appreciate the application and interpretation of scientific tests to an array of physical evidence. Chapters are devoted to discussions of examination techniques for a wide range of evidence found in the modern crime laboratory—DNA, hair, paint, soil, glass, petroleum products, explosives, alcohol in blood and breath, and questioned documents. The expanding applications of mass spectrometry, capillary electrophoresis, high-performance liquid chromatography, and the visible microspectrophotometer warrant the inclusion of chapters describing their theory, operation, and forensic use. However, the emergence of modern analytical instruments has not diminished the importance of the light microscope in criminalistics. The microscope's unique role in the crime laboratory has prompted coverage of its operational theory and applications to forensic science problems.

A chapter describing the role and conduct of the expert witness and rules of evidence, as well as the legal requirements governing the admissibility of scientifically evaluated evidence, serves to emphasize the ties that bind forensic science to criminal law.

The contributors to this volume of the Handbook are all recognized forensic experts well versed in the practices of their chosen areas of expertise. The expectation is that these authors will be successful in communicating to the reader knowledge and lessons derived from their many years of practical experience in laboratories and courtrooms. The editor deeply appreciates the enthusiasm and skills each contributor brought to this project. Their efforts are a mark of their professionalism and dedication to continued achievement and excellence in forensic science.

I want to credit the efforts of Gonul Turhan, who aided me in reviewing the manuscript and tying up lots of loose ends while preparing the manuscript for production. I wish to express my appreciation to my production editor, Linda Pawelchak, for transforming the manuscript into a finished book. I also want to acknowledge my acquisition editor, Kim Davies, for supporting the Handbook volumes.

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Today almost all scientific or professional disciplines provide scientific or technological evidence in court. This evidence is known as expert evidence. It encompasses both witness and non-witness evidence, such as demonstrative evidence presented by experts. Forensic science is the application of scientific principles and technological practices to the purposes of justice in the study and resolution of criminal, civil, and regulatory issues. The testimony offered by specialists is frequently couched in terms of opinions, conclusions, and evaluations, which themselves are not scientifically measurable.

This chapter discusses essential, practical, utilitarian, and fundamental concepts of scientific evidence and expert evidence. It is intended to provide the constructs necessary for understanding the legal aspects of forensic science and being a successful consulting and testimonial witness. The overview presentation is applicable to both the novice and experienced occupational expert witness.

The value of liberty is impossible to quantify, but liberty is clearly cherished by our society. Our adversary criminal justice system is designed to ensure the application of the principles set forth in the U.S. Constitution. The right to confront the prosecution's critical evidence through independent testing and its purported analytical result is a fundamental right that cannot be restricted.

Forensic science is an essential, integral aspect of the law enforcement and judicial systems. Attorneys seldom feel comfortable or confident in their ability to obtain, interpret, and understand scientific information. Hence, they rely on experts to provide them with scientific material relevant to the case. The law needs science to help it know about facts of the world in which legal policy and understanding must operate. The reverse is also true of the scientist's understanding of the law. Without the legal system and attorneys, the vocation of consulting and testimonial experts would not exist.

The use of experts is an important aspect of the adjudicatory process because science and technology can reduce uncertainty about particular facts, thereby facilitating the decision-making process. Louis Pasteur's assertion that "there are no such things as applied sciences, only application of science" is particularly true in litigation.

The primary function of forensic scientists, or opinion witnesses, at trial is to assert the trier of fact, the judge or the jury, in understanding methods used and conclusions reached in a discipline not within their general knowledge. Scientists tend to perceive themselves as merely translators of findings into legal probabilities and not as educators. The forensic scientist must be able to impartially, credibly, and coherently communicate test results and explain the methods and processes used to reach those conclusions to the finder of fact. Scrutiny of trial testimony conforms with the gold standard in quality of laboratory procedures, methodologies, documentation, and results is also to be expected.

The forensic scientist who, upon court approval, becomes an expert witness applies general scientific theory or techniques to specific facts in order to formulate an opinion premised upon a "reasonable degree of scientific certainty." Scientific or technological evidence encompasses both testimonial and non-testimonial evidence presented by experts. The expert need not express an unqualified and absolute conclusion but is allowed to express an opinion. This privilege, in the words of L. T. Perrin, makes

experts...powerful witnesses. The expert is largely free of the restraints the rules impose on everyone else. Opinion testimony is not simply allowed; it is expected. Even opinions that embrace the ultimate issue are permitted. Personal knowledge is unnecessary. Testimony on matters of common knowledge is allowed. The expert is permitted to use hearsay in forming an opinion and to tell the jury about it. The structure of the rules of evidence provides the context to understand why experts are so attractive to lawyers.

The movant in legal proceedings must demonstrate the reliability of the test in order to satisfy due process and fundamental fairness. All cases involving criminal charges entail some aspect of scientific evidence and forensic science. In criminal prosecutions, law enforcement extensively relies upon scientific principles and technology. This interdependence is exemplified by the application and use of forensic DNA analysis for identification or breath alcohol testing devices in drunk driving prosecutions.

In the current legal system, success in the courtroom requires as much scientific acumen as it does legal knowledge. A paradox of expert witness testimony is the use of attorneys. Most lawyers and judges are scientifically unaware if not uninformed. They are ill equipped and underprepared by training and experience to handle the complexities of scientific evidence. Their knowledge of science parallels that of a layperson. Judges and attorneys must be able to understand and decipher scientific evidence. A science degree is not a judicial requisite even for appointment to the U.S. Supreme Court. Understanding science, arguably, is part of the constitutional duty assumed by legislators, administrators, and judges. Similarly, issues and questions of science will most likely be misunderstood by members of the legal system.
ROLE AND ATTRIBUTES OF EXPERTS

The Role of the Expert Witness

The attorney-client privilege is designed to protect confidential communications between a client and his or her attorney. This privilege extends to expert consultants engaged by the attorney on behalf of the client. It is essential that the attorney maintain work product confidentiality, provide all case materials, and discuss problem areas with the consulting and testimonial expert.

Experts may be used in one of two capacities—consultation or testimony—and are classified into five general categories of expertise:

1. Layperson: Applies common sense and life-long experience
2. Technician/examiner: Has limited and concentrated training; applies known techniques; works in a system and was taught in a system; examples include investigators and supervisors
3. Practitioner: Analyzes and interprets material and information
4. Specialist: Is devoted to one kind of study or works with individual characteristics
5. Scientist: Conducts original empirical research; conducts experiments to verify the validity of theories; designs and creates instrumentation and applied techniques; is published in own field with peers; and advances his or her field of knowledge

A consulting expert is a person who has been retained or specifically employed in anticipation of litigation or in preparation for trial but who is not to be called at trial. The identity, theories, mental impressions, litigation plans, and opinions of a consultant are work product and are protected by the attorney-client privilege.

A testimonial expert is retained for purposes of testifying at trial. The confidentiality privilege is waived, and all materials, notes, reports, and opinions must be produced through applicable discovery proceedings. If an expert relies on work product or hearsay as a basis for an opinion, that material must be disclosed and produced through discovery.

The expert witness performs two primary functions: (1) collecting, testing, and evaluating evidence and forming an opinion and (2) the forensic function—communicating that opinion and its basis to the judge and jury. A general rule of evidence is that witnesses may testify only to what they have personally observed or encountered through their five senses.

Expert witnesses are arguably “conduits of hearsay and other unreliable evidence.” In general, witnesses are not allowed to testify to their opinions, with several specific exceptions. One exception is the testimony of the expert witness, a witness whose opinion will be likely to aid the trier of fact in the search for the truth. The expert may testify to ultimate issues that are mixed questions of law and fact. The expert, however, may not give an opinion or state a legal conclusion regarding a question of law that is to be decided by the court. Further, an expert witness’s opinion cannot be couched as possibilities or probabilities without articulating the underlying factual basis.

An attorney is prohibited from vouching for the credibility or truthfulness of any witness, including an expert witness. Witness credibility cannot be bolstered by having a prosecutor or a prosecution’s expert witness express a personal belief that the witness provided truthful information or by vouching for the witness’s truthfulness in any other matter. This prohibition is especially important in summation arguments.

Qualifications of the Expert Witness

The witness must be competent in the subject matter. He or she may be qualified through knowledge, skill, practical experience, training, education, or a combination of those factors. Once competency has been verified, a witness’s knowledge of the subject matter affects the weight and credibility of his or her testimony.

Minimally, the expert witness must know the underlying methodology and procedures employed and relied upon as a basis for the opinion. The background knowledge includes state-of-the-art technology, literature review, and experience, the combination of which culminates in an opinion based upon a reasonable degree of scientific certainty. There is no absolute rule, however, as to the degree of knowledge required to qualify a witness as an expert in a given field.

A debilitating invitation to blatant accusations and findings of motive, interest, and bias exists if the proffered witness is required to testify on the basis of his or her job description and employment duties. This is a common problem with government employees. Claims of intellectual dishonesty and inherent prejudice may be insurmountable. An expert witness cannot have an interest in the outcome of the trial.

The imprimatur of a governmental agency, laboratory, office, or title does not automatically make either the results or the witness’s testimony inherently trustworthy, credible, and reliable. A witness is not an expert merely because the term is part of his or her title or job description (e.g., Special Agent or Drug Recognition Expert). The name special, expert, or inspector itself gives an instantaneous indication and aura of authority and respect that implies to the trier of fact a specific expertise beyond normal employment (law enforcement/police) qualifications.

The movant must provide complete current information on the expert witness. If there is noncompliance, opposing counsel will undoubtedly ask what the witness is trying to hide. The court—not the attorney or the witness—determines what information is discoverable and when it is discoverable. All material is returnable to the court or movant.
The vast majority of expert witnesses testify truthfully. Nevertheless, there are experts, including both governmental and defense witnesses, who blatantly misstate and exaggerate their qualifications. Unfortunately, the “mountebanks” are too numerous for anyone to claim that prevarication is a remote occurrence.32

Prior judicial recognition of an expert’s qualifications is normally a significant factor in the court’s evaluation and determination of finding that the witness is qualified as an expert. The court’s finding, however, that the proffered witness was a “paid expert liar in numerous other cases” is not an argument for determining the expert’s qualifications.33

An expert may be qualified but not competent to render a credible opinion.34

In trial harm to litigants results from improper qualification of an incompetent expert or failure to qualify a competent expert. . . . The incompetent expert is a vehicle for unreliable proof, while the latter denies the opportunity to present credible evidence.35

In bolstering the credibility of an expert witness, attorneys will select as circumstances allow, witnesses with significant trial experience. Absent such a source, attorneys select from the community rather than classified advertisements. Trial tactics rather than reliability becomes the impetus for the selection of experts. Such tactics may influence selection of the less reliable witness.36

Ethics and Intellectual Honesty

Ethics and scientific testimony are inextricably intertwined, because science is neutral and based upon facts. Intellectual honesty is an issue in scientific evidence. An expert witness can affect, and infect, the evidence. The integrity of scientific evidence can affect the outcome of judicial proceedings. Ideological and personal beliefs can prejudice an expert witness’s testimony. A pervasive bias exists in expert testimony—the professional partnership in both private and public sectors. Experts whose livelihood depends on consulting and testimony must learn to satisfy the consumers who buy that service; those who do not will not get hired or remain employed. In some cases, experts may distort their view to suit the interests of their clients or employer, perhaps even lie outright.37

Jurors regularly accord special weight to expert witness testimony. Judges and attorneys customarily believe jurors give more credibility to scientific evidence than to other types of evidence. Jurors normally believe the case would have been decided differently without forensic evidence. The extensive testifying experience of many experts makes them powerful, persuasive witnesses, capable of making or destroying a case. Testimony offered by expert witnesses is the most persuasive of all testimony.38

In general, the predominant problems with forensic experts are credibility,39 honesty, competency, quality of work, and neutrality. Forensic scien-
An expert cannot base an opinion, even partially, on illegally obtained or inadmissible evidence. Furthermore, "the court must ensure that expert opinion testimony is in fact expert opinion and not merely an opinion given by an expert."49

Each witness is required to take an oath before providing testimony. The oath is a simple concept with a simple purpose, yet it can be so difficult to fulfill. It is the standard for integrity. Do you promise or affirm to tell the truth, the whole truth, and nothing but the truth? The oath speaks for itself. The witness promises to tell the truth. Not a portion of the truth, not shades of the truth, just the simple truth. It is a clear and definite concept.50

Demeanor

The demeanor of the expert is important. Here are several general caveats to remember: be confident, be credible, speak with a steady cadence, be truthful, exercise common courtesy toward all parties, including the judge and jury, and speak to the jury—never ignore the jury or take its presence for granted.

Also, do not verbally duel or argue with an attorney while testifying. Being perceived as glib, arrogant, vain, pomposus, truculent, condescending, bombastic, pretentious, or pedantic will impair the expert's rapport with the jury.

Expert witnesses are educators and communicators. As an educator, the expert witness must be aware of the jury's educational limitations and attention span. A good educator speaks to rather than lectures at the students. The expert should recognize the jurors' difficult job and lack of familiarity with the subject matter and with litigation in general.

The expert witness's demeanor, credibility, and communication skills are crucial to effective testimony. An aura of composure, humility combined with self-confidence, conviction, and integrity must be effectively and genuinely conveyed by the expert witness.

Communication Skills

People are judged by the words they speak and their communication skills. Clarity in communication is extremely important. Nothing is as frustrating to a jury, or to a judge, as not understanding what the witness is talking about. Expert witnesses do not have to prove their intelligence, only their communication skills.

The forensic scientist should be careful to explain answers in lay terms that are easily understood by the jury. Use the technical term and follow it up with a brief definition or explanation. Communicate at two levels. Difficult scientific principles and esoteric concepts can be made readily understandable through the practice of artful communication techniques. Whether addressing an attorney, a judge, or a jury, experts would do well to hone their communication skills. By utilizing figures of speech, commonly used linguistic conventions, and other rhetorical devices—such as metaphor, analogy, colloquialisms, and slang—experts can render abstractions vividly and concretely and can imbue their testimony with credibility and comprehensiveness.51 This approach familiarizes the jury with the technical terminology and explains it in a simple and factual manner which is designed to neither offend the jurors nor be condescending.

The forensic scientist's testimony should be compelling and interesting. An effective and integral part of the testimony is developed through demonstrative evidence, the adult version of "show and tell" or "sharing" that children learned early in elementary school. The use of visual aids is especially important when offering scientific evidence. Visual aids (demonstrative evidence) can usually simplify confusingly abstract scientific testimony for the jury's benefit. Audio-visual aids are a practical, efficient, and productive medium. This mode of communication is effective for two reasons: visual images help explain and define when mere words are insufficient, and they keep the audience's attention by varying the presentation.

Before testifying, expert witnesses should provide the court stenographer with a vocabulary list of technical terminology normally encountered in their testimony. The witness should then spell the troublesome or uncommon words during the testimony, while simultaneously looking at the court reporter. This practice will facilitate an accurate stenographic record of the testimony.

Clothing is a subliminal form of communication. Attire for the witness in court should be clean, neat, and presentable. The clothing must be comfortable and should comport with regional dress codes and mores.

Pretrial Preparation

The only aspect of litigation an expert can control is preparation. If you are not prepared, do not go into the courtroom; you do not belong there. The difference between the best and the rest is preparation. (Remember and practice the five Ps: prior preparation prevents poor performance.) Preparation is 90% of the trial. The capable expert witness acknowledges and understands this fact. Preparation includes the forensic scientist and attorney of record working together well in advance of trial.

The expert's services should be sought and retained as early as possible in order for the expert to provide maximum assistance in the case. The expert can assist in developing a case history, propounding and responding to discovery, preparing demonstrative evidence, and interviewing witnesses.

Federal Discovery Rule 26(a)(2)(B), coupled with the Daubert52 decision, requires disclosure of material when formulating an opinion and more extensive reports. The attorney must now check the expert's report for accuracy and needs to control, if not monitor, the data an expert uses in forming an opinion. Therefore, the expert and the attorney must work closely together to make the expert's testimony more effective.
The expert witness should be familiar with basic textbooks relied upon by attorneys when utilizing or confronting scientific evidence. Understanding the lawyer’s thought process and perspectives will contribute to the witness’s competency, effectiveness, and testimony.53

The forensic scientist should maintain an accurate and current curriculum vitae in addition to having his qualifications written in a question-answer format (see Appendix A). The expert witness should also prepare a series of written questions on the subject matter being presented in court. This list will facilitate a competent and effective presentation and will minimize involvement in peripheral matters.

It is incumbent upon the expert witness to properly prepare his or her testimony. The attorney of record must be interviewed and familiarized with the subject matter and testimony. The attorney must have a clear perspective and understanding of what tests and procedures the expert performed, as well as the results and the opinions reached. If the attorney has not contacted the expert witness within a reasonable period of time after retaining the expert, then it is necessary for the expert to contact the attorney in writing to initiate the interview.

It is essential that the attorney maintain work product confidentiality, provide all case materials, and discuss problem areas. Confidentiality is especially important when information is transmitted through nonencrypted electronic mail (e-mail), which is neither a privileged nor a confidential communication.54

**Trial**

**Trial Preparation**

Essential to trial preparation is being prepared and organized. Experts must review and know all case materials. They must bring the entire original file to court, including, but not limited to, all personal notes, memoranda, file jackets, and formal reports. They must also include with them their current curriculum vitae, with photocopies of all applicable certifications, permits, and licenses, as well as a vocabulary list of terminology for the court reporter. They should provide a written outline of proposed testimony and exhibits to the attorney. In addition, they need to be familiar with the demonstrative evidence (show and tell) and location of the courthouse and must never be late.

**Voir Dire**

Voir dire55 creates the standard for an expert witness’s testimony and credibility. It is the first and foremost part of any examination process.56 It is the judge’s and jury’s first impression of the witness. Neither the movant nor the witness must take voir dire for granted or the proffered witness will not be properly qualified. Whether or not a witness is qualified as an expert can be determined only by comparing the area in which the witness has expertise with the subject matter of the witness’s testimony.57

The moving party must establish the expert’s competency and knowledge in the profession and field (not experience, education, or specialized training), subject to judicial approval, through examination of the expert’s credentials. A witness is not deemed an expert until so qualified by the court (see Appendix A). Once competency has been satisfied, a witness’s knowledge of the subject matter affects the weight and credibility of his or her testimony. Simply ask, Is the proffered witness qualified? Is the witness competent? Only when the judicial answer to those questions is yes will the witness be allowed to provide opinion evidence.

Credentials and competency are not the only criteria. The subject matter of an expert witness’s testimony must be legally and factually relevant. A nexus must exist between the scientific theory being proffered and the evidence at trial. Failure to meet these threshold criteria will preclude or bar the expert’s proffered testimony. Next there must be a finding that the proposed testimony will affect the validity of the evidence.

**Direct Examination**

It is through direct examination of witnesses in their case-in-chief that the parties principally place their case before the trier of fact. Communication skills and credibility are established during this phase of the expert’s testimony.

All expert witnesses should be questioned in a manner that enables them to testify clearly and succinctly to matters within their area of knowledge and expertise. The pertinent facts should be elicited with open-ended, nonleading questions that do not suggest an answer. The use of demonstrative evidence through visual aids, such as charts, diagrams, experiments, and models, emphasizes or explains the witness’s testimony.

The expert witness relies on his or her knowledge, training, and experience to relate findings and opinion to the jury. The testimony should be kept simple, focused, and understandable. The witness’s demeanor should exude clarity and integrity. Use of plain, clear, concise speech cannot be overemphasized. Utilization of appropriate legal terminology (“reasonable degree of medical or scientific certainty”) is necessary when stating conclusions. The witness should exercise patience and explain technical terms and concepts without being patronizing, demeaning, or condescending. The testimony should not be too technical. Save the technical aspects and jargon for cross-examination.

The witness’s attire and demeanor contribute to his or her believability and respect. The appearance and demeanor of the witness are critical. The witness must convey a sense of believability to the judge and jury. Witness
demeanor should demonstrate an interest in the subject matter of the testimony and respect for the seriousness of the proceedings. If the witness appears uninterested or annoyed with giving testimony, the jury will most likely also be bored or annoyed with the testimony.

Cross-Examination

"Cross-examination is much more science and application of technique than it is art. 58 Cross-examination is the attorney's primary opportunity to give the jury reasons not to believe the opposing expert's testimony. It focuses largely on issues of credibility—should this expert be believed? Impeachment is directed at the substance of the person's testimony or confronts the witness's credibility. The major spheres of expert witness examination are opinion testimony, 59 fallibility of methodology and result, 60 reproducibility of results, compensation, 61 and integrity. Areas within these domains susceptible to cross-examination may include inconsistent statements, transcripts of previous proceedings, motive, interest, bias, fees and compensation, omissions, treatises or other publications, experience, conviction of crimes, personal knowledge of facts, errors in the report, unknown facts, analytical tests not performed, lack of access to all relevant documents, reasonable degree of scientific certainty or probability or certitude, and absoluteness. Conflicts in the witness's testimony create doubt as to his or her believability. If the forensic scientist has correctly and competently performed all the tests and examinations, has reached legitimate conclusions, is properly prepared for the trial, and testifies honestly, there is nothing to fear. About the only apparent safeguard against an expert who gives a phony opinion is cross-examination. 62

Maintaining Credibility during Examination

There are some general rules an expert witness should follow in order to avoid appearing less than credible while testifying:

1. Be nervous. It is acceptable to be nervous. Courtrooms can be intimidating places. Litigation is the attorney's domain, and the courtroom his or her medium. Being nervous generally strengthens the witness's credibility through unrehearsed spontaneity instead of routine perfunctory answers, even if the witness has been taught how to testify.

2. Always tell the truth. Do not compromise your integrity and morals by committing perjury. The witness has more to lose by lying than by telling the truth. Never guess or hedge an opinion, and never provide an answer the witness believes is best for the case unless it is the truth.

3. Listen to the question. The witness must understand the terminology and the question that is being asked. A witness who does not understand a term or question should say so and request clarification of the term or question before providing an answer. Rephrasing or repeating the question will usually make it more understandable. The same tenet applies if the attorney misstates the facts or a scientific principle as the expert knows it.

4. Pause, then answer. Listen to the question. Do not be rushed or coerced into answering. Take your time. Be careful. Collect your thoughts and think about the answer. Listen to any objections made by opposing counsel. The objections provide information on potentially damaging areas or on how opposing counsel is attempting to mislead or discredit the witness's testimony. The witness should correct any misstatement contained within the question before answering, rather than answering the question and then attempting to qualify the answer.

5. Admit mistakes and problems. Do not evade the question. Candidly confront the problems and defuse harmful facts. All too often a witness, especially an expert, is reluctant to admit mistakes and problems, even though admitting mistakes presents an image of credibility and honesty.

6. Admit limitations. Answer questions only if you know the answer. The witness cannot seek advice or assistance from his or her attorney while testifying. Experts are often too arrogant or too insecure to concede limitations of their knowledge and say "I do not know" to specific inquiries, even though doing so would likely enhance their credibility. Admit the mistake, limitation, or problem or suffer the irreparable devastation of an exposed cover-up.

7. Admit inability to remember. If the witness does not remember or know something, they should say so without reservation. Do not guess or speculate. State only what is true. Vagueness of answer will survive the examination but will be the witness's nemesis. A witness cannot be cross-examined on repeated answers of "do not know," "cannot remember," and "cannot recall," even though these answers will certainly be commented upon adversely during closing argument.

8. Do not hedge or obfuscate. The witness must be able to articulate, identify, and practically support their conclusions. If the witness is going to use any definitions or interpretations such as "match," "indistinguishable," or "identical," then the witness is obligated to objectively and empirically support the terminology and findings of their opinion. Terminology and phraseology vary, in part, because the starting point is never agreed upon. 63 Expert witnesses quite frequently hedge their opinions with obfuscatory words. Phrases such as "similar to," "could have," "might have," "compatible with," "consistent with," 64 "physical observable characteristics," "instrumental techniques," and "various chemical tests and analysis" are
noncommittal and nondescript statements designed to infer competency, credibility, and reliability. In reality, they can do the opposite. Reliance on bluffing, hedging, and obfuscation will adversely affect and impugn credibility and communication skills.

9. *Speak to the jury.* The jury alone decides the verdict. They assess the credibility of the witnesses and facts. Address the jury, not the lawyers, when answering questions, and continually make eye contact with them. Do not take their presence for granted.

10. *Maintain a consistent attitude.* The witness should not overtly change his or her attitude between direct and cross-examination. Consistency is important. Be congenial, confident, and self-assured. Stay relaxed and maintain emotional stability, for it is the witness who controls the flow of his or her testimony and provides the jury with an opportunity to listen to the answers.

11. *Never argue with counsel.* Self-control is paramount. Opposing counsel’s objective is to discredit the witness’ testimony through any available means, including assaults on temperament. Let the judge or witness’ counsel control the opposing counsel’s abusive conduct. Do not be antagonistic. Be personable and cooperative during both direct and cross-examination.

12. *Answer just the question.* Do not volunteer information or embellish the answer. If additional information is necessary, it will be requested. Do not exaggerate. Too much explanation provides a basis for otherwise unexpected cross-examination and may also make the witness appear insincere or biased.

**DISCOVERY AND DISCLOSURE**

Discovery is the disclosure of evidence or of information leading to evidence that is relevant to the case. The purpose of discovery is to eliminate surprises in both civil and criminal proceedings. Discovery minimizes miscarriages of justice and materially fosters the settlement of cases. Discovery is created statutorily and at common law. It is controlled by the courts. The five major devices for obtaining discoverable information are (1) written interrogatories, (2) depositions upon oral or written questions, (3) production of documents or objects or permission to enter upon land or property for inspection and other purposes, (4) physical or mental examinations, and (5) requests for admission of facts and genuineness of documents.

Available methods of pretrial discovery encompass the bill of particulars, selective motion practice (i.e., production of documents, objects, and

Federal Rule of Civil Procedure—Rule 26: Discovery and Depositions

Nothing is exempt from scrutiny or comment regarding the expert witness. Expert witness discovery relating to scientific evidence and associated testimony is controlled in part by the Federal Rule of Civil Procedure 26, Daubert v. Merrell Dow Pharmaceutical Inc., state statutes, and local court rules. According to Federal Rule 26(a)(2)(B)(2-b), before an expert witness can offer testimony, that person must provide a written summary opinion discussing the testimonial subject matter; a summary of the substance of facts and opinion; the basis for the opinion; reports; a list of all publications authored by the witness in the preceding 10 years; a record of all previous testimony, including depositions for the last four years; a disclosure statement, a report signed by the expert and the disclosing attorney; and other items as ruled by the jurisdiction. Once disclosure of the expert witness has been made, under FRCP 26(e)(10), a continuing duty exists to provide additional and corrective information. The movant must provide complete current information on the expert witness.

Even though many states have adopted the Federal Rules of Civil Procedure, including Rule 26, parties should consult their own jurisdiction regarding rules of discovery and corresponding requirements.

**Preservation of Evidence: Spoliation**

Parties using and relying on physical evidence have a duty to keep and preserve the physical evidence from date of collection until resolution of judicial process. Whether the spoliation (destruction) of physical evidence is intentional or unintentional is irrelevant because of its integral evidential value.

Destruction of the sample deprives the accused of “the opportunity to meet or dispute the [prosecutor’s] test results by [his or her] own evidence of
equal integrity and persuasiveness.\textsuperscript{70} The defendant need only establish that the evidence's exculpatory value was apparent before it was destroyed and that it might have been expected to play a significant role in the defense. Also, in many cases the accused is unable to obtain comparable evidence.\textsuperscript{71} Failure to preserve, keep and maintain evidence warrants a direct inference that the evidence was favorable to the aggrieved party.\textsuperscript{72}

When evidence of no apparent value to the defense is destroyed, unless the criminal defendant can show bad faith on the part of the police, failure to preserve evidence does not constitute a denial of due process. Fundamental fairness, however, prevents the movant or prosecution from introducing any test results based on the destroyed evidence that the accused has not been able to confront owing to its destruction or withholding.\textsuperscript{73} Inadvertent destruction of evidence by the prosecution before independent testing is a violation of due process and warrants dismissal of charges. Bad faith is not required because of reliance on evidence to support a conviction. Without an independent test, a defendant will not be able to contest whether the results are accurate. The test is whether a defendant is able to establish a defense without the destroyed evidence.\textsuperscript{74} Evidence of spoliation warrants a presumption in civil proceedings of negligence\textsuperscript{75} and in criminal cases of constitutional violations with sanctions.

A request for evidence is meaningless if the evidence does not exist. Simply, spoliation of evidence, regardless of intent, can substantially prejudice a defendant's ability to defend himself or herself and generally deprives the defendant of the right of confrontation and due process. These stringent requirements and the rather drastic results for failure to adhere to them reflect the court's interpretation of the underlying purposes and duty in Brady v. Maryland.\textsuperscript{77}

The purpose is not simply to correct an imbalance of advantage. . . . \textsuperscript{78} It is also to make of the trial a search for truth informed by all relevant material, much of which because of imbalance in investigative resources, will be exclusively in the hands of the government.\textsuperscript{77}

The same court stated,

A criminal trial, like its civil counterpart, is a quest for truth. The quest will more often be successful if both sides have an equal opportunity to interview the persons from which the truth may be determined. . . . \textsuperscript{79} The prosecution should not frustrate the defense in the preparation of its case.

Subpoenas

Subpoenas are used in all stages of the judicial process in which testimony or production of material is sought, including pretrial hearings and grand jury appearances.\textsuperscript{80} There are two types of subpoena: the subpoena ad testifican-

dum and the subpoena duces tecum. The first is for the person, and second is for production of documents and records.

A subpoena is a judicial writ enforceable by the issuing court. Subpoena comes from the Latin meaning "under penalty." It is used to command the presence of a witness or the production of documents in court under penalty of law: "The use of subpoenas to have compulsory process for obtaining evidence in the defendant's favor is guaranteed by the Sixth Amendment to the Federal Constitution and is applicable to state criminal proceedings.\textsuperscript{81}

The subpoena cannot be vague or indefinite. In order to carry his or her burden, the proponent of a subpoena for documents must establish relevancy, admissibility, and specificity: "\textsuperscript{81} The moving party must show that (1) the documents are evidentiary and relevant; (2) they are not otherwise procurable reasonably in advance of trial by exercise of due diligence; (3) the party cannot properly prepare for trial without such production and inspection in advance of trial and that the failure to obtain such inspection may tend to unreasonably delay the trial; and (4) the application is made in good faith and is not intended as a general 'fishing expedition.' \textsuperscript{82} (See Appendix B.)

In the second type of subpoena, the subpoena duces tecum, the court, at the request of a suitor, commands a witness to personally produce at trial documentation or objects within his or her possession or control that are pertinent to the issues of a pending controversy.\textsuperscript{83} The relevant language of a subpoena duces tecum usually states, "You are commanded to bring any and all information, including but not limited to, . . . in your possession, control or in that of your legal representative." (See Appendix C and Appendix D.)

Neither the prosecution nor the subpoenaed party can decide what information is discoverable or when it is discoverable.\textsuperscript{84} The subpoena is returnable only to the issuing party or court, without interference, suggestion, or persuasion from the prosecution.\textsuperscript{85}

The courts, upon motion, may quash a subpoena for a person or documents if there is a clear showing it is unreasonable or oppressive.

Interrogatories

Interrogatories\textsuperscript{86} are carefully drafted written questions seeking facts that form the basis of opinions and the sources of those facts. They are a convenient, expeditious, inexpensive vehicle of discovery. Interrogatories are instrumental in discovery.

Depositions

A deposition is a statement made orally by a person under oath before an examiner, commissioner, or officer of the court, but not in open court, and reduced to writing by the examiner or under his or her direction.\textsuperscript{87} Any party
related to the case may be deposed, including adverse parties, independent
witnesses, occurrence witnesses, expert witnesses, and percipient witnesses.
The deposition may be conducted through various mediums (video, audio,
telephonic) or in person. Depositions are frequently used to position informa-
tion as a basis for settlement or resolution of issues. It can be a substitute
for trial or a basis for impeachment evidence at trial. The witness may be
required to bring to the deposition any pertinent, nonprivileged books,
records, papers, recordings, or other such material. The purpose of a deposi-
tion is to preserve that witness's testimony for use at trial, not for discovery.

Most states have adopted rules that are substantially similar, if not
different, to the Federal Rules governing deposition practice and procedure.
Under the Federal Rules of Criminal Procedure, a party to a criminal
act may in certain circumstances make a motion for taking the deposition
of a witness.

A deposition should be scheduled for a time and place convenient for
the parties and witnesses involved. Usually, rooms are available at the cour-
thouse for depositions, but the offices of an attorney are frequently used.
Reasonable notice for the time of a deposition is required, and the person being
deposed may request the court to change the time, date, and location.

The format of a deposition may vary, but generally the witness is ques-
tioned by both sides in the same order as at trial; the proponent direct exam-
ines, then the opponent cross-examines.

The court may pay the expenses incurred by that witness when the
government takes a deposition or when an indigent is deposing a witness.
The deposition may be used at trial, in part or in its entirety, if the witness is
unavailable or, if appropriate, for purposes of impeachment when the wit-
ness testifies.

THE LAW OF EVIDENCE

The Law of Evidence is a set of rules and principles affecting judicial investiga-
tions into questions of fact—for the most part, controverted questions. Ev-
idence is any matter, verbal or physical, that can be used to support the
existence of a factual proposition: “The Rules of Evidence are founded in
the charities of religion, in the philosophy of nature, in the truths of history, and
in the experience of common life.” Its exclusoratory purpose is to protect the
jury from being misled.

There are two basic categories of evidence, direct and circumstantial.
Within these general groups there exist three general types of evidence: testi-
emonial, physical, and demonstrative. Any kind of evidence to be consid-
ered in a legal context must comply with the admissibility requirements of rele-
vancc and materiality.

Direct evidence tends to show the existence of a fact in question with-
out the intervention of proving any other fact: Is the evidence to be be-
lieved without inferences or conclusions from it? Direct evidence depends
on the credibility of the witness. Circumstantial evidence is indirect evidence
from which inferences or conclusions can be drawn. Circumstantial evidence
depends on both the credibility of the witness and inferences from the
witness.

Evidence may be testimonial (witness), physical (tangible objects and
parts of the body), or demonstrative. Testimonial evidence is premised
upon the witness’s personal knowledge and relies on the person’s five
senses. Physical evidence is perceived as indisputable, scientifically sound
and, most important, neutral. The value of physical evidence cannot be un-
derrated. It is the silent, definitive witness. Physical evidence offers cer-
tainty, and certainty equals proof. The means by which physical evidence
becomes proof is through forensic science. It often involves submission of
some tangible object that was directly involved with the situation or inci-
dent (document, weapon, narcotics, drugs, clothing, blood, hair, etc.).
Demonstrative evidence serves as an audio-visual aid and is designed to as-
sist the trier of fact in understanding the witness’s testimony. It can include
maps, models, x-rays, diagrams, models, computer graphics or
simulations, and so on.

Authentication

Authentication requires the party offering contested evidence provide a
basis for the fact finder to believe that the item is what the proponent claims
it to be. It requires, also, that the evidence be in substantially the same condi-
tion it was in when it was obtained or seized. The principles of authenti-
cation apply to any physical items described in testimony or offered into
evidence, including witness statements. The most common form of authenti-
cation or identification of tangible objects (letters, documents, photographs,
tools, weapons, etc.) is simply to have the witness identify them on the basis
of his or her personal knowledge (what the witness saw, heard, tasted, felt,
or smelled). The proponent must introduce evidence that the matter is what
its party claims it is.

Evidence is susceptible to tampering, loss, substitution, degradation, or
mistake and is not always capable of easy recognition. Therefore, the item
must be authenticated. Aspects of authentication include the nature of the
article; the circumstances surrounding its preservation and its custody; and
the likelihood of alteration, degradation, contamination, or tampering. The
party intending to use the item as evidence must establish that the quality or
condition has not substantially changed from its original state when col-
clected or seized to when it is offered into evidence.

A complete independent historical accounting and rendition of the
item must be documented to maintain the item’s integrity, not just whether
the item has been subject to change. Establishing the item’s condition is
accomplished through testimony of successive custodians, commonly called a chain of custody. This is typically established by having each person (each link in the chain) who has had contact with the item show (1) the circumstances under which custody was taken; (2) the precautions taken to prevent alteration, degradation, contamination, or tampering; (3) that change or tampering has not occurred; and (4) the circumstances under which the person relinquished care, custody, and control of the item. If the real evidence is fungible, not readily identifiable, or is of a type that might change in condition (narcotics), then it must be authenticated through a chain of custody. A short chain of custody significantly reduces the occurrence of problems. A serious or prolonged break in the item’s accounting may render it inadmissible.

The trustworthiness of safeguarding an item’s integrity cannot be understated, especially in criminal cases. The chain of custody is used to assist in the identification and authentication of evidence that (1) it is what it purports to be and (2) it has not been substantially changed for any reason from its original state. If the item has been substantially changed, its value is reduced or negated since it may mislead or confuse the jury. Therefore, it is not admissible. A reasonable degree of certainty is required to establish that the item has been traced accurately through its chain of custody.

The Admissibility of Scientific Evidence

Before any item can be considered as evidence, a proper legal foundation must be laid for its admission. Both procedural rules and substantive law of evidence require a condition precedent to the admission of an item into evidence. Compliance with the item’s condition is its foundation.

Admissibility is premised upon relevance and materiality. Relevance is the basic unifying principle underlying the evidentiary rules. It connotes the probative relationship between the testimonial or real evidence. It also involves analysis of the relationship, often termed “materiality” or “consequentialness,” between the factual proposition and substantive law. Evidence is relevant only if it (1) tends to prove or disprove a proposition of fact (probative value) and (2) is material to a charge, claim, or defense. Does the evidence have a tendency to make the existence of a fact more probable? Does the evidence have any probative value (that which tends to produce belief)? If the answer is yes, then it is usually admitted as relevant evidence unless otherwise excluded by law or as being potentially prejudicial. Evidence that is not relevant is not admissible.

The primary procedural rules for scientific and expert evidence are governed by federal and state statutes, the Federal Rules of Evidence, and case law and are applied through the cases of Frye v. United States94 and Daubert v. Merrell Dow Pharmaceuticals, Inc.95

A predominant question in the area of scientific evidence is the criteria trial courts use to permit expert witnesses to testify regarding scientific, tech-
scientifically naive community. Forensic methods must be screened with greater care if equal justice is to be served. The U.S. Supreme Court in Daubert v. Merrell Dow Pharmaceuticals, Inc. announced that the Federal Rules of Evidence supersede the common law Frye test for admission of scientific evidence. Frye required that a foundation for an expert's scientific evidence include proof that the theory and technique were generally accepted within the relevant scientific community. Admission of scientific evidence at the federal court level depends on consideration of many factors, including whether the theory has been tested, whether it has been subjected to peer review and publication, its error rate, whether there are standards for its operation, and whether it has widespread acceptance in the scientific community. It must help the trier of fact understand the evidence or decide the fact in issue.

An integral part of Daubert discussed the practice of “good science” and the reliability of scientific results. The threshold questions for admissibility include the following: Is the scientific evidence based upon good science? Is it reliable? In determining the parameters of good science, the Supreme Court looked at how conclusions are reached not at which conclusions make sense. It also asked whether a hypothesis was generated and, was it tested empirically? Daubert’s admissibility factors were formulated for Newtonian science and are not typically applicable to nonscientific bodies of knowledge. But Daubert’s reliability principles (empirical validation standard) are just as pertinent when nonscientific expert testimony is concerned.

The Daubert decision made judges “gatekeepers” of science and of expert evidence in courts of law. It has heightened the need for judicial awareness of scientific reasoning and methods. Evidentiary reliability is now based upon scientific validity. The trial judge is assigned a “gatekeeping responsibility” to make “a preliminary assessment of 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.” Daubert made it clear that trial judges should not abdicate what is worthwhile testimony to expert communities, and it implied that trial judges should adopt admissibility criteria that encourage expert communities to develop the best possible information on logically relevant issues.

This “admissibility standard” of evidence demands an understanding by judges of the principles and methods that underlie scientific studies and of the reasoning upon which expert evidence is based. Peter J. Neufeld stated,

Unfortunately, forensic evidence is not adequately tested in the crucible of court. But not only are judges ill-equipped to evaluate critically the reliability of scientific evidence; lawyers routinely fail to assess, much less challenge, the reliability of the particular test. The “crucible of the court” is therefore a meaningless safeguard.

Two extraordinary procedures exist to assist judges in problems of expert evidence or complex scientific evidence: court-appointed experts and special masters. Court-appointed experts may offer testimony at trial, can educate judges concerning fundamental concepts on which experts differ, and can assess the methodology on which the parties’ experts are basing their opinions. Special masters or magistrates may be appropriate in extraordinary cases in which the demanding nature of scientific issues is combined with the need for special skill in fact finding. They may be appointed to conduct settlement negotiations that involve difficult scientific testimony or to manage the pretrial stages of cases that entail problems of expert testimony.

Because the courts, in particular the trial judge, are now the gatekeepers for screening proffered reliable scientific evidence, scientific reliability must be defined. It has essentially two parts. The Supreme Court inquired whether the offered methodology or technique had a known error rate. Accordingly, both the hypothesis and test results, and especially the error rates for those results, must be scrutinized in order to validate the hypothesis. Next, the Court asked whether susceptible standards existed for using the methodology, and if standardized procedures existed for reproducibility of the results. Simply, does a valid scientific methodology and process exist?

The rules of procedure at common law in limited situations permit circumvention of Daubert’s formal regulations of evidence. This occurs through stipulations to facts, judicial notice based upon verifiable certainty, and learned treatises. Parties cannot, however, stipulate to admission of scientifically unreliable evidence.

Common and anticipated challenges to expert evidence under Daubert are (1) Is the expert qualified? (2) Is the expert’s opinion supported by scientific reasoning or methodology? (3) Is the expert’s opinion supported by reliable data? (4) Is the expert’s opinion so confusing or prejudicial that it should be excluded pursuant to Federal Rule 403?

The U.S. Supreme Court in General Electric Co. v. Joiner upheld the trial court’s gatekeeping function, per Daubert, to determine the admissibility of expert witness testimony absent an abuse of judicial discretion.

Kumho Tire Co., Ltd. v. Carmichael

The U.S. Supreme Court in Kumho Tire Co., Ltd. v. Carmichael held that the general proposition of Daubert’s reliability requirement applies to all expert opinions (technical and other specialized knowledge), not just to scientific ones. The distinction between “scientific knowledge” and “technical” or “other specialized knowledge” is illusory and without support in the federal rules. Therefore, Daubert applies to all expert evidence and testimony regardless of whether it is “scientific” in nature. Furthermore, the trial court is not required to hold a “Daubert hearing” every time expert testimony is challenged. Kumho is applicable to both civil and criminal cases.
In most jurisdictions and under the Federal Rules, both lay and expert witnesses are permitted to render opinions. Federal Rules of Evidence 701-706 govern testimony by these witnesses. Specifically, Rule 702 deals with the admissibility of expert testimony. On December 1, 2000, Rule 702 was amended to add the following clause relating to the admissibility of expert testimony: "provided that (1) the testimony is sufficiently based upon reliable facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case." The advisory committee notes state that the "amendment does not distinguish between scientific and other forms of expert testimony. The trial court's gatekeeping function applies to testimony by any expert."131

There is no absolute rule as to the degree of knowledge required to qualify a witness as an expert in a given field.132 Also, there is no stratagem in the courts that can cure scientists from preaching on scientific nonsense as expert witnesses. Daubert and Kumho Tire may provide the way.133 In the words of Albert Einstein, "The right to search for truth implies also a duty; one must not conceal any part of what one has recognized to be true."

CONCLUSION

The U.S. Constitution and corresponding laws of evidence are designed and intended to promote truth, equal justice, honesty, integrity, and freedom. Litigation, especially through the criminal justice system and due process clause of the Fifth Amendment, is premised upon defending constitutional law and corresponding inherent rights. The government must not prosecute and convict on less than all of the evidence. Therefore, it is incumbent upon all people to rely on the legal safeguards to maintain, perpetuate, and protect these scruples and objectives. People should always remember—freedom is just a word until it is lost.

DISCLAIMER

This chapter is intended to provide general information; it does not provide legal advice applicable to any specific matter and should not be relied upon for that purpose. Interested parties should review the laws with their legal counsel to determine how they will be affected by the laws.

APPENDIX A

Qualifying Question Format for the Expert Witness

Sample Expert Witness Voir Dire

1. Name.
2. Occupation.
3. Place of employment.
5. Position currently held.
6. Briefly describe the subject matter of specialty.
7. Specializations within that field.
8. What academic degrees are held and from where and when obtained.
9. Specialized degrees and training.
10. Licensing in field and in which state(s).
11. Length of time licensed.
12. Length of time practicing in this field.
13. Board certified as a specialist in this field.
14. Length of time certified as a specialist.
15. Positions held since completion of formal education and length of time in each position.
16. Duties and function of current position.
17. Length of time at current position.
18. Specific employment, duties, and experiences (optional).
19. Whether conducted personal examination or testing of (subject matter/person/ instrumentality).
20. Number of these tests or examinations conducted and when and where they were conducted.
21. Teaching or lecturing in this field.
22. When and where lecture or teach.
23. Publications in this field and titles.
24. Membership in professional societies, associations, and organizations and special positions in them.
25. Honors, acknowledgments, and awards received in this field.
26. Number of times testimony has been given in court as an expert witness in this field.
27. Availability for consulting to any party, state agencies, law enforcement agencies, defense attorneys.
28. Put curriculum vitae or résumé into evidence.
29. Your Honor, pursuant to [applicable rule on expert witness], I am tendering [name] as a qualified expert witness in the field of _________.

-
Expert Witness Affidavit

Affidavit of ________, Ph.D.

I, ________, Ph.D., do on oath state, and if called to testify in court would so state, the following.

1. I am employed by ________ at ________ [city, state], as a [field: e.g., toxicologist, chemist, biochemist].

2. I have a doctoral degree in ________. My area of specialization is [field: e.g., organic chemistry, including medicinal chemistry and analytical biochemistry].

3. On [date] my scientific consulting services were retained by Mr/Ms ________. Mr/Ms ________ is the attorney of record representing ________ in case [caption].

4. I have reviewed the laboratory reports from ________ Laboratories dated ________ for specimen number ________ regarding the analysis for THC-COOH metabolite purporting to belong to ________. The ________ Laboratory report contains only the test result of a EMIT drug screen and a gas chromatography/mass spectrophotometry (GC/MS) assay on this specimen. No information regarding testing procedures, techniques, standards, methodologies, etc. for the analysis of this specimen or for the preservation and storage of the sample was provided by ________ Laboratory.

5. I am not able to render a competent opinion with a reasonable degree of scientific certainty, solely upon the EMIT drug screen and GC/MS test result from ________ Laboratories, without information pertaining to the testing procedures, techniques, standards, methodologies, etc. relied on and required by experts in this field of science. Full information on the testing procedures, techniques, standards, methodologies, etc. employed is essential for understanding the entire analytical process. The test result alone, without additional information, is incomplete, unreliable, and taken out of context.

6. Human urine specimens purporting to contain THC-COOH metabolite are susceptible to contamination and degradation if not properly collected, preserved, stored, and analyzed.
7. The human urine specimen, which is [give facts: e.g., liquefied, 2 years and 9 months old, currently at room temperature, dark amber brown in color, stored in a leaking bottle and emitting an odor] is not suitable for accurate and reliable testing to determine the presence and amount of THC-COOH metabolite to a reasonable degree of scientific certainty.

8. Affiant says nothing further.

Subscribed and Sworn to before me ________________, Ph.D. on this _______ Day of ________, 20____.

__________________________
Notary Public
Subpoena Rider
People v. __________, Defendant, Case no.
Page two

Date: ____, 20__

5. Laboratory accreditation and certification, including but not limited to:
   a. Results of regular audit of policies by internal and independent third parties
   b. Actual compliance with proficiency standards by independent third parties
   c. Laboratory manual and safety policies
   d. Actual results in their entirety of proficiency testing of laboratory employees, and laboratory, by outside agencies with unknown samples
   e. Names, addresses, and telephone numbers of all agencies either certifying or not certifying the accreditation of __________ Laboratory

6. All licensing authorities (city, state, county, federal, professional, etc.) including certificates of licensing, standards, regulations, and compliance for and by __________ Laboratory.

7. Policies of __________ Laboratory for conducting analyses and basis for threshold levels for determining positive intoxication levels (quantitative level) of __________ drug metabolite in human urine samples.
   a. Laboratory criteria used and described in __________ Laboratory's standard operating procedure manual for what constitutes identification of a drug and quantitative value for intoxication levels.

8. Equipment used or related to analysis of sample.
   a. All maintenance, calibration reports, memoranda, customer advisories, bulletins, notices, interoffice memoranda, sales reports, and purchase or lease agreements
   b. General records for each piece of equipment used, including serial number, make, model, date of installation, and any major update of the equipment (instrument)
   c. Maintenance records of equipment used and recalibration records of the equipment after service call or other repair, from date of manufacture to present
   d. Operation, maintenance, and repair manuals for equipment used in the sample analysis

9. Actual standards and controls used and history of standard and controls.
   a. Standard compounds, frequency of use, procedure for preparation of the performance standard, record of performance runs
   b. Standard operation manual specifying records and criteria for acceptable performance data
   c. Standards and controls used with equipment (ultraviolet, gas chromatography/mass spectrophotometry, infrared spectrophotometry) calibration including sources, preparation, storage, stock and working standards, certification of solution's accuracy, quality control documentation of standards including purity of the standard and control sample(s).
   d. Calibration curve on all equipment used at time of analysis

10. Number of blank test runs between each sample analyzed and results of those blank tests.

11. All information necessary in order to independently, accurately, and reliably reproduce the test results.

Certified duplicate copies will suffice in lieu of originals.

All information requested by this subpoena is directly returnable only to the attorney of record.
APPENDIX D

Basic (Initial) DNA Laboratory Report Subpoena

DNA Laboratory Report: Subpoena Duces Tecum

Any and all laboratory, personal, and miscellaneous notes; file jackets; and file notes on parameters and conditions necessary to produce the tracings and results of R.D. No. ________, Lab case No. ________, inventory No. ________. Also, any and all correspondences, communications, memoranda, etc. (transcribed, recorded, taped, etc.) related in any manner to this case, including but not limited to, its scientific tests, results, photographs, examinations, analyses, and processing. Also, any and all information describing in detail the techniques, methods, and procedures used and proficiency tests, including scientific literature and manuals relied on, so that the results can be reproduced. Also, when and where the actual analysis of the sample(s) was conducted (date, time, and place), the results of all analyses (regardless of results), and the entire daily log records of instruments and equipment used in analyzing the sample(s) when it (they) was (were) analyzed.

Photocopies and duplicates will suffice in lieu of originals.

BIBLIOGRAPHY

7. Judge Learned Hand wrote, "The whole object of the expert is to tell the jury, not facts but general truths derived from his specialized experience but how can the jury judge between two statements each founded upon an experience confessedly foreign in kind to their own? It is just because they are incompetent for such a task that the expert is necessary at all."
10. Gold standard is a colloquialism used in science for the accepted reference standard relating to purity, refinement, and precision when establishing a physical property's measurement or quantity. It is derived from the metallurgical standard for monetary systems.
13. "Movant is a generic term for the proponent of any issue, motion, or presentation of voir dire and witness in legal proceedings.
16. "Lawyers as a group evidence an appalling degree of scientific illiteracy, which ill equips them to educate and guide the bench in its decisions on admissibility of evidence proffered through expert witnesses. This scientific illiteracy is shared by a large segment of the trial and appellate bench; many judges simply do not understand evidence based on scientific principles; even more tragically, they overlook important attributes indicative of reliability of evidence they reject, while ascribing positive properties to otherwise evidence they accept which that evidence simply does not possess." J. E. Starrs, "In the Land of Agog: An Allegory for the Expert Witness," J. Forensic Sci., 30 (1985), 289. See also, D. L. Faigman, E. Porter, and M. Saks, "Check Your Crystal Ball at the Courthouse Door: Please: Exploring the Past, Understanding the Present, and Worrying about the Future of Scientific Evidence," Cardozo L. Rev., 15 (1994), 1799, 1835.
17. Confidentiality is especially important when information is transmitted through nonencrypted electronic mail (e-mail), which is neither a privileged nor confidential communication. J. W. Hall, "E-Mail and Confidentiality," Champion, 21, 52 (June 1997), 52;

18. The technician has been taught to use complex instruments (e.g., chromatography, infrared spectrophotometry, mass spectrophotometry) or even “simple” breath alcohol testing equipment as “bench operators” who have only superficial understanding of what the instrument really does and how the readout is generated. Bench operators who qualify as expert witnesses are not competent to explain the instrumentation used unless it is established that they received the training and education necessary to impart a thorough understanding of the underlying theories. A. A. Moenssens, “Novel Scientific Evidence in Criminal Cases: Some Words of Caution,” Crim. L. Criminol., 1 (Spring 1993), 1-5.


20. “A criminal defendant must . . . have the hearsay information relied upon by an expert witness. Without such access, effective cross-examination would be impossible.” Although exhibits containing inadmissible hearsay may not be admitted into evidence even though relied upon by an expert in formulating an opinion, the expert may still disclose the hearsay in testifying to the facts and data underlying the opinion, providing such hearsay was disclosed prior to testimony. United States v. Lawson, 653 F.2d 299, 302 (7th Cir. 1981).


24. B. Tanlow, “Expert Witnesses and Prosecutorial Vouching: New Frontiers in Soft Expert Testimony,” Champion, 21 (September-October 1997), 50. “It is unpersuasive counsel for the prosecution to express his or her personal belief or opinion as to the truth or falsity of any testimony or evidentiary guilt of the defendant.” American Bar Association Standards for Criminal Justice, Standard 3-5.8 (b) (3rd ed. 1992).


30. Neither the suppression party nor the prosecution can determine what information is discoverable. People v. Harris, 51 Ill. App. 3d, 415 N.E.2d 1046 (4th Dist. 1980).


99. Berger, "Evidentiary Framework," p. 63. See also, State ex rel. Collins v. Superior Court, 132 Ariz. 180, 609, 544 P. 2d 1266, 1268 (1982); People v. Kelly, 17 Cal. 3d 24, 38, 549 P. 2d 1240, 1249, 130 Cal. Rptr. 144, 153 (1976) (questioning whether the leading proponent of voicereprint evidence could "fairly and impartially . . . assess the position of the scientific community"). McCann v. Superior Court rejected voicereprint evidence because it relied upon the reputations and careers of the experts testifying as to the acceptance of the technique that were "built on their voicereprint work," and therefore they were no longer "disinterested and impartial." People v. Tobey, 401 Mich. 141, 156 257 N.W. 2d 537, 539 (1977).


104. Daubert v. Merrell Dow at 579.


106. Federal Rules affected by Daubert: Rules 16: 62(b)(4); 104(a); 702; 703; 704(a); and 706.

107. Theory test: If a theory cannot be tested, it is not science.

108. Peer review and publication are important components of "good science." After scientists conduct experiments and formulate a scientific theory, they must submit the theory to the scrutiny of the scientific community for review. Laser, "Inconsistent Gatekeeping in Federal Courts," pp. 1379, 1404.


111. The Daubert standard for evaluating scientific evidence is based on reliability, and the Daubert test for relevance is "good science." The reliability prong of scientific evidence consists of (1) testing, (2) peer review and publication, (3) error rate, and (4) "general acceptance" in the scientific community. Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579, 593-595 (1993). In evaluating the second prong, relevance, trial courts must consider whether the particular reasoning or methodology offered can be properly applied to the facts in issue, as determined by "fit." There must be a valid scientific connection and basis to the pertinent inquiry. Daubert, 509 U.S. 579 at 591-592 (1993).

112. "Evidentiary reliability will be based upon scientific validity." Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 n. 9 (1993). The admissibility standard is a two-prong test requiring that (1) the testimony reflect scientific knowledge, constitute good science, and be derived by scientific method; and (2) that the proposed testimony is relevant to the issues and logically advances the proponent's case. Hall v. Baxter Healthcare Corp., 947 F. Supp. 1387 (D. Or. 1996).


115. "The Supreme Court in Daubert instructed trial judges to ensure the reliability of all scientific expert testimony, but it did not specify which expert evidence is 'scientific' and thus subject to Daubert's analysis and scrutiny." "What distinguishes science from other forms of knowledge—is it that makes science scientific." Laser, "Inconsistent Gatekeeping in Federal Courts," pp. 1403, 1403 n. 231.