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Recent Developments in Federal and State Rules Pertaining to Medical and Scientific Expert Testimony

James E. Starrs

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*James E. Starrs**

It is decidedly a pleasure being with you. This occasion presents me with a unique and ideal opportunity to address many different issues with respect to forensic science in the presence of the gatekeepers of scientific evidence—the decision-makers. I am tempted therefore to be encyclopedic in my comments and, even more so, in my criticisms on the subject. As a lawyer and a forensic scientist I shall attempt to reign in my overpowering inclination to take this opportunity to pontificate on subjects in the forensic sciences that gnaw away at me on a daily basis.

My earliest formal connection to the forensic sciences occurred in the late 1960's when the forensic sciences graduate program was initiated at George Washington University at the suggestion and the invitation of the FBI. As the law school representative on the founding committee I became keenly aware of the need for a more expanded education in the forensic sciences. This impetus for education was conceived by the planning committee to know no bounds. All persons in the legal and scientific systems were to be its beneficiaries.

Unhappily there are those who have learned about forensic science only from the portrayal of it in Hollywood. For example, I recently purchased the movie Presumed Innocent. I am sure many of you have seen it. It was adapted from a book of the same name written by Scott Turow, a lawyer. It is just one of an unholy number of movies that have misrepresented the proper uses of forensic science. These movies I have dubbed "Hollyweirds," for that is what they truly are. Forensic science cannot be learned from the silver screen.

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In Presumed Innocent, for example, an issue is raised concerning a fingerprint on a glass at the murder victim's apartment which had the distinctive friction ridge minutiae of the prosecuting attorney, Rusty Sabich. To Hollywood the glass proves not only that Rusty was present at the scene but also that he was the murderer. What Hollywood, and the lawyer-author, fail to realize is that a fingerprint cannot be scientifically time-dated. Thus the fingerprint could have been placed on the glass at some time other than the occasion of the murder when Rusty was on the premises with consent and without a murderous intent. In other words, the evidence of Rusty's guilt from the fingerprint on the glass is not so air-tight after all.

In addition to this exercise in fingerprint scientific hocus-pocus the scenario included a number of others amounting to scientific foll-de-roll as well. Rusty's wife, in an effort to pin the murder on her husband when she was in fact the murderess, plants evidence on the deceased woman which she expects will do her husband in. The evidence is a mixed stain of vaginal and seminal fluid that she has retrieved from herself after having had sex with her husband.

The difficulty here is that Rusty's wife would have had to be well-trained in biological stains and their forensic analysis to have perfected her plan. How did she know that Rusty was a secretor? What did she know of the A-B-O blood types of the three persons involved? Remember, this was all in an era just prior to the coming of DNA analysis. The wife's concoction was doomed from the outset, that is if Hollywood had cared the least about the veracity of the scientific issues that it derived from the book.

This is the kind of absurdity that one would expect from Hollywood, am I not right? But then again only a professorial pettifogger like myself would make much of Hollywood's peccadillos in this connection. I suppose, in all truth, I am fated, as a professor, to be a professional picker of nits. And, to your misfortune, I have combed the Pennsylvania cases with the same nit-picker's eye in preparing my remarks to you today. I have searched high and low in Lexis and Westlaw for decisions at the appellate level, in the Superior Court and Supreme Court of Pennsylvania, in which I could glean references to *Frye v. United States*[1] or to *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,[2] since these are the foundation stones upon which the judicial

1. 293 F. 1013 (D.C. Cir. 1923).
2. 509 U.S. 579 (1993).

edifice of forensic science has been constructed. It could well be that there were other cases that did not refer to either *Frye* or *Daubert* which my search terms would have caused me to miss.

Indeed, one decision at the appellate level in Pennsylvania on the question of the admissibility of scientific evidence came in *Commonwealth ex. rel. Riccio v. Dilworth*,[3] back in 1955, well before *Frye* became established here by reason of the Supreme Court of Pennsylvania's opinion in 1977 in *Commonwealth v. Topa*.[4] *Dilworth* did not refer to *Frye* as a controlling precedent. And yet it is a *Frye* case by any stretch of judicial reasoning and in fact, in *Topa* it is referred to as an indication of the trend, at least at that time, in Pennsylvania cases.

It gives me more than a moment of unease to realize that I am lecturing in the home of *Commonwealth v. Westwood*,[5] in which the Supreme Court of Pennsylvania in 1936 gave its approval to the paraffin glove test as an acceptable scientific method to determine whether a person had fired a gun or not. Now that case is, to put it mildly, an atrocity on the face of forensic science. The high court of Pennsylvania considered a positive color reaction in the then-called "paraffin glove test" for gunpowder residues to be conclusive evidence of the existence of gunpowder residues on the hands of an individual. From that the court extrapolated that the individual must necessarily have fired a weapon.

What was wrong here was that the paraffin glove or more appropriately the diphenylamine reagent test was then and is now only a screening test for nitrates or nitrites and not specifically for gunpowder to the exclusion of other sources of nitrates or nitrites. Moreover, even the finding of gunpowder on the hands of a suspect is no certain evidence that he has fired a weapon. He could have touched a weapon; he could have been in the presence of a weapon when it was discharged or he could have had gunpowder residues transferred to his hands from another person who had fired a weapon.

What was particularly unique about the *Westwood* case was that an expert testified for the defendant. That is a rarity, as you know, in criminal cases involving persons of little means. In addition, the expert very competently pointed out that there are twenty-three other commonly encountered substances other than

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3. 115 A.2d 865 (Pa. Super. Ct. 1955) (excluding polygraph testing in a robbery case).

4. 369 A.2d 1277 (Pa. 1977) (excluding voice spectrography evidence in a first degree murder case).

5. 188 A. 304 (Pa. 1936).

gunpowder that could have caused the same color reaction, including urine, lawn fertilizers and so many others, cosmetics, etc. Twenty-three others, think of that.

In the aftermath of *Westwood*, and in the embarrassment created by it in the scientific community, there were studies conducted testing the confirmatory value of the diphenylamine reagent for gunpowder. As a consequence of those studies the whole scientific community has reacted with more than uncomfortable chagrin to the outcome in this case. As a result, testing is no longer for gunpowder residues but for the primer residues of barium, antimony and lead. *Westwood* forced a change in the scientific community's thinking and methodology because it was a decision that was such outrageous scientific flap-doodle that measures had to be taken to remedy it and to save face in the scientific community.

In today's world of forensic science whenever an admonition of caution is uttered on the question of the reliability of scientific evidence, it is always *Westwood* that is cited as the worst example of science gone awry in the courts. No one wants to be caught walking in the footsteps of *Westwood*.

And yet that is precisely what happened in *Commonwealth v. Browdie*,[6] in 1995, a case which saw the reappearance of the flaw that prevailed in *Westwood*. *Browdie* involved the tragic death of a child whose death was said to have been the result of child abuse, in part involving a blow to the abdomen resulting in trauma to the liver. The defendant, Browdie, the step-father of the child, was charged with the asphyxiation of the child after extended brutalization.

The trial took place in Allegheny County. Browdie was convicted of murder in the third degree. The scientific evidence that was adduced was of great and serious concern to me for it seemed to verge on being totally speculative.

A hospital pediatrician, Dr. Davis, testified that there was evidence of child abuse. This conclusion was reached from the elevated liver enzymes detected in tests of the child's blood. To support this position a scientific article was introduced concerning a study on the matter.[7]

Apparently the deceased child's elevated liver enzymes could not be correlated with a laceration of the liver, observable by a

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6. 654 A.2d 1159 (Pa. Super. Ct. 1995) (admitting evidence of the correlation between elevated liver enzymes and child abuse), *aff'd*, 671 A.2d 668 (Pa. 1996).

7. Pierre Coant et al., *Markers for Occult Liver Injury in Cases of Physical Abuse in Children*, PEDIATRICS, Feb. 1992, at 274. My thanks to Judge Brosky of the reviewing court for providing me with a copy of this article.

CT scan or through the autopsy. Nevertheless, Dr. Davis was of the opinion that the elevated liver enzyme levels in the deceased child were a result of a bruise, not a laceration, to the child's liver. Even though the reviewing court does not speak to the issue, it is manifest that it had information that a CT scan had not disclosed any laceration of the child's liver. What the autopsy might have revealed is not stated or even suggested.

The question before the appeals court was deceptively simple. Do elevated liver enzyme levels, without the confirmation of a laceration proved by a CT scan, signify that liver injury attributable to child abuse has occurred? The court refers to the article from *Pediatrics* which is said to support Dr. Davis' thesis. That article referred to an evaluation of forty-nine juvenile patients for possible child abuse. Of these, four had elevated liver enzyme levels. Of these, three had confirmation through CT scans of the existence of liver lacerations. The CT scan of the remaining one "did not demonstrate a liver injury."[8] There is nothing, absolutely nothing, in this article to bolster the view that liver injury, not discernible on a CT scan, has occurred where elevated liver enzymes are the only pathogenic finding. Yet Judge Elliott of the Pennsylvania Superior Court found it to be "a logical inference . . . that the fourth child (with the CT scan not disclosing any liver laceration) had the type of liver injury that would not appear on a CT scan, such as a bruise." This inference is stated in spite of the fact that the authors of the referenced article conclude that "liver enzymes provide a means to *screen* for unsuspected liver injury" while "the injury is documented by the abdominal CT scan, which provides medical evidence of abdominal trauma inflicted on the child."[9]

Judge Elliott's view reiterates and acquiesces in that of Dr. Davis, and neither is supported by the referenced article nor by prior scientific articles on the subject.[10] Clearly the most that could be said of the elevated liver enzymes found in the deceased child was that they might have resulted from trauma to the liver. Other causes, including trauma to other internal organs, could not be ruled out as a cause. The most that could be scientifically said on this score was that the elevated liver enzyme levels were a *presumptive*, but inconclusive, sign of liver

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8. Coant et al., *supra* note 7, at 275.
9. *Id.* at 277.
10. Halim Hennes et al., *Elevated Liver Transaminase Levels in Children With Blunt Abdominal Trauma: A Predictor of Liver Injury*, PEDIATRICS, July 1990, at 87; Allan Haftel et al., *Abdominal CT Scanning in Pediatric Blunt Trauma*, 17 ANN. EMERGENCY MED. 684-89 (1988).

injury.

As a presumptive test for liver injury the elevated enzyme levels were no more persuasive of criminality than the diphenylamine reagent test in *Westwood*. The conclusions to be drawn from both are of little assured reliability. And neither reaches the level of proving that there was any wrongdoing necessarily involved. Just as the existence of gunpowder on a suspect's hands does not signify with apodictic certainty that he fired a weapon, so too the fact of elevated liver enzymes does not prove with any sure degree of scientific certainty that the cause was attributable to child abuse.

It is abundantly clear that the *Frye* test of general scientific acceptance was in no way satisfied by Dr. Davis' inconclusive and challengeable musings on the matter. But, withal, the testimony was found to be unobjectionable.

Now the problem with that scenario is complicated by the facts in *Commonwealth v. Pestinikas*.[11] This case arose in Lackawanna County, and it has been in the courts and in the news for years.

It has its start in 1986, when two people, Mr. and Mrs. Pestinikas, were charged with homicide in the death of a ninety-two-year-old man who had been given over to their care, and who died of malnutrition and hypothermia because they didn't care for him, so the prosecution alleged, even though they agreed to do so.

My concern with this prosecution is not with respect to the responsibilities under the common law to aid someone who is in distress, either by contract or otherwise. My concern lies with the evidence that came in on something of a collateral issue. It turned out that somebody suggested that there should be an exhumation of this ninety-two-year-old man for the purposes of determining whether body parts had been switched. In other words, whether the funeral director, who happened also to be the defendant Pestinikas, in conducting the autopsy and preparing the deceased for burial, had in fact taken nice, young, vibrant, and new body parts and put them into the man's body to show that it wasn't really malnutrition from which he died.

So the question was upon exhumation, when we find these packaged body parts, are they the body parts of the ninety-two-year-old victim or are they somebody else's body parts? And how do we determine that? We determine it by DNA, and Dr. Edward Blake was called from California to come to the rescue.[12]

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11. 617 A.2d 1339 (Pa. 1992) (admitting PCR as to embalmed tissues).
12. Jean L. Marx, *DNA Fingerprinting takes the witness stand*, 240 SCIENCE

Dr. Blake reported that he found no evidence, through his DNA testing, that body parts had been switched. When I heard of this outcome I queried Dr. Blake by letter as to what studies had been conducted on the effect of embalming fluid on DNA for the purposes of conducting PCR analysis. His reply did not satisfy me that the forensic significance of the cross-contamination or degradation of embalming fluid on DNA had been sufficiently probed in the scientific literature.

Yet, in spite of the paucity of supporting studies Dr. Blake's conclusion was taken as soundly based. It was, of course, within the discretionary authority of the prosecutor to accept the report of Dr. Blake. However, under *Topa* it certainly would lack scientific credibility in a court of law.

Now, admittedly, I am a *Frye* rule believer.[13] It is my conviction that the courts should not hornswoggle, nor hogtie, scientific evidence but that careful and prudent restraints are necessary. I have seen altogether too many cases of the Presumed Innocent type of foibles in the use of forensic science in the real world of criminal cases for me not to be very skeptical of the admission of scientific evidence without making it tow the scientific mark. What is not scientific to the generality of scientists seasoned in the particular field of scientific endeavor should not be scientific evidence in a court of law.

Frye is not the draconian, nor the austere rule that some commentators and courts have made it out to be. The Pennsylvania courts, in theory wedded to *Frye*, have been quite casual and liberal in applying it. The consequence has been that junk science has found its way into the courts of Pennsylvania. The decision in *Commonwealth v. Graves*[14] is a dispiriting example of the application of *Frye* in name only. I know the *Graves* case well, having written an article in the American Journal of Forensic Medicine and Pathology in criticism of it.[15]

In *Graves* a baby sitter was alleged to have killed two children by manually strangling them while babysitting for them. Part of

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1616 (1988); Debra Cassens Moss, *DNA: The New Fingerprints*, 74 A.B.A.J. 66 (1988); Moody, *DNA Analysis in Forensic Science*, BIOSCIENCE, Jan. 1989, at 31.

13. *See* James E. Starrs, Frye v. United States *Restructured and Revitalized: A Proposal to Amend Federal Evidence Rule 702*, 26 JURIMETRICS J. 249 (1986), *cited in* Daubert v. Merrell Dow Pharmaceuticals, Inc., 113 S. Ct. 2786 (1993); James E. Starrs, *A Still-Life Watercolor*: Frye v. United States, 27 J. FORENSIC SCI. 684 (1982).

14. 456 A.2d 561 (Pa. Super. Ct. 1983) (admitting an odontologist's testimony as a toolmark expert on fingernail markings on human skin).

15. *See* James E. Starrs, *Procedure in Identifying Fingernail Imprint in Human Skin Survives Appellate Review*, 6 AM. J. FORENSIC MED. & PATHOLOGY 171 (1985).

the evidence against Graves was scratch marks on the neck of one of the two deceased children. Scratch marks, not interpretable imprints. Odontologists of note in the American Academy of Forensic Sciences and elsewhere, three of them in fact, were called to testify that the scratch marks were made by the fingernails of the defendant Graves.

The opinions of the experts were alike in one respect. They fudged in stating their conclusions as to whether the marks were made by Graves' fingernails to the exclusion of anyone else. The conclusions were framed in "bob and weave" terms, no one being willing to be definite or emphatically and pellucidly conclusive. It was "highly likely" and "highly probable" and even within "a high degree of certainty" that Graves' fingernails had left the scratch marks. But in the absence of any scientific literature on the subject the experts were playing it close to the vest in stating their conclusions.

No expert was summoned to testify for the defense. The trial court, apparently overwhelmed by the testimony of the prosecution's experts, admitted the experts' evidence. The reviewing court affirmed that decision but not without slyly indicating that it had some reservations on the matter. The prosecution, as the appeals court viewed it, was not trying to associate the scratch marks to Graves. No, indeed, the question was the commonplace one of matching a weapon to a wound. As the court put it, "we have a suspected weapon (here a fingernail) and we wish to know the probability that the suspected weapon inflicted the injury."[16]

This tenuous and unprecedented distinction was most puzzling. What the court was seeking to do was to perform the scientific gymnastic of flipping a dental analysis over into a ballistics determination. And that is precisely the problem here. Odontologists are ever alert to the need to expand their scientific horizons beyond the reach of simple (or not so simple) dental identifications. It is all a question of turf. The professional livelihood of odontologists is highly contingent on expanding their turf to new fields of inquiry. And the *Graves* court let them do that by letting the strictures of *Frye* pass by unregarded.

The fingernail to wound analysis allowed in *Graves* was merely scientific flotsam and jetsam afloat in but one court of law until the coming of *State v. Mark Charles Oppie.*[17] In *Oppie*, Dr. Michael West, a dentist by profession, had reported that the

16. *Graves*, 456 A.2d at 567.
17. No. 90-10,600(3) (Cir. Ct., Jackson Cty., Miss. 1991).

wounds on the defendant Oppie's skin were "indeed and without a doubt" produced by the victim, one Shumock. Fortunately that report played no part in the case and did not enter into the ultimate verdict. But it was made part of a grievance filed against Dr. Michael H. West with the Ethics Committee of the American Academy of Forensic Sciences.[18] And that grievance resulted in Dr. West's having lost his membership in the American Academy of Forensic Sciences.

Frye can just be misapplied as in *Graves* or it can be sidestepped as in *Department of Environmental Resources v. Al Hamilton Contracting Co.*[19] *Frye* will not control where it is inapplicable. Therefore, to avoid the mandate of *Frye*, just find that it is inapposite under the circumstances at hand. That is what happened in *Al Hamilton.*

The issue before the court was the use of a computer to assist in mapping a mine site. The computer had generated contour lines which had then been superimposed on a map of the mine site. The question was whether that use of the computer was within the confines of scientific evidence or novelty as required in order to apply *Frye*.

The court, in the first instance, said that this was a *Frye* issue and that the computer usage did not satisfy the requirements of *Frye*. On rethinking the subject the court reversed itself and said that *Frye* was not implicated. The contour lines developed by the computer constituted only demonstrative evidence like a photograph or a skeleton brought into the courtroom. Being demonstrative, *Frye* is not in question but the results of the computer's creativity were nevertheless excluded since, as a straightforward evidentiary matter, the computer's work product was not sufficiently representative of the actual state of affairs at the mine site. More than merely demonstrating the state of affairs, it actually added its own creative imprint to it. It went from a computer animation to a computer simulation.

Frye can be avoided in other ways as well. Since *Frye* is said to be applicable only to scientific evidence, if the evidence can be described as other than scientific in nature, then *Frye* has no place in the admissibility equation.

Such a distinction with a difference can be made in the case of using the computer to reconstruct crime scenes. Here the essential question is whether the computer only animates for demonstrative purposes the opinion of the expert or whether it goes

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18. *See* Letter from John Holdridge to Douglas M. Lucas, Chairman of the Ethics Committee (Jan. 22, 1992) (on file with author).

19. 1995 WL 536341 (Pa. Commw. Ct. 1995).

beyond that and becomes the underpinning, indeed the entire framework, from which and only through which the expert reaches his opinion.

Take for example the computerized reconstruction which I created of the Menendez brothers killing of their parents in California. There was no way one could tell what the sequence of the shots fired might have been nor from which gun the shots were fired. The two sons entered the room where their parents were watching television and just blazed away with the two guns they had in hand.

Not knowing the factual details which a computerized reconstruction could legitimately demonstrate I put a smoke screen around the happening in the room in which the killings occurred. I portrayed black smoke obscuring the visibility of the event, rather than going on record, speculatively, in portraying the details of the occurrence. However, I did show the execution-style shots from Lyle Menendez when he returned to the room after leaving momentarily to reload his shotgun. Those details were matters not in dispute from the record.

The short of it was that I was demonstrating how the killings were carried out through the usage of demonstrative evidence. That is not, it seems to me, the kind of usage that should be of concern under *Daubert, Frye* or other standard of the admissibility of scientific evidence.

However, when I effected a computer reconstruction of Dr. Frank R. Olson's going to his death out of the thirteenth floor of New York City's Hotel Statler, I created a computer simulation, not an animation. Dr. Olson had been the unwitting victim of an LSD experiment, courtesy of the CIA. The question before me, after exhuming the remains of Dr. Olson from his grave in Frederick, Maryland, was whether Olson had plummeted to his death on his own volition or because he was forced out of the window due to the homicidal conduct of some third person or persons. I called upon the computer wizardry of Engineering Animation, Inc. of Ames, Iowa to assist me in resolving that question.

At bottom I was anxious to see what the computer would tell me had happened after I had incorporated into the computer program various known facts and other facts based on principles of physics. What might have been the horizontal velocity as Olson went out the window? We knew where he had been found on the sidewalk abutting Seventh Avenue in New York City. We knew the dimensions of the window opening and the strength of the glass, if he had gone through it. We also had calculated the vertical distance that he had fallen. Assembling all the known

data and utilizing the principles of motion we derived a computer reconstruction of the occurrence.

But this reconstruction was a simulation, rather than an animation, and therefore was on a different legal footing from the animation I had accomplished, also with Engineering Animation Inc., in the Menendez killings. As a consequence, the admissibility of it before the fact finder would be a most telling concern under any rule for the admissibility of scientific evidence.

Frye, as I have said, has often been seen as too rigorous to be tolerable. In part that viewpoint has turned the switch that started the quest for a new rule, a new rule which we now have in *Daubert*. But is *Daubert* being interpreted with an open and welcoming mind or is it being applied with a squinty-eyed skepticism toward science, be it old or be it new? The recent federal district court opinion in *Williamson v. Reynolds*[20] has given *Daubert* a quizzical twist that Justice Blackmun, its draftsman, may not have anticipated or even desired.

What we have in the *Williamson* case is but one representation of an ongoing assault on forensic science under the supposed urging and imprimatur of the United States Supreme Court in *Daubert*. *Daubert* has clearly made the subject of the admissibility of scientific evidence a tabula rasa. Until the dust settles in the courts we will be quite unsure where *Daubert* will lead (or is it rather regress?).

Williamson involved a murder in Oklahoma and a successful prosecution for murder in the Oklahoma state courts. The first feature of this case worthy of note is that this is a federal habeas corpus petition from a conviction in the state courts. What is the federal constitutional issue, for without one the dispute would not be justiciable in the federal courts?

The constitutional issue revolves around the hair analysis presented by the Oklahoma State Crime Laboratory during Williamson's trial for murder. And, yet, knowing that, we can still properly ask—what's the fuzz? The prosecution's expert had testified that the hair found on the victim was consistent with originating with Williamson. It was not said that the hair came from the defendant to the exclusion of everyone else, for they could not scientifically go that far. Basically, without indulging in the disputatious matter of hair analysis statistics, the expert was only saying that the hair could have come from Williamson. How that created a federal constitutional issue worthy of a fed-

20. 904 F. Supp. 1529 (E.D. Okla. 1995).

eral court's attention defies explanation.

Nevertheless, the habeas corpus petition was granted because the testimony of the state's expert did not comport with *Daubert*. This opinion was indeed a first in many ways. It was the first time that hair analysis had been constitutionalized. It was the first time that a federal court had mandated that a rule exclusively of federal evidence would control in a state court's prosecution. It was the first time that the careful and prudent testimony on the limits of hair analysis by an expert had been found totally wanting in acceptability. Whether the decision portends further inroads under the supposed aegis of *Daubert* remains to be seen. As of now we know that *Williamson* is distinctly a mark of disfavor toward test results which are less than conclusive. Are we now on the verge of extirpating all presumptive tests from the courts under the guise of a *Daubert* rule designed to liberalize the rigidity of *Frye*?

Another presumptive test which has come on hard days in the court is the use of the luminol reagent as a presumptive test for the presence of blood.[21] This catalytic test is very sensitive and can be carried out rapidly and even by persons unschooled in its scientific properties.

When Judge Ito at the murder trial of O.J. Simpson ruled that the results of luminol testing would be inadmissible without proof that further confirmatory tests had been performed he was not breaking new decisional ground. The Arkansas appellate courts had preceded him in this negative judicial attitude to luminol testing results.[22]

What was the cause of this disapproval of luminol testing results, one might rightly ask? The simple explanation is that luminol, being but presumptive of the presence of blood, is not certain enough for judicial tastes. Would this reasoning then make all presumptive testing subject to challenge, where no confirmatory tests had been the sequel? Think of all the on-the-street drug screening tests that are conducted by the police on a day-to-day basis. All of these tests are akin to luminol testing. They are color reactions of a very sensitive nature but they are also all presumptive, giving no assurance that the interpretation of the results is correct.

Presumptive tests may be on the judicial ropes not only because they are too uncertain to be reliable, in the judicial mind,

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21. *See* R.E. GAENSSLEN, SOURCEBOOK IN FORENSIC SEROLOGY, IMMUNOLOGY, AND BIOCHEMISTRY 112-15 (1983).

22. *See* Brenk v. State, 847 S.W.2d 1 (Ark. 1993); *but cf.* United States v. Burks, 36 M.J. 447 (C.M.A. 1993).

that is, but also because they are perceived to have an unacceptable level of subjectivity involved in their interpretation. Subjectivity, the antipode of scientific objectivity, is anathema to the truly scientific way of doing business. On that there is no dispute. But there is subjectivity and there is intolerable subjectivity.

All scientific testing bears the imprint of operator subjectivity, more or less. It is when subjectivity becomes rank speculation that there is just cause for judicial angst. So when a forensic pathologist emotes in a confessional-like way that he has performed thousands of autopsies over the years but he now wonders whether his opinions, based on nothing more than his experience, are worth crediting, the pathologist's troubled ruminations are misplaced.[23] Experience can be the bedrock for a scientific evaluation so long as the experience is not simply that of the blind leading the blind.

This judicial and scientific soul-searching does credit to *Daubert* when it is not carried to paranoid extremes. To see judges and scientists alive to the compelling need for a constant critiquing of scientific evidence can only be salutary and beneficial to the truth in science when and if that critiquing is kept within bounds.

In that regard *Daubert* can be faulted for placing its emphasis exclusively on scientific methodologies, leaving scientific conclusions to fend for themselves without judicial intervention. The limited question which *Daubert* committed to judicial gatekeeping was whether the testing method was in good scientific form—in the abstract rather than as applied. Consequently the fact that a responsible scientific method resulted in an unjustifiable unscientific conclusion is beyond the ken of judicial control, at least through *Daubert*'s reasoning. Such a view is nothing but errant nonsense on high.

However, *Daubert* does give some unbleached hope that the opinion of the expert and not alone the method employed by him will be a relevant matter for judicial scrutiny. *Daubert* does have a "fit" requirement by reason of which the opinion and the method must be compatible with each other. More than that the opinion is not to be judicially recognized if it is not reasonably the product of the method giving rise to it.

The Federal District Court of New Hampshire was eminently correct to disallow the expert testimony of an ophthalmologist

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23. James E. Starrs, *A Time to Reflect*, 19 SCI. SLEUTHING REV. 14 (Summer 1995), *discussing* Gee, *Reaching Conclusions in Forensic Pathology*, 12 MED. SCI. L. 11-16 (1995).

who proposed to testify that the defendant, Hoffmann-LaRoche, Inc., could be held accountable in damages for manufacturing the prescription drug accutane since it had a direct causative influence on the development of the plaintiff's cataracts.[24]

The deficiency in the plaintiff's expert's proposed testimony lay in his not having connected his experimental models to his conclusion. The court was willing to agree that some photosensitive drugs can, if they become photobound to the lens of the eye, produce cataracts. But that was not to say that accutane was proved to have that result, nor in what therapeutic dosage.

The expert's method was not in serious question, except as to how it related to the expert's conclusion which he wished to express in open court. Even though the focus of *Daubert* is on the scientific method in question and its reliability, still the conclusions drawn from it and the opinions based upon it are not irrelevant considerations. The reliability of the method is determined, in the first instance, by whether it supports the opinion which is predicated on it. A method is not considered in the abstract but rather only in relation to the opinion which is said to be derived from it. The theory underlying a method is great coffee-house conversation among scientists, but if it bakes no loaves, if it does not produce verifiable results, then it has no place in a court of law. This is the "fit" requirement of *Daubert*.

And, as Forrest Gump was wont to say, "that's all I have to say about THAT."

Before continuing in a somewhat different vein, I should like to point you to a very excellent book for general reading on the subject of scientific evidence. I refer to Hard Evidence which is authored by a journalist, not a scientist, but, notwithstanding, it is a readable and legitimate recital of a variety of aspects of testing in the forensic sciences, albeit according to the gospel of the FBI.

The focus of any rules of admissibility for scientific evidence is in my view the imperative necessity of keeping the courts from being contaminated and overrun by dinosaurs of the Steven Spielberg order. The unarticulated concern[25] is that the courts will play the willing host to fantasies and fictions that parade as qualified scientific methods. Steven Spielberg could use the process of recombinant DNA for the purpose of reconstituting the long vanished dinosaurs and the public might be taken in by the belief that it is possible for science to do that. But what is

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24. *See* Grimes v. Hoffmann-LaRoche, Inc., 907 F. Supp. 33 (D.N.H. 1995).

25. The Supreme Court in *Daubert* never mentions dinosaurs or for that matter what is its equivalent "junk" science.

good entertainment in a movie theater or on the silver screen is not therefore also legitimate fare for the solemnity of a courtroom. Judges must be ever mindful that the dinosaurs of an imaginative Steven Spielberg do not invade the courthouse.

In Virginia recently, however, exactly the opposite result transpired. The case involved a hunter and in that regard puts one in mind of an earlier incident in Virginia that has certain similarities. It seems that a hunter from down-state Virginia was charged with killing his mother-in-law. He did kill his mother-in-law. Of that there was no doubt but he sought to excuse the killing as entirely accidental. As he told his version of the killing, he was vigorously chasing a racoon around his garage with an axe when he finally cornered it and gave it some twenty or so chops with his axe when, all-of-a-startle, he realized the racoon was in reality his mother-in-law, his 270 pound mother-in-law. One wonders whether there might be a scientific expert lurking out there someplace who might be inveighgled into testifying that there might be a credible psychological behavior pattern which would cause a man with an axe to mistake his mother-in-law for a racoon. Far-fetched, you say. You can think so only because you are not immediately familiar with the recent decision from the Virginia Court of Appeals in *Farley v Commonwealth*.[26]

The facts in this case involved a hunter, not of racoons or mothers-in-law, but of wild turkeys. If the pun is not too tasteless (as most are anyway), Farley, the wild turkey hunter, made a turkey of himself by shooting another hunter instead of a wild turkey. Farley was charged with involuntary manslaughter since his mistake was said to have been exceedingly reckless. On the contrary, Farley said he had little or no choice in the matter since the psychology of hunters and hunting was such that his mind was in a state of "closure" when he shot and killed his fellow hunter. To back up his argument Farley called an experimental psychologist who was accepted in the trial court as an expert on "closure."

The expert was proffered to testify that closure "is the tendency of the brain, when in receipt of ambiguous stimuli, to complete an image for the person based on the ambiguous stimuli even though the image does not actually exist."[27] The short of it was, according to the expert, that closure deprived Farley of the ability to have any conscious actions at the time of the shooting.

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26. 458 S.E.2d 310 (Va. Ct. App. 1995).
27. *Farley*, 458 S.E.2d at 312.

His mind caused him to play the part of an automaton. Certainly, in the expert's view, Farley was not behaving like a reckless human being or even as a responsible hunter, for that matter.

The trial court, applying Virginia's permissively lax standard of admissibility for expert testimony, found the expert's proffered evidence to be relevant and, as such, admissible. As the trial judge pithily put it, the expert "knew what he was talking about."[28] The prosecution did not contest these judicial pronouncements but argued that the jury was perfectly able to decide the issue of recklessness without the aid of the defense psychologist. The trial judge, apparently agreeing with the prosecutor, declared the expert's testimony to be inadmissible as a matter of law.

On appeal to the Virginia Court of Appeals, that decision was reversed and a new trial awarded to Farley. The appeals court viewed the expert's testimony as helpful to the jury and, consequently, no usurpation of the jury's decision-making function. The jury, it was surmised, might not have fully appreciated how Farley might have misidentified the hunter as a turkey and how he might have been convinced that he was shooting at a turkey and nothing but a turkey. It was not only that the hunter's eyes might have played tricks on him but his mind might have had no capacity to control what his eyes saw. It could be this "psychological phenomenon" which was responsible for the hunter's death, not Farley's reckless misjudgment, or so the jury might properly find.

Farley's defense was a novel excuse and the scientific evidence was equally novel. But beyond-the-bleachers excuses for criminal acts are blooming crazily throughout the land. According to lawyer for the high and mighty, Alan Dershowitz, there is an "excuse abuse" afoot in the land. California's Menendez brothers won a retrial for their brutal murders of their parents after they raised the sordid spectacle of their having been the victims of their parents' abuse. In South Carolina, Susan Smith claimed her homicidal action in drowning her two children was programmed by the sexual abuse her father had inflicted on her many years before. That excuse may have influenced the jury in deciding against imposing capital punishment upon her for her murderous behavior.

Farley, in essence, claimed he had made an honest mistake. Honest mistakes do happen. There is no doubt of that. Take the case of the irate apartment dweller in New York City who pro-

28. *Id.* at 313.

tested her neighbors' notifying the police that the odor of a putrefying dead body was wafting from her apartment. Dutifully, the summoned police broke down the door of the offending apartment and found to their olfactorial chagrin that the smell that had been attributed to that of decaying human flesh was but the malodorous aroma of the apartment occupant's cooking her dinner. The consequences of that honest mistake were unfortunate, but forgivable. Farley's mistake was of a different order entirely and the result of it was no laughing matter. Only the authorized testimony of his expert had a jocular quality, making light of the standard of admissibility and poking fun at this dinosaur of scientific evidence.

In *Daubert*, we find that *Frye* is described as an "austere" standard. I take it that austere means strict or rigid. And yet, around the country, we have some courts saying, when asked to accept *Daubert* and reject *Frye*, that *Daubert* is even more austere, even stricter than the *Frye* standard. But there is at least a standard when you apply *Daubert* or *Frye*.

In Virginia, on the other hand, the relevancy rule calls the shots. The relevancy rule means that literally anything goes. If it is of some, even though paltry, significance in assisting the jury, if it has some impact, it is admitted. I suppose, therefore, the Arkansas case was wrongly decided, in Virginia's terms anyway, when it excluded a hydrologist's evidence to the effect that swimming in the treacherous currents of the Arkansas river is risky business. Anyone not totally out of his mind would know that it does not take an expert to tell you that it is dangerous to swim in a fast river like the Arkansas River. You do not need an expert to tell you that, and therefore, he provides no aid to the jury in quoting what everybody already knows. But, under the rudderless relevancy standard, all doors are open and all gates are unlocked.

Some of the federal courts, which had previously distanced themselves from *Frye* and had adopted a much more open-gate policy under a relevancy criterion, have continued their old ways, even in the new and more demanding era of *Daubert*. The Third Circuit has taken such a grudging attitude toward *Daubert* and *United States v. Velasquez*[29] is illustrative.

Velasquez came on the heels of (or was it rather in the wake of) *United States v. Starzecpyzel*[30] from the Federal District Court for the Southern District of New York in 1995. The issue

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29. 64 F.3d 844 (3d Cir. 1995). *See* James E. Starrs, *In the Wake of Harbor Pilots*, 19 SCI. SLEUTHING REV. 1 (1995).

30. 880 F. Supp. 1027 (S.D.N.Y. 1995).

in *Starzecpyzel* was whether handwriting experts are experts within the meaning and language of *Daubert*. The federal court refused to credit handwriting experts with being scientists. They were akin to "harbor pilots," according to the court.

I have not surveyed document examiners who identify handwriting querying them on whether and to what extent they take umbrage with the federal court's characterization of them. One can expect, however, that handwriting analysts will be nonplussed, even outraged by the court's analogizing them to harbor pilots. The harbor pilot analogy apparently stems from the court's view that harbor pilots learn to avoid hazards by first running into them. If they go aground, they know, therefore, that they should not take that course in the future.

Such an approach to learning may be effective and practical but it hardly qualifies as the epitome of the scientific method. It is, on its face, a very empirical method of proceeding but without a more scientifically structured design it suffers the fate of faltering as no more than an epigram. The more one errs, the more one learns not to err.

Velasquez, then, tacked away from *Starzecpyzel* by giving handwriting experts the benefit of the doubt when challenged as engaging in non-scientific pursuits. However the Third Circuit followed the conclusion in *Starzecpyzel* by treating such experts as entitled to a less intense scrutiny under the relevancy standard of admissibility operative in the Third Circuit prior to *Daubert*.

The pertinent issue in *Velasquez* was whether Professor Denbeaux of Seton Hall Law School should have been allowed to testify for the defense in order to throw brickbats at the "field of handwriting analysis." Denbeaux, along with Saks and Risinger, had co-authored an article in the University of Pennsylvania Law Review[31] taking document examination to near fatal task for not being properly scientific.

Professor Denbeaux was asked to testify for the defense that the field of document examination should not be elevated to the status of a science. He was also expected to detail the numerous shortcomings in the field of document examination.

But Denbeaux was a lawyer who was out moonlighting as a document examiner with an honesty chip on his shoulder. His qualifications for his task as an expert were just a shade above that of a well-read person. His major qualification was said to be

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31. D. Michael Risinger et al., *Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lessons of Handwriting Identification "Expertise"*, 137 U. PA. L. REV. 731 (1989).

his eight years of self-study. Of course, his co-authored article also stood him in good stead as an expert.

The Third Circuit stated that under its pre-*Daubert* relevancy standard, it could be responsibly found that Professor Denbeaux would aid the jury in their coming to a sustainable conclusion. The court reversed the failure of the trial court to let him testify and remanded.

This admissibility of the scientific evidence world is a wild but not so wondrous one. Things seem to go bump in the night whether a court follows *Frye* or the federal standard-bearer in *Daubert* or the relevancy standard of the Third Circuit and in Virginia. It is enough to make the inclination to paint crazy-quilt patterns on one's bedroom wall a temptation too overpowering to resist.

Q. Let me ask you with respect to the trial, how does a trial judge avoid the possibility that in denying the defense in a criminal case the opportunity to present bogus scientific evidence the trial judge will chance the real likelihood of reversal on appeal due to the protected right of the accused to present evidence in his behalf?

A. There are two ways to approach a reply to your well-conceived concern. First it must be recollected that the United States Supreme Court has not constitutionalized the matter of expert testimony. Certainly *Daubert* is not founded in any federal constitutional right. Nor has the Supreme Court given any substantial credence to the argument that the right to present testimony in one's own behalf should prohibit the court from excluding defense submissions even where they are total bunkum.[32]

A second way to approach the problem of the dread of appellate review and reversal is to note that the standard of review of a trial judge's decision on the matter of the admissibility of scientific evidence is not to henpeck the trial court with a de novo review. The standard of review in Pennsylvania is clear or manifest abuse of discretion, and, therefore, appellate review in a de novo fashion is passe. Consequently what you do at the trial level, whether it is to admit or to exclude, under the Pennsylvania cases, is most likely to be upheld in the appellate courts. I say most likely because some of the appellate decisions are to the contrary.

Judges are to be reminded, if reminding is at all necessary, that although they do not have plenary and unreviewable power

32. *See* Rock v. Arkansas, 483 U.S. 44 (1987).

they do have sufficient authority over the management of a trial to impose reasonable limits on the admissibility of scientific evidence so long as they are within the spirit of the criteria they are implementing. I am pondering the California experience with its *Kelly-Frye* rule, now known only as the *Kelly* rule, for the admissibility of scientific evidence.

California has given birth to many things, some good and more questionable or bad. One distinctly California rule that sides with the good is the requirement under *Kelly* that both sides be heard through their respective experts on the question of the admissibility of the novel scientific testimony which is before the court. Thus if an expert appears to testify that a new-found electrophoretic technique is worthy of acceptance, both sides must be heard on the issue.

This prerequisite is undoubtedly very hamstringing. What it says, in effect, is that there must be an equilibrium, that for every scientific exhortation of a new technique there must be found some review at odds with it.

So, for example, when *Topa* speaks to the need to produce a scientific article in support of a novel technique, that is only half a loaf in terms of presenting convincing evidence of general scientific acceptance of a novel scientific technique. Even an article concededly in a peer reviewed journal is not thereby blessed with scientific acceptance unless and until the peer review has resulted in a meaningful reevaluation of the premises and conclusions of the article by the relevant scientific community. Publication in a peer reviewed journal is just submitting your work and its product to critiquing by your peers. The article is meaningless as a sign of scientific acquiescence in it until it is tested by its readers.

But suppose the scientific readers who staunchly oppose the position of the peer reviewed article do not have the time or the driving inclination to write and respond to the article. It is always possible that the article is viewed as scientific drivel about which any sensible person, like the reader, would give as little attention as the pedestrian does to the expansion cracks in the sidewalk. As a result the negative side of the article is not exposed to view.

A court has the authority to remedy this deficiency in peer reviewed publications by insisting upon the adversarial approach. In most jurisdictions a trial judge is authorized to appoint an independent expert at county expense to assist the judge in evaluating the novel scientific evidence. That, of course, quite obviously is backstopping the judge at the trial level to show that you did not abuse your discretion and that you went the

full mile for purposes of making a determination of the legitimacy of the evidence that is being admitted.

It is as rare as finding an elephant on the Aran Islands to be witness to a defense attorney who produces an expert in support of his indigent client where the expert's fees are not compensable by the state or locality in which the trial occurs. Most criminal defendants are indigent or at least functionally so and thus most defense attorneys do nothing to find and secure expert testimony for their clients since compensation from the locale is either not forthcoming or so paltry as to be insufficient to employ an expert who can do anything more than put a scarecrow's fear in the prosecution.

Even more unusual is the defense attorney's producing an expert who will testify that a new scientific evidence is acceptable and will result in freeing the accused. One of the main bones of contention on the part of myself and others in the field relates to the impossibility of getting defense attorneys geared up to utilize scientific evidence. If they do, like Barry Scheck and Barry Neufeld, the results render their appearances most ethical and most imperative.

Q. In Pennsylvania, it's my recollection that just about anybody can qualify as an expert, that's a problem because people come in to testify and there are cases where medical expertise is absolutely required because a jury is presumed not to understand those problems. But when it's all finished, if again the jury is charged by the judge that it can disregard all of that because it is the fact-finder and it should make the decision. And the other problem you can have is that you can always get two experts fairly equally qualified on either side to testify exactly to the opposite.

A. Well, that's the hired gun routine, I suppose that's true.

Q. It is true, we see that all the time, but it's a problem when you put this before a jury of lay people.

A. Well, you're asking the elemental question and that is—is a jury competent to make the determination when there are competing claims made from the scientific community? And the answer to that in my view is a resounding no.

I have excogitated on the workings of juries for years. In fact, I was a participant in the Supreme Court of the United States in *McKeiver v. Pennsylvania*,[33] involving the question of the right to a jury trial for juveniles. I was asked by the National Council of Juvenile Court Judges to act as an amicus for them

33. 403 U.S. 528 (1971).

and I did, and I provided an argument for the Supreme Court of the United States against a jury trial. To some the jury, especially in criminal case, is the palladium of liberty. But in *McKeiver* the Supreme Court said that there is no constitutional right which requires that a jury be provided for a juvenile tried as a delinquent in a juvenile court.

No one wishes for the demise of the jury, nor could those wishes come to pass. It is enough to instruct and inform the jury and to give them enough information so they can make that impossible decision which is an intelligent one. Admittedly, I am not so hide-bound and ivy-twined to think that with professorial pedagoguery to lead it that juries can winnow out the truth in the facts presented to them. Jury competence in the presence of scientific evidence is no greater than that of judges and lawyers. It is a will-o'-the-wisp.

Who are qualified to be expert witnesses in matters scientific is another concern that bulks large on the expert witness front. Even before one reaches the issues of the reliability of a scientific method, the qualifications of the expert witness on the subject are immediately confronted. There is nothing in *Daubert* which directly addresses the question of qualifying the expert. Yet it has been a part of the decisional progeny of *Daubert* to envelop every jot and tittle of science in the courtroom under the sweeping umbrella of *Daubert*.

Numerous federal cases subsequent to *Daubert* have looked at the qualifications of experts to testify. The intense scrutiny given to that concern arises from a misplaced understanding of *Daubert*. *Daubert*, in this context, has given rise to a form of scientific expert overkill.

As the argument has it, if the expert must aid the jury by the expert's testimony, then that aid is patently lacking if the expert is not qualified. The aid to the jury rationale for the *Daubert* decision then expands its horizons to include the judicial close monitoring of the qualifications of expert witnesses.

There is a suggestion, only the merest aberrant hint, that Pennsylvania will follow those federal decisions that give *Daubert* free reign on the issue of expert witness qualifications. I refer to *Al Hamilton*, where a dissenting judge propounds the view that *Frye* is dead and *Daubert* controls in Pennsylvania. There is absolutely no justification for hinting, much less saying, that *Frye* is dead, long live *Daubert* in Pennsylvania jurisprudence.

The pervasive influence of *Daubert* is seen in a federal district court opinion from New York involving a motion to change ven-

ue.[34] Such a motion is a most unlikely venue for a *Daubert* application but there it was in all its tenacity. The question was whether the proceedings should be tried in Wisconsin rather than in New York. The argument on behalf of the motion was that New York experts are partisan and biased. They were purported to be guns for hire. But in Wisconsin, on the contrary, where the air is as clear of ethical contaminants as that in nearby Lake Wobegone, the situation would be improved as the experts would be as pure as the air.

The motion was granted. The movant's reasoning prevailed. *Daubert* dictated that the venue be changed. But hold! *Daubert* speaks not one whit to the issue of expert witness bias. Yet *Daubert* is being given the treatment of a smorgasbord. It is being used for every purpose under the sun. Is it that trial judges have taken their newly-authorized powers too unsparingly? *Daubert* has its limits, but the cases do not give any comfort to those who would define its limits.

Another application of *Daubert* which, on reflection, is not entirely surprising extends its reach to the practical application of the method under review for its reliability. It is one thing to say that a methodology must be in good scientific form to be a reliable measuring rod in the legal arena. It is another thing entirely to say that a reliable method can become unreliable if it is not performed according to the rules of Hoyle, or whomsoever names the rules of the game.

Every method may have one or more procedures or protocols for its proper performance. A variance from the chosen protocol indicates that the method has been compromised and its results are not reliable. Nothing is said or intimated in *Daubert* as to whether its strictures apply only to a method in the abstract or a method in the concrete, viz. Whether it was conducted in compliance with the established protocol. That a method is nothing but unreliable if its protocol is not adhered to point by point is indisputable. Yet *Daubert* leaves this obvious fact unarticulated and unrecognized.

For example, in examining the remains said to be those of Jesse James which I had exhumed on July 17, 1995 from Mount Olivet cemetery in Kearney, Missouri we came upon a bone fragment from the area of the left occipital of the skull. Under X-ray the bone fragment displayed a radio-opacity that led me to believe there was a deposit of lead on it. There is an established

34. Max Planck Gesellschaft Zur Foederung Der Wissenschaften E.V. v. General Electric Co., 858 F. Supp. 380 (S.D.N.Y. 1994).

and very specific test for lead which I decided to call upon to resolve the question of whether lead was in fact on the bone.

The test to be used is called the sodium rhodizonate test. It is a two-step procedure according to its standard protocol. After performing the first step and finding the result to be positive, I was encouraged to believe that the trace element on the bone was lead. But without carrying the test through to the second step the positive reading on the first step could mean either that lead was present or that strontium or barium or even antimony was the cause for the color reaction.

One of my fellow laboratory workers, observing the result on the first step, remarked: "Ah, Prof., you know it is lead. Forget it. How many times have we done this test and it always turns out to be lead if the first step says it might be lead." I refused to heed the siren call to deviate from the protocol. The second step soon followed and it also gave the appropriate color reaction indicating that lead and nothing but lead was present on the tested area of the bone fragment.

With that information in hand the issue now became one of interpretation. What did the presence of the lead on the inner surface of this occipital fragment signify? Was the lead that of a bullet that had lodged there after circuiting his skull? Or was this possibly a trace of lead sheared off a bullet as it exited his skull at this location? The interpretation now took precedence but only because the two-step procedure had been followed to the letter.

The point is that the methodology for the proper use of sodium rhodizonate in testing for lead is well recognized and must be adhered to at all costs to give a reliable result. The protocol literally called the shots. And none of the shots would be off the target if the protocol ruled the day in the laboratory in this specific instance. The acceptability of the methodology of sodium rhodizonate testing could mislead one into acquiescing in its results where, in point of fact, the test as conducted involved a short-cut. Short-cutting from two steps to one short circuits the results of the testing in science and should also do so in a court of law.

Adherence to a laboratory protocol can also be bound up with the professionalism of the laboratory and its personnel. Once again take an example from my investigation into the identity of the remains exhumed from the grave in Kearney, Missouri. The overriding question was whether mitochondrial DNA profiling could establish a match between the bones from the grave and the known matrilineal descendants of Jesse James. In the first testing the bones from the gravesite were found to be too de-

graded to enable Dr. Mark Stoneking at Penn State to sequence the DNA. He then went to the teeth seeking a sequencible pattern. Note that the whole blood from the known descendants of Jesse James' sister Susan Lavinia was at all times present in storage in the Penn State laboratory of Dr. Stoneking.

Why did Dr. Stoneking not simply sequence the samples of blood from the known relatives and then seek to match that to the DNA from the teeth? That would seem to be the simpler and less time-consuming way to make a decision on the identity of the remains from the grave.

That was not done because we did not want to implant in the mind of the laboratory operative the knowledge of what Jesse James' true mitochondrial DNA looked like. To do so would have injected a highly subjective element into the testing, giving good cause to be skeptical of the results.

Of course it could be argued that adherence to the laboratory protocol is just fodder for cross-examination on the weight to be attributed to the results. Suffice it to say in answer to this suggestion that when a deviation from the protocol renders the results useless for scientific purposes, then they should have no value in law either. Certainly it would grant an arrogant power to the jury to allow it to choose to give weight to an opinion drawn from fatally flawed scientific testing. And yet in the federal circuit courts there is a clear division of authority at present on whether *Daubert*, when applied to DNA profiling, should or should not require that the protocol for the testing have been followed slavishly in order for the method itself to be deemed to be reliable.[35] The *Daubert* guidelines give no guidance on this question, except to say that the guidelines are not exclusive of other judicially-imposed guidelines.

Q. Why would there be a dispute between the federal circuits dealing with what sounds to me to be a common-sense understanding that the protocol is important?

A. Just as we have a question of interpretation in the case of the bone fragment from Jesse James, so the federal courts have been ceded considerable authority by *Daubert* to interpret it on a day-to-day, methodology-by-methodology manner.

In addition one must recall that the time consumed at the trial level in reviewing the adequacy of the laboratory testing will necessarily involve more than a few ticks of the courtroom clock. The expenditure of inordinate time on the question could

35. *See* United States v. Chischilly, 30 F.3d 1144 (9th Cir. 1994) (holding that performance according to the protocol only goes to the weight of the evidence not its admissibility). *Contra* United States v. Martinez, 3 F.3d 1191 (8th Cir. 1993).

well move one court to a restrictive interpretation of *Daubert*. In addition, whereas one decision on the merits of a methodology will give a degree of precedential permanence to the matter in subsequent litigation, a decision in one case that a laboratory held fast to its protocol is of no value in deciding whether to probe the matter in a different case at a future time. Courts can take judicial notice that DNA has reached a level of assured respectability in the scientific community and that will end the matter in future litigation. But there can be no judicial notice that a laboratory's protocol will or will not be given full blown and conscientious attention on any occasion.

Q. Are the courts so scientifically literate as to be adequate gatekeepers?

A. The question of greatest significance, at once troubling and formidable, in the application of any rule of admissibility of scientific evidence caparisoned as scientific is whether judges, be they appellate or trial judges, are equal to the task of keeping a sextant's measure of the distance between science which is good and that which is no more than hocus-pocus. The decisions that I have witnessed from the courts at every level are not just cause to be sanguine on this matter of judicial competency in the face of novel scientific evidence come knocking at the courthouse door.

One of the most ubiquitous and perplexing conundrums in all of forensic science concerns time dating. Pathologists are constantly hectored for a statement of their opinion on the time of death of the deceased. Fingerprint examiners and police evidence technicians are forever giving their opinion on the freshness of latent prints.[36] Document examiners and chemists now enter the lists with their insupportable efforts to time date the writing on documents through various methods of accelerated aging.[37]

All of the major areas in the no man's land of forensic science concern time dating. How long has blood been on an object? How long does it take blood to dry? Lizzie Borden's trial for the murder of her father and step-mother hinged on matters as esoteric and controversial as these. Time dating has not escaped the attention of the United States Supreme Court. In 1974 then-Justice Rehnquist wrote an opinion indicating that the police had stopped a car and had discovered a homicide victim's, one

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36. *See, e.g.*, Hale v. State, 1995 Ala. Crim. App. LEXIS 226 (Ala. Crim. App. 1995); State v. Cline, 909 P.2d 1171 (Mont. 1996).

37. *See* Charles Midkiff & James E. Starrs, *Ink Dating—In the Footsteps of Cold Fusion?*, 18 SCI. SLEUTHING REV. 1 (1994).

Lanzi's, dead body. According to Justice Rehnquist, the police found a second gun, "also recently fired," a short distance from Lanzi's remains.

Recognizing that there is nothing in firearms analysis or in chemical testing that will enable scientists to say whether a gun was recently fired, I decided to probe the background of the case in an effort to determine the basis for the "recently fired" comment of Justice Rehnquist.

A gun can be found smoking or it can be warm to the touch. These are non-scientific means of determining that it was recently fired. But, other than such non-scientific circumstantial evidence one should not hurry to science for a quick fix on a better means to assess the recency of a gun's firing. Of course it was always possible, although exceedingly unlikely considering the non-scientific source of the comment, that Justice Rehnquist was on to something that scientists themselves have been unable to unpuzzle.

Sensing that the Supreme Court had merely reported on a scientific breakthrough that I had somehow missed in the literature, I decided to probe the background of the investigation, trial and conviction of the defendant in this prosecution in the state courts of Massachusetts. In the opinion of the Massachusetts Supreme Judicial Tribunal it was said that a Harrington & Richardson handgun was found in or about the place where the victim's body had been located. It was also said that the gun had been buried at that site.

The plot thickened since it was now seen that the gun in question was not only recently fired but it was buried and in rusty condition when it was recovered back in 1974. It seemed quite implausible that the gun could have been determined to be recently fired when it was found buried and rusted, causing the weapon to be fouled by burial artifacts.

My skepticism of Justice Rehnquist's statement having been quickened, I probed more deeply into the record at the trial in Massachusetts. I located the recorded testimony of William Cummings, the firearms expert who testified for the state at the murder trial. Cummings said nothing on the matter of the time dating of the firing of the buried weapon nor could he. He had received the Harrington & Richardson revolver, so he testified, in "a very dirty and rusty condition." That condition would have prevented any testing of the weapon for the time when it was last fired, even if such testing had any recognized scientific stature.

Having found nary a word in support of Justice Rehnquist's "recently fired" statement in his opinion for the United States

Supreme Court in *Donnelly v. DeChristoforo*[38] I decided to throw caution to the winds and to beard the lion, so to speak, by writing to Justice Rehnquist for the wherewithal of his "recently fired" comment. My letter was sent on September 2, 1983. In due course (on September 20, 1983) I received a reply from Justice Rehnquist. In it he apologized for a memory lapse on his part of the underpinning for the remark by him in question. Since so many years had passed since his decision in *Donnelly* he indicated that he was "sorry to say that I simply have no independent recollection of the basis for the statement in the opinion to which you refer."

I toyed with the idea, but only for a moment, of riposting to the Justice that, in the absence of his "independent recollection," I would be willing and ready to hear his "dependent recollection." Needless to say I did not reply in any way, shape or form, prudence having gotten the better of me. However, I was sorely pressed to fire off a riposte that resipiscence is a virtue even in judges.

But if the Justice, now Chief Justice, was wrong in his statement that the gun was found to be "recently fired," how is it that the appellate court decisions are replete with references to firearms experts having testified that a gun was determined to have been "recently fired?" Surely it is not Justice Rehnquist who was in error, but yours truly in stating that a gun cannot scientifically be said to have been "recently fired."

Au contraire! Just as there is a plethora of legal legerdemain, so too there is an equivalent in obfuscatory scientific mumbo-jumbo. In science as in law words can have a meaning all their own, which meaning will not at all necessarily correspond to the meaning the common, but educated, person would ascribe to that word. "Recently fired" is a telling and head-scratching example.

When an expert expostulates that a gun was "recently fired," the expert is referring to the gun's last thorough cleaning. "Recently fired" can be translated as follows: The gun in question has been "recently fired" since it was fired since its last thorough cleaning. Now that statement is not only patently obscure, it is painfully misleading.

Take for example a gun that was provably cleaned in all respects one year ago. Assume that there is no evidence of any other or further cleaning of the weapon from that date to the present. If a person has been shot by that gun but we know only

38. 416 U.S. 637 (1974).

that the shooting occurred some time within the last year, even possibly one day following the gun's thorough cleaning a year ago, then it is permissible, in firearms' experts lore, to say that the gun was recently fired. Poppycock! Arrant nonsense! Deceptive balderdash! Verbal scamming! And whatever other pejorative comes to mind.

If the United States Supreme Court, being the Homer of the judiciary, can nod through error, can the state courts be expected to perform more acceptably when confronted by the miasma of scientific evidence?

State v. Aubert[39] is a particularly distressing case from the Supreme Court of New Hampshire. It is an accepted canard among the populace, and among some scientists as well (but not many), that righthanders will fire a gun with their right hand and left handers will shoot with their left hand. The dominant hand is the preferred shooting hand and shooting does not occur ipsi-laterally. Such is the common refrain upon which the defense theory in *Aubert* was founded.

Under the facts presented in *Aubert* we learn that a wife went to a party which her husband, to her knowledge, was attending. While at the party and in the presence of a number of persons the wife put a gun to the husband's head and pulled the trigger. But for some fortunate but inexplicable reason the bullet, having penetrated the husband's skull, did not kill him. He survived to be a witness at his wife's prosecution for assault with intent to kill.

At the wife's trial the focus of attention was predominantly on her intention at the time the gun went off. Did she intend to kill or was her intent less minatory? Was she just partying around in a risible but dangerously scary way?

The defense called an expert, a firearms expert, who proposed to testify that the wife, being right handed, and having held the gun in her left hand when it discharged, could not and did not intend to kill at that time. The trial court rightly viewed this supposedly expert testimony as just so much scientific hogwash. It was deemed to be both beyond the competence of the firearms expert to speak to that question and beyond the competence of his profession to emote on the subject, there being no scientific foundation for such an opinion. The short of it at the trial was that scientific fol-de-rol was unacceptable no matter how gussied-up.

A conviction having been returned, the wife appealed to the

39. 421 A.2d 124 (N.H. 1980).

New Hampshire Supreme Court which reversed the conviction. Evidence had been tendered that the shooting was accidental, said the court apparently referring to the firearms expert, consequently the trial court was in error in failing to instruct the jury that it was entitled to find that the shooting had not been intentional.

Here was a trial court judge who was right on the money, scientifically speaking, but the reviewing court erred grievously in giving credence to the bunkum of the firearms expert. In disgust and dismay with this reviewing court's opinion, I pen this clerihew:

The New Hampshire high court
found firearms not its forte.
So to a weapons expert it turned
Who, for better or worse,
It should have spurned.

As the saying among ballpark-goers has it, you cannot know your players without a scorecard. Similarly you cannot know your scientific experts without understanding the rudiments of their specialty. One of the fundamentals of any professional discipline is the definition of its scope and purposes as well as by the training in the subject undertaken by its practitioners. We know, for example, that a graphologist is not a document examiner because we realize that, by definition, a graphologist determines the personality of the writer of a document but a document examiner eschews that topic as he or she would the plague.

Yet, the Ninth Circuit, the same circuit out of which *Daubert* erupted, in a 1972 opinion[40] refused to express an opinion on a matter it deemed to be within the purview of graphology since it could "profess no expertise at graphology."[41] Not only was the court lacking in knowledge of the tenets of graphology, it was also seemingly unaware that Webster's and any other commonly encountered dictionary defines "graphology" as related to detecting personality traits from handwriting. The question before the court was entirely divorced from the issue of the personality of the maker of the medical record in question. The issue was one of an interpretation of the handwriting on the document as displaying a "50" or a "150." The task of piecing out that puzzle

40. *See* United States v. Kelly, 469 F.2d 1310 (9th Cir. 1972).
41. *Kelly*, 469 F.2d at 1312.

was appropriately that of a document examiner and inappropriate for a graphologist.

What happened in *Kelly* was bad but what happened in *Hooten v. State*[42] was ten tons worse. *Hooten* saw the transmogrification of a housewife into a polished document examiner, all courtesy of judicial bootstrapping.

Marie B. Hill, the expert in controversy, was a housewife, a high school graduate and a correspondence course graduate of the grapho-analysis school in Chicago. Following her matriculation from her Chicago-based course, Mrs. Hill went on to appear, so she testified in *Hooten*, in hundreds of trials in Mississippi as an expert in document examination. Even though her credentials were sorely limited and then only to graphology, still she managed to inveigle her way into testifying in numerous trials as a document examiner, among persons who are to a person repulsed by any affiliation their discipline is purported to have to graphologists.

In the proffer of her testimony for the defense at the murder trial of *Hooten*, Ms. Hill expressed herself as unfamiliar with the standard texts in the field of document examination. She did not know the leading names in the document examination field and she seemed to preen herself in her refusal to be acquainted with her chosen field and its leading lights. The trial judge, hearing all of this high-handed nincompoopery, refused to allow the proffered testimony to be presented to the jury.

On appeal of the conviction to the Mississippi Supreme Court the conviction for murder was reversed solely because the trial court had disallowed Ms. Hill's testimony. Her practical experience and her frequent court appearances, it was said, had clearly qualified her to testify as an expert in this case. The case was remanded for a new trial.

The Mississippi high court, like the New Hampshire high court and the Ninth Circuit and numbingly numberless trial courts throughout the country have, in Rumpole's felicitous phrasing, made a pig's breakfast of it in their interpretation and understanding of forensic science. 'Nuff said on the subject, although the tale of woe could go on tiresomely.

What is the cause of this thusness?

Rarely does anyone delve into the raison d'etre for a special rule governing the admissibility of scientific evidence. What is it that lies at the heart of the concern, for concern it most certainly must be, that any special rule simply reflects that the courts feel

42. 492 So. 2d 948 (Miss. 1986).

toward scientific evidence? Are scientists less worthy of belief than non-scientists? Or is it the methods of scientists that pique a court's conservatism?

Daubert is sated with word after word on the subject of the scientist's method. *Commonwealth v. Avellar*,[43] decided in Massachusetts in the same year as *Daubert*, goes so far as to say that Massachusetts' reliance on the *Frye* rule was moved by the need to keep a weather eye out for "scientific testing methods" rather than, more generally, for scientific evidence. Since *Avellar* did not involve the results of scientific tests *Frye* was deemed inapplicable. Consequently an emergency room physician was allowed to testify to his opinion that the defendant-father's reactions to the death of his infant child were not typical of a truly grieving parent's reactions.

Is the judicial reaction to scientific evidence on a par with the now disavowed past attitude of the courts to the claimed victims of sexual offenses? If you will recall, the word of a rape victim that she had been raped was, in the old days, never enough to warrant a conviction of the pinpointed rapist. Corroboration was the name of the judicial game in which the rape victim had become embroiled. The reason for the corroboration requirement and the reason for its ultimate demise in rape cases was the distrust of the word of the victim herself. Is there a similar attitude that prevails with respect to scientific evidence? Must scientists be corroborated, say by general acceptance of the relevant scientific community in a *Frye* jurisdiction or by reliability guideposts as in *Daubert*, so as to be certain that they tow the mark of integrity, honesty and all those other good things that non-scientists are touted inferentially to have by their say so alone?

I hesitate to voice the subject in this post-O.J. world, but are the courts fearful that fabrication, fraud and lying lie in wait whenever a scientist appears in court? Is there a perceived anomic lawlessness in science that has gulled the courts into an anti-admissibility reaction? Is that why we have a special rule for scientific evidence? Horrors to Betsy, I hope not. Has it really come to pass that not only are judges and lawyers out of touch with science but they are also steeped in suspicion of it? Is such an attitude prevalent? Does it explain the explosion downward of interest in science in grade schools today? Has Armageddon come again, this time for science and its products?

It may be that there are frissons of fear for the unknown in

43. 622 N.E.2d 625 (Mass. 1993).

science which are conceived also to be unknowable by those awash in the justice system. Over the years in testifying as an expert witness and in coaching others in the how-to-do-its of testifying as an expert I have been tempted to field an experiment which I instinctively feel needs no such experimental support. I believe I could walk away unscathed and unchallenged if I were to say that the scientific instrumentation supporting my opinion on whatever subject is up for judicial grabs was predicated on my use of the infrared luminometer interfaced with a frangible collimator operated in the pulsed mode. I know that that reminds one of the testimony of the FBI expert in that Hollywood classic of courtroom comedy My Cousin Vinnie.

Just as the FBI man in the movie was too far out in left field to catch anything but grief, so my instrumentation is equally unavailable for constructive use and is, in addition, intrinsically self-contradictory. Take, for a moment, the frangible collimator which if it were to exist would be a contradiction in terms. If there were a frangible collimator, then there could also be a square circle. To be frangible it is breaking the item under analysis into smaller components. To be a collimator it is collecting and aggregating small pieces into a unit. You cannot have it both ways. Either it is a square or it is a circle. Either it is frangible or it is a collimator. Never the twain shall meet, as the saying goes.

Another reason, less often articulated, for the judicial lids that have been placed on scientific jars is that the presentation of scientific testimony takes a hellacious amount of courtroom time. I call this the "logjam syndrome." It is rampant in hearings on motions in limine on the admissibility of scientific testimony, most particularly in California.

It may be that the courts have construed the need to get on with it, in terms of the trial of cases in the courts. To that end the rules are being cemented to keep a handle on the amount of juror time which will be devoted to science in the courtroom. Let the judge hear the arguments of counsel and their witnesses in the spare environment of a pre-trial admissibility hearing but save the jurors and the court's time from being consumed and overrun by the miasma of scientific testimony at the trial when the meat and potatoes are on the adjudicatory plate.

While on the subject of syndromes, there is another one at large in this admissibility endeavor which I choose to term the "mystique syndrome." It could also be called the "don't-let-the-jury-be-taken-in syndrome" but that is an appellation that is so pellucidly clear that it would put a halt to the felt need for any further discussion of it. It is this fear that juries will be over-

awed by the phantasmagora of science that seems to underlie *Topa*. It also seems to be the loggerhead in *Commonwealth v. Nazarovitch*[44] which admitted evidence of electrophoresis. In other places this syndrome is called the problem of the mystic infallibility that is accorded to the scientific enterprise. If nothing else, the verdict in the trial of O.J. Simpson knocked that generality into a cocked hat.

For judges, especially at the trial level, the issue, in my view, should be directed to the "whyness" factor rather than to the criterion of admissibility. Why is there a need for a standard of admissibility in this particular case? If a fracture match of glass from a car in an automobile crash can be made in the courtroom in the sight and sound of the jury should not the concern for the jury's being hoodwinked be lessened? If so, should not the standard of admissibility be less rigid? The question of why should always be a necessary prerequisite to the assignment of a criterion of admissibility. Finding the why then becomes the overriding and the sometimes quite thorny issue.

Finally, I should like to comment on another matter concerning the choices that we make. In science we look not only at a hypothesis but at the null hypothesis as well. In brief, all sides should be considered. The fingerprint examiner who looks only for Dalton details which enable him or her to certify that there are sufficient points of similarity to say there is an identification to a particular person is not only short of the scientific mark but is also doing a disservice to the scientific inquiry he or she is performing. It is not only similarities that are under scrutiny but dissimilarities as well. The possibility that there may be an exclusion of an individual should be given equal scientific attention to that given to whether there is an inclusion of an individual. After all, fair is fair, which is to say that equal treatment is a measure of the law in proper balance just as it is of science in equipoise.

As a result of these ruminations it seems to me that too little attention is being given to the "flip side" of the admissibility coin. If scientists are being weighed in the balance, are we forgetting about the fact that non-scientists are coming more and more to fill the gap left by junk scientists with their own lay persons' form of junk science? The police officer who testifies to the speed of the car without the scientific credentials to do so and without buttressing by hard factual details from the scene is indulging just as much in a foray into the junkery of science as

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44. 436 A.2d 170 (Pa. 1981).

true hooded and gowned scientists might. Say a police officer identifies a controlled substance as marijuana because he or she knows from experience, always long and always intense, that when persons pass a cigarette butt from person to person to be inhaled they are engaging in a communal marijuana smoking event. Are we not concerned about the acceptance of this ribaldly ludicrous testimony as well as that of scientists?

I am not proposing that the scientist should have a standard of admissibility as lax as that of the police officer. I am simply pointing to the fact that maybe non-scientists who give expert testimony should also bear the burden of measuring up to a certain standard of reliability. Opinion testimony is opinion testimony where spoken from the mouths of lay persons or scientists. Quite possibly the coming of the *Daubert* era, or is it a millennium, will percolate over to root out fakery among other supposed experts as well as scientists. I await the advent of such an even-handed day. For now, however, I say with Forrest Gump—"that's all I have to say about THAT."

APPENDIX: *FRYE* IN THE PENNSYLVANIA DECISIONS

1) Department of Environmental Resources v. Al Hamilton Contracting Company, 1995 WL 536341 (Pa. Commw. Ct. 1995).

2) Commonwealth v. Browdie, 654 A.2d 1159 (Pa. Super. Ct. 1995), *aff'd*, 671 A.2d 668 (Pa. 1996).

3) Commonwealth v. Francis, 648 A.2d 49 (Pa. Super. Ct. 1994).

4) Commonwealth v. Crews, 640 A.2d 395 (Pa. 1994).

5) Commonwealth v. Khamphouseane, 642 A.2d 490 (Pa. Super. Ct.), *allocatur denied*, 649 A.2d 668 (Pa. 1994).

6) Commonwealth v. Moore, 635 A.2d 625 (Pa. Super. Ct. 1993), *allocatur denied*, 656 A.2d 118 (Pa. 1995).

7) Commonwealth v. Zook, 615 A.2d 1 (Pa. 1992), *cert. denied*, 113 S. Ct. 1420 (1993).

8) Commonwealth v. Rodgers, 605 A.2d 1228 (Pa. Super. Ct.), *allocatur denied*, 615 A.2d 1311 (Pa. 1992).

9) Commonwealth v. Dunkle, 602 A.2d 830 (Pa. 1992).

10) Commonwealth v. Apollo, 603 A.2d 1023 (Pa. Super. Ct.), *allocatur denied*, 613 A.2d 556 (Pa. 1992) .

11) Commonwealth v. McCauley, 588 A.2d 941 (Pa. Super. Ct. 1991), *allocatur denied*, 604 A.2d 248 (Pa. 1992).

12) Commonwealth v. Garcia, 588 A.2d 951 (Pa. Super. Ct. 1991), *allocatur denied*, 604 A.2d 248 (Pa. 1992).

13) Commonwealth v. Reed, 583 A.2d 459 (Pa. Super. Ct. 1990), *allocatur denied*, 598 A.2d 282 (Pa. 1991).

14) Commonwealth v. Smith, 567 A.2d 1080 (Pa. Super. Ct. 1989), *allocatur denied*, 592 A.2d 44 (Pa. 1990).

15) Commonwealth v. Middleton, 550 A.2d 561 (Pa. Super. Ct. 1988).

16) Commonwealth v. Miller, 532 A.2d 1186 (Pa. Super. Ct. 1987).

17) Commonwealth v. Mehmeti, 500 A.2d 832 (Pa. Super. Ct. 1985).

18) Commonwealth v. Graves, 456 A.2d 561 (Pa. Super. Ct. 1983).

19) Commonwealth v. McCabe, 449 A.2d 670 (Pa. Super. Ct. 1982).

20) Commonwealth v. Nazarovitch, 436 A.2d 170 (Pa. 1981).

21) Commonwealth v. Topa, 369 A.2d 1277 (Pa. 1977).

22) Commonwealth *ex rel.* Riccio v. Dilworth, 115 A.2d 865 (Pa. Super. Ct. 1955).