

Letters to the Editor

Discussion of "Photographic Techniques of Concern in Metric Bite Mark Analysis"

Dear Sir:

We would like to comment on Thomas C. Krauss' "Photographic Techniques of Concern in Metric Bite Mark Analysis" (*Journal of Forensic Sciences* Vol. 29, No. 2, April 1984, pp. 633-638). Our basis for doing so is considerable experience in actual examination of bite mark photographs, measurement using these photographs, and testimony in both criminal and civil cases involving bite mark and other photographic evidence. It is our feeling that many if not most of Dr. Krauss's contentions in this article, while well-meant and carefully thought out on what might at first be taken to be logical level, have little to do with the analysis of most photographic bite mark evidence with currently accepted techniques of bite mark identification, or with the "real world" in general. We will first discuss a number of points brought up by Dr. Krauss in his paper, and will end with a general discussion of some of the *realities*, as we perceive them, in the use of photographic bite mark evidence for forensic science purposes.

We agree with Dr. Krauss that a photographer's skill, concern for detail, and knowledge of the photograph's intended use is important, but we would have to take issue with the statement that these things by themselves "... determine the analytical value of his photograph" (p. 633). The great majority of photographs that we have ultimately used in bite mark analysis and as courtroom exhibits were taken not for the express purpose of illustrating bite marks; many are overall crime scene photos and show bite marks only peripherally or at very small scale. Even most clinical and autopsy photographs do not focus on bite mark evidence, and in fact in most cases the existence of bite marks and their locations are *not recognized or known* by medical examiners, but are only discovered late upon examination of these photographs.

Consequently, scales included in the photograph are located in many cases far away from either the location or the plane of the bite marks themselves. Scales that are included in bite mark photographs are always of a very different sort than the scales advocated by Dr. Krauss, which, he says, "should comply with accepted metrological principles exemplified by the federal specifications for rigid measuring rules" (p. 634). Plastic rules available from chemical and other supply houses are often used, as are a variety of cut-up or homemade measuring scales. Very rarely is it even *possible* to see millimetre graduations on scales that appear in such photographs, and sometimes it is very difficult to see centimetre graduations. When such scales, which often appear at a very small size in evidential photographs, are viewed under magnification it becomes apparent that photographic enlargement and printing introduces other visibility problems, particularly blurring and widening of scale lines in the photographic image. These effects increase with each succeeding generation through which the photographic product proceeds. At times the only photographic bite mark evidence available is a print made from a negative taken from a transparency, or worse yet an "instant" print. The scales that one has to work with in bite mark photographs—at least to judge from our own joint experience encompassing hundreds of cases—are not only uncertified by the National Bureau of Standards, but it would make no difference if they had been.

But the forensic odontologist and photogrammetrist are, in fact, lucky to have even these sorts of scales in photographs, for, in many other instances, there are no rulers at all in the pictures available. In many such photographs, however, physical objects appear that survive as evidence long after the disposal of the body. We have utilized various articles of clothing and insignia, jewelry, firearms, weapons and other implements, containers, and household articles as scales in bite mark photographs. Sometimes even when there are ruler-type scales in a photo, it is more desirable to use an object that can also be measured in "real life" as a primary

scale because of its resolution and ease of measurement in the photograph, or because it is closer to the bite mark or other feature of interest and its object plane than the provided rule.

Dr. Krauss is correct in pointing out that curved or irregular surfaces are "distorted" when accommodated to a flat film plane. The word "distorted," it should be pointed out, is used by Dr. Krauss in the same way as it would be used by a photogrammetrist, and in a very different way than it would be used in a court of law where it has quite different implications. For the photogrammetrist, distortion is not a negative or in fact even undesirable entity, but a natural and useful property of all photographs or other images. Actually, there are a number of different kinds of distortion apparent in photographs. One of these is *scale differences* which result from various parts of the scene or object photographed being different distances from the plane of the optical center of the camera's lens. Another "distortion" is *relief displacement*, which affects the apparent position of the top and bottom of an object in proportion to its distance from the exact center, or principal point, of a photograph [1]. Scale differences provide perspective cues to the location of objects in photographs, and are one of the primary bases of photointerpretation. Radial displacement is analyzed by photogrammetrists and can be used to make accurate three-dimensional measurements of the locations of objects from either single or stereo photographs.

Yet other "distortions" are introduced by the lack of flatness of the film in a camera, and by asymmetrical or uncollimated camera lenses. It is interesting in this regard to note that the Nikkormat EI camera body and 55-mm lens used by Dr. Krauss in his "parallelism experiment" would *not* be classed by a photogrammetrist as a "metric camera." Indeed, not even the most expensive cameras used in normal photography are strictly "metric," a term that photogrammetrists take to mean that a camera has inherent radial distortions of less than $5\ \mu\text{m}$ [2]. Metric cameras are highly specialized instruments costing upwards of \$15 000 each, and the photographs they produce are subsequently used for highly accurate, three-dimensional mapping using optional-mechanical or analytical photogrammetric plotters. It would be ideal if all forensic photographs were taken with such instruments, for then we could measure all evidence appearing in a stereoscopically recorded scene very accurately. Some traffic accident investigation units in the United States and abroad do employ metric cameras and photogrammetric plotters in collecting evidence. To our knowledge, odontologists examining bite marks have never done so.

So the odontologist/photogrammetrist team is confronted with a manyfold quandary: crimes are committed; photographic bite mark evidence figures in forensic science analysis and litigation; photographs are the *only* evidence available for bite mark analysis in many cases; often bite marks are only identified *after* medicolegal examination of perishable evidence and do not constitute the "purpose" of photography; and scales appearing in forensic photographs are nearly always uncertified, inadequate, hard to see, or even nonexistent. What are we to do? There is a twofold answer to this. The first, simple retort is that we must do as best we can with what is available to us. Things *can* be measured in photographs to a greater or lesser degree of accuracy and precision no matter what sorts of scales are available.

Another answer, however, is not quite so easily stated. It has to do with why one would want to attempt to produce detailed measurements of bite mark evidence from photographs in the first place. While we will not discuss accepted methodologies of forensic odontology exhaustively at this point, we do feel that an adequate answer to Dr. Krauss's paper requires the thorough consideration of the ways that bite mark evidence are analyzed, compared, and used in courts of law and for other forensic science purposes.

Measurement is only one of the possible uses of photographs. A photograph contains enormous amounts of information embodied in variations of tone and texture in the photographic emulsion. Analysis of the contents of a photograph begin and end with the expert interpretation of the spatial arrangement of objects or marks—that is, pattern recognition.

We feel that pattern recognition, identifiable gross and individual characteristics, and the multitude of other data present in a photograph are of equal, if not greater, value to the exam-

iner than the presence of a certified scale located in the immediate area of interest. Detailed measurements are possible if the gross and individual characteristics are present in exceptional resolution; however, if this is the case, multiple measurements are not necessary as the general overall size of the bite mark, canine to canine, can be readily determined. When this has been accomplished, the investigator can then proceed with the analysis of the individual characteristics present in the injury pattern.

The major role of measurement during the forensic science analysis of bite mark evidence is to establish that the patterning being studied is consistent in size with human dentition or the dentition of a suspect or both. Pattern recognition of individual characteristics, and not their measurement, allows the identification of bite mark patterning. The forensic odontologist can recognize and interpret bite mark patterning in a tiny photograph or an enormous enlargement; "life size" photographs at 1:1 scale are unnecessary for such analysis. Such photographs are useful as courtroom exhibits, and adequate 1:1 enlargements can almost always be determined using the scales available in the original photographs.

In conclusion, while it would be ideal to have all forensic photographic evidence produced using the most accurate possible cameras, scales, and procedures, this is simply not the case in the real world. The fact that certified scales are not used by the majority of agencies concerned with the collection and preservation of evidence does not, however, negate the analytical value of photographs nor the information they contain. A qualified photogrammetrist can use purposely or incidentally include scales to measure to some degree of accuracy from almost any photograph. Finally, should even the most ideal, complete, and accurate photographic preservation of the evidence be available, without individuals well trained in the recognition of gross and subtle features these photographs will be of little forensic science value.

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References

- [1] Wolf, P., *Elements of Photogrammetry*, McGraw Hill, New York, 1974, pp. 115-119, 257-258.
- [2] Muessig, H., "Equipment for Close-Range Photogrammetry," in *Technical Papers of the American Society of Photogrammetry. 1982 ACSM-ASP Convention*, American Society of Photogrammetry, Falls Church, VA, 1982, pp. 182-190.

Author's Response

Sir:

The words "Is this a fair and accurate representation . . ." are familiar to everyone responsible for the introduction of photographic evidence into court. *The Guidelines for Bitemark Analysis* unanimously adopted in February 1984 by the American Board of Forensic Odontology provide accepted standards significant to the production of fair and accurate bite mark photographs. They state in Section II (collection of evidence from victim) Part A (Photography):

4. Photography of the mark should be taken with and without a scale in place.
 5. When the scale is used, it should be on the same plane and adjacent to the bite mark.
- It presently appears desirable to include a circular reference in addition to a linear scale.

6. The most critical photographs should be taken in a manner that will eliminate distortion.

The article in question, although written before the adoption of these guidelines, addresses these matters by: simply demonstrating the significant influence of film plane-object plane parallelism; describing an easily accomplished evaluation of some inherent errors found in photographing a curved surface; and by suggesting the use of a commonly available precise scale. Ebert and Campbell do not dispute that reasonable measures should be taken to accomplish accurate photographs, the basic offering of the article.

They describe in great detail experience with less than ideal bite mark evidence. All experts have had to deal with this type of evidence, making the best of it wherever possible. They certainly do not use these experiences to justify using less than optimal collection procedures either personally or by others.

Certainly the validity of less than ideal evidence or conclusions drawn from it must be put in perspective by comparison with the ideal. The record shows that quality evidence is being routinely collected by odontologists and evidence technicians, negating much of the legitimacy they claim for the acceptance of low quality evidence with its compelling compromises. Photographic bite mark evidence is too important not to be accurate.

The patterning discussed is one method used in bite mark analysis. Being subjective and very susceptible to bias, many experts find the need to use additional comparative tests in order to achieve unbiased objectivity. Using the same evidence, frequently two experts recognize different patterns or even fail to agree upon the existence of a pattern. Illustrative of this was a recent case presented before an annual AAFS Odontology section scientific session when a large group of experts not only failed to accept the presenter's bite mark pattern, but even failed to accept the existence of the alleged bite mark. The quality of evidence was comparable to that described in Ebert's and Campbell's letter.

We are in agreement that even the ideal photograph is useless without the services of a competent examiner. My article simply suggests that methods useful in the optimum collection of bite mark evidence so the examiner can use any or all methods he deems appropriate to his scientific analysis. To deny reasonable excellence in the execution of the accepted guidelines is not in the best interests of justice.

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Discussion of "Fiber Evidence: Laboratory Methods and Observations from Casework"

Dear Sir:

Michael C. Grieve (Discussion of "Fiber Evidence: Laboratory Methods and Observations from Casework," *Journal of Forensic Sciences*, Vol. 29, No. 4, pp. 955-957) is quite correct in characterizing the alternate viewing of questioned and known fibers for purposes of color matching as a dangerous practice. The available scientific literature on successive color matches does not support Fong's (Author's Response, *Journal of Forensic Sciences*, Vol. 29, No. 4, pp. 957-959) belief that reliable color matches can be made with retained mental images. Newhall et al [1] have reported the results of successive color matching experiments in which test subjects viewed colored chips and then attempted to match their memories of the colors to a set of Munsell color standards. Only five seconds elapsed between the removal of the test color and the search for a match. Nevertheless, despite the very short time interval between the viewing of the test color and the attempt to match its memory, Newhall et al found systematic errors in the color matches obtained. The colors selected as matching the test colors had systemati-

cally higher values of chroma (saturation) than the test colors. Furthermore, the MacAdam ellipses of the successive color matches were much greater than those for simultaneous color matches. The procedure suggested by Fong is therefore likely to introduce a systematic bias into color comparisons. It will also probably result in greater random error in the color matches than color comparisons carried out with a comparison microscope.

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Reference

- [1] Newhall, S. M., Burnham, R. W., and Clark, J. R., "Comparison of Successive with Simultaneous Color Matching," *Journal of the Optical Society of America*, Vol. 47, No. 1, Jan. 1957, pp. 43-56.

Author's Response

Sir:

Much can be written on both sides of this issue. If so, those who are workers in laboratories amply endowed with tax payers' money and who are the proud users of expensive comparison microscopes will not be persuaded to abandon their usage based upon what I can say or have said. Such persuasion has never been my intent. Similarly, those who are workers in deprived laboratories wanting in an adequate comparison microscope will not be persuaded to abandon their efforts to apply fibers as evidence based upon the statements of Grieve and the results of Newhall's study as given by Rowe. There are not many points on which we can all agree upon, but on this one we can. This fact notwithstanding Rowe's letter is worthy of some comment.

The principal problem I have with Newhall et al's study is Rowe's attempt to use the results of Newhall's work in support of his and Grieve's contention because its relevancy to the problem of fiber comparisons as I have encountered them in practice is low. Following the procedures I use, only fibers qualifying by description in all discernible microscopic characteristics are compared, that is, it is commonly a one versus one situation. This is not the same as one color chip versus a set of many chips which differ by slight amounts in the various attributes that characterize a particular color. Also, the slides can be interchanged for as many times and comparisons made for as long as required. Again, such is not the condition described by Newhall as given by Rowe.

Difficult situations can arise. If so, there is a relatively simple recourse: remove the fibers from their original mounts and remount on a single slide so that they can all be seen in one microscopic field. Needless to say, a method of identifying the fibers by source must be applied. Comparisons can now take place under optical conditions at least equal to if not superior to those taking place with the most sophisticated comparison microscope.

Whether or not a comparison microscope is an essential need is to be left to the individual worker as determined by his or her work situation. However, no one can deny that an essential need in the practice of the criminalistics art is *wisdom*.

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