

## BOOK REVIEW

Maureen C. Bottrell, M.S.,<sup>1</sup> and Jodi Blakely Webb, M.S.<sup>1</sup>

### Review of: *Forensic Interpretation of Glass Evidence*

**REFERENCE:** Curran JM, Hicks TN, Buckleton JS. *Forensic Interpretation of Glass Evidence*, CRC Press, Boca Raton, Florida, London, New York, Washington, D.C., 2000, 178 pp., \$99.95.

*Forensic Interpretation of Glass Evidence* begins with a brief overview of the physical properties of glass, methods for glass analysis, classical approaches to the interpretation of forensic glass data, and glass transfer and persistence studies. Building on this foundation, the Bayesian method of interpretation is outlined, and the authors discuss some of the various parameters that may be necessary for a Bayesian analysis. The Bayesian method is a statistical treatment that uses a “continuous approach” to evidence interpretation that abandons the conventional “match/non-match” treatment of the data. The Bayesian method, as presented in this book, uses the likelihood ratio to numerically represent the weight of the evidence. The likelihood ratio is an expression for the relative probabilities of the evidence under competing hypotheses. The significance of a measured parameter, limited in the text to refractive index (RI), is modified by taking into account factors such as the background information (eyewitness statements, previous criminal activity, . . .), presence, transfer, and persistence of glass.

The book is an easily readable, very general overview of the Bayesian philosophy for evidence interpretation. The reader is cautioned, however, that because the explanation is so general and some of the examples are inaccurate, the text cannot be used as an instruction manual for performing a Bayesian analysis. The literature reviews on transfer and persistence are good, but the limitations of the listed studies are not adequately explained. The bibliography is a good source of article citations for the student interested in learning about glass analysis. Unfortunately, these are the only aspects of the book we can recommend.

When we originally started writing this review, we intended to give a chapter-by-chapter summary and critique. However, this has proven to be impractical. The editing and factual errors that should be pointed out for a helpful review are too numerous for this forum. These errors include references to the wrong tables, spelling and grammatical errors, unattributed statements, undefined terms and

variables, and misstatements of facts. A few specific examples follow:

1. In the section on density determination, pages 12 and 13, the sink float method is outlined, and the authors describe how to measure the density of a liquid using a “densitometer.” A densitometer is an instrument used for determining optical or photographic density. The correct name for the instrument described is density meter.
2. On page 15, the authors indicate that experienced examiners can identify glass “by choosing those fragments with freshly broken edges and ‘appearance,’ sometimes referred to as the conchoidal fracturing” and determining whether they are isotropic. While this is effective in most cases, garnet, quartz, and many other minerals are also characterized by conchoidal fracture, and some minerals, including some with conchoidal fracture, are isotropic. Also, strained glass can appear anisotropic. Therefore, using these properties alone could lead to the misidentification of some materials as glass or conversely, glass as other materials.
3. On page 19, dark phase contrast microscopy is written “dark contract phase microscopy,” and on page 82, elemental composition is written “elemental decomposition.”
4. On pages 60 to 61, the authors present an example of how to calculate the probability and odds of drawing a card of 10 or higher using a “fair” deck of 52 playing cards. The authors perform their calculation assuming that the deck contains only one suit and, therefore, miscalculate the probability and odds.
5. In the flow chart for the transfer and persistence of glass fragments on page 129,  $w_i$  is not defined.
6. On page 151, the authors state “We will continue with the presentation of four examples involving single and multiple controls and recovered, using elemental analysis.” However, the authors follow in the next chapter with the presentation of only one example, which consists of only one group, one control, and RI data alone.
7. A data set of RI values for recovered glass fragments is given in chapter seven. These fragments are identified as belonging to one indistinguishable group, and a Bayesian analysis based on

<sup>1</sup> Geologist/Forensic Examiner, Federal Bureau of Investigation Laboratory, Washington, DC.

this assumption follows. Statistical tests to determine the number of groups in a given data set are provided in chapter two. When any of these tests are applied to the data set in chapter seven, at least two groups are identified. In light of this, either the grouping tests in chapter two were not performed, or they were performed incorrectly on this data set, in either case resulting in a Bayesian analysis using improperly grouped data. Furthermore, these grouping tests contain undefined variables and incorrect table references. It is therefore necessary to refer to the original papers to perform the tests.

Rather than being a treatise on the forensic interpretation of glass evidence as the title indicates, this book clearly advocates the Bayesian method. In their enthusiasm for the method, the authors address neither the strengths of other methods nor the weaknesses of the Bayesian approach. Also, the numerous editing and factual

errors detract from the message championed in this book—that glass evidence should be interpreted in a Bayesian framework.

The value of this book is that it presents many of the considerations that must be used in the interpretation of glass evidence. These considerations are an integral part of both the traditional and Bayesian approaches to evidence interpretation. Interpretation of trace evidence, including glass, fibers, paint, etc., is one of the most difficult and contentious topics of modern forensic science. The interpretation of this evidence is of the utmost importance to a court of law, where it is the job of forensic scientists to present their findings and offer an easily understood explanation of the meaning and value of the results to the jury. Therefore, the concepts presented in this book should be of interest to all trace evidence examiners, but an impartial critical review of the strengths and weaknesses of all the various methods of interpretation would, ultimately, better serve the forensic science community.