FIREARM AND TOOLMARK IDENTIFICATION - MEETING THE DAUBERT CHALLENGE

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ABSTRACT

This article was written to enhance the awareness of firearms/toolmark examiners to the standards of admissibility of firearms/toolmark evidence and the potential challenges they may face in court today.[2]

It is the authors' intention to present a strong argument for the proposition that the identification of striated toolmarks in the firearms/toolmark field is a science and, as such, fulfills all criteria for admissibility of scientific evidence set by federal statutes, case law, and the laws of those states which explicitly or implicitly follow Daubert.

INTRODUCTION

The utilization of the scientific method in the field of striated toolmark identification is not predicated upon an examiner having a science degree. Federal Rule of Evidence 702, which now controls expert witness testimony in all federal courts does not make education any more or less important than knowledge, skill, experience, or training. We feel, however, as a general rule that examiners should possess a baccalaureate degree in physical, natural, or forensic science, industrial technology or related fields of study.

In this article we will present Rule 702 codified alternatives ("technical or other specialized knowledge") to scientific knowledge required of an expert and demonstrate why, although firearm and toolmark examiners may still qualify under these non-scientific categories, their testimony may either be limited by a judge, or the weight of it may be diminished. They may also be subjected to more rigorous scrutiny if they fail to present an adequate description of objective comparison standards.

This article should provide some guidelines for answers to questions which challenge the principles of firearms/toolmark identification whether by means of separate Frye/Daubert type evidentiary hearings or by voir dire of an expert in court.

We are confident that if examiners become knowledgeable about and conversant with the scientific method, apply objective criteria, and are prepared to discuss the four Daubert criteria for admissibility of scientific evidence as specifically applicable to firearms/toolmark identification, their expert testimony will be easier to understand and will be met with far less challenge or opposition.

FRYE v. DAUBERT: HISTORICAL PERSPECTIVE AND THE CURRENT STATE OF THE LAW

For many years, the courts have struggled with the concept of reliability of evidence, particularly if such evidence was seen to originate from a "new science." Expert witnesses have historically been afforded an aura of infallibility, with the result that their testimony has carried a lot of weight. Thus, jurisprudence has for some time been concerned with the reliability of yet untried and unproven scientific principles making their way into courtrooms.

In 1923, a standard of admissibility of scientific expert testimony was set by the District of Columbia Court of Appeals in the case of Frye v. U. S.(1). For some 70 years, this standard was

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followed by all U. S. Courts and practically all of the individual states. Scientific testimony was allowed if it **"gained general acceptance in the particular field in which it belongs."** At least, the court reasoned, such proffered scientific testimony would have to be tried and proven by the very scientists who practiced in a particular field.

In 1975, the U.S. Congress passed the Federal Rules of Evidence(2) which control admissibility of expert witness testimony in federal courts. Although they never mentioned "general acceptance" criteria, the Frye standard was so firmly established in American jurisprudence that it took precedence over the rules.

Since 1923, many states "improved" upon the Frye standard either by specific case law or by statute. Some applied the "general acceptance" test to the fundamental scientific principles employed. Some added the acceptance requirement to examination techniques used in testing these principles, and some went as far as requiring that on any given day the technique's specific application by a scientist in the laboratory be generally accepted in a particular field.

Needless to say, it was quite a restrictive standard, particularly for any new scientific proposition which, although scientifically valid, could not be introduced in court until it gained general acceptance within the relevant scientific community.

In 1993, the U.S. Supreme Court changed the Frye standard applied for seventy years in federal courts by deciding Daubert v. Merrell Dow Pharmaceuticals(3). In Daubert the court dismissed the "general acceptability" standard and established that the **Federal Rules of Evidence** control the issue of admissibility of expert testimony, particularly Rule 702 which specifically addresses the issue of when an expert can testify, what body of knowledge is a proper subject of such testimony, and what are to be the qualifications of an expert. Furthermore, pursuant to Rules 401 and 104, such testimony must be relevant and its admissibility decided by a trial judge. In effect, Daubert set the trial level judges as "gatekeepers" of expert evidence. To aid the judges in that "gatekeeping" role, the Daubert court set four criteria (not all inclusive) by which scientific testimony must be evaluated before it can be admitted.

These four criteria are:

1. Testability of Scientific Principle
2. Known or Potential Error Rate
3. Peer Review and Publication
4. General Acceptance in a Particular Scientific Community

These are discussed in detail in subsequent sections of this article.

Justice Blackmun, who delivered the opinion of the Daubert Court, used different phrases to describe each of the four tests to be applied to "scientific knowledge" before scientific expert testimony can be admitted. These four phrases are: 1) "A key question to be answered" was used to describe **testability**; 2) "... the court ordinarily should consider" referred to determination of known or potential **error rate**; 3) "Another pertinent consideration" was chosen to discuss **peer review**; and 4) "Widespread acceptance can be an important factor" is how Justice Blackmun viewed **general acceptance** in the scientific community factor. Throughout this paper we used the word "requirement" to describe each of these four factors because we feel that, however framed or worded, any proffered scientific evidence will be **required** to meet them to be admitted in federal court. This is a yardstick by which most trial judges will measure such evidence simply because it is what makes scientific expert testimony reliable.

As a matter of fact, the Court said (on page 481): "In short, the **requirement** that an expert's testimony pertain to "**scientific knowledge**" establishes a standard of evidentiary reliability" (underlining and bold face added by authors for emphasis).

In summary, Daubert stands for the proposition that, in federal courts, all expert testimony is controlled by the Federal Rules of Evidence, and that scientific expert testimony is further subjected to the specific four criteria listed above.

Two important points must be recognized. First, the Frye "general acceptance" standard found its place post Daubert, although in somewhat diluted form as only one of the four criteria. Second,
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nowhere in the Daubert court's lengthy opinion is there any guidance as to what weight is to be attached to any of these four criteria. Presumably, they are all equal.

Although Daubert is the controlling case in the federal justice system, many state legislatures had enacted their evidence statutes patterned directly after the Federal Rules of Evidence, thus some confusion ensued. Consequently, to clarify matters, some state courts found it necessary to either explicitly or implicitly accept or reject Daubert in their jurisdictions. Those who rejected Daubert adopted the Frye test in one form or another. Bohan and Heels(4) have summarized the acceptance standards in each of the 50 states. It must be remembered, however, that laws change. It is, therefore, a good idea to inquire about the admissibility standards in a particular state prior to rendering expert witness testimony there.

FEDERAL RULES GOVERNING EXPERT WITNESS TESTIMONY

In federal jurisprudence the admissibility of evidence is governed by the Federal Rules of Evidence. Rule 104 provides that the preliminary questions concerning the qualification of a person to be a witness and the admissibility of evidence is in the province of the court.

Rule 401 defines "relevant evidence," and Rule 402 provides that all relevant evidence is admissible (with some exceptions not specifically referred to in the body of this rule). Rule 403 excludes relevant evidence if its probative value is substantially outweighed by the danger of unfair prejudice, confusion, or if it is misleading to the jury, or by consideration of undue delay, waste of time, or cumulative effect. Bear in mind that all evidence is prejudicial since it tends to support one side or the other. It is only if the proffered evidence is unfairly prejudicial as weighed against its probative value that the court will not allow its introduction.

The most important rule governing expert witness testimony is Rule 702:

> Federal Rules of Evidence Rule 702: Testimony by Experts. If scientific, technical or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise. (Underlining added by authors for emphasis.)

The Daubert case decision made Rule 702 the key to admissibility of expert witness testimony. Rule 702 provides guidance for us in three ways. **First,** it defines the situation when an expert can provide testimony. If scientific, technical or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, an expert can be allowed to provide testimony. Presumably, if expert testimony can not provide such assistance, it will not be allowed. **Second**, the knowledge of an expert must fall within one of three categories: scientific, technical, or other specialized knowledge. Presumably, all knowledge can be placed in one of those three groups. **Third**, the qualifications of an expert must be determined by knowledge, skill, experience, training, or education. No specific weight is attached to any one of these qualifications and not all of them must be possessed by an expert at any one time. Thus, the lack of a college degree is not fatal to qualification of an expert in the firearms/toolmark field, particularly if no specific college course curriculum exists in this area. However, there is very little doubt that college education in a closely related field is helpful and certainly should be encouraged. Nevertheless, quality in-service training (especially that which has been clearly documented), other relevant formal courses of training, participation in and successful completion of proficiency tests, coupled with experience, appear to sufficiently meet the qualifications requirement of Rule 702.

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Please remember that scientific evidence meeting all Rule 702 requirements is still subject to the Daubert analysis (four criteria).

CAN THE FORENSIC IDENTIFICATION SCIENCES MEET THE DAUBERT CHALLENGE

Saks(5) has described in detail what he feels we must do to meet the Daubert challenge. He says that our ability to make unique identifications of individual objects (gun barrels, other tools, etc.) depends on the validity of a series of premises (deductive reasoning). We will list his three premises and then discuss why we feel they are valid for toolmark identification.

Premise No. 1. **That many kinds of physical entities exist in unique, one-of-a-kind form.**
Through our knowledge of the effect of manufacturing processes on class and subclass characteristics, we are able to determine whether or not individual (unique, one-of-a-kind) features are present on tool working surfaces.

Premise No. 2. **That they leave correspondingly unique traces of themselves.**
By determining that unique working surfaces of tools leave reproducible toolmarks, we determine that objects leave unique traces of themselves. "Trace," in this context, is synonymous with toolmark.

Premise No. 3. **That the techniques of observation, measurement, and inference employed by forensic identification science are adequate to link these traces (toolmarks) back to the one and only object that produced them.**

This is where objective, quantifiable criteria come in. It is our view that the adequacy of our interpretations of identity is based on sound empirical research. Members of our profession have used the scientific method in attempts to determine the quantifiable difference between an identification and a non-identification. Nichols(6) has summarized many of these research efforts. Biasotti and Murdock(7) have previously reported on all examinations utilizing mathematical and mechanical models and actual toolmarks up to 1984. Biasotti and Murdock(8) have also reported on their empirical research performed using microscopic techniques customarily employed in casework and have recommended the following numerical criteria that they describe as conservative quantitative criteria for the identification of striated toolmarks.

1) In three dimensional toolmarks when at least two different groups of at least three consecutive matching striae appear in the same relative position, or one group of six consecutive matching striae are in agreement in an evidence toolmark compared to a test toolmark.

2) In two dimensional toolmarks when at least two groups of at least five consecutive matching striae appear in the same relative position, or one group of eight consecutive matching striae are in agreement in an evidence toolmark compared to a test toolmark. For these criteria to apply, however, the possibility of subclass characteristics must be ruled out.

Throughout this paper we will refer to these specific criteria as the "numerical criteria." Two dimensional striated toolmarks are those that are very shallow when viewed using conventional light microscopy. Three dimensional striated toolmarks have greater depth so that contour variation can be seen using conventional light microscopy. Subclass characteristics have been defined in the AFTE Glossary(9) and have been discussed extensively by Biasotti and Murdock(10). In the past, they have been called "family" characteristics.

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Saks(11) also states that "As a consequence of Daubert, a groundless consensus of opinion, no matter how widely shared among a fields practitioners, no longer passes the test of admissibility." We argue that identification criteria for toolmarks have not been groundless; they have simply not been universally described quantitatively (numerically). It has been, therefore, difficult for most examiners to describe their criteria in a cogent fashion to others. To be accepted as being scientifically valid, it is our opinion that we must adopt the sort of numerical criteria suggested above. The proponents of these criteria simply attached numbers, determined by empirical study, to non-numerical criteria based on pattern recognition that already exist in the competent examiner's minds-eye.

DAUBERT GUIDELINES FOR JUDGES (GATEKEEPERS) TESTIMONY BASED ON SCIENCE

Before we discuss the four **Daubert** criteria, let's first discuss science and the scientific method. Thornton(12) has provided us with a clear definition of both science and the scientific method (numbers 1-4 added for clarity):

> There is a difference between science and the scientific method, a difference that even scientists may not fully appreciate. The latter is generally the means to the former, but the two concepts are at best loosely related. The classical definition of a science is (1) an orderly body of knowledge (2) with principles that are clearly enunciated. While this definition will suffice for most purposes, it is generally conceded that a few other qualifiers may be necessary. For example, additional requirements commonly added specify that (3) the subject be susceptible of testing and (4) that it be reality-oriented. When these two additional provisos are added, religion, for example, fails to qualify, regardless of how clearly its principles have been enunciated or how orderly those principles may appear.
>
> The scientific method, on the other hand, isn't a body of knowledge; it is a way of looking at things.

Full utilization of the power of the scientific method is predicated on having an "open-mind" attitude and embracing the notion that anyone has the right to question any accepted fact. A scientist must guard against being annoyed if someone, even a non-subject matter expert, questions them about their methods/conclusions. You may have to endure some ill-founded questions before you receive that one perceptive inquiry that causes you to rethink your methodology/conclusions. But the questioning should start with you; be critical of yourself and your methods and doggedly pursue information that may contradict your beliefs. Be creative and try every way you can think of to prove that you are wrong. If, in the end, you can't prove you are wrong, you are probably right.

The utilization of the scientific method involves six steps:

Step No. 1 - State the Problem
The "problem" can be anything you want to think about. For example, your problem might be stated as follows: When I have a small amount of matching striae, how do I know whether I have a positive identification.

Step No. 2 - Develop a Hypothesis
A hypothesis is simply a tentative explanation or a possible solution to the stated problem. For example, two hypotheses that follow from the problem statement above are:

1) The percent of total matching striae can be relied on as a meaningful criteria for the identification of striated toolmarks; and

2) The quantity of consecutive matching striae that exceeds the most such agreement found in the comparison of known non-matching striated toolmarks can be relied upon as a meaningful criteria for the identification of striated toolmarks.

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Step No. 3 - Test the Hypothesis by Experimentation

The purpose of this testing is to see if you can prove that the hypothesis is false. This testing is done by conducting experiments. When conducting experiments, conditions (or variables) should be carefully controlled such that the analyst can be confident that the subject of interest is the one truly being observed. It is important to assign numerical value to observations whenever possible because this provides useful detail that can be conveniently communicated to other interested persons. The analyst must be constantly alert to internal bias caused by expectations, which can prevent anomalous results from being recognized. The analyst must be thorough and consider all relevant ways of varying the conditions of experiments designed to test the propriety of the hypothesis.

There are two types of reasoning processes used to acquire knowledge: inductive and deductive reasoning(13). In the inductive process, we summarize the observations of experimental results into a conclusion called a generalization.

In the deductive process, new information is developed by reasoning from statements considered true, called premises, to a conclusion, called a deduction. Unlike an inductive generalization, we can be certain of a deduction only if the premises are true. The analyst must, therefore, do everything possible to ensure the correctness of the premises. An example of the deductive process would be where you receive a fired bullet as evidence and are asked to determine if it is a "Black Talon" bullet. You have standards of "Black Talon" bullets and can clearly see the class characteristics. You examine the evidence bullet and see that it clearly does not have "Black Talon" features. It can be deduced from these premises that the evidence bullet is definitely not a "Black Talon" bullet. But you can see that the correctness of your deduction depends upon the creditability of your reference standards.

Most problems are solved through a constant interplay of induction (gather facts and make generalizations) and deduction (operate with generalizations to make deductions/conclusions).

Step 4 - Formation of a Theory

If other researchers are able to replicate the experiments and get the same results, a theory can be formed. Such a theory is the Theory of Identification adopted by AFTE(14). This is a non-quantitative theory. As previously mentioned, Nichols(15) has compiled a detailed summary of many research efforts that have contributed in various ways to the AFTE theory of firearm and toolmark identification. The quantitative results reported by Biasotti and Murdock(16) were obtained by empirical inductive research. In time, if a substantial amount of replicative evidence comes to exist in support of their quantitative generalization, it too will be considered a theory.

Step No. 5 - Use Theories to Predict Events

The end result of the scientific method is the development of a theory that provides us with the ability to predict events or results. Using the conservative numerical criteria described above(17) as an extension of the AFTE Theory of Identification, we can predict that when agreement in either two or three dimensional striae is found that meet or exceed this criteria, an identification can be made with confidence.

Step No. 6 - Theory Becomes Law

As a theory holds up under testing as an accurate predictor, the theory eventually becomes a scientific law. If a theory of numerical criteria is developed, it could eventually become a scientific law.

It is also generally acknowledged that the status of a body of knowledge as a science depends, in part, upon the degree to which mathematical methods have been applied to it. Tulleners and Guisto demonstrated a mathematical treatment of a portion of their striae comparison data in their recent presentation(18) at the 1997 AFTE annual training seminar in Annapolis, Maryland. We know that treatments of this type make some examiners uncomfortable, but given the importance of a proper mathematical treatment of striae comparison data, we ask you to patiently consider the results of statistical treatments. We are all relying on the researcher's skill to make such treatments understandable so that all examiners can explain its significance to those outside of our field.

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Let us now return to a reiteration of the four Daubert criteria and discuss how firearm/toolmark examiners can respond in a way that should allow proper conclusions of striated toolmark identity to be accepted as "scientific" knowledge by the court.

Criterion No. 1 - Testability of Scientific Principle:
Thornton(19) underscored the need for us to constantly be trying to falsify our Theory of Identification as published in the AFTE Glossary. We would further extend this need for testing to the numerical criteria described above(20). Thornton also points us in the direction of Pirsig(21) for a cogent and entertaining discussion of the scientific method.

Within the next year we understand that several comprehensive studies of the extent of consecutive striae agreement in known non-matching toolmarks will be published. Studies such as these must be done in an attempt to falsify the numerical criteria proposed(22). For now, each examiner should conduct his/her own individual studies to test and attempt to falsify these numerical criteria. If you cannot falsify them, you may choose to adopt them as your personal criteria and would thus be prepared to discuss your own objective criteria for identification in court.

Criterion No. 2 - Known or Potential Error Rate
This requirement of the Daubert test has created some controversy because the measurements of the error rate for any particular forensic science specialty have not been truly standardized. The Daubert court opinion again fails to provide any help or shed any light in this regard. The firearms/toolmark field, however, has generated some measure of error rate by participating in the proficiency testing program developed by the Collaborative Testing Service over the past fifteen years. The results have been tabulated by Peterson and Markham(23). Their summaries provide information about the total rate of error in each specialty, including firearms and toolmarks, and can be used as the basis for discussion on this subject.

Assuming a scenario least favorable to our profession by not taking into account the number of inconclusive results (which, in fact, are neither correct not incorrect), the error rate based on the total percentage of correct responses is 12% for firearms and 26% for toolmarks. But if we view the error rate strictly as the function of incorrect responses, as we believe it should be viewed, the results are far better: 1.4% for firearms and 4% for toolmarks. There are, of course, many variables in this process to be considered when contemplating these results. For example, how these tests are administered in any particular laboratory (blind or known) can influence the results as can their use as training exercises rather than proficiency tests.

The amount of time and attention devoted to proficiency tests can have an effect on the outcome. Nevertheless, the overall purpose of them is to directly test the proficiency of an individual analyst and to indirectly test the validity of a particular method and protocol. We may not be altogether happy with the results, but at least a general indication of error rate is determined through these tests. It's not the best data, but the courts are interested in this information and we should be prepared to describe the tests as well as their strengths and limitations accurately.

We must also remember that, by design, most proficiency tests are probably not peer reviewed since the test results are supposed to represent individual efforts. In actual casework, however, internal quality control procedures of peer and administrative review serve to further reduce the error rate.

Criterion No. 3 - Peer Review and Publication
There have been numerous articles published regarding criteria for identification of toolmarks. We have already cited Nichols compilation(24). Springer(25) has compiled and reviewed a list of references that trace the development of toolmark examinations, with special emphasis on attempts to make these examinations objective.

An article has more standing in the scientific community, and potentially the court, if it is published in a journal having a peer review process. Thornton(26) has directed us toward a particularly well written discussion by Relman and Angell(27) of the value and limitations of the peer review process. Although the peer review process cannot guarantee the validity of scientific research, it increases the likelihood of detecting flaws in methodology, reasoning, and conclu-

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sions.

AFTE Journal articles have always been peer reviewed. The exact nature of this process is currently being drafted in detail by AFTE Journal editor Jerry Miller and should be published soon. This process is important to everyone who relies on AFTE Journal articles. In addition, members of our profession should be able to describe the journal peer review process.

Once an article is published, it is, of course, presented to the relevant scientific community. This is the post publication peer review phase. Good scientific practice requires that reported research be replicated to see if, in other hands using similar equipment, the same or similar results can be obtained. If they cannot, due to flaws in methodology, etc., letters to the journal's editor, and the results of the "counter" research, should ensue. This professional self-correcting exchange should result in the original research results being put in proper perspective. Thornton(28) correctly points out that it cannot be assumed that this self-correcting procedure will be employed every time. Whether an individual participates in this self-correcting procedure or not, it is important that every analyst look critically at reported research that he/she uses to form the basis for forensic science decision making. This underscores the need for all analysts to have a firm grasp of the principles of the scienific method for use in this critical appraisal process.

Criterion No. 4 - General Acceptance in Scientific Community

This fourth prong of the Daubert criteria is what remains from the Frye test. However, it now represents only a fourth of the required elements for admissibility of scientific evidence. The Supreme Court, quoting from the United States v. Downing, permitted "explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community."

In this regard there are several cases dating back to 1929 which stand for the proposition that the firearms/toolmark identification field has been accepted in the scientific community in which it belongs (identification, individualization)(29). Although we are not expected to know them all, the key cases are one of the ways *(albeit indirect)* to establish general acceptance in the scientific community.

It is worth noting that although general acceptance is only one fourth of the Daubert test, there may be some courts which will treat this criterion as having the greatest weight among the four requirements. They will probably reason that if scientists generally agreed upon some proposition, it must be reliable. After all, Daubert does not specifically instruct the court to consider all four requirements as having equal weight.

TESTIMONY NOT BASED ON SCIENCE

Rule 702 provides that if it will assist the trier of fact to understand the evidence, "*technical or* other specialized knowledge" can also be admitted in the form of expert opinion. The majority of trial court judges as well as legal scholars have agreed that the four Daubert requirements are not applicable to this type of expert witness testimony. There still are some courts, however, who would apply these four criteria to any expert testimony with potentially disastrous results for these disciplines(30).

In one now famous case, U.S. v. Starzecpyzel(31), a federal court in New York characterized the nature of the forensic document examiner's expertise not as scientific but as practical in nature, "similar to that developed by a harbor pilot who has repeatedly navigated a particular waterway." One may argue that there is nothing wrong with this characterization as long as the testimony is still admissible, and it most likely is, under the "technical or other specialized knowledge" criterion of Rule 702. However, if this characterization occurs, a particular trial judge may either limit an expert's testimony to some general statements, or instruct the jury that such nonscientific testimony "may be less precise, less demonstrably accurate" than that of a scientist. **Such jury instruction was given in the Starzecpyzel case (page 1050).**

Firearms examiners are also expected in many cases to render expert testimony in areas not directly associated with identification, such as the determination of a firing distance, or reconstruc-

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tions of shooting scenes. In these areas we practice what is often referred to as "applied science" in that we apply scientific, objective measuring, and instrumental techniques to arrive at a subjective interpretation of the results. When we do this, we are not employing the scientific method in the pure meaning of the term, but are practicing "applied science." It is interesting to note that at least one federal court (U.S. Air Force Court of Criminal Appeals) has held that shooting scene reconstruction based on powder and lead patterning is "a part of ballistics" which is so well established in the scientific community that it does not fall within "unknown science or technology" and, therefore, is not subject to the Daubert test(32).

WHY DO WE MEET THE DAUBERT TEST?

The Daubert opinion has created more controversy than it solved. It technically created as many standards as there are trial level judges in the judicial branch of the U.S. government. In the aftermath of this decision, the "gatekeepers" of expert evidence have often become the "gateblockers," as some judges tend to inject their personal views and experiences into their decision making process(33). In fact, Daubert has shifted the responsibility of determining the validity of science for judicial purposes from scientists to jurists.

Some courts have interpreted Daubert as applicable exclusively to **novel scientific evidence**. Some courts apply Daubert to **all scientific evidence** (as it was meant to be applied, according to most legal scholars). Some courts still attempt to apply Daubert to all expert testimony even if it is within the "technical or other specialized" category of Rule 702.

The firearms/toolmark identification field has all the indicia of a science: 1) It is well grounded in scientific method; 2) it is well accepted in the relevant scientific community; 3) it has been subjected to many forms of peer review and publication; 4) it has participated in proficiency testing and published error rates; and 5) it provides objective criteria that guide the identification process.

Admittedly, the criteria that have gained widespread acceptance (AFTE Theory of Identification) are qualitative (non-numerical). However, every examiner requires a requisite amount (quantity) of agreement before making an identification whether or not they can express this quantity using numbers. This is acknowledged in paragraph (b) of the AFTE Theory of Identification(34) where in it states that: "Agreement is significant when it exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools ..." The numerical criteria research referenced in this paper(35) has simply attached numbers to this portion of the AFTE Theory of Identification in order to numerically describe the quantity of agreement in identifications that will, in the researchers experience, exceed the best known non-match agreement for striated toolmarks.

CONCLUSION

The identification of striated toolmarks in the firearms/toolmark field has every element of admissibility required by both Rule 702 and the Daubert decision.

In our opinion an expert no longer can proclaim "I know it when I see it, I am the expert" and hope to be unchallenged. The defense bar has experts at their disposal and a lot more information now than ever before. Anything less than well supported and documented case examinations, leading to conclusions based on objective identification criteria, often followed with a cogent presentation in court, could be viewed with serious doubt and criticism which may leave the court no option but to declare the witness unscientific. That, in turn, may cause the scope of testimony to either be limited or characterized as having diminished weight.

We ask the courts to take our assertions on faith when we describe our identifications as being based on unspecified criteria. Daubert asks us to "put up or shut up." We think we can, as a profession, "put up" and meet the challenge.

Both Saks(36) and Thornton(37) agree that whatever other effect(s) Daubert may have on the forensic science identification fields, one beneficial effect should be that the introspection generated by the decision should cause members of

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these fields to become more familiar with the utilization of the scientific method in the conduct of inquiry. And, if our conduct of inquiry improves, so should the quality of our forensic conclusions, which is, after all, the whole point of the Daubert decision.

Although we should leave legal arguments to lawyers, we must neither fear them nor stand on the sidelines when the very basis of our profession is being discussed or questioned in court.

We must convey to the legal profession, including judges, that our firearms/toolmark identification processes are based on the scientific method and utilize objective, verifiable criteria. Thus they are unbiased and trustworthy.

We must view the Daubert decision as providing us with the tools to do just that.

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