

BOOK REVIEW

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Review of Scientific Evidence in Civil and Criminal Cases (Fourth Edition)

REFERENCE: Moenssens AA, Starrs JE, Henderson CE, Inbau FE. (The Foundation Press, Inc., Westbury, N.Y., 1995), ISBN 1-56662-233-6, 1241 pages with an 11 page index, 152 illustrations, approx. 3700 footnotes, 1063 bibliographic references, and a table of more than 2500 cases, \$48.95.

Media coverage of the O.J. Simpson trial focused global attention on the forensic sciences and the role of scientific and medical evidence in the courtroom. There was little discussion, however, of books that present a scholarly overview of the subject. *Scientific Evidence in Civil and Criminal Cases* is one of those texts.¹ Now in its fourth edition, this treatise has more than doubled in size, scope, and value since publication of the original manuscript by Moenssens, Moses, and Inbau in 1973. Substantial additions and revisions in the 1995 text appropriately reflect not only developments in the field but also the wisdom and insight gained from the authors' nearly 100 years of combined experience in legal practice and scholarship.²

Organization

Scientific Evidence is sensibly divided into four parts. The first section contains four chapters devoted to *general concepts* underlying expert testimony (97 pages), real and demonstrative evidence (72 pages), and the opinions of skilled witnesses who routinely

testify in speeding and DUI cases (80 pages). Part II tackles evidence based on the *physical sciences*, with separate chapters addressing questioned documents (50 pages), firearms and toolmarks (90 pages), arson and explosives (98 pages), fingerprints (60 pages), accident reconstruction (28 pages), voice spectrography (22 pages), and trace evidence (75 pages). Part III covers the *biologic sciences*, with chapters on forensic pathology (77 pages), serology (55 pages), toxicology (58 pages), odontology (26 pages), anthropology (76 pages), and DNA evidence (94 pages). Finally, part IV examines forensic aspects of *behavioral science* in chapters that explore psychiatry, psychology, neurology, and "syndrome" evidence (129 pages), and the detection of deception using polygraphs, hypnosis, and narcoanalysis (35 pages).

Content: Strengths

One of the greatest strengths of *Scientific Evidence in Civil and Criminal Cases* is its evenhanded approach to the potentialities as well as limitations of scientific evidence. The authors clearly encourage more extensive and sophisticated use of science and medicine in the courtroom, but they readily distinguish qualitative from quantitative forensic evidence and they frequently identify controversial practices (e.g., graphoanalysis, voice spectrography, Cinderella analysis, horizontal gaze nystagmus, dermal nitrate, etc.) that probably do not belong in American courtrooms. Nearly a quarter of the chapter on DNA discusses factors that may decrease the validity or reliability of this type of evidence. By contrast, the extensive discussions of forensic anthropology and polygraph testing (implying that these techniques have acquired a significant degree of validity and reliability) may surprise some readers.

Content: Limitations

A treatise on the role of science in the legal process cannot be "all things to all people." The fourth edition has expanded its scope to include scientific evidence in *civil*, as well as criminal cases, but potential readers should not be misled by the title. *Scientific Evidence in Civil and Criminal Cases* continues to emphasize the role of forensic science in criminal proceedings. The discussions pertinent to civil litigation are limited to: Lawsuits against firearms' manufacturers, retailers, owners, and magazine publishers; the use of fingerprints in lieu of signatures and for general identification purposes; the use of document examiners and accident reconstruction experts; pathologist testimony in environmental tort, traffic accident, and medical malpractice cases;

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¹Competing texts in this field include Giannelli PC, Imwinkelreid EJ. *Scientific Evidence* (2nd ed.), Charlottesville: The Michie Company (1993 with 1995 supplement); and Tarantino JA. *Strategic Use of Scientific Evidence*, New York: John Wiley & Sons (1988 with 1994 supplement).

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employee/workplace drug testing; paternity testing; the use of psychiatric, psychological, and neurological experts; and the use of forensic anthropologists to identify remains in mass disasters, airplane crashes, and tort actions concerning the mishandling of corpses.

Some of the most difficult issues at the interface of science, medicine, and the civil law, including the roles of epidemiologic, statistical, clinical ecologic, and risk assessment evidence, are not addressed. Furthermore, though the admissibility of computer animation and simulation evidence in aviation, personal injury, product liability, patent infringement, and environmental litigation is discussed, the role of computer science and hardware or software expertise in civil and criminal cases is not covered.

Utility in the Classroom

For at least two semesters, the author of this review has taught a 50-contact hour course in forensic science using *Scientific Evidence in Civil and Criminal Cases* (4th edition) as the required textbook. This experience provides a useful basis for analysis of the book's content and academic value. The response of M.D., J.D., M.S., Ph.D., and M.H.A. candidates to the assigned readings has been uniformly positive. Not unexpectedly, students with minimal training in the physical and biologic sciences find occasional "tough sledding" in the technical portions of some chapters. In contrast, non-JD candidates often request explanation of basic aspects of civil and criminal procedure and the law of evidence. Importantly, most of the text provides an appropriate balance between science and law, and students especially appreciate the lists of definitions of common technical terms provided in nine of the book's twenty chapters.

Educators in criminal justice programs, law schools, medical schools, graduate schools, and trial advocacy programs can easily adapt the materials in *Scientific Evidence*. In a typical survey course over one semester, instructors can readily cover an average of 15 to 20 pages per contact hour. If fewer hours are available, or if curricular needs are more focused, greater emphasis can be placed on specific sections. For example, a course for medical or life science students might feature the bioscience section and the introductory chapter on scientific evidence and expert testimony. By contrast, a course for criminal justice or police science students might emphasize the introductory chapter, demonstrative evidence, and evidence based on the physical sciences. A course for students of mental health would most appropriately highlight the behavioral science section as well as the chapters on alcohol and other drugs.

Utility for Lawyers

The authors state that *Scientific Evidence* was written to assist, among others, prosecutors and defense attorneys. To this end, the book offers five types of information. First, each chapter supplements a review of current law with suggestions for the future development of the law. Second, each chapter reviews the qualifications needed for expertise in the relevant forensic discipline. Third, many chapters offer detailed strategies for cross-examination of specified forensic experts. Fourth, many chapters catalog various sources for locating experts. Finally, approximately 3700 footnotes and 1063 bibliographic references provide a firm basis for undertaking more focused research.

Utility for Forensic Professionals

The scientist or physician interested in one (or a few) of the disciplines featured in *Scientific Evidence* should not expect anything approaching a technical treatise on his or her favorite forensic

specialty. Rather, the discerning forensic professional will find reasonable coverage of important facts and legal issues typically confronted by those who would present or undermine specific types of scientific evidence. Importantly, this book enables forensic specialists to acquaint themselves with other sciences and techniques with which contact may be anticipated, both inside and outside of the courtroom.

Pearls, Gems, and Gold Nuggets

Scientific Evidence in Civil and Criminal Cases offers some delightful historic vignettes, including the contributions of Paul Revere to forensic odontology, George Dorsey and Douglas Ubelaker to forensic anthropology, and Oliver Wendell Holmes to various forensic disciplines. To supplement the solid analysis of *Frye*, *Daubert*, and *Brady* issues, Chapter 1 also covers the ethical obligations and potential malpractice liability of expert witnesses. In Chapter 2, the expected emphasis on the admissibility of photographic, motion picture, and videotape evidence is punctuated by a reminder that the Supreme Court has deemed unconstitutional the placement of a large screen between a young girl and her alleged assailant during her testimony in a child sexual abuse case.³

Highlights of Chapter 3 include a debunking of the horizontal gaze nystagmus test, and materials of sufficient depth to enable unsophisticated readers to understand the advantages and disadvantages of evidential breath testing, preliminary breath testing, and passive alcohol screening devices. Chapter 4 on speeding discusses both the sound principles and practical problems that may affect the validity and reliability of speed detection by RADAR (Radio Detection and Ranging), VASCAR (Visual Average Speed Computer and Record), and LASER (Light Amplification by Stimulated Emission of Radiation).

Emphasizing the critical distinction between professional (i.e., appropriately trained) document examiners and "graphologists," Chapter 5 reviews the principles and standards for comparison and decipherment of questioned documents.⁴ The materials revolve around three main issues. First, did the person (or machine) that supposedly wrote (or produced) a questioned document actually do so? Second, when was the document executed? Third, have any alterations or erasures been made on the document in question? By way of example, several pages address the dramatic role of handwriting analysis in the trial of Bruno Hauptmann, who was accused of kidnapping and killing the infant child of aviator Charles Lindbergh in 1932.

Following a brief review of the physical characteristics of firearms and ammunition, most of Chapter 6 deals with principles of firearms and toolmark identification and the detection of gunshot residue and trace elements. Chain of custody problems, testimonial conditions, and the admissibility of elemental analyses, firing distance determinations, and comparative micrographic analyses of bullets, shells, wadding, and pellets are also addressed. The authors underscore the lack of specificity of the historically influential, but now uniformly condemned, "dermal nitrate" and Harrison-Gilroy tests for gunshot residues.

Chapter 7 is exceptional in breadth as well as depth. Attorneys and forensic scientists will be hard pressed to find a more efficient

³See *Coy v Iowa*, 487 U.S. 1012 (1988).

⁴For a glimpse of the controversy surrounding the role of forensic document examiners, see e.g., *U.S. v Starzepyzel*, 880 F. Supp. 1027 (S.D.N.Y. 1995); *U.S. v Velasquez*, 1995 W.L. 519297 (3rd Cir. [Virgin Islands]), 8/31/95; Risinger, Denbeaux, Saks: Exorcism of ignorance as a proxy for rational knowledge: The lessons of handwriting identification "expertise". *U Pa L Rev* 1989;137:731.

(98-page) presentation of scientific and legal information on arson and explosives. A brief review of the chemistry of fire and explosives precedes discussion of scene investigation, indicators of arson, laboratory analysis of fire debris and explosive residues, and the admissibility of testimony concerning the cause and site of origin of a fire or explosion. Chapter 7 distinguishes administrative warrants (needed to inspect a premises for the cause and origin of a fire) from classic search warrants (needed to search for evidence of criminal activity).⁵

Fingerprints are used in law enforcement because the friction ridge patterns: a) differ among individuals, b) do not change during life, and c) can be systematically classified. Inked prints must be distinguished from latent prints, which are detected by magnetized or reagent powders, iodine or cyanoacrylate vapors, immersion in silver nitrate, or laser illumination. Chapter 8 advocates further development of automated fingerprint identification systems and stresses the lack of a valid basis for requiring a predetermined minimum number of friction ridge characteristics in two impressions in order to establish positive identification.

Microanalysis of hair, fibers, paint, glass, soil, cosmetics, wood, and other trace evidence is the subject of Chapter 9. The authors support the current recommendation that a known head hair sample consist of at least 20 hairs from each of five different areas of the scalp. Referring to a 1984 FBI Hair Comparison Report, they stress that: a) "hair comparisons are somewhat subjective"; b) "hairs must be compared in the same growth phase"; c) "hairs from a single body region of any one person vary in their characteristics and in the range of values attributable to any one characteristic"; d) "the value of a particular characteristic is usually not constant along successive portions of a single hair from root to tip"; and e) "the determination of which characteristics are unusual (and, therefore, uncommon) is an important part of the hair examiner's job."

Chapter 10 on voiceprints concludes that spectrographic voice recognition offers hope of becoming a reliable means of establishing identity, but only if the claims of the originators of the "voiceprint" technique can be substantiated by reliable, unbiased research. At this time, there is an insufficient basis for accepting the principle of voice uniqueness and the art of comparing voice spectrograms for the purpose of determining identity. By contrast, accident reconstruction experts who analyze skidmarks, tire imprints, scuff marks, yaw marks, scratches, gouges, and holes have convinced many judges and juries that they can create an accurate post accident picture of how and why the mishap occurred. Chapter 11 concludes that the opinions of these experts are properly admissible, even if there is eyewitness testimony, where it is necessary to rely on the expert's knowledge and application of principles of engineering, physics, and other sciences beyond the ken of the average juror.

The materials on forensic pathology (Chapter 12) focus on the history of coroner and medical examiner systems; the determination of cause, manner, and mechanism of death; the diagnosis of asphyxia, wounds, rape, poisoning, and burns; and the estimation of early and late postmortem intervals. Twenty well-chosen photographs illustrate the classic features of stab wounds and wounds caused by contact, close, or distant gunshots. The authors state that medical experts need not testify as to cause of death with a level of certainty "beyond a reasonable doubt." Many courts accept lesser degrees of certainty, including "possible," "probable," "likely," and "could have caused."

⁵See eg, *Michigan v Tyler*, 436 U.S. 499 (1978); *Michigan v Clifford*, 464 U.S. 287 (1984).

Forensic serologists typically identify stains as blood, determine the species origin of blood, identify human blood types, analyze blood spatters, detect sperm, individualize semen, and analyze saliva, feces, vomitus, sweat, urine, and other biologic material. These topics are addressed in Chapter 13, which also suggests that one who would testify on the significance of blood spatter patterns must show that he or she has personally conducted numerous tests, has knowledge of the literature, and has accumulated reference patterns on which to base an opinion.

Chapter 14 on forensic toxicology includes a list of 163 street names for various illicit substances and a twenty page overview of the pharmacology and laboratory analysis of opiates, cannabinoids, cocaine, barbiturates, amphetamines, and hallucinogens. A section on statutory control of drugs includes an update on the regulation of anabolic steroids, and a section on special defenses concludes that the cocaine isomer defense is dead.

Chapter 15 offers a timely tour-de-force on DNA typing. Federal prosecutor and guest author Ken Melson briefly reviews DNA biochemistry and the principles of RFLP-based typing and PCR-based typing. He covers the essentials of extraction, digestion, electrophoresis, and hybridization with single or multi-locus probes, and explains the factors that may influence the validity and reliability of DNA "fingerprinting" (i.e., mixed stains, partial digestion, star activity [excess cleavage by endonucleases], washes of reduced stringency, incomplete stripping, degradation, contamination, and environmental insults). Melson discusses the roles of the NRC "ceiling principle" and the Hardy-Weinberg equilibrium presumptions in the statistical evaluation of a DNA match, and concludes with materials on quality assurance, parentage testing, prosecution and defense strategies, DNA banking statutes, and legislative and judicial responses to the debate over the admissibility of DNA evidence.

Although statistical evidence for the individuality of human dentition is meager, the role of dental identification techniques in civil and criminal cases has increased in the last 20 years. Standards, guidelines, and methodologies have been (and continue to be) developed for comparisons of antemortem dental records of suspected victims with postmortem data from an unknown body, and for analyses of bite marks on various surfaces. Chapter 16 briefly reviews the principles of forensic odontology, explains how and why bite marks do not provide an accurate representation of the teeth that caused them, and underscores the willingness of most American courts to admit dental identification evidence despite the apparent inability of much of this evidence to meet the "general acceptance" standard of *Frye* or the reliability/validity standards of *Daubert*.

The stature of anthropology as a forensic discipline has grown during the 20th century. Since 1972, at least 53 appellate decisions have referred to the testimony of anthropologists; in addition, a handful of appellate courts have accepted bones as demonstrative evidence as long as the bones have some connection to the expert's testimony. Chapter 17 details how forensic anthropologists identify specimens as bone, determine the species origin of bone, estimate the age of bone, estimate the post mortem interval, and individualize bone on the basis of class and unique characteristics. Case examples are provided to demonstrate the use of anthropologic evidence to corroborate a confession, identify a decedent or perpetrator, identify ante, peri, or post mortem trauma, determine what instrument or event caused the trauma, or to determine if the trauma was sufficient to have caused death.

The final three Chapters (18, 19, and 20) address the role of behavioral science evidence in civil and criminal cases. Chapter

18 summarizes the main psychiatric disorders and characterizes three types of mental health professionals (psychiatrists, psychologists, and neurologists) as well as their testing methodologies (e.g., physical examination, radiographic procedures, personality-intelligence-psychomotor tests, and electroencephalograms). The authors document the widespread acceptance of testimony by all three types of experts, the refusal of courts to permit these experts to comment on witness veracity, the right of the prosecution to compel psychiatric examinations, the defendant's privilege against self-incrimination, and the defendant's right to a court-appointed psychiatrist.

Chapter 19 primarily covers insanity and related mental health defenses to crime, especially the battered spouse syndrome, the premenstrual syndrome, and post traumatic stress disorders. Also highlighted are the determinations of competency (to stand trial, to plead guilty, to waive counsel, and to be executed), and the procedural distinction between "acquittal by reason of insanity" and "guilty but mentally ill." Chapter 19 concludes with substantial sections on involuntary civil commitment, the prediction of future dangerousness, the unreliability of eyewitnesses, and mental health evidence in child custody cases.

The 20th and final chapter acquaints the reader with the nature, potential, and limitations of various techniques that attempt to detect deception. An extensive section on polygraph testing is followed by brief discussions of hypnosis, narcoanalysis, and voice stress analysis. The authors suggest that courts should not admit polygraph test results unless the examiner: a) possesses at least a baccalaureate degree; b) has received at least six months of internship training under an experienced, competent examiner, with a

sufficient volume of casework to afford frequent supervised testing in actual case situations; c) has at least 3 years of relevant field experience; d) can make the actual polygraph records available for cross-examination; and e) is permitted to use a standardized description of the nature and purpose of "control" questions.

Quibbles, Quirks, and Suggested Improvements

All great books can be improved. This reviewer's wish list for *Scientific Evidence in Civil and Criminal Cases* includes: A "pocket part" for periodic updates during the 5 to 10 year shelf-life of the book; more extensive materials on scientific fraud and misconduct in the public and private sectors; additional, well-chosen illustrations, perhaps some in color; and more extensive materials on hardware, software, Internet, and computer science issues and experts.

Summary

At \$48.95, *Scientific Evidence in Civil and Criminal Cases* is a superb buy for anyone seeking an introduction to the interface of law and forensic science. The logical organization and extensive references will save students, lawyers, and forensic scientists both time and money. Anyone giving this book a serious read will understand better what it means to recognize, preserve, document, collect, identify, compare, individualize, and reconstruct scientific evidence for legal purposes. Professors Moenssens, Starrs, Henderson, and Inbau have clearly improved their important (and hopefully continuing) contribution to the forensic literature.