The Forensic Entomologist as Expert Witness

ROBERT D. HALL

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Introduction

Evidence from medicocriminal entomology can affect investigative or legal proceedings in various ways. Oral and written anecdotes pertaining to insects may be useful as investigators piece together a present or retrospective look at pertinent circumstances. Occasionally, insect evidence may lead to other lines of investigation, which in turn may reveal the truth. Insect-derived data may simply corroborate other real or testimonial evidence. In fact, litigation seldom turns solely on insect evidence. Sometimes it does.

As the medicocriminal entomologist becomes increasingly involved with the judicial system, the procedures governing such involvement become progressively more stringent. For example, the aforementioned anecdotes, verbal comments, or suggestions during the processing of a crime scene may represent informal involvement. However, entomological opinions by written report (usually discoverable by the opposition), affidavit, deposition,
or in-court testimony represent formal procedures ultimately characterized by testimony under oath, where prescribed penalties for perjury attach.

If entomological evidence is to have any impact on the outcome of litigation, it somehow must find its way into the proceedings. In virtually all instances, insect evidence is evaluated by state or federal courts under the general rubric of scientific “expert testimony.” In brief, this means that the entomological data must be analyzed by someone qualified to render an opinion regarding how such evidence fits the facts of the case at hand. Such expert testimony is governed by several Federal Rules of Evidence, or the codification thereof that exist in state jurisdictions (see Giannelli and Imwinkelried 1993).

**Theories of Admissibility**

The guidelines governing whether or not evidence will be admitted—that is, evaluated by the trier of fact (a jury in criminal proceedings)—depend upon several fundamental tests that appear deceptively simple (see Imwinkelried 1992). First, the proffered evidence must be relevant—both logically and legally. Irrelevant evidence is not admissible, because it would not serve to make the trier of fact believe that any certain set of circumstances was more or less likely. Therefore, evidence about the presence of a certain species of butterfly at a crime scene would be considered logically irrelevant if such information had no scientific or other bearing on the analysis of the case. The issue of legal relevance is treated under Federal Rule of Evidence 403, where evidence may be excluded by the trial judge if “its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.” This powerful rule obviously gives the judge wide latitude.

In addition to being relevant, proffered evidence and witnesses must also be competent. Witnesses may be declared incompetent for violation of various procedural rules. As an example, if the court has adopted an exclusionary rule, witnesses must remain outside the courtroom until called. If an expert violates this procedure, he or she may be barred from testifying in that proceeding.

To qualify as competent, witnesses and evidence must not be protected by any of the various common law, statutory, or constitutional privileges (such as spousal privilege, attorney-client privilege, privilege against self-incrimination, and so forth), and evidence must be trustworthy. It is argument over trustworthiness that absorbs the most time when admissibility, or weight of insect evidence, is contested. If it can be shown that evidence is untrustworthy, it follows as a matter of law that it is incompetent, and if incompetent, it should not factor into the trier of fact’s decision-making process. Such a straightforward analysis, however, can lead to emotionally charged argument because the legal terms of art employed can be interpreted as hurtful when perceived as an ad hominem (that is, against a person rather than against the evidence) attack. In fact, most affidavits, pretrial motions to exclude, and oral argument directed toward exclusion of evidence affirmatively use such terminology as the legally proven way to achieve the most direct defense against entomological, and indeed all, expert testimony: by simply keeping it out of the courtroom altogether.

Federal Rule of Evidence 702, followed in federal courts and virtually all states, is entitled “Testimony by Experts.” It is remarkably broad, stating that “if scientific, technical, or
other specialized knowledge will assist the trier of fact to understand the evidence or to
determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience,
training, or education, may testify thereto in the form of an opinion or otherwise.” The
question, then, becomes “Who is an expert?” Whereas educational credentials may not be
important in qualifying a witness whose “expertise” was gained through experience—such
as carpentry or driving a truck—they are critical in the qualifications of an expert in sci-
ence. An expert lacking such credentials may be barred from testifying.

Legal Tests of Admissibility

Whether the analysis is under a federal Daubert* standard or any of the various state stan-
dards typified by Frye,† the same four broad elements seem to shape decisions regard-
ing whether or not scientific, including entomological, evidence will be admitted (Cantor
1994). First, is the “expert” qualified? Second, is the opinion supported by scientific prin-
ciples? Third, is the opinion based on reliable data? Fourth, is the opinion so confusing or
prejudicial that it should be excluded? The first three questions may be restated in another
way, which can be regarded as a three-pronged test for admissibility. Is it (first) good sci-
ence, incorporating (second) reliable data, as applied to the facts of the case at hand, by
(third) a qualified expert? If the answer to any of these is no, a good legal argument can be
made to keep the jury from hearing the evidence.

Good Science

Although the federal and state standards are at variance with each other on minor
points, the issue of whether a field, technique, or procedure constitutes “good science”
is fairly straightforward. Under the Frye general acceptance principle, in order to qual-
ify as good science, the relevant scientific community must have generally accepted
a theory. Publication, peer review, and reliance all are elements to be examined and
weighed when making a decision about whether something constitutes such good sci-
ence. Additional elements under Daubert include evaluation of known error rates, and
any standards or indices of reliability. The latter decision makes the trial judge the
“gatekeeper,” deciding what testimony enters the courtroom. While a judge has argu-
ably more discretion under the latter standard—and many have used it since Daubert
was announced—most scientists, attorneys, and the judiciary seem to understand obvi-
ous differences between documented and accepted science, scientific uncertainty, and
pure speculation.

From a practical standpoint, medicocriminal entomology has enjoyed more than a
century of judicial acceptance in regard to its fundamental scientific principles, including
temperature-dependent insect development, necrophilous ecological behavior patterns,
and the generally predictable succession of decomposer fauna. These have also been well
documented in the scientific literature. It is therefore highly unlikely an assertion that
medicocriminal entomology does not constitute good science per se and thus should be
excluded would prevail in any U.S. jurisdiction today. When entomological evidence is

† Frye v. United States, 293 F. 1013, D.C. Cir. (1923).
important to a case, then the first prong of the three-part admissibility test is essentially unassailable. The same cannot be said for the remaining two.

Qualifications of the Expert

Whether or not an individual is qualified to render an opinion in a case involving medico-criminal entomology depends principally on his or her educational and experiential background. As described in the introduction of this book, the modern trend in U.S. courts is to view postgraduate education in entomology, such as the master of science (MS) or master of arts (MA), or doctoral degrees such as the doctor of philosophy (PhD) or doctor of science (ScD), as the educational minima to qualify an expert. Organizations such as the American Board of Forensic Entomology require that applicants possess an earned (in contrast to honorary) doctoral degree with a major in medical entomology, and this seems to be recognized as reasonable by the judiciary. However, testimony by masters-prepared “experts” is still frequently admitted in many state courts. The progression, however, is inexorable: the expectation that the best-credentialed expert will be best received by the jury militates toward the highest academic degrees. There is, of course, ample precedent for this pattern in expert medical testimony.

In addition to demonstrating educational qualifications, the putative expert, to be considered fully qualified, must also show consistent involvement with research or teaching of forensic entomology. This can be done by exhibiting publication lists of the expert’s scientific papers germane to the subject, and documenting involvement with classroom teaching or workshops. The latter sort of hands-on association is important to show that the expert is involved day to day with the so-called “wet work” in a manner analogous to medical experts in surgery and related clinical areas. The goal here is to identify and eliminate so-called experts who are “book smart” but without actual experience.

Another important aspect of expert qualification is absence of genuine or perceived bias. That is, the jury may perceive, rightly or wrongly, an expert whose record shows testimony only for the defense in criminal cases as biased toward the defense in all cases. Such a pattern is certain to be brought up during cross-examination of qualifications. On the other hand, a record of cases where the testimonial history shows involvement with either prosecution or defense, without regard for the type of entomological evidence, tends to demonstrate a lack of bias.

In practicality today, unless an individual offered as an expert witness in medicocriminal entomology can be shown to be patently unqualified on educational grounds (such as no college degree altogether), or to be unconscionably biased, it is likely he or she will be allowed to testify. This is only one reason why expert testimony on one side must usually be countered by expert testimony on the other, resulting in a predictable “battle of the experts.”

Application of Reliable Data to the Facts

It is therefore the third and last prong of the three-part test, that is, the application of entomological science to the facts of the case, where most arguable points arise and most controversy centers. In addition to presenting as tight and scientifically valid an entomological analysis as possible, another function of the expert witness is to identify weak points in the
opponent’s analysis and educate counsel so that they may be thoroughly attacked. As will be explained later, this involvement does not constitute advocacy. Although the science of medicocriminal entomology per se will be considered “good science” by virtually all courts, application of scientific principles to individual cases can readily be seen as fraught with opportunity for error. Absent measurements or evidence of repeatable and documented phenomena, the expert witness quickly moves from science to guesswork. While a prerogative of the expert is to render an opinion, such an opinion must be supported by good science, and guesswork is speculation—not science. One of the tasks of our adversarial legal system is to identify and attack such speculation, thus exposing shortcomings and showing the trier of fact why it is unreliable and incompetent. Commonly argued weak points in the application of reliable entomological data to the facts of a case include, but are by no means limited to, the following:

**Were the insects or other arthropods identified correctly?** Accurate taxonomic identification is the foundation upon which the remainder of the entomological analysis rests, yet it is seldom challenged. It is obvious that errors here can have a fundamental impact on the validity of any estimates made, because different species of flies, for example, may have different developmental times and different proclivities. If a postmortem interval is calculated on the mistaken assumption that it was species X developing, but it can be shown that it was in fact species Y, it is easy for the jury to conclude that the entomological analysis is flawed. Further, demonstration of such misidentification can be damaging to the credibility of the expert who made the mistake. “Why, you couldn’t identify species Y correctly when it was right in front of you, could you, Doctor?” can be fatal to an entomological analysis on re-cross-examination, in addition to being personally humiliating. To reduce the chances of this sort of attack being successful, prudent medicocriminal entomologists “backstop” identifications by getting second opinions from other specialists before completing analysis of the case. In the future, it is likely that molecular techniques such as polymerase chain reaction or DNA sequencing may be useful as taxonomic “litmus tests” in species identification of forensically important insects, especially hard-to-identify eggs, and larvae. At present, attempts to rear a subsample of specimens to the adult stage, which is most reliably identified, represent a prudent course of action.

**Temperatures from remote sites do not accurately reflect temperatures at the scene.** When temperature-dependent insect development is used to gauge postmortem interval, so-called retrospective weather records usually have to be employed. What this means is that the entomologist or investigator will get weather records from the nearest, or several nearest, weather recording stations for the timeframe in question. Weather conditions are recorded routinely at many sites, but most often at airports, agricultural experiment stations, water treatment facilities, and other municipal facilities. Such data may range from complete hourly temperatures, precipitation, relative humidity, wind speed, and cloud cover, to thearker record of daily maximum and minimum temperatures. The entomologist uses these temperatures, known to have prevailed during the time when the case at hand was transpiring, to estimate the temperatures under which the insect evidence developed. It is immediately apparent to any lay observer that the basic
assumption—that the remote, retrospective temperatures in fact represent what actually prevailed at the crime scene—is tenuous at best.

If the weather recording station was generally proximate—say, within 20 miles or so—to the crime scene, it is reasonable to assume that prevailing conditions were at least similar at the two locations. As one judge remarked, “When it’s hot in Oklahoma City, it’s hot in Stroud [a small town about 60 miles away], and when it’s cold in Oklahoma City, it’s cold in Stroud.” This proposition is generally true when two locations are fairly close together, as long as there is no major difference in elevation, no big geographical feature, such as a mountain range or body of water, separating the two, and the situation under evaluation is out-of-doors. Trivially, everyone has witnessed rain on one side of a street while the other side was sunny, or rapid changes in temperature as a cold front moved through.

The weakness in using remote temperature data is when microclimatic factors introduce unknown but consistent variables. Weather stations are usually designed to measure air temperatures in unshaded sites, with the thermal equipment protected from direct solar radiation. Suppose a body was found hidden in a deep, wooded ravine where midsummer overstory created intense shade? The combination of shade with cool air currents, especially in the evening, might produce a microclimate measurably cooler than the temperatures measured at an airport several miles away. On the other hand, a body found inside a closed car trunk, when the car was parked in direct summer sunlight, might have been exposed to temperatures much higher than those recorded at a remote weather station.

Because temperatures are so important to many entomological analyses, and because in most cases there is no way to escape using retrospective, remote temperature data, it is important to measure concordance, or lack thereof, between the remote site and the crime scene. This can simply involve taking temperatures, hourly or daily maximum-minimums, for about a week at the crime scene, at the same time of year and under conditions identical to those prevailing when the crime occurred, and subsequently co-locating the thermometer with the site producing the retrospective weather data. This technique will determine if the two instruments measure identically, and allow correction if not. Furthermore, it will allow correction of the appropriate thermal units for any consistent microclimatic differences noted between the crime scene and the remote temperature site. Absent such measurements, questions on cross-examination can draw attention to flaws.

Q. Doctor, you used the daily maximum and minimum temperatures from City Airport when you calculated the fly development in this case, is that right?
A. Yes.
Q. How far is City Airport from where the body was found?
A. Twenty miles, more or less.
Q. Well, Doctor, we’ve all experienced situations where the weather was different over a 20-mile distance, right? How do you know they were the same?
A. You’re right about the weather changes, but in this case I’m quite sure that the temperatures were similar.
Q. Did you make any measurements?
A. No.
Q. Did you have any temperature data available to you other than those derived from City Airport, 20 miles from the crime scene?
A. No.

Q. Then you cannot say for sure that the temperatures were identical, can you?
A. No, but…

Q. In fact, you had to guess they were the same, isn’t that correct?
A. Yes.

Maggot Mass May Have Affected the Temperature

A fascinating aspect of studying the thermal development of maggots is that under certain circumstances they can generate heat. Although insects are cold-blooded and generally must develop as a function of ambient temperature, the teeming, writhing mass of maggots that sometimes occurs during decomposition may produce significantly elevated temperatures (Greenberg 1991). These higher temperatures have the effect of shortening the developmental time of the insects themselves in relation to what analysis of ambient temperatures would suggest. Obviously, the occurrence of any maggot mass is important and should be taken into account. Problems arise, however, when there is no evidence that a maggot mass occurred. Absent eye-witness testimony of the existence of fly pupal cases in large numbers (resulting from the maggots in the mass), or in some cases, the disarticulation of skeletal remains in the absence of scavenging animals, conjecture about the effect of maggot mass temperatures may represent speculation. Conversely, failure to account for maggot mass temperatures when one obviously occurred (documented in scene photographs, for instance) also represents error. When actual measurements of maggot mass temperature are absent, such “refinement” of ambient thermal data generally involves some amount of guesswork. The proper way to reflect this uncertainty is to present conclusions describing a range, rather than a discrete number.

Accumulated Degree-Hours May Give the Impression of Precision without Substance

The thermal units necessary for well-known necrophilous flies to progress through their various life stages have been recorded in various data sets. The theory of application is simple: if one knows how many so-called thermal units were available at a crime scene, and also knows the thermal units necessary for a given species of fly to develop from the stage deposited by the female (generally egg or first-instar larva) to the stage collected, by putting the two together, one can infer that the decedent must have been dead for at least that period of time. This interval is termed the minimum postmortem interval, or minimum PMI.

The climatological theory of accumulating degree-hours or degree-days is widely accepted in both agricultural science and heating and cooling engineering, and is readily applied to insect development. In brief, it involves cumulative additions of temperatures (as either degrees Celsius or Fahrenheit) on an hourly or daily basis (see Chapter 9). The attractiveness of such an approach is that it can be quite precise if applied correctly. From the standpoint of litigation, it typically appears to be quite precise when presented to a jury. Some entomologists count only those thermal units over a base of, for example, 6 or 10°C,
depending on the fly species involved. Accumulated degree-hours (ADH) are calculated appropriately only from hourly temperature data. Daily maximum and minimum temperatures can be used to calculate a daily average and accumulated degree-days (ADD), but no more. Some analysts have attempted to calculate ADH by multiplying the daily average (calculated from a maximum and minimum temperature) by 24. This calculation is valid only if the daily temperature change from warm in the afternoon to cool in the early morning fluctuates as a sine curve about that average. While this presumption may have some validity when considered over a lengthy time span, it is obviously problematic over shorter times, such as the few days generally considered in most crime analyses. It is, of course, possible for temperature to “dwell” more on the hot or cool side of a daily average, and this cannot be calculated when only maximum and minimum temperatures are analyzed. Misuse of the ADH developmental models thus puts the entomologist at risk of attack.

**Did Other Temperatures Affect Insect Development?**

Bodies exposed outdoors soon become an insect habitat thermally affected by ambient temperature and perhaps by maggot mass. However, complications can arise when bodies, along with the maggots on them, are refrigerated. As temperature falls, maggot development slows. When the temperature is low enough, for example, under 6 to 10°C for many common blow flies, development—for all practical purposes—ceases. Therefore, prolonged periods in air-conditioned ambulances, morgues, and so forth can have major effects on thermal calculations. Whereas body temperature drops in fairly predictable fashion shortly following death, when actual temperature measurements (which constitute recommended procedure) are absent, there is no way to know for sure how rapidly a corpse’s temperature dropped. In some cases, engineers have calculated cooling curves applied to this question on an a posteriori basis, but they remain vulnerable to criticism for possible inaccuracy.

**When Did the Insects Arrive at the Decedent? When Did They Lay Their Eggs or Larvae?**

The most often asked question in relation to medicocriminal entomology is: “How long does it take for flies to arrive at a corpse?” The typical answer is: “Within minutes.” This seemingly incredible ability of necrophilous flies has been documented repeatedly over many years and constitutes a repeatable phenomenon widely accepted by forensic entomologists.

The problem is that when this observation is applied to the facts of a particular case, the assumptions necessary may not be met. Three assumptions are required to support the assertion that flies will arrive “within minutes.” First, it must be the season of the year when flies are active. To assume that flies will arrive within minutes at a decedent during wintertime depends upon the climatic conditions prevailing at the moment. Cold weather hinders and finally stops fly activity. Second, it must be during daylight hours. Necrophilous flies are generally inactive nocturnally, and so the arrival “within minutes” must usually occur during daylight. Third, the flies must have ready access to the corpse.

The repeated observations regarding prompt arrival of necrophilous flies have inevitably been made when the corpse or surrogate was exposed in open air to fly activity. Thus, a decedent lying on the ground surface, such as on the side of a rural road or in a city park, would meet this criterion. The basic assumption regarding the out-of-doors decedent is
that there are “no barriers” to fly access and “no barriers” to dispersal of the decomposition odors recognized as an attractant by the flies. At the other extreme, it is easy to conceive of a decedent, otherwise highly attractive to necrophilous flies, that would never exhibit any fly activity at all. A body sealed within a closed casket, zipped inside a tight body bag, or stuffed inside a tightly sealed automobile trunk would qualify. This is one of the reasons why dismembered bodies wrapped in plastic garbage bags often prove refractory to successful entomological analysis. Frozen bodies constitute a similar problem.

Between the two extremes, one of complete exposure and the other of complete protection, lies an infinite number of gradations in accessibility of flies to corpses. What about corpses inside houses with doors and windows closed? With a window open? What about corpses wrapped in various numbers of blankets? Waffle-weave blankets versus thick wool blankets? It will quickly be seen that evidence of any major “barrier” to fly access is liable to introduce insurmountable uncertainty to estimates made therefrom. In many such cases, estimates about when flies actually accessed decedents represent nothing more than guesswork, although some experiments have been conducted (Goff 1992).

Further, access to corpses by flies does not necessarily mean that oviposition or larviposition occurred at that time. Given the major assumptions enumerated earlier—season, time of day, and access—it is generally accepted that necrophilous flies make access to and utilization of the corpse for their offspring reasonably contemporaneous. This has not been demonstrated equally convincingly when major barriers come into play. Thus, estimates derived under these circumstances often may be challenged as speculation, as in the following illustration of cross-examination:

Q. Now, the decedents in this case were found inside a closed building, correct?
A. Yes.
Q. The screens were shut, the blinds were down, and the doors were all shut and locked, is that right?
A. Yes.
Q. And your assumption, if I understood you correctly, is that the flies—the ones that laid the eggs producing the maggots you used to estimate the PMI in this case—arrived at the decedents’ within 1 hour after the decedents had died, correct?
A. Yes, that was my conclusion.
Q. Doctor, do you think the decedents in this case had any maggots on them before they were dead?
A. No, that’s very unlikely.
Q. And the crime scene report reflects that the decedents were covered with maggots and flies when they were found, do you remember that?
A. Yes.
Q. So what we know for sure is that the decedents didn’t have any maggots when they died, and they had plenty of maggots when they were found, right?
A. Yes.
Q. Now, Doctor, were you in the house when the flies arrived on the decedents?
A. Of course not.
Q. So you don’t know exactly when the flies actually got there?
A. No.
Q. So your statement that the flies arrived within an hour is really a guess, then, isn’t it?
A. Yes.
When Were the Insect Specimens Actually Preserved?

The theory behind using temperature-dependent insect developmental times to calculate an entomological-based PMI is to “work back” from a known point in the insect’s life history. That is, if the insects collected were mid-stage third instars, as evidenced by gross length, length-to-crop ratio, or other factors, it is possible, by knowing prevailing temperatures, to estimate how long it would have taken the species in question to grow from the stage (egg or larva) deposited to the stage collected. This minimum PMI, as mentioned previously, is the length of time that the decedent in question had to be dead. Infestation of living humans with necrophilous fly maggots (myiasis) is comparatively rare today. Such PMI estimates are routinely analyzed by the entomologist in accordance with time of day, because nocturnal oviposition by necrophilous flies seldom occurs.

The validity of these “had to be dead at least so long” estimates depends upon knowing, as medicocriminal entomologists are fond of saying, when the “clock was stopped” on the insects. That is, when were they actually killed and preserved so that their development terminated? Written records by crime scene investigators or medical examiners to the effect “maggot samples obtained and preserved in 80% alcohol at 0900 hours this date” leave little room for argument. Fluids as exotic as special entomological fixatives or as simple as embalming preservative have a similar effect. Perhaps the best maggot specimens are obtained by dropping them alive into boiling water, which causes them to extend full length and kills them, after which they are moved to preservative. Freezing the samples, although not recommended, will also serve to kill them quickly and preserve them. The common denominator documenting all these techniques is the written record.

Absent specimens killed and preserved at known times, the resulting entomological analysis can be fatally confused. In some cases, investigators retain insect evidence with no attempt to kill or preserve it. As an example, maggots collected into empty plastic 35 mm film containers can continue to develop for variable times afterward, even molting to the next stage. With this sort of evidence, the entomologist can only guess at the time that the insects developed to the stage identified, and this sort of speculation is vulnerable to attack. Similarly, insect evidence retained in paper bags with no preservative may be examined years later. Attempts at speculation that specimens were “crushed” and thus “preserved” at known times, such as when a decedent was moved from the crime scene to autopsy, represent no verifiable phenomena and are rightly attacked in court.

In addition, mistakes are frequently made by misinterpreting the time when the specimens were actually preserved. Bodies may be found but not autopsied until a day or so later. It is an obvious error to calculate the portion of the postmortem interval based on insect activity by using an insect specimen collected and preserved at autopsy, but employing the date the body was found as the starting point for analysis.

How Were the Collections Made? Were These the Oldest Specimens?

From the foregoing, it should be clear that reliable estimation of the minimum PMI from insect evidence is contingent upon several assumptions. First, it must be known when the specimens were preserved, so that one knows when to start to “work backwards” in time. Second, there must be concordance between the temperatures used and those prevailing
at the scene. Finally, the “minimum” PMI represents the time it would have taken the oldest specimens on the body to get to the stage identified. Of course, if a body has 4-day-old insects on it, it is possible for that same body to have younger, say 3-day-old, insects on it also. Because necrophilous flies ovi- or larviposit over a period of time, an accurate estimation of minimum PMI rests upon analysis of the oldest insects associated with the corpse. All else being equal, “oldest” in the context of necrophilous flies generally means “largest.” Thus, the procedure at crime scenes is to collect the largest specimens available. Because this typically is done by personnel other than the medicocriminal entomologist, the latter must usually depend on the skill of the collector as one fundamental assumption in the analysis. Shortcomings may come out during cross-examination.

Q. So, Doctor, you identified the insects in this case as third-instar Phormia regina, is that correct?
A. Yes.
Q. And you used the temperatures available to you to calculate that these maggots were 4 days old, is that right?
A. Yes, 4 days.
Q. And did you base your estimate of how long the decedent had been dead on this 4-day interval?
A. Yes.
Q. Now, Doctor, if the maggots you examined were not the oldest available on the body, then your estimate would be incorrect, would it not?
A. Yes, it would tend to underestimate the PMI.
Q. And you don’t know for sure that the specimens you examined were in fact the oldest available.
A. They were the oldest of the ones I looked at.
Q. My point is, there might have been older ones on the body that were not available to you, isn’t that possible?
A. Well, I’m sure that the investigator who collected them followed proper procedure.
Q. But you didn’t collect the specimens yourself did you, Doctor?
A. No.
Q. In fact, you never actually examined the decedent in this case at all, did you?
A. No.

Another shortcoming in basing analyses on evidence collected by someone else is the appearance of unfamiliarity with the crime scene in question. If possible, it is always best to visit the scene during the acquisition of evidence, and if this is impossible, to view the scene personally before rendering a final opinion. As a last resort, photographs of the scene may be examined, and this has become more convenient with the advent of CD-ROM computer discs containing many image files. A forced admission of having not visited the crime scene can be especially damaging if the opposing expert has done so.

Q. Now, Doctor, have you had a chance to examine the basement where the decedent was found and where Dr. X made the extensive insect collections?
A. I’ve seen some photographs.
Q. Have you been to the house where all this took place?
A. Not personally, no.
Q. So you haven’t seen with your own eyes any of the things we’re talking about here today, have you?
A. No.

Serving as Expert Witness

The medicocriminal entomologist must be prepared to function in the adversarial legal system if his or her analyses are to affect the outcome of litigation. The initial contact may stem from being part of a crime scene investigation team, where the entomologist physically collects insect evidence, documents and analyzes it, or delivers it to someone else for analysis. In other cases, the entomologist may be called to the necropsy and be involved with collection and preservation of specimens. Most frequently, however, the entomologist is contacted at some point during the investigation when it has become apparent that insect evidence is important. In times past, and fortunately becoming less frequent today, the entomologist might not be contacted until insect evidence surfaced during a new trial, often years later.

The rubric of “expert witness” attaches when the attorneys handling either side of a case make an oral or written formal agreement to retain an individual in that capacity. A lawyer would say that the legal theory here “sounds in contract law” because of the actual or implied contractual relationship. This may be either as a testifying or nontestifying expert, the distinction being whether the identity of the expert need be disclosed to the opposing side. Whereas experts anticipated to testify in court must be disclosed, occasionally an expert will be retained in a nontestifying status as a second-opinion backup or to deny his or her services to the opposing side. In any event, the attorneys involved should make the status clear. During initial dialog, the actual work to be performed should be discussed and the rate of compensation, payment schedules, and billing particulars set (Cantor 1997). Expert witnesses can expect reasonable compensation for their services, but exorbitant fees affect credibility. The amount of fees, expenses, and other compensation is fair game during cross-examination, and it is important for the expert to keep in mind that such fees represent compensation for his or her expertise and expenses—not for the testimony itself. It is good practice for the expert to keep stringent records of time spent on a case, usually to a fraction of an hour. “Book” billings should always be avoided, such as “I always charge $1,000 for an opinion in a murder case,” or “I always bill for 3 hours for an insect identification, no matter how long it takes me.” Unless the retaining side represents a governmental or other entity likely good for any amount due, it is prudent for an expert to ask for advance payment sufficient to cover initial expenses. Further, if travel is anticipated, agreement about reimbursable expenses should be reached early in the relationship. As trial nears, the time value of money often makes it expedient to request, for example, that airline tickets be forwarded directly to the expert, or that hotel bookings be billed directly to the retaining party, rather than to depend on reimbursement at some time in the future.

It is unethical for expert witnesses to enter into fee agreements contingent upon the outcome of the case or for a percentage of any settlement. Therefore, an arrangement where “we’ll pay your fee, but only if we win” is forbidden as unconscionably biased, as is an arrangement where the retaining side says, “We’ll pay you 20% of whatever damages we recover.” Such arrangements put lawyers in jeopardy of disciplinary action. No ethical attorney will suggest such a fee arrangement, and no expert witness should accept one.
From a purely practical standpoint, such agreements are considered void as against public policy; thus, they are unenforceable and an aggrieved expert will have no legal remedy.

Experts Are Not Advocates

Perhaps no other line becomes blurred so easily as that between detached, scientific expert and biased advocate for one side or the other. The function of the expert is to assist the trier of fact in understanding the circumstances of the case, and this cannot be done except in a neutral and detached capacity. This is one rationale for the court-appointed expert, but in U.S. courts litigants have the right to retain experts of their own choosing. The public perception of “hired gun” expert witnesses who will say anything if the price is right has some basis in reality, although by far the majority of scientific experts do their best to present unbiased reports and testimony.

When contacted initially by law enforcement authorities, the prosecuting attorney, or defense counsel, the responsibility of the medicocriminal entomology expert is to gather available information, perform an entomological analysis, and apply the analysis to the facts of the case as they are known—“take it or leave it.” The same can be said for civil matters. Whether or not the expert’s analysis supports the plaintiff’s or defense’s position should be immaterial in the analysis itself. Whether it is scientifically valid is everything. Most cases are settled before trial, and the support of experts, or the lack of such support, is often critical in decisions to settle. When performing this initial analysis, it is probably best for the expert to know only the minimum necessary about unrelated facts of the case, so that potential sources of bias can be avoided. At this point, if the entomological analysis runs counter to the case being made by counsel, the expert can be compensated for time spent with no further involvement anticipated. Alternatively, the expert may be put “on hold” as a nontestifying witness. In either event, the information generated by the expert to that point might be protected under various confidentiality doctrines. Therefore, the expert should not discuss the case with outside parties until it has been resolved. In particular, experts should not discuss a case in the presence of an opposing expert except during formal proceedings with counsel present.

The danger lurking in the background here is twofold: one is that the expert witness will tend to identify excessively with the particulars of the case as they favor his side, and the other is that prospective remuneration will be enough to sway objectivity. Probably analogous to the psychological identification of prisoners with their captors, it is not unusual to see scientific experts adopt biases as they increasingly identify with “their side” in a case. Highly insidious, such bias is unethical and prejudicial to fair resolution of controversies. As an example, an entomologist routinely contacted by law enforcement agencies may begin to adopt the “us or them” attitude frequently a product of street survival. “Help us put this dirtbag behind bars, where we know he belongs” may be enough to induce an impressionable expert to stretch his analysis to fit a theory that will do just that. Similarly, it is a rare defense team unable to make the compassionate statement, “There’s just no way that this guy could have done that crime. We’re sure of that—all we have to do is prove it.” Under this type of pressure, skewed analyses may result and thus negate the theory behind admissibility of entomological, and indeed all expert, testimony: that it will lead to discovery of the truth.

Under the ethical codes of virtually every scientific society, including the American Academy of Forensic Sciences and the Board Certified Entomologist category of the
Entomological Society of America, slanting or skewing analyses to favor one side or the other, without a valid scientific reason, is actionable. On the other hand, the expert will be expected to educate those responsible for retaining him or her in regard to weak points in the opposition’s case. As will be amplified later, this requires walking a fine line between advocacy and education. If the expert remembers that his or her job is to perform an unbiased analysis and apply it to the facts of the case, and that it is the job of counsel to present that application in the light most favorable to one side or the other, things generally will go smoothly.

Occasionally, an expert witness may be retained in the capacity of consultant. In this instance, there should be no expectation of actual testimony. The job of the consultant is to assist counsel in putting together the best possible case. An expert functioning as a consultant may properly be regarded as an advocate, and bias in such cases is not problematical because the expert will not testify or give sworn statements in the proceedings.

The Entomology Expert and Formal Legal Proceedings

As the entomologist deploys his scientific expertise toward the resolution of a litigated controversy, there are three principal ways in which such expert opinion can be documented. These include the filing of an affidavit, the giving of a deposition, and courtroom testimony. The common denominator is that all constitute sworn statements. In addition to the expectation of intellectual honesty (which of course pervades day-to-day activities in science and scholarship), penalties for perjury attach.

Affidavit

An affidavit is a written, voluntary declaration of fact or opinion made before one authorized to administer an oath. Most entomology experts become associated with affidavits as they are used in support of pretrial motions. Typically, discussion between the expert and attorneys results in some consensus regarding the “fit” between the expert’s opinion and the fact pattern of the case. When the expert’s opinion can be used to support any of the many pretrial motions possible in legal proceedings, he or she may be asked to sign a notarized affidavit, which then accompanies the motion. In essence, the expert’s opinion is used as testimony in support of the motion. Perhaps the example most common in medicocriminal entomology is the pretrial motion to exclude expert testimony. The sequence of events usually takes the following pattern. If one side or the other proposes to use entomology evidence in support of their case, that intent plus evidence accumulated and analyzed to that point must be disclosed. This disclosure may involve the name of the entomologist, any reports he or she has filed, and an accounting of the entomological evidence, such as specimens and weather data.

Upon such disclosure, the opposing side has the opportunity to respond to such evidence, and often does so by retaining a separate expert to review it. If the latter expert’s analysis points out flaws or deficiencies in the entomological analysis, then a motion to exclude can be made under the legal standard appropriate in that jurisdiction. The attorneys making the motion to exclude will draft it. What often comes as a surprise to the entomologist is that they will also draft an affidavit (a voluntary, written statement of facts made under oath) for his or her signature. This procedure is efficient in several ways, because the affidavit will reflect the entomological results and conclusions as they have been discussed...
between the expert and the attorneys and will be in the proper format. Most entomologists have no background in preparation of affidavits.

However, entomologists should be keenly aware that the affidavit they are asked to sign becomes their own statement. It will be drafted by the attorneys to give the best support to the motion, and will typically contain legal terms of art. As mentioned previously, such terms are included solely to achieve a desired legal result. The entomologist should read the affidavit carefully before signing it, to ensure that it presents a scientific analysis he or she can support in good conscience. If there are misstatements or other problems, the affidavit should be edited and revised so that the entomologist—the one “making” the statement—is completely in agreement with it. Once notarized and filed, affidavits become part of the official record and may be used to impeach the affiant in the present or future proceedings.

Q. Doctor, you have testified just now on direct examination that in your opinion it is impossible to perform an entomological analysis solely from photographic evidence, is that correct?
A. Yes.
Q. And that is your expert opinion in this case?
A. Yes, it is.
Q. I have here your affidavit filed in the case of State v. Smith. Do you remember that case, Doctor?
A. Well, I think that’s been several years ago.
Q. Paragraph 4 of this affidavit, which you signed under oath, Doctor, reads as follows, “My conclusion from examination of the crime scene photographs, which were all the entomology evidence available, is that the insects present were probably migrating third-instar black blow flies.” Do you remember that assertion?
A. Yes.
Q. So your conclusion in State v. Smith was in fact based solely on photographic evidence, wasn’t it?
A. Yes.
Q. And that’s directly counter to what you’ve just said in this courtroom, isn’t it?
A. Yes.

Depositions

There is considerable misunderstanding surrounding depositions and the entire associated process by those outside the legal system. Current federal rules actually limit the number of depositions in civil cases. A deposition is testimony—out of court, to be sure, but under oath—in response to questions posed, most often, by attorneys for the opposing side. It is part of the carefully regulated exchange of information called discovery. A deposition may be taken in the attorney’s office, but more often is conducted in the expert’s office or conference room. An authorized court reporter will administer the oath and will record the deposition word for word for transcription. The expert, as deponent, has the right to read and correct the transcription before affixing his notarized signature. Occasionally, a deposition is so straightforward that review is waived. Videotaping of depositions is becoming increasingly popular and places an additional burden on the deponent—that of a visual, in addition to a written, record.

A deposition by a medicocriminal entomologist typically focuses on the entomology report and conclusions. At the beginning, prefatory remarks usually include a statement
and spelling of the expert’s name, introduction of the attorney who will be asking the questions, and a reminder that clarification of questions may be sought and that responses must be verbal (court reporters cannot record grunts, nods, or shakes of the head).

Because the questioning attorney will generally have studied the entomology report and the expert’s curriculum vitae, the trend of medicocriminal entomology depositions is fairly predictable. They usually begin with background questions in regard to the expert’s academic qualifications and performance history. This may be glossed over, or may become the subject of in-depth questioning. In some cases, questions may be asked about the particulars of every scientific article the expert has published. It is thus important to be well prepared.

Sooner or later, though, questioning will turn to the entomology report and the application of entomological science to the facts of the case. Because responses on deposition can be used to impeach subsequent in-court testimony, the deponent must take care to provide accurate and supportable responses to questions asked. Although the expert will often be allowed to provide a discourse (narrative) on a particular topic, it is good advice to limit one’s responses to the best and most straightforward answer to the question asked. The more one rambles on, the greater chance that such information will be inconsistent with later statements. Although minor inconsistencies and fine points may be clearly understood as such by fellow entomologists, they may be perceived by the jury as undermining the expert’s credibility.

Most depositions are straightforward, although they may be lengthy. If a break is needed, simply make a request. One major difference between depositions and courtroom testimony is that no judge is present. Therefore, objections cannot be ruled upon at the moment. Still, if the questioning attorney asks an objectionable question, the attorney representing the side retaining the expert (a critical point is that he or she does not represent the expert) may register an objection, saying “subject to that, you can answer.” The effect of this give-and-take is that much information usually comes out during a deposition, and each bit can be fairly brought up during future testimony, where objections may have to be argued, or where it may be inconsistent with responses offered at that time.

Depositions may or may not be done under subpoena. A subpoena, especially a subpoena duces tecum, commands a party to appear in court or for deposition at a certain date and time, and to bring relevant documents. This court order must be obeyed, or contempt sanctions may result. Most expert witnesses are willing to have depositions scheduled without compulsion, and the subpoena is often dispensed with. If this is the case, it is wise to ensure that payment for time and expenses will be forthcoming despite the lack of a subpoena. In some cases, an expert may be compelled to testify under subpoena with only the statutory compensation for travel expenses and appearance in court. This situation is far from ideal and is comparatively rare, but it underscores the wisdom of arriving at written expert fee and compensation agreements early in the relationship. The party requesting the deposition, either the prosecution or defense in criminal matters, is responsible for paying for the deponent’s time and travel expenses, if any. Needless to say, they are also responsible for the transcription fee, which is often greater than the expert’s charges.

In addition, the attorney with whom the expert is associated should examine all documents the expert expects to bring to the deposition. Often, this is not done and can constitute a major mistake. Such documents are discoverable, and stray notes, memoranda, and correspondence may contain statements or information adverse to one’s party. Inadvertently bringing harmful documents may constitute negligence. The best procedure is to avoid
creating these in the first place; thus, the expert should give much thought before making any notes, memoranda, letters, reports, or other written materials.

**Courtroom Testimony**

When entomological evidence is going to be argued in court, whether at trial or in relation to pretrial motions, the expert witness will generally be needed on the stand. As with affidavits and depositions, courtroom testimony is under oath. Also similar to other statements under oath, trial transcripts are historical documents available to future litigants. What this means in practice is that testimony from one trial can be used to impeach a witness in a second proceeding. Therefore, the expert should be aware of and avoid inconsistent statements, and if these become necessary, for instance, because of new scientific knowledge, the expert should be prepared to explain inconsistencies.

Good preparation is fundamental to success in litigation, and expert testimony is no exception. Prior to trial, the expert should review all reports, notes, and associated documents relevant to analysis of the case. Further, there should be a pretestimony meeting between the expert and the attorney who will be representing the side for which the expert is testifying. A trial lawyer’s maxim is “never ask a question when you don’t know what the answer will be.” This applies to expert testimony and represents good preparation and rehearsal. It does not constitute advocacy for the expert to review the salient scientific aspects of his or her analysis and alert the attorney as to which points need to be made, and to go through a question-and-answer session to ensure that both are in accord. Similar to depositions, all documents that the expert expects to bring into court should be screened beforehand. Like the situation with depositions, a subpoena may or may not be issued by the court; if one is issued, absent an agreement to the contrary with appropriate counsel, the expert is entitled only to the statutory compensation for his or her appearance.

On the day of courtroom testimony, the expert should arrive with sufficient lead time for a final session with counsel, if required. Sometimes, an expert can request to be put “on call” so that it is not necessary to wait at the courthouse. If an exclusionary rule is in effect, it will be necessary to wait outside the courtroom (in a hallway, or in a witness room) until called. This time can be used for final review of relevant documents. If the exclusionary rule has been waived, the expert may and should listen to the testimony of opposing experts. If in doubt, consult with the appropriate attorney.

While an expert witness need not adopt the formal attire of trial lawyers, he or she should present a professional appearance. This means, at a minimum, coat and tie for men and its equivalent for women. Remember that expert testimony is valueless unless it affects the decision-making process of the trier of fact. The goal is for the jury to believe the scientific opinion of the expert. Therefore, inappropriate attire or mannerisms can have an adverse effect by causing the jury to reject the expert and his or her theories. In extreme circumstances, attorneys may request a recess and have a clerk or paralegal purchase a change of clothing for an expert—to be paid for from the fee owed.

While on the witness stand, the expert should strive to maintain composure even under pressure. Anger, argumentative responses, and annoying mannerisms are usually counterproductive. The best results are obtained by assuming a relaxed but alert attitude and making eye contact with the questioning attorney, judge, or jury as appropriate. It is especially important that the expert not “look to” the attorney with whom he or she has been working for support when difficult questions are asked on cross-examination.
The initial questioning of the expert in court is called direct examination and is done by the attorney representing the party calling the expert. This critical period is relatively friendly, because it consists of the attorney and expert who recently rehearsed precisely for this occasion. The initial portion of the question-and-answer period will be devoted to the expert’s qualifications, in order to convince the trial judge to admit the testimony under the appropriate rules of evidence pertaining to such expert witnesses. In the case of medicocriminal entomologists, the focus will be on academic preparation and degrees, academic appointments and other professional positions, and research contributions, including papers published, students advised, and grants awarded. It is important to document qualifications in the field of forensic entomology—the fact that one is an expert in another entomological field, control of insect pests on corn, for example, is irrelevant when seeking qualification as a medicocriminal entomologist. A medicocriminal entomologist with experience testifying as an expert witness can effectively point out his or her academic and professional background in narrative form. If one is not so experienced, it is best to allow the attorney to take the lead by asking pertinent questions. In either event, it is important to ensure that the judge and jury understand the full impact of the expert’s credentials. Whereas misrepresentation of one’s credentials, by affirmative misstatement or by omission, is an ethical violation and not tolerated, this is no time to be modest about one’s honestly earned background. The issue here is believability, and the expert the jury considers best qualified is often the one believed. Thus, one’s professional title should be stated and all academic degrees, along with the institution where each was earned. After that, a coherent presentation covering professional stature, number and type of publications, major grants or endowments, membership in professional and scientific societies, and significant honors should be provided by narrative or questioning. In particular, the manner in which the expert’s background makes him or her uniquely qualified to enlighten the jury should be emphasized. Frequently, opposing counsel will attempt the old ploy of stipulating to the expert’s credentials. The purpose of this tactic is to cut short the litany so the jury will not hear it. Inevitably, the attorney seeking to qualify the expert will request permission to proceed—to preserve the matter on the record—and this is typically granted.

After the expert has been qualified by the court, the next function of the direct examination is to present the expert’s theory of the case to the jury. This will usually start with the expert’s written report, which has earlier been disclosed. As in the qualification phase, the expert may proceed by testifying in narrative form, or in direct response to questions from counsel. Typically, direct examination consists of responses elicited by nonleading direct questioning, and therefore, in some instances, opposing counsel may object to narrative testimony. If this objection is sustained, it constitutes a major reason for adequate preparation between the expert and associated counsel. The goal is for the expert to be able to teach the jury and instruct them why his or her theory of the case is correct and should be believed. Two points become important here. One is that the expert may refresh his or her memory by referring to a wide range of materials. Because accuracy is critical to expert testimony, it is not a sign of weakness to ask permission to refer to notes, documents, or other written sources to ensure that testimony is factually correct. The second point is that responses during direct examination impact the scope of cross-examination, in that the latter phase is a derivative of those questions answered during direct examination.

As the expert testifies in narrative form or in response to questions, it is important to include the jury in the discussion by eye contact. It is not necessary to look at the jury to
the exclusion of everyone else in the courtroom—indeed, this would appear awkward—but a relaxed demeanor in which the expert looks at counsel when questions are asked and at the jury as they are answered is often effective. Within the strictures of good science and ethical limits, the expert should appear positive and forthright, and able to explain the biological variability limiting the precision of his or her answer.

Another often fatal error of scientific experts is to infuse their responses with excessive technical jargon. It is a mistake to assume that reliance on mystical-sounding terminology will be taken by the jury to represent education or wisdom. In fact, often the opposite occurs. If an expert confuses responses with arcane jargon, thinking that it sounds technical, and that the jury will believe that someone who knows so many technical terms must also know the correct analysis of the case, a fundamental mistake has been committed. While the use of some jargon or technical language may be unavoidable, it is best to couch answers in terminology that anyone can understand. Remember that the job of the expert is to educate the trier of fact, and it is impossible to provide doctoral-level education in an hour or even many hours on the stand. Usually, exactly the opposite results: the jury becomes bored with the testimony and simply ignores it. Therefore, the key is to use clear language while avoiding “talking down” to the jury. This sort of presentation involves craftsmanship and can be learned with practice.

Q. Now, Doctor, can you tell us what your entomological analysis of this case was?
A. Yes, the climatological data were applied retrospectively to the thermal developmental profile for putatively late but premigratory third-instar Phormia regina collected in this instance by the medical examiner at necropsy. At least 3,472 accumulated degree-hours are required for this species to enter the prepupa; thus, I calculated that.

Whereas this response would be intelligible to another medicocriminal entomologist, it is one only an entomology graduate student could love. Unless much time is taken to define each term and make it understandable, the jury will fail to learn much, if anything, from it. Without talking down to the jury, a better response might be as follows:

A. The insects tell us a good bit about how long Mr. Smith had been dead. I identified the flies found on his body and their stage of development. I also checked the temperatures for that time from Central City Airport and performed a short test that showed it was valid to use them. Knowing that flies grow up at different rates, depending on how warm it is, the insect evidence here tells me that Mr. Smith had to have been dead for at least 4 days when he was found.

If use of scientific terminology is unavoidable, such as when discussing the various species of flies, it may be useful to prepare a list of arcane terms to hand to the court reporter before testifying. This will at least ensure that the terms are spelled correctly in the trial transcript. Although the fine points of the analysis, such as latinized names of species, use of thermal data like ADH, and so forth, will surely be argued on cross-examination, the effect of simple initial responses is for the entomologist to transmit their result to the jury in a fashion they will understand and remember.

It has been well documented that retention and learning improve with visual, in addition to auditory, input. Therefore, many experts enjoy success with well-designed courtroom presentations, which fall under the category of *demonstrative*, rather than
testimonial, evidence. These may be as simple as chalkboards or flip charts, as straightforward as slide presentations from a projector or television, or as sophisticated as preserved or living exhibits, computer imagery, or videotapes. Although possibly smacking a bit of theater, there is no question that thoughtful visual aids are very effective in getting the expert’s point across. Often, they can be left in place after the expert testifies, and thus serve to remind and reeducate the jury as the proceedings continue. Because these sorts of aids or exhibits must be disclosed before they will be permitted in the court, be sure to advise counsel of what you intend to present. Do not wait until trial, or opposing counsel will likely object to the surprise and will probably be successful in keeping such demonstrative evidence out of court. This can be especially damaging if the expert is building a critical presentation around the visuals.

At the conclusion of the direct examination, opposing counsel is given the opportunity to cross-examine the expert witness. A principal difference between the form of questions on direct versus cross-examination is that the latter may be leading; that is, the question itself may suggest the answer. The expert must be especially alert during cross-examination, because an experienced opposing attorney will have identified all possible inconsistencies arising as a result of the direct examination, affidavits, depositions, or former testimony. These inconsistencies may then be pointed out to the jury and serve to impeach (to make less credible) the expert’s opinion. Experts should pay particular attention to the following points because cross-examination is such a critical phase of testimony.

Listen carefully to the question asked. If the question is not clear, ask for clarification. It is good practice to develop a habit of pausing deliberately before responding to any question on cross-examination, in order to give counsel on your side time to recognize and register an objection. Generally, if the question is unclear, poorly phrased, argumentative, or exhibits similar defects, counsel will register a timely objection. If the question is not legally objectionable but is unclear scientifically, it is appropriate to request restatement or clarification.

Q. So, as I understand it, it is your opinion that the insect larvae in this case support a PMI estimate of four days, is that right?
A. I’m sorry, there were three insect species involved: two species on one decedent and one species on the other. I am not sure which species you mean.
Q. I’m talking about the species that was found on Mr. Jones. I think that decedent had only one kind of fly maggot on him.

On cross-examination, an experienced expert will respond as truthfully and briefly as possible to the questions asked. While it may be tempting to offer additional explanation, it is best to refrain from doing so. The opportunity may seem particularly tempting when a well-phrased question has apparently exposed some weakness in the expert’s response. The best way to handle this is to permit the attorney representing the side retaining the expert to rehabilitate the expert on re-direct examination. Of course, a re-direct may be followed by re-cross-examination, but the number of iterations of these decreases rapidly as the scope of possible questions narrows.

It is imperative that the expert retains his or her composure during cross-examination. This may be difficult to do when the questions posed constitute a direct attack on the expert’s credentials, scope of practice, and professional competence. Answers given in anger are often regretted. Resist the temptation to “match wits” with the attorney asking the questions, and remember that the courtroom is his or her professional habitat. Making
a witness angry is only one of many strategies employed by trial lawyers. An experienced attorney will never try to match an expert one on one when arguing the fine points of entomological science. Similarly, an expert who tries to “outsmart” the attorney in the courtroom is generally doomed to failure.

**Q. Doctor, the data you used to analyze this case were generated at the “Body Farm” in Tennessee, weren’t they?**

**A. I see what you’re getting at. There’s no proof that data from the Body Farm reflect faunal enrichment or are otherwise unreliable.**

**Q. Doctor, did I ask you about faunal enrichment?**

**A. No.**

**Q. Did I ask whether or not such data were unreliable?**

**A. No.**

**Q. Well, would you please simply respond to the questions that I ask?**

In this manner, the attorney has made it clear to the jury who is in charge during the cross-examination. The expert in this example has not educated the jury; worse, his or her esteem has been lessened because the jury will perceive that he or she “lost” this confrontation.

Another way in which expert witnesses get into difficulty is by venturing outside their discipline. What this means is that experts must be highly cognizant of the boundaries demarcating their scientific specialty. The medicocriminal entomologist is an arthropod expert qualified to render an opinion about the identity of insects and related species, their biology, including reproductive behavior, successional occurrence in relation to geography, season and time of day, rate of development, and so forth. The entomologist may be extremely familiar with closely allied fields, such as forensic pathology, but must be sensitive to questions that call for an opinion outside the area of qualification.

**Q. Doctor, may I refer you to the photograph marked “State’s Exhibit 43,” which you have previously testified depicts third-instar larvae of the black blow fly?**

**A. Yes, I have that photograph.**

**Q. If you will examine the decedent’s forehead in the photo. Can you see the forehead, Doctor?**

**A. Yes, I can see it.**

**Q. What appear to me to be fly maggots are depicted crawling around a hole in the forehead, are they not?**

**A. I see them around a hole, yes.**

**Q. Doctor, does that hole appear to have been made by a 9 mm bullet?**

**A. I don’t know. I’m not an expert in regard to bullet holes.**

Venturing outside one’s area of expertise can be tempting, especially during heady moments on the witness stand. Be assured that experienced trial attorneys will know this and may lead into it simply to “dull” the expert’s luster and erode his or her credibility with the jury.

An important role of the expert witness, as emphasized previously, is to educate the attorneys involved so that they can elicit the truth during the direct and cross-examinations for which they are responsible. This role can become especially interesting if the exclusionary rule is waived. Then, the opposing experts are present in the courtroom during testimony and are expected to provide expert insight into the responses provided. In
some cases, the expert will sit at the appropriate counsel’s table and take notes as his or her counterexpert undergoes direct or cross-examination. While this appears close to advocacy (it certainly has all the visual trappings of it), it is important to remember that the expert’s role continues to be one of education. That is, the expert is used to alert the appropriate counsel to inaccurate statements of fact, misrepresentations, subtly artful responses, and so forth. This allows clarification on re-direct or re-cross examinations. As might be expected, the plainly adversarial nature of such participation can elicit hard feelings and misunderstandings between experts. If this happens, it is a good idea to deal with it immediately so that interpersonal bad feelings do not become a major issue. In fields such as medicocriminal entomology, where there are relatively few experts, long-term associations with colleagues work best on a positive, rather than negative, note.

**Malpractice**

An area seldom considered by expert witnesses is malpractice liability. Whereas the attorneys involved in a case are invariably well insured, most experts are not. While it is true that certain immunities attach to testimony under oath, such as immunity from slander and similar charges, many vulnerable areas remain. The theory most commonly applied to malpractice of expert witnesses is common law *negligence*, which is a tort. In order to establish a negligence cause of action, the plaintiff must prove the existence of a duty, breach of such duty, cause-in-fact and proximate cause, and damages. Often, these elements are not difficult to establish in malpractice cases.

The agreement in contract between the expert and the side employing him or her establishes duties owed, and the expert’s appearance in court is evidence of awareness. The issue of causation is also straightforward: whether or not the expert’s actions caused the loss of a criminal case or civil lawsuit, for instance, and whether or not it was reasonably foreseeable that such a result would occur. The issue of damages is often easily determined, in that criminal penalties or civil monetary awards are clear. Most argument centers on whether or not the expert in fact breached his or her duty to the side retaining him.

Common mistakes by expert witnesses that can be considered breach of duty and thus incur malpractice liability include factual misstatements or errors, breaches of confidentiality, and inadvertent disclosure of documents. The expert should thus take care to ensure that all testimony is factually accurate. The truth is a powerful defense against malpractice. Further, the expert should not discuss an ongoing case outside the courtroom with anyone other than counsel for the side retaining him. Narrow exceptions exist for personnel coming under the umbrella of the confidentiality doctrine, such as technicians and other employees of the expert. Expectations of confidentiality extend to these personnel, and any breaches may be actionable against them or against the expert himself or herself under the theory of *respondeat superior*. As stated earlier, negligent disclosure of damaging documents may be considered malpractice. In addition to following good practice, the prudent medicocriminal entomologist will carry adequate malpractice insurance and may seek legal advice regarding methods to limit potential exposure by skillful use of certain business organizations.
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