistics." Similarly, scent lineup analysis requires knowledge of canine and human anatomy, physiology, physics, psychology, chemistry, and osphresiology. Defining what constitutes the relevant field often pre-determines whether Frye is met. Thus, if the field of voice-

297. Id. at 123.
298. Id.
299. Id.
300. Id.
301. Id.
303. Id. at 1208.
305. See, e.g., W. McCartney, supra note 169, at 1-15. "Osphresiology," the study of the sense of smell, is a word no longer found in the dictionary, but the use of which McCartney, in his classic work on the subject, has revived. See id. at 10.
print analysis is defined to consist of the technicians who administer
voice spectrograms, such technicians unquestionably will declare
voiceprint analysis "generally accepted." On the other hand, if the
field is defined more broadly to include research scientists in many
of the fields noted above, the opposite declaration will result.

The best approach is to define the relevant field to include
scientists who either have conducted research regarding the relevant
principles and techniques or are familiar with and capable of criti-
tiquing such research. Testimony regarding general acceptance
among such scientists should be offered only by one of their number
who does not make his living from application of the technique in
question. This approach has several advantages. Frye's purpose
is to ensure some minimal guarantee that evidence is trustworthy.
The general acceptance requirement achieves that purpose by as-
suming that "those most qualified to assess the general validity of
a scientific method will have the determinative voice." Clearly,
scientists are most qualified to assess the validity of a scientific
method. This assertion is better understood when it is emphasized
that the Frye requirement only makes sense if "general acceptance"
refers to acceptance of the results of, and the inferences drawn from,
scientific experimentation. After all, it is experimentation that dem-
strates the value of a scientific technique. Only a scientist is

308. See People v. Kelly, 17 Cal. 3d at 38, 549 P.2d at 1249, 130 Cal. Rptr. at 153;
Moenssens, Admissibility of Scientific Evidence—An Alternative to the Frye Rule, 25 WM.
309. Giannelli, supra note 250, at 1215-16; see Kelly, 17 Cal. 3d at 38, 549 P.2d at
1249, 130 Cal. Rptr. at 153.
310. Giannelli, supra note 250, at 1206-08.
312. Moenssens, supra note 308, at 556-57. Professor Moenssens points out that a
technique should pass through six stages before it may be admitted at trial:
Stage 1: A theory is postulated.
Stage 2: Experiments are designed to verify the validity of the theory.
Stage 3: If the theory's validity is not disproved after a searching inquiry and
empirical testing, it is "proven" valid and a court then appropriately may take
judicial notice of the theory. This result is unlikely to occur at this stage, however,
because no vehicle exists for translating the theory into relevant evidence in a law
suit.
Stage 4: A technique is devised, or an instrument is designed and built, that will
permit the theory to be applied practically in a forensic setting.
Stage 5: After devising a methodology, further tests must demonstrate a positive
correlation between the results and the underlying theory. This stage is necessary
to prove that the effects observed are not the result of some unidentified cause.
Stage 6: After the test has been shown to yield reliable results that are relevant
likely to be familiar with the experimental data and their meaning.\(^\text{313}\) Moreover, only a scientist will be familiar with the nature and extent of dissenting views and their significance.\(^\text{314}\) Specifically, a scientist will know whether experimentation is in such an early stage that no clear conclusions can be drawn, particularly where there are conflicting points of view.\(^\text{315}\) Alternatively, the scientist will know whether, despite some dissent, experimentation has advanced to the point that there are indeed "generally accepted" conclusions.\(^\text{316}\) Finally, a scientist who does not make his living from application of the technique will have no "axe to grind" and can be better trusted to offer an unbiased opinion.\(^\text{317}\)

This technique has been applied successfully to voiceprint analysis, the result being that the Frye test was failed when the only testimony regarding general acceptance was that of a technician and law enforcement officer. In People v. Kelly,\(^\text{318}\) the California Supreme Court held that a voiceprint analysis was inadmissible since it failed to meet the Frye test. The only testimony regarding general acceptance was that of a technician and law enforcement officer who had been trained by the leading pioneer in voiceprint analysis, headed the to disputed issues in a law suit, a court then may admit these results properly into evidence, and a qualified expert may interpret the results before the jury. \(\text{Id. at 556 (footnote omitted).}\)

Professor Moenssens notes that the courts' failure to examine these six stages of development of a scientific technique has led to the acceptance of some techniques under Frye that have not reached the final stage of experimental verification. This failure is one of many reasons that have led Professor Moenssens to argue for replacing Frye with a more flexible alternative. Whether or not such a course is wise, Frye is much more likely to achieve its purposes when courts apply the test with the six stages of scientific development in mind.

\(313.\) As Professor Giannelli states:

Even if empirical validation is recognized, a technician's testimony should never suffice to establish the validity of a novel technique: "[The technician merely follows prescribed routines, and is not expected to understand their underlying fundamentals. He knows how, but not why." Because it is critical to know the "why," or, as in the case of empirical validation, the implications of not knowing the "why," the views of scientists are essential. Moreover, a technician would not be qualified to testify about the general acceptability of a technique because presumably only a scientist would be sufficiently conversant with the views held by those in the relevant field.

Giannelli, supra note 250, at 1214-15 (footnotes omitted) (quoting Kirk, The Interrelationship of Law and Science, 13 BUFFALO L. REV. 393, 394 (1964)).

\(314.\) \text{Id.}\n
\(315.\) \text{See supra notes 312-313.}\n
\(316.\) \text{See Giannelli, supra note 250, at 1210-11; Giannelli, General Acceptance of Scientific Tests—Frye and Beyond, in SCIENTIFIC AND EXPERT EVIDENCE, supra note 259, at 24.}\n
\(317.\) \text{See E. IMWINKELRIED, METHODS OF ATTACKING SCIENTIFIC EVIDENCE § 4-6(b), at 137-41 (1982) [hereinafter E. IMWINKELRIED, METHODS OF ATTACKING]; J. TARANTINO, supra note 307, at 12-14; Giannelli, supra note 250, at 1215-16.}\n
\(318.\) 17 Cal. 3d 24, 549 P.2d 1240, 130 Cal. Rptr. 144 (1976).
Michigan State Police Voiceprint Identification Unit, frequently testified as a voiceprint expert, and, in short, had "virtually built his career on the reliability of the [voiceprint] technique." The court declared that such a technician could not "assess fairly and impartially the nature and extent of any opposing scientific views."

Applying this approach to scent lineups results in defining the "relevant scientific field" as consisting of those scientists, whether biologists, anatomy specialists, or dog psychologists, who are familiar with the experimental data regarding the trustworthiness of canine scent discrimination generally and scent lineups in particular. Furthermore, any witness testifying about general acceptance must not make his living by using dogs for scent discrimination tasks. It is this definition of the relevant field, and this restriction on the persons whose opinions are being considered, that leads to the conclusions stated below.

Second, both validity and reliability must be shown. "Validity" addresses whether a test is accurate and whether it measures what it is supposed to measure. "Reliability" refers to the consistency with which repeated tests yield the same results. The purposes of Frye suggest that both validity and reliability are necessary since a single test suggesting high accuracy is meaningless if later tests reach contrary conclusions. Such later tests may reveal flaws in the methods used in, or limits to the inferences that may be drawn from, the early tests.

319. Id. at 38, 549 P.2d at 1249, 130 Cal. Rptr. at 153-54.
320. Id.
321. This definition of those who make up the relevant field does not mean that only experiments conducted by scientists in that field are relevant in determining general acceptance. For example, a technician lacking the technical credentials of a research scientist but who gains a strong familiarity with the scientific method might, in consultation with scientists, conduct scent lineup experiments under controlled conditions. If research scientists review the nature of the experiments and approve of the methods and the likely trustworthiness of the results, and if the results are replicable in similar controlled experiments, then the technician's work will be relevant in deciding the question of general acceptance. Indeed, at least one "scientific technician," Brigadier Jan de Bruin of the Rotterdam Municipal Police, has conducted controlled experiments concerning scent lineups, doing so in consultation with Professor E.P. Koster, an olfaction expert at the University of Utrecht, Holland. See infra text accompanying notes 379-381. However, whether this technician's experiments, in conjunction with the work of others, establish general acceptance of the validity and reliability of scent lineups is a question to be resolved by the views of research scientists, not the "scientific technician."
322. Giannelli, supra note 250, at 1201 & n.20; Moenssens, supra note 308, at 548.
323. J. TARANTINO, supra note 307, at 3-4; Giannelli, supra note 250, at 1201 & n.20.
324. See supra note 323.
325. See McCord, supra note 30, at 1190.
Third, the validity and reliability of both the underlying scientific principles and the scientific technique must be shown.\(^{326}\) A technique that appears consistent and accurate may not justify reaching the conclusions that the technique suggests if the underlying principles are in error. For example, if a victim receives a threatening phone call and records that call, numerous voiceprint experts might agree that the recorded voice and the defendant’s voice “match.” That match is meaningless, however, unless the underlying principle that each person has a unique voice is correct. Conversely, if the underlying principle is correct but the voice spectrogram cannot be trusted accurately to match one voice to another, the results of a spectrographic comparison will be meaningless.\(^{327}\)

There are five relevant questions that the scientific community must answer affirmatively if dog scent lineups are to pass the *Frye* test:\(^{328}\) (1) Does each person have a unique scent? (2) If yes, is there a “core scent” that stays the same over time, despite changes in individual mood, diet, clothes, cologne, and similar factors? (3) If yes, are at least some dogs biologically capable of discriminating among the unique human body scents? (4) If so, can those dogs be trained to use their capability accurately whenever so commanded by their handlers? (5) If those dogs can be so trained, how much time can elapse between the application of scent to the object and the holding of the lineup after which the dogs still can discriminate successfully among scents? The first two questions are concerned with the validity of the underlying scientific principles, and the latter three questions inquire as to the validity and reliability of the technique.

To the first question many might answer “yes,” each person does indeed have a unique scent. Although both the principle of scent uniqueness and its general acceptance often are articulated clearly,\(^{329}\) the basis for such acceptance is less clear. Many widely varying experiments have demonstrated that a dog can, under certain circum-

\(^{326}\) Giannelli, *supra* note 250, at 1211-14. The “validity” of a scientific principle, as opposed to the technique applying that principle, might be better understood as meaning that the theory reflects sound scientific reasoning, *see* Black, *supra* note 251, at 599-600, and that it is supported by empirical verification, *see* Giannelli, *supra* note 250, at 1212-14.


\(^{328}\) These questions are suggested by the research results summarized in W. McCartney, *supra* note 169, at 58-59, and by an analogy to the case law regarding the admissibility of voice spectrograms. *See* supra note 327.

\(^{329}\) “It is generally accepted that humans have a scent and that it differs from one individual to another.” W. Syrotuck, *supra* note 160, at xiii.
stances, accurately distinguish among human odors (although the dispute continues as to what these particular circumstances are).\textsuperscript{330} That fact, however, does not necessarily establish that human odors are unique. A wide enough sample might show that dogs cannot distinguish among the scents of certain persons, thus suggesting that these persons indeed have similar or identical scents.\textsuperscript{331} Moreover, a dog's choosing among several persons might be the result of badly designed experiments, not necessarily perceived differences in human odors.\textsuperscript{332} Nevertheless, some authors at least implicitly accept the view that research has proceeded far enough to justify the conclusion that the uniqueness of each human's scent is "generally accepted."\textsuperscript{333} This uniqueness has been explained as follows. Heredity gives rise to individual DNA and its resulting individual characteristics. Thus, each person's sweat should have a unique composition.\textsuperscript{334} The action of each individual set of skin bacteria on individual skin components and secretions (such as sweat) further differentiates each person's scent.\textsuperscript{335} Varying combinations of clothing, shoes, toiletries, and diet, among other factors, therefore should particularize each person's scent.\textsuperscript{336}

Dissenters from the theory of scent uniqueness, however, now have new evidence. Drs. I. Lehr Brisbin, Jr. and Steven N. Austad have completed research that challenges the theory of scent uniqueness.\textsuperscript{337} Brisbin and Austad conducted numerous trials in which three dogs were required to choose between two scented articles, one treated with scent from a portion of the handler's body and one with scent from a portion of a stranger's body. They concluded that dogs could distinguish between handler and stranger scents both taken from human hands or both taken from human elbows but could not consistently distinguish between handler and stranger scents taken from different body parts; for example, from the handler's elbow but the

\textsuperscript{330} See the experiments summarized in W. McCartney, \textit{supra} note 169, at 18-58; \textit{infra} text accompanying notes 337-390, 514-548.

\textsuperscript{331} \textit{Cf. infra} notes 376-377 and accompanying text (summarizing experiment that suggests that dogs cannot distinguish between identical twins living in the same environment).

\textsuperscript{332} See \textit{infra} notes 522-548 and accompanying text (suggesting ways to design fair scent lineup experiment).

\textsuperscript{333} See \textit{infra} notes 334-336, 340-341 and accompanying text.

\textsuperscript{334} W. McCartney, \textit{supra} note 169, at 28-29; W. Syrotuck, \textit{supra} note 160, at 21.

\textsuperscript{335} W. Syrotuck, \textit{supra} note 160, at 21-44. \textit{But see} Telephone interview with Dr. L.J. Myers, Director, Institute for Biological Detection Systems, Auburn University (Oct. 3, 1989) (challenging the notion that the bacterial action theory of human scent has been experimentally proven correct).

\textsuperscript{336} W. Syrotuck, \textit{supra} note 160, at 21-44.

stranger’s hand. The authors suggested two possible conclusions from their study. Individual odors may exist for specific human body parts, but there is no unique individual odor characteristic of a particular human and detectable by the dog regardless of the anatomical source of the odor. Alternatively, there may be an individual unique human body scent, but present training methods are inadequate to teach the dog to make the necessary discrimination accurately. Brisbin and Austad’s research is important because it draws into question the theory of scent uniqueness, and if human scents are not unique, then scent lineups unquestionably fail the Frye test. At the very least, Brisbin and Austad’s work suggests the need for further research on whether human scents are unique, and if so, on how dogs can better be trained to discriminate among those scents.

The second question—whether there is a “core scent” that remains the same despite changes in mood, diet, clothes, and the like—is even harder to answer. Limited experimentation, discussed in Part III(B)(1)(a) of this Article, suggests that properly trained dogs of certain types can, at least under certain circumstances, discriminate between the scents of identical twins based solely on differences in the twins’ diet or environment. But whether a dog can match the scent of an individual taken at one point in time to the scent of that same individual at a later time when his diet, clothes, and environment have been varied in the interim has been little tested.

A suggested experiment would have a subject handle a porous object, then eat a different diet, wear different clothes, live in an environment where different odors were present, and finally, change his cologne for one week. A non-suggestive, properly designed object lineup would then be held at the end of that week. If the dog chose the correct object in the lineup, and if other experimenters working with other dogs reached similar results, that would strongly suggest that there is indeed a “core” scent that remains constant over time. To the author’s knowledge, as of the writing of this Article, no such series of experiments has been conducted.

Nevertheless, respected authors in the field have concluded, with some caution, that “[t]here is probably a basic odor which is typical of each individual in good health and normal circumstances. This, in turn, can likely be varied somewhat by emotions, toiletries, clothing, and diet.” This “basic odor” is thought to “retain its characteristic feature just as a human face does whether angry, or

338. Id. at 1, 3-4, 9-12, 14-15.
339. See infra text accompanying notes 373-377.
laughing, or weeping." The basis of this conclusion is unclear, but it is probably founded on the success of a significant number of dogs in correctly discriminating among persons and objects after the passage of a fairly long period of time. Yet ultimately, the lack of controlled experimentation specifically designed to test that conclusion calls into question whether the conclusion should be considered "generally accepted" within the meaning of Frye. Moreover, the experiments of Brisbin and Austad outlined above suggest that there may be many "core" scents if indeed there are any "core" scents at all, because there may be a different "core" for each part of the human anatomy.

It is important to emphasize that even if the "basic odor" theory were discarded, that only would call into question the trustworthiness of lineups conducted after such time as to permit significant changes in the subject's diet and environment. If the lineup is conducted within hours of the crime, the individual's scent is less likely to have significantly changed.

The third question should be answered "yes": numerous experiments demonstrate that, at least under some conditions, properly trained dogs are biologically capable of discriminating among human odors.

The fourth question, however, should be answered "no": it is not generally accepted that a dog can be trained to use his biological capacity for scent discrimination accurately upon command. Factors that raise the chances of correct canine scent discrimination include: the dog's breed; careful selection of a highly motivated animal; close bonding between dog and handler; lengthy, tedious, and precise training for a single type of scent discrimination task; and the elimination of suggestive circumstances. When these factors are present, it is unquestionably true that under certain circumstances some dogs have been trained to discriminate correctly upon command. There has been too little experimentation, however, to determine precisely what training and which other circumstances are necessary to ensure accuracy on any given occasion.

Indeed, Brisbin and Austad's recent research efforts suggest that our present knowledge of dog training is insufficient to justify the use of dog scent lineups. Thus these authors conclude:

341. W. McCartney, supra note 169, at 59.
342. See supra text accompanying notes 337-338.
343. See W. McCartney, supra note 169, at 73, and the numerous experiments summarized throughout McCartney's text.
344. See id. at 17, 27-28, 57-58, 60-61, 74-75.
345. See id.; infra text accompanying notes 362-390.
Identification of individuals on the basis of information that the dog obtains from scent articles is an important component of the use of dogs in law enforcement. Although it may indeed be possible to train individual dogs to perform such [scent discrimination] tasks, we feel that the results presented here make it clearly incumbent upon the individual dog trainer or handler to demonstrate with data collected under conditions of controlled scientific observation, that the dog under consideration can indeed perform the required scent identification tasks with an acceptable degree of statistical reliability, before evidence based on the performance of such a dog should be accepted in a court of law.

Dr. Brisbin also found much research on the training of dogs to perform scent lineups to be flawed, because the dogs were not asked to perform "blank" lineups in which the true match to the scent did not appear at all. Such tests are necessary in order to control against the dog's choosing someone because it wants to please its master, and not because it truly recognized the scent.

European research technician Jan de Bruin meanwhile insists that he indeed has learned how to train dogs to avoid such false identifications and that he has performed controlled experiments confirming that dogs can be trained accurately to discriminate scents in lineups upon command. Although the results of his experiments are available in English, de Bruin has yet to publish any explanation of the number, manner, and circumstances of the experiments conducted. Moreover, replication of his experiments has not yet been attempted in the United States or elsewhere.

Finally, as to the fifth question, it is unclear how much time may elapse between the laying of a scent and the holding of a lineup before the accuracy of a dog's discrimination is affected. Assuming that there is a unique core scent that remains constant over time, over how long a period can a dog still detect that scent? Some experiments suggest an upper limit of between three to six weeks, while others

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346. I. Brisbin & S. Austad, supra note 198, at 14-15; see also Telephone interview with Dr. L. J. Myers, Director, Institute for Biological Detection Systems, Auburn University (Oct. 3, 1989) (expressing the opinion that further experimental research is necessary to determine whether scent lineups are reliable).

347. Telephone interview with I. Brisbin (June 1, 1989).

348. de Bruin, supra note 157, at 8-9, 11; see also Frawley, supra note 157, at 10-12. As noted earlier, de Bruin is in charge of the Rotterdam, Holland, Police Canine Unit. He has conducted all the experiments discussed in this Article himself, but he designed the experiments (and his program for training dogs and handlers) by consulting with a scientist, Dr. E.P. Koster of the University of Utrecht, Holland. See supra note 321; infra note 379 and text accompanying both notes; see also Letter from Dr. E.P. Koster to Andrew E. Taslitz (June 16, 1989) (on file with the author of this Article).

349. de Bruin, however, is working on a book that will explain his experiments in detail. See Letter 1, supra note 9.

350. See infra text accompanying notes 383-386.
suggest that, under the right circumstances, the limit may be as high as six months.\textsuperscript{351} Some European researchers claim an upper limit of three years if certain standardized procedures are followed.\textsuperscript{352} These few limited experiments, only one of which dealt with a true scent lineup,\textsuperscript{353} are insufficient to establish the general acceptance of a time limit within which scent lineup discrimination may still be considered trustworthy.

Moreover, the European claim of accurate results after three years is implausible. One of the critical components of human scent is the vapor produced by bacterial action on human skin cells and skin secretions.\textsuperscript{354} It is difficult to imagine conditions under which this bacterial action could be maintained for such a long period of time. Moreover, it seems that a bacterial action lasting that long would break down all the skin cells and skin secretions involved. If "food" other than skin cells and skin secretions were given to the bacteria, the nature of the vapor released by the bacteria and thus the scent on the object likely would change. Absent rebuttal of these observations, it is impossible to understand the significance of the little research done or to reconcile the apparently conflicting results.

Accordingly, scent lineups, whether conducted promptly or long after a crime, do not pass the \textit{Frye} test. This does not mean, however, that such lineups should never be admissible in a \textit{Frye} jurisdiction; rather, it means that scent lineups should be inadmissible until and unless research establishes their reliability.\textsuperscript{355}

In the many jurisdictions that do not follow \textit{Frye} at all or that consider general acceptance as only one factor in a broader analysis of relevancy and weight,\textsuperscript{356} the lack of general acceptance will not automatically condemn scent lineups to exclusion at trial.

\textsuperscript{351} See infra text accompanying notes 387-388.
\textsuperscript{352} See Frawley, supra note 157, at 12.
\textsuperscript{353} See de Bruin, supra note 157, at 8-11.
\textsuperscript{354} See supra notes 182-185 and accompanying text.
\textsuperscript{355} Professor Samuel G. Chapman, a political scientist who has written extensively on the use of police dogs, has reached a similar, if slightly more optimistic, conclusion (albeit without reviewing for his readers the scientific research supporting that conclusion):

It will take many years of research and experimentation, but it is possible that law enforcement will enter the age of scent identifications. This suggests that trained dogs, under the supervision of handlers, could be used to conduct scent lineups with the results eventually carrying the weight of a fingerprint identification. Farfetched, perhaps, but efforts to rise above problems in this area could lead to an impressive achievement.


\textsuperscript{356} United States v. Downing, 753 F.2d 1224, 1238 (3d Cir. 1985) (acceptance among the scientific community as but one factor); Giannelli, \textit{supra} note 250, at 1203, 1232-35 (alternatives to \textit{Frye}).
B. Relevancy

Those jurisdictions following a relevancy analysis in place of Frye admit scientific evidence only if the probative value of the evidence outweighs such countervailing considerations as its tendency to mislead the jury.\textsuperscript{357} Scientific evidence thus, in theory, is treated like all other evidence,\textsuperscript{358} for all evidence must survive this weighing process.\textsuperscript{359} Countervailing factors, however, cannot be weighed against probative value without first determining \textit{how} probable the evidence is or rather how good a predictor the scientific test in question is.\textsuperscript{360} This section thus begins by discussing the state of the experimental research on the predictive power of dog scent lineups. Having established what that predictive power is (what the "probative value" is), the discussion then considers two potential counterweights: the "indeterminacy" or lack of guidance for the jury in deciding what the probative value of lineups is generally and in particular cases and the highly subjective nature of the lineup expert's testimony. This section finally examines the legal bases of the relevancy approach in greater depth to understand how courts have applied that approach to scent lineups and whether, when that approach is properly understood, the balance tips against admissibility.

\textsuperscript{357} Giannelli, supra note 250, at 1235-39.

\textsuperscript{358} But in practice, concluding that certain evidence is "scientific" results in special treatment of that evidence, even under a relevancy analysis. First, a rational inquiry into the probative value of scientific evidence necessarily requires a court to delve deeply into scientific principles and processes, instead of relying on the judge's own logic and experience. Compare S. Saltzburg \& M. Martin, Federal Rules of Evidence Manual 125 (5th ed. 1990) (generally only "logic and experience together ... supply the judge with skills in determining whether a given piece of evidence tends to prove or disprove a disputed proposition") with Giannelli, supra note 250, at 1235 ("The probative value of scientific evidence, however, is connected inextricably to its reliability ... Because the judge in most cases cannot resort to logic and experience to evaluate the probative value of a novel technique, he must turn to science."). Second, as explained in Section III A(1) of this Article, scientific evidence is very likely to overawe a jury and must therefore be treated with some special caution. See supra note 260 and accompanying text. Third, some jurisdictions following a relevancy analysis nevertheless consider Frye general acceptance as one factor (although, unlike with the Frye approach not the sole factor) in determining admissibility. See supra note 356; infra note 448 and accompanying text. Frye's application to "scientific" evidence thus may retain importance in relevancy approach jurisdictions.

\textsuperscript{359} P. Giannelli \& E. Imwinkelried, Scientific Evidence 31 (1986) ("The principle alternative to the Frye test is to treat scientific evidence \textit{in the same way as other evidence}, weighing its probative value against countervailing considerations." (emphasis added)).

\textsuperscript{360} See Giannelli, supra note 250, at 1235-39.
(1) Validity and Reliability: An Exploration of the Scientific Data

As noted above,361 there is no consensus in the scientific community on the accuracy of dog scent lineups. Moreover, not only are there numerous incomplete, poorly designed, and conflicting experiments in dog scenting generally, but most concern dog tracking, not scent lineups in particular.362 Some experiments, however, are worth discussing. These can be divided into two broad categories: experiments in which little time elapsed between the laying of the scent and the time of the scent lineup; and experiments conducted in order to determine how much time could elapse before significantly affecting the dog's accuracy.

a. Where Time is Not a Factor

The scenting abilities of dogs, both in tracking and scent discrimination, were tested in Berlin during 1913 and 1914 under the auspices of several persons, including Professor Pfungst and then Police Lieutenant Konrad Most.363 Konrad Most, although a police lieutenant by trade, had a contemporary reputation as one of the persons most seriously engaged in the scientific investigation of training police dogs.364

In one of the Berlin experiments, ten objects belonging to ten persons were laid in a row. Each object was placed in the row by its owner, without the touch of any other human being. A dog, Flott, was given the scent from test person number three when he held both his hands around Flott's nose for twenty seconds. Flott then was told to fetch the object belonging to number three. In seventeen trials, Flott retrieved the correct object on only two occasions for an accuracy rate of under twelve percent, or little better than chance.365

In a second experiment, ten persons laid their gloves on the ground, then went off some distance, and stood in a row with three paces between each man and his neighbor. A dog was given the scent from one of the pairs of gloves and told to find the gloves' owner. The test subjects were not told which pair of gloves were sniffed by the dog, in an attempt to control for minimal cues. During each of

361. See supra notes 289-356 and accompanying text.
362. See, e.g., W. McCARTNEY, supra note 169, at 18-58.
363. Craig, supra note 205, at 38, 41; see also W. McCARTNEY, supra note 169, at 43 (recounting Most's experiments).
364. Craig, supra note 205, at 38.
365. Id. at 40.
the four trials, the dog failed to find the correct owner. The use of police dogs for identification of criminals was abandoned in Berlin because of these horrendous failures. The Berlin lineup experiments were, however, few in number and involved few animals. The failures may have been due to poor training, a possibility further suggested by the superior results achieved in other experiments.368

Perhaps the best known experiments in which contrary results were reached were those conducted by the psychologist, Frederick Jakobus Johannes Buytendijk.369 Buytendijk arranged zinc pails, each with a stirrup handle, into three retorts. Each retort contained a mixture of different acids found in human perspiration. A dog, Albert, sniffed a fourth mixture that was identical to one of the first three. The dog was then led by a handler to the line of zinc pails. The handler did not know which pail contained the matching mixture. When the dog located a match, he retrieved the pail. The experiment was repeated with the same dog twelve times, with an accuracy rate of almost sixty-seven percent based on eight correct choices out of twelve.370 In a second series of experiments, the same dog achieved an accuracy rate of eighty percent based on eight out of ten correct choices.371 From these experiments, Buytendijk concluded that Albert could discriminate among the three odor compounds very well. Buytendijk cautioned, however, that “at the same time, despite this discriminating power, an incorrect choice did occur several times, and we see accordingly how very cautious one has to be in using police dogs in judicial investigations.”

More recent experiments illustrate the precision with which the experimental analysis of scenting can be undertaken. These experiments also suggest—although alone they do not prove—that properly trained dogs may have extraordinary powers of discrimination.

One of the most interesting recent experiments was conducted by Peter G. Hepper of the Department of Psychology at The Queen’s University of Belfast.373 Dr. Hepper conducted a series of three experiments designed to determine the dog’s ability to distinguish var-
iations in scent based upon genetic, dietary, and environmental differences among humans. These experiments were conducted after each dog was given extensive training in a specific type of discriminatory task. In each experiment odors were obtained by having subjects wear T-shirts continuously for a twenty-four-hour period. Prior to wearing the T-shirts, each subject was asked to wash and rinse thoroughly using the same soap. The T-shirts also were washed in the same washing powder. Experiments were held after no more than a twenty-four-hour lapse between wearing the T-shirt and conducting the experiment. Furthermore, the dog's owners were not informed which T-shirt was the "correct" choice for the dog to make.

In the first type of experiment, male twins aged two to three months were used and four dogs were tested. Each dog's performance was tested with a different subset of five twin pairs for a total of fifty trials per dog. Environmental and dietary factors were controlled because the twins lived in the same homes and were fed identical diets. The twins, however, were non-identical, thus differing in genetic relatedness.1 The four dogs respectively demonstrated accuracy rates of ninety-two, ninety-four, eighty-four, and eighty-six percent (because only two T-shirts were involved in each trial, if the dog randomly chose (i.e. without scenting) one T-shirt over the other, the dog would have a fifty percent chance of being correct). Consequently, each of the dogs was capable of discriminating between individuals to a significant degree according to genetic differences.2

The same four dogs were involved in the second type of experiment. In this type, ten sets of identical twins aged between thirty-four and fifty years, eating different diets and living in different homes, were examined, again with fifty trials per dog. The dogs had greater difficulty distinguishing between the scents of genetically identical persons differing only in diet and environment but still did much better than chance. The respective accuracy rates of the four dogs were eighty, eighty-two, eighty-four, and eighty-eight percent.3

In the final type of experiment, both environmental and genetic factors were the same. As in the first experiment, ten sets of twins between the ages of two and three months were used, but this time the twins were identical. The dogs did no better than, and sometimes

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1. Identical or "monozygotic" twins come from the same fertilized egg, thus sharing the same genetic material. See Dorland's Pocket Medical Dictionary 687 (22nd ed. 1977). Non-identical twins come from two different eggs, thus they do not share identical genetic material although they still are born at the same time. Id.
2. Id. at 550-51.
3. Id. at 551-52.
worse than, pure chance—demonstrating respective accuracy rates of fifty-four, forty-six, forty-six, and fifty percent.377

Dr. Hepper's experiments, while enlightening, were far too limited. First, because they involved only two choices per dog per trial, they created the very high pure chance accuracy rate of fifty percent. Second, too few dogs were tested to draw broad conclusions. Third, the experiments did not include "blank lineups," (for example, scenting the dog on an object handled by person "A" but then asking the dog to choose between persons "B" and "C" where all three individuals differ genetically but eat the same food, wear similar clothes, and work in the same place). Of course under this scenario the only "correct" answer is for the dog to choose no one at all.378

In contrast, Brigadier Jan de Bruin, supervisor of the Rotterdam, Holland, Police Department Canine Unit, in consultation with Dr. E.P. Koster, an olfaction expert at the University of Utrecht, Holland, conducted a series of scent discrimination experiments that included "blank" lineups.379 These experiments, described in greater detail in Part III.E.(3) of this Article, involved "true" lineups; that is, lineups in which the dog was required to choose among numerous human scents, not simply scents "A" and "B." de Bruin reports a ninety-five percent accuracy rate, based upon his special training program,380 but precise information as to the number and details of the individual experiments has not yet been published.381 To this author's knowledge, no similar experiments have been reported elsewhere.

Not all recent experiments, however, have reached the fairly high accuracy rates claimed by Jan de Bruin and reported by Dr. Hepper. Drs. Brisbin and Austad found that, even in their simplest experiments, which required three dogs to distinguish between the scent of the handler's hand and a stranger's hand, the dogs were correct only 75.7% of the time.382

377. Id. at 550-52.
378. See supra note 347 and accompanying text.
379. See de Bruin, supra note 157, at 7-11; Frawley, supra note 157, at 10; infra notes 522-546 and accompanying text; see also Telephone interview with I. Brisbin, Research Professor, University of Georgia (Oct. 6, 1989) (coining the term "blank lineups").
380. de Bruin has reported that he takes about one year to train each dog, a process that involves daily exercise and testing of the animal. See Letter I, supra note 9. He has described his training techniques as among the "newest," but he has not yet described in any significant detail what those training methods are or how they differ from older methods. He has promised to do so, however, in a book to be completed in the near future. Id.
381. Letter I, supra note 9.
382. I. Brisbin, Jr. & S. Austad, supra note 198, at 9. The dogs did much better in distinguishing human scent from no scent at all, but, even then, the dogs were accurate only about 93% of the time. Id. at 11.
b. Where Time is a Factor

Very few experiments have studied the effect of time on a dog's accuracy. In one of the few that did investigate this area, researchers King, Becker, and Markee randomly placed slides in a five station circle in such a way that a fingerprinted slide appeared at each station five times in every twenty-five trials. Five fresh slides (one fingerprinted and four blank) were used in each trial, with a rotary fan clearing the air between trials. The slides were aged indoors and therefore not exposed to the elements. Two dogs were tested to see whether they could still detect the human odor trace on the single fingerprinted slide in each trial over successively longer periods of time.

After three weeks, one of the dogs was correct ninety-four percent of the time while the other dog was correct only sixty-eight percent of the time (chance accuracy, of course, being one out of five slides or twenty percent). At the end of six weeks, both dogs were performing in the forty to fifty percent accuracy range. And by eight weeks, their success rate had fallen to twenty percent accuracy or that of chance performance. King, Becker, and Markee described these results as demonstrating that the dogs had "high performance scores" in choosing among the slides for "up to 6 weeks.'

These experiments are of limited value, however, in determining what period of delay is acceptable between the laying of the scent and the conduct of the dog scent lineup. King, Becker and Markee's dogs were only tested as to detection of human odors, not discrimination, since only one slide in each trial had a human scent trace. It presumably would be much harder for a dog to match an individual's scent to a slide after three weeks if each slide contained the scent of a different human. Yet such a circumstance would be much closer to what happens in a dog scent lineup and, therefore, would provide better guidance in making judgments regarding how quickly scent lineups must be held if they are to be accurate.

The Menzels, who conducted various scenting experiments in the 1920s and early 1930s, maintained that a dog could recognize a human odor on an object for as long as six months if the odor was suitably preserved in a glass container in a dry and cool place.

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384. Id. at 312-13.
385. Id. at 314.
386. See id. at 312.
387. W. McCartney, supra note 169, at 59.
ertheless, they recommended that a control object also be taken from a person known to be innocent at the same time as the tested object and from the same body part as that from which the tested object was taken. The Menzels further recommended that a control test with this object be made a day or two before the actual criminal investigation. The use of a control in the procedure acts as a check on the accuracy of the dog's scenting. It is unclear what would explain the superior results reported by the Menzels compared to the results achieved by King, Becker, and Markee, although the Menzels' special effort to store the scent in glass containers in a dry, cool place may offer a partial explanation. In any event, their isolated efforts are of little value without similar results being achieved by an adequate number of other researchers.

Finally, as discussed above, Brigadier de Bruin's experiments suggest a high accuracy rate after a lapse of time as long as three years. It is difficult to formulate a theory that would explain accuracy after such a long passage of time.

(2) Relevancy and Indeterminacy

This review of the experimental data on scent discrimination demonstrates that widely varying results have been achieved regarding dog's accuracy and that too little experimentation has been done to justify broad conclusions as to how good dogs are at scent discrimination. Without a measure of how effective they are at that task, however, there is no way to determine whether evidence of scent discrimination at lineups is "relevant."

The Federal Rules of Evidence define "relevant evidence" as "evidence having any tendency to make the existence of any fact that

388. Id.
389. Compare id. at 59 (scent stored in glass container) with King, Becker, & Markee, supra note 383, at 312 (slides stored in cabinets protected by fine gauze screening where the slides "could become dusty but not completely begrimed"). In his classic work on dogscenting, McCartney offers an English language summary of the Menzels' work, which they had originally reported in German. Unfortunately, McCartney summarizes their conclusions, not the details of their individual experiments, so it is difficult to critique their methodology. McCartney, supra note 169, at 59.
390. Frawley, supra note 157, at 12 ("In Brigadier de Bruin's experiments, he has stored the scent of police officers from his department in the glass bottles for three years. The dogs are still identifying the correct individual."); cf. J. TARANTINO, supra note 307, at 12-15 (discussing the need for general acceptance in the relevant scientific community that the technique of electrophoresis of evidentiary blood stains can result in an accurate reading of genetic markers after the lapse of a specified period of time); Moenssens, supra note 308, at 567 (emphasizing that a technique must be reliable for the precise purpose for which it is being used).
is of consequence to the determination of the action more probable or less probable than it would be without the evidence."

The accuracy of a particular kind of scientific evidence determines in part whether that evidence is logically relevant. For example, if a murder is committed with only four people present, there is automatically a twenty-five percent chance that any one of them committed the crime. If the murder weapon was found, a dog scent lineup could be conducted to determine which of the four had handled the weapon. If the dog used had an accuracy rate of only twenty-five percent, assuming that only one of the four had handled the weapon, the dog's selection of any individual in the lineup would not make it any more probable that that individual was guilty than would have been true without the lineup. Consequently, the lineup results would not be "logically relevant."

An approximate measure of accuracy is also necessary when analyzing what two well-known commentators have called "pragmatic relevance." An inquiry as to the pragmatic relevance of evidence asks whether the probative value of that evidence outweighs countervailing considerations such as its tendency to confuse a jury. Thus, while a ninety-nine percent accuracy rate in the example above might justify admitting scent lineup evidence despite a tendency to mislead, a twenty-six percent accuracy rate would not.

When the accuracy rate of a type of evidence is unknown or is subject to dispute, logical relevancy is indeterminate. If only a range

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392. The term "logically relevant" means relevance as defined in Rule 401 and is used to delineate such relevance from "pragmatic relevance," defined below. See R. Lempert & S. Saltzburg, supra note 259, at 153 (defining "logical relevance" and comparing it to other concepts of relevancy); see also infra note 393 (defining "pragmatic relevance").
393. See C. Mueller & L. Kirkpatrick, Evidence Under the Rules: Text, Cases, and Problems 79 (1988) (coining the term "pragmatic relevance"). "Probative value" refers to the tendency of evidence to establish the proposition that it is offered to prove; the requirement that there be at least some such tendency is part of Federal Rule of Evidence 401's definition of relevant evidence. See C. McCormick, McCormick on Evidence § 185, at 541-42 (1984) [hereinafter McCormick on Evidence]. The additional requirement that probative value be outweighed by countervailing considerations—what Mueller and Kirkpatrick call "pragmatic relevance"—is set forth in Federal Rule of Evidence 403. "Pragmatic relevance" has also been called "legal relevance," id. at 548 & n.43, but the phrase "pragmatic relevance" is clearer because both commentators and courts have used "legal relevance" to mean many different things. See id.

The need for an inquiry into scientific accuracy to resolve both logical and pragmatic relevancy questions is discussed in Giannelli, supra note 250, at 1235-39, although he uses slightly different terminology.
394. Professors Lempert and Saltzburg identify this indeterminacy as one example of an "estimation problem," or a problem in estimating true probative value. R. Lempert & S. Saltzburg, supra note 259, at 160. They note that "[i]n these circumstances courts often
of likely accuracy rates is known (as opposed to literally no estimate of accuracy being available), the lower end of the range might be high enough to justify a finding of logical relevancy. For example, a forty to sixty percent probability of scenting accuracy in the four person murder lineup posited above would increase a suspect's probability of guilt above pure chance. Nevertheless, without a more precise determination of accuracy, a court may be hard pressed to determine whether probative value outweighs countervailing considerations. Because of the scant research on scent lineups the court in a lineup case is always faced with this very problem of uncertainty: without a measure of probative value, that value cannot be weighed against other concerns.  

A second problem of indeterminacy arises regarding the difficulty in determining whether certain persons, objects, or phenomena fit within a specified class. For example, a test for the presence of barium and antimony may reveal levels of those elements on a person's hands that are well in excess of the amounts found in the general population. The usual explanation for the presence of these elevated concentrations is that the defendant recently fired a gun. Assuming that this is the correct explanation in eighty percent of the cases, however, there is arguably still no way of knowing whether in any particular case the elevated levels were due to firing a gun or some other unknown cause. Some courts, therefore, exclude statistical evidence of the explanation for scientific phenomena as logically irrelevant because "[e]ven if statistical evidence of the general reliability . . . were valid, such evidence would not warrant a finding of reliability in a particular case."  

Of course as a matter of pure logic this approach to logical relevancy is wrong, as is again demonstrated by the barium-antimony example above, because there the statistical evidence unquestionably exclude evidence as irrelevant rather than let the jurors speculate on its import. Since such evidence might well relate to the probability of guilt or innocence if its true implications were known, a more precise justification for exclusion is 'relevance unknown.'" Id. at 160.  

395. See United States v. Wilson, 361 F. Supp. 510, 514 (D. Md. 1973) (indeterminacy regarding the accuracy of the polygraph examination was one factor leading the court to declare polygraph results inadmissible in a criminal trial).  

396. George, Statistical Problems Relating to Scientific Evidence, in SCIENTIFIC AND EXPERT EVIDENCE, supra note 259, at 105, 127-33. This problem is more pronounced where the classification of phenomena has a substantial subjective element, as is true with dog scent lineups. See id. at 122.  

397. McCord, supra note 30, at 1194.  

398. E.g., Commonwealth v. Foley, 7 Mass. App. Ct. 608, 611, 389 N.E.2d 762, 765 (1979) (emphasis added) (error to allow an expert to testify that the statistical probability of polygraph accuracy was 85% or better).
made it "more probable" than not that the defendant had fired a gun. It is therefore more sensible to admit that the barium-antimony evidence is logically relevant, but to note the danger of the jury's being misled by the evidence, thus assuming that the defendant is guilty based only or in large part on the statistics. The jury's proper role should be to determine to which group the defendant belongs, the eighty percent for whom shooting a gun is the correct explanation or the twenty percent for whom the explanation is unknown.399

Alternatively, assume that besides the gun firing explanation the only other known cause of elevated levels of barium and antimony is exposure to those elements in the course of certain professions.400 Under these circumstances, the solution to the problem is easy. An expert could explain the two possible causes to the jury, and the prosecutor could offer evidence that the defendant was not working in the relevant professions at the time of the crime. If the defense offered evidence to contradict the prosecution's assertion, the jury could then decide for itself which alternative it believes is the true source of the elevated elements.

With scent lineups, however, research has not progressed this far and no one understands why even well-trained dogs occasionally make mistakes. Thus, if there is an eighty-five percent accuracy rate, why is the dog wrong fifteen percent of the time? What factors lead to error? Are such factors present here? Only when such questions have been answered can the jury decide in any particular case whether the fact that a dog identified a particular defendant falls within the fifteen percent group of inaccurate identifications or the eighty-five percent group of accurate ones.

(3) Subjectivity: Cues and Miscues

The greater the element of subjectivity in a scientific test, the greater the risk of error and the greater the danger of misleading the

399. Some commentators oppose allowing the jury ever to hear statistical evidence of this nature because they fear that the statistics will mislead the jury. E.g., George, supra note 396, at 136. But see McCORMICK ON EVIDENCE, supra note 393, at 656-57 (favoring admissibility of such probability evidence to aid the jury under certain circumstances). Whether or not jurors are given precise statistics, however, it is arguably appropriate to advise them that a particular technique is imperfect without ever mentioning the numbers that purport to measure how imperfect. Such an approach eliminates the major danger created by statistical evidence: that seemingly impressive numbers may mislead or overwhelm the jury. Id. at 652; see also Tribe, Trial by Mathematics: Precision and Ritual in the Legal Process, 84 HARV. L. REV. 1329 (1971). But see Saks & Kidd, Human Information Processing and Adjudication: Trial by Heuristic, 15 LAW & Soc'y 123 (1980-81) (arguing that the danger of jury confusion is overstated). The approach, however, does not eliminate the problem that jurors may still lack guidance in determining whether the technique was or was not correct in the specific case before them.

400. See P. GIANNELLI & E. IMWINKELRIED, supra note 359, at 333-36 (1986).
"Subjectivity" refers to effects on test outcomes or on the interpretation of test results that cannot be measured, or, if measurable, cannot be cataloged in a systematic manner. As the potential for subjectivity increases so does the risk of unnoticed error and the likelihood that the accuracy of the results will depend heavily on the examiner's skill in reducing subjectivity and in accurately interpreting test results.

As is discussed previously, scent lineups involve tremendous subjectivity in both their design and administration. The behavior of both the examiner and the subjects can affect the lineup outcome, yet that effect cannot be measured or cataloged and may, therefore, not even be noticed. Not only is the examiner's skill critical in training his dog and in designing a fair, non-suggestive lineup, but so is his skill critical in interpreting the behavior of his dog. This subjectivity is exacerbated by the lack of uniform industry guidelines to which the examiner may refer when he interprets canine behavior or designs a fair lineup. Nor are there uniform guidelines regarding who qualifies as a scent lineup examiner. As a consequence, it is


403. This is so for two reasons: first, sources of error can be introduced but undetected in the creation of the data, Lewis, supra note 401, at 413-14; and second, adequate criteria do not exist for the experts to articulate the precise foundations for their conclusions, often resulting in differing experts reaching contrary opinions regarding the meaning of the same data. Comment, supra note 402, at 1020-24.

404. See supra notes 240-242, 259, 344-345, 396 and accompanying text.

405. See infra notes 514-548 (emphasizing that creating fair scent lineups, if possible at all, requires a knowledge of underlying scientific principles and great care in applying them); Letter I, supra note 9 (dog trainers must "have ability and patience in order to be able to handle and control the dogs [sic] conduct and reactions, they must have authority and be resolute, they must have the capability to use their special abilities in criminal investigations," and they must, when paired with their dogs, "reach a 95% positive score" in practice before they may be considered as "operative units.").

406. Cf. State v. Frazier, 162 W. Va. 602, 617, 252 S.E.2d 39, 48 (1979) (excluding polygraph results because so "much depends upon the subjective analysis of the results by its operator. We know of no scientific test conventionally admitted by the courts which carries such a high degree of interpretative subjectivity.") (emphasis added).

407. See United States v. Williams, 583 F.2d 1194 (2d Cir. 1978) (existence and maintenance of interpretive standards critical in judging the reliability of spectrogram), cert. denied, 439 U.S. 1117 (1979); Imwinkelried, Instrumental Techniques Yielding Nonnumerical Test Results, in SCIENTIFIC AND EXPERT EVIDENCE, supra note 259, at 405-06 (noting the lack of uniform standards in forensic odontology and firearms identification).

408. Telephone interview with Dr. L.J. Myers, Director, Institute for Biological Detection Systems, Auburn University (Oct. 3, 1989); telephone interview with Phil Hoelcher, a dog training expert (June 2, 1989); cf. Abbell, Polygraph Evidence: The Case Against Admis-
difficult to screen the quality of the examiners or objectively identify whether, in any particular case, subjective distortions in the administration or interpretation of the test are unduly affecting the examiner’s opinion. Such subjectivity, when combined with the numerous other concerns surrounding the conduct of dog scent lineups—particularly the incipient stage of experimental research and the problem of indeterminacy—suggests that, as a class of evidence, scent lineups should not be admitted at trial.

(4) Is the Relevancy Test Met?

The primary alternative to the Frye test for admissibility of scientific evidence is the “relevancy approach” that is associated with Professor McCormick. Variations on this approach abound. The common thread among these variations is that they all balance the probative value of admitting novel scientific evidence against countervailing considerations. Two of the Federal Rules of Evidence are the primary sources for the McCormick approach.

Under Rule 702, an expert may testify only if “scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue.” Evidence cannot assist the jury, however, unless the soundness and reliability of that evidence outweigh its tendency to overwhelm, confuse, or mislead.
Furthermore, Rule 403 offers alternative or supplementary support for the McCormick approach: “Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.”

The relevancy analysis has been applied to scent lineups in only the most indirect and cursory fashion. In Ramos v. State, the Supreme Court of Florida reversed a defendant’s murder conviction that the lower court based on two dog scent-discrimination lineups. The court, recognizing that the scent lineup was a new method of proof, held that the lineup evidence was improperly admitted partly because the state had not first established that “this type of lineup evidence” was reliable. The court, however, did not address how reliable lineups must be in order to pass the relevancy test or what countervailing considerations, if any, should be weighed against lineup reliability.

In United States v. McNiece, the court applied a relevancy approach and upheld the admission of scent lineup evidence. The court conceded that the chance of two individuals having similar or identical scents had not yet been established in the scientific community. The court concluded, however, that jurors would be skeptical of the “human-like” lineup evidence and that a combination of adequate jury instructions, a heavy burden of proof, and a corroboration requirement would prevent the jury’s being unduly prejudiced or misled. Although it voiced the belief that jurors would be duly skeptical of scenting evidence, the court itself expressed no such skepticism, noting that dogs have either a very heightened or sophisticated sense of smell, or even what we might well term to be an extra sensory perception that

on which the dog is placed is either not the wrongdoer’s scent or is so contaminated by other scents that there is no way to know whether or not the scent is the wrongdoer’s. See Epperly v. Booker, 235 Va. 35, 366 S.E. 2d 62 (1988) (In Epperly, the court considered a similar claim to that described but the court concluded that, as a factual matter, there was no evidence that either the object scented or the trail followed had been contaminated by other scents.).


415. 496 So. 2d 121 (Fla. 1986).
416. Id. at 123.
418. Id. at 615.
419. Id. at 615-16.
provides them with the ability to sense or perceive unique characteristics or special odors that exist in all humans, thus enabling dogs to distinguish among humans.\textsuperscript{420}

The \textit{McNiece} court, however, never examined the scientific literature relevant to evaluating the accuracy of lineups. The court failed to achieve a thorough and rational balancing of probative value against countervailing concerns because it ignored this literature. By failing to confront the mythic infallibility of the dog, the court itself fell victim to that very myth.

The \textit{McNiece} court purported to apply the relevancy analysis articulated by the United States Court of Appeals for the Second Circuit in \textit{United States v. Williams}.\textsuperscript{421} Had the \textit{McNiece} court carefully followed the \textit{Williams} approach, however, the decision in \textit{McNiece} would have been very different.

In \textit{Williams}, the court concluded that a spectrographic voice analysis was properly admitted at the defendant’s narcotics trial. The court held that the probative value of the spectrogram outweighed any tendency to mislead, prejudice, or confuse the jury.\textsuperscript{422} The court found that the probative value was high for five reasons: (1) the false identification rate ranged between 2.4 and 6.3 percent, depending on how the rate was measured;\textsuperscript{423} (2) inaccuracies in the spectrogram or its failures to reflect accurately the voice of the accused were more likely to result in false negatives than false positives;\textsuperscript{424} (3) the International Association of Voice Identification maintained standards to guide examiners in declaring matches;\textsuperscript{425} (4) the technique historically has been applied with care and concern—particularly by the examiner involved in the case before the court—instead of the technique’s lending itself to abuse;\textsuperscript{426} and (5) the technique was analogous to other types of accepted scientific techniques, such as handwriting comparison and analysis of gun barrel striations, which require an examiner to compare known and unknown specimens to determine whether there are sufficient points of similarity to justify declaring a “match.”\textsuperscript{427}

\textsuperscript{420} \textit{Id.} at 614 n.2 (emphasis added).
\textsuperscript{421} \textit{583 F.2d} 1194 (2d Cir. 1978), \textit{cert. denied}, 439 U.S. 1117 (1979).
\textsuperscript{422} \textit{Id.} at 1198-1200.
\textsuperscript{424} \textit{Williams}, \textit{583 F.2d} at 1199.
\textsuperscript{425} \textit{Id.} at 1198.
\textsuperscript{426} \textit{Id.} at 1199.
\textsuperscript{427} \textit{Id.} at 1198-99.
On the other hand, the court found four reasons why the technique’s tendency to mislead the jury was low. First, the jury can easily understand and evaluate the “simple step of visual pattern-matching.”428 Second, the jury can visually examine and compare on its own the written graphs and aurally examine and compare the taped voices.429 Third, effective cross-examination can reveal weaknesses in the reliability of both the technique and the equipment, as well as the qualifications of the expert.430 And finally, the jury can be instructed that the expert’s opinion is solely for its assistance to be completely rejected if considered unreliable.431

None of the factors suggesting a high probative value in Williams are present with dog scent lineups. The false identification rate of such lineups is indeterminate, and, in any event, the few available studies suggest error rates of at least ten percent, not 2.4 to 6.3 percent.432 Moreover, unidentified lineup suggestiveness or other flaws in the technique are more likely to lead to false positives (identifying an innocent person) than false negatives (freeing a guilty person).433 Furthermore, there is no association of scent lineup examiners that has formulated standards to guide the conduct of specific lineups. Additionally, there is at least some reason to suspect that, instead of the scent lineup technique being applied with care and concern, it has been subject to abuse by careless or even unscrupulous examiners.434 Nor is the technique analogous to other accepted techniques. Indeed, as will be discussed below,435 the dog scent lineup is most analogous to those techniques that largely have been found to be inadmissible by most American courts. The known probative value of the scent lineup therefore is much less than is that of the spectrogram, which was the method at issue in Williams.

The scent lineup also has a much greater tendency to mislead the jury than the spectrogram. With evidence of a scent lineup, unlike that of a spectrogram, there are neither visual patterns for jurors to compare nor the opportunity for jurors to perform their own comparison of scents. Moreover, effective cross-examination is difficult

428. Id. at 1199.
429. Id.
430. Id. at 1200.
431. Id.
432. See supra text accompanying notes 363-382. Only de Bruin claims fairly high accuracy rates, yet even he reports an error rate of five percent. See supra text accompanying notes 379-381.
433. See infra text accompanying notes 518-548.
434. See supra text accompanying notes 152-155 (detailing the allegations of fraud by John Preston).
435. See infra text accompanying notes 442-444.
because jurors cannot know why the dog has made his choice in a particular case, and experimental research is at too early a stage for weaknesses in the technique to be revealed clearly. Even cross-examination regarding the limited nature of the scientific research is unlikely to be effective given the dog's aura of infallibility. For these same reasons, jury instructions are likely to be an ineffective method of control.

In fact, the court's analysis in Williams was flawed in many respects. For example, the court underemphasized the subjective elements of voice identification, including both the examiner's use of aural comparison as a supplement to the spectrogram and the examiner's interpretation of the spectrographic charts. As noted earlier, techniques relying upon subjective judgments raise a significant possibility of confusing or misleading the jury. Furthermore, the court rejected the claim that insufficient tests had been conducted to establish that spectrograms of the same voice do not differ more than spectrograms of different voices, and concluded that courts "must decide admissibility issues in the light of the current state of the art." This approach ignored the basic rule of the scientific method that there must be adequate and consistent experimental verification of a theory before the theory may be considered sound. Voice identification based upon spectrographic analysis thus is not nearly as reliable as the Williams court maintained, as other courts since have concluded. Because the proven experimental reliability of the scent lineup is subject to even greater doubt than the questionable voice spectrogram, under a relevancy analysis scent lineups should be viewed with caution.

Support for this conclusion is even clearer when it is noted that scent lineups are more analogous to the polygraph than to the voice spectrogram. Both the polygraph and scent lineup are techniques in which "unusual responsibility" is placed on the examiner. The examiner is a potential source of conscious or unconscious improper

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436. Cf. United States v. Baller, 519 F.2d 463, 466 (4th Cir. 1974), cert. denied, 423 U.S. 1019 (1975) (suggesting that cross-examination and refutation are inadequate means of attack when "an exaggerated popular opinion of the accuracy of a particular technique makes its use prejudicial or likely to mislead the jury.") (emphasis added).

437. See Thomas, Voiceprint: Myth or Miracle, in SCIENTIFIC AND EXPERT EVIDENCE, supra note 259, at 1015, 1029-30 n.28.

438. See United States v. Downing, 753 F.2d 1224, 1239 (3d Cir. 1985); see also supra text accompanying notes 401-408.


440. See supra text accompanying notes 261-320.


suggestion and in both techniques his interpretation of results is highly subjective.\footnote{See id. at 512-13; supra text accompanying notes 401-408.} This subjectivity suggests a lack of consistency among examiners. Moreover, because the two techniques involve grave concerns over false positives, they both involve a significant chance of convicting the innocent.\footnote{See J. TARANTINO, supra note 307, at 221 (cautioning about the false positives danger with the polygraph).} Both techniques involve limited verified experimental data and significant scientific dispute regarding the accuracy of the techniques, thus raising the problem of indeterminacy discussed above.\footnote{See United States v. Wilson, 361 F. Supp. at 514 (noting indeterminacy and incipient stage of polygraph research).} Furthermore, an aura of mythic infallibility surrounds both techniques.\footnote{Skolnick, \textit{Scientific Theory and Scientific Evidence: An Analysis of Lie-Detection}, 70 \textit{Yale L.J.} 694, 704-05 (1961). \footnote{Imwinkelried, \textit{Critique}, supra note 244 at 567-68.} \footnote{E.g., United States v. Downing, 753 F.2d 1224, 1238 (3d Cir. 1985).} \footnote{See generally Rapp, \textit{The Comparative Reliability of the Polygraph}, 4 \textit{The Review of Litigation} 151 (1985) (comparing reliability of polygraph evidence with that of other forms of admissible evidence.)} Although some psychologists have expressed doubt regarding the existence of the myth of the infallible polygraph,\footnote{Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).} no psychologist has doubted—for none has yet investigated—the myth of the dog. Finally, although the \textit{Frye} notion of general acceptance was of little importance to either the \textit{McNiece} or \textit{Williams} courts, when many courts apply a relevancy analysis, they recognize general acceptance as one factor to be considered in weighing probative value against countervailing concerns.\footnote{Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).} The lack of such general acceptance clearly is significant for both techniques, although it is particularly important for the scent lineup.

Of course, the polygraph has its defenders, since in the view of some the technique has made great strides in the many years since its development.\footnote{Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).} The same cannot be said of scent lineups. The present stage of scientific development of the scent lineup is closer not to today’s polygraph test but rather to the 1923 polygraph test that was rejected by the Circuit Court for the District of Columbia in \textit{Frye}.\footnote{Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).} Accordingly, scent lineups should be excluded from evidence at trial, both in jurisdictions applying \textit{Frye} and in those applying a variant of the McCormick relevancy analysis.

C. Calibrating the Dog

In addition to demonstrating the validity and reliability of a scientific technique and the theory underlying the technique, the in-
instrument used must be shown to be in proper working order at the time of the test. 451 With animate instruments such as dogs, this "calibration" requirement is equally important because the canine sense of smell can be weakened by many factors, including disease and re-training by an inadequately skilled handler. 453 To ensure that dogs used in law enforcement are properly "calibrated," some scientists have suggested that there should be at least a periodic certification process by which the animals' olfactory performance will be

451. Imwinkelried, Evidence Law and Tactics for the Proponents of Scientific Evidence, in SCIENTIFIC AND EXPERT EVIDENCE, supra note 259, at 33, 52-53. This requirement is often stated but its rationale rarely explained. See id. at 52; P. GIANNELLI & E. IMWINKELRIED, supra note 359, at 40. In some jurisdictions the proper working order requirement is imposed by statute, while in other jurisdictions the requirement is rooted in case law. Id. at 41. Some courts, however, view whether an instrument was in proper working order as affecting the weight accorded to the evidence, not the admissibility of the evidence. Id. at 40; see Imwinkelried, supra, at 52 (noting majority of jurisdictions consider proper working condition a prerequisite to admissibility). The better view would seem to be that proper working order should go to admissibility, because the factfinder may easily be misled by a result from a machine not in proper condition. For example, if a radar speedometer is misadjusted so that it always reads cars as moving 60 miles per hour (m.p.h.) no matter how fast they really are traveling, a reading that a car was traveling 60 m.p.h. in a 55 m.p.h. zone misleads the factfinder as to the value of the evidence (such evidence might be offered in a wrongful death suit against the speeding driver). Indeed, arguably the reading of such a radar machine is not even logically relevant, for the result makes it no more likely than would otherwise be true that the defendant was speeding (alternatively, if the radar is sometimes accurate and sometimes not, the proper objection in a particular case might be "relevancy unknown," thus creating a danger that the radar reading will mislead the jury). Indeed those jurisdictions treating "proper working condition" as an admissibility question are clearly concerned greatly about the danger of jury confusion. They generally treat the question as one to be resolved by the court under Federal Rule of Evidence 104(a), with the burden on the proponent to establish proper working condition by a preponderance of the evidence. See P. GIANNELLI & E. IMWINKELRIED, supra note 359, at 43. But see People v. Pompilio, 137 Misc. 2d 997, 999, 522 N.Y.S.2d 761, 763 (1987) (trial court must consider whether there is "sufficient evidence from which the trier of facts could reasonably conclude that the breathalyzer instrument was in proper working order," a standard equivalent to that in Federal Rule of Evidence 104(b) for questions of conditional relevancy).

452. To "calibrate" means "to standardize (as a measuring instrument) by determining the deviation from a standard so as to ascertain the proper correction factors . . . [to] adjust tune." WEBSTER'S NINTH NEW COLLEGIATE DICTIONARY 197 (Merriam-Webster Inc. 1988). "Calibration" is "the act or process of calibrating." Id. Rephrased, "calibration" is the act of adjusting or tuning an instrument to a standard, that is, the act of placing an instrument in proper working order.

453. E.g., Myers, Nusbaum, Swango, Hanrahan & Sartin, Dysfunction of Sense of Smell Caused by Canine Parainfluenza Virus Infection in Dogs, 49 AM. J. VETERINARY RES. No. 2 188 (1988); Myers, Hanrahan, Swango, & Nusbaum Anosmia Associated with Canine Distemper, 49 AM. J. VETERINARY RES. No. 8 1295 (1988); Simpson & Myers, Dyosmia Caused by Encephalitis in a Dog, 191 J. AM. VETERINARY MED. Assn 1593 (1987); see Letter from Dr. L. J. Myers, Director, Institute for Biological Detection Systems, to Andrew E. Taslitz (Mar. 7, 1990) [hereinafter Letter from Dr. L. J. Myers] (discussing need for canine calibration procedure).
evaluated based on scientific methods. Such a calibration procedure will consider the sensory function of the dog, which can be tested by electro-encephalographic olfactometry or behavioral olfactometry, his temperament, his motor function and history of treatment by veterinarians, and the continuing training of his handler. Such an approach is essential if the courts are to have any confidence in the use of dogs in scent lineups.

D. Who Is Qualified as an Expert on Dog Scent Lineups?

Under Federal Rule of Evidence 702, only a witness "qualified as an expert by knowledge, skill, training, or education" may testify concerning scientific, technical, or specialized matters. Moreover, testimony on scientific and technical matters is admissible only if it will "assist the trier of fact." Again, only a properly qualified expert will assist the jury. Indeed, the testimony of an insufficiently qualified "expert" is likely to confuse and mislead the factfinder, thus requiring exclusion of the testimony under Federal Rule of Evidence 403.

With scientific evidence, each of three types of experts must be shown to be qualified to testify regarding three distinct aspects of scientific evidence: an educating witness (the educator) who teaches the jury about the validity and reliability of the underlying scientific principle and the scientific instrument or technique; a reporting witness (the reporter) who verifies that the particular instrument used was in proper working order at the time of the test, that proper testing procedures were followed, and that the test yielded a certain result; and an interpreting witness (the interpreter) who interprets the test result and explains the reasoning underlying his interpretation. Sometimes an educating witness is unnecessary, for example when

454. Letter from Dr. L. J. Myers, supra note 453.
456. Letter from Dr. L.J. Myers, supra note 453.
457. FED. R. EVID. 702 (emphasis added).
458. Id.
459. Graham, supra note 244, at 73 ("Anyone with scientific, technical, or specialized knowledge, including knowledge gained through experience, which will assist the trier of fact, is an expert.") (emphasis added); see also R. LEMPERT & S. SALTZBURG, supra note 259, at 859-60.
460. See R. LEMPERT & S. SALTZBURG, supra note 259, at 864.
the court may judicially notice the validity of the theory and the reliability of the instrument. Other times an interpreting witness may be unnecessary because, for example, certain test results may be self-explanatory. For jurisdictions facing the novel question of the admissibility of dog scent lineups, however, all three types of witnesses will be necessary since the validity of the technique and the theory are not subject to judicial notice and the test results are not self-explanatory.

Unfortunately, the courts largely have not made any inquiry into whether lineup "experts" have the qualifications necessary to testify in all of the three mentioned capacities. Instead, the courts generally rely solely on the testimony of the dog's handler, who discusses his training in handling dogs, his experience regarding the accuracy of his own dogs, and his involvement in the particular lineup in question. The handler, while properly qualified as a reporting witness, lacks the theoretical training necessary to verify the validity of the theory and the instrument. Moreover, he is not necessarily equipped to interpret the results because proper interpretation requires both theoretical knowledge and practical experience, which he may be lacking. If the requirement that an expert be sufficiently qualified

462. Id. at 39; see, e.g., State v. Wilcox, 40 Ohio App. 2d 380, 381-83, 319 N.E.2d 615, 617-18 (1974) (judicial notice taken of theory of the Doppler principle underlying the radar speedometer's general reliability as a scientific instrument.).


464. At least one court has in effect "judicially noticed" the validity of the theory underlying scent lineups and the reliability of the dog as a discriminating biological instrument. Roberts v. State, 298 Md. 261, 273 & n.5, 469 A.2d 442, 447 & n.5 (1983). The Roberts court, based upon its own cursory review of the tracking literature, concluded that a trained tracking dog can focus on one scent. From this premise, the court leaped to the conclusion that such a dog can ignore suggestive influences in scent lineups. Id. at 273, 469 A.2d at 447. Of course, the court's use of "judicial notice" was inappropriate, for only adjudicative facts "not subject to reasonable dispute," Fed. R. Evid. 201(b), may be judicially noticed, a test clearly failed. See also Neal v. Fisher, 312 Md. 685, 696, 541 A.2d 1314, 1320 (1988) (following "not subject to reasonable dispute" test for judicial notice); accord Ohio R. Evid. 201(b); Okla. Stat. tit. 12, § 2202 (1980); N.C.R. Evid. 201(b). Moreover, the court's sole reliance on tracking literature, ignoring the differences between scent lineups and tracking, emphasizes the dangers of courts' making improper use of the doctrine of judicial notice.


466. See Imwinkelried, supra note 451, at 39-50 (offers the example of a chemist, who is the educating witness, and a laboratory technician, who is the reporting witness); E. IMWINKELRIED, METHODS OF ATTACKING, supra note 317, at 196 ("The teaching witness' primary credential is theoretical knowledge, obtained through formal education.").

to “assist the trier of fact” in making a particular inquiry is to have any meaning, courts must pay closer attention to whether a particular witness is qualified to serve all three functions, and if not, must limit that witness’ testimony to the scope of his qualifications. In practical terms, this generally will mean that there must be at least one expert in addition to the handler who has a theoretical background regarding the research on the accuracy of dog scent lineups. Such experts may have practical experience that makes them useful as interpreter as well as educator experts.

E. Suggestiveness and the Role of Counsel

The Article thus far has considered how the common law and rule-based evidentiary objections that are common to all cases involving scientific evidence should be applied to dog scent lineups. But the law of evidence in criminal cases in many ways has been “constitutionalized” by the United States Supreme Court. The Court has, in particular, recognized two constitutional protections that come into play only in lineups or similar pretrial confrontations: the sixth amendment right to counsel at pre-trial identification procedures and the due process prohibition against such procedures being conducted in an unnecessarily suggestive manner. If either of these protections is violated, evidence of the pre-trial identification (here, the lineup) may be suppressed at trial. It is these two constitutionally-based objections to which this Article next turns.

(1) General Principles

Due process requires the trial court to suppress all identification evidence derived from unnecessarily suggestive pretrial confrontations.

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469. See infra notes 475-513 and accompanying text.
470. This Article addresses another constitutional protection—the right of an accused to confront the witnesses against him—in section III F(2). See infra notes 577-628 and accompanying text. Because of its close logical connection to the confrontation clause question, another common law/rule-based issue—hearsay—is discussed immediately before the confrontation clause. The due process, right to counsel, hearsay, and confrontation clause analyses are all necessary to understand yet another set of common law and rule-based issues: those surrounding the unique evidentiary tests used by the courts in tracking and scent lineup cases. See infra text accompanying notes 629-643. These evidentiary issues differ from those in sections III A-D above (covering grounds for objection common to all types of scientific evidence) because these special issues involve tests unique to dog-scenting. See infra text accompanying notes 629-643. The discussion of those special issues in turn sets the stage for understanding questions that may arise on appeal, thus completing the analysis of potential objections to lineups. See infra text accompanying notes 644-651. The penultimate section of the Article then considers methods for correcting the problems with scent lineup evidence other than by complete exclusion. See infra text accompanying notes 652-684.
tions that have created a very substantial likelihood of misidentification. Whether a substantial likelihood of misidentification exists is determined by examining the totality of the circumstances. Even unnecessarily suggestive pretrial confrontations are admissible, however, if the court is convinced that the witness had a reliable independent basis for the out-of-court identification. Thus a witness who observed a robber in bright light for twenty minutes and who gave an excellent detailed description of the robber to the police probably had a reliable independent basis for selecting the defendant from a visual lineup that was conducted one day after the crime, even though there was some unnecessary suggestion that he do so. A similar test governs admissibility of in-court identifications by the same witness: if the suggestive pretrial confrontation created a very substantial likelihood of "irreparable" misidentification in court, the witness may not identify the defendant at trial. Again, reliability is the "linchpin" of the analysis.

The few cases that have considered the applicability of these due process tests to dog scent lineups have failed to examine closely the reliability question or to consider whether scent lineups may, because of their unique characteristics, require a modified or wholly different due process test.

In Roberts v. State, a defendant appealed a rape conviction that resulted from a dog's identifying as the defendant's a ski cap worn by the rapist. The identification was made in two dog scent lineups, each of which involved the defendant and four police officers. The court affirmed the defendant's conviction and concluded that the lineups were not unduly suggestive even though the dog knew the four police officers involved but did not know the defendant, meaning that the defendant was the only stranger in each lineup. The

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471. Neil v. Biggers, 409 U.S. 188, 198 (1972) (where there is unnecessary suggestiveness, a subsequent in-court identification is inadmissible only if there is "'a very substantial likelihood of irreparable misidentification,' " and "'with the deletion of 'irreparable,' [that test] ... serves equally well as a standard for the admissibility of testimony concerning the out-of-court identification itself'") (quoting in part Simmons v. United States, 390 U.S. 377, 384 (1968)); accord Manson v. Braithwaite, 432 U.S. 98, 107, 109-14 (1977) (rejecting a per se rule and reaffirming the Biggers analysis).

472. Manson, 432 U.S. at 104.

473. Id. at 114.


476. Manson, 432 U.S. at 114 (using "linchpin" language in discussing suppression of an unnecessarily suggestive pretrial confrontation).

court based this conclusion on its own survey, "to some extent," of the general literature on tracking dogs. In this survey, the court found "no indication that a trained and reliable tracking dog will signal a find because the person found is the only one unfamiliar to the dog from among a group of persons." 478 Indeed, the court noted that, "so far as we can determine from the literature, the purpose of training a tracking dog is to keep it focused on the given scent and not distracted by other scents." 479

The court's analysis in Roberts ignored both fundamental principles of due process and the science behind scent lineups. First, the court ignored the principle that lineup participants should be substantially similar in appearance or, at minimum, that the defendant should not have an obvious distinguishing characteristic. 480 In United States v. Wade, 481 the Supreme Court illustrated the importance of this principle when it recounted several horror stories of suggestive lineups in which the defendant was the only Oriental, the only person with black hair, the only tall suspect, or the only young suspect. 482 Indeed, it is inconceivable that a visual lineup involving a human witness would be upheld if it consisted of four friends of the witness and a single stranger, the defendant.

Despite the Court's discussion in Wade and its acknowledgment of the danger of suggestiveness inherent in the conduct of a visual lineup, the Roberts court, in effect, imbued the dog with magical powers to ignore such suggestions and to make a reliable identification. The court found these magical powers by engaging in an admittedly limited review of the relevant literature. From the mere absence of literature addressing the precise suggestive circumstances before the court and from the fact that the goal of tracking training is to keep a dog focused on a single scent, 483 the court concluded that a dog can indeed generally focus solely on that scent. This is a tremendous leap in logic. A tracking dog may focus on a particular scent simply because the vegetative portion of that scent is of a different age than competing vegetative track scents, not because the dog has a proven ability to ignore suggestive influences in discrim-

478. Id. at 273, 469 A.2d at 447.
479. Id.
480. The prevention of lineups where the defendant has an obvious distinguishing characteristic was one of the reasons the Supreme Court gave for extending the right to counsel to post-indictment lineups. United States v. Wade, 388 U.S. 218, 232-33, 236-37 (1967).
481. Id.
482. Id. at 232 (quoting P. Wall, Eyewitness Identification in Criminal Cases 53).
483. Roberts, 298 Md. at 273, 469 A.2d at 447.
inating among human scents.\textsuperscript{484} Furthermore, the scent lineup offers additional potential suggestion, in the form of subconscious minimal cues,\textsuperscript{485} that are not present in tracking when the dog cannot see its human quarry.

Second, the court reached its sweeping conclusion that a lineup involving the defendant as the sole stranger can never be suggestive without looking to the totality of the circumstances. Had the court looked to all the circumstances and given the parties the opportunity to supplement its own research, the court might have noted, for example, that in one of the two lineups the defendant was placed at the end of the line—a circumstance that by itself would prompt some researchers to find that the lineup was suggestive.\textsuperscript{486} This circumstance, when combined with the defendant’s being the only stranger in the lineup and with the failure to protect against minimal cues, easily could have supported a conclusion that the lineup was unnecessarily suggestive.

Third, the court ignored the practical problem of determining whether a dog’s identification of a man results from suggestion or from a clear, accurate, independent recollection of events. After all, a dog cannot be cross-examined.

Finally, the court failed even to consider whether the prosecution bore the burden of proving reliability. If the burden was on the prosecution, it is difficult to imagine how so suggestive a lineup as this could have been upheld.\textsuperscript{487}

In the only other case considering an attack on the fairness of a scent lineup, \textit{Ramos v. State},\textsuperscript{488} the court held that lineup evidence should have been excluded partly because of the suggestive nature of the procedure.\textsuperscript{489} Two lineups were held, the first involving a line of five blue shirts, four of which belonged to the husband of the secretary to the police chief. The fifth shirt, the victim’s and the one identified by the dog as having a scent matching the defendant’s, was the only shirt that had been worn by a female and the only shirt with blood on it. The second lineup involved five knives, only one of

\textsuperscript{484} See supra text accompanying notes 195-204.

\textsuperscript{485} See supra notes 241-243, 404-407 and infra notes 514-544 and accompanying text.

\textsuperscript{486} F. Buytendijk, supra note 173, at 92.

\textsuperscript{487} W. LaFave & J. Israel, Criminal Procedure 462 (2d ed. 1985) (reviewing the conflicting arguments regarding allocation of the burdens of production and persuasion as to the suggestiveness of lineups).


\textsuperscript{489} Ramos, 496 So. 2d at 123.
which—the knife found in the victim and later matched by the dog to the defendant—had blood on it. Both lineups involved one obviously unique item, and the court accordingly found the conduct of both lineups to be unfair.490

Although the court reached the correct conclusion, it did so without considering whether scent lineups should be held to the same due process standard as either visual or voice lineups. Nor did the court consider upon whom the burden of proving reliability should fall or under what circumstances, if any, an unnecessarily suggestive scent lineup can be considered reliable.

A careful analysis of dog scent lineups suggests that they are fundamentally different from either human visual lineups or human voice identification lineups. First, while it is easy to guard against obvious kinds of suggestion—like those in *Roberts* and *Ramos*—it is harder to guard against more subtle but no less pernicious forms of suggestion. For example, a visual lineup can attempt to include persons of similar height, weight, race, and skin and hair color. A voice lineup, although with more difficulty, can attempt to include voices of similar timbre and pitch.491 But how can it be determined whether a scent lineup includes similar scents, particularly when the dog’s sense of smell is not only so different from our own but also so poorly understood?

The answer to the problem may lie partly in the meaning of the word “unnecessary” as it is used in the due process test.492 Although the Court never has clearly defined “necessity,” most cases have treated the concept as similar to “urgency,” permitting, for example, a one-person showup where the hospitalized victim is near death.493 On the other hand, the Court has a flexible notion of urgency, as demonstrated by *Simmons v. United States*,494 in which the Court concluded that using photo arrays, instead of some other less suggestive identification procedure, one day after a gunpoint robbery was not “unnecessarily suggestive.” The Court reasoned that

A serious felony had been committed. The perpetrators were still at large. The inconclusive clues which law enforcement officials possessed led to Andrews and Simmons. It was essential for the FBI agents swiftly to determine whether they were on the right track,

490. *Id.*
491. See, e.g., A MODEL CODE OF PREARRAIGNMENT PROCEDURE § 160.2(3) (1975) (requiring that voice identifications be “made from a selection of several voices, a reasonable number of which shall be similar to that of the person to be identified”).
492. *See supra* text accompanying note 471.
so that they could properly deploy their forces in Chicago and, if necessary, alert officials in other cities.495

The scope of the Simmons notion that suggestion may be necessary to determine whether they are "on the right track" is uncertain.496 It is important to note, however, that the Court's discussion of necessity was directed to whether it was necessary to use the particular type of identification procedure—a photo array instead of a lineup.497 But the Court emphasized that each photo array, while not perfect,498 involved at least six photographs, with each witness being alone while viewing the photographs, and with no evidence that the FBI suggested which persons shown were under suspicion.499 The pressing need to conduct identifications by photo arrays did not, therefore, make it "necessary" that those photo arrays be conducted in a suggestive manner. Thus, if the police had been sloppy or careless in the manner in which they conducted the arrays, for example using only one or two photographs or declaring that "the perpetrators are probably in these photos," the Court probably would not have held that suggestiveness necessary.500 Indeed, since Simmons, the Court has made it clear that the police are expected to make reasonable efforts to render lineups fair and that the technical difficulty of organizing fair lineups does not make the resulting suggestion "necessary."501 Consequently, police ignorance of the scientific prin-

495. Id. at 384.
496. See W. LaFave & J. Israel, supra note 487, at 338 (Simmons has most often been applied by lower courts to justify identification procedures conducted within several hours of the crime, and these cases suggest, without clearly articulating the point, that the stronger the need for conducting a particular procedure, the higher the risk of error that will be tolerated as "necessary").
497. 390 U.S. at 383-86 & n.6 (noting dangers of photographic identifications and emphasizing that "a corporeal identification . . . is normally more accurate"). Five photospreads were conducted. Id. at 385. The court spoke generally at one point about the need to use spreads at all, id. at 384-85, but at another point noted that if one spread resulted in an identification, the remaining confrontations could have been done in the form of lineups. Id. at 386 n.6.
498. Id. at 386 n.6 ("[I]t probably would have been preferable for the witnesses to have been shown more than six snapshots, for those snapshots to have pictured a greater number of individuals, and for there to have been proportionally fewer pictures of Simmons."). The six photographs used were primarily group photographs, and Simmons appeared several times in the series. Id. at 385.
499. Id. at 385.
500. See id. at 383 (the danger of suggestion in photospreads is increased if the police display only a single picture of an individual who generally resembles the wrongdoer or if the police indicate to the witness that they have other evidence that one of the persons pictured committed the crime).
501. See, e.g., Neil v. Biggers, 409 U.S. 188 (1972) (showup was unnecessarily suggestive, despite the police finding no one at either the city jail or the juvenile home on the date of the identification procedure who fit a physical description comparable to the defendant's).
ciples underlying fair scent lineups or the failure to exercise common sense—as in Ramos and Roberts when the police created obviously suggestive scent lineups—arguably should not excuse the police from obtaining the necessary knowledge or exercising appropriate common sense. This does not mean that every officer must become an expert on the subject, but only that police must either retain a properly qualified expert or have one on the staff. Still, when science has not accounted for all the factors that may lead to suggestion or when designing an entirely suggestion-free lineup (such as one in which all participants eat similar food, use similar soap, work in similar locations, and use similar colognes) is extremely expensive and time-consuming, the burden on the police of minimizing suggestion may be so intolerable that some potential suggestion ought to be permitted as “necessary.”

Second, it is much more difficult than with a visual lineup under the Manson due process test to determine whether a suggestive dog scent lineup is so reliable as to outweigh the effect of suggestion, thus making the lineup and later in-court identification admissible under the due process test despite the unnecessary suggestion. In Manson v. Braithwaite, the Court noted that five factors must be considered in making this reliability determination: (1) the witness’ opportunity to view the accused during the perpetration of the crime; (2) the witness’ degree of attention; (3) the accuracy of the witness’ description; (4) the witness’ degree of certainty; and (5) the time between the crime and the confrontation. These factors, in turn, are weighed against the corrupting effect of the suggestiveness of the identification.

The court cited with approval the district court’s opinion on this point: “In this case it appears to the Court that a lineup, which both sides admit is generally more reliable than a show-up, could have been arranged. The fact that this was not done tended needlessly to decrease the fairness of the identification process to which petitioner was subjected.” Id. at 199 n.6 (quoting lower court’s opinion). See also W. LaFave & J. Israel, supra note 487, at 462 (rejecting notion that “accidental” suggestion by the police renders the suggestion “necessary”); cf. Alpert and Smith, Law Enforcement Defensibility of Law Enforcement Training, 26 Crim. L. Bull. 452 (October 1990) (generally discussing the many ways in which the complexities of constitutionally-mandated procedures, even if an expert must be retained to train the officers).


503. As noted previously, the admissibility of both unnecessarily suggestive pretrial identifications and subsequent in-court identifications under the due process clause turns on substantially similar totality of the circumstances tests that weigh the effect of the suggestion against independent indications that the identifications are reliable. See supra notes 471-476, 503.


505. Id. These same five factors apply in determining the reliability of the suggestive
With a scent lineup the first consideration is not at issue. Because the dog can sniff the persons and objects involved for as long as necessary, its ability to observe and accurately remember a scent to which the dog earlier was exposed is not in question and its opportunity “to view” is not important. Of course, it may be important to know whether a dog sniffing a new scent for the first time can, upon leaving the scent to approach a line of persons or objects, remember the scent long enough to complete sniffing the line (if the dog forgets what it is he smelled, how can he possibly know that a later scent matches the one previously smelled but now forgotten?). That problem, however, does not turn on the dog’s “opportunity” to sniff on an earlier occasion (for example, during the crime itself) but rather on whether the dog has the mental capacity to retain the memory of an object that he sniffs on this particular occasion for the few seconds (or minutes) that it takes thereafter to sniff those persons in the lineup.

Unfortunately, the effect of the additional three factors on the dog’s reliability cannot be determined. The degree of attention a dog pays to his scenting task may be clear to a trained observer, but beyond this gross determination there is no way to know or test precisely the intensity of the dog’s concentration. The dog cannot describe the two scents and, even if the dog could do so, we have no way of testing whether the description of the scent taken and the “matching” scent are the same. Nor can the dog convey his level of certainty about a match.

The last factor—the time between the crime and the confrontation—is relevant not because memories may fade, the concern in visual and voice lineups, but rather because scents may fade. The longer the time lapse, the greater the likelihood that the dog will not accurately detect any single scent or discriminate one scent from among many. While science can shed some light on how much time can elapse before a dog’s scenting ability is impaired, the research is at such an early stage that, under many circumstances it is im-

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506. See Tracking the Tracker, supra note 42, in which Phil Hoelcher, a tracking expert, upon viewing a videotape of one of John Preston’s dogs at work, concluded, “This dog does not look like he is even remotely trying to find scent. There is just a total lack of enthusiasm, intensity, about the dog’s entire performance.”

507. See supra text accompanying notes 383-390.
possible to draw a conclusion regarding the significance of this factor.

The difficulties in applying the *Manson* factors to a dog scent lineup demonstrate that using the factors in this circumstance deprives the court and jury of guidance in weighing the corrupting effect of suggestion against indications that the dog can identify accurately despite such suggestion. The *Manson* Court was willing to tolerate admission of identification testimony with "some questionable feature" because the Court could "rely on the good sense and judgment of American juries, for evidence with some element of untrustworthiness is customary grist for the jury mill." But an inability to cross-examine the dog, the limited state of scientific knowledge, and the juror's belief in the canine's mythic infallibility undermine the assumption that in the case of dog scent lineups, the jury can be trusted to weigh questionable identification procedure features against reliable ones. Merely exposing the fact that scientific evidence regarding the reliability of dog scent lineups is scant by cross-examining prosecution witnesses, is, for the reasons noted in the discussion of relevancy, unlikely to make the jury sufficiently skeptical of the dog scent identification.

The unique features of the dog scent lineup and the illustrated unsuitability of the *Manson* test suggest two possible approaches to evaluating alleged denials of due process in the scent lineup scenario. One possible approach would be to exclude all unnecessarily suggestive dog scent lineup evidence per se, without inquiring whether the resulting identifications are reliable despite this suggestiveness. Alternatively, the burden of proving reliability could be placed on the prosecution. This approach is followed in some jurisdictions

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508. 432 U.S. at 116.
509. See supra notes 391-400, 434-436 and accompanying text.
510. This would be similar to the approach that the Court has followed concerning constitutional violations in other areas. Thus confessions may be suppressed because of the failure to give *Miranda* warnings even if the defendant knew all his rights without those warnings. *Miranda* v. Arizona, 384 U.S. 436 (1966). Similarly, pretrial identification evidence is excluded from trial where there has been a violation of the defendant's sixth amendment right to counsel at the identification procedure, even if the procedure was otherwise fair and non-suggestive. *Gilbert* v. California, 388 U.S. 263, 273 (1967) ("Only a *per se* exclusionary rule as to such testimony can be an effective sanction to assure that law enforcement authorities will respect the accused's constitutional right to the presence of his counsel at the critical lineup.")
511. *Compare* Corn v. Zant, 708 F.2d 549, 566-67 (11th Cir. 1983) (once a defendant establishes that a suggestive pretrial confrontation has created a very substantial likelihood of irreparable misidentification, the burden shifts to the government to prove by clear and convincing evidence that the in-court identification is derived from an independent source
and seems to make particularly good sense with dog scent lineups because, on the one hand, the defendant is not handicapped by the minimal information available regarding scent lineup reliability, since the burden is the prosecutor's, but, on the other hand, the government still has a chance to get scent lineups into evidence despite unnecessary suggestion if it can nevertheless come up with the necessary scientific proof. Moreover, this approach is more consistent with United States Supreme Court case law discussed above in that identification evidence is not automatically excluded; rather, the prosecution has the opportunity to establish reliability via expert testimony on the particular question being considered, leaving the court to weigh that reliability against the corrupting effect of the unnecessary suggestion. For example, if a defendant's shirt was the only shirt in a lineup that had been exposed to a flower bed, the prosecution might argue that the unnecessary suggestiveness did not undermine the reliability of the identification because flowers do not emit a scent that is "biologically significant" to dogs.\textsuperscript{512} The success of such an argument would depend in part upon the details of the expert testimony, but the important point is that the availability of the argument protects the legitimate concerns of both the defense and the prosecution, unlike the one-sided, defense-skewed approach of a per se rule.\textsuperscript{513}

In any event, under either approach, the government is best advised to do all that it can to minimize the suggestiveness in any particular scent lineup. Only science can shed light on how to accomplish that task.

(2) Science Enlightens the Inquiry

Frederick Buytendijk has noted several canine behaviors, displayed even by well-trained police dogs, that must be kept in mind in designing a fair dog scent lineup. These behaviors include, among others: (1) a dog is more likely to select an object at the end of a row;\textsuperscript{514} (2) a dog will stop sniffing objects in a line—he will sniff no

\textsuperscript{512} F. Buytendijk, supra note 173, at 79-80.

\textsuperscript{513} See supra notes 471-476 and accompanying text (explaining the Manson and Biggers approaches to the exclusion of unnecessarily suggestive pretrial confrontations).

\textsuperscript{514} Id. at 92.
further—once he reaches an object that, to him, has a “special” smell;\(^5\) (3) a dog often will select an object with a “similar” but not identical smell to the object upon which the dog was scented—for example, odors from the same group, such as all tar smells, will be “matched”;\(^6\) (4) a dog often chooses an object because of visible characteristics instead of scent;\(^7\) and (5) a dog may choose the object that the trainer wants the dog to select, a desire that Buytendijk suggested might be conveyed to the dog by slight differences in the trainer’s tone of voice but which, of course, also can be conveyed by other minimal cues.\(^8\) Although Buytendijk described his own experiments as yielding “very satisfactory results,”\(^9\) he cautioned that the combination of these five (and other) behavioral tendencies establishes that lineup results “can never attain the degree of certainty that is necessary before condemning a human being.”\(^10\)

Buytendijk recounts the following experiment to demonstrate the dangers inherent in dog scent lineups:

In the police station there was a suspect. The officials wanted to find out whether a coat (a) which had been found somewhere belonged to this man, and the experiment was carried out in the following way. Six coats were placed in the passage, the coat (a) and five belonging to the office clerks. The dog was allowed to sniff at the suspected man, and it brought back coat (a). Such a test proves nothing. In any case that particular coat would have a different smell-complex from those of the five clerks. Let us imagine that smells are visible—then the dog, for example, would see five grey coats and one bright red one before it. The chances that the one that looked so prominent would be chosen are very great. Only when all the objects belong to the same odour-group and are also alike to the eye as far as size and shape are concerned, can there be a chance of trustworthy results.

It is still more dangerous to let a dog choose a person out of a row of people on the score of the odour of an object offered to the dog. Even if the trainer knows nothing about the test, and has himself no suspicion of anybody, there still remains the possibility, by no means a slight one, that the dog may respond to the faintest movement of one of these persons.\(^11\)

Since Buytendijk wrote these words, there has been little research to challenge his conclusions on the dangers of dog scent lineups. What has been challenged, however, is whether those dangers

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515. *Id.*
516. *Id.* at 93.
517. *Id.*
518. *Id.* at 81, 90, 92-93.
519. *Id.* at 93-94.
520. *Id.* at 99.
521. *Id.* at 99-100.
can, indeed, be controlled so that a fair dog scent lineup is possible.

(3) **Designing a Fair Scent Lineup**

de Bruin and Koster have designed techniques for conducting scent lineups that appear to address many of the concerns Buytendijk expressed. They suggest three different lineup methods, which are discussed seriatim below.

The first is a variation on the classic person lineup. All the persons participating in the lineup must stand behind a screen of horizontal slats so that the dog cannot see the lineup participants. This approach controls for minimal cues from those in the line. Fans are sometimes placed behind the screen to ensure that the scent reaches the dog's nostrils. All participants must come from the same environment and must not wear "strong smelling clothes." If the participants are not all from the same environment, they all wear similar clean overalls for two hours before the lineup.

Neither the dog nor the handler is present when the persons are placed in the line. Indeed, although the handler gives the dog the scent, the dog enters the lineup room without the handler, again eliminating minimal cues. If the dog finds a matching scent, the dog sits down at that lineup participant. The procedure is repeated twice, with the participants changing positions each time.

In de Bruin's tests, the suspect's position is selected either by the suspect or by lot; the better practice might be to increase the size of the line and never place the suspect at either end because of the dog's tendency to select items at the end of a line. Of course, if the screen keeps the dog from seeing where the line ends, this concern may be unwarranted.

An alternative procedure proposed by de Bruin involves the use of eighteen glass jars, each containing stainless steel tubes. The six participants wash their hands with the same odorless soap, then dry their hands with a clean piece of paper towel so that smells additional to human scent are equal for all. The participants hold three tubes in their hands for five minutes, and these tubes then are returned to

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522. de Bruin, supra note 157.
523. Id. at 6-7.
524. Id. at 7.
525. Id.
526. Id. at 6-7.
527. Id. at 7.
528. See supra note 514 and accompanying text.
Next, a person other than the dog handler then puts the tubes on the floor of a special room, taking care not to touch them. Again, neither the dog nor the handler is present during this procedure. The handler gives the order "search," and the dog then sniffs the tubes and selects the one, if any, that matches a scent given to the dog earlier. The test is repeated twice with previously unused tubes used in each new experiment. A positive match is declared only if the dog makes a positive identification of the suspect's tube on each of the three tries. The handler is not present in the special room at the time that the lineup is actually performed. The position of the suspect is determined as with the person lineup described above, but since the dog can see the tubes, it might be wiser for the procedure to be modified by not placing the suspect's tube at the end of the line, perhaps compensating for the reduced variation by increasing the number of participants in the lineup.

This procedure has an advantage over the in-person lineup because the only scent on the tube is human body scent. The scents of clothing, shoes, and other sources are not present.

A variation on the tube method involves the use of cloths. A special sterilized cloth may be used to wipe an object found at a crime scene such as a gun. The cloth is placed in a glass jar for storage. Instead of holding tubes in their hands, lineup participants hold similar cloths; otherwise the tube lineup procedures are followed. The advantage of this method over the tube method is that the gun can be wiped of scent, the scent stored, and the gun then sent to a forensics laboratory.

In each of the above-described methods, the dogs used in the lineups were specially trained in dog scent lineups for at least eighteen months. A trainer-handler team is approved for work on actual cases only if the team has a success rate with known matches of ninety-five percent. In their training, the dogs used also must have proven that they are capable of "negative identification," that is, of not selecting

529. de Bruin, supra note 157, at 7.
530. Id.
531. Id. at 7-8.
532. Frawley, supra note 157, at 10-12.
533. de Bruin, supra note 157, at 8.
534. See id. at 7.
535. Frawley, supra note 157, at 10, 12.
536. Id. at 11.
537. Id. at 8.
538. Id. at 11-12. Actually, de Bruin's manual says at least a year and Frawley's description of de Bruin's work claims 18 months.
anyone if there is no scent match in the lineup.\textsuperscript{540} As a consequence, the dogs are trained only to signal a match if an identical, and not merely a similar, scent is found within the line.

In addition, if at any time during the three lineups that include the suspect's scent the dog's identification appears to be "hesitant,"\textsuperscript{541} de Bruin's technique calls for a series of five lineups that includes two negative identification tests (or two lineups in which the suspect does not participate). A match is declared only if the dog identifies the suspect in each lineup in which the suspect's scent is present and identifies no one in each lineup in which the suspect's scent is absent.\textsuperscript{542} This procedure increases the likelihood that matches are derived from identical and not merely similar scents. A further improvement, however, would be to require the use of the five-lineup negative identification procedure in all cases, rather than allowing the decision to conduct negative identification lineups to depend on the handler's subjective judgment that the dog has made a "hesitant" identification.

Some variation on de Bruin's procedures seems well-suited to creating a fair dog scent lineup. Although he is working on a book that will address these matters, de Bruin has not yet published the details of his research and training methods.\textsuperscript{543} It is therefore impossible to know precisely how he trains his dogs or whether his research results are reliable. Once the results are available, however, their replication and the confirmation of their reliability by researchers in the United States may well suggest that fair lineup procedures are possible.

Although de Bruin's suggestions may go far towards creating a fairer scent lineup procedure, his suggestions are not perfect. Thus, he apparently does not account for and control variations in scent resulting from the accused's diet.\textsuperscript{544} It may, of course, turn out that dietary differences are unimportant but this must be experimentally verified. For example, if everyone but person "A" in a lineup eats the same garlic-free food while "A" eats garlic, yet in repeated lineups the dog always chooses non-garlic-eater "B" (who is the correct match) and in several negative identification trials that exclude "B" but include "A" the dog does not react at all, that should be strong evidence that the garlic does not affect the dog's reliability. Yet de Bruin reports no such experiments.

\textsuperscript{540} De Bruin, \textit{supra} note 157, at 8.

\textsuperscript{541} \textit{Id.} at 9. de Bruin does not define precisely what he means by "hesitant" or how this determination is to be made. \textit{See id.}

\textsuperscript{542} \textit{Id.}

\textsuperscript{543} \textit{See Letter I, supra note 9.}

\textsuperscript{544} \textit{See} de Bruin, \textit{supra} note 157, at 4, 6-11 (recognizing that diet affects human scent, but not including dietary controls among the preparatory procedures for a dog scent lineup).
One other aspect of de Bruin’s experiments requires particularly close examination. He maintains that his experiments have proven effective with scent stored for as long as three years. Indeed, he has begun a scent bank in which scent is taken from suspects arrested and stored or kept “on file.” If a new crime is committed, a scent lineup can be done using the stored scents. The concept is very similar to fingerprinting all persons arrested and later using those prints in fingerprint comparisons.

If, as previously noted, human scent consists of vapors released from bacterial action, it is difficult to understand how a scent can be stored for so long without the bacteria dying. Brigadier de Bruin apparently theorizes that his special cloth, when stored in a glass container, can retain scent for very long periods and that his experiments prove this. If he is right, the bacterial action theory of human scent may need to be reexamined. Without further research, however, it is impossible to know whether he is right and thus whether, and under what circumstances, fair lineups are possible.

(4) The Role of Counsel

Apart from, and yet related to, the due process requirement of a fair lineup is the sixth amendment right of a suspect to counsel at a post-indictment visual lineup. The sixth amendment provides that, “in all criminal prosecutions, the accused shall enjoy the right... to have the Assistance of Counsel for his defense.” The Court has held that this right begins only with the initiation of adversary judicial proceedings against the defendant, and even then, applies only at “critical stages” of the prosecution. Although the Court has also held that not every pretrial identification procedure constitutes a “critical stage,” a post-indictment visual person lineup is such a critical stage because it is a “trial-like confrontation” in which counsel can act as the accused’s “spokesperson... or advisor.” What the Court means by these terms is not entirely clear, although it has emphasized that

545. Frawley, supra note 157, at 11-12.
546. Letter II, supra note 238.
547. See supra text accompanying notes 181-191.
548. See supra sources cited at note 157.
550. U.S. Const. amend. VI.
554. Id.
the defendant's physical presence at a lineup offers "opportunities for prosecuting authorities to take advantage of the accused." More- 

over, counsel will be more sensitive to suggestive influences and can help at the lineup to remove these "disabilities of the accused," thereby 

"protect[ing] the defendant from errors that he might make if he appeared . . . alone." Presumably this means that the attorney can seek to correct improper suggestiveness. Moreover, the Court has emphasized that because the attorney is present, he will be better able to reconstruct the lineup at trial. With scent lineups of persons, these same concerns—that a defendant needs protection against the police taking unfair advantage and needs counseling on what he can do to minimize suggestion—apply and, as with visual lineups, an attorney who is present at such a lineup will be better equipped to represent the defendant at trial.

It is less clear whether a suspect has a right to counsel at a scent lineup, like de Bruin's tube and cloth lineups, involving only objects. The United States Supreme Court held in United States v. Ash that there is no sixth amendment right to counsel at a photographic array identification because the accused is not present during the array; thus, no spokesperson or advisor is needed. Arguably this is equally true in a tube or cloth scent lineup, as the defendant is not then present. The Ash court based its decision in part on the belief that the adversary mechanism at trial would cure the ill effects of certain unrepresented pretrial confrontations. Thus, counsel need not be present at the accused's fingerprinting, or at analysis of his blood samples, clothing, and hair, since knowledge of science and technology regarding those techniques is sufficiently advanced and the variables involved in the techniques are few enough that the accused still has an opportunity for a meaningful confrontation of the government's witnesses at trial. The Court found this to be equally true with photographic displays because the photos can be brought to the trial and the witnesses adequately cross-examined.

Scent lineups, however, are like neither photo displays nor fingerprint comparisons. Scents cannot be reproduced for the jury, and the combination of scientific ignorance and canine mythology make effective cross-examination difficult. Arguably, then, the sixth amend-

555. Id.
556. Id. at 312-13.
557. See id.
558. 413 U.S. 300 (1973).
559. Id. at 315-16.
560. Id. at 315 (quoting United States v. Wade, 388 U.S. 218, 227-28 (1967)).
561. Id. at 317-21.
ment right to counsel should extend to any post-indictment dog scent lineup, whether or not the defendant is present.\(^{562}\)

Assuming that an accused is entitled to have counsel present at a post-indictment scent lineup, there remains a dispute over what role counsel should play at a lineup: passive observer or active participant.\(^{563}\) Whatever role the courts deem "proper," counsel should at the very least attempt to persuade the police to accept his recommendations regarding how to minimize suggestion at a scent lineup. The discussion above of de Bruin's experiments offers a useful checkl-

\(^{562}\) Although there is no sixth amendment right to counsel at pre-indictment lineups, an argument can be crafted that there is a due process right to such representation at a dog scent lineup. Cf. Grano, Kirby, Biggers, and Ash: Do Any Constitutional Safeguards Remain Against the Danger of Convicting the Innocent?, 72 Mich. L. Rev. 717 (1974) [hereinafter Grano] (arguing that at least in certain cases there is a due process right to counsel pre-indictment). In Gagnon v. Scarpelli, 411 U.S. 778, 781-82 (1973), the Court held that due process required the state to provide appointed counsel in certain parole and probation revocation hearings, even though there was no sixth amendment right to counsel at such post-criminal prosecution proceedings. Under precedent, the Court had held that due process afforded the parolee or probationer substantial hearing rights. The Gagnon Court concluded that, under certain circumstances, counsel would be needed to ensure the effectiveness of the hearing rights guaranteed by due process. The Court refused, however, to create an absolute due process right to counsel in all parole or probation revocation proceedings. Id. at 787. Instead, the Court declared that the decision was one to be made on a case-by-case basis. Id. at 790. Although the Court did not set precise guidelines for making this decision, the Court did declare that counsel "presumptively" should be provided where the parolee or probationer requests counsel based upon a colorable claim that he has not committed the violation with which he is charged or that there are substantial reasons that justified or mitigated the violation, reasons that are complex or otherwise difficult to develop or present. Id.

Similarly, there is a due process right to fair procedures at lineups. The Court in Kirby v. Illinois, 406 U.S. 682, 690-91 (1972), in holding that the sixth amendment did not extend the right to counsel to pre-indictment identification procedures, noted that the defendant still was protected from police abuse by this due process right to fair procedures. But it may be difficult for defense counsel to recreate in court any suggestiveness in a scent lineup or to cross-examine the government's witnesses on the scent lineup's fairness. This will hamstring counsel in a suppression hearing as well as at trial. Counsel's best bet is to prevent suggestion in the first place by taking an active role at the lineup. However, unlike in the probation and parole revocation proceedings addressed in Gagnon, where a scent lineup is involved, the issue is always whether the defendant committed the act with which he has been charged, one of the two circumstances that the Gagnon Court labeled as "presumptively" creating a due process right to counsel. Arguably, therefore, a case-by-case approach is unwarranted; a due process right to counsel is necessary to protect the due process right to fair procedures at all dog scent lineups. Cf. Grano, supra, at 742-55 (arguing that, even after Gagnon, there is a due process right to counsel at all precharge station house confrontations).

ist of safeguards that counsel can insist be followed at the lineup.\textsuperscript{564} The danger that the jury may attach undue weight to an identification by the dog, even an identification made under clearly suggestive circumstances, is too great for counsel to risk playing a passive role. As the Court concluded in \textit{United States v. Wade}, "[t]he trial which might determine the accused's fate may well not be that in the courtroom but that at the pretrial confrontation... with little or no effective appeal from the judgment there rendered by the witness—'that's the man.' "\textsuperscript{565}

Counsel, therefore, must educate themselves in the literature regarding scent lineups and must argue strenuously for the use of procedures at least as protective of the defendant's rights as those de Bruin designed. If the defendant nevertheless is identified, knowledgeable counsel who has spotted each of the suggestive factors in the lineup will be far better prepared to argue effectively that the lineup evidence must be excluded as violative of due process. Of course, counsel also must move vigorously to exclude the lineup on \textit{Frye},\textsuperscript{566} relevancy,\textsuperscript{567} and the other grounds discussed in this Article, for the suppression motion may be far more important than the actual trial. If the motion to suppress nevertheless is denied, counsel who at least attempted to play an active role at the lineup and who was fully aware of the scientific underpinnings of scent identification will be far better prepared at trial to clarify for the jury those aspects of the identification procedure that render the procedure untrustworthy.

\section*{F. Hearsay-Related Objections}

(1) \textit{Hearsay}

A small minority of jurisdictions have concluded that dog scent identification evidence is inadmissible hearsay.\textsuperscript{568} The rationale for this

\textsuperscript{564} See supra notes 522-548.
\textsuperscript{565} 388 U.S. at 235-36.
\textsuperscript{566} See supra notes 247-356 and accompanying text.
\textsuperscript{567} See supra notes 391-450 and accompanying text.
\textsuperscript{568} See the cases collected at Annotation, supra note 98, at 1228-29. Although neither this Annotation's summary of the cases, nor the cases themselves, use the word "hearsay," the cases either explicitly or implicitly emphasize the inability to cross-examine the dog. See, e.g., People v. Pfanschmidt, 262 Ill. 411, 462, 104 N.E. 804, 823 (1914) ("Neither court nor jury can have any means of knowing why the dog does this thing or another... ."); State v. Grba, 196 Iowa 241, 260, 194 N.W. 250, 258 (1923) (" 'If a person was testifying to having tracked the defendant from or about the place, he could be cross-examined upon that subject... . Not so with the dog.' ") (emphasis added) (quoting with approval a dissent of a
position is straightforward. Hearsay is an out-of-court statement offered to prove the truth of the matter asserted. The dog’s alerting to a defendant’s presence is the dog’s way of saying, “That is the man; his scent matches the scent on the source object.” When used in court, this statement is admitted to prove exactly what it asserts: the two scents match. Since the source scent is that of the wrongdoer, the statement logically supports the conclusion that it is the defendant who did the crime. The dangers arising from the use of this kind of hearsay were summarized in Brott v. State:

Undoubtedly, nice and delicate questions are time and again presented to [the bloodhound] for decision. But the considerations that induce[d] him, in a particular case, to adopt one conclusion rather than another can not go to the jury. The jury can not know whether the reasons on which he acted were good or bad, whether they were all on one side or evenly balanced, or whether his faith in the identity of the scent which he followed was strong or weak. In attempting to separate one smell from ten, twenty, fifty, or a hundred similar smells with which it is intermixed and commingled, it is highly probable, if not quite certain, that the bloodhound undertakes a task altogether beyond his capacity.

The flaws in this position are obvious. As two well-known commentators on the law of evidence have declared:

The hearsay rule responds to the frailties of human declarations and the degree to which these frailties can be better assessed if the declarant testifies in person before the trier of fact subject to cross-examination. The rule does not apply to statements which emanate from non-human sources, whose “testimony” cannot be tested by cross-examination.

That the hearsay rule is thus primarily a rule of preference for the live testimony of humans who can be cross-examined in court is further underscored by the definition of a “statement” in Federal Rule of Evidence 801. That definition includes the “nonverbal conduct of a person, if it is intended by [the person] as an assertion.”

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569. See e.g., FED. R. EVID. 801(c); OKLA. STAT. tit. 12, § 2801 (1980); N.C.R. EVID. 801(c); Omo R. Evid. 801(C).
570. 70 Neb. 395, 97 N.W. 593 (1903).
571. Id. at 397-98, 97 N.W. at 594.
573. FED. R. EVID. 801(a)(2) (emphasis added); OKLA. STAT. tit. 12, § 2801 (1980); N.C.R. EVID. 801(a)(2); Oho R. Evid. 801(A)(2).
Moreover, a dog's actions are meaningless without the testimony of a handler or other expert to explain the dog's behavior. "[I]t is the human testimony that makes the trailing done by the animal competent, and [the dog's] actions are described by human testimony, just as it would describe the operations of a piece of intricate machinery." This analogy to expert testimony regarding the responses of machinery has led most courts to conclude that dog scent identification evidence is not hearsay because the handler, not the dog, is the true witness.

Although the majority of courts are correct in concluding that dog scent identification evidence is not hearsay, in arriving at this conclusion the courts fail to respond adequately to the concerns of the Brott court: that neither the trainer nor the dog himself can explain the dog's actions adequately.

Two options are available for protecting against the danger of erroneous convictions resulting from this lack of information. The first option is to consider the likelihood that the trainer's ignorance will so mislead the jury that the evidence must be excluded because the dangers of using the evidence outweigh its probative value under a test such as that in Federal Rule of Evidence 403. As discussed earlier, there is a good chance that this first option will succeed in barring scent lineup evidence from trials. The second option is to ask whether the expert's minimal knowledge about the subject matter of his testimony may be so inadequate as to deprive a defendant of his right under the sixth amendment to confront the witnesses against him.

(2) The Confrontation Clause

The confrontation clause in the sixth amendment of the United States Constitution provides: "In all criminal prosecutions, the accused shall enjoy the right . . . to be confronted with the witnesses against him." This right protects defendants in both state and federal criminal proceedings. A primary purpose of the right is to secure for the defendant the opportunity for effective cross-examination of the witnesses against him. Because dogs cannot be cross-examined,
defendants have argued—although generally without success—that admission of dog scent identification evidence violates confrontation rights. The argument has failed for reasons similar to those that have resulted in rejection of the hearsay challenges to such evidence: the true witness is the handler, and the handler is subject to cross-examination.

Most courts improperly treat the conclusion that the handler is the true witness as the end of the confrontation clause analysis. That would be the case if the clause did not guarantee more than merely the right to question a witness. The United States Supreme Court’s decisions suggest, however, that the clause guarantees something more; specifically, the opportunity for effective cross-examination. This is not a guarantee of actual effectiveness but rather of a realistic and fair chance of calling the credibility of a witness’ testimony into question.

With dog scent lineups, the dog’s mythic infallibility makes it difficult for a defendant to find effective weapons with which to attack the dog’s “testimony.” This problem is compounded because the handler or other expert also has little reliable basis for his opinion. The state of scientific research regarding the meaning and accuracy of dog scent lineups is too primitive to enable anyone to know with any degree of certainty how accurate a dog is in any specific case. Moreover,
the concerns of the court in *Brott v. State* remain: neither the handler nor any other expert knows enough about canine behavior to be able to determine what "nice and delicate" decisions the dog made, why he made them, how certain he was of their accuracy, or how much his choices were influenced by suggestive factors.\(^{586}\) Merely pointing this out is unlikely to lead jurors to reconsider their preconceived notions of canine infallibility.\(^{587}\) Thus, the presently immature state of scientific research combines with juror preconceptions to make effective cross-examination of the handler or other expert impossible.

The starting point for analysis is *Delaware v. Fensterer*.\(^{588}\) In *Fensterer*, a government expert in a murder trial testified that, in his opinion, a hair found on the murder weapon was forcibly removed from the victim. The expert, however, could not remember which of three possible methods he had used to arrive at his conclusion.\(^{589}\) A defense expert suggested that the government expert has in fact relied on one particular theory, a theory that the defense expert then vigorously challenged.\(^{590}\) The United States Supreme Court rejected the defendant’s argument that the government expert’s memory lapse deprived the defendant of his confrontation rights because the defendant could not expose and test the basis for the expert’s opinion.\(^{591}\) The Court concluded that the "Confrontation Clause guarantees an opportunity for effective cross-examination, not cross-examination that is effective in whatever way, and to whatever extent, the defense might wish."\(^{592}\) This minimal constitutional guarantee was met in the case before the Court for two reasons: first, the government expert’s failure to recall the basis for his opinion "invite[d] the jury to find that his opinion [was] as unreliable as his memory";\(^{593}\) and second, the defense was able to demonstrate through its own expert that the prosecution relied on a theory which the defense considered baseless.\(^{594}\)

The Court also rejected the Delaware Supreme Court’s conclusion that due process required the prosecutor, who knew in advance of the trial of the witness’ memory lapse, to refrain from calling the witness to the stand. Treating the due process and confrontation clause analyses as virtually identical, the Court concluded that because under the

\(^{586}\) See *Brott v. State*, 70 Neb. 395, 397-98, 97 N.W. 593, 594 (1903).
\(^{587}\) See supra note 436 and accompanying text.
\(^{589}\) Id. at 17.
\(^{590}\) Id.
\(^{591}\) Id. at 18.
\(^{592}\) Id. at 20.
\(^{593}\) Id. at 19.
\(^{594}\) Id. at 20.
confrontation clause the expert's memory lapse went solely to the weight, not to the admissibility of the testimony, the prosecution had no obligation to refrain from calling the witness.\(^{595}\) In reaching this conclusion, however, the Court noted the following:

We need not decide whether the introduction of an expert opinion with no basis could ever be so lacking in reliability, and so prejudicial, as to deny a defendant a fair trial. The testimony of Dr. DeForest [the defense expert], suggesting the actual basis for Robillard's [the prosecution expert's] opinion and vigorously disputing its validity, utterly dispels any possibility of such a claim in this case.\(^ {596}\)

Although in the quoted language the Court posits a situation in which an expert opinion literally has "no basis," logic suggests that confrontation clause guarantees may be violated where there is a min-

imal basis but a great danger of prejudice. Indeed, if no basis whatsoever was the test, the Court would not have gone on to talk of opinions "so lacking in reliability," instead of opinions with "no reliability," as to deny a defendant a fair trial. The constitutional rule that the Court suggests may thus be restated as follows: If expert testimony is extremely unreliable, that is, if the testimony is based on unsound or insufficiently tested scientific principles, and if the jury nevertheless is likely to give that testimony great weight, confrontation rights are violated if the defense is unable to elicit, by even the most probing questions, sufficient information to offer the defense a realistic chance of calling the credibility of the expert's opinion into question.\(^ {597}\) Since Fensterer was decided, no court has directly con-

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595. The only case cited by the Court in reaching this conclusion was United States v. Bastanipour, 697 F.2d 170 (7th Cir. 1982), cert. denied, 460 U.S. 1091 (1983). In Bastanipour, a government chemist testified that he based his opinion that a certain substance was heroin on laboratory tests and on information obtained from a computer. The defendant claimed that he was denied meaningful cross-examination because the expert "knew nothing" about the computer program upon which he based his opinion, and therefore the government should, at the very least, have made the program available to defense counsel prior to trial. The Seventh Circuit rejected defendant's claim because there was no appreciable risk that prejudice resulted. Defense counsel had rejected the proffer of a sample for testing, and the white powdery substance analyzed had been found hidden under the false bottoms of caviar tins. Under these circumstances, the court found it "wholly unrealistic" to believe that the substance analyzed was not contraband. Id. at 177. The Bastanipour court did not find that mere questioning of the expert was sufficient to protect defendant's confrontation rights. Rather it found that under the circumstances defendant had been offered an adequate "opportunity" for "effective" cross-examination.

596. Fensterer, 474 U.S. at 22-23.

597. This concern with giving the jury sufficient information to enable it fairly to evaluate the evidence and thus to promote the accuracy of the truth-finding function, has been expressed repeatedly in the Court's confrontation clause jurisprudence. See, e.g., Maryland v. Craig, 110 S. Ct. 3157, 3163 (1990) ("The central concern of the Confrontation Clause is to ensure the reliability of the evidence against a criminal defendant by subjecting it to rigorous testing
sidered whether the rule suggested by the Court's dicta is indeed the rule that the Court will follow.

In *Pennsylvania v. Ritchie*, however, a plurality of the Court suggested that the confrontation clause guarantees no more than an opportunity to pose questions, thus rejecting any inquiry into the likelihood that such questions may have a significant impact on the jury's assessment of credibility. *Ritchie* involved a child protective services agency's refusal to comply with a defendant's subpoena for the medical records of his daughter, whom the defendant had been charged with raping. The trial court denied the defendant's motion to require the agency to disclose the subpoenaed records. On appeal the Court remanded the case with instructions that the trial judge review the records in camera to determine whether they contained information that may have affected the outcome of the trial.

The plurality based its decision on the prosecution's due process obligation to turn over information that is both favorable to the accused and material to his guilt. Justice Powell, in an opinion in which Chief Justice Rehnquist and Justices White and O'Connor joined, rejected the argument that the confrontation clause created a pretrial right to access to those records necessary to ensure an adequate opportunity for cross-examination at trial. Justice Powell stated simply that, "Normally the right to confront one's accusers is satisfied if defense counsel receives wide latitude at trial to question the witnesses." Because withholding of the records requested did not prevent trial counsel from questioning the witnesses fully, the plurality found no confrontation clause violation.

Justice Blackmun strongly disagreed in a separate concurring opinion. In his view, simple questioning often may be insufficient in the context of an adversary proceeding before the trier of fact.

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599. *Id.* at 43.
600. *Id.* at 45.
601. *Id.* at 57.
602. *Id.* at 52-53.
603. *Id.* at 53.
604. *Id.* at 54.
605. *Id.* at 61-66 (Blackmun, J., concurring).
to serve the purposes of cross-examination.\textsuperscript{606} Although the confrontation clause does not ensure a defendant the most effective available means of cross-examination, Justice Blackmun concluded that the clause does guarantee a method sufficient to call a witness' credibility into question.\textsuperscript{607} When a defendant is denied pre-trial access to information that would make possible effective cross-examination of a crucial prosecution witness, the defense may be denied the minimally sufficient cross-examination at trial that the confrontation clause protects.\textsuperscript{608} Nevertheless, Justice Blackmun concurred in the result because he considered the Court's remand order sufficient to protect confrontation rights.\textsuperscript{609}

The theory of the plurality in \textit{Ritchie}, that mere questioning is sufficient to protect confrontation rights, has not been followed by a majority of the Court in later opinions. Indeed, while the Court has found it very easy to establish that a defendant has been offered an opportunity for "effective" cross-examination, the Court has not retreated from its inquiry into whether, under the specific facts before it, the defendant has indeed been offered such an opportunity.

The Court's most significant recent inquiry into this question was undertaken in \textit{United States v. Owens}.\textsuperscript{610} \textit{Owens} involved an assault victim who had been hospitalized because of a skull fracture suffered in an attack. While in the hospital, the victim identified the defendant in a photo array.\textsuperscript{611} At trial, however, the victim could not remember that he had been his assailant.\textsuperscript{612} Moreover, although the victim remembered identifying the defendant in the photo array, the victim could not recall whether any of his hospital visitors had suggested, before the array, that the defendant was the assailant.\textsuperscript{613} The Court, in an opinion by Justice Scalia in which all four members of the \textit{Ritchie} plurality as well as Justices Stevens and Blackmun

\textsuperscript{606} Id. at 63.
\textsuperscript{607} Id. at 62-65.
\textsuperscript{608} Id.
\textsuperscript{609} Justice Brennan, dissenting in an opinion in which Justice Marshall joined, agreed with Justice Blackmun that the denial of pretrial discovery can, in certain circumstances, deprive a defendant of the opportunity for effective cross-examination, thus violating the confrontation clause. \textit{Id.} at 66-72 (Brennan, J., dissenting). \textit{Ritchie}, Justice Brennan concluded, involved such a violation because denial of access to prior statements that may be inconsistent with a witness' trial testimony "strikes at the heart of cross-examination." \textit{Id.} at 71. Justice Stevens also filed a dissenting opinion, in which Justices Brennan, Marshall, and Scalia joined, concluding that the orders challenged should not have been reviewed because of their lack of finality. \textit{Id.} at 72-78.
\textsuperscript{610} 484 U.S. 554 (1988).
\textsuperscript{611} Id. at 556.
\textsuperscript{612} Id.
\textsuperscript{613} Id.
joined, considered whether despite the victim’s memory lapse the defendant has an adequate opportunity for effective cross-examination of the victim.\footnote{Id. at 555-56.}

The Court found that the defendant had an opportunity for effective cross-examination because he had “realistic weapons” for cross-examination.\footnote{Id. at 560.} This was demonstrated by defense counsel’s summation, which emphasized the witness’ memory loss and argued that the witness had identified the defendant solely because of the suggestions of visitors to the hospital.\footnote{Id.} The Court rejected the argument that, given the grave dangers of identification testimony, the out-of-court identification was so inherently unreliable that the tools used by defense counsel were inadequate means of impugning the victim’s testimony.\footnote{Id. at 559-60.} The Court emphasized, however, that it based this final conclusion on the absence of any argument that the photo array was conducted in a suggestive manner.\footnote{Id. at 561.} The Court thus left open the possibility that much more powerful weapons may be required to meet minimum constitutional requirements when there is evidence of a potentially suggestive identification.

Despite affirming the defendant’s conviction in the case before it, the Owens Court upheld the theory that a defendant must have a realistic opportunity for effective cross-examination.\footnote{Id. at 559-60.} This interpretation of Owens is consistent with the Court’s repeated emphasis in its other confrontation clause cases that the purpose of the clause is “to augment accuracy in the factfinding process by ensuring the defendant an effective means to test adverse evidence.”\footnote{Id. at 561.} The prospect remains that, in an appropriate case, the Court will overturn a conviction in which no true opportunity has been offered for effective cross-examination, despite the fact that a defendant may have been afforded an unrestricted scope to pose appropriate questions. This

\footnote{Id. at 559. Justice Brennan, in his dissent, characterized the majority opinion very differently: “[W]e have never before held that the Confrontation Clause protects nothing more than a defendant’s right to question live witnesses, no matter how futile that questioning might be.” Id. at 567. Although the result reached by the Owens majority might reflect an unarticulated belief that the mere opportunity for questioning is all that the clause requires—the precise view advocated by the Ritchie plurality—the Owens majority nevertheless adhered at least in form to the notion that the confrontation clause guarantees an opportunity for effective cross-examination, not mere questioning. Justice Brennan’s characterization of the majority’s reasoning is, therefore, unfair.}

\footnote{Ohio v. Roberts, 448 U.S. 56, 65 (1980).}
Article argues that dog scent lineups offer just such an "appropriate case."

This interpretation is also consistent with the Court's emphasis in right to counsel cases on the need to provide the defense with effective tools, not simple questioning, to preserve fundamental confrontation values. Thus, in *United States v. Wade*, the Court declared that the sixth amendment right to counsel extended to post-indictment lineups because the "inability effectively to reconstruct at trial any unfairness that occurred at the lineup may deprive [the defendant] of his only opportunity meaningfully to attack the credibility of the witness' courtroom identification." The Court continued:

Insofar as the accused's conviction may rest on a courtroom identification in fact the fruit of a suspect pretrial identification which the accused is helpless to subject to effective scrutiny at trial, the accused is deprived of that right of cross-examination which is an essential safeguard to his right to confront the witnesses against him.

The Wade Court found that a right to counsel was necessary at a lineup because of the mere possibility that, without counsel, it would be impossible effectively to disclose at trial whether the lineup was "suspect," that is, conducted in a suggestive manner. The Owens Court, on the other hand, apparently demanded evidence that a pretrial confrontation was in fact suggestive before requiring some special means to ensure effective cross-examination at trial concerning the reliability of the pretrial identification procedure. When Wade and Owens are considered together, therefore, it seems likely that the Court will pay particularly close scrutiny to the ability to cross-examine effectively when there is evidence that a lineup was suggestive.

The results of cases like *Delaware v. Fensterer* and Owens demonstrate that the Court is extremely reluctant to conclude that a particular cross-examination did not offer a defendant an opportunity for effective cross-examination when the trial court did not significantly restrict the scope of that examination. On the other hand, the Court consistently has inquired into whether such an opportunity has been

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621. 388 U.S. 218 (1967).
622. Id. at 232.
623. Id. at 235 (citing Pointer v. Texas, 380 U.S. 400) (emphasis added); see also Pennsylvania v. Ritchie, 480 U.S. at 69-72 (Brennan, J., dissenting) (arguing that both Wade's due process analysis of the reliability of lineups and the numerous confrontation clause decisions of the Court reflect a common concern with protecting the opportunity for an effective cross-examination at trial, that is, cross-examination that augments the accuracy of the factfinding process).
offered and repeatedly has suggested that there may be cases in which the evidence is so prejudicial and the opportunity for effective cross-examination so weak that the confrontation clause will have been violated.\textsuperscript{627} While the Court undoubtedly will find such a violation only in very special cases, dog scent lineups, which not only are viewed as powerful evidence of a defendant's guilt but also offer little information to enable jurors to evaluate that evidence fairly, would seem to be one such special case. Moreover, as suggested in\textit{Owens},\textsuperscript{628} this argument may be particularly appealing when there is evidence that a particular scent lineup was suggestive, for the dangers of an erroneous conviction are then great while the tools for exposing those dangers are minimal.

G. The Traditional Foundation Requirements for Tracking Evidence

The review of the common law, rule-based, and constitutional objections to scent lineups emphasized the difficulties in designing fair and accurate scent lineups and in offering defense counsel as adequate opportunity to reveal lineup weaknesses at trial. That review sets the stage for understanding the flaws in the unique common law rules crafted by the courts for tracking evidence and the absurdity of applying those rules to scent lineups.

Several courts have admitted scent lineup evidence when some variation on the traditional majority foundational requirements for tracking evidence has been met.\textsuperscript{629} Those traditional requirements, as adapted to scent lineups, require that the particular dog: (1) be of pure blood and of a stock characterized by acuteness of scent and the power to discriminate among individual human beings; (2) be accustomed and trained to discriminate among individual human beings; (3) be found by experience in actual cases to be reliable in such discrimination; (4) be placed on the scent of an article where the scent of the alleged criminal participant is present; and (5) be placed on such scent and for such identification purposes within the period of his efficiency.\textsuperscript{630}

These requirements are easily criticized. While olfactory acuity may vary among breeds, such acuity also varies with the individual dog's hereditary traits and health; in addition, motivation and training

\textsuperscript{627} See supra notes 591-597, 610-620 and accompanying text.
\textsuperscript{628} 484 U.S. at 561.
\textsuperscript{630} McNiece, 558 F. Supp. at 616 n.5; accord Gates, 680 F.2d at 1119.
alter the accuracy of identification and discrimination.631 It is, therefore, difficult to understand why, if a particular dog is deemed sufficiently reliable based upon "experience in actual cases," the dog's breed should be an absolute prerequisite to admissibility.632

Moreover, the requirement that the dog involved be trained to discriminate among individual human beings is also of little value as it usually is applied. This requirement generally is met by the testimony of the dog's handler regarding the proper training of dogs for scent lineup discrimination.633 But without scientific testimony establishing that dogs can indeed be so trained, the court or the jury cannot determine whether a dog's training was adequate.634 The requirement that the dog be found reliable by experience in actual cases in practice also has been met by the handler's testimony that he repeatedly has found his dog to be correct.635 Again, without scientific testimony, it cannot be known whether prior accurate results reflect the dog's olfactory talents or just the poor design of suggestive tests.

Finally, the requirement that the dog be asked to perform within the "period of his efficiency" has proven meaningless in practice. Thus, in United States v. McNiece,636 while purporting to follow the five-part test outlined above, the court concluded that a delay of twenty-one months between a robbery and a lineup "might, arguably" reduce the probative value of the lineup, but that possibility went solely to the weight, not the admissibility, of the evidence.637 This result is particularly shocking because even the few researchers who would consider an accurate lineup possible after such a delay would discount the lineup in McNiece because no special precautions to preserve the scent were taken.638

The traditional approach, therefore, has not worked. A better-reasoned approach is to treat dog scent evidence the same as other

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631. W. McCARTNEY, supra note 169, at 17-18. "Acuity" refers solely to sensory ability, not to the dog's behavior in using that ability. Comments of Dr. L.J. Myers in reviewing an early draft of this Article (on file with the author of this Article).

632. See M. PEARSALL & H. VERBRUGGEN, supra note 3, at 12 ("A dog's ability to track is an individual trait, which is not tied to a particular breed.").


634. Cf. State v. Loucks, 98 Wash. 2d 563, 567, 656 P.2d 480, 482 (1983) ("While a dog's trainer may be available for cross examination, he obviously will be unable to answer many questions bearing on the reliability of the dog's conclusions.").

635. See cases cited supra note 629.


637. Id. at 617 n.6.

638. See Letter I, supra note 9 (special cloths and airtight container used for scent storage).
scientific evidence, thus focusing attention more clearly on the underlying reliability problems that fairness suggests should be the courts' primary concern.

H. The Corroboration Requirement

Some courts acknowledge the weaknesses of scent lineup evidence but admit the evidence subject to the requirement that the defendant may be convicted only if there is other, corroborating evidence of guilt.639 Corroborating evidence has been defined as "evidence supplementary to that already given and tending to strengthen or confirm it."640 Thus, evidence that meets the minimal requirements of logical relevancy, or that makes it ever so slightly more likely than would otherwise be true that the defendant is the wrongdoer,641 meets the corroboration test. Such a test provides little assurance that the only direct evidence of identity, the dog's lineup alert, is reliable.

One court has sought to compensate for the weaknesses of the vague, unguided corroboration rule by instructing the jury that it may consider the lineup only if the jury is first convinced of the defendant's guilt by clear and convincing corroborating evidence.642 This approach is also inadequate.643 If the scent lineup is the only evidence that raises

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640. State v. Ellis, 48 Wash. App. 333, 335, 738 P.2d 1085, 1087 (1987) (tracking case) (quoting BLACK'S LAW DICTIONARY 414 (4th rev. ed. 1968)); see also State v. Nicholas, 34 Wash. App. 775, 779, 663 P.2d 1356, 1358-59 (1983) (tracking case rejecting the argument that corroborating evidence must, in itself, provide substantial evidence of identity; all that is necessary is that the combination of tracking and other evidence be sufficient to permit a rational jury to find defendant guilty beyond a reasonable doubt).

641. "'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." FED. R. EVID. 401; OKLA. STAT. tit. 12, § 2401 (1980); N.C.R. EVID. 401; OHIO R. EVID. 401.

642. United States v. McNiece, 558 F. Supp. 612, 616-17 (E.D.N.Y. 1983). The McNiece court combined the traditional five-part test for the admissibility of tracking evidence with the requirement that there be clear and convincing corroborating evidence of the defendant's identity. Id. at 616 & n.5, 617. Neither the tracking test nor the corroboration requirement provides significant assurance that the scent evidence is reliable, and accordingly, the combination does little to address the fundamental problem facing the courts.

643. Cf. S. ESTRICH, REAL RAPE 43-44 (1987) (noting the inability of the judiciary to use the corroboration requirement with either consistency or clarity in rape cases); V. HANS & N. VIDMAR, JUDGING THE JURY 207 (1986) ("there is some evidence that the corroboration instructions don't work the way they ought to"); thus a jury simulation study conducted by one of the authors in a rape case revealed that, "contrary to expectations, when jurors were given corroboration instructions, they were no more likely to scrutinize the victim's credibility or the potentially corroborative evidence").
the level of the jury’s belief in the defendant’s guilt from clear and convincing to beyond a reasonable doubt, and if the lineup is of questionable value, the conviction may stand on sand.

Perhaps the greatest failing of the corroboration requirement is that it serves as a substitute for the court’s examination of the strengths and weaknesses of the lineup itself as a scientific technique. If those strengths and weaknesses are properly examined, however, and if a court is convinced that the technique is valid and will not unduly mislead the jury, there seems little reason to impose a vague and confusing corroboration requirement. On the other hand, if the court has serious doubts about the technique’s validity, the lineup should never reach the jury.

I. The Standard of Proof and Harmless Error

Two procedural matters—the standard of proof for admitting evidence and the standard of review on appeal—must be considered if the review of potential objections to dog scent lineups is to be fully understood.

As to the first of these matters, Professor Giannelli, relying upon an analysis first suggested by Professor Saltzburg, has recommended admitting novel scientific evidence only if the court is first convinced beyond a reasonable doubt that the underlying scientific technique is valid. The justification for the recommendation is that novel scientific evidence poses significant reliable problems and runs the risk of causing extreme jury prejudice. Therefore, errors regarding the validity of a scientific technique are very likely to result in erroneous verdicts. This danger is particularly great when, as with dog

646. Giannelli, supra note 250, at 1247-48. Professor McCord has argued that a heightened standard of proof is unnecessary to guard against erroneous verdicts where a trial court has otherwise properly done its job in determining the reliability of scientific evidence and its likely impact on the jury. McCord, Profiles, Syndromes and Other Mental Exotica: A New Approach to the Admissibility of Nontraditional Psychological Evidence in Criminal Cases, 66 OR. L. REV. 19, 106 (1987). Professor McCord, like so many other academics, including the author of this Article, has proposed his own set of guidelines to assist the courts. What Professor McCord misses, however, is that courts faced with the complexity of scientific evidentiary questions have repeatedly ignored exhortations to more careful analysis, and attorneys, perhaps because they have known that they too could “get away with” truncated analyses, have done little to help the courts. A heightened standard of proof provides a strong incentive for the proponents of scientific evidence to do their homework, and, in addition, impresses upon the courts the need for more than a casual examination of scientific evidence before such evidence is presented to a jury.
scent lineups, a finding of the preliminary fact ("validity") is likely to be dispositive of guilt. Professor Giannelli's approach properly focuses judicial attention on whether the lineup is a sound scientific technique while assuring, as the corroboration requirements does not, a high degree of confidence in the outcome of the trial.

Whether the admission of scent lineup evidence is "harmless error" is, of course, a determination that only can be made on a case-by-case basis. It is important to emphasize, however, that because of the jury's potential misuse of the evidence, the government bears a heavy burden in seeking to persuade a court beyond a reasonable doubt (for constitutional errors) or by a high probability (for non-con-

647. This preliminary fact is to be decided solely by the judge, pursuant to Federal Rule of Evidence 104(a), and the proponent will have the burdens of both production and persuasion as to the existence of the preliminary fact of "validity." Giannelli, supra note 250, at 1247 & n.372. "Since the purpose of imposing a special burden on the admissibility of novel scientific evidence is to insulate the jury from unreliable evidence, treating the issue as one of conditional relevance under Fed. R. Evid. 104(b) would undermine that purpose." Id.

648. At first blush, Bourjaily v. United States, 483 U.S. 171 (1987), seems to call into question whether heightening the standard of proof is an option still available to federal courts in resolving questions concerning the admissibility of scientific evidence. In Bourjaily, the Court suggested that preliminary fact-finding under Federal Rule of Evidence 104(a) is subject to the preponderance of the evidence standard only. Although Bourjaily involved the very narrow question of the standard of proof to be applied in determining whether a conspiracy existed for purposes of the co-conspirators exception to the hearsay rule, commentators have concluded that, under Bourjaily, "it is highly likely that the preponderance standard will be used in virtually all preliminary factfinding governed by Rule 104(a)." 1 S. SALTZBURG & M. MARTIN, FEDERAL RULES OF EVIDENCE MANUAL 42-43 (5th ed. 1990).

The Bourjaily Court, however, rested its holding primarily on two conclusions: first, that the preponderance standard has been used successfully in other areas, notably determining the admissibility of confessions and evidence seized pursuant to searches conducted under fourth amendment standards; and second, that based on this experience, there was "'nothing to suggest that admissibility rulings have been unreliable or otherwise wanting in quality because not based on some higher standard.'" 483 U.S. at 175-76 (quoting Lego v. Twomey, 404 U.S. 477, 488 (1972)).

But both Professor Giannelli's article, which proposes a heightened standard of proof, and this Article challenge the applicability of the Bourjaily Court's second conclusion to decisions involving the admissibility of scientific evidence. See supra notes 244-643 and accompanying text; Giannelli, supra note 250, at 1247-48. To the contrary, such decisions often have been "wanting in quality," as has been demonstrated in numerous examples discussed throughout this Article. Accordingly, Bourjaily's holding should not bar federal courts from adopting a heightened standard of proof in screening dog scent lineups.

649. See Chapman v. California, 386 U.S. 18, reh'g denied 386 U.S. 987 (1967). Chapman established that most evidentiary errors of constitutional dimension will result in reversal in criminal cases if the court is not convinced beyond a reasonable doubt that the errors are harmless. For non-constitutional evidentiary errors, a lesser standard applies: whether it was "highly probable" that the error was harmless. Dowling v. United States, 46 Cr. L. Rptr. 2057, 2058, 2060 (1990). "High probability" requires that the Court have a "sure conviction" that the error did not prejudice the defendant, although it is not necessary that every reasonable possibility of prejudice be disproved. United States v. Dowling, 855 F.2d 114, 123 (3d Cir. 1988).
stitutional errors) that the error did not contribute to the verdict.\textsuperscript{650} This will be so particularly when the lineup is the only direct evidence of the perpetrator’s identity or when other direct evidence of identity is equivocal.\textsuperscript{651}

\textbf{IV. The Full Disclosure Alternative}

The studies regarding the impact of expert evidence on a jury are sparse and conflicting.\textsuperscript{652} Several commentators have suggested that,  

\textsuperscript{650} Cf. Dudge v. State, 442 So. 2d 429 (Fla. Dist. Ct. App. 1983). In Dudge, the court held that it was not harmless error to bar the testimony of a defense expert on scent discrimination where the defendant’s conviction was based on a combination of a scent lineup held more than three months after the crime, an inconclusive analysis of a hair sample, and the equivocal identification testimony of the victim. The court also held that the admission of hearsay supporting the reliability of the dog was not harmless error because the dog’s "abilities were the key to Dudge's identification." \textit{Id.} at 431. See also State v. Roscoe, No. CR-89-0160-PC, slit op. at 5-6 (Ariz. Oct 19, 1989) (given the absence of scientific support for scent lineups and the circumstantial nature of the case in question, newly-discovered evidence of fraud by the prosecution's scent lineup expert might—depending upon its nature and specificity, as demonstrated at a hearing—justify a new trial). But see United States v. Gates, 680 F.2d 1117 (6th Cir. 1982) (finding no error in the admission of dog scent lineup evidence, but concluding that, even if there was error, the error was harmless).

\textsuperscript{651} This discussion of harmless error raises another question to be addressed on appeal: what standard of review should be applied to a trial court’s determination that the canine nose is imbued with a mythic infallibility?

The easy answer is that the question is not a relevant one, for a determination that proffered evidence is or is not imbued with "mythic" qualities is merely a tool that aids the court in finding preliminary facts or deciding questions of admissibility. For example, under a relevancy approach to scientific evidence, a determination of "mythic infallibility" aids the court in finding the preliminary facts whether the evidence is prejudicial and, if so, to what degree. \textit{See supra} notes 244-246, 409-550 and accompanying text; 22 R. Wright \& C. Graham, \textit{Federal Practice and Procedure} § 5224, at 320 (1990) (the existence of Rule 403 countervailing factors is a preliminary fact to be determined by the trial judge). Once these and other preliminary facts are found, they are weighed against probative value to determine Rule 403 admissibility. That final decision is reviewed under an abuse of discretion standard. \textit{See, e.g.}, United States v. Downing, 753 F.2d 1224, 1239-41 (3d Cir. 1985) (apparently treating the determination of "mythic infallibility" as but one step in the court's exercise of its discretion under a relevancy approach to scientific evidence; no consideration of the possibility that the conclusion that evidence is "mythic" might be subjected to a separate and different standard of review).

But this approach ignores two factors: first, as a practical matter, characterizing evidence as "mythic" or choosing not to do so may in some cases be the most important reason for a court's excluding or admitting evidence; and, second, under the approach suggested herein, \textit{see supra} note 33, the appellate court is as competent as the trial court to determine whether a myth exists, for both can examine the same sources, and generally neither must make credibility judgments. Consequently, a more realistic and more effective approach—and one that creates a powerful incentive for both attorneys and trial judges to examine evidence of myth carefully—is to review decisions concerning the existence or non-existence of myth de novo. \textit{Cf.} Monahan \& Walker, \textit{supra} note 33, at 514 (recommending de novo review of social science research findings relied upon by trial courts in crafting new rules of law).

\textsuperscript{652} \textit{Compare} M. Myers, \textit{Rule Departures and Making Law: Juries and Their Verdicts}, in
at the very least, juries may be overawed by some experts but not others. 653 A separate analysis must be made of each class of expert evidence to determine whether the jury is likely to abuse evidence in that class. 654 An analysis of expert testimony regarding dog scent line-ups is in part what this Article has sought to achieve. That analysis is incomplete, however, if exclusion of the potentially misleading evidence is treated as a court's only option. 655 Other options, specifically the availability of techniques for controlling the weight that the jury may give the testimony, must be considered. These options seek to alter the effect of expert testimony by providing full disclosure to the jury of all information necessary for it to evaluate the evidence fairly. Full disclosure might include instructing the jury that it should not give the evidence undue weight; that certain factors make the accuracy of the evidence in the particular case questionable and that scientific bases exist for challenging the accuracy of the entire class of evidence.

This Part addresses four major full disclosure techniques, including discovery, adversary attack, demonstrations and independent testing, and jury instructions.

A. Discovery

A successful challenge to scientific evidence may require extensive research in preparation for cross-examination, the retention of an opposing expert, and the opportunity for independent investigation and testing. A detailed and thoughtful examination of the nature of the tests performed, the procedures employed, and the qualifications of

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653. Doyle, Applying Lawyer's Expertise to Scientific Experts: Some Thoughts About Trial Court Analysis of the Prejudicial Effects of Admitting and Excluding Expert Scientific Testimony, 25 WM. & MARY L. REV. 619, 636 (1984) ("Assuming, for the sake of argument, that jurors will have some tendency to defer to a scientific expert, the belief that they will defer to different experts equally is difficult to sustain."). 654. Id. at 658; see McCord, supra note 30 at 1183-1189 (arguing that rape trauma syndrome testimony is not of a kind likely to overawe the jury). 655. See Doyle, supra note 653, at 658.
the examiner also will be necessary.656 Consequently, not only should advance notice of the intention to use scientific evidence—particularly novel scientific evidence—be required, but so should the opportunity for full disclosure of all bases for the expert’s opinion.657 Full disclosure is not achieved effectively by procedural rules requiring that the opposition be provided reports of scientific experts, for such reports often provide little insight into the expert’s opinion.658 Moreover, depositions should be permitted for discovery purposes, not simply to preserve evidence for trial.659 Early and thorough discovery not only will increase the effectiveness of adversary attack at trial but also will offer the defense an opportunity for a careful and well-reasoned assault on the admissibility of the evidence.

Despite repeated calls for reforms of this type,660 the rules governing pretrial discovery of scientific testimony in criminal cases have changed little. Unless and until those calls for reform are heeded, pleas for improved discovery procedures will be of no value to defendants hoping to mount an effective attack on the dog scent lineup evidence at trial.

Constitutional grounds for pretrial discovery might, of course, be raised. The prosecution has a due process obligation to disclose to the defense, upon request, evidence that is material to guilt or punishment and favorable to the accused.661 When the prosecution is in possession of evidence that the defense might use to impeach prosecution witnesses, the test of materiality is clear: “the evidence is material only if there is a reasonable probability that, had the evidence been disclosed to the defense, the result of the proceeding would have been different.”662 The argument might be made that dog scent lineups have such a powerful impact on the jury that any evidence regarding the limits of witness expertise, the circumstances under which the dog at issue has performed accurately or inaccurately, the expert’s knowledge of studies calling the accuracy of scent lineups into question, and so

656. See Giannelli, supra note 250, at 1242.
657. Id. at 1240-43; Giannelli, Scientific Evidence: A Proposed Amendment to Federal Rule 702, 26 Jurimetrics J. 260 (1986).
658. Giannelli, supra note 250, at 1242.
659. Id.
660. See supra notes 654-657.
on, might change the outcome of the proceeding and must, therefore, be disclosed.\textsuperscript{663}

In practice, however, the materiality test is difficult to meet because the court must speculate on the likely impact on jury perceptions of impeachment at trial. Moreover, absent improved discovery techniques, it is difficult for defense counsel to know when the prosecution is aware of material impeaching evidence that it does not disclose. The defense is placed in the awkward position of relying primarily on the good faith of zealous prosecutors.

B. Adversary Attack

Effective adversary attack upon scientific testimony turns on several factors, including: the availability of experts in the field to educate the lawyer, prepare him for cross-examination, and testify on his client’s behalf; the availability of substantial scientific literature exposing the potential weaknesses in testimony concerning the subject in question; the competency of counsel; and the jury’s willingness to reevaluate its preconceptions in light of the expert’s testimony.\textsuperscript{664}

Few well-qualified experts with a substantial background in the science underlying dog scent lineups are now available. Moreover, not only is the literature on the accuracy of scent lineups sparse, but unless there is a significant increase in the funding available for basic research, this circumstance is unlikely to change soon.\textsuperscript{665} Furthermore, the assumption of counsel’s competence is all too often unjustified,\textsuperscript{666} although a vigilant interventionist judge may to some degree offset this problem.

Additionally, the little research available suggests that jurors resist expert testimony that is dramatically inconsistent with their funda-

\textsuperscript{663} Brady generally has not been interpreted as dictating when disclosure must be made. W. LaFave & J. Israel, supra note 487, at 760. Some courts have interpreted the Brady doctrine as imposing upon the defendant the burden of establishing that the “lateness of that disclosure so prejudiced [defendant’s] preparation or presentation of his defense that he was prevented from receiving his constitutionally guaranteed fair trial.” Id. For the reasons noted in the text, a strong argument can be made that disclosure must be made pretrial or a particular defendant will be unable to prepare effectively for cross-examination. This approach also would be consistent with the prosecutorial custom of disclosing Brady material pretrial, id. at 760 n.18, and with the recommendation of some courts that the prosecution disclose Brady material as soon as possible. See id. at 760-61 & n.18 (noting the “recommendation of numerous courts” that Brady materials be disclosed as soon as possible, preferably pretrial).

\textsuperscript{664} See generally E. Imwinkelried, Methods of Attacking, supra, note 317; Giannelli, supra note 250, at 1239-45; McCord, supra note 30, at 1188.

\textsuperscript{665} See interview with Dr. I. Lehr Brisbin, Jr. (June 1, 1989).

\textsuperscript{666} See Doyle, supra note 653, at 656.
mental preconceptions.\textsuperscript{667} The myth of the dog’s infallibility, pressed upon jurors in newspapers, film, and television, therefore is likely to be reconfirmed by prosecution experts and affected insubstantially, if at all, by defense cross-examination and defense expert witnesses. Despite the best of intentions, behavioral experts tend to frame their testimony in conclusory terms that offer little help to the jury.\textsuperscript{668} The combination of these factors makes it likely that, in a battle of scent lineup experts, the prosecution will win.

C. Demonstrations and Independent Testing

At least one appellate court has noted its reservations in accepting dog scent lineup evidence, conceding that “jurors may give such evidence considerable weight.”\textsuperscript{669} This court suggested that future use of demonstrations in the courtroom or on film, or other “independent verification” of the dog’s abilities, would be advisable.\textsuperscript{670} Nevertheless, the court upheld the admission of the lineup in the case before it despite the absence of such “independent verification.”\textsuperscript{671}

Requiring a combination of videotaping the lineup at issue, a solution thus far not suggested by any court, and holding fairly-designed videotaped or courtroom demonstrations of the dog’s abilities, preferably under the auspices of an independent, court-appointed expert (a modification of the solution suggested above) may greatly assist the jury. Such an approach also would aid the court in making its initial admissibility decision. For example, Phil Hoelcher, a well-known dog trainer, maintains that his observations of videotapes of one of Preston’s dogs revealed that the dog was not “working,” meaning the dog

\textsuperscript{667}. If the discrepancy between the expert’s opinion and the juror’s preconceptions is great, the likely attitude change will be small. C. FREDERICK, supra note 652 at 173-174. People generally resort to various strategies to resist changing their opinions, including derogating the source (“the defense expert just was not as impressive as the prosecution expert”), distorting the message (“the defense expert’s position was ridiculously extreme”), and paying closest attention to the counter-arguments to the expert’s views. See id. at 156-57. Although some commentators have suggested that jurors remain skeptical of the views of behavioral experts, whom the jurors see as fallible humans, it is likely that the jurors will—because of a belief in the dog’s mythic infallibility—view prosecution scent lineup experts as merely reporting the results of an infallible “machine” (the dog) and defense experts as fallible humans reporting their own flawed observations of canine behavior.

\textsuperscript{668}. Cf. D. BAZELON, QUESTIONING AUTHORITY: JUSTICE AND CRIMINAL LAW 54 (1989) (noting the tendency of psychiatric experts on the insanity defense to testify in “misleading and conclusory terms”).


\textsuperscript{670}. Id.

\textsuperscript{671}. Id.
was not concentrating heavily on the scent being followed. Accordingly, Hoelcher concluded that the dog’s “alerting” had to be caused by something other than the dog’s locating a “matching” scent. Videotaping the lineup on which the prosecution is based would offer an opportunity for defense or court-appointed experts to uncover at least the most egregious instances of fraud or incompetence, both of which Hoelcher charged Preston with committing.

Videotaping, however, is likely to be less effective in providing the jury with a lineup “recreation” subject to the jurors’ independent scrutiny. A videotape cannot “record” a scent, and even if the scent could be recorded, the jurors lack the biological ability to detect that scent and evaluate the “match” independently. Unlike videotapes of visual lineups, therefore, a videotape of a scent lineup will do little to reveal suggestion. On the other hand, merely because videotapes are more interesting, they may increase the impact on the jury of such obvious suggestive factors as the defendant’s being the only male in the line or the only one wearing a blood-stained shirt.

Independent testing offers a much more effective opportunity for challenging the dog’s abilities. Indeed, the administration and failure of a court-ordered and supervised test of a dog’s abilities led one court to exclude a handler’s testimony at trial. If both sides have input on the design of the test, and if the test is administered by a court-appointed expert, it will be difficult for anyone to cry “foul.” Moreover, multiple tests are more likely to reach useful results. If some tests are passed and some are failed, this information will be of critical use to the defense if the evidence is admitted at trial. On the other hand, if consistently successful results were reached, either those results were obtained contrary to defense recommendations for a fair test and can be impeached at trial, or the tests complied with defense recommendations and the court and the jury can have greater confidence that the particular dog is trustworthy.

The success of independent testing of the particular dog depends, however, on the state of scientific knowledge regarding the abilities of dogs and on what constitutes a fair test. A well-developed body of scientific knowledge can prevent drawing unwarranted conclusions from a small number of tests. Adequate knowledge also can aid in detecting subtle unintentional suggestive influences. The uncertain state of scientific development regarding the accuracy of scent lineups thus

672. Tracking the Tracker, supra note 42 (voice of, and interview with, Phil Hoelcher).
673. Id.
674. Id.; see also supra note 153 and accompanying text (discussing Preston’s court problems).
may suggest that such lineups still should not be admitted at trial. Nevertheless, if lineups are admitted, a requirement of repeated independent testing of the dog’s abilities, combined with the videotaping of the original lineup, at least will let the jury make a judgment that will be more informal than would otherwise be true.

D. Jury Instructions

Recent psychological studies, although admittedly preliminary, suggest that jury instructions rarely are understood and often do not have their intended impact on jury verdicts. Many of these same studies conclude that instructions can be redrafted to achieve greater comprehension and impact. Redrafting, however, can take lengthy and expensive psychological research aimed at the particular instructions in question, and the efficacy of instructions in overcoming the effects of prejudicial evidence still is questionable.

In scent lineup cases, the courts have relied on two primary types of instructions. The first type simply articulates for the jury the existence and meaning of the corroboration requirement, the problems of which have been detailed earlier in this Article. The second type, based upon a common instruction in tracking cases, cautions the jury not to give scent lineup evidence “undue weight.” One such instruction read as follows:

Evidence has been presented in this case that law enforcement authorities conducted portions of their investigations with the aid of a trained dog. Because it is of course not possible for the dog to communicate its findings to us directly, we must rely on the interpretation of the dog’s actions provided by the testimony of its trainer, witness John Preston. Because of the nature of this evidence, you are instructed to receive it with caution and not to give it undue weight. It is to be considered as a part of, and along with, all the other evidence in the case in your deliberations.


676. E.g., A. Elwork & B. Sales, supra note 675 (devoted to consideration of ways to improve the understandability of jury instructions).

677. See id. at 22-42; infra note 681.

678. See United States v. McNiece, 558 F. Supp. 612 (E.D.N.Y. 1983); see also supra notes 642-643 and accompanying text (discussion of additional instructions given by the McNiece trial court on burden of persuasion).


This type of instruction—one that vaguely cautions the jurors not to give the evidence "undue" weight—is likely to be ineffective in controlling jury misuse of evidence. A much more effective instruction would explain why there is a concern that the evidence will be given improper weight and would outline what factors might affect the weight of such evidence generally and of the lineup before the court specifically. A similar approach, the "Telfaire instruction," has been followed with eyewitness identification evidence. If the instruction is given both before and after the trial, as all instructions ideally should be, and is phrased in simple, understandable language, the instruction might help the jury understand why scent lineup evidence may differ from other evidence and how the evidence should be evaluated.

Nevertheless, the sparse and conflicting research on the effect of instructions on juries and the suggestion in some research that specific psychological tests are necessary to determine the efficacy of the re-drafted instructions—tests not yet conducted for scent lineup instructions—make it difficult to determine with any confidence that jury instructions can "cure" the ill effects of scent lineup evidence.

E. A Multi-Pronged Attack

Although each of the "full disclosure alternatives" outlined above has some problems, the combination of these alternatives might have a significant impact on the jury's assessment of dog scent lineup evidence at trial. Emphasis must be placed on the word "might," how-

681. National Jury Project, Inc., Jurywork: Systematic Techniques § 2.04(2)(c) (2d ed. 1983) (concluding that jury instructions are an ineffective cure for general bias); C. Frederick, supra note 652 ("instructing jurors to ignore information or to use it in a specific and restricted fashion may be ineffective"); Sheehan, supra note 652 (noting that some cautionary instructions cause jurors to overattend precisely to what they have been told to avoid); cf. Bruton v. United States, 391 U.S. 123 (1968) (constitutional error to try one defendant where the jury has before it another, non-testifying co-defendant's statement implicating the first defendant, even if cautionary instructions warn the jury that the statement is only admissible against the non-testifying co-defendant).

682. United States v. Telfaire, 469 F.2d 552, 558 (D.C. Cir. 1972). The Telfaire instruction focuses the jury's attention on many of the factors that can affect the accuracy of eyewitness identification but does not tell the jury why they are being so instructed or direct their attention to the scientific studies calling the accuracy of eyewitness testimony into question. Professor Grano has proposed an eyewitness identification instruction that goes further than Telfaire by focusing the jury's attention on the expert evidence that raises concerns about such evidence. Grano, supra note 562, at 796-97. The instruction suggested here would go even further than Professor Grano's suggestion by also alerting the jury to its own potential tendency to overvalue lineup evidence.

683. A. Elwork & B. Sales, supra note 675, at 12-24, 45-49.

684. Id. at 25-44.
ever, because without further studies, it is difficult to assess whether the various techniques for controlling jury weight assessments ever can be adequate to overcome social myths. Of course, legal decisions often must be made in a world of uncertainty, but the law should minimize those uncertainties when a single, questionable item of evidence might decide an individual’s fate. An even “weightier” objection to the full disclosure alternative is that it turns on wider systemic reforms in the treatment of scientific evidence that have thus far proven elusive. Without such broader reforms, there are too many doubts concerning lineup evidence to justify admitting the evidence at trial.

**Conclusion**

Dogs have served, and can continue to serve, a special and valuable function in law enforcement. New ways for the dog to use its talents to aid law enforcement officers can and should be explored. This, however, does not necessarily justify admitting evidence of the dog’s efforts at trial. All evidence must be scrutinized to determine its relevancy and appropriate weight, and evidence generated through the use of dogs should be treated no differently. Yet courts have treated the dog scent lineup very differently from other forms of evidence.

Relying upon an untested set of assumptions regarding the abilities of the canine nose, courts have admitted scent lineup evidence without adequate consideration of the trustworthiness of the technique or of its impact on juries. This judicial blindness reflects on inaccurate and irrational belief or mythic faith in the dog’s infallibility. That same myth pervades the public understanding, suggesting a danger that jurors will overvalue such evidence and ignore any real inquiry into its appropriate weight. Expert evidence that is so likely to “overawe” the jury is precisely the kind of evidence that courts traditionally have treated with special caution, inquiring carefully into the scientific bases for the evidence in a search for guarantees of trustworthiness that are independent from the mere word of the export or the uninformed preconceptions of the jury.

Since experimental research on the reliability of dog scent lineups is in an incipient stage, the proper weight to be accorded such evidence in any particular case cannot yet be determined. Nevertheless, because of the public’s affection for dogs and its mythic belief in their scenting powers, juries are unlikely to approach scent lineup evidence with appropriate skepticism. Consequently, although there may be some acceptable judicial uses for scent lineups, they should not be admitted as evidence of guilt at a criminal trial.

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Some studies suggest the possibility that further research will, in the not too distant future, specify circumstances under which scent lineup evidence can be trusted. Should this come to pass, the courts nevertheless must continue to be alert to the scientific nature of scent lineup evidence. Specifically, courts must pay close attention to the presence of suggestive circumstances; the qualifications of the expert witness; the proper "calibration" of the dog; the need for active judicial intervention to ensure the complete disclosure of expert data before the jury; and the careful drafting of understandable, informative, and useful jury instructions designed to counteract the popular misconceptions of canine scenting prowess. Anything less than such scrutiny raises the danger of convictions based more upon superstition than upon a rational belief in the guilt of the accused, and such convictions are inconsistent with our society's fundamental commitment to fairness in the system of criminal justice.

evidence could be considered in establishing probable cause even though the traditional foundational requirements for admission of such evidence at trial were absent). This does not mean, however, that courts considering non-trial uses for scent lineups may ignore the validity and reliability of such evidence or its mythic impact. See supra notes 66-96 and accompanying text.