

CHAPTER 12

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Forensic Science and Expert Testimony

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Cross-References:

- Breathalyzer and field sobriety tests, § 47.7, 47.8
- Discovery, ch. 16
- Expert testimony in child abuse cases, § 48.5
- Identification cases, ch. 18
- Researching experts through computer databases, § 11.3B(3)

§ 12.1 INTRODUCTION

The term *forensic evidence* is often used to describe the application of science to the law. Forensics includes a wide variety of disciplines that include physical sciences, biological and life sciences, behavioral sciences, computer sciences and more. The past two decades have seen exponential growth in the use of forensics in criminal cases.¹

Scientific evidence is ordinarily introduced through an expert witness who describes observations or scientific tests she has performed on a party or physical evidence in the case. The expert then interprets those tests or observations to assist the fact finder.

Admissibility of expert testimony is subject to the discretion of the trial judge and is a function of the following criteria: whether the expert is properly qualified;² whether the expert’s opinions rest on permissible factual bases: personal observation, facts in evidence, or facts of the sort upon which experts in the field routinely rely that are independently admissible³; “whether the reasoning or methodology underlying the testimony is scientifically valid *and* whether that reasoning or methodology properly can be applied to the facts in issue,”⁴; and whether the expert’s testimony is logically and legally relevant.⁵

Much has been written about the “CSI effect” in recent years. Some prosecutors, judges and journalists have claimed that the CSI effect causes juries to

¹ General learned treatises include P. C. Gianelli and E. J. Imwinkelried, *Scientific Evidence* (Lexis Nexis 4th ed., 2007); A. E. Moenssens, F. E. Inbau, and J. E. Starrs, *Scientific Evidence in Criminal Cases* (Foundation Press 4th ed., 1994); R. Saferstein, *Forensic Science Handbook* (Prentice Hall 2d ed. 2002) (contains a useful bibliography at pp. 131–60); and J. A. Tarantino, *Strategic Use of Scientific Evidence* (1989).

² *Commonwealth v. Ruiz*, 442 Mass. 826, 833-34 (2004); *Commonwealth v. Boyd*, 367 Mass. 169, 182–83, 326 N.E.2d 320, 328–29 (1975)

³ *Department of Youth Services v. A Juvenile*, 398 Mass. 516, 531–32, 499 N.E.2d 812, 821 (1986); *Commonwealth v. Russ*, 232 Mass. 58, 73, 122 N.E. 176, 182 (1919)

⁴ *Commonwealth v. Lanigan*, 419 Mass. 15, 26, 641 N.E.2d 1342, 1349 (1994) (emphasis added) (quoting *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 592–93 (1993)); see also *Commonwealth v. Gambora*, No. SJC-10472, 2010 WL 3421502, at *4-8 (Mass. Sept. 2, 2010); *Commonwealth v. Sliech-Brodeur*, 457 Mass. 300, 326-28 (2010); *Commonwealth v. Shanley*, 455 Mass. 752, 761-66 (2010)

⁵ See Massachusetts Guide to Evidence §§ 401-403 (2010).

acquit in the absence of forensic evidence. Recent studies reveal that is not necessarily the case.⁶

The proponent of scientific evidence often benefits from the apparent objectivity of the expert witness. A United States Justice Department report based on two studies of criminal cases, including interviews with 300 jurors and attorneys in four states, found that experts “were ranked by jurors as the most persuasive of all witnesses.” Victims of crimes were ranked next most persuasive, and defendants least persuasive. Even defense attorneys overwhelmingly believed that local crime laboratories, and the experts employed there, were accurate and impartial.⁷

Such a belief is unjustified. Even as early as 1978, a survey conducted by the Law Enforcement Assistance Administration (LEAA) examined the results from an average of 118 state and local crime laboratories. “Unacceptable” responses were submitted in 7 to 18 percent of drug identification tests, 28 percent of firearm identification tests, and 71 percent of blood characteristic tests.⁸

In addition to problems of basic incompetence in the gathering, preservation, and testing of physical evidence, mounting data show that counsel cannot be too skeptical when confronting “impartial” forensic evidence. Examples abound of “junk science” parading as scientific fact, and of pro-prosecution investigator bias extending, in some instances, to fabrication of evidence, false and misleading lab reports, and courtroom perjury.⁹ Dozens of crime lab scandals have been reported in the past twenty years.¹⁰

Pseudo experts such as police claiming to be drug behavior experts and detector dogs must also be approached with skepticism and discovery. The concerns for these types of pseudo experts include lack of accuracy, training, and the risk of jurors placing too much stock in the testimony of these pseudo experts in the courtroom.

The NAS “blockbuster” critique: In November, 2005, Congress passed an act which authorized the National Academy of Sciences to conduct a study of the needs of the forensic community. Their findings were published in February, 2009 in the report

⁶ See *The ‘CSI Effect’: Does It Really Exist*, by Honorable Donald E. Shelton at <http://www.nij.gov/journals/259/csi-effect.htm>; *Identifying And Measuring Juror Bias About Forensic Science Evidence*, slideshow at <http://www.slideshare.net/mbromby/identifying-and-measuring-juror-bias-about-forensic-science-evidence>.

⁷ Peterson, *Use of Forensic Evidence by the Police and Courts*, NATIONAL INSTITUTE OF JUSTICE RESEARCH IN BRIEF (Oct. 1987).

⁸ Jonakait, *Forensic Science: The Need for Regulation*, 4 HARV. J. L. & TECH. 109 (1991). In 1997 a report disclosed serious deficiencies in the nation’s “premier” crime laboratory, that of the FBI. See USDOJ/OIG Special Report, “The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases” (April 1997).

⁹ For an excellent discussion, please see Chapter 4 of the NAS report “The Principles of Science and Interpreting Scientific Data,” available at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>. See also Giannelli, *The Abuse of Scientific Evidence in Criminal Cases: The Need for Independent Crime Laboratories*, 4 VA. J. SOC. POL. & LAW 439, passim (1997); Giannelli, “Junk Science”: *The Criminal Cases*, 84 J. CRIM. L. & CRIMINOLOGY 105 (1993).

¹⁰ COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIS. CMTY., NAT’L RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 120 (2009) [hereinafter REPORT], at 44-48, available at <http://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>.

entitled “Strengthening Forensic Science in the United States: A Path Forward. This report, commonly referred to as the NAS Report, has been referred to as “cutting edge” and a “blockbuster” for its findings. It is a critique of many areas in forensics and concludes that many of the disciplines are deficient in standards, methodology and accreditation.

Based on two years of studies reviews and testimony, the NAS Report contains an introduction to forensic science, an analysis of the forensic science community and the need for integrated, independent governance, forensic science in litigation, the scientific method, descriptions and and recommendations for improvement a number of forensics areas,¹¹ The Report also includes information and recommendations for improving methods, practice and performance in forensic science; strengthening oversight of forensic science practice, education and training in forensics; and a review and recommendations relative to the medical examiner and coroner systems in the United States, AFIS (the automated fingerprint identification systems), and homeland security and forensic disciplines.

One of the NAS Report’s most important conclusions is that “[w]ith the exception of DNA analysis, . . . no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source.” The NAS Report details how opinions and conclusions are often “overstated” and labs and forensic scientists often lack objective independence from law enforcement.¹²

The NAS Report is a valuable tool for counsel who face forensics issues in their cases. It can serve as a framework for learning about the reliability and/or the weaknesses and shortcomings in various disciplines. The NAS Report emphasizes the need for standards, best practices, quality control and quality assurance. The NAS Report also emphasizes the need for standards that are clear and repeatable for analysis, interpretation and reporting of results, and standards that guard against error and bias. It is important for counsel to use the discovery phase of a case to obtain all the certifications and accreditations of laboratories and analysts , as well as their standards, protocols, and guidelines. One can look to the NAS Report for guidance on whether these are sufficient in a particular forensic area.

There have been multiple responses to the NAS Report in the forensics community as well as academia since its publication in 2009. Scientific working groups in the forensics disciplines have responded to the NAS Report. Studies have begun in various disciplines in response to the NAS Report. Articles have been written on the progress or the lack of progress that has been made in forensic science since the NAS published its recommendations. It is important for counsel to look beyond the NAS Report to the most recent developments in order to be current on the state of any forensic science and to fully prepare forensic aspects of a criminal case.

In light of the NAS Report and in the wake of a number of court decisions, Judge Gertner of the U. S. District Court, Massachusetts, issued a Procedural Order in 2010 relative to trace evidence. She wrote that the NAS Report “called for sweeping changes in the presentation and production of evidence of identification involving fingerprints, bullets, handwriting, and other trace evidence.” The order requires counsel no later than two months before a pretrial conference to indicate, in instances

¹¹ These include biological evidence and DNA, controlled substances, friction ridge analysis, shoe and tire prints, toolmark and firearm identification, hair and fiber analysis, explosives and fire debris, bitemark, bloodstain pattern analysis, and digital/multi-media analysis.

¹² NAS Report, described *supra* at sec. 12.1

where counsel is appointed, whether expert funds are sought to deal with the trace evidence and whether all discovery obligations have been met or whether additional discovery is required.

The order further requires counsel at or prior to a pretrial conference to identify whether or not they seek to introduce trace evidence, whether or not either party seeks a Daubert/Kumho hearing prior to trial and to indicate what witnesses and exhibits will be required for the Daubert/Kumho hearing. Judge Gertner commented that while in the past, admissibility of this type of evidence was presumed, the NAS Report suggests a “different calculus” in which the question of admissibility of trace evidence should be examined carefully in each case.¹³

Unfortunately, to date, the Supreme Judicial Court in Massachusetts has not yet taken the same approach to forensic evidence. However, in a firearms identification case in 2011, the SJC issued guidelines that require firearms examiners to document observations and findings that support the examiners’ opinions, and that require any measurements, notes, sketches, and photographs to be provided to defense counsel in discovery. This case can be analogized to require detailed discovery in other types of cases with forensics issues.¹⁴

As a result of advances in forensic science disciplines as well as the NAS Report, experts whose testimony is based primarily on observations and experience, rather than scientific tests, have also come under fire. Though this testimony is commonly not the result of laboratory testing, and may even be refuted by laboratory testing, many jurors and judges are inclined to believe those with years of experience who purport to be experts, even when the experience is outdated and no longer scientifically valid. Many of these troubling forensic areas are improving with increasing modernity, but some still pose significant risks.

§ 12.2 DEVELOPING DEFENSE EVIDENCE

§ 12.2A. SOURCES OF BACKGROUND INFORMATION

The effective defense attorney must be sufficiently aware of the forensic sciences to recognize a gap in the state’s case or an opportunity to develop scientific evidence for the defense. Handbooks and textbooks provide an overview, and periodicals are a necessary supplement, including periodicals aimed at prosecutors or police. In recent years, the internet has become a tremendous forensics resource. In some areas with rapidly increasing technology, the Internet provides the most up-to-date information. Web sites, texts, and periodicals are listed below in this section.

In addition, counsel should consult the latest CPCS Training Conference Materials on forensics, and other materials oriented toward Massachusetts criminal

¹³ The Procedural Order on trace evidence can be accessed at <http://www.mad.uscourts.gov/boston/pdf/ProcOrderTraceEvidenceUPDATE.pdf>

¹⁴ *Commonwealth v. Heang*, 458 Mass. 827, 845 (2011) (“An evidentiary Daubert-Lanigan hearing is generally not required where we have previously admitted expert testimony of the same type, where the testimony is offered for the same purpose, and where there is no factual issue as to whether the expert is qualified, whether the appropriate methodology has been followed, or whether the quality of the evidence is sufficient to permit an opinion. See *Commonwealth v. Shanley*, 455 Mass. 752, 763 n.15, 919 N.E.2d 1254 (2010); *Commonwealth v. Frangipane*, 433 Mass. 527, 538, 744 N.E.2d 25 (2001); *Mass. G. Evid.*, *supra*.”)

defense.¹⁵ Counsel must also familiarize themselves with the NAS Report as well as the most recent studies, articles, and standards concerning the NAS findings that continue to be produced in response to its publication.

1. Major web sites:

- <http://www.forensicpage.com/>. Reddy's Forensic Home Page contains lists of books and websites for dozens of forensic topics, including ballistics, fingerprints, forensic pathology, forensic toxicology, trace evidence, arson, and many others. This is an excellent gateway to other links and sites.
- <http://www.crimeandclues.com>. This is a good site with which to begin your education about techniques in the following areas: crime scene investigation, fingerprint evidence, physical evidence, demonstrative evidence, testimonial evidence, death investigation, and expert witness testimony. A criminal investigation discussion forum is also available.
- <http://www.crimelynx.com>. A beginning source for criminalistics and forensic information.
- <http://www.crimespider.com>. Crime Spider searches for the best crime and law enforcement sites and categorizes topics.
- <http://www.kruglaw.com>. This site contains links to over 1,500 sites on topics from forensics to law.
- <http://www.ncstl.org/> National Clearinghouse for Science, Technology, & the Law at Stetson University College of Law. A huge compilation of free forensic resources from DNA to dog sniff testimony.
- <http://www.nfstc.org/> National Forensic Science Technology Center offers free DNA and general forensic science training tutorials on its website.
- <http://www.dna.gov/> The DNA Initiative hosts free training, tutorials, and useful links and tools for counsel on DNA. An excellent resource to get an understanding of DNA as a science and evidence.
- <http://www.tncrimlaw.com/forensic/> Carpenter's Forensic Science Resources

¹⁵*See, e.g.,* The training section of the CPCS website is at http://www.publiccounsel.net/Training/training_index.html: GOLDBACH et al, CSI 7 ACCIDENT RECONSTRUCTION (MCLE 2009); PAGE (ED.), TRYING SEX OFFENSE CASES IN MASSACHUSETTS, chs. 7, 10 (2 vols., MCLE, 2010); PAGE TIPTON et al, TRYING MURDER AND OTHER HOMICIDE CASES IN MASSACHUSETTS (2 vols. MCLE 2004). The training director at CPCS also retains materials from the various CPCS Annual and Public Defender Conferences.

- There are also a number of technical and scientific working groups that focus on forensic research, e.g. the Scientific Working Group on Digital Evidence (<http://www.swgde.org>), Scientific Working Group for the Analysis of Seized Drugs (<http://www.swgdrug.org>), Scientific Working Group on Friction Ridge Analysis, Study, and Technology (<http://www.swgfast.org>), Scientific Working Group for Firearms and Toolmarks (<http://www.swggun.org>), the Scientific Working Group on Shoeprint and Tire Tread Evidence (<http://www.swgtread.org>), and the Technical Working Group on Fire and Explosions (<http://www.twgfex.org>).

Topical Internet for news reports on forensics may give insight into hot topics under current debate. These searches should be followed up with more in-depth forensic research from the above links or respected professional forensic organizations and practitioners.

2. *Some helpful textbooks:*

- A. Jamieson and A. Moenssens, *Wiley Encyclopedia of Forensic Science* (2009)
- Werner U. Spitz, ed., *Medicolegal Investigation of Death, Guidelines for the Application of Pathology to Crime Investigation*, Fourth Edition (Charles C. Thomas, Publishers, Springfield, IL 2005)
- Vincent J.M. DiMaio, and Suzanne E. Dana, *Handbook of Forensic Pathology, Second Edition* (CRC press 2006)
- Andre A. Moenssens, James E. Starrs, Carol E. Henderson & Fred E. Inbau, *Scientific Evidence in Civil and Criminal Cases* (The Foundation Press, Inc., New York 2007 and 2009 supplement)
- Keith Inman & Norah Rudin, *An Introduction to Forensic DNA Analysis*, Second Edition (CRC Press LLC 2001)
- Hon Peter M. Lauriat and Hon. James F. McHugh et al, *Massachusetts Expert Witnesses, Second Edition* (2 volumes) (MCLE 2010)
- Stephanie Page, ed., *Trying Sex Offense Cases in Massachusetts*, chs. 7, 10 (2 vols., MCLE, 2010)
- Stephanie Page, Larry R. Tipton et al, *Trying Murder and Other Homicide Cases in Massachusetts* (MCLE, 2004, supplemented regularly)
- Richard Saferstein, Criminalistics, *An Introduction to Forensic Science*, (10th ed. 2010); Richard Saferstein, *Forensic Science Handbook*, Vols. 1-3 (Prentice Hall, Inc., Englewood Cliffs, NJ 2001)

- Henry C. Lee, George M. Taft & Kimberly A. Taylor, *Forensic Science Today*, (Lawyers & Judges Publishing, 2006)
- Giannelli & Imwinkelried, *Scientific Evidence* (Lexis Law Publishing 2007)
- John J. Lentini, *Scientific Principles for Fire Investigation* (CRC Press, to be published August 31, 2012)
- Hinkle et al., *Expert Testimony in Criminal Cases* (MCLE 1997)

3. *Useful periodicals:*

- *Journal of Forensic Sciences*, published by American Academy of Forensic Sciences, P.O. Box 669, Colorado Springs, CO 80901-0669; *The Expert and the Law*, newsletter of the National Forensic Center. This journal is also available online at <http://www.aafs.org> for an annual subscription fee. There is a charge of \$25 to obtain individual articles without a subscription.
- *The Champion*, published by the National Association of Criminal Defense Lawyers (NACDL).

§ 12.2B. FINDING AN EXPERT

Having identified an area requiring expertise, the next task is to find an expert. Word of mouth is the best way to locate experts used by the local defense bar. Referral from another lawyer provides access to such important information as the expert's reliability, promptness, confidentiality, and performance on the witness stand. Some of these are former employees of police departments or the state police crime laboratory who have retired and now practice privately. In some instances, former law enforcement experts may be appropriate for a particular case but on some occasions, counsel may need to seek experts with different backgrounds. For appointed counsel, the Committee for Public Counsel Services (CPCS) has a Forensic Services Director, who maintains names, resumes, and testimony transcripts of forensic experts, including those of experts commonly used by the state.¹⁶

The National Directory of Expert Witnesses, published annually by the National Forensic Center, is a useful sourcebook listing experts available for forensic consultation by field of expertise, both nationally and by state. This listing is also available through the Westlaw and Lexis-Nexis computer research systems. The National Forensic Center also provides an online search function and email forms for requesting information on experts.¹⁷ Commercial expert-finding services also exist,

¹⁶ "Forensic Resource Lists" are available to appointed counsel from CPCS by contacting Anne Goldbach, Forensic Services Director, at agoldbach@publiccounsel.net or 617 988-8337.

¹⁷ <http://www.national-experts.com>; National Forensic Center, P.O. Box 3161, Princeton, NJ 08540, tel. (609) 883-0550, (800) 526-5177.

although their focus may be more on lucrative civil litigation.¹⁸ Listings of expert witnesses can also be found in numerous websites on the Internet.¹⁹

When choosing an expert, counsel must conduct thorough research to determine the appropriate expert for a particular case. Counsel should examine the curriculum vitae of prospective experts before making a decision. Is the expert's education appropriate to the investigation? An emergency room internist, although an M.D., might not be competent to determine the cause of a wound, while a pathologist could do so.²⁰ Are there boards of registration within the expert's discipline, and if so, is the expert board-certified? Membership in professional associations may show only that the expert knows how to pay dues. If the expert seems qualified, further information should then be obtained by ascertaining the expert's reputation and/or by an initial interview. The initial interview should include a discussion of the case and the potential forensic issues. Counsel should make sure that the expert's experience is appropriate to the case. She should find out whether or not the expert has been qualified as such in court before. Case searches using the expert's name in Westlaw or LexisNexis may elicit prior mention, either positive or negative, by judges. Counsel should determine the number of times an expert has testified for the government and for the defense. Counsel should also ask the expert if there are weaknesses in their experience or training that could make them vulnerable to cross-examination. In some instances, it is advisable to obtain names of attorneys who have worked with the expert in the past, so that counsel can further evaluate the skills and effectiveness of the expert. If the expert is to testify, counsel may wish to personally critique the expert's weaknesses to preemptively identify any problem areas to be dealt with before direct examination and to extract the differences between counsel's expert and the prosecution's expert.

Finally, fees for testing and testimony should be discussed in advance, as costs may vary widely. As discussed *infra* in § 12.2E, appointed counsel has access through CPCS to funds for the development of scientific evidence.

§ 12.2C. ENSURING CONFIDENTIALITY

Confidentiality is a critical consideration in choosing an expert because the forensic investigation commissioned by the defense may turn out to support the state's accusations. When an expert is privately retained and the evidence to be examined is not in the prosecution's custody, a written agreement as to confidentiality should suffice. Reciprocal discovery obtainable by the prosecution under Mass. R. Crim. P.

¹⁸ See, e.g., Expert Network, A Division of DJS Associates, 1603 Old York Road, Abington, PA 19001, tel. (215) 659-2010 (can serve Massachusetts); Technical Advisory Service for Attorneys (TASA), 1166 DeKalb Pike, Bluebell, PA 19422, tel. (617) 482-6161, (1-800) 523-2319.

¹⁹ See, e.g., <http://www.forensic.org/>; <http://expertpages.com/index.htm>; <http://www.robsonforensic.com/>; http://www.martinelliandassoc.com/forensic_experts.html. (These are listed for informational purposes only and are not an endorsement of any particular websites.) By going to the CPCS website, <http://www.publiccounsel.net> and clicking Practice Areas > Criminal > Defender Links, you will find numerous forensic websites. One hyperlink, "Experts - Checking Them Out", will take you to websites that help check an expert's credentials.

²⁰ See *Commonwealth v. Neverson*, 35 Mass. App. Ct. 913 (1993) (judge properly excluded expert's opinions that did not relate to expert's field of expertise); *Commonwealth v. Cadwell*, 374 Mass. 308, 315 (1978).

14(a)(1)(B) applies only to material that the defendant intends to use at trial. Thus, adverse expert opinion is not discoverable and is protected unless the expert is called as a defense witness.²¹

When funds must be obtained through the court or the evidence to be examined is in police custody, the confidentiality of a defense expert's findings may be preserved by a protective order from the court.²² The Supreme Judicial Court has characterized as "unethical" an attempt by a prosecutor to uncover defense experts by reviewing bills submitted to the court and has held that failure to develop scientific defense evidence due to fear that the prosecutor will obtain it constitutes ineffective assistance of counsel.²³

§ 12.2D. ACCESS TO EVIDENCE ²⁴

Some potential evidence may be readily available to defense experts, such as the defendant's body fluids and mental status. More often, the evidence to be analyzed — for example, drugs; fingerprints; victim's or perpetrator's body fluids, hairs, or fibers; weapons or spent ammunition, and so on — is in police custody.

If the prosecution alters, destroys, or otherwise denies defense access to evidence for the purpose of scientific examination or testing, the defendant's state and federal constitutional rights may be violated.²⁵ The right to access to evidence for

²¹ Counsel must be very careful in crafting or amending a pre-trial conference report to limit reciprocal discovery to expert witnesses, reports and statements of persons *to be called at trial*. See *Commonwealth v. Reynolds*, 429 Mass. 388, 396–398 (1999); *Commonwealth v. Haggerty*, 400 Mass. 437, 441 (1987). *Haggerty* further notes that it would be unethical for the prosecution to call as a witness an expert retained but not called by defense counsel. See also *Thompson v. Commonwealth*, 386 Mass. 811, 819 (1982) (report by doctor pursuant to court ordered independent medical examination of indigent person "should be treated the same as if the physician had been hired privately").

²² *Commonwealth v. Haggerty*, 400 Mass. 437 (1987).

²³ *Commonwealth v. Haggerty*, 400 Mass. 437 (1987).

²⁴ See full discussion *infra* §§ 16.6A and 16.6B.

²⁵ *Commonwealth v. Williams* 455 Mass 706 (2010) "When a defendant makes a claim that the government has lost or destroyed potentially exculpatory evidence, it makes sense that he or she should bear the initial burden of demonstrating the exculpatory nature of that evidence, using the *Neal* "reasonable possibility, based on concrete evidence" formulation. *Neal*. 392 Mass. at 12. We therefore hold that the defendant will be required to meet this threshold burden in order to advance a claim for relief. If the defendant does meet the burden, then, as indicated in, for example, *Commonwealth v. Cintron*. 438 Mass. at 784, and the other cases that have followed the lead of *Commonwealth v. Olszewski*. 416 Mass. at 714 (*Olszewski II*), the judge, or the court on appeal, must proceed to balance the Commonwealth's culpability, the materiality of the evidence, and the prejudice to the defendant in order to determine whether the defendant is entitled to relief." *Commonwealth v. Harwood*, 432 Mass. 290, 295 (2000) ("When a defendant claims he is prejudiced by missing evidence, a judge must weigh the materiality of the evidence and the potential prejudice to the defendant, as well as the culpability of the Commonwealth and its agents"; - loss of documents by the Commonwealth deprived the defense of an opportunity to authenticate handwriting in document, and witness's testimony regarding document is therefore suppressed); *Commonwealth v. Olszewski*, 401 Mass. 749 (1988) (loss or destruction of highly relevant evidence by the Commonwealth deprived the defendant of the opportunity effectively to present a defense); *Commonwealth v. Gomes*, 403 Mass. 258, 275 (1988) (no new trial from state's failure to photograph electrophoretogram, since no agreement and no prejudice); *Commonwealth v. Gliniewicz*, 398 Mass. 744, 749 (1986) (new trial warranted under Mass. R. Crim. P. 11 by state's destruction of

examination or testing is part of the right to present a defense under both the due process clause of the Fifth Amendment²⁶ and the compulsory process clause of the Sixth Amendment²⁷ of the U.S. Constitution, applied to the state by the Fourteenth Amendment. Article 12 of the Massachusetts Constitution Declaration of Rights explicitly guarantees the “right to produce proofs, that may be favorable” to the defendant.²⁸

Interference by the prosecution with the defendant’s access to evidence and development of exculpatory evidence by forensic scientific techniques may deny the defendant due process, requiring dismissal.²⁹ The remedy will depend on the culpability of the prosecution, materiality of the evidence, and prejudice to the defense.³⁰

items by blood testing, in violation of pretrial agreement); *Commonwealth v. White*, 47 Mass. App. Ct. 430, 433-435 (1999) (Commonwealth's destruction of cocaine despite defendant's specific request for its preservation prevented defendant from testing which might have supported particular defense); *Commonwealth v. Sasville*, 35 Mass. App. Ct. 15, 27-29 (1993) (Commonwealth's failure to preserve fetus aborted from alleged rape victim deprived defendant of opportunity to show non-paternity through blood testing).

Where the prosecution seeks to perform potentially destructive tests on the evidence, the prosecutor will either request the court’s permission or notify the defense that a defense expert can observe the exhaustive testing. In the case of exhaustive DNA testing, both the Boston Police and Massachusetts State Police labs have policies that provide for observation at some or all of the stages of exhaustive DNA testing. The new policy at Massachusetts State Police DNA Unit, POLDNA-02, (June 9, 2010) states that even if the biological evidence is exhausted, when there is enough purified genomic DNA such that re-analysis requires less than or half of the of the remaining extract, the defense expert will not be permitted to observe any further steps in the analysis. Regarding lost or destroyed evidence, *see generally infra* § 16.6B, MSP POLDNA-02 (version2.0)

Where a defendant made a specific request for *existing* exculpatory evidence that the government improperly failed to disclose or withheld, the standard is that “a defendant need only demonstrate that a substantial basis exists for claiming prejudice from the nondisclosure.” *Commonwealth v. Tucceri* 412 Mass. 401, 405-408 (1992)

²⁶ *Wardius v. Oregon*, 412 U.S. 470, 474–76 (1973) (due process requires balance of forces between defense and prosecution); *Brady v. Maryland*, 373 U.S. 83, 87 (1963) (suppression of material evidence, even in good faith, violates due process); *United States v. Augurs*, 427 U.S. 97, 112 (1976) (same). *See also* *Commonwealth v. Woodward*, 427 Mass. 659, 678–680 (1998) (“When potentially exculpatory evidence is lost or destroyed, a balancing test is employed to determine the appropriateness and extent of remedial action.”).

²⁷ *United States v. Valenzuela-Bernal*, 458 U.S. 858, 867 (1982); *Washington v. Texas*, 388 U.S. 14, 16 (1967).

²⁸ *See* *Commonwealth v. Balliro*, 349 Mass. 505, 517 (1965) (art. 12 right of access to potential witnesses and to present defense).

²⁹ *California v. Trombetta*, 467 U.S. 479, 485 (1984). However, failure to preserve an alcohol breath test sample was not found a violation. *See* *Commonwealth v. Sasville*, 35 Mass. App. Ct. 15 (1993) *See also infra* § 16.6B.

³⁰ *Commonwealth v. Woodward*, 427 Mass. 659, 678–680 (1998) (loss of potentially exculpatory evidence was prejudicial but did not require dismissal; defendant’s request that case not be remanded for trial obviated need to consider reversal and exclusion of evidence at new trial); *Commonwealth v. Phoenix*, 409 Mass. 408, 415 (1991) (new trial not required despite Commonwealth’s negligent destruction of evidence where other evidence supported Commonwealth’s theory); *Commonwealth v. Olszewski*, 401 Mass. 749, 753–58 (1988); *Commonwealth v. Willie*, 400 Mass. 427, 431 (1987) (remand after semen stain destroyed; enunciation of balancing test); *Commonwealth v. Neal*, 392 Mass. 1, 12 (1984) (no right to

Even if the prosecution is cooperative, gaining access to evidence in police possession for defense testing will reveal the fact of the defendant's development of scientific evidence and often the identity of the defense expert, underscoring the importance of a confidentiality agreement with the expert.³¹

§ 12.2E. COSTS

The indigent defendant is entitled to be provided the same resources for defense preparation that the ordinary nonindigent person in the defendant's position would expend.³² Appointed counsel may obtain funds to retain forensic experts by motion under G.L. c. 261, § 27C.³³ In considering the motion for fees and costs, "the judge may look at such factors as the cost of the item requested, the uses to which it may be put at trial, and the potential value of the item to the litigant."³⁴ If the court denies the

preservation of blood alcohol test ampoules); *United States v. Arra*, 630 F.2d 836 (1 Cir. 1980). *But see Arizona v. Youngblood*, 488 U.S. 51 (1988) (failure to preserve potentially exculpatory semen samples not due process violation absent bad faith).

³¹ *See supra* § 12.2C.

³² *Commonwealth v. Lockley*, 381 Mass. 156 (1980). *See also* Mass. R. Crim. P. 41 (court may appoint experts); "Documents and Experts," *Crim. Prac. Man.* (BNA) No. 35, 21: 401-431 (Nov. 1989) (discussion of statutory and constitutional bases for right to funds, including sample motions). The SJC has recognized that "the prosecution has no proper role to play in a defendant's motion for defense funds unless the judge requests the prosecution's participation." *Commonwealth v. Dotson*, 402 Mass. 185, 187 (1988); *see also Commonwealth v. Baker*, 440 Mass. 519, 526 (2003).

CPCS has published the Guidelines for the use of experts on the web, available at http://www.publiccounsel.net/private_counsel_manual/private_counsel_manual_pdf/chapters/manual_chapter_6.pdf. It has also published CPCS Qualifications and Rates for Investigators, Social Service Providers and Expert Witnesses (June 2002, revised December 2005, June, 2007, August, 2008, October 2008 and December 2008), available on the web at http://www.publiccounsel.net/billing_information/expert_qualifications_and_rates/expert_qualifications_and_rates_index.html

³³ General Laws c. 261, § 27C requires that counsel file a written motion that states that the requested expenses are "reasonably necessary" to the preparation of the defense. The test of "reasonableness" is "whether the item is reasonably necessary to prevent the party from being subjected to a disadvantage in preparing or presenting his case adequately in comparison with one who could afford to pay for the preparation which the case reasonably requires." G.L. c. 261, § 27C. General Laws c. 261, § 27C also requires that counsel file a written affidavit containing a statement of facts that support the request for funds and verify that the defendant is indigent.. While some judges require an affidavit of indigency that is signed by the defendant on a form prescribed by the Supreme Judicial Court, it ordinarily should suffice to file an affidavit of indigency signed by defense counsel in which counsel recounts the trial court's earlier determination that the defendant is indigent and the fact that the defendant's financial situation has not changed.

Section 27C(4) provides funds only for "prosecution, defense or appeal." But defense counsel may also obtain funds for a convicted defendant's motion for new trial, following a 2001 amendment to Mass. R. Crim. P. 30(c)(5). This rule now provides that the motion judge, "after notice to the Commonwealth and an opportunity to be heard, may ... exercise discretion to allow the defendant costs associated with the preparation and presentation of a motion under this rule."

³⁴ "Defendant's trial counsel is under a duty imposed by both State and Federal constitutional law to conduct an independent investigation of the facts, including an investigation of the forensic, medical, or scientific evidence..." *Commonwealth v. Greineder*,

motion, the defendant has a right to interlocutory appeal.³⁵ From the district court, appeal lies to the appellate division, from the juvenile court to the superior court in the nearest county or Suffolk, and from the superior court to a single justice of the appeals court.³⁶ The notice of appeal must be filed within seven days of denial of the motion; the motion judge is then required to make written findings. The appellate court may stay the lower court proceedings.

If appointed counsel fails to obtain needed funds by motion and appeal to the courts, she should apply to the chief counsel of CPCS, who may provide funds in certain cases.

Defense strategy may occasionally require that funds be sought without notice to the prosecution. Both *Commonwealth v. Haggerty*³⁷ and *Commonwealth v.*

458 Mass. 207, 248 (2010), citing *Commonwealth v. Baker*, 440 Mass. 519, 529 (2003), and citing in support: *Commonwealth v. Alvarez*, 433 Mass. 93, 103-104, 740 N.E.2d 610 (2000); *Commonwealth v. Farley*, 432 Mass. 153, 156-157, 732 N.E.2d 893 (2000); *Commonwealth v. Robiero*, 428 Mass. 278, 281, 700 N.E.2d 830 (1998); *Commonwealth v. Haggerty*, 400 Mass. 437, 441-442, 509 N.E.2d 1163 (1987). See also *Strickland v. Washington*, 466 U.S. 668, 690-691 (1984); *Wiggins v. Smith*, 539 U.S. 510 (2003), and *Williams v. Taylor*, 529 U.S. 363, 395-396 (2000) citing 1 ABA Standards for Criminal Justice 4-4-1, commentary, p. 4-55 (2d ed. 1980). *Commonwealth v. Lockley*, 381 Mass. 156, 161 (1980).

For detailed advice on how to obtain needed funds for expert services, see http://www.publiccounsel.net/private_counsel_manual/CURRENT_MANUAL_2010/Ch.6.pdf. Counsel may consider in arguing a motion for funds: disabusing judges of the common misperception that approved expenditures come from the trial court's budget; stressing the defendant's right to reasonably necessary services that would be obtained by a defendant who could afford them, not to a "million dollar defense;" ways to anticipate and meet judicial concerns that the requested sum is excessive; and requesting leave, in the original motion, to seek supplemental funds at a later date.

³⁵ G.L. c. 261, § 27D. This section was amended on July 20, 1992 (St. 1992, c. 133, § 563). The amendment discarded what was previously a right to a "speedy hearing" on this appeal, in favor of a right to a "speedy decision" on the appeal. See *supra* § 8.4B. In 2004, this section was amended to read: "If the matter arises in the superior, the land, the probate or the housing court departments, the appeal shall be to a single justice of the appeals court at the next sitting thereof. If the matter arises in the juvenile court department, the appeal shall be to the superior court sitting in the nearest county or in Suffolk county. If the matter arises in the district court or Boston municipal court departments, the appeal shall be to the appellate division."

The defendant has seven days in which to file a notice of appeal. See *Commonwealth v. Clark*, 67 Mass. App. Ct. 832, 833 (2006) ("[a]n explicit statutory appeal period cannot be extended in the court's discretion"). The notice of appeal must be filed with the clerk of *the court that heard the motion*. If the motion was heard in Superior Court, the clerk will forward the appeal to a single justice of the Appeals Court. If the motion was heard in district court, the appeal will be heard in the appellate division. If the motion was heard in juvenile court, the appeal will be heard in the Superior Court. See *Donald v. Commonwealth*, 452 Mass. 1029 (2008) (where defendant filed appeal with wrong court, single justice's denial affirmed and appeal transferred to correct court). The judge who denied the motion has three days to make written findings. Either court may issue a stay of the proceedings pending the resolution of the appeal.

³⁶ In either instance, the decision of the interlocutory judge is final, and the issue is not available for normal appellate review. *Commonwealth v. Pope*, 392 Mass. 493, 502 (1984); G.L. c. 261, § 27D. However, counsel should consider resort to a petition to the S.J.C. single justice under G.L. c. 211, § 3, see *infra* § 45.4A.

³⁷ 400 Mass. 437, 441 (1987).

*Dotson*³⁸ may support a motion for an ex parte hearing on a defendant's motion for funds. If such a request is denied, the funds are essential and notice to the prosecution would be detrimental, appointed counsel should again apply to the chief counsel of CPCS for special funds.

§ 12.3 ADMISSIBILITY AND WEIGHT OF SCIENTIFIC EVIDENCE³⁹

Expert testimony regarding scientific, technical or other specialized knowledge functions to help the trier of fact to understand the evidence in a case or help to determine a fact in issue in a case. A witness may qualify as an expert by virtue of training, education, knowledge or skill. An expert's testimony must be based on adequate information and data, on reliable principles and methods within the area of expertise, and a reliable application to the facts or issues in the case.

§ 12.3A . RELEVANCE OF SUBJECT MATTER

Scientific opinion evidence is admissible as relevant in the court's discretion *if the ordinary juror lacks sufficient knowledge to interpret the facts in evidence.*⁴⁰ Thus exclusion of expert testimony by a psychologist on the accuracy of eyewitness identification has been upheld as within the court's discretion,⁴¹ but that of an

³⁸ 402 Mass. 185, 187 (1988). This case and *Commonwealth v. Haggerty*, 400 Mass. 437 (1987), appear to preempt Super. Ct. R. 54, which requires notice of a motion for expert funds to the prosecution and an opportunity to be heard.

³⁹ See Massachusetts Guide to Evidence, §7.702, which is based on Fed. R. Evid. 702 and Proposed Mass. R. Evid. 702. For further discussion see LIACOS, BROWN & AVERY, HANDBOOK OF MASSACHUSETTS EVIDENCE (8th ed. 2006 & supplemented annually).

⁴⁰ See *Commonwealth v. Heang*, 458 Mass. 827 (2011); *Commonwealth v. Shanley*, 455 Mass. 752, 761 (2010) "The role of expert testimony is to assist jurors in interpreting evidence that lies outside their common experience. The proponent of such testimony bears the burden of establishing that it 'will assist the trier of fact to understand the evidence or to determine a fact in issue,' Mass. G. Evid. § 702 (2008-2009), and that the methodology or theory underlying the expert testimony is sufficiently reliable to be presented for the jury's consideration." See also *Commonwealth v. Little*, 453 Mass. 766, 768 (2009); *Commonwealth v. Miranda*, 441 Mass. 783, 792-793 (2004); *Commonwealth v. Crawford*, 429 Mass. 60 (1999) (expert on battered women's syndrome should have been allowed to testify at motion to suppress and at trial to assist in determining voluntariness of defendant's confession); *Commonwealth v. Pike*, 431 Mass. 212 (2000)(lengthy discussion on battered women's syndrome; motion judge found the defendant's claim of battered women's syndrome was false); *Commonwealth v. Fournier*, 372 Mass. 346, 350 (1977); *Commonwealth v. Devlin*, 365 Mass. 149, 152 (1974).

⁴¹ See *Commonwealth v. Pagano*, 47 Mass. App. Ct. 55 (1999) (trial judge has broad discretion whether to admit expert testimony on voice identification); *Commonwealth v. Watson*, 455 Mass. 246, 257 (2009); (pursuant to G. L. c. 261, § 27B, an indigent party may request payment by the Commonwealth of fees and costs associated with litigation, including funds to hire an expert witness on eyewitness identification. See *Commonwealth v. Zimmerman*, 441 Mass. 146, 152-153, 804 N.E.2d 336 (2004)."); *Commonwealth v. Bly*, 448 Mass. 473, 495 (2007); *Commonwealth v. Kent K.*, 427 Mass. 754 (1998); *Commonwealth v. Ashley*, 427 Mass. 620 (1998); *Commonwealth v. DiBenedetto*, 427 Mass. 414 (1998), and *Commonwealth v. Santoli*, 424 Mass. 837, 838-840 (1997) (all cases stating that defendant does

ophthalmologist was allowed where the eyewitness had impaired vision.⁴² An expert witness may not give an opinion about the defendant's guilt⁴³ or the credibility of a witness.⁴⁴

not have a right to present expert testimony on eyewitness identification, and trial judge has broad discretion); *Commonwealth v. Walker*, 421 Mass. 90 (1995) (expert testimony on cross-racial identifications excluded) (citing *Commonwealth v. Francis*, 390 Mass. 89, 101 (1983)).

⁴² *Commonwealth v. Sowers*, 388 Mass. 207, 218 (1983). *See also* *Commonwealth v. Cyr*, 425 Mass. 89, 96–97 (1997) (no abuse of discretion to allow medical examiner to opine that wounds on victim could be characterized as defensive wounds).

⁴³ *Commonwealth v. Dancy*, 75 Mass. App. Ct. 175, 183 (2009) (stating that “the use of narcotics police to testify as experts in drug cases has been consistently upheld” but “[d]efinitive testimony by police experts as to the occurrence of a drug deal is improper”); *Commonwealth v. Rivera*, 425 Mass. 633, 645 (1997) (error to allow police officer to testify over objection that, based on his training and experience, activity he observed was drug transaction; testimony “exceeded bounds of admissible expert testimony” but error harmless). “An expert’s opinion within the domain of his professional knowledge may be admissible even if the testimony touches on the ultimate issue before the jury, but the expert may not offer an opinion as to the defendant’s innocence or guilt.” *Commonwealth v. Woods*, 419 Mass. 366, 374–75 (1995) (police testimony that defendant was involved in a drug sale was, in effect, expert opinion on defendant’s guilt; this “impermissibly intruded on the jury’s vital fact finding function,” but the error was harmless) (citing *Simon v. Solomon*, 385 Mass. 91, 105 (1982), and *Commonwealth v. LaCorte*, 373 Mass. 700, 705 (1977)). *See also* *Commonwealth v. Lovejoy*, 39 Mass. App. Ct. 930 (1995) (admission of police testimony that defendant was engaged in a drug transaction and that a driver “swallow[ed] some crack cocaine” was reversible error); *Commonwealth v. Pallotta*, 36 Mass. App. Ct. 669 (1994) (reversible error to exclude expert opinion that defendant’s alleged mental defect was direct cause of lack of criminal responsibility). *But see and compare facts in* *Commonwealth v. Tanner*, 45 Mass. App. Ct. 578 (1998) (police officer’s testimony “from my experience, I believed a drug transaction had taken place” did not require reversal as it was insufficiently prejudicial; includes detailed discussion on police testimony and expert opinion evidence at 579–582); *Commonwealth v. Pike*, 430 Mass. 317, 324 (1999) (police officer’s testimony about methods of doctors and drug users in drug diversion schemes admissible; such testimony is more like describing modus operandi than profile of a drug dealer).

⁴⁴ *Commonwealth v. Deloney*, 59 Mass. App. Ct. 47, 56 (2003) (expert testimony that explains how child abuse victims may behave in illogical ways is permissible but testimony describing how a typical victim looks or acts or that compares actions of child victims in case as typical of a “norm” is not admissible.); *Commonwealth v. Federico*, 425 Mass. 844 (1997) (child psychiatrist’s responses to flawed hypothetical questions by the Commonwealth, which closely followed facts at trial, impermissibly endorsed credibility of child victim and should not have been admitted); *Commonwealth v. Pare*, 43 Mass. App. Ct. 566, 580–581 (1997), *aff’d*, 427 Mass. 427 (1998) (social worker’s testimony that alleged victim of child sexual abuse told her “disclosures, albeit hard disclosures but truthful disclosures” was likely to have been given considerable weight by the jury); *Commonwealth v. Spear*, 43 Mass. App. Ct. 583, 592–594 (1997). *Compare* *Commonwealth v. Malchionno*, 47 Mass. App. Ct. 73 (1999) (social worker’s general testimony on delayed disclosures in child sex abuse cases was properly admitted, and did not improperly vouch for the complaining witness, even though social worker was both a direct witness and an expert); *Commonwealth v. McIntyre*, 430 Mass. 529, 538 (1999) (emergency room nurse’s testimony regarding the victim’s level of consciousness did not amount to improper expert opinion on victim’s credibility; testimony was admitted to describe victim’s mental state at the time she spoke to police). The SJC has stated that “‘An expert may not offer his opinion on issues that the jury are equally competent to assess, such as credibility of witnesses.’” *Commonwealth v. Colin C.*, 419 Mass. 54, 59 (1994) (reversible error to permit expert opinion that alleged victims had been sexually abused, which was ultimate issue before jury, quoting *Simon v. Solomon*, 385 Mass. 91, 105 (1982)). *See also* *Commonwealth v.*

Expert testimony may be required where an element of proof is beyond lay knowledge.⁴⁵ Similarly, effective defense representation may demand the investigation or production of scientific evidence.⁴⁶ Admission of scientific evidence in such a case is clearly not merely discretionary.⁴⁷ In some instances, expert testimony may be

LaCaprucia, 41 Mass. App. Ct. 496 (1996) (reversible error to admit expert testimony linking characteristics of sexually abused children to complainants' experience, which amounted to implicit vouching for complainant's credibility) (*Commonwealth v. Trowbridge*, 419 Mass. 750, 759–60 (1995) (expert testimony comparing characteristics of allegedly abused child-witness to general characteristics of abused children impermissibly intrudes on jury's province to assess witness's credibility)). *But see Commonwealth v. Quincy Q.*, 434 Mass. 859, 871-873 (2001) (physician could testify that majority of sexually abused children bear no physical traces of abuse); *Commonwealth v. Colon*, 49 Mass. App. Ct. 289, 291-293 (2000) (same).

On the narrow "line between proper testimony as to patterns of disclosure of child sexual abuse victims and improper testimony constituting endorsement of the credibility of a victim-witness," *see Commonwealth v. Rather*, 37 Mass. App. Ct. 140, 148 (1994); *see also Commonwealth v. Richardson*, 423 Mass. 180, 186 (1996); Bachrach, *Expert Testimony — Victim Profile Evidence*, 197 MASS. L. REV. 204 (criticizing *LaCaprucia*, and arguing for application of *Daubert-Lanigan* test to victim-profile evidence); *infra* § 48.5 (expert witnesses in child sexual abuse cases).

See also United States v. Gonzalez-Maldonado, 115 F.3d 9, 17 (1997) (error to exclude expert's testimony as to defendant's tendency, caused by mental illness, to exaggerate; evidence was highly relevant to help jurors decide weight to give defendant's recorded statements).

⁴⁵ *See Commonwealth v. Filoma*, 79 Mass. App. Ct. 16 (2011) (Where Commonwealth seeks to establish operation of a motor vehicle under the influence of alcohol by proof of impairment method, as opposed to the "per se" method, there must be expert testimony to explain breathalyzer results as they relate to impairment, citing *Commonwealth v. Colturi*, 448 Mass. 809, 817-818 (2007)); *Commonwealth v. Sands*, 424 Mass. 184, 188 (1996) (error to admit officer's testimony to administration or Horizontal Gaze Nystagmus (HGN) sobriety field test without giving defendant opportunity to challenge officer's qualifications and procedures used; HGN test relies on underlying scientific proposition that is not within common experience of jurors, so evidentiary foundation in satisfaction of *Lanigan* standard is required before evidence admitted). *Compare Commonwealth v. Gordon*, 422 Mass. 816, 840 (1996) (*Frye* [or *Lanigan*] standard inapplicable where witness's testimony "is based on personal observations [or results of scientific blood testing] rather than dependent on scientific theories") (citing *Commonwealth v. Devlin*, 365 Mass. 149, 155 (1974) (medical testimony identifying victim from X-rays admissible as "product of years of experience viewing . . . X-rays"; "opinions based on personal observations of scientific procedures, which are themselves generally accepted in the scientific community, are not governed by *Frye*").

⁴⁶ *See Commonwealth v. Baran*, 74 Mass. App. Ct. 256 (2009) (motion for new trial properly granted where defense counsel failed to properly prepare case, to interview witness and to obtain experts, along with other deficiencies.); *Commonwealth v. Roberio*, 428 Mass. 278 (1998) (failure to investigate insanity defense was ineffective assistance of counsel and required new trial); *Commonwealth v. Haggerty*, 400 Mass. 437 (1987) (failure to investigate insanity defense by retaining expert was ineffective assistance of counsel); *Commonwealth v. Daniels*, 366 Mass. 601, 609 (1975) (lack of psychiatric testimony on issue of voluntariness of statement by mentally impaired defendant factor in granting new trial).

⁴⁷ *See, e.g., Commonwealth v. Cardoza*, 29 Mass. App. Ct. 645 (1990) (reversing conviction for indecent assault and battery; excluded testimony that foreign pubic hair recovered from victim was dissimilar to sample taken from defendant, was directly relevant to identification issue); *Commonwealth v. Smythe*, 23 Mass. App. Ct. 348, 355 (1987). If the court excludes expert defense testimony, it should make specific findings indicating its reasons for doing so, because otherwise the court cannot assume exclusion was a proper exercise of discretion. *Smythe, supra*. *See also infra* § 32.6B, discussing right to present a defense.

admissible even if the subject matter is within “common knowledge” of the trier of fact.⁴⁸

Prior to 1994, the Commonwealth adhered to the so-called *Frye* test,⁴⁹ which required the proponent of novel expert evidence to demonstrate that theories or tests relied on by the expert to reach the offered conclusion are generally accepted in that field of science.⁵⁰ In the 1994 case *Commonwealth v. Lanigan*, the Supreme Judicial Court “adopted, in part, the reasoning” of the Supreme Court’s *Daubert* test, which is based on Rule 702 of the Federal Rules of Evidence and applies in the federal courts.⁵¹ A more flexible test of admissibility, *Daubert uses reliability and helpfulness to the trier of fact as the test of admissibility*.⁵² Under this test, the judge must be satisfied that

⁴⁸See *Commonwealth v. Miranda*, 441 Mass. 783, 793 (2004) citing P.J. Liacos, M.S. Brodin, & M. Avery, *Massachusetts Evidence* § 7.6.1, at 385 (7th ed. 1999), *Commonwealth v. Francis*, 390 Mass. 90, 99 (1980) and *Commonwealth v. Trainor*, 374 Mass. 796, 801-802, 374 N.E.2d 1216 (1978).

⁴⁹ *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923).

⁵⁰*Commonwealth v. Cappas*, Lawyers Weekly No. 12-073-93 (1993) (excluding autistic victim’s testimony by means of “facilitated communication”); *Commonwealth v. Lanigan*, 413 Mass. 154, 159–63 (1992) (*Lanigan I*) (affirming exclusion of results of DNA testing because Commonwealth failed to satisfy its burden of showing a DNA match under the *Frye* test; however, evidence of absence of a match would be admissible) (citing *Commonwealth v. Curnin*, 409 Mass. 218, 222–23 (1992), and a report critical of current DNA testing techniques, “DNA Technology in Forensic Science” (National Research Council, April 1992)); *Commonwealth v. Gomes*, 403 Mass. 258, 266 (1988). However, the *Frye* test has not been applied to “preclude the admissibility of novel scientific techniques or information developed by a particular expert witness utilizing accepted scientific instruments or theories.” *Commonwealth v. Cifizzari*, 397 Mass. 560, 569–73 (1986) (expert testimony regarding bite marks just assisted jury to make physical comparison). See also *Commonwealth v. Ghee*, 414 Mass. 313, 320 (1993); *Commonwealth v. Phoenix*, 409 Mass. 408, 420 (1991) (expert testimony on allotype genetic testing); *Commonwealth v. Beausoleil*, 397 Mass. 206, 215 n.11 (1986); *Commonwealth v. Devlin*, 365 Mass. 149, 155 (1974) (expert comparisons of premortem and postmortem bone X-rays); *Commonwealth v. Hyatt*, 29 Mass. App. Ct. 140, 144–145 (1990) (approving admission of statistical evidence regarding probability of hair match), *rev’d on other grounds*, 409 Mass. 689, 692–93 (1991) (avoiding issue, but referring trial court to *Commonwealth v. Curnin*, *supra*, n.34 for instruction). A case admitting novel scientific evidence is *People v. Weinstein*, 591 N.Y.S.2d 715 (Sup. 1992) (admitting evidence of Positron Emission Tomography (PET) and Skin Conductance Response (SCR) testing to show organic brain disorder).

⁵¹ *Commonwealth v. Pytou Heang*, 458 Mass. 827, 847 (2011) *Commonwealth v. Patterson* 445 Mass. 626, 640 n.11, 840 N.E.2d 12 (2005); *Commonwealth v. Sands*, 424 Mass. 184, 185 (1996) (citing *Commonwealth v. Lanigan*, 419 Mass. 15, 22–26 (1994) (*Lanigan II*)) (admitting DNA testimony using “ceiling principle” instead of “product rule” testimony previously rejected under *Frye* test), citing *Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 (1993) (Rule 702 supersedes *Frye* in federal courts); *Commonwealth v. Zimmermann*, 70 Mass. App. Ct. 357, 359-360 (2007).

⁵² See *Mass. Guide to Evidence*, §7.702 (the language of Fed. R. Evid. 702 is incorporated in Rule 702 of the Massachusetts Proposed Rules of Evidence, which admits expert evidence if it will “assist the trier of fact to understand the evidence or to determine a fact in issue.”; *Commonwealth v. Rodriguez*, 418 Mass. 1 (1994) (expert testimony about “battered woman syndrome” admissible, even before passage of G.L. c. 233, § 23E); *Commonwealth v. Hudson*, 417 Mass. 536 (1994) (expert testimony about posttraumatic stress disorder admissible to assist jurors in assessing victim witness’s testimony and credibility); *Commonwealth v. Mamay*, 407 Mass. 412, 421–22, 426–27 (1990) (evidence of rape trauma syndrome allowed in case of

the expert's opinion has "a reliable basis in the knowledge and experience of his discipline." The "overarching issue is 'the scientific validity—and thus the evidentiary relevance and reliability—of the principles that underlie a proposed submission.'" ⁵³ Under *Lanigan*, however, the Court has said that "general acceptance in the relevant scientific community will continue to be the significant, and often the only issue."⁵⁴ "Thus, a party seeking to introduce scientific evidence may lay a foundation either by showing that the underlying scientific theory is generally accepted within the relevant scientific community, or [under *Daubert*] by showing that the theory is reliable or valid through other means."⁵⁵

While the SJC initially ruled that a " trial court's conclusion on the issue of scientific validity is subject to de novo review in light of current scientific knowledge,"⁵⁶ in 2000, in *Canavan's Case*,⁵⁷ the Supreme Judicial Court held that the standard of review of a trial judge's determination as to whether expert testimony is reliable is an

indecent assault and battery; Chief Justice Liacos, concurring, criticizes inadequate scientific support for expert's testimony); *Commonwealth v. Mulica*, 401 Mass. 812, 819 (1988) (posttraumatic stress disorder); *Commonwealth v. Carter*, 383 Mass. 873 (1981) (evidence of "reality testing" of child witness). *But see* *Commonwealth v. Day*, 409 Mass. 719, 723 (1991) ("Evidence of a 'child battering profile' does not meet the relevancy test. . . . The use of criminal profiles as substantive evidence of guilt is inherently prejudicial."); *Commonwealth v. Roche*, 44 Mass. App. Ct. 372, 380 (1998) (error to allow expert testimony regarding common characteristics of an "abusive male") (citing *Commonwealth v. Goetzendanner*, 42 Mass. App. Ct. 637, 642–46 (1997) ("[e]xpert testimony may not be admitted to profile or describe the typical attributes of the perpetrators of crime"); [Name Redacted—hereinafter Victim/Plaintiff] v. Francis E. McDonough, Jr.; Hartford Fire Insurance Company, third-party defendant, 16 Mass. App. Ct. 163, 176 (1983) (evidence of rape trauma syndrome).

⁵³ *Commonwealth v. Fernandez*, 458 Mass. 137, 147 (2010); *Commonwealth v. Lanigan*, 419 Mass. 15, 25–26 (1994) (*Lanigan II*) (quoting *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 591–93 (1993)).

⁵⁴ *Commonwealth v. Patterson*, 445 Mass. 626, 640 (2005); *Commonwealth v. Sands*, 424 Mass. 184, 185 (1996) (quoting *Commonwealth v. Lanigan*, 419 Mass. 15, 16 (1994)).

⁵⁵ *Commonwealth v. Patterson*, 445 Mass. 626, 640 (2005); *Commonwealth v. Sands*, 424 Mass. 184, 185–86 (1996). If "the proponent of scientific evidence fails to show its "general acceptance" in the relevant scientific community, evidence of general acceptance remains a factor for the court to consider in its determination of the reliability of the scientific evidence." *Sands, supra*, 424 Mass. at 186, n.1 (citing *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 594 (1993)). Peer review and publication is also pertinent but not indispensable to admissibility. *Commonwealth v. Lanigan*, 419 Mass. 15, 24–25 (1994). For a case illustrating application of the factors considered relevant in *Daubert* to deciding if proffered testimony is valid "scientific knowledge" and, therefore reliable, *see* *Shahzade v. Gregory*, 923 F. Supp. 286 (D. Mass. 1996) (holding that reliability of phenomenon of repressed memory was established; evidence of memories recovered after 45 years is admissible).

⁵⁶ *Commonwealth v. Vao Sok*, 425 Mass. 787, 796–98 (1997) (upholding scientific validity of PCR-based analysis of forensic DNA samples); *Commonwealth v. Fowler*, 425 Mass. 819, 826–28 (1997) (holding, based on current knowledge unavailable to trial judge at time of ruling, "product rule" is scientifically acceptable method of analyzing RFLP-based DNA testing). This is a more stringent standard than the "manifestly erroneous" standard that applies in the federal courts under *Daubert*. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 678 n.14 (1993); *Hicks v. Brox Indus.*, 47 Mass. App. Ct. 103 (1999).

⁵⁷ *Commonwealth v. Gomes*, 459 Mass. 194, 205 (2011); *Commonwealth v. Fernandez*, 458 Mass. 137, 149 (2010); *Commonwealth v. Shanley*, 455 Mass. 752, 762 (2010); 432 Mass. 304 (2000).

abuse of discretion standard.⁵⁸ “Once the issue of scientific validity is resolved,” the proponent of admitting scientific evidence has the burden “to show that the testifying expert properly performed a scientifically valid methodology in arriving at his opinion.”⁵⁹ “This entails a fact-based inquiry, which is appropriately resolved by the trial judge . . . and his decision is accorded considerable deference.”⁶⁰ In the 1999 case, *Kumho Tire Co. v. Carmichael*,⁶¹ the Supreme Court held that *Daubert* applies not only to scientific testimony but to all expert testimony. Specifically, in *Kumho Tire*, the Court ruled that *Daubert* factors can apply in considering testimony of engineers and other experts. The Court also ruled that a trial judge can use one or more of the *Daubert* factors in determining admissibility, and that the *Daubert* standard is a flexible one that must be tied to the facts of the case. In *Hicks v. Brox Industries, Inc.*⁶² the Appeals Court noted that *Lanigan/Daubert* applies to opinions of engineers, as indicated in *Kumho Tire*.⁶³ The decision in *Canavan's Case* also indicated that a trial judge's *Lanigan* analysis needs to be flexible, and that the *Lanigan* analysis applies to expert opinions based on personal experience and/or clinical observations.⁶⁴

The *Daubert* issue should be investigated in light of recent developments in the forensic disciplines. Empirical support underlying several fields of “forensic science” has been questioned, including handwriting analysis,⁶⁵ and comparisons of textile fiber, footprints, bite marks, and human hair.⁶⁶ The NAS report can be an excellent starting point for learning about potential challenges to the analysis of biological evidence, controlled substances, print analysis, toolmark and firearms identification, analysis of hairs and fibers, questioned document examinations, arson and explosives analysis,

⁵⁸ *Commonwealth v. Gomes*, 459 Mass. 194, 205 (2011); *Commonwealth v. Fernandez*, 458 Mass. 137, 149 (2010); *Commonwealth v. Shanley*, 455 Mass. 752, 762 (2010); *Canavan's Case*, 432 Mass. 304, 312 (2000).

⁵⁹ *Commonwealth v. Fernandez*, 458 Mass. 137, 150 (2010). *See also* *Commonwealth v. Duguay*, 430 Mass. 397 (1999) (holding that the trial judge properly excluded testimony by a polygraph examiner because there was no proof that the examiner had “in similar circumstances demonstrated, in a statistically valid number of independently verified and controlled tests, the high level of accuracy of the conclusions that the tester reached in those tests.”); *Commonwealth v. Vao Sok*, 425 Mass. 787, 797–98 (1997).

⁶⁰ *Commonwealth v. Roberio*, 428 Mass. 278, 281–282 (1998) (It was error for the judge to deny motion for a new trial based on his assessment of the expert’s credibility. “Once the expert’s qualifications were established and assuming the expert’s testimony met the standard of . . . *Lanigan* . . . the issue of credibility was for a jury, not a judge.”). *See also* *Commonwealth v. Vao Sok*, 425 Mass. 787, 798 (1997); *Commonwealth v. Fowler*, 425 Mass. 819, 826–28 (1997).

⁶¹ 526 U.S. 137, 119 S. Ct. 1167 (1999).

⁶² *Hicks v. Brox Industries, Inc.*, 47 Mass. App. Ct. 103 (1999).

⁶³ *Hicks v. Brox Industries, Inc.*, 47 Mass. App. Ct. 103, 107–108 (1999).

⁶⁴ *Commonwealth v. Gomes*, 459 Mass. 194, 205 (2011); *Commonwealth v. Fernandez*, 458 Mass. 137, 149 (2010); *Commonwealth v. Shanley*, 455 Mass. 752, 762 (2010); *Canavan's Case*, 432 Mass. 304, 312 (2000).

⁶⁵ *United States v. Saelee*, 162 F.Supp.2d 1097 (D.Alaska 2001). *See also* *Crim. Prac. Manual (BNA)*, vol. 11, no. 5, at 88 (Feb. 26, 1997), reporting success of counsel for Oklahoma bombing defendant Timothy McVeigh in excluding prosecution handwriting expert for lack of scientific basis.

⁶⁶ Jonakait, *Forensic Science: The Need for Regulation*, 4 HARV. J.L. TECH. 109, 137–38 (fiber), 139–40 (footprints), 140–41 (bite marks), 141, n.136 (human hair) (1991).

bitemark analysis, and bloodstain pattern analysis. Rulings on admissibility will change according to scientific progress. Past exclusion of a body of scientific knowledge should not deter defense counsel from making a new offer when warranted by advances in the field or broader acceptance of theory.⁶⁷ An offer of novel or disputed scientific evidence should be made prior to trial by way of a motion in limine.⁶⁸

§ 12.3B. COMPETENCY OF EXPERT

Assuming the testimony is relevant, its proponent must also demonstrate the expert's competency as foundation for the testimony. The competent expert witness must possess both (1) appropriate qualifications and (2) the personal knowledge or hypothesized basis to form a relevant opinion.

The qualification of a proposed expert is a preliminary question to be determined by the trial judge.⁶⁹ Opposing counsel is entitled to challenge the expert's qualifications,⁷⁰ but the judge's decision to accept the expert as qualified may be implicit rather than express.⁷¹ A voir dire hearing should usually⁷² be requested on the qualifications of an opposing expert. Leaving this question to the jury over objection is error;⁷³ the court must examine each case to decide whether the proposed expert has

⁶⁷ U.S. v. Cerna, 2011 WL2119304 (N.D.Cal. 2011); U.S. v. Zajac, 749 F.Supp.2d 1299(D.Utah 2010); U.S. v. Taylor, 663 F.Supp.2d 1170, 1173-1180 (D.N.M. 2009); Commonwealth v. Heang, 458 Mass. 827 (2011) Commonwealth v. Mendes, 406 Mass. 201 (1989) (polygraph excluded); Commonwealth v. Carter, 383 Mass. 873 (1981); Commonwealth v. Lykus, 367 Mass. 191, 205 (1975) (voiceprint); Commonwealth v. Tarver, 369 Mass. 302, 311 (1975) (hair); Terrio v. McDonough, 16 Mass. App. Ct. 163 (1983).

⁶⁸ Commonwealth v. Foley, 7 Mass. App. Ct. 608 (1979).

⁶⁹ Commonwealth v. Phillips, 452 Mass. 617, 636 (2008); Commonwealth v. Frangipane, 433 Mass. 527, 530 n.4 (2001) (The judge should not declare the witness an "expert" in front of the jury).

⁷⁰ See Commonwealth v. Sands, 424 Mass. 184, 188 (1996) (conviction overturned; error to admit police officer's testimony on administration of HGN sobriety test without affording defendant a hearing on officer's qualifications and procedures used). See also Canavan's Case, 432 Mass. 304, 314 (2000) (no evidence indicating that methodology used by expert physician to arrive at diagnosis of MCS, or multiple chemical sensitivities, was reliable); Commonwealth v. Malchionno, 47 Mass. App. Ct. 73, 75-76 (1999) (social worker trained in questioning victims of sexual abuse and who had investigated sexual abuse cases for twenty years was properly qualified as an expert. Defense called social worker as a witness and prosecution cross-examined her on general patterns of delayed disclosure);

⁷¹ Commonwealth v. Rivera, 425 Mass. 633, 645 (1997) (approving the assumption "that a trial judge has decided to qualify an expert when she accepts the expert's credentials and allows him to testify"). See also Commonwealth v. Grissett, 66 Mass. App. Ct. 454, 459 (2006); Commonwealth v. Allen, 40 Mass. App. Ct. 458, 468 (1996) ("ill-advised" but not "abdication" for judge to respond to prosecutor's motion to qualify expert by saying, "That's not for me to decide. . . . I'm going to leave that for the jury to decide.").

⁷² Commonwealth v. Phillips, 452 Mass. 617, 636 (2008); Commonwealth v. Frangipane, 433 Mass. 527, 530 n.4 (2001) (holding that the voir dire should take place out of the presence of the jury, but in some cases, counsel may make a tactical decision that it would be better to confront the expert through cross-examination during trial rather than alert the prosecutor to the expert's deficiencies ahead of time).

⁷³ Commonwealth v. Zeininger, 459 Mass. 775, 790 (2011); Commonwealth v. Boyd, 367 Mass. 169, 183 (1975).

sufficient skill, training, or experience to assist the fact finder.⁷⁴ Counsel should be alert to opinion questions that require expertise but crop up in the middle of any eyewitness testimony, particularly of police officers.⁷⁵ There is no litmus test for the qualification of an expert, and the expert need not be a specialist in the field of the fact in issue.⁷⁶ However, an opinion may be excluded as beyond the expertise of an otherwise qualified witness.⁷⁷

⁷⁴ *Commonwealth v. Phillips*, 452 Mass. 617, 636 (2008); *Commonwealth v. Richardson*, 423 Mass. 180 (1996) (judge need not qualify witness as an expert in presence of the jury). Defense counsel might even consider filing a motion in limine asking the Court *not* to make such a finding in open court, citing the language in *United States v. Bartley*, 855 F.2d 547, 552 (8th Cir. 1988): “Although it is for the court to determine whether a witness is qualified to testify as an expert, there is no requirement that the court specifically make that finding in open court upon proffer of the offering party. Such an offer and finding by the Court might influence the jury in its evaluation of the expert and the better procedure is to avoid acknowledgement of the witness’ expertise by the Court.” *See also* *Commonwealth v. Gaulden*, 383 Mass. 543, 549 (1981); *Commonwealth v. Boyd*, 367 Mass. 169, 182 (1975).

⁷⁵ *See* *Commonwealth v. Lodge*, 431 Mass. 461, 467–468 (2000) (lead detective was cross-examined on Commonwealth’s failure to conduct tests and to pursue suspects. On redirect, over objection, detective was erroneously allowed to explain these things had not been done because all the evidence pointed to the defendant and to list the incriminating evidence); *Commonwealth v. Rivera*, 425 Mass. 633, 645 (1997) (error to allow police officer to testify over objection that, based on his training and experience, activity he observed was drug transaction; error harmless); *Commonwealth v. Sands*, 424 Mass. 184, 188 (1996) (error to admit officer’s testimony on administration of HGN sobriety test without giving defendant opportunity to challenge officer’s qualifications and procedures used); *Commonwealth v. Montanino*, 409 Mass. 500, 502–05 (1991) (police officer’s testimony that irregularities in alleged victim’s statements were consistent with manner in which truthful victims of sexual assault recounted their experiences, was inadmissible opinion on another witness’s credibility); *Commonwealth v. Olszewski*, 401 Mass. 749, 759 (1987) (error to allow police officer to testify as an expert witness “within a reasonable degree of police certainty” that a chrome strip came from the defendant’s car). The Mass. Appeals Court has cited *The Admissibility of Ultimate Issue Expert Testimony by Law Enforcement Officers in Criminal Trials*, 93 COLUM. L. REV. 231 (1993), as authority “for the dangers involved in permitting police officers to give opinion testimony beyond their practical expertness.” *See supra* § 12.3A. *But see and compare facts in* *Commonwealth v. Tanner*, 45 Mass. App. Ct. 576, 578 (1998) (police officer’s testimony “from my experience, I believed a drug transaction had taken place” did not require reversal as it was insufficiently prejudicial; but includes detailed discussion on police testimony and expert opinion evidence *id.* at 579–582, disfavoring police expert testimony about what drug dealers “commonly do”); *Commonwealth v. Pike*, 430 Mass. 317, 324 (1999) (police officer’s testimony about methods of doctors and drug users in drug diversion schemes admissible; such testimony is more like describing modus operandi than profile of a drug dealer); *Commonwealth v. LaBella*, 17 Mass. App. Ct. 973, 975 (1984) (allowing police opinion on habits of bookies); *Commonwealth v. Kimball*, 16 Mass. App. Ct. 974, 975–76 (1983) (allowing police opinion on footprints).

⁷⁶ *Letch v. Daniels*, 401 Mass. 65, 68 (1987) (“It is well established that the professional specialty of a medical practitioner offered as a witness need not be precisely and narrowly related to the medical issues of the case” (quoting *Kapp v. Ballantine*, 380 Mass. 186, 192–193 n.7 (1980)); *Commonwealth v. Monico*, 396 Mass. 793, 803–805 (1986) (error to exclude opinion of psychologist on defendant’s criminal responsibility); *Lambley v. Kameny*, 43 Mass. App. Ct. 277, 287 (1997); *Commonwealth v. Sullivan*, 17 Mass. App. Ct. 981, 982 (1984) (medical examiner’s opinion on proximity of shot admitted).

⁷⁷ *Commonwealth v. Frangipane*, 433 Mass. 527, 533–536 (2001) (expert social worker witness was qualified to testify about dissociative memory loss and disclosure of traumatic

Where an expert is found to be qualified by the court, opposing counsel may do well to stipulate to the expert's qualifications before the jury in hopes of avoiding a lengthy list of impressive credentials. However, such a stipulation will not prevent admission of such evidence before the jury as bearing on credibility.⁷⁸

The qualified expert may base her opinion on any combination of personal knowledge and facts made known to her at or before the hearing. When the expert's opinion is based on personal knowledge, the expert is simply questioned about her knowledge and consequent opinion.

When the basis for the expert opinion is not within the personal knowledge of the expert, a hypothetical question based on facts in evidence was formerly required.⁷⁹ However, the rule has been expanded to permit an expert to base an opinion on facts that are not and will not be presented, provided they are independently admissible and a permissible basis for an expert to consider in formulating an opinion.⁸⁰ Thus, although a hypothetical question may be used, it is not required. However, opposing counsel is entitled to elicit the underlying facts in cross-examination, and also to a voir dire before the trial testimony to determine whether the basis of the expert opinion is admissible evidence.⁸¹ Presumably, if the truth of the underlying basis is challenged, the jury must still find at the end of the trial that the facts assumed have been proved in order to give any weight to the expert's opinion.⁸²

The expert may have received hearsay information in learning about the case, but the offered opinion must be based on the expert's personal knowledge or on admissible evidence.⁸³ The expert may testify as to the basis of an opinion, but hearsay

memory, but testimony about how the brain functions when individuals remember traumatic events was outside the scope of her expertise and its admission was reversible error). *See also* Santos v. Chrysler Corp., 430 Mass. 198, 206 (1999); Commonwealth v. Weichell, 390 Mass. 62 (1983)(opinion of photography expert on eyewitness identification excluded); Commonwealth v. Seit, 373 Mass. 83, 91–92 (1977)(opinion of ballistics expert on body's response to shot excluded); Commonwealth v. Neverson, 35 Mass. App. Ct. 913 (1993)(opinion of professor of physics and biomechanics on medical consequences of fall of child excluded).

⁷⁸ Commonwealth v. Boyd, 367 Mass. 169 (1975).

⁷⁹ A hypothetical question asks the expert to assume certain facts and to apply special knowledge to those facts to reach a conclusion. The question must state the specific facts to be assumed; the expert may not be asked generally to consider "the testimony of the witnesses" or otherwise privately choose facts to rely on.

⁸⁰ Commonwealth v. McNickels, 434 Mass. 839, 855 (2001); Commonwealth v. O'Brien, 423 Mass. 841, 850–52 (1996).

⁸¹ *But see* Commonwealth v. Phillips, 452 Mass. 617, 636 (2008); Commonwealth v. Frangipane, 433 Mass. 527, 530 n.4 (2001)(the examination as to the expert's qualifications should not be held in front of the jury); Commonwealth v. Ashley, 427 Mass. 620, 623–624 (1998) (after voir dire of defense's expert on eyewitness identification, judge did not abuse discretion in excluding expert's testimony at trial); Commonwealth v. Federico, 425 Mass. 844 (1997) (child psychiatrist's responses to flawed hypothetical questions by the Commonwealth, which closely followed facts at trial, impermissibly endorsed credibility of child victim and should not have been admitted); Department of Youth Servs. v. A Juvenile, 398 Mass. 516, 531–32 (1986).

⁸² Commonwealth v. Biorkman, 364 Mass. 297 (1973).

⁸³ Vassallo v. Baxter Healthcare Corp., 428 Mass. 1, 16 (1998); Commonwealth v. Waite, 422 Mass. 792, 802–804 (1996); Commonwealth v. Roman, 414 Mass. 235, 237–39 (1993); Sacco v. Roupenian, 409 Mass. 25, 29 n.3 (1990); Commonwealth v. LeFave, 407 Mass. 927, 945 n.2 (1990) (Liacos, J., dissenting); Department of Youth Servs. v. A Juvenile, 398 Mass. 516, 531–32 (1986); Adoption of Seth, 29 Mass. App. Ct. 343, 351–53 (1990); *See*

should not be admitted on this ground, especially if prejudicial.⁸⁴ It is imperative that counsel keep in mind the recent rulings in *Melendez-Diaz* and *Bullcoming* which limit the admission of expert testimony which relies on testimonial hearsay information, as discussed in § 12.4B.

§ 12.3C. WEIGHT OF EXPERT OPINION EVIDENCE

The jury may give such weight to expert testimony as it wishes, just as it may judge the testimony of any other witness. The jury should be instructed to consider factors bearing on the expert's credibility, such as bias toward his employer⁸⁵ or lack of personal knowledge; that the jury is free to disbelieve part or all of the expert's testimony; and that if the jury finds that facts the expert has relied on have not been proved, it must reject the expert's testimony.⁸⁶

§ 12.4 CONFRONTING PROSECUTION EXPERTS AND CERTIFICATES

§ 12.4A. DISCOVERY⁸⁷

Mass.R.Crim.P. 14(a)(1)(A)(vi) requires the prosecution to provide discovery of expert opinion evidence. The rule mandates that the prosecution shall provide the identity, curriculum vitae, publications and all reports of the expert. Mass.R.Crim.P. 14(a)(1)(A)(vii) provides for automatic discovery of, inter alia, reports of physical examinations of any person or of scientific tests or experiments.⁸⁸

Mass.R.Crim.P. 14(a)(1)(B) makes it clear that the Commonwealth is only entitled to discover evidence or witnesses that "the defendant intends to use at trial."⁸⁹ Defense counsel should be careful in completing pre-trial conference reports to assure that counsel only agrees to provide statements of expert witnesses intended to be used.

also *Commonwealth v. Harris*, 1 Mass. App. Ct. 265, 267–72 (1973). *Commonwealth v. Leinbach*, 29 Mass. App. Ct. 943, 944 (1990) (rescript)(when a drug analysis certificate had been received under G.L. c. 147, § 4D, and the testing chemist was unavailable, his supervisor was permitted to testify to the procedures used in that case)...

⁸⁴ *Commonwealth v. DeSalvo*, 353 Mass. 476, 480 (1968); *Commonwealth v. Martin*, 17 Mass. App. Ct. 717, 723–25 (1984) (overruled by *Commonwealth v. Martin*, 393 Mass. 781 (1985)(holding that introduction of defendant's testimony was improperly prejudicial).

⁸⁵ For an unusual variation of the normal rule, *see Commonwealth v. Fitzgerald*, 412 Mass. 516, 522 (1992) (defense could offer that its witness had been hired by Commonwealth; this deemed relevant to show background of evidence and to support its trustworthiness).

⁸⁶ *Commonwealth v. Burgess*, 450 Mass. 422, 434 (2008)*Commonwealth v. Russ*, 232 Mass. 58 (1919).

⁸⁷ *See also infra* ch. 16 (Discovery).

⁸⁸ *See Commonwealth v. Velazquez* 78 Mass. App. Ct. 660, 669 fn. 15 (2011) reversed on other grounds but notes that the better practice for the Commonwealth is to "expressly identify each expert witness it intends to call, and to make such witness's curriculum vitae and other required documentary material available to the defendant without prior request."

⁸⁹ Mass. R. Crim. P. 14(a)(1)(B); *see also Commonwealth v. Durham*, 446 Mass. 212, 217–18 (2006).

The Supreme Judicial Court has limited the discovery of investigative and expert witness reports to those witnesses the defendant will call at trial, citing Rule 14.⁹⁰ the defense is not required to provide *any* reciprocal discovery until the Commonwealth has delivered *all* discovery it is required to produce pursuant to rule or court order. Mass. R. Crim. P. 14(a)(1)(B). The Commonwealth cannot discover, via reciprocal discovery, an unfavorable expert witness opinion where the expert was retained by the defendant, since the defendant would not intend to use the expert at trial.⁹¹

It is wise for defense counsel to routinely include in any pretrial conference report an agreement that the prosecution will provide notice of any expert evidence to be offered at trial by a date sufficiently in advance of trial so that counsel is able to prepare to meet it. Discovery should seek (1) the substance of opinion evidence to be offered, (2) a description of the materials examined and/or particular tests or techniques employed to arrive at the expert opinion, (3) a resume or other statement of the expert's credentials and (4) all learned treatises, journal articles or other sources upon which the expert relied to arrive at the opinion.⁹²

On motion, the defense and prosecution may seek additional discovery regarding experts and opinion evidence to be offered at trial to enable them "to conduct effective cross examination or to have rebuttal evidence available."⁹³ This rationale is similarly the basis for the notice requirement of Mass. R. Crim. P. 14(b)(2) in cases where a defense of insanity will be offered.

Counsel can consult the NAS Report, websites for the various technical and scientific working groups in forensics as well as other internet resources to fashion motions for additional discovery. Counsel should also consider moving for protocols, policies and procedures of law enforcement agencies and crime labs. In instances where tests have been conducted, counsel should consider moving for all underlying data, notes and reports connected to the tests, as well as the qualifications, training and proficiency testing of any analysts. There may be instances where counsel will need to seek information on testing equipment, quality control and error reports as well. It is important to investigate the qualifications, publications, references and prior testimony of proposed Commonwealth experts. At times, it will be possible to compare various versions of an expert's curriculum vitae which may have been tailored to different

⁹⁰ See *Commonwealth v. Paszko*, 391 Mass. 164, 187 n.26, 27 (1984). Cf. *Commonwealth v. Bing Sial Liang*, 434 Mass. 131 (2001) (victim-witness advocates are part of the prosecution team, and subject to the same legal discovery obligations and rules as are prosecutors, including a duty to disclose exculpatory information).

⁹¹ *Commonwealth v. Haggerty*, 400 Mass. 437, 441 (1987)

⁹² In *Commonwealth v. Giontzis*, 47 Mass. App. Ct. 450 (1999), defense counsel made a very detailed motion for discovery of the Commonwealth's expert, asking for information regarding *any* person who might give expert testimony for the Commonwealth, which was allowed. The Commonwealth was found to have violated the discovery order by failing to notify the defense of a witness who was called in rebuttal. For sample discovery requests, see *Trying Murder and Other Homicide Cases in Massachusetts*, Tipton, Page et al, Chapter 7 (MCLE, 2004).

⁹³ *Commonwealth v. Chappee*, 397 Mass. 508, 518 (1986). See also *Commonwealth v. Slicch-Brodeur*, 457 Mass. 300, (2010); *Commonwealth v. Durning*, 406 Mass. 485, 498 n.13 (1990). Compare above discussion of confidentiality (see § 12.2C) and *Commonwealth v. Haggerty*, 400 Mass. 437 (1987)

Mass.R.Crim.P. 14(b)(2) places limitations on the prosecution's discovery of a defendant's expert information where the defense is lack of criminal responsibility.

types of cases. It may be necessary to determine whether certifications and training courses are legitimate or available to almost anyone. Based on the outcome of discovery, counsel should consider filing a motion in limine to exclude or limit the prosecution expert opinion.⁹⁴

Counsel should consider whether to retain an expert in drug cases to review the discovery provided by the Commonwealth, to educate counsel on potential forensic issues, and to assist in preparing cross-examination of government witnesses. It is the rare case that counsel will want to engage an expert to independently test the drugs because in most cases, this will merely confirm the results obtained by the Commonwealth. However, an expert may be useful to re-weigh drugs or to see if fingerprints or DNA can be found on drug packaging. Remember that MRCP Rule 14(a)(1)(B) requires that defense counsel timely provide reciprocal discovery of expert information, expert opinion and/or expert testing *only* when counsel intends to use these at trial.

See also sec. 12.11, *infra*, on police as experts in drug cases.

§ 12.4B. MELENDEZ-DIAZ FACTORS – CERTIFICATES, SUBSTITUTE ANALYSTS & TESTIMONIAL HEARSAY

In 2009, the Supreme Court in *Melendez-Diaz* held that drug certificates, being testimonial in nature⁹⁵, violated the Confrontation Clause of the Sixth Amendment when offered in lieu of the analyst's presence in court.⁹⁶ Now, the determination of whether the admission of a certificate without the certificate's author is harmless error beyond a reasonable doubt frequently rests on corroborating testimony or evidence. For example, there may need to be other evidence indicating that a drug is a drug, or a

⁹⁴ *See* TRYING DRUG CASES IN MASSACHUSETTS, Page et al., Chapter 7 Expert Witness Issues (MCLE, 2010); For examples of motions in limine in cases involving allegations of sex offenses, *see* TRYING SEX OFFENSE CASES IN MASSACHUSETTS, Page et al., (MCLE, 2009). *Commonwealth v. Barbosa*, 457 Mass. 773, 783 (2010) held that

Under our common-law rules of evidence, the Commonwealth must establish five foundational requirements before expert testimony will be admitted in a criminal case: (1) that the expert testimony will assist the trier of fact, *see Commonwealth v. Little*, 453 Mass. 766, 768, 906 N.E.2d 286 (2009); (2) that the witness is qualified as an expert in the relevant area of inquiry, *see Commonwealth v. Frangipane*, 433 Mass. 527, 533, 744 N.E.2d 25 (2001); (3) that the expert's opinion is based on facts or data of a type reasonably relied on by experts to form opinions in the relevant field, *see Department of Youth Servs. v. A Juvenile*, 398 Mass. 516, 531, 499 N.E.2d 812 (1986); (4) that the process or theory underlying the opinion is reliable, *see Commonwealth v. Lanigan*, 419 Mass. 15, 26, 641 N.E.2d 1342 (1994); and (5) that the process or theory is applied to the particular facts of the case in a reliable manner, *see Commonwealth v. Patterson*, 445 Mass. 626, 648, 840 N.E.2d 12 (2005). *See generally*, Mass. G. Evid. § 702, at 218-224 (2010). If a defendant contends that any of these foundational requirements is missing, the defendant may move in limine to prohibit the admission of the expert testimony and request a hearing. *See Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 113 S. Ct. 2786, 125 L. Ed. 2d 469 (1993); *Commonwealth v. Lanigan*, *supra*. Where the motion in limine challenges the reliability of the expert's opinion, the judge must perform the role of "gatekeeper" to ensure that the expert testimony meets a minimum standard of reliability.

⁹⁵ *Crawford v. Washington*, 541 U.S. 36 (2004).

⁹⁶ *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527 (2009).

firearm is a firearm, in order for the analyst's absence to be harmless error. Several recent cases continue to address and refine the holding.⁹⁷

Since *Melendez-Diaz*, the SJC has ruled several times that the use of substitute analysts does not violate a defendant's right to confrontation but there are limitations. Unavailability of the original analyst is a requirement for substitution. On direct examination, the substitute analyst may only testify to observations, personal knowledge and evidence already admitted or that will be admitted. If during cross-examination, opposing counsel questions the expert about the basis of the opinion, the substitute analyst may testify regarding hearsay that is independently admissible and the type of evidence on which experts in that field customarily rely upon as a basis for opinion testimony. A substitute can give her own independent opinion based on her review of the case, but cannot simply repeat the other analyst's opinion.⁹⁸

In 2011, the Supreme Court relied on *Crawford* and *Melendez Diaz* for its decision in *Bullcoming v. New Mexico* and held that testimony by a substitute analyst regarding a blood alcohol testing device and a lab's testing procedures, and admission of a blood alcohol level report, violated a defendant's confrontation rights. The Supreme Court further ruled that the prosecution may not introduce such a report without a witness who is competent to testify about the contents of the report. It remains to be seen whether the SJC will further restrict the use substitute experts in light of the *Bullcoming* decision.

⁹⁷ *Commonwealth v. Barbosa*, 457 Mass. 773, 784 (2010)(stating that “[i]f the conclusion or opinion of the nontestifying expert is testimonial, because a reasonable expert would anticipate that her findings would be available for use at trial, its admission would also violate the defendant's right of confrontation, because the opinion of the second expert would not be subject to cross-examination”); *Commonwealth v. Durand*, 457 Mass. 574 (2010) (testimony regarding the factual content of a non-testifying medical examiner's autopsy report violated the defendant's constitutional right of confrontation); *Commonwealth v. Loadholt*, 456 Mass. 411 (2010) (Commonwealth did not meet its burden that the admission of ballistic certificate was harmless beyond a reasonable doubt, because the only evidence of the gun's operability was the certificate), *Commonwealth v. Depina*, 456 Mass. 238 (2010) (ballistic expert's erroneously entered certificate was not harmful beyond a reasonable doubt because the evidence of the gun's working condition was overpowered any effect the certificate might have had on the jury), *Commonwealth v. Muniz*, 456 Mass. 166 (2010) (Defendant's trial objections that certificates were entered without the opportunity to cross-examine led to reversal of convictions for unlawful possession of a firearm and cocaine by the Supreme Judicial Court's interpretation of the harmless error standard), *Commonwealth v. Fluellen, Jr.*, 456 Mass. 517 (2010) (After the Commonwealth admitted drug certificates with no cross-examination, and despite many other considerations, including that the defense was personal use, the nature of the substance was not raised by the defendant, the defendant identified the items as crack to the officer, and the prosecutor made no mention of the certificates in closing argument, the Supreme Judicial Court still found little doubt that the certificates contributed to the verdict and was not harmless error). *See also* *Commonwealth v. King*, 77 Mass. App. Ct. (2010).

⁹⁸ *See* [Commonwealth v. Nardi](#), 452 Mass. 379 (2008) (substitute medical examiner); [Commonwealth v. Avila](#), 454 Mass. 744 (2009) (substitute medical examiner); [Commonwealth v. Rodriguez](#), 457 Mass. 461 (2010) (substitute medical examiner); [Commonwealth v. Banville](#), 457 Mass. 530 (2010) (substitute DNA analyst); [Commonwealth v. Durand](#), 457 Mass. 574 (2010) (substitute medical examiner); [Commonwealth v. Barbosa](#), 457 Mass. 773 (2010) (substitute DNA analyst); [Commonwealth v. Greineder](#), 458 Mass. 207 (2010) (substitute DNA analyst); [Commonwealth v. McCowen](#), 458 Mass. 461 (2010) (substitute M.E. and DNA analyst); *Commonwealth v. Taskey*, 75 Mass. App. Ct. 787 (2011) (substitute DNA analyst); [DYS v. A Juvenile](#), 398 Mass. 516 (1986); Proposed Mass. R. Evid. §703 and §705.

Counsel must be mindful of the Crawford, Melendez-Diaz, Bullcoming line of cases and should be prepared to move to exclude any “testimonial statements” contained within any documents that the Commonwealth seeks to introduce where the author of the documents is not a witness.

§ 12.4C. BEFORE THE JURY

If the expert has been found competent and the testimony admissible, there are several factors to consider in preparing to confront it.

Defense counsel should consider bias⁹⁹ and weaknesses in the expert’s qualifications, theory, knowledge about this case, techniques, and final opinion.¹⁰⁰ The expert himself may be biased by regular employment by the prosecution or by the fee in this case. The expert may have deficient training or experience in the particular subject of this case.

The expert’s theoretical basis may be novel. Other scientific theories may better apply to this case. A defense consultant may suggest other approaches that were ignored.¹⁰¹

The expert may lack personal knowledge about this case, relying on hearsay or hypotheses that, if untrue, would void the opinion.

The expert’s technique may have included the use of machines not working properly, materials subject to contamination, or tests requiring subjective interpretation. The expert may have omitted some details in applying the technique or lent insufficient time or effort to the examination.

The expert’s opinion may be overly qualified, contain too many assumptions, or contradict opinions of other experts or of this expert in other cases.¹⁰²

Often an expert will testify that evidence is “consistent” with guilt; such weak evidence should be vigorously cross-examined, identifying numerous innocent conclusions with which the evidence is also consistent.

⁹⁹ See *Commonwealth v. Fernandes*, 436 Mass. 671, 675 (2002)(prosecutor properly argued that defense expert was being coy when he testified he had been paid by the Commonwealth for his services, and only confirmed that he had been retained by the defense after several more questions); *Commonwealth v. Baldwin*, 426 Mass. 105, 113 (1997)(defense counsel entitled to cross-examine prosecution psychiatric expert regarding expert’s opposition to a tape recording or defense counsel’s attendance at the expert’s interview of defendant); *Commonwealth v. Perkins*, 39 Mass. App. Ct. 577, 581 (1995)(“[i]f there is a possibility of bias, even a remote one, the judge has no discretion to bar all inquiry into a subject that could show bias or prejudice on the part of the [expert] witness”).

¹⁰⁰ IMWINKELREID, *THE METHODS OF ATTACKING SCIENTIFIC EVIDENCE* (LEXIS Law Pub. 4th ed. 2004)

¹⁰¹ “The strength or weakness of the *methods* respectively used, as opposed to the *conclusions* reached, may be a proper subject of expert opinion.” *Commonwealth v. Kendall*, 9 Mass. App. Ct. 152, 159 n.12 (1980).

¹⁰² Appointed counsel should check with the Forensic Services Director in the Boston office of CPCS for transcripts of prior testimony by individual prosecution experts. It is also advisable to contact the expert and attempt to interview her regarding her proposed testimony. If she refuses, you may bring this out on cross-examination. By going to the CPCS website, <http://www.publiccounsel.net> and clicking Practice Areas > Criminal > Defender Links, you will find numerous forensic websites. One hyperlink, "Experts - Checking Them Out", will take you to websites that help check an expert's credentials.

*The absence of scientific evidence is a valid ground on which to build a defense.*¹⁰³ Evidence that particular tests were available, or would have been performed in the ordinary course of investigation but were bungled or not performed, is admissible on direct or cross-examination and is a proper basis for argument.¹⁰⁴ The defense should request a jury instruction that such an omission may raise a reasonable doubt in the jury's mind as it may support an inference that the tests, if properly performed, would have resulted in evidence favorable to the defendant,¹⁰⁵ although whether to give such an instruction is a matter of the court's discretion.¹⁰⁶

Subpoena the expert if necessary. One kind of expert is impossible to cross-examine: the paper expert. G.L. c. 233, § 79, permits the admission of certain portions of *hospital records*. Although hearsay objections have failed in the appellate courts, the defendant's confrontation right does require that in such cases the defense be able to call the author of the document for the cross-examination.¹⁰⁷ There may also be instances in which an objection to the admission of records should be made on the basis of Crawford, Melendez-Diaz and Bullcoming.

§ 12.5 DRUG ANALYSIS AND WEIGHING

Drug identification is a common form of scientific evidence. In almost all drug cases, the Commonwealth will use one or more "experts" to identify controlled substances. Since Melendez-Diaz and Bullcoming,, the Commonwealth routinely summonses drug analysts to court to testify in Massachusetts.. The expert who makes the identification is ordinarily trained in chemistry, immunoassay, and/or botany and

¹⁰³ Commonwealth v. Benoit, 382 Mass. 210, 221 (1981) (cross-examination on failure to perform tests); Commonwealth v. Bowden, 379 Mass. 472, 485–86 (1981) (scientific tests). See also Commonwealth v. Richardson, 49 Mass. App. Ct. 82, 84 n.1 (2000) ("the failure to investigate leads may provide in some cases the basis for both comment by defense counsel at trial, and special jury instructions relating to the significance of such conduct"). See also

Commonwealth v. Silva-Santiago, 453 Mass. 782, 801 (2009); Commonwealth v. Vuthy Seng 456 Mass. 490 (2010).

¹⁰⁴ Commonwealth v. Gilmore, 399 Mass. 741 (1987) (absence of real evidence); Commonwealth v. Person, 400 Mass. 136, 140 (1987) ("The defendant may expose any deficiencies in the police investigation [and] argue to the jury that, had the police done certain aspects of their investigation differently, it would have supported his defense"); Commonwealth v. Rodriquez, 378 Mass. 296 (1979).

¹⁰⁵ Commonwealth v. Bowden, 379 Mass. 472 (1981). Although argument on this issue must be permitted because it may constitute reasonable doubt, whether to give a jury instruction on inferences that may be drawn from failure to conduct tests is in the court's discretion. Commonwealth v. Fitzgerald, 412 Mass. 516, 525 (1992). See also *infra* § 35.2D.

¹⁰⁶ Commonwealth v. Rivera, 424 Mass. 266, 274 (1997); Commonwealth v. Adams, 34 Mass. App. Ct. 516, 519 (1993). In accord: Commonwealth v. Snell, 428 Mass. 766, 779 (1999); Commonwealth v. Rivera, 424 Mass. 266, 274 (1997); Commonwealth v. Vuthy Seng 456 Mass. 490, 503 (2010)(judge acted properly to caution the jury about the relevance of "CSI" references during testimony but his reference to "CSI" in his *Bowden* jury instruction was undesirable, though not error.

¹⁰⁷ Commonwealth v. Franks, 359 Mass. 577, 580–81 (1971) (hospital records); Commonwealth v. Harvard, 356 Mass. 452, 462 (1969) (drug certificate).

performs various tests on the questioned substance.¹⁰⁸ There are three agencies that conduct drug testing in Massachusetts: the Massachusetts State Police Forensic Sciences Group Drug Unit, the Massachusetts Department of Public Health Forensic Drug Labs in Boston and Amherst, and the University of Massachusetts Medical School Drugs of Abuse Lab in Worcester. The State Police Drug Unit and U. Mass.

¹⁰⁸ In the area of drug identification, a highly regarded treatise is *Clarke's Isolation and Identification of Drugs in Pharmaceuticals, Body Fluids and Post-Mortem Material* (2d ed. 1986), A. E. Moffett et al. (eds.) and *Clarke's Analysis of Drugs and Poisons* ((2004), which are encyclopedic in their compilation of graphs, spectra and other identifying data. HOUTS, BASELT, & CRAVEY, *COURTROOM TOXICOLOGY*, Vols. 3–6 (1991), lists drugs with appropriate identifying tests. See TRYING DRUG CASES IN MASSACHUSETTS, S. Page et al., Chapter 9 Trial Issues Post *Melendez-Diaz* (MCLE, 2010); Links to numerous drug and toxicology websites can be found within Defender Links at the CPCS website, <http://www.state.ma.us/cpcs>. The Defender Links are updated periodically. Compiled and edited by Stephanie Page, Senior Trial Counsel, the websites listed therein are currently as follows:

<http://www.nlm.nih.gov/medlineplus/druginformation.html> -- Major site with information about over the counter and illegal drugs.

<http://www.erowid.org/psychoactives/psychoactives.shtml> -- Erowid's Psychoactive Vaults: This is a great site with endless info on illegal drugs.

<http://leda.lycaeam.org/quickindex.shtml> -- All the drugs you may have...heard about ...in the past and more.

<http://www.well.com/user/woa/> -- Web of Addictions: This site has fact sheets regarding all kinds of drugs, legal and street.

<http://www.druginfonet.com/> -- Drug InfoNet is a one-stop web site for all drug and health/disease informational needs. Although this does have both the manufacturer's pamphlet re: interactions and one on user friendly language, the selection is limited.

<http://www.medscape.com/> -- Free online search after registering.

<http://www.health.org/catalog/index.htm> -- This is The National Clearinghouse for Alcohol and Drug Information. It has alcohol and drug Facts under categories, crack, ice, etc. at <http://store.samhsa.gov/facet/Substances>

http://www.bu.edu/police/prevention/rohypnol_fact_sheet.htm
<http://www.chestnut.org/li/trends/Street%20Drugs/rohypnol.html> -- Fact sheets on date rape drug: rohypnol.

<http://www.soft-tox.org/> -- The Society of Forensic Toxicologists, Inc. (SOFT) is an organization composed of practicing forensic toxicologists. This site has good links to: American Board of Forensic Toxicology; Journal of Analytical Toxicology; Forensic Toxicology Laboratory Guidelines; Toxtalk Newsletter; Www Toxilinks.

<http://toxnet.nlm.nih.gov/> -- Basic Toxicology search engine with definitions and explanations.

<http://www.criminology.fsu.edu/journal/hold.html> -- Saliva as an analytical tool in toxicology.

<http://www.criminology.fsu.edu/journal> -- International Journal of Drug Testing, including articles on hair. Currently undergoing relocation and updating.

<http://link.springer.de/link/service/journals/00213/index.htm> -- Psychopharmacology Journal that will send you online Table of Contents with search capacities.

Labs have their own drug testing protocols, while the DPH Lab follows the SWGDRUG guidelines.¹⁰⁹

Occasionally, the Commonwealth will try to circumvent the need for a drug analyst by attempting to use a police officer as a drug expert to testify to either a visual identification of a drug and/or to describe field tests that were conducted. Most police officers claim to have expertise based on experience and observation with some minimal training rather than formal forensic training in the scientific method, chemistry, biology or physics.

Because expert testimony is crucial for the Commonwealth in drug cases, it is important for counsel to look for opportunities to challenge this type of evidence. The pre-trial conference report can be amended for specific discovery requests or counsel can file separate discovery motions in these cases to obtain information regarding some or all of the following: testing procedures; testing methods; testing equipment used; protocols; training; operation manuals; equipment types and maintenance records; a complete copy of the lab file including notes, preliminary screens, weights, analysis, raw data, printouts, statistical determinations, and error logs; quality assurance records; CV and proficiency tests of analysts involved; and analyst and lab certifications and accreditations.¹¹⁰ In reviewing these discovery materials, counsel should consider whether the appropriate tests and procedures were used, whether the analysts were qualified, whether protocols were properly followed and whether there are signs of lab errors or analyst mistakes. Any deficiencies in these areas can give rise to a Daubert challenge or motion in limine to prevent or limit the admission of expert testimony. Counsel should also consider a request for a voir dire hearing of the expert in order to get a preview of what the expert would say at trial and to use that information as a basis for a motion in limine to either exclude the testimony in the appropriate case or to prevent the expert from testifying to impermissible inferences and conclusions.

The examination and testing of controlled substances can involve visual identification, field tests, preliminary lab tests, and specific drug identification analyses. Many preliminary tests used by crime labs are *nonspecific* in that they indicate the presence of a particular drug by a response that could be produced by the presence of one or more substances other than the particular drug. Thus false-positive results are possible. A physical examination test for marijuana, for example, is nonspecific because there are other plants that have the identical appearance.¹¹¹ Occasionally, lab analysts will identify pills by comparing their physical characteristics and markings to various reference guides.

¹⁰⁹ The State Police and U. Mass drug testing protocols are available through CPCS – contact Forensic Services Director Anne Goldbach at agoldbach@publiccounsel.net or 617 988-8337. SWGDRUG guidelines are available at www.swgdrug.org.

¹¹⁰ The <http://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>, Report, p. 135 notes that: ‘Some laboratories might mention the tests that were conducted, but in most cases the spectra, chromatograms, and other evidence of the analysis and the chemist’s notes are not submitted. Likewise, possible sources of error and statistical data are not commonly included. From a scientific perspective, this style of reporting is often inadequate, because it may not provide enough detail to enable a peer or other courtroom participant to understand and, if needed, question the sampling scheme, process(es) of analysis, or interpretation.’

¹¹¹ Check various websites for lab guidelines and protocols for drug testing. The Society of Forensic Toxicology, <http://www.soft-tox.org/>, has lab guidelines online. Counsel may wish to compare those guidelines and protocols to what was done in a particular case. Counsel should consider discovery requests for, or summoning local police and/or state police lab protocols for drug testing. Also see GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE § 23 (Lexis Law Publishing 2007)

Other nonspecific tests are color change tests, which are often used by police in field-testing kits; microcrystal tests; ultraviolet spectrophotometry;¹¹² melting point tests; and chromatographic tests, including paper, thin layer, gas and high pressure liquid chromatography. Immunoassay tests (including radioimmunoassay, enzyme multiplied immunoassay, and free radial assay) analyze the body fluid, usually urine, of a person to determine whether a drug has been ingested. These tests are also nonspecific with a significant risk of false positives.¹¹³

Instances where the Commonwealth seeks to rely on visual identification or preliminary, non-specific testing of controlled substances are ripe for a Daubert challenge or motion in limine.

Lab protocols dictate that preliminary tests must be confirmed with another specific test. The most common and well-known confirmatory test is gas chromatography/mass spectroscopy (GC/MS). Other, similar tests include Fourier transform infrared spectrophotometry (FTIR), high-performance liquid chromatography (HPLC), UV Spectrophotometry, and gas chromatography with a flame ionization detector (GC/FID). GC/MS is a highly specific two part test but may be subject to interpretative error on the part of the analyst. The SWGDRUG guidelines can provide some guidance as to whether the appropriate test was used in a given case. A challenge to specific drug identification tests normally requires expert consultation to review all of the discovery materials including computer printouts, error logs, quality assurances records, equipment maintenance records and other data..¹¹⁴ The expert can assist

¹¹² See *Commonwealth v. Adames*, 41 Mass. App. Ct. 14 (1996) (technique of “ultraviolet tracing” by marking drug “buy” money with ultraviolet crayon, visible only under ultraviolet light, is distinct from ultraviolet spectrophotometry; testimony on former technique requires no foundation under *Frye*).

¹¹³ GIANNELLI & IMWINKELRIED, *SCIENTIFIC EVIDENCE* § 23 (Lexis Law Publishing 2007); SAFERSTEIN, *CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE*, Chapter 9 (10th ed. 2010); MOENSSENS, INBAU & STARRS, *SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES*, Chapter 14 (4th ed., Foundation Press, MINEOLA, NY, 1995). See also TRYING DRUG CASES IN MASSACHUSETTS, S. Page et al., Chapter 9 (MCLE, 2010); GIANNELLI & IMWINKELRIED, *SCIENTIFIC EVIDENCE* § 23 (Lexis Law Publishing 2007). The Internet has numerous resources on drugs and crimes, as well. The National Institute of Justice website lists numerous articles on drugs and crime. The Drug Enforcement Administration (DEA) and Carpenter’s Forensic Science Resources (available at <http://www.tncrimlaw.com/forensic/>) contain informative links and articles. See also *Gonzalez v. Commissioner of Correction*, 407 Mass. 448, 450–51 (1990) (finding below that double enzyme multiplied immune test is unreliable under *Frye* test; reversed and remanded on other grounds).

At the Journal of Analytical Toxicology website <http://www.jatox.com/search.htm>, counsel can search for articles on issues such as “false positive” results in drug testing. Another website that provides such a search is that of the International Association of Forensic Toxicologists, at <http://www.tiaft.org/>.

¹¹⁴ GIANNELLI & IMWINKELRIED, *SCIENTIFIC EVIDENCE* § 23 (Lexis Law Publishing 2007); MOENSSENS, INBAU & STARRS, *SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES*, Chapter 14 (4th ed., Foundation Press, MINEOLA, NY, 1995). The National Institute of Justice has numerous forensic-related publications that are available online at <http://www.ojp.usdoj.gov/nij>. In the area of “Drugs and Crime”, for example, you can find the following: Law Enforcement and Corrections Standards and Testing Program, *Trace Detection of Narcotics Using a Preconcentrator/Ion Mobility Spectrometer System*, by John E. Parmenter and Gary A. Eiceman, April 2001.

counsel in determining whether the specific tests in a particular case are vulnerable to attack due to lab or analyst error, equipment flaws, or other issues of reliability.¹¹⁵

The weighing and sampling of drugs is another area that counsel must consider. In cases where multiple packages of drugs are submitted, the labs follow specific protocols to determine the total weight of the controlled substances. Counsel should be aware that not all of the drugs may be tested and that weights may be averaged in certain cases. For example, The State Police Drug Unit protocol requires that in cases with 10 packages or less, “the actual net weight of the material in the individual bags... are to be recorded.” In cases involving more than 10 bags, there is a choice between measuring the net weight of all the bags and using one of two formulas: the average weight of material per bag multiplied by the number of bags *or* the gross weight of the material *and* bags minus the amount obtained by multiplying the average weight of the bags by the number of bags. The protocol then requires determination of a statistical “confidence limit.”¹¹⁶ Testing in multiple sample drug cases involves grouping the samples based on information and packaging. All are tested if there are three samples or less, but where there are more than three samples, testing is done on a random selection of a certain number of samples. The random selection is based on various formulas, depending on whether or not the net weight is “trafficking weight”.¹¹⁷

In order to fashion effective cross-examination, defense counsel must know how false positive results occur, and how often in the non-specific tests, and must understand how instruments may fail or interpretation prove faulty in the specific ones. Even if counsel asks the right question, the opposing expert may refuse to concede the truth. Thus defense counsel must be prepared to call a defense expert witness to establish the scientific basis of her argument.

Understanding the alleged amount of the substance may be easier for the nonscientist attorney, but again detailed discovery of the state’s procedures may be fruitful.¹¹⁸

Expert testimony also may be useful in drug distribution cases to establish that a certain amount of a drug is consistent with personal use as opposed to distribution.¹¹⁹ Police officers assigned to drug details are routinely permitted to give opinions on this

¹¹⁵ See e.g. <http://www.thetruthaboutforensicscience.com/drugs-of-abuse-doa-analysis-performed-today-in-the-us/>; TRYING DRUG CASES IN MASSACHUSETTS, S. Page et al., Chapter 8 Scientific Evidence and Protocols (MCLE, 2010).

¹¹⁶ Massachusetts State Police Forensic Services Group Drug Unit Protocol for the Weighing Multiple Sample Drug Cases v. 4.0 effective date 6/18/07.

¹¹⁷ Massachusetts State Police Forensic Services Group Drug Unit Protocol for the Testin g of Multiple Sample Drug Cases v. 4.0 effective date 7/31/07.

¹¹⁸ In one such case investigated by defense expert Patrick Demers of Springvale, Maine, the state’s analyst tested one of many packets of powder obtained from the defendant. The analyst then mixed the other packets with the first packet, weighed the mixture and produced a drug analysis document reciting the single packet test result as the analysis of the mixture. See also Commonwealth v. Johnson, 410 Mass. 199, 200–01 (1991) (certificate calculated total weight of contents of 71 plastic bags by extrapolating from average weight of a random sample of bags; upheld) and cases cited therein. In May 1992 the Attorney General’s Office noted possible inaccuracies in and/or improprieties of procedures and analyses in drug tests at the 1010 Commonwealth Avenue [Boston] drug laboratory, and ordered resubmission of narcotics for testing in certain pending cases; counsel should ask for further documentation in appropriate cases, see *CPCS Training Bulletin*, vol. 2, no. 3 (Sept. 1992).

¹¹⁹ At the National Institute of Justice website, <http://www.ojp.usdoj.gov/nij>, in publications, you can find numerous articles or pamphlets on drug use in various populations.

point that are likely to be accepted by the jury unless rebutted by a person experienced in treating drug addiction.¹²⁰ For more information on police officer testimony in drug cases, *see* § 12.11A (Pseudo Experts, Police Generally, Presumptive Field Tests).

§ 12.6 SCIENTIFIC EVIDENCE ON IDENTIFICATION ¹²¹

§ 12.6A. FRICTION RIDGE ANALYSIS: FINGERPRINTS, PALM PRINTS AND SOLE PRINTS

Friction ridge analysis is an important forensic science because identifications or individualizations are made on the basis of the print patterns left by fingers, palms and feet.¹²² For decades, it was believed that each person's prints are unique and that barring injury or rare disease, they develop before birth and last until decomposition. Recently scholarly articles argue that uniqueness of prints has not been proven and that the concept of individualization in forensics should be replaced by terms that describe the probative value of a comparison.¹²³

The surface of the fingers and palms has skin that is corrugated or rough. This skin contains raised portions that are called ridges. It is the arrangement of these ridges that is believed to be unique.¹²⁴ Tiny sweat glands in the skin produce a discharge that leaves an impression of the fingerprint pattern on any smooth surface touched, from glass, metal, or paper to unfinished wood, and even fabrics and human skin.¹²⁵ The residue left by a fingerprint is composed of inorganic salts and organic matter, including amino acids. There are three kinds of latent prints: invisible, visible and plastic. Invisible prints occur when the skin and surface touched are clean and smooth.

¹²⁰ *See* Commonwealth v. Frias, 47 Mass. App. Ct. 293 (1999) (detective's testimony regarding the operations of midlevel drug distribution points did not amount to "profile" evidence); Commonwealth v. Johnson, 413 Mass. 598, 603–04 (1992) (testimony of experienced DCU detective that packaging consistent with intent to distribute); Commonwealth v. Dennis, 33 Mass. App. Ct. 666, 669–70 (1992) (testimony by experienced narcotics investigator describing modus operandi of street level dealers); "Coping with the Commonwealth's So-Called 'Expert' Drug Witness," *CPCS Training Bulletin*, vol. 2, no. 3, at 11 ff. (1992).

¹²¹ *See also infra* ch. 18.

¹²² For an excellent discussion on friction ridge analysis, *see* NAS Report, <http://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>, pp. 16-145. Further information is available in a new publication from the National Institute for Justice, The Fingerprint Sourcebook by SWGFAST at <http://www.nij.gov/pubs-sum/225320.htm>.

¹²³ *See, e.g.,* Simon A. Cole, *Forensics without Uniqueness, Conclusions without Individualization: the New Epistemology of Forensic Identification Law, Probability and Risk* (2009) 8, 233–255 (2009), available on the internet at the web site <http://lpr.oxfordjournals.org/content/8/3/233.full.pdf?keytype=ref&%2520ijkey=ds6pfuzlQdrzbGt>.

¹²⁴ For a brief look on the uniqueness of fingerprints from a biometrics view, please see http://www.360biometrics.com/blog/are_fingerprints_unique/.

¹²⁵ TARANTINO, STRATEGIC USE OF SCIENTIFIC EVIDENCE 54 (1988). *See also* GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE § 16 ((Lexis Law Publishing 2007)); MOENSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES (4th ed., Foundation Press, MINEOLA, NY, 1995); SAFERSTEIN, CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 16 (10th ed. 2010).

Visible prints are those left in wet substances, such as ink, paint or blood. Plastic fingerprints occur when the finger makes a negative impression on a soft substance, such as wax, clay or gum on an envelope. An individual's prints can vary depending upon degrees and angles of pressure, distortions and surfaces.¹²⁶

Impressions may be visible, as, for example, in wet paint, or may require "visualization," a procedure to make the print visible. Visualization techniques should vary depending on the porous or nonporous nature of the surface tested.¹²⁷ Some techniques are well accepted, but novel techniques involving lasers, radioisotopes, and super glue are not well established and may be susceptible to a challenge to their admissibility.¹²⁸ Visualization of fingerprints on human skin should have been done

¹²⁶ The NAS Report, available at <http://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf> (see Ch. 5 for further information on friction ridge analysis). The report notes at p. 144, "Uniqueness does not guarantee that prints from two different people are always sufficiently different that they cannot be confused, or that two impressions made by the same finger will also be sufficiently similar to be discerned as coming from the same source. The impression left by a given finger will differ every time, because of inevitable variations in pressure, which change the degree of contact between each part of the ridge structure and the impression medium. None of these variabilities—of features across a population of fingers or of repeated impressions left by the same finger—has been characterized, quantified, or compared."

¹²⁷ See GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE § 16 (Lexis Law Publishing 2007); MOENSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES (4th ed., Foundation Press, Mineola, NY, 1995); SAFERSTEIN, CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 16 (10th ed. 2010). For example, the Boston Police Department often uses Super Glue (cyanoacrylate ester) fuming for nonporous surfaces, and the Massachusetts State Police have purchased a reflective ultra violet imaging system and an alternate light source (which is similar to a laser) that can be used for detecting prints. The website for the Massachusetts State Police and the Crime Scene Service Section can be found at <http://www.state.ma.us/msp>.

¹²⁸ TARANTINO, STRATEGIC USE OF SCIENTIFIC EVIDENCE 54 (1988). See also GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE § 16 (Lexis Law Publishing 2007); MOENSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES (4th ed., Foundation Press, Mineola, NY, 1995); SAFERSTEIN, CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 16 (10th ed. 2010).

Links to numerous websites pertaining to fingerprints can be found within Practice Areas > Criminal > Defender Links at the CPCS website, <http://www.state.ma.us/cpcs>. The Defender Links are updated periodically. Compiled and edited by Stephanie Page, Senior Trial Counsel, the websites listed therein are as follows:

<http://www.fbi.gov/hq/lab/handbook/examlatp.htm> -- FBI guidelines for collection and processing of latent prints.

<http://www.swgfast.org/> -- SWGFAST is the FBI - supported Scientific Working Group on fingerprinting or Friction Ridge Analysis.

<http://onin.com/fp/> -- Fingerprint primer site with links to other forensic sites. Very informative. It keeps up with current legal developments.

http://onin.com/fp/daubert_links.html -- Lists all the cases where prints have been challenged under *Daubert* with Motions in Limine that have been filed and names of all experts who testified in cases. You can do a search within the website for all links to Motions in Limine.

<http://www.fdiai.org/Newsletter%20Archives/Newsletters/Jan1997/Jan1997futrell.pdf> - Hidden Evidence: Latent Prints on Human Skin by Ivan Ross Futrell, April 1996. Mr. Futrell is a supervisory fingerprint specialist in the Latent Fingerprint Section of the FBI Laboratory in

within two hours of the prints being deposited and may still be inconclusive due to the blending of the chemicals deposited in the impression with the similar chemicals present on the surface skin.¹²⁹ Many police departments now use solely the cyanoacrylate (super glue) method of preserving fingerprints because it is quick, inexpensive, and relatively easy to learn.¹³⁰

Once an impression is visualized, it must be photographed immediately because the image produced by some techniques fades quickly. In addition, the impression is “lifted” by applying sticky tape to the impression after dusting it with powder and then removing the tape, removing as well any powder or other substance that has been applied to the impression.

Fingerprint identification is accomplished by the visual comparison of the visualized prints with the inked impressions of known suspects. Fingerprint patterns are composed primarily of shapes called loops, whorls, and arches, which occur in that order of frequency. Both identical pattern characteristics and particular points of identity are sought. Some points of identity are rare and therefore more significant; some are common and so relatively insignificant. There is no generally accepted number of points of identity required for an identification, although most examiners require twelve points. Even one point of difference, if it cannot be explained, rebuts a claimed identification.

Fingerprints are classified and filed by law enforcement agencies according to several systems based on the numbers of particular shapes of the patterns on particular fingers. The classification of fingerprints is an area of expertise in itself and is different from expertise in fingerprint identification. It is common for these two jobs to be performed by different people in a police department.

Police use computers in fingerprint identification, especially in cases where they have no suspect.¹³¹ Defense discovery of any computer use and, if so, the

Washington, D.C. Recent research proves that identifiable prints can be obtained from the skin of homicide victims under real field conditions, not just in the laboratory.

<http://onin.com/fp/printsonskin.html> -- How to get prints from skin.

<http://www.phys.ttu.edu/~menzel/fscipub.html> --Excellent list of scientific articles re: different tests for fingerprints.

¹²⁹ TARANTINO, STRATEGIC USE OF SCIENTIFIC EVIDENCE 56 (1988).

¹³⁰ For a brief introduction, see The Cyanocrylate Fuming Method, Eric W. Brown, available at <http://www.ccs.neu.edu/home/feneric/cyanoacrylate.html>.

¹³¹ For cases where fingerprints provided the major evidence against the defendant, *see, e.g., Commonwealth v. Patterson*, 445 Mass. 626, 628-634, 840 N.E.2d 12 (2005); *Commonwealth v. Gambora*, 457 Mass. 715 (2010); *Commonwealth v. Baptista*, 32 Mass. App. Ct. 910 (1992) (rescript); *Commonwealth v. Fazzino*, 27 Mass. App. Ct. 485, 488 (1989); *Commonwealth v. Drayton*, 386 Mass. 39 (1982); *Commonwealth v. Clark*, 378 Mass. 392, 403-406 (1979); *Commonwealth v. LaCorte*, 373 Mass. 700, 702-705 (1977). If the only identification evidence is the defendant’s fingerprint at the crime scene, the prosecution must prove beyond a reasonable doubt that the fingerprint was placed there during the crime. *Commonwealth v. Morris*, 422 Mass. 254 (1996) (where evidence merely created reasonable inference that defendant’s thumbprint *might* have been placed on mask used in crime, shortly before or during the crime, court should have granted motion for required finding of not guilty). *Compare Commonwealth v. Ali*, 43 Mass. App. Ct. 549, 562-63 (1997) (upholding conviction although instruction implicitly, rather than explicitly, required jury to find that prints were impressed during or in conjunction with robbery; *Morris* distinguished as case where fingerprints were sole evidence linking defendant to the crime); *Hall v. DiPaolo*, 72 F.3d 243 (1st Cir.), *cert. denied*, 518 U.S. 1010 (1996) (sufficient corroborative evidence to sustain

computer program, is crucial to what may well be a successful challenge to the admissibility of the computer-assisted conclusion.¹³² Again, expert consultation is necessary.

To date, Daubert challenges to fingerprint evidence have met only with limited success in Massachusetts. The Supreme Judicial Court held in *Commonwealth v. Patterson* that the theory and process of fingerprint identification, and in particular the ACE-V method of identification, are reliable in terms of matching full latent fingerprints but that the Commonwealth had failed to demonstrate the reliability or general acceptance in the relevant scientific community of attempts to match a known print to a number of partial prints potentially left on an object at the same time.¹³³ In *Commonwealth v. Gambora*, the SJC ruled that the NAS Report did not require exclusion of fingerprint evidence and reiterated that “[g]eneral acceptance in the relevant community of the theory and process on which an expert’s testimony is based, on its own, continues to be sufficient to establish the requisite reliability for admission in Massachusetts courts under Daubert and Lanigan.”¹³⁴

§ 12.6B. BODY FLUIDS

The forensic study of body fluids, or forensic serology, examines blood or other fluids for genetic markers that are possessed by certain percentages of the population. With the advent of DNA analysis, one does not see serological forensic evidence as often as ten years ago, yet it is important in certain cases. Different parts of the blood (red cells, white cells, plasma) have their own types of markers, which include both those used to determine blood type and numerous other chemicals that are found in some people and not in others. About 85 percent of people are “secretors” whose saliva, semen, mucous, and perspiration also contain their characteristic chemical markers.¹³⁵

Forensic serology may conclusively *exclude* the defendant as the perpetrator, because of the absence in the defendant’s body fluid of markers found in the perpetrator’s.¹³⁶ However, serology cannot conclusively establish guilt; if the tests include the defendant as a possible perpetrator (because of the presence in the defendant of markers possessed by the perpetrator), the most the tests can show is a statistical chance of guilt.

conviction beyond mere presence of defendant’s fingerprint at the scene); *Commonwealth v. Keaton*, 36 Mass. App. Ct. 81 (1994) (same).

¹³² See sample discovery motion, TARANTINO, STRATEGIC USE OF SCIENTIFIC EVIDENCE 69 (1988). Computer systems are generically referred to as AFIS systems, or Automated Fingerprint Identification Systems. See, e.g., Forensic-Evidence.com: Identification Evidence/Is Fingerprint Identification a “Science”, by Andre Moenssens, at http://forensic-evidence.com/ID/ID0004_2.html.

¹³³ *Commonwealth v. Patterson*, 445 Mass. 626, 628-634, 840 N.E.2d 12 (2005); ACE-V refers to “analysis, comparison, evaluation, and verification”

¹³⁴ *Commonwealth v. Gambora*, 457 Mass. 715 (2010).

¹³⁵ See GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE (Lexis Law Publishing 2007) MOENSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES, Chapter 13 (4th ed., Foundation Press, Mineola, NY, 1995); CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 10 (10th ed. 2010)

¹³⁶ *But see Commonwealth v. Sims*, 30 Mass. App. Ct. 25, 30 (1991) (serological exclusions absolute in paternity investigations, but not in sexual assaults).

A forensic serologist requires training in genetics, fluid testing, population characteristics, and statistics.¹³⁷ A national registration examination exists for forensic serologists. Discovery and expert consultation as to the qualification of any purported expert in this field should be rigorous.¹³⁸

Tests to identify body fluids and their genetic markers are subject to the usual types of error. Most common tests for the presence of blood are nonspecific “catalytic” tests: while a negative result is reliable, a positive result is not, unless confirmed by a “crystal” test or electrophoresis.¹³⁹ Likewise, a common test for the presence of human blood, the precipitin test, reacts positively to the blood of other primates.¹⁴⁰

Electrophoresis is a technique for testing dried blood stains for genetic markers. Evidence of this technique is admissible in Massachusetts.¹⁴¹ The reliability of electrophoresis may be compromised by the age of the stain or by contaminants.

New tests may determine the sex or race of the source of a blood stain, whether the source had ingested particular drugs, or the age of the stain itself. As such tests are not widely accepted, defense counsel may be able to prevent their admission through careful discovery and expert consultation.

Blood spatter patterns at crime scenes may also be interpreted by experts (also known as bloodstain pattern analysis). Blood spatter may enable determinations of the clothing worn by victims and perpetrators at the scene, the position of both parties, the movement of the body before and after death, and the sequence of events. The International Association of Bloodstain Pattern Analysts is the leading authority on bloodstain analysis. The Scientific Working Group on Bloodstain Pattern Analysis publishes guidelines on standard operating procedure at regular intervals.¹⁴²

Bloodstains are classed into three categories, passive, transfer, and projected.¹⁴³ Passive bloodstains are left from gravity acting on flowing blood and may be either dripped or spilled. Transfers are created when a bloodied object meets another surface, such as a bloody hand or shoe print. Projected bloodstains originate from a sudden

¹³⁷ *Commonwealth v. Gomes*, 403 Mass. 258 (1988).

¹³⁸ See checklist of qualifications, TARANTINO, STRATEGIC USE OF SCIENTIFIC EVIDENCE 496 (1988).

¹³⁹ TARANTINO, STRATEGIC USE OF SCIENTIFIC EVIDENCE 499 (1988). See also *Commonwealth v. Gordon*, 422 Mass. 816 (1996), regarding blood spatter pattern evidence as well as the ortho-tolodine test for occult (invisible) blood.

¹⁴⁰ *But see Commonwealth v. Yesilciman*, 406 Mass. 736, 744–45 (1990) (evidence of blood stains on defendant’s possessions admissible despite inability to determine its age or whether blood was from human); *Commonwealth v. Beldotti*, 409 Mass. 553, 561 n. 6 (1991) (*accord*). In *Commonwealth v. Duguay*, 430 Mass. 397, 401–402 (1999), the Supreme Judicial Court declined to find error in the admission of the presumptive ortho-tolodine test even where there was no additional confirmatory evidence.

¹⁴¹ *Commonwealth v. Gomes*, 403 Mass. 258 (1988); *Commonwealth v. Gliniewicz*, 398 Mass. 744 (1986). See also *People v. Reilly*, 196 Cal. App. 3d 1127, 1148 (1987). Gel electrophoresis is also used in DNA testing. See *Commonwealth v. Vao Sok*, 425 Mass. 787 (1970); *Commonwealth v. Lanigan*, 413 Mass. 154 (1992); *Commonwealth v. Curnin*, 409 Mass. 218 (1991).

¹⁴² SWGSTAIN Guidelines available at <http://www.swgstain.org/>, direct link <http://www.swgstain.org/documents/STANDARDOPERATINGPROCEDURES-Final.pdf?attredirects=0>

¹⁴³ The International Association of Bloodstain Pattern Analysts maintains a very informative and helpful tutorial as an introduction to blood spatter, available at <http://www.bloodspatter.com/BPATutorial.htm>.

trauma, such as a gunshot wound or a blow with a heavy object. Bloodstain pattern analysts study the type of bloodstain and the directionality of the stain to determine the probable events. Computers are frequently used to discern the directionality of the stain.

§ 12.6C. DNA TESTING

As noted in the NAS Report, “DNA typing has been subjected to the most rigorous scrutiny by the courts, presumably because its discriminating power is so great and so much is at stake when a suspect is associated to a crime scene only through DNA typing. Or perhaps because (at least some) modern courts or lawyers are more literate about science than they were in the past.”¹⁴⁴

After initial caution,¹⁴⁵ the Supreme Judicial Court has approved the validity of DNA match evidence.¹⁴⁶ DNA testing is performed on biological evidence left by a perpetrator at a crime scene or on the person of a crime victim or found on the person or clothing of a suspect.¹⁴⁷ This evidence may be blood, semen, or any tissue since

¹⁴⁴ The NAS Report at 99, <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>, citing D.L. Faigman, M.J. Saks, J. Sanders, and E.K. Cheng. 2007-2008. *Modern Scientific Evidence: The Law and Science of Expert Testimony*. Eagan, MN: Thomson/West, § 1:30, pp. 85-86.

¹⁴⁵ Commonwealth v. Lanigan, 413 Mass. 154, 159–63 (1992) (*Lanigan I*) (affirming exclusion of results of DNA testing because Commonwealth failed to satisfy its burden of showing that statistical methods for finding positive DNA “match” met the *Frye* test; however, evidence of absence of a match would be admissible) (citing Commonwealth v. Curnin, 409 Mass. 218, 222–23 (1992) (*accord*), and a National Research Council report (“DNA Technology in Forensic Science,” (1992)) advocating changes in current DNA statistical techniques). Compare Commonwealth v. Teixeira, 40 Mass. App. Ct. 236 (1996) (admitting DNA testimony on match probabilities recalculated according to recommendations of NRC Report). The cited NRC Report has been updated: see NRC, Committee on DNA Forensic Science, “The Evaluation of Forensic DNA Evidence” (1996).

¹⁴⁶ Commonwealth v. McNickles, 434 Mass. 839, 845-849 (2001); Commonwealth v. Vao Sok, 425 Mass. 787, 799–803 (1997) (upholding scientific validity of PCR-based analysis of forensic DNA samples, both in general and specifically at DQA1, PM and D1S80 loci; “such testing is admissible as evidence when the tests are properly conducted”); Commonwealth v. Rosier, 425 Mass. 807, 817 (1997) (“product rule,” used to calculate approximate DNA frequencies in the population, is scientifically acceptable method of analyzing PCR-based DNA testing); Commonwealth v. Lanigan, 419 Mass. 15 (1994) (*Lanigan II*) (abandoning *Frye* test in favor of *Daubert* test). See also *supra* § 12.3A; Commonwealth v. Teixeira, 40 Mass. App. Ct. 236, 240 (1996) (weaknesses in lab proficiency testing go to weight, not admissibility, of DNA evidence). More recent cases include: Commonwealth v. Mattei, 455 Mass. 840 (2010)(test results of a DNA match will not be permitted without statistical information regarding the likelihood of a match); Commonwealth v. Bly, 448 Mass. 473 (2007)(defendant could not be excluded as donor of blood on clothing – peer review and publication of DNA database are important but not prerequisite to admissibility); Commonwealth v. O’Laughlin, 446 Mass. 188 (2006); Commonwealth v. Gaynor, 443 Mass. 245 (2005).

¹⁴⁷ For a useful introduction to DNA testing, see U.S. Congress, Office of Technology Assessment, Genetic Witness: Forensic Uses of DNA Tests OTA-BA-438 (Washington, D.C.: U.S. Government Printing Office, July 1990). See also the 1992 and 1996 NRC reports cited *supra* note 107; Larry Tipton, “DNA and the Defense: A Brief Overview of the Science, Strategy and Selected Issues (1997),” in Page, Tipton & Regan, “Forensics Part II,” *CPCS Training Conference Materials* 24–28 (Nov. 14, 1997); Technical Working Group on DNA Analysis Methods (“TWGDAM”), *Guidelines for a Quality Assurance Program for DNA Analysis*, 22 CRIM. LAB. DIG. 21, 32 (1995).

DNA (deoxyribonucleic acid) appears in the nucleus of every cell in the body. Red blood cells do not have a nucleus and are one of the few body cells to lack DNA. DNA is the genetic code that makes each person develop from fertilized egg to unique adult. The evidence is tested by extracting the DNA and dividing it in pieces that form a pattern. This pattern is compared with the DNA fragment pattern extracted from a suspect's or victim's blood.¹⁴⁸ In most instances, nuclear DNA testing is used to

¹⁴⁸ Although somewhat dated, a good primer on DNA identification testing is INMAN & RUDIN, AN INTRODUCTION TO FORENSIC DNA ANALYSIS (1996). See BIEBER ET AL., FORENSIC DNA EVIDENCE IN THE COURTROOM (MCLE, 1999); MILES, BIEBER ET AL., UNDERSTANDING DNA EVIDENCE (MCLE, 1999); Goldbach, Geiger, & Jackson, "DNA for Dummies" *CPCS Training Conference Materials* (May 2000). Additionally, hundreds of websites relating to DNA can be found on the Internet. An extensive list of DNA sites is maintained by Kruglick Law Office found at http://www.kruglaw.com/f_dna.htm. The link entitled "Basics of DNA Fingerprinting" is a good explanation for beginners. Another excellent website can be found at <http://www.scientific.org>. This website is entitled "Scientific testimony, An Online Journal." Click on the "tutorials" link to learn more about DNA. The websites for the National Institute of Justice and the National Institute of Standards and Technology contain numerous articles on DNA that can be located through their internal search engines.

Links to numerous websites pertaining to DNA can be found within Practice Areas > Criminal > Defender Links at the CPCS website, <http://www.state.ma.us/cpcs>. The Defender Links are updated periodically. Compiled and edited by [Stephanie Page](#), Senior Trial Counsel, the websites listed therein are as follows:

http://denverda.org/DNA/DNA_INDEX.htm -- DNA Litigation Resource Page. Even though this is maintained by prosecutors it is useful. This is kept pretty current and has links to all the major cases.

<http://www.scientific.org/tutorials/articles/riley/riley.html> -- DNA Testing: An Introduction for Non-Scientists - An illustrated explanation by DONALD E. RILEY, Ph.D. This primer on DNA evidence is designed to help people who are new to the area get up to speed quickly on the technology and terminology involved in forensic DNA testing.

<http://www2.fbi.gov/hq/lab/html/testinglab.htm> -- Quality Assurance Standards for Forensic Labs for DNA adopted by the FBI. This document consists of definitions and standards. The content of the pages is determined by the SWG members and the funding is provided by the FBI.

<http://www.cstl.nist.gov/div831/strbase/> -- Short Tandem Repeats: Good learning page with explanations, data and list of those scientists working with STR's.

<http://vector.cshl.org/dnaftb/> -- DNA From the Beginning: This is a basic DNA site that explains the actual science in a lesson plan. This is put out by the Cold Harbor Springs Lab [where it all began!]

http://www.kruglaw.com/f_dna.htm -- This site has links to an incredible amount of DNA material: articles, studies, journals, definitions, new advances, etc.

<http://www.ncjrs.gov/pdffiles1/nij/177626.pdf>-- Post conviction DNA Testing: Recommendations for Handling Requests" (NCJ 177626) (Issues and Practices) is available on the NCJRS World Wide Web site. The document suggests recommendations for prosecutors, defense counsels, courts, victims' advocates, and laboratory personnel when receiving requests for post conviction DNA testing to maximize the future benefits and use of DNA in post conviction proceedings.

<http://www.dna.gov/audiences/investigators/know--> "What Every Law Enforcement Officer Should Know About DNA Evidence". This NIJ brochure describes the need for investigators to have fundamental knowledge about identifying, preserving, and collecting DNA to help solve cases. The brochure also discusses CODIS (Combined DNA Index System), an electronic database of DNA profiles that can identify suspects.

identify 13 or more short tandem repeats (STR's) in an evidence sample, and samples from alleged victims and from suspects. Identification may be as conclusive to 99.9 percent and more according to the chemical companies that offer the testing commercially. In instances of sexual assault and some other cases where there is a mixture of two or more individual's DNA, and in which only a small amount of male DNA is detected, Y-STR testing can be used to identify STR's on the male Y chromosome. Y-STR testing cannot yield results that are as discriminating as those from nuclear DNA testing. Mitochondrial (mtDNA) testing can be used when there is not enough nuclear DNA present in biological sample such as hair, bones and teeth. Mitochondrial DNA is inherited maternally which means that all maternal relatives will have the same mtDNA. This type of analysis looks at one location or "locus" and is also less discriminating than nuclear DNA testing. Low copy number DNA or touch DNA refers to instances in which there is less than 100 picograms that can be "copied" for testing purposes. This type of analysis can yield sampling artifacts and detection of extraneous DNA contamination.¹⁴⁹

Unlike the genetic marker chemicals tested by other serologic techniques, DNA is stable in dried specimens and may remain so for years. Thus, acceptance of this form of testing has led to the successful reopening of old closed cases.¹⁵⁰

http://www.promega.com/profiles/203/ProfilesinDNA_203_10.pdf -- Defense Tactics for DNA Litigation by Paul C. Giannelli

http://www.accessexcellence.org/WN/NM/interview_dr_bruce_weir.html -- An Interview With DNA Forensics Authority Dr. Bruce Weir: an expert witness for the prosecution in the OJ Simpson case, about the methods and controversies surrounding DNA evidence.

<http://www.promega.com/profiles/default.htm> -- Online journal re: articles, discussions surrounding DNA uses and advances. Select your country to advance to the home page.

<http://www.ojp.usdoj.gov/nij/topics/forensics/events/dnamtgtrans5/trans-g.html> -- Transcript of session on: National Commission on the Future of DNA Evidence, May 7 1999: Crime Scene Investigation Working Group Report.

Also note that the "mega" criminal law websites all have large sections devoted to DNA links:

<http://www.crimelynx.com/> This is a relatively new and exciting criminal law site. Jerrilyn Merritt, a Colorado attorney and NACDL member, etc., started it. She is an excellent lawyer and resource.

<http://www.kruglaw.com/> More than 800 links to forensic and criminal law sites. Just follow the trail.

<http://www.jflax.com/> Jeff Flax's Law Related Resources; Super Sites; Criminal Law Oriented Sites. This is a link site.

<http://www.dna.gov/> The DNA Initiative hosts free training, tutorials, and useful links and tools for counsel on DNA. An excellent resource to get an understanding of DNA as a science and evidence.

¹⁴⁹ To learn more about Y-STR, mtDNA, LCN go to <http://www.dna.gov/training/markers/> and http://www.nfstc.org/pdi/Subject00/pdi_s00.htm.

¹⁵⁰ See DWYER ET AL., ACTUAL INNOCENCE: FIVE DAYS TO EXECUTION AND OTHER DISPATCHES FROM THE WRONGLY ACCUSED (2000); National Institute of Justice, "Convicted by Juries, Exonerated by Science: Case Studies in the Use of DNA Evidence to Establish Innocence After Trial" (June 1996), documenting convictions of 28 men who have since been exonerated via posttrial DNA testing. The study is discussed in Current Reports, BNA Crim. Prac. Rep., vol. 10, no. 15, at 283 (July 17, 1996).

While DNA evidence can absolutely exclude a suspect as the donor of bodily substances, the report of a DNA “match” is usually expressed in terms of statistical analysis that indicates the probability of observing the same DNA profile if it came from another individual unrelated to the defendant or suspect.¹⁵¹ Information about DNA testing is available from commercial testing laboratories and from companies that produce test “kits” commercially; these sources might well be expected to overstate the accuracy of their own products.¹⁵² Along with the widespread admissibility of DNA evidence comes a host of critical legal issues and techniques with which defense counsel must become familiar in appropriate cases.¹⁵³ Yet, as noted by a well-respected forensic scientist, there remain concerns regarding the way in which DNA is databased, as well as issues regarding the manner in which DNA results are acquired, calculated and reported.¹⁵⁴

It remains important for defense counsel to consider that notwithstanding a finding of reliability of the methodology and specific kits, laboratory procedures must be determined to be reliable before evidence will be admitted. and Issues such as contamination and subjectivity of interpretation continue to be viewed as going to the weight of the evidence and do not bar admissibility.”¹⁵⁵ These themes frame issues for defense counsel such as whether to bring a motion to preserve DNA-related evidence, defense discovery,¹⁵⁶ selection of an expert, techniques for challenging the reliability of

¹⁵¹ See <http://www.newkirkcenter.uci.edu/Thompson/Costanzo-03.pdf>; THOMPSON, W. C. & COLE, S. A., Psychological Aspects of Forensic Identification Evidence, in, Psychological Testimony for the Courts (Costanzo, M., Krauss, D., Pezdek, K. eds., 2007). See also the SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories at <http://www.fbi.gov/about-us/lab/codis/swgdam-interpretation-guidelines>. In 1997 the FBI announced that its lab analysts can testify, in appropriate cases, that a match exists to a “reasonable degree of scientific certainty.” For discussion, and criticisms of the announcement as a “public relations ploy,” see “The FBI’s New DNA Policy: What Does it All Mean?” BNA Crim. Prac. Rep., vol. 11, no. 26 at 495–500 (Dec. 17, 1996).

¹⁵² Prominent manufacturers of DNA identification testing kits and/or instrumentation are Promega (www.promega.com), Applied Biosystems (www.appliedbiosystems.com) and Perkin Elmer (www.perkinelmer.com). Each of these companies maintains extensive websites containing scores of information regarding their test kits and instrumentation.

¹⁵³ See Thompson, William C., “The Potential for Error in Forensic DNA Testing (and How That Complicates the Use of DNA Databases for Criminal Identification)” Council for Responsible Genetics national conference, *Forensic DNA Databases and Race: Issues, Abuses and Actions*, June 19-20, 2008, New York University available at <http://www.councilforresponsiblegenetics.org/pageDocuments/H4T5EOYUZI.pdf>.

¹⁵⁴ *The NAS Report On Forensic Science: A Forensic Scientist’s Response*, Brent E. Turvey, MS1, Crime Reconstruction 2009.

¹⁵⁵ See *Commonwealth v. Bly*, 448 Mass. 473, 482-489 (2007).

¹⁵⁶ The Massachusetts State Police Crime Lab’s DNA Unit and the Boston Police Crime Lab’s DNA Unit each have a policy of notifying defense counsel if DNA testing will be destructive of an entire sample of biological evidence so that counsel can determine whether or not they wish to have an expert observe the testing. In cases where DNA test results do not exclude the defendant, defense counsel should never be satisfied with the “bare bones” 3-5 page digest of a DNA test result summary. For example, counsel should consider seeking discovery of the following: all photographs, notes, reports, memoranda, inventories, chain of custody document records and other documents relating to or documenting the location, collection, packaging, transportation and storage of all evidence taken from the crime scene and all biological samples taken in connection with this case; the item/s of evidence tested; the date of testing, the testing facility, the type of testing conducted, the names and manufacturers of any

proffered DNA evidence in a *Daubert* hearing,¹⁵⁷ and attacks on the validity and persuasiveness of admitted evidence.¹⁵⁸ Counsel should be prepared to consult with an expert regarding the particulars of DNA testing in a given case so that even if DNA evidence is ruled admissible, counsel can demonstrate issues and weaknesses in the government's case through cross-examination or direct evidence. These may include mis-typing, test results indicating the presence of a gene when it is not present (false-positive), failure to indicate the presence of a gene that is in fact present (false-negative), problems with sample mixtures, bias, subjectivity in interpretation, lack of adequate controls, and contamination.

§ 12.7 POLYGRAPH EVIDENCE

Although many clients might fail a polygraph test, exculpatory test results are potentially valuable, either to influence the prosecutor's decision to charge, or as evidence in court in certain cases. However, while polygraph testing has been and remains a popular investigative technique in government and law enforcement,¹⁵⁹ courts have not always welcomed test results in evidence.¹⁶⁰ Yet, exclusion of

testing "kits" which were used, the names, titles, and addresses of each individual who conducted the testing, or interpreted or analyzed the test results, and the test results. There are numerous other items that defense counsel might wish to discover after these types of documents are provided by the Commonwealth. For samples of various discovery motions in a DNA case, contact Anne Goldbach, Forensics Director, CPCS, at 617-482-6212.

Both Boston Police and Massachusetts State Police are now accredited by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB). Counsel should check to make sure which testing procedures were accredited at the time particular tests were conducted. Additionally, if either the Boston or State lab chooses to send tests out to other labs, counsel should discover the reasons local labs weren't used. For instance, in cases in which very small or degraded samples have been obtained, mitochondrial DNA testing might be the only viable option. To learn about mitochondrial DNA testing online, go to <http://www.mitotyping.com>.

¹⁵⁷ Challenges might be based, inter alia, on chain of custody, testing procedures and protocols, testing and statistical data, proficiency tests, error rates, and expert qualifications.

¹⁵⁸ See Fallible DNA evidence can mean prison or freedom, *New Scientist*, 11 August 2010 at <http://www.newscientist.com/article/mg20727733.500-fallible-dna-evidence-can-mean-prison-or-freedom.html>; Tarnish On The 'Gold Standard': Recent Problems In Forensic DNA Testing, *Champion Magazine*, NACDL 2006 at <http://www.nacdl.org/public.nsf/0/6285f6867724e1e685257124006f9177>. For a bibliography on bias in forensics go to http://www.forensidna.com/~Media/Bias_FS.htm. In addition, the procedures and protocols for conducting the test are complicated and subject to many errors. See *Commonwealth v. Vao Sok*, 425 Mass. 787, 806 n.27 (1997).

¹⁵⁹ The Department of Defense, for example, conducted over 400,000 polygraph examinations between 1981 and 1997 in connection with counterintelligence, security, and criminal investigations. *United States v. Scheffer*, 523 U.S. 303, 324 n.7 (1997) (dissenting opinion of Justice Stevens).

¹⁶⁰ American jurisdictions are split among those that per se exclude polygraph evidence, those that decide admissibility case by case, and one (New Mexico) that makes such evidence generally admissible without prior stipulation of the parties and without significant restriction. See *Holmes v. South Carolina*, 547 U.S. 319 (2007); *United States v. Scheffer*, 523 U.S. 303, 311 (1997) (upholding blanket rule of exclusion under Military Rules of Evidence over claim that exclusion violates constitutional right to present defense); *Lopez v. Massachusetts*, 349 F. Supp. 2d 109, 119 (D. Mass. 2004).

exculpatory test results threatens to violate defendant's fundamental right to present relevant evidence in his defense.

Before the Supreme Judicial Court's 1989 decision in *Commonwealth v. Mendes*,¹⁶¹ polygraph evidence was in some circumstances admissible in Massachusetts courts.¹⁶² *Mendes* held that polygraphic evidence did not satisfy the *Frye* test of general scientific acceptance; therefore, the result of a polygraph test taken by any witness, including the defendant, is not admissible at trial for any purpose.¹⁶³ Five years after *Mendes* the Court replaced *Frye* with *Daubert's* reliability test,¹⁶⁴ opening the way for admission of polygraph evidence¹⁶⁵ if the proponent can show the reliability of the polygraph test.¹⁶⁶ In view of historic judicial skepticism about the reliability of polygraph test results,¹⁶⁷ this task requires careful preparation.

In the 1996 case, *Commonwealth v. Stewart*, the Supreme Judicial Court stated that for polygraph evidence "to be admissible . . . it seems likely that its reliability will be established by proof in a given case that a qualified tester who conducted the test had in similar circumstances demonstrated, in a statistically valid number of independently verified and controlled tests, the high level of accuracy of the

¹⁶¹ 406 Mass. 201 (1989). See also *Commonwealth v. Martinez*, 437 Mass. 84, 88 (2002) (because polygraph inadmissible for any purpose, witness's offer to submit to polygraph examination as evidence of consciousness of innocence also inadmissible).

¹⁶² *Commonwealth v. Vitello*, 376 Mass. 426, 453–57 (1978); *Commonwealth v. A Juvenile*, 365 Mass. 421 (1974).

¹⁶³ *Commonwealth v. Mendes*, 406 Mass. 201, 212 (1989).

¹⁶⁴ *Commonwealth v. Lanigan*, 419 Mass. 15, 22–26 (1994) (if reliability and accuracy can be established, polygraph evidence could be admissible. (*Lanigan II*), discussed *supra* at § 12.3A.

¹⁶⁵ For a discussion of polygraphs and brain scans, see <http://www.wired.com/wired/science/2009/03/nolienmri/> -- MRI Lie Detection to get First Day in Court; <http://news.bbc.co.uk/2/hi/health/4051211.stm> -- Brain Scans and Lie Detector; <http://www.wired.com/wiredscience/2010/05/fmri-daubert/> -- Eyewitness Account of Brain Scans Legal Hearing.

¹⁶⁶ See *Commonwealth v. Duguay*, 430 Mass. 397, 402 (1999); *Commonwealth v. Kent K.*, 427 Mass. 754, 763 (1998); *Commonwealth v. Stewart*, 422 Mass. 385, 389 (1996) (discussing argument that *Mendes* no longer controls because *Frye* test, on which it relied, was displaced in *Lanigan II*, *supra*). See Ramy, *The Whole Truth and Nothing But the Truth: Will Commonwealth v. Lanigan Lead to the Use of Polygraph Test Results in Criminal Trials?*, 80 MASS. L. REV. 48 (Mar. 1995). A more recent study of polygraphy is Committee to Review the Scientific Evidence on the Polygraph, *The Polygraph and Lie Detection*, pp. 29-105, National Academies Press, Washington, DC, 2003, available at <http://www.nap.edu/openbook.php?isbn=0309084369>.

¹⁶⁷ See, e.g., *United States v. Scheffer*, 523 U.S. 303, 309 (1997) (Military Rule of Evidence which excludes (exculpatory) polygraph evidence does not unconstitutionally abridge right to present a defense; "there is simply no consensus that polygraph evidence is reliable"). Compare dissenting opinion of Justice Stevens, *Scheffer*, *supra*, 118 S. Ct. at 1270, 1276ff. (studies place reliability of polygraph tests at 85 percent to 90 percent; test in given case might satisfy *Daubert* standard); *United States v. Godin*, 563 F. Supp. 2d 299, 300 (D. Me. 2008); *United States v. Catalan Roman*, 368 F. Supp. 2d 119, 121 (D.P.R. 2005); *United States v. Canter*, 338 F. Supp. 2d 460, 464 (S.D.N.Y. 2004); *United States v. York*, 357 F.3d 14, 23 (1st Cir. Mass. 2004); *United States v. Galbreth*, 908 F. Supp. 877 (D.N.M. 1995) (expert testimony on polygraph results admissible under *Daubert*).

conclusions that the tester reached in those tests.”¹⁶⁸ It has been pointed out that this language “goes to the consistency and reliability of the polygraph examiner, and not the validity of the underlying science.”¹⁶⁹ Satisfaction of this rigorous standard requires counsel to select and qualify her polygraph examiner with particular care. In addition, counsel is advised to insist on an evidentiary hearing to establish admissibility of the polygraph results, present “testimony from at least one psychophysicologist to establish the scientific reliability and validity” of the test evidence, and be prepared to call the polygraph examiner as well.¹⁷⁰

§ 12.8 WOUNDS ¹⁷¹

An injury itself can tell a great deal about the incident that caused it. The appropriate expert is a pathologist or medical examiner who will require all available information about the injury.¹⁷²

¹⁶⁸ *Commonwealth v. Stewart*, 422 Mass. 385, 389 (1996); *Furtado v. Town of Plymouth*, 451 Mass. 529, 533 (2008);. *See also Commonwealth v. Dinnall*, 1997 WL 625473 (Mass. Super.) (Brassard, J.) (Middlesex) (Action No. 97-661-001) (excluding defendant’s polygraph evidence where examiner was qualified tester, but did not conduct a statistically valid number of tests, and tests were not independently verified and controlled).

¹⁶⁹ *Odiaga, What Are They Afraid Of? THE DEFENDER 4* (Feb. 1998, Mass. Ass’n Crim. Defense Lawyers). *Odiaga* advises that the examiner “should use the Control Question Test, either the Probable Lie or the Directed Lie control, and should tape record the entire polygraph examination.” *Odiaga, supra*, at 4.

¹⁷⁰ *See Commonwealth v. Duguay*, 430 Mass. 397 (1999) (trial judge properly excluded testimony by a polygraph examiner because there was no proof that the examiner had “in similar circumstances demonstrated, in a statistically valid number of independently verified and controlled tests, the high level of accuracy of the conclusions that the tester reached in those tests”); *Odiaga, What Are They Afraid Of? THE DEFENDER 4* (Feb. 1998, Mass. Ass’n Crim. Defense). Links to websites pertaining to polygraph can be found within Practice Areas > Criminal > Defender Links at the CPCS website, <http://www.state.ma.us/cpcs>. The Defender Links are updated periodically. Compiled and edited by Stephanie Page, Senior Trial Counsel, the website now listed therein is <http://truth.boisestate.edu/polygraph/polylaw.html>. Following *Daubert* most of the Federal Courts and many of the state courts have revisited the issue of admitting the results of polygraph tests as evidence in courts of law. This page was created by Charles Honts as a resource for those legal and polygraph professionals who are interested in this topic. In addition to articles and cases it contains transcripts. See Neni Odiaga in the CPCS Cambridge Office.

¹⁷¹ *See e.g. DIMAIO, GUNSHOT WOUNDS* (Second Edition) (Elsevier, New York: 1999); *DIMAIO & DIMAIO, FORENSIC PATHOLOGY* (2d Edition) (CRC Press, 2001); *SPITZ & FISHER, MEDICOLEGAL INVESTIGATION OF DEATH* (4th Edition) (Charles C. Thomas, Springfield, IL: 2006). *See also GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE* § 12 (Lexis Law Publishing 2007) *MOENSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES*, Chapter 12 (4th ed., Foundation Press, MINEOLA, NY, 1995).

A tutorial on gunshot wounds can be found on the internet at <http://library.med.utah.edu/WebPath/TUTORIAL/GUNS/GUNINJ.html>.

Images of other types of wounds can be accessed on the internet at <http://library.med.utah.edu/WebPath/FORHTML/FORIDX.html>.

A number of forensic medicine and pathology links are accessible through Kruglick’s Forensic Resource and Criminal Law Search Site, available on the internet at http://www.bioforensics.com/kruglaw/f_med_path.htm

Autopsy evidence from a pathologist is standard in murder cases, but when a live victim exists, the prosecution seldom looks to the wound itself. Defense counsel should do so to challenge the alleged victim's versions of events.

For example, the alleged victim says he was cut with a knife and has what looks like a cut to prove it; the defendant says he was unarmed and struck the alleged victim with his fist. A pathologist can testify that if abrasions (scrapes) or bruises appear on either side of a "cut" and the edges of the "cut" are irregular, that injury is a laceration that resulted from blunt force trauma and not from cutting. The length of the laceration indicates the force of impact, with the width of the abrasions or bruising showing the size of the blunt object.

Another alleged victim says she was cut with a knife; the defendant says she fell on a broken bottle. Again, look to the wound. A smooth-edged laceration is consistent with cutting rather than blunt force. However, a curved laceration is more likely caused by a curved instrument such as a bottle than by a knife.

Head injuries can reveal whether they resulted from movement of the injuring force or movement of the head — that is, from a blow or a fall. A blow produces bruising to the side of the brain that is struck; a fall produces bruising to the side of the brain *opposite* the side that hits the ground or other surface.

Gunshot wounds reveal the path and the distance of the shot. Entrance wounds are smooth edged and surrounded by a "collar" of abrasions, while exit wounds are irregular tears. A wound caused by a gun pressed against the skin (as in a struggle) may look like an ordinary exit wound unless the examiner tests for smoke or powder just

¹⁷² See *Commonwealth v. Grissett*, 66 Mass. App. Ct. 454, 457 (2006); *Commonwealth v. Cyr*, 425 Mass. 89, 96–97 (1997) (no abuse of discretion to allow medical examiner to testify that wounds on victim could be characterized as defensive wounds). See also SPITZ & FISHER, *MEDICOLEGAL INVESTIGATION OF DEATH* (3d ed. 1993); MOENSSENS et al, *SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES* (4th ed. 1995); SAFERSTEIN, *CRIMINALISTICS, AND INTRODUCTION TO FORENSIC SCIENCE* ((10th ed. 2010) Links to numerous websites pertaining to wounds can be found within Practice Areas > Criminal > Defender Links at the CPCS website, <http://www.publiccounsel.net> . The Defender Links are updated periodically. Compiled and edited by Stephanie Page, Senior Trial Counsel, the websites listed therein are as follows:

<http://www1.shore.net/~ocmema/> --This was the Office of the Chief Medical Examiner of Massachusetts' web page. This site is no longer active but you can find an archive of it at the Wayback Machine, www.archive.org.

<http://www.ojp.usdoj.gov/nij/pubs-sum/167568.htm> -- This takes you to a PDF link to the DOJ Guidelines for Death Investigation: A Guide for the Scene Investigator.

<http://www.bartleby.com/107/> -- Gray's anatomy online: OK – so you don't know what a sphenoid sinus is. Now you do!

<http://www.crime-scene-investigator.net/deadbodyevidence.html> -- A Dead Body Checklist! Describing the types of evidence for which one should look.

<http://www.dundee.ac.uk/forensicmedicine/llb/water.htm> -- Drowning - how to determine, types of tests.

<http://www.soton.ac.uk/~jb3/bullet/gsw.html> -- Gunshot Wounds: A Summary: done by anthropologist Ann Ross describing different wounds with photos, etc.

<http://www.fortunecity.com/tattooine/williamson/235/> -- This site also has links to other forensic sites. The site is Professor Anil Aggrawal's web page from India, who writes: "I am working as a Professor of Forensic Medicine at the Maulana Azad Medical College, New Delhi-110002, India. I love to exchange ideas on Forensic Medicine, Forensic Pathology and Forensic Toxicology." He is willing to receive quick questions at: dr_anil@hotmail.com.

under the skin. Smoke indicates that the shot was fired point blank; powder shows it was close; the absence of either shows there was some range to the shot. The range of a shotgun blast may be determined by the appearance of the wound.

Even if exculpatory evidence is no longer available, by demonstrating in appropriate cases through a defense expert that such evidence was readily available at the time of the injury but neglected by the prosecution, the defendant may argue that the absence of probative evidence about the injury raises a reasonable doubt.¹⁷³

§ 12.9 FIREARM IDENTIFICATION AND BALLISTICS¹⁷⁴.

Experts in firearm identification assert that they can conclusively determine whether or not a bullet, cartridge, or shotshell case was fired from a particular gun.¹⁷⁵

¹⁷³ Cf. *Commonwealth v. Bowden*, 379 Mass. 472, 486 (1981). See also *infra* § 16.6B (lost or destroyed evidence).

¹⁷⁴ The following links pertaining to firearm identification and ballistics may prove helpful:

<http://www.swggun.org/index.htm> -- SWGGUN is the FBI - supported Scientific Working Group on Fire Arms and Toolmarks.

<http://www.firearmsID.com/> -- A mega gun and ammo cite that is updated with all related information including recall notices involving defects, expert testimony, distances, gunshot residue.

<http://www.soton.ac.uk:80/~jb3/bullet/gsw.html> -- Entrance/exit wound photographs.

<http://www.firearmstactical.com/wbr.htm> -- An index of articles published in each issue of the *Wound Ballistics Review*; for example: *Forensic Pathology in Firearms Cases*; *Comments on the "Finger on the Trigger" Issue*; *The Dynamics of Bullet Contact with Hard Surfaces*.

<http://members.tripod.com/~SnipersNest/index.html> -- Nice pictures. The Sniper's Nest is a page that is dedicated to Law Enforcement Officers, Military Servicemen, Hunters, Marksmen, and all types of responsible shooters that enjoy the skill and discipline involved in successfully operating a firearm. This page contains information on Ballistics, Engagement of Moving Targets, Weapon Specifications, Minute of Angle instructions, Windage, useful Range tips, and general hints and information to help the informed Marksman. Including definitions at <http://members.tripod.com/SnipersNest/index-2.html>

¹⁷⁵ See National Research Council. 2008, *Ballistic Imaging* (Washington, DC: The National Academies Press, Chapter 3), available at http://books.nap.edu/catalog.php?record_id=12162#toc; The scientific working group for firearms and toolmark identification is SWGGUN, <http://www.swggun.org/swg/index.php>. SWGGUN maintains a list of cases in which admissibility of this type of evidence has been raised at http://www.swggun.org/resources/resourcekit.htm#court_rulings. AFTE is the Association of Firearm on Toolmark Examiners - <http://www.afte.org/>. An introduction to firearms identification is at <http://www.firearmsid.com/>. In its section on the NAS Report, AFTE's website states: "While most of the recommendations coming from the NAS study are highly commendable and long overdue, their attack on the validity of FA/TM ID appear to ignore the extensive history of peer reviewed validation studies on the uniqueness of toolmarks. Both the Association of Firearm and Toolmark Examiners (AFTE) and the Scientific Working Group on Firearms and Toolmarks (SWGGUN) are working to address this and other perceived issues with the report." Also see *Theory of Identification, Range of Striae Comparison Reports and Modified Glossary Definitions -- An AFTE Criteria for Identification Committee Report*, 24 AFTE J. 336, 340 (1992); GIANNELLI & IMWINKELRIED, *SCIENTIFIC EVIDENCE* § 14 (Lexis Law Publishing 2007) MOENSSENS, INBAU & STARRS, *SCIENTIFIC*

Ballistics, on the other hand, is the science of the movement and impact of a bullet or shot. Expertise in one area does not indicate expertise in the other.

Rifles and handguns are individualized by grooves and lands (spaces between grooves), called rifling, which are cut into the inside, called the bore, of the barrel of the gun. In each gun the rifling spirals in a certain direction, at a certain angle and depth. The purpose of the rifling is to put a spin on the bullet; its effect is to mark the sides of the bullet with the characteristics of the gun, including tiny variations resulting from manufacturing and from use over time. “Class characteristics” refers to those characteristics common to many firearms such as the number of grooves and the direction of the spiraling in a particular model of firearm. “Subclass characteristics” are common to a smaller group of firearms and “individual characteristics” are the microscopic markings that are theoretically unique to a particular firearm. A test-fired bullet may be compared for these toolmarks with a bullet found at a crime scene. Rifles and handguns are also identified by the breadth of the barrel, called caliber (.22, .45, etc.). Handguns may also be identified by the way they are loaded, whether they are hand-loaded or automatic, and whether they eject a cartridge with each shot.

Shotguns are not rifled. They are described by their gauge, which is determined by the size of the pellets they fire, with a lesser gauge indicating a larger-size pellet (12, 20, etc.).

Bullets may be identified as having been fired from a particular gun by matching the caliber and rifling characteristics of the gun with the caliber and marks on the bullet after firing. The caliber and the number, direction, and depth of the grooves and lands are the same for classes of guns, while microscopic variations distinguish individual firearms.¹⁷⁶ Cartridge cases are identified, like bullets, with a particular gun due to imprints made on the cartridge during firing.

The theory that such microscopic variations are unique to individual guns is generally accepted by firearms identification experts but is not supported by statistical studies.¹⁷⁷ Nor are there particular criteria that are generally accepted as necessary to support an identification.¹⁷⁸ In addition, the rifling and other characteristics of a particular gun change through use. The marks on a bullet may also be affected by any

EVIDENCE IN CIVIL AND CRIMINAL CASES, Chapter 6 (4th ed., Foundation Press, MINEOLA, NY, 1995); SAFERSTEIN, CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 17 (10th ed. 2010) . The Boston Police Department and the Massachusetts State Police now have computerized systems for comparison purposes. For example, the Boston Police uses IBIS (Integrated Ballistics Information System) which matches guns to bullets or cartridge cases as well as DRUGFIRE, which also compares and links firearms evidence.

¹⁷⁶ See National Research Council. 2008, *Ballistic Imaging* (Washington, DC: The National Academies Press, Chapter 3), available at [http://books.nap.edu/catalog.php?record_id=12162#toc](http://books.nap.edu/catalog.php?record_id=12162#toc;); GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE § 14 (Lexis Law Publishing 2007); MOENSSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES, Chapter 6 (4th ed., Foundation Press, MINEOLA, NY, 1995); SAFERSTEIN, CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 17 (10th ed. 2010) (10th ed. 2010) .

¹⁷⁷ See GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE § 14 (Lexis Law Publishing 2007)MOENSSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES, Chapter 6 (4th ed., Foundation Press, MINEOLA, NY, 1995); SAFERSTEIN, CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 17 (10th ed. 2010) .

¹⁷⁸ See GIANNELLI & IMWINKELRIED, SCIENTIFIC EVIDENCE § 14 (Lexis Law Publishing 2007)MOENSSSENS, INBAU & STARRS, SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES, Chapter 6 (4th ed., Foundation Press, MINEOLA, NY, 1995); SAFERSTEIN, CRIMINALISTICS, AN INTRODUCTION TO FORENSIC SCIENCE, Chapter 17 (10th ed. 2010)

foreign object or substance, such as sand or rust, inside the barrel of the gun and by damage to the bullet after firing. Thus the identification of a bullet or cartridge with a particular gun is a subjective judgment that may well be disputed by a different, equally qualified defense expert.

The NAS Report (described *supra* at sec. 12.1) cites the 2008 NRC report, *Ballistics Imaging*, which states “The validity of the fundamental assumption of uniqueness and reproducibility of firearms-related toolmarks has not yet been fully demonstrated.” The NRC report also describes the characterization of firearm and toolmark identification as “part science and part art form.” The AFTE’s protocol for toolmark analysis lacks specificity.¹⁷⁹ The NAS Report notes that much more research is needed to determine to what extent one could call toolmarks “unique” and that statistics for error rates and for probability of a “match” are lacking.¹⁸⁰ There have been a number of Daubert challenges to this type of forensic evidence in recent years which have resulted in decisions in which firearms identification testimony has been admitted but with limitations.¹⁸¹ Defense counsel should consider whether a Daubert

¹⁷⁹ NAS Report p. 154 referencing National Research Council. 2008. *Ballistic Imaging*. Washington, DC: The National Academies Press, p. 3 and p. 55. Available at http://books.nap.edu/catalog.php?record_id=12162#toc.

¹⁸⁰ See the NAS Report, Chapter 5, pp. 150-155 for its analysis of firearm and toolmark identification.

¹⁸¹ *Commonwealth v. Pytou Heang*, 458 Mass. 827, 846-848 (2011), states:

In light of our ruling today and the findings of the NRC report, we offer the following guidelinesFirst, before trial, the examiner must adequately document the findings or observations that support the examiner's ultimate opinion, and this documentary evidence...shall be provided in discovery, so that defense counsel will have an adequate and informed basis to cross-examine the forensic ballistics expert at trial..... Second, before an opinion is offered at trial, a forensic ballistics expert should explain to the jury the theories and methodologies underlying the field of forensic ballistics. This testimony should include, but is not limited to, explanation of how toolmarks are imparted onto projectiles and cartridge casings; the differences between class, subclass, and individual characteristics of firearms; and the different types of resulting toolmarks that examiners look for and compare. Such testimony should also clearly articulate the differences between class and subclass characteristic toolmarks, which can narrow down the group of weapons that may have fired a particular projectile, and individual characteristic toolmarks, which potentially may permit an opinion that a particular firearm fired a projectile..... Third, in the absence of special circumstances casting doubt on the reliability of an opinion, and once these two things have been done, a forensic ballistics expert may present an expert's opinion of the toolmarks found on projectiles and cartridge casings. Where a qualified expert has identified sufficient individual characteristic toolmarks reasonably to offer an opinion that a particular firearm fired a projectile or cartridge casing recovered as evidence, the expert may offer that opinion to a "reasonable degree of ballistic certainty.

See also U.S. v. Taylor (663 F. Supp. 2d 1170 D. Mex.2009)(Daubert challenge - examiner not allowed to testify that bullet came from a particular firearm to the exclusion of all other firearms, but can testify to a reasonable degree of certainty, citing Monteiro, Diaz and Green) ; U.S. v. Mouzone (696 F. Supp 536 _D. Md. 2009) (detailed challenge to firearms evidence with list of issues raised in affidavit of defense expert Adina Schwartz – US Magistrate recommends that examiner not be allowed to testify that it was a “practical impossibility” that any other firearm could have fired cartridge but could testify by using words such as “more likely than not” or “to a reasonable degree of ballistic certainty); Ramirez v. State, 810 So. 2d. 2d 836 (Fla. 2001); Sexton v. State, 93 S.W. 3d 96 (Tex.Crim. App. 2002); United States v. Green, 405 F.Supp.2d 104 (D.Mass.2005) (police sergeant allowed to testify

challenge is warranted in a particular case, and/or whether a motion in limine should be filed which seeks to limit the testimony of a firearms examiner.

§12.10 ARSON INVESTIGATION

Arson investigators visit the scene of a fire or, with less frequency, review evidence photos to establish its cause. Arson investigators first determine whether a fire was accidental or arson by observing burn patterns, possible points of origin, typical accidental causes of fires (wiring, heaters, etc.), furniture, debris, and other types of evidence created by fires. In the event of a suspected arson fire, arson investigators or police personnel also take laboratory samples to test for the presence of accelerants.

Arson investigation has only recently begun to modernize. There has been much media attention regarding flawed arson investigations.¹⁸² Previously, arson investigators learned primarily in an apprentice-style system where outdated and often incorrect methods were passed down for generations. Many of the fire behavior myths previously associated with arson have been debunked. Spalling, the fragmenting of stone or mortar once thought to indicate areas where accelerants had been poured has been proven to show no such connection. Fires fueled by liquid accelerants previously were thought to burn hotter or faster than wood-based fires, and evidence of melted metals, particularly aluminum window or door sills, or other flame-resistant materials were frequently used to corroborate this idea.¹⁸³ This belief has been discredited through numerous field tests and reenactments showing accelerant-fueled fires burn no

about his comparison of shell cases and suspected weapon but not allowed to testify that there was “match” to the exclusion of all other firearms); *United States v. Monteiro*, 407 F.Supp.2d 351 (D. Mass. 2006); *Commonwealth v. Meeks*, 2006 WL 2819423 (Mass. Super. Ct. 2006); *State v. Diaz*, 2007 WL 2007 WL 485967 (N.D. Ca. 2007); *United States v. Williams*, 506 F. 3d 151(2d. Cir. 2007).

¹⁸² See the links below:

<http://newenglandinnocenceproject.blogspot.com/2010/09/arson-convictions-in-massachusetts.html> - The New England Innocence Project, *Arson Convictions in Massachusetts Coming under Fire*.

http://www.newyorker.com/reporting/2009/09/07/090907fa_fact_grann - New Yorker article, Trial by Fire: Did Texas Execute an Innocent Man? by David Grann.

<http://truthinjustice.org/arson-myths.htm> - “Myths And Other Falsehoods Are Often Presented As Scientific Evidence Many Rulings Of Arson Are Not Arson At All” by Tim Zeak.

<http://www.forensicpage.com/new21.htm> - Reddy’s Forensic Page on arson with links to articles, controversial cases, and training and educational materials.

<http://abc.go.com/watch/2020/SH559026/VD5553367/fire-scientist-questions-arson-finding> ABC’s 20/20 epison “Burned”

<http://www.pbs.org/wgbh/pages/frontline/death-by-fire/etc/transcript.html> - PBS’s Frontline “Death by Fire”

¹⁸³ The melting point of aluminum alloys has been erroneously recorded in many trial transcripts. While the melting temperature of pure aluminum is 1,220° F, aluminum used for building purposes is very rarely pure aluminum. Generally the aluminum alloys used in sills, known as #6063 aluminum alloy, melts between 1,100° and 1,200°F. A wood-based fire can burn at temperatures up to 2,000° F. See <http://www.azom.com/details.asp?ArticleID=2812> for the properties of aluminum alloy 6063.

hotter than their wood-based counterparts.¹⁸⁴ V-shaped burn areas previously believed to denote multiple points of origin (and thus arson) are now known to also be caused by furniture or decorations in a setting where a container fire has reached flashover.¹⁸⁵ Low and fast burning and irregular burn patterns are no longer directly connected with accelerant-powered fires.¹⁸⁶ Airflow, building materials, and furniture also play a much larger role in the evidence left behind than previously believed by generations of arson investigators. Many poor arson investigators still attempt to use incorrect scientific “facts” to disguise their inability so defense counsel must always investigate and confirm the investigator’s own assertions.

When a fire is considered arson, and the prosecution has retained an arson investigator, defense counsel is strongly encouraged to retain their own expert. Failure to do so in the presence of any question about the fire’s origin may result in ineffective assistance of counsel.¹⁸⁷

Arson investigators must now follow the “NFPA 921”, the definitive guidebook on investigating suspicious fires.¹⁸⁸ NFPA protocol requires investigators to rule out other possible causes of ignition before considering an arson determination. The NFPA advises in great detail about the proper way to conduct all steps of fire investigation from origin to burn patterns to photographs to laboratory tests and is an important resource for counsel in arson cases.

Samples taken from carpets, floors, or other burn areas must be sent to a laboratory for further testing.¹⁸⁹ Control samples should also be taken and tested.¹⁹⁰ Bear in mind that many types of footwear and some furniture contain chemicals that may register positively for accelerants on a laboratory test when the footwear or furniture has been burned. Where dogs are used to identify sample areas, the NFPA dictates that confirmatory lab testing must always be done before the alert may be considered valid.¹⁹¹ Dogs are to be used merely as a screening test to determine from where samples should be obtained. Please see § 12.11B. Detector Dogs for further information; Massachusetts has not always followed the NFPA in this respect, however recently it has been more amenable.¹⁹²

¹⁸⁴ National Fire Protection Association, *Guide for Fire and Explosion Investigations* 921 (2008, 2004 and 1995 eds.), §6.8.2.2.

¹⁸⁵ The term “container fire” denotes a fire in any closed area, such as a room.

¹⁸⁶ “Irregularly shaped objects on the floor ...may provide protection to the floor, resulting in patterns that may be inaccurately interpreted.” *Id.* §22.2.2.3.

¹⁸⁷ See *Dugas v. Coplan*, 428 F.3d 317 (2005) and *United States of America v. Hebshie*, 754 F. Supp. 2d 89 (2010).

¹⁸⁸ National Fire Protection Association, *Guide for Fire and Explosion Investigations* 921 (2008, 2004 and 1995 eds.),.

¹⁸⁹ *Id.* §16.5.4.4, 2008 ed.

¹⁹⁰ *Id.* §16.5.4.6. 2008 ed.

¹⁹¹ *Id.* §16.5.4.7. 2008 ed.

¹⁹² See *United States of America v. Hebshie* 754 F. Supp 2d 89 (2010)(petition for writ of habeas corpus granted. Defense counsel should have requested a Daubert hearing on arson investigation and use of canine evidence. Judge Gertner notes in this decision that after a canine alerted to one location at the fire scene, government experts failed to check other areas for accelerants and failed to take control or comparison samples. The analysis of the single sample taken was “light petroleum distillate” which can be found in any number of legitimate substances or caused by the heat of the fire on items at the scene. There was no further analysis of the sample.) .

Arson investigators for both prosecution and defense must always be subject to rigorous review by defense counsel with respect to their education, training, and adherence to the NFPA 921 guidelines to ensure the investigator is current on technology and training. Arson investigators trained using antiquated techniques do still perform arson investigations throughout the United States. *US v. Hebshie* is an excellent decision and can assist counsel in learning about arson investigations and the need for Daubert challenges in certain instances.¹⁹³

§12.11 PSEUDO EXPERTS

§ 12.11A. POLICE GENERALLY

Prosecutors often use police officers masquerading as experts to provide testimony that might not otherwise be admissible. Do not be fooled by this subterfuge! It is important to keep in mind that police officers receive no formal education in biology, neurology, chemistry, biochemistry, and/or the scientific method. Compared to forensic scientists and analysts, their training in forensics areas is minimal. They do not base their opinions on accepted scientific research. Police officers called (formally or informally) as experts are merely police officers making typical police judgments.

The “expert” testimony of police officers can be ripe for attack by way of a *Daubert* hearing, motion in limine and impeachment. Since police officers’ testimony is based on their own observations and training based on others’ observations, there is no “error rate” to their assumptions. This “expertise” is neither committed to writing nor subject to peer review.

To avoid a last minute attempt by the prosecution to admit this type of testimony, always submit a motion to discover Commonwealth experts. Arguments about the actual “expertise” aside, where the prosecutor has neglected to inform you of the police officer’s “expert status” it would be unfair for the court to allow such testimony. Timely notification by the Commonwealth would have prompted you to file a motion for funds to seek your own expert to assist you in meeting this testimony and to prepare a challenge to police experts.

Should you uncover the Commonwealth’s intent to use police officers as experts, a Daubert/Lanigan motion or a motion in limine should be used. If the motions fail, a detailed and particularized objection at trial over any admitted “expert” evidence by police officers should always be sought.

Mass. R. Prop. Evid. 702. notes that an expert witness must be “qualified as an expert by knowledge, skill, experience, training, or education,” and “the testimony is based upon sufficient facts or data, the testimony is the product of reliable principles and methods, and the witness has applied the principles and methods reliably to the facts of the case.” In every case before an expert may be allowed in, the judge must serve as a “gatekeeper” and make a “preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.”¹⁹⁴

¹⁹³ United States of America v. Hebshie 754 F. Supp 2d 89 (2010).

¹⁹⁴ Commonwealth v. Lanigan, 419 Mass. 15, 26 (1994) (accepting as Massachusetts law the reasoning of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993)); *see also* *Kumho Tire v. Carmichael*, 526 U.S. 137, 147 (1999) (holding that *Daubert* applies not only to scientific knowledge, but to “all expert testimony”).

When trying to keep all types of police expert testimony from the finders of fact, it may be helpful to consult this argument checklist.¹⁹⁵

Visual Identification and Modus Operandi (MO):

One area where police officers frequently testify as “experts” is in the visual identification of drugs and the modus operandi (“MO”) of drug users and dealers. In this way prosecutors attempt to introduce “expert” police testimony on the purchasing and selling of drugs, the street value of drugs, the ways in which drugs are hidden and stored, drug dealing items, the locales where drug deals take place, and individual behaviors that are “consistent” with drug dealing or drug use.

Expert testimony may not merely lump together the type of persons who may commit a crime¹⁹⁶, and cannot be conclusory.¹⁹⁷ “[I]n determining whether particular expert testimony is lawful, the better practice is to focus the analysis on whether the evidence is explanatory . . . Expert testimony must be explanatory, and not 'presented in conclusory form . . . in terms of whether [the] defendant did or did not commit a particular offense,' to avoid infringing on the defendant's right to a fair trial.”¹⁹⁸ “[T]he Commonwealth may not offer expert testimony regarding the expected characteristics of perpetrators of a crime.”¹⁹⁹

¹⁹⁵ Checklist to prohibit police expert testimony, because the testimony is:

1. Not based on any “reasoning or methodology” that is “scientifically valid,”
2. Unreliable because it is based on personal observations made in the course of law enforcement experience,
3. Not based on observations compiled or analyzed in accordance with the scientific method,. *See Daubert*, 509 U.S. at 590 (“Proposed testimony must be supported by appropriate validation . . . the requirement that an expert’s testimony pertain to “scientific knowledge” establishes a standard of evidentiary reliability.”)
4. Not accepted by a general scientific community. *See Daubert*, 509 U.S. at 594,
5. Has not been subjected to peer-review or publication. *See Daubert*, 509 U.S. at 593, and
6. Not based upon any scholarly treatise or scientific material.

¹⁹⁶ “[T]he Commonwealth may not offer expert testimony regarding the expected characteristics of perpetrators of a crime.” *Commonwealth v. Johnson*, 78 Mass. App. Ct. (2010) referencing *Commonwealth v. Federico*, 425 Mass. 844, 850 (1997) and *Commonwealth v. Goetzendanner*, 42 Mass. App. Ct. 637, 644 (1997).

¹⁹⁷ “Expert testimony must be explanatory, and not 'presented in conclusory form . . . in terms of whether [the] defendant did or did not commit a particular offense,' to avoid infringing on the defendant's [***320] right to a fair trial.” *Commonwealth v. Madera*, 76 Mass. App. Ct. 154, 162 (2010) citing *Commonwealth v. Grissett*, 66 Mass. App. Ct. 454, 458 (2006) quoting from *Commonwealth v. Tanner*, 45 Mass. App. Ct. 576 (1998).

¹⁹⁸ *Commonwealth v. Madera*, 76 Mass. App. Ct. 154, 162 (2010) citing *Commonwealth v. Grissett* 66 Mass. App. Ct. 454, 458 (2006), and quoting from *Commonwealth v. Tanner*, 45 Mass. App. Ct. 576 (1998).

¹⁹⁹ *Commonwealth v. Johnson*, 78 Mass. App. Ct. (2010) referencing *Commonwealth v. Federico*, 425 Mass. 844, 850 (1997) and *Commonwealth v. Goetzendanner*, 42 Mass. App. Ct. 637, 644 (1997).

Defense counsel may argue that the court exercises its gatekeeper role to exclude police “expert” testimony because the officer’s opinion is:

1. not based on any “reasoning or methodology” that is “scientifically valid,”
2. unreliable because it is based on personal observations made in the course of law enforcement experience,
3. not based on observations compiled or analyzed in accordance with the scientific method. See *Daubert*, 509 U.S. at 590 (“Proposed testimony must be supported by appropriate validation . . . the requirement that an expert’s testimony pertain to “scientific knowledge” establishes a standard of evidentiary reliability.”),
4. not accepted by a general scientific community. See *Daubert*, 509 U.S. at 594,
5. has not been subjected to peer-review or publication. See *Daubert*, 509 U.S. at 593, and
6. not based upon any scholarly treatise or scientific material.

Objecting at the earliest possible time is preferable, and, as above, filing a motion to discover Commonwealth experts may help prevent nasty surprises at a later date.

While the courts have allowed police officer testimony on a broad range of subjects,²⁰⁰ the recent NAS report may prompt an opening for new challenges. In the case of police testifying about the nature of a drug by visual identification, so-called drug courier or drug dealer profile evidence, defense counsel may have better luck.²⁰¹ The Supreme Judicial Court in *Vazquez* also noted that police officers may make

²⁰⁰ Several of these areas include:

- *packaging*, *Commonwealth v. Munera*, 31 Mass. App. Ct. 380, 384–85, 578 N.E.2d 418, 421–22, review denied, 411 Mass. 1103, 581 N.E.2d 481 (1991) (dollar bills used to package cocaine); *Commonwealth v. Davis*, 376 Mass. 777, 788, 384 N.E.2d 181, 189–90 (1978) (small manila envelopes used to package heroin);
- *the significance of various quantities*, *Commonwealth v. Little*, 453 Mass. 766, 769–71 (2010) (fifteen small plastic bags of marijuana more consistent with intent to distribute than personal use); *Commonwealth v. Johnson*, 410 Mass. 199, 202, 571 N.E.2d 623, 625 (1991) (33.33 grams of cocaine not consistent with personal use); *Commonwealth v. Pimentel*, 73 Mass. App. Ct. 777, 784, review denied, 453 Mass. 1110 (2009) (thirteen “dime” bags of cocaine found on and about defendant’s person sufficient to infer defendant’s connection to larger quantity of nearby drugs); *Commonwealth v. Munera*, 31 Mass. App. Ct. at 385, 578 N.E.2d at 421–22 (chunk of cocaine more consistent with a dealer’s sample than with personal use); *Commonwealth v. Johnson*, 410 Mass. 199, 202, 571 N.E.2d 623, 625 (1991) (33.33 grams of cocaine not consistent with personal use); *Commonwealth v. Sendele*, 18 Mass. App. Ct. 755, 758–59, 470 N.E.2d 811, 815 (1984), review denied, 393 Mass. 1106, 474 N.E.2d 182 (1985) (contents of vial consistent with personal use but contents of valise intended for distribution); and
- *the street value of drugs*, *Commonwealth v. Fiore*, 9 Mass. App. Ct. 618, 624, 403 N.E.2d 953, 957 (1980).

²⁰¹ See *Commonwealth v. Charles*, 456 Mass. 378, 380–82 (2010) (two police witnesses’ opinions that substances looked like particular narcotics, in the absence of specialized training or experience, insufficient to qualify them as experts who could opine on the nature of the substances).

identification mistakes.²⁰² There are a number of other relevant drug identification cases from Massachusetts.²⁰³

When faced with a police officer posing as an expert, object if the subject matter of his or her testimony is based solely upon observations and/or anecdotal (rather than scientific) types of “training” regarding drugs, drug dealers, and drug users. Counsel should also move in limine and object to so-called “expert” police testimony that is actually within the common knowledge of an average juror, or if the police officer offers specific opinions beyond his or her area of expertise. This is also applicable to drug recognition experts, below.

Drug Recognition Experts:

Police may also pose as Drug Recognition Experts (DREs). Police officers who are trained as DREs are purportedly able to determine whether a suspect is under the influence of alcohol or drugs. Despite the appendage of expert to their title, due to their limited training and lack of formal medical education DREs are not experts and should not be qualified as such.

DREs are trained through the International Association of the Chiefs of Police (IACP)/National Highway Transportation Safety Authority (NHTSA). Certification requires an IACP/NHTSA-approved Standardized Field Sobriety Testing training course, an approved two-day DRE Pre-School or equivalent, an approved seven-day DRE School, and on-the-job field certification. DRE officers must receive a score of 75% or better on the field evaluations to pass.

DREs use a series of twelve steps to make their assumptions.²⁰⁴ The test must be administered in a “controlled environment”, and thus not on the roadside. The

²⁰² See *Commonwealth v. Vazquez*, 456 Mass. 350, 364 (2010), wherein the Supreme Judicial Court recognized that “[m]istaken identification of cocaine by trained and experienced law enforcement personnel is not unknown in the annals of our law.” See also e.g. *Commonwealth v. LaVelle* 414 Mass. 146, 148 (1991)...*Care & Protection of Frank*, 409 Mass. 429, 495-496 (1991)...*Commonwealth v. Scott*, 362 Mass. 363, 701 (1998).

²⁰³ See *Commonwealth v. Dawson*, 399 Mass. 465, 467 (1987) (witness’s opinion that a substance looks like a particular drug, without more, is not sufficient to prove its identity; if a judge permits a police officer to offer this type of opinion, “the knowledge and competence of that witness, and his lack of training in chemical analysis, will bear on the weight to be given to his testimony”) *Commonwealth v. Dawson*, 399 Mass. 465, 467, (1987) (witness’s opinion that a substance looks like a particular drug, without more, is not sufficient to prove its identity); *Commonwealth v. Wolcott*, 28 Mass. App. Ct. 200, 207– 10, (1990) (reversible error to admit testimony of experienced detective about the defendant’s involvement in a Jamaican posse where the witness was not qualified as an expert and where his highly prejudicial testimony was “conjectur[al]” and “consisted of a mélange of hearsay and opinions based on hearsay, all well beyond the permissible range of testimony by nonexperts”).

²⁰⁴ The twelve-step process must be completed in full and in order and consists of:

1. Breath Alcohol Test
2. Interview of the Arresting Officer
3. Preliminary Examination and First Pulse
 - Initial angle of onset (horizontal gaze nystagmus, nystagmus is the involuntary jerking of the eye)
 - Initial estimate of pupil size (in room light)
4. Eye Examination
 - Horizontal gaze nystagmus

arresting officer need not be the DRE officer who performs the examination. The examination must be performed fully and in order, with the officer's observations recorded on a DRE examination form.

Although failure to consent to a breathalyzer test will result in the loss of an individual's license for 120 days, under current Massachusetts general law no penalty exists for failing to submit to either the blood or urine tests performed as the last step in the DRE evaluation.²⁰⁵

Discovery motions regarding DREs should include requests for the CV (curriculum vitae) of the officer, training dates, course materials including the student handbook and training manual, rolling log book, the number and identifying information for all cases in which the DRE testified as an expert, any publications by the DRE, and the officer's written evaluation along with any notes or supplemental reports.

Massachusetts generally allows DREs to testify.²⁰⁶ The risk of unfair prejudice may be high with drug recognition experts, given the word *expert*, especially on testimony allowed as opinion. In these instances a jury limiting instruction should be given.

Once testimony is admitted, the best challenge to DRE testimony is the examination, which must be done fully and in order. In addition, in the beginning of the test officers must perform a "medical rule out", effectively foreclosing the

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- Vertical gaze nystagmus
 - Lack of convergence (the eyes do not cross)
 - 5. Divided Attention Tests
 - Romberg balance test
 - Walk and turn test
 - One leg stand test
 - Finger to nose test
 - 6. Vital Signs and Second Pulse
 - Blood pressure assessment
 - Body temperature assessment
 - 7. Dark room examination
 - Pupil size assessment (room light, near total darkness, bright light)
 - Ingestion assessment (check nasal and oral cavities)
 - 8. Muscle tone assessment
 - Normal, flaccid, or rigid
 - 9. Injection Site Assessment and Third Pulse
 - 10. Interrogation of Subject
 - Typically the officer should read *Miranda* rights at this time
 - 11. Opinion of Evaluator
 - 12. Toxicology

²⁰⁵ Penalty for failing to submit to breathalyzer test is covered by M.G.L.A. c. 90, § 14(1)(f)(1).

²⁰⁶ See *Commonwealth v. Ferola*, 72 Mass. App. Ct. 170, 172 (2008) (drug recognition expert allowed to testify) and *Commonwealth v. Leccese*, 2010 WL 1253162 (Mass. App. Ct.) (motion in limine to exclude DRE testimony denied).

possibility of a medical condition causing the perceived symptoms. With their lack of medical training, police officers base this on the limited section of police training dedicated to medical rule outs on diabetes and heart attacks. Virtually no other medical conditions are covered. The defense may use a qualified medical expert to assess the “normal” condition of the defendant, based on personal medical history. Hand in hand with this technique comes challenging the training and education of the officer for issues such as neurology (balancing tests), ophthalmology (eye tests), and toxicology (gathering the urine or blood samples). DRE officers may be unwilling to admit they have very little formal medical training; DRE literature suggests officers are more adept at distinguishing “medical rule-outs” than is possible given their limited training.²⁰⁷

Presumptive Field Tests:

Presumptive field tests are administered by police officers in the field to test suspicious substances believed to be illegal drugs. Several manufacturers produce field test kits, which are usually pouches or plastic tubettes with ampoules of testing liquid that are broken at the time of the test. After an initial test kit, which distinguishes the family of drug, test kits are personalized to certain substances. A single test will not conclusively test for both cocaine and heroin. The reliability and accuracy of field tests range from fair to notoriously unreliable.

Because of their unreliability and issues with quality control in the field, presumptive field testing must always be corroborated by laboratory testing.²⁰⁸ Completed field tests cannot be brought into court as evidence. The colors, if ever accurate, are decidedly inaccurate after sixty seconds per the manufacturers’ instructions. Test materials specifically disallow storing the used tubes.

Presumptive field tests may be unreliable due to storage, application, and the officer’s interpretation. Cocaine tests in particular have been shown through testing to be exceptionally unreliable at higher temperatures and more sensitive at lower temperatures, despite manufacturers’ claims of validity from 50°F to 104°F.²⁰⁹ Field test kits generally have a one-year expiration date, and tests that have remained in sunlight for any period of time are not reliable. While cocaine tests are most sensitive at temperatures around 39°F, which may be achieved by keeping tests in front of acar’s air-conditioning unit, it is unknown how many officers store their tests immediately before use this way, and whether the increased sensitivity to cocaine corresponds with an increased sensitivity for other substances that may trigger false positives.²¹⁰ With

²⁰⁷http://www.ndaa.org/pdf/drug_evaluation_classification_dec.pdf--The American Prosecutors Research Institute, *The Drug Evaluation and Classification (DEC) Program: Targeting Hardcore Impaired Drivers*, Alexandria, VA: American Prosecutors Research Institute, Oct. 2004, Page 3.

²⁰⁸See *Commonwealth v. Vasquez*, 456 Mass. 350, 364, n. 17 (2010) (“protocols [...] require that a chemical analysis be conducted for each substance; identification of the substance on the basis of a visual inspection alone is not authorized”). See also http://www.cacj.org/documents/SF_Crime_Lab/Studies_Misc_Materials/FalsePositives.pdf; Alan Harris, *A Test of a Different Color: The Limited Value of Presumptive Field Drug Tests And Why That Value Demands Their Exclusion From Trial*, 40 Sw. L. Rev. 531, 2011.

²⁰⁹ Jim W. McGill, Crystal A. Dixon, David Ritter, and Joanna D. Sides, *Discovery of an Interesting Temperature Effect on the Sensitivity of the Cobalt Thiocyanate Test for Cocaine*, *Microgram Journal*, Vol. 6 Iss. 1-2, Jan. - Jun. 2008, available online at http://www.justice.gov/dea/programs/forensicsci/microgram/journal_v6_num12/pg3.html.

²¹⁰ *Id.* at 5.

these concerns it is necessary to file discovery motions about the test's storage and temperature at application.

Presumptive field test kit results may be highly subjective. The interpretation of the test usually involves several steps and identifications of different colors or shades of the same colors, and types and amount of flaky or unflaked precipitates. It is important to ask officers if they are color-blind. The amount of sample used may trigger false positives, particularly in heroin cases where too much is used. Always review the particular test's manual to determine similarities in colors between sample results or the number and intricacy of steps involved in reaching the drug diagnostic to challenge the test's reliability. Discovery motions should be made for the color identification process and the application of the field test to rule out the risk of contamination or inaccurate administration.

Even in properly administered and interpreted field tests, many common substances also test positive as controlled substances.²¹¹ Bergamot tea in particular may test positive on several marijuana field tests. Under *Jackson v. Virginia*, all drug tests must be specific, in that they do not test positive for legal substances.

A motion in limine filed by the defense should make clear that presumptive field tests must always be followed with laboratory testing.²¹² Presumptive field tests, standing alone, cannot prove beyond a reasonable doubt that a substance was an illegal drug.²¹³

If the field test was followed with confirmatory laboratory testing, *Melendez-Diaz* requires the defendant be able to confront the laboratory witness against him. The laboratory examiner should be present to face cross-examination on their credentials and process. Laboratories vary widely in their standard operating procedures, and testing procedures vary widely in accuracy. To counteract the notorious brevity of lab reports, discovery motions should be filed to obtain exact testing procedures, the tester's notes, paper documents certifying the tester's credentials, and the reliability of the testing lab. Laboratory tests may also give false positives, through omitting steps in the interest of time, failing to perform the test according to exact protocol, or improperly accredited laboratory chemists.

Should all else fail, including language in the motion to refer to presumptive field tests as "preliminary" field tests may assuage some risk of unfair prejudice.

²¹¹ Please see the list on AskDocWeb.com, *False Positives*, Apr. 20, 2010 at <http://www.askdocweb.com/falsepositives.html>.

²¹² See *Digby v. United States*, 981 A.2d 598, 605-606 (D.C. 2009) ("While we recognized that a field test 'does constitute evidence' of the identity of the seized substance, and 'we considered it in determining whether the evidence against [appellant] was overwhelming,' nevertheless a field test 'is not dispositive.' We recalled that appellant's conviction in *Callahan* was reversed 'notwithstanding evidence of a positive field test for cocaine, because 'positive field test, standing alone, cannot prove beyond a reasonable doubt that the substance was cocaine.'").

²¹³ See above, and the NIJ official materials even require that all kits contain "a statement that the kit is intended to be used for presumptive identification purposes only, and that all substances tested should be subjected to more definitive examination by qualified scientists in a properly equipped crime laboratory" and "that the reagents can give false-positive as well as false-negative results." See Nat'l Institute of Justice Law Enforcement and Corrections Standards and Testing Program, Std 0604.1, *Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse* (2000), at <http://www.ncjrs.gov/pdffiles1/nij/183258.pdf>.

§ 12.11B. DETECTOR DOGS

Both canines and canine handlers should be approached with skepticism. Many canine handlers will posit themselves or their dogs as experts, but neither handler nor dog should be considered an expert in any sniff context. This is true for dogs allegedly trained to sniff out drugs, cadavers, accelerants, explosives, and firearms, in addition to dogs used for scent lineups.

Detector dogs are generally brought to the scene of a crime, arrest, or traffic stop and instructed to search out the dog's specialty. The dog may be worked on or off leash but always with the dog's personal handler. The handler must be present to interpret the dog's "alert", or positive indication of the presence of the sought item.

The heavy reliance on the trainer's interpretation, and the reliability of the dog, place canine sniff testimony well outside the realm of experts. Dog sniff tests are frequently likened to polygraph tests for this reason.²¹⁴ The possibility of conscious or subconscious cuing, particularly for dogs worked on leash, remains a valid concern.²¹⁵

While many detector dog handlers may exaggerate the accuracy of their dogs through pride or misinformation, drug-trained dog sniff results are frequently unreliable. Studies show anywhere from 12.5% to 60% of drug alerts are false positives.²¹⁶ Trace amounts of drugs may trigger an alert despite the individual's lack of involvement in drugs, and a majority of paper currency in circulation contains enough cocaine to cause a dog to alert.²¹⁷

The unreliability of dog sniff testimony may also stem from the absence of enforced training guidelines and oversight.²¹⁸ Many handlers "train" their own dogs without direct supervision from overarching law enforcement agencies and use techniques susceptible to producing undesired (or desired despite a suspect's innocence) results. Many dogs are trained using reward-based techniques that may encourage false positives so the dog may please its handler.²¹⁹ In some cases, dogs are fed only when they indicate a positive alert.

To challenge dog sniff testimony, defense counsel may use Fourth Amendment violations (the sniff occurred during an unlawful stop)²²⁰, the relevance and credibility

²¹⁴ Jacobson v. \$55,900 in U.S. Currency, 728 N.W.2d 510, 531 (Minn. 2007).

²¹⁵ Richard E. Myers II, *Detector Dogs and Probable Cause*, 14 Geo. Mason L. Rev. 1, Fall 2006, available from http://www.georgemasonlawreview.org/doc/14-1_Myers.pdf. Cuing risks are on Pages 5 and 22-24.

²¹⁶ Illinois v. Caballes, 543 U.S. 405 (2005)(Souter, J. dissenting).

²¹⁷ United States v. \$5,000 in United States Currency, 40 F.3d 846, 849 (6th Cir. 1994).

²¹⁸ Many organizations compete for training contracts to state K9 units. National Narcotic Detector Dog Association, Eastern States Working Dog Association, International Police Working Dog Association, Virginia Police Work Dog Association, and a number of other private organizations all hold training contracts.

²¹⁹ For issues with dog sniff training and detection generally, as well as a look into Bayes' Theory, see Richard E. Myers II, *Detector Dogs and Probable Cause*, 14 Geo. Mason L. Rev. 1, Fall 2006, available from http://www.georgemasonlawreview.org/doc/14-1_Myers.pdf. Bayes' Theory can be used to determine probabilities useful for judging the reliability of detector dogs. Detector dog training critiques are located on Page 5.

²²⁰ See United States v. Place, 462 U.S. 696 (1983) (a dog sniff itself is not a search), Illinois v. Cabelles (dog sniff during the course of a lawful traffic stop are not inherently illegal), United States v. Davis, 430 F.3d 345 (6th Cir. 2005) (delaying the stop unreasonably to perform a sniff, or performing a second sniff, is an unnecessary search). Dog sniffs done on homes or in the course of a larger illegal search frequently violate the Fourth Amendment; see

of the alert,²²¹ and the risk of unfair prejudice.²²² Cases where none of the sought contraband is found present a different approach.

Any search warrants obtained from dog sniffs are subject to truthfulness about the dog's accuracy and must be free from misstatements.²²³ This means that canine handlers and officers must not grossly overstate the dog's reliability and abilities. It may be hard to ascertain the reliability of certain dogs, however, because many police stations do not record false negatives. Some handlers also do not track false positives in routine training.

In arson cases, the NFPA 921 guidelines instruct that positive dog alerts must be confirmed by laboratory analysis.²²⁴ Despite this admonition, Massachusetts has some troubling case law that has recently improved.²²⁵ The mere use of the phrase "accelerant detection dog" may lead the jury to believe the dog only alerts to accelerants such as gasoline. Accelerant detection dogs alert to a number of legitimate products that may act as accelerants and to initially benign substances (such as the foam used in some couches) that gained an accelerant-like composition through pyrolysis.²²⁶ In this instance defense counsel may request a jury limiting instruction to the effect that the dog is trained to alert on detecting many innocuous compounds as well. All detector dogs carry a high risk of prejudice. Dogs are highly persuasive to juries and many do not realize that a dog's alert is only as good as its human training and handling.

State v. Rabb 920 So. 2d 1175, 1184 (Fla. App.), rev. den., 933 So. 2d 522 (Fla. 2006), cert. den., 549 U.S. 1052, 127 S. Ct. 665, 166 L. Ed. 2d 513 (2006) (a dog sniff on the citadel of a home is a search and violates the Fourth Amendment).

²²¹ Reliability may also be contested with *Daubert/Lanigan* and Rule 702 of Fed. R. Evid. for competence. For a case with no drugs found, see *United States v. Carr*, 25 F.3d at 1216-1217 (many studies regarding currency contamination render positive dog sniffs "meaningless").

²²² The risk of unfair prejudice with dog sniff evidence is high. Dogs are highly persuasive to juries and many jurors place much higher regard than is due in a positive alert. The general public's lack of knowledge about the prevalence of cocaine on most paper money may also be argued as unfairly prejudicial.

²²³ See *Commonwealth v. Pinto*, 45 Mass. App. Ct. 790, 794 (1998). If the warrant is not truthful about the dog's abilities, defendants are entitled to a Franks review. See also *Commonwealth v. Ramos*, 72 Mass. App. Ct. 773, 778 (2008) citing *Franks v. Delaware*, 438 U.S. 154, 155-156 (1978).

²²⁴ National Fire Protection Association, *Guide for Fire and Explosion Investigations* 921 (2008, 2004 and 1995 eds.), § 16.5.4.7 ("Research has shown that canines have been alerted to pyrolysis products that are not produced by an ignitable liquid;" unconfirmed positive canine alerts "should not be considered validated"). The NFPA guidelines on detection dogs describe the canines' role as "assisting with the location and collection of samples."

²²⁵ See *Commonwealth v. Crouse*, 447 Mass. 558 (2006). After a fire in July 2000, an arson dog was brought to the scene in October 2000. The dog positively alerted to the vehicle but samples sent to a laboratory came back negative. Despite this, the Court allowed the dog sniff testimony. *But see United States v. Hebshie* (2010)(conviction overturned where dog handler took poor samples and employed substandard collection practices, among other affronts to justice).

²²⁶ Pyrolysis is the thermochemical decomposition of certain substances due to intense heat and pressure.

Much success with cross-examination of dogs' abilities comes from certain answers sought in discovery.²²⁷ Tread with care, however, because cross-examination about the dog's fallibility might lead to the prosecution's in-court demonstration of the dog's skill.²²⁸

Many of these issues are also present in dogs used to track human scent on the ground (tracking) and in the air and water. Dogs that are trained in human tracking are trained to follow one human scent on the ground. Dogs trained in air and water human scent investigation may follow any human scent or a particular scent depending on training.²²⁹ It is also important to remember that dogs trained in any particular area must not be assumed to have adequate training in others. A dog originally called to the scene to find a firearm will not necessarily be trained in tracking or confirming human scent.

To familiarize with dog sniff testimony, counsel may wish to refer to published articles and websites.²³⁰

²²⁷ Sample discovery checklist for dog sniff testimony:

1. How was the dog trained and by whom? How long was the training?
2. How was the handler trained and how experienced is he/she?
3. What substance(s) is it trained to detect? Were those the substances detected? If not, is there another possibility for the alert (recent presence, cash, etc.)? Was the substance later tested at a laboratory? The presence of cocaine residue on up to 90% of paper money in circulation may cause false alerts. *United States v. \$5,000 in United States Currency*, 40 F.3d 846, 849 (6th Cir. 1994).
4. How long has the dog and handler pair been together?
5. Are the dog's veterinary records clear? Cigarette smoke and certain thyroid medications may tamper with a dog's nose.
6. Does the dog have a certification and by whom? How frequently is recertification required?
7. Was the dog worked on or off leash during the sniff? Dogs worked on leash may be significantly less reliable than those worked off leash, according to animal scientist Lawrence Myers.
8. How successful has the dog been in previous situations? Are training records available? Are false alerts included in training records? A dog with a 90% success rate does not mean a positive alert coincides with a 90% likelihood of narcotics at the scene. Richard E. Myers II, *In the Wake of Caballes, Should We Let Sniffing Dogs Lie?*, 20 Crim. Just. 4 (Winter 2006) at 10.
9. Was the sniff videotaped to ensure no cuing took place? The court despises anything less than "scrupulously neutral procedures". *United States v. Trayer*, 898 F.2d 805, 809 (D.C. Cir.), cert. den., 498 U.S. 839, 111 S. Ct. 113 (1990).

²²⁸ See *United States v. Rackley*, 742 F.2d 1266 (11th Cir. 1984).

²²⁹ <http://www.theforensicexaminer.com/archive/summer08/5/> -- John Lechliter, *Best Friends to the Lost: Search and Rescue Dog Teams Should be Activated Sooner in Most Searches*, *The Forensic Examiner*, 2008.

²³⁰ Accelerants:

<http://www.vetmed.ucdavis.edu/ccab/accelerant.html> -- Accelerant Detection Dog website at University of California, Davis. Many links to associations and certification programs. Also see above §12.10 ARSON INVESTIGATION.

Cadavers:

National Narcotics Detector Dog Association Certification for cadaver dogs -- http://www.nndda.org/official-docs/doc_download/6-cadaver-search-certification. There is no uniform certifying agency in the United States but the NNDDA is one of the largest.

<http://massardf.org/documents/MASSARDF%20basic%20Cadaver%20eval%20form.pdf> -- Massachusetts State Search & Rescue Dog Federation Basic Human Remains Detection Canine Evaluation Form.

Drugs:

Stephen P. Hurley, *Defending Drug Cases, Barking up the Wrong Tree: Dogs, Reliability, and Admissibility*.

Bruce Baron, Search and Seizure Commentary: A Human Look at Canine Sniffing, *NACDL Champion*, Apr. 2010, Page 58.

http://www.nndda.org/docman/doc_download/2-narcotics-detection-standard -- National Narcotics Detector Dog Association certification form for narcotics dogs.

Explosives and dog sniffing ability:

Ira Gazit, Joseph Terkel. *Explosives detection by sniffer dogs following strenuous physical activity*. Department of zoology, George S. Wise Faculty of Life Sciences, Tel Aviv University, 19 November 2002, available online at <http://k9.fgcu.edu/articles/Gazit-Terkel2.pdf>.

http://www.nndda.org/docman/doc_download/7-explosive-detection-certification -- National Narcotics Detector Dog Association certification form for explosive detection dogs.

Scent lineups:

<http://www.innocenceprojectoftexas.org/pdf/junk-science-2009.pdf> -- The Innocence Project of Texas, *Dog Scent Lineups, A Junk Science Injustice*, Sept. 21, 2009.

Information on detector dogs generally:

The Scientific Working Group on Dog and Orthogonal Detector Guides (SWGDOG) has a website containing protocols and other information on K-9's: <http://www.swgdog.org/>.

<http://www.llrx.com/features/caninedetectionevidence.htm> - Ken Strutin, *Canine Detection Evidence*, September 25, 2010. Excellent forensic resource with many links to scientific studies, legal scholarship, and standards.

<http://www.ncstl.org/education/Canine%20Sniffs%20&%20Scent%20Detection> -- NCSTL webpage on Canine Sniffs & Scent Detection with many useful law review and study links.

http://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/detector_dog.pdf -- Report targeted mainly at detector dogs used in ports and airports to sniff for contraband plants and imports, but may be useful as a reference on working and keeping detector dogs according to government regulations.

<http://www.detectordog.net/> Informal website maintained by detector dog enthusiasts with links.