

BOOK REVIEW

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A Review of *Tire Imprint Evidence*

REFERENCE: McDonald, P., *Tire Imprint Evidence*, Elsevier Science Publishing Co., Inc., 52 Vanderbilt Ave., New York, NY 10017.

This slim book consisting of 20 short chapters deals with a very important topic and will undoubtedly be of some value to criminalist and investigator alike. The author, a retired tire tread designer with several years of experience in helping investigators locate candidate tires capable of making certain tracks and in interpreting casework exhibits, could be expected to contribute the definitive work on the subject. The latter this book is not. There is not a great deal presented that experienced forensic scientists have not learned from casework experience, readings scattered among diverse sources, and, perhaps visits to tire manufacturing facilities. There seems to be no question that Mr. McDonald knows much of forensic science relevance that he could teach us about tires. One would have hoped that some of this expertise could be made available to criminalists. Very little that is not already known to experienced criminalists is shared in this volume. This is probably not a book that will remain on the criminalist's bookshelf. Although it may provide some useful new information for many criminalists, this new information is likely to be mastered in one reading. This is not a reference work.

There are no empirical data to suggest that features referred to as "general accidental characteristics" are in fact distributed randomly. Certainly some are not. All tires wear with use, albeit often unevenly. Contrary to the author's claim (pp. 74 and 79), exposed tie bars hardly represent "general **accidental** characteristics" (emphasis added). This assertion is not consistent with his earlier definition of accidental characteristics, that is, those that are acquired by chance or "happening by chance" (see p. 76). Tie bars are designed "to help stabilize the tread elements" and are exposed when the tire wears to some predetermined percentage of the tread life. Although wear can often be asymmetrical, and there are several general types of tread wear, the variations within each form a continuum. In addition, the process has relatively few discrete degrees of freedom. The various manifestations of wear are more constructively thought of as refined class characteristics. With a few notable examples of unusual wear, this is not a random process. Randomness is clearly a necessity for the production of individual or "accidental" characteristics.

In the casework examples given, one is left asking what were the "specific accidental characteristics" used to make the "positive match"? The occasional figures containing both test and evidence print with arrows pointing to rather nondescript features are of

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little help. Of course, there is an obvious limitation in illustrating such matches because of the size of the reproductions in the book. However, one-to-one photographs of particular regions illustrating this type of "match" would have been helpful and appropriate. One has to take the "matches" presented on faith. One cannot independently verify the author's work on any of these cases, an unsatisfactory situation and a major shortcoming of the book.

It is disturbing to read (on p. 181) that his criterion for a positive match is a single corresponding "specific accidental characteristic." This is dangerous thinking in the hands of nonscientist examiners. Individual features or "specific accidental characteristics" can vary greatly in quality or value. Is the presence of a mark left by the flattened corner of a tread element or an enlarged sipe (containing a stone) grounds for concluding that no other tire could have made the mark? The value of the presence of such a flattened corner or an enlarged sipe in the questioned pattern will depend on many factors including various class characteristics of the tire thought to have made the mark. However, it should be clear that there will be several questions crucial to an interpretation for which there will be no answers. For example, with what detail is this mark rendered in the evidence impression? Is there any empirical data that addresses the probability that a particular sipe in a given tire design will contain a stone? What is the frequency of occurrence of such a feature? How does the occurrence of stones in sipes vary with season, types of roads, driving speeds, and so forth? Is an enlarged sipe unidimensional? What shapes and sizes of stones will be held? How do factors such as sipe size and shape and degree of tire wear influence stone intrusion and retention? In spite of these concerns, this correspondence between questioned pattern and exemplar print clearly has significance and may in fact be very persuasive to a jury. One can conceive of single features with enough detailed structure to warrant a conclusion that a specific tire made a particular impression. However, such a feature is not unidimensional and, properly, can be thought of as containing several "points of comparison." However, to repeat the question posed above, is the presence of a single flattened corner of a tread element or the presence of an enlarged sipe at a particular location grounds for a conclusion of a "positive match"?

Although it should be obvious, it needs to be made abundantly clear that individual features of a size which approach the realm of the resolution limit imposed by the granularity of the receiving surface cannot be considered. This is a point that was not discussed and that too often is not fully appreciated. This is the realm in which, if one is not scrupulously careful, imagination and wishful thinking can become significant and science goes out the window. Could this be the phenomenon producing some of the matches that cause this reviewer's disquiet with the strong positive conclusions drawn in the examples given? Mr. McDonald offers no demonstrable proof to support his conclusions.

Mr. McDonald advocates the use of inked imprints exclusively for producing exemplars. He repeats this in at least two locations in the book. He fails to mention situations in which tracks are made in relatively coarse underlying material overlain by silty fines that may only reproduce the shoulder and lower sidewall areas well. On p. 183, the author advises against trying to duplicate the crime scene surface claiming that it causes more problems than it is worth. Curiously, in the table on p. 74 he lists "side treatment" as one of seven "specific accidental characteristics."

Most of the inked exemplars used in the case examples are of poor or mediocre quality. This is presumably because they were received by the author from investigators with little experience in producing such exemplars. Criminalists who have trained investigators in their own jurisdictions would not have this problem. This brings up another point. A strong case can be made for obtaining a minimum of two exemplars from each tire *while the tires are still available*, particularly in cases in which investigators without extensive experience are charged with this responsibility. This reviewer has seen too many cases

in which supposedly individual features are found that serve as the basis for finding a match between a questioned print or track and the exemplar, but the examiner has overlooked the fact that no such features exist on the article itself (footwear or tire). They were merely an artifact in the exemplar. The examination of tire and footwear evidence is not as straightforward an examination process as some would have us believe. Interpretation should be undertaken by scientists.

Some of the advice on photography is sound but a bit sketchy. Some silly folklore regarding the admissibility of photographs is perpetuated, although this probably does not do any serious harm. Photographs taken according to sound scientific principles, of a properly secured scene or evidence, will be admissible. Extensive use is made of direct quotes from other sources on photography by the author rather than writing the material himself. This is true of other parts of the book as well. The excerpts are not well integrated together. In many of the case examples, he quotes large sections from his own reports. The recommendations regarding shielding a three-dimensional print from strong ambient light so that controlled angle artificial illumination can be used are sound and, for many investigators, surprisingly necessary. However, there is no discussion of varying the f-stop to obtain complementary, and often necessary, additional control. More attention should be given to film contrast, not just its speed.

Although discussed, too little attention is paid to the necessity/desirability of obtaining parallelism between the film plane and the subject plane. The tripod is discussed as though it is merely an option. Certainly, cases can be solved using photographs that have been taken "hand-held" using off-camera flash. However, this misses the point. Several advantages accrue to the investigator who makes the effort to use a tripod. Many of these were not discussed by the author (for example, repeat photos without and with scale and/or repositioned scale, repeat photos with different lighting, time exposures, preview and control of shadowing using a flood lamp, and so forth). Certainly one does not want to discourage an investigator after the fact by saying flatly that "hand-held" photographs cannot be used. However, the use of a robust tripod should certainly be encouraged.

The author makes the excellent suggestion of using an information-bearing index card in each photograph but does not show an example of this practice in any of the photographs in the book. A computer program for entering general class characteristics of a questioned tire print developed by the Michigan State Police to aid in the search for candidate tires is mentioned briefly, but no case in which this was used is presented.

How does McDonald justify the use of screen positives in the comparison process? Some criminalists prefer the use of high contrast positive exemplar transparencies (for example, Kodaliths) placed over color or black-and-white (low-to-moderate contrast) one-to-one prints of the evidence imprint or impression, despite the fact that the area of interest in the exemplar or test impression must be known (for example, by taking advantage of pitch sequence information) before the transparency is made. Alternatively, several transparencies, covering the length of the exemplar, must be made before the comparison proper can begin. Aside from being more logical, there are several persuasive arguments to support this approach to the production and use of overlays. For one thing, artifacts or false correspondences are more likely to be recognized for what they are. Additionally, quick, very simple, and convenient exemplar transparencies can be made using an electrostatic copier with products such as "Scotch Transparency Film for Plain Paper Copiers" produced by 3M Corp. The dimensional accuracy of copiers is easily checked and in most cases is satisfactory for producing acceptable one-to-one transparencies from the inked exemplar. Laying the transparency over the exemplar can serve as a quick check on this. Single color overlays made with copiers with capabilities for changing toner color can be useful for getting better contrast with the evidence mark photo.

On p. 187, McDonald says (in "mission analysis") under the heading of accuracy that "cross-examination" should not weaken the substance of the report. If this means that the report is written with attention to scientific conservatism and to an anticipation of topics that may arise in cross examination, then all well and good. On the other hand, this could be a very dangerous concept if it is construed to mean that under cross-examination one does not waiver or concede points that have not been given proper consideration by the expert before taking the witness stand.

The captions for the excerpts from the **Tread Design Guide** in the sample test from the workshop example in Chapter 20 are incorrect. They refer to the particular tire on that page that is a candidate for inclusion after an initial screening based on a search of the **Tread Design Guide** for class characteristics. They are not appropriate captions for the two-page spreads excerpted from the **Tread Design Guide** which are depicted.

Is there enough caution given to problems arising when important decisions are based on too heavy a reliance on material in the **Tread Design Guide**, which is acknowledged to have errors? In one case report given in the book, he describes finding 3/4 views of tires that are reversed in printing. We need to ask whether this reference is accurate enough to serve as a foundation for expert opinions. This question is not addressed adequately.

Chapter 15, entitled "One Case from Beginning to End" raises some additional questions about the author's understanding of individualization. This reviewer is somewhat familiar with the case described because he was contacted by the defense attorney in 1984, but declined to accept the case because he had been consulted (although not retained) earlier by the prosecutor on another physical evidence aspect of the case. The case was referred to a respected criminalist/lab director with a good deal of experience. The defense criminalist found ample class characteristics but disagreed with Mr. McDonald about the presence of any unambiguous individual characteristics. At the end of the chapter, the author notes that a defense expert disagreed with his positive match and includes excerpts from the defense expert's report and critiques them. Without going into the details of the uninformative critique, he notes that the judge in the trial "suggested that standards for examining tire imprints are needed . . ." This would certainly be worthwhile. He continues, ". . . I hope the standards and procedures set forth in Chapter 9 (esp. Table 9.1) meet that challenge." It is not clear to this reviewer that they do. There seems to be a fundamental problem in Mr. McDonald's understanding of what constitute individual features of a tire as well as the constraints on their manifestation in the resulting imprint or impression. For example, in examining the transcript of Mr. McDonald's testimony he cites as 1 of 16 points of comparison, a bent sipe. He conceded on cross-examination that this was a mold defect and thus a class characteristic. This reviewer has not examined the original full-sized case exhibits and is thus not able to evaluate the remaining 15 "points of comparison."

The primary contribution of the author's expertise and, thus, the value of this book is in providing information of value for use in three situations: (1) gleaning useful investigative information from tire prints before a suspect has been developed, (2) looking for exclusions based on subtle class differences such as those that arise from wear or mold-to-mold variations (mold offset, and so forth), and (3) locating the proper area around the periphery of the tire to conduct the detailed comparison, taking advantage of pitch patterns, and other class characteristics. The book can be expected to be of value to many criminalists in these areas. On the other hand, most criminalists have more expertise than the author with respect to the comparison of individual features in pattern evidence. The author greatly oversimplifies the interpretation process used with matches. In general, the reader's inability to verify independently the "matches" cited in his book does little to dispel doubts concerning the author's understanding of what is required to establish a unique association between tread and print. Such work is best done by an

experienced criminalist. However, once a positive comparison has been made using valid scientific criteria, additional information about tires, some of it from the book, may be necessary for a properly weighted interpretation.

Despite the criticisms raised in this review, the book will be useful, albeit less useful than it might have been, to criminalists. However, one could have wished for more. It is to be hoped that its many shortcomings can be overcome in a second edition, should one be in the offing. It seems clear that the author has much of value to offer. The apparent lack of understanding of what constitutes a true individualization notwithstanding, the present edition (with appropriate precautions) does serve to underscore what can be accomplished with limited tire imprints and impressions.