Bad Science

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Forensic science is the product of an uneasy and unholy mating of Science, the objective seeker of truth and knowledge, and Forensics, the argumentative persuader of courtroom advocacy. It is not called Justice Science, Law Science, or Truth Science, as many of us would like to imagine. We are a bastard child, an orphan, but still the subject of an intense child custody battle between our estranged parents, the truth seeker and the advocate. The tug-of-war goes on daily for our loyalties and confidences, each side offering candy and warm hugs. These separated parents have visitation rights. Sometimes they take our brothers and sisters away. Sometimes they don't come back.

We in forensic science like to think of ourselves as our mother's child--Mother Science, pure and incorruptible--and most of us start out this way. Some of us remain pure. Some grow up to be delinquents. The advocacy half of forensic science will not go away; it has weekday visitation rights and the power-of-subpoena. It has advocate friends called prosecutors, attorneys, cops, the press, and the Government. The advocates rarely understand the appeal of Mother Science, cannot fathom a search for truth in a game plan which calls for scores and trophies. They are constantly trying to persuade us to see it their way, to compromise, to bend just a little. They don't realize it, but what the advocates are asking for is Bad Science.

The pressure to be a Bad Scientist, to fit in and go along, is great, and it doesn't go away unless you put your foot down and say Enough Is Enough! And keep saying it to each supervisor, each detective, and each fair-haired boy from the prosecutor's office. Bad Science is what forensic science becomes when an attorney or prosecutor, who often display all the ethics of a full-grown hamster, get a forensic scientist to play ball, to get with their program and see their big picture. There is an old Bad Science joke about a scientist who was working with an ant. The scientist would cut off one of the ant's legs and shout, "Jump!" And the ant would jump. The scientist cut off a second leg, told the ant to jump, and again the ant jumped. And so it went, until the scientist had cut off all six of the ant's legs. This time, when told to jump, the ant did not jump. This proves it, the scientist concluded: when you chop all the legs off an ant, the ant goes deaf!

You may recognize some scenes from the following examples of Bad Science at Work. Some are laughable, others disturbing. Some simply haven't happened to you yet. I have not personally encountered all of these situations, but I know that each is true. If you haven't witnessed at least some of them, you will. If this helps you steel yourself against the onslaught of the Advocates, so be it. Finally, not all Advocates are malicious. Many, in fact, are simply not versed in the ways of good scientific method. When they ask for Bad Science, you can pity them as helpless people doing the wrong thing for the right reason. This type of Advocate needs to be taught . . . and watched.

Misinterpretation of Test Results

In a robbery case the victim, a bartender, testifies that the defendant had come into the tavern earlier in the night for a glass of beer. Three unwashed glasses were found at the scene and were processed for latent prints. Two of the glasses yielded prints, but these were of persons unknown, not the defendant. The prosecutor suggests that the print examiner testify that the third beer glass must have been used and then wiped clean by the defendant, because the other two glasses were obviously not his. The print examiner suggests that the prosecutor look elsewhere for this kind of testimony. The prosecutor looks surprised.

Manipulation of Raw Data

An accident reconstruction expert with a computer is hired by a plaintiff's attorney to determine the speed of the defendant's vehicle in a two-car collision. The expert enters into his computer program the road surface drag factor, skid and yaw mark lengths, and the location and severity values of the vehicle damage. The first run of his computer program produces an unrealistically high speed for the defendant's striking vehicle. The expert changes his drag factor estimate and tries again. The figures are still outrageous. Three program runs and several crush data changes later, the speed determination begins to look more believable. The defendant's attorney begins his attack with a subpoena for all five of the expert's computer printouts.

Jeopardy

As in the television game show where contestants reply in the form of a question, certain managers give their subordinates a desired answer and demand that they come up with the appropriate research questions to support it. During one police department's trial period of a 9mm pistol, a police officer wounds an assault suspect. Because the suspect was not instantly incapacitated, the police chief scraps the entire 9mm changeover program. He hears of the FBI's 10mm pistol program. One of the theories he returns with states that, by virtue of its "larger size," the 10mm is much better at striking blood vessels than the smaller 9mm bullet. The department's shooting instructor points out that an extra half-millimeter along on each side of the 10mm bullet's diameter would not really make much difference, unless you missed a blood vessel by half a millimeter with a 9mm bullet. Then the instructor begins his litany about the training budget, that training is at least as important as hardware, but the administrator doesn't hear him, because it's time to play Double Jeopardy with the police chief.

Comparing Apples and Orangutans

In a product liability suit, the plaintiff's attorney finds an expert witness who will testify that, if the shotgun involved in the shooting had as safe a firing mechanism as a rivet gun, the incident may not have happened at all.

Manipulation of Test Results

During a burglary trial, the prosecution produces seven latent prints recovered from inside the victim's house. The fingerprint examiner testifies that he has identified these prints as belonging to the defendant. The prosecutor suggests that the fingerprints are like seven little photographs of the burglar inside the house. Because he does not want a repeat of an earlier case lost to the defense attorney, the prosecutor calls a second examiner to the stand to verify the comparison performed by the first. The prosecutor then states that the seven latent prints, times two print examiners, make for fourteen little photographs of the defendant inside

the crime scene. Later, when jokingly asked why he didn't call a third examiner to up the score to twenty-one fingerprints, the prosecutor replies that he had simply neglected to subpoena another print examiner.

Compulsive Computing

A .223 Remington bullet is found lodged in a house several hundred feet to the rear of a rifle practice range at which .223 weapons are frequently fired. The investigators want to know if it is possible for a .223 bullet to fly the several hundred feet necessary to reach the house, so they ask a firearms examiner. The examiner, who had recently invested in a ballistics program for his home computer, took down the range, wind speed, bullet shape, temperature, barometric pressure, and several other pieces of data. His computer charted the results. Finally, his answer to the investigators was, "Yes, it's possible." As a qualified firearms examiner, he had already known that the house was well within the range of the .223 cartridge and could have given the same answer when first asked the question . . . without computation.

Denial

In many major criminal investigations it is the practice of a detective unit to offer polygraph examinations to the suspects and, in cases of questionable accusations, to the victims. While they are not admissible in court, the polygraph results are relied upon as a valid investigative tool. One day a young police officer shoots and wounds a juvenile who he claims fired at him first, although no weapon is found. The officer claims he was also struck several times about the head and shoulders with a board prior to the shooting, although he exhibits no bruises, head injuries, or defense injuries to his hands or arms. When asked about this lack of consistent injuries, a detective reports that the young officer was wearing a bullet-resistant vest. The detectives do not offer the suspect or the officer a polygraph examination in this particular case.

Ethical Bankruptcy

In a homicide case the prosecution demonstrates a laser reconstruction of a bullet's path through a woman which indicates her husband fired a rifle from his shoulder height. The husband's story is that he was cleaning the weapon while it lay on a tabletop. The defense attorney finds a firearms expert who will claim that, while the weapon was not malfunctioning before the incident, was not malfunctioning when collected from the crime scene, and is not malfunctioning now at the time of trial, it may have suddenly malfunctioned and fired all by itself as a result of a buildup of dirt and powder within the weapon's mechanism on the day of the shooting. The expert does not address the issue of the shooting reconstruction, but the jury does and returns a guilty verdict.

No Scientific Methodology

A city truck driver runs a stop sign and causes an accident with serious injuries. Instead of relying on the skid marks, crush damage, and scene evidence, the city authorities order a traffic investigator to conduct acceleration tests to determine the maximum possible speed the truck could have achieved in the one-block distance leading up to the crash. Because the truck involved was disabled in the accident, the traffic investigator uses a motorcycle to run the one-block acceleration test and reports back a peak speed of 35 miles-per-hour for the city truck.

Too Many Cooks Spoil the Broth

A city bus rear-ends and crushes a carload of teenagers, killing four. The first traffic investigators at the scene measure the skid marks of the bus and determine that the bus driver was speeding. A national civil rights leader says the bus driver is being made a scapegoat by the city solely because he is a racial minority. The follow-up investigation by city authorities reports that the original traffic investigators, who have been abruptly removed from the case, must have been measuring tire marks tracked through melted roadway tar and that, on second thought, the city bus driver was not really speeding. A local television station gets a radar gun and reports that most drivers, including all city bus drivers, regularly exceed the speed limit on this section of road. Tire tracks in tar look nothing like skid marks to the trained eye of the traffic investigator. Excessive speed aside, it is unlawful to follow another vehicle at an unsafe distance in that state.

Pursuit of the Inconsequential

In the faked robbery of a fast food restaurant, the night manager shoots to death an employee in a walk-in cooler, hides the "stolen" money and a .357 Magnum revolver, and calls the police. The crime scene personnel notice fallen dust on a restroom floor and discover the money hidden in a ceiling panel. The revolver is found among the night manager's possessions. In preparation for trial, the prosecutor asks for a shooting sound test to be done inside the restaurant's cooler. This, he says, will determine whether or not the fatal shots could have been heard by a teenage girl who was having sex with a man (not her boyfriend) in her boyfriend's van parked across the street from the restaurant. The girl, who incidentally had a full-length cast on her leg at the time (another mystery altogether), did not recall hearing much of anything, least of all gunfire. Her partner that night also somehow missed the sounds. The crime scene investigator refused to participate in such an experiment, arguing that it was invalid, irrelevant, and silly . . . and what would it prove anyway? The prosecutor suggested that the defense might use the fact that the girl had not heard the shots to argue that the time of the murder was somehow different. "Then let the defense make a sound test," the investigator says, leaving. The prosecutor is insistent. After being turned down by the police firearms trainer and the state regional laboratory examiners, the prosecutor gets three detectives to fire the shots for the sound test. To duplicate the sounds of a .357 Magnum, they load the weapon with light .38 Special target loads; they fire the quieter ammunition into a sandbagged pipe inside the walk-in cooler so as not to make holes in the walls. It is several months later, and the air temperature is sixty degrees lower than the night of the murder. By the time the test begins, the noisy morning rush hour traffic has clogged the street in front of the restaurant. To duplicate the hearing of the busy girl with the cast on her leg and other things on her mind, they use the prosecutor's ears as he stands across the street. (Later there were several profane allegations about what the prosecutor had to endure to fully recreate the event.) The results of the test? "It sounded like a hand clap," said one of the detectives stationed in the restaurant's dining room. So, apparently, one can induce deafness by making love to a girl in a full-length leg cast, the same as one can by cutting all six legs off an ant.

Examples of truly Bad Science are everywhere. So, what can one do to avoid ambush by the Bad Scientists? Three small philosophical exercises come to mind. The first is a methodological battle plan called "Ockham's Razor," named after the 14th century philosopher William of Ockham. In philosophy, it says that a problem should be stated in its basic and simplest terms. In science, according to Ockham's Razor, the theory that fits the facts of a problem with the fewest number of

assumptions is the one that should be selected. This is the great-grandfather of the K.I.S.S. (Keep It Simple, Stupid) theory, and it works well against Bad Scientists.

The second tactic is termed "reductio ad absurdum," which is the disproof of a proposition (or stupid experiment) by showing the absurdity to which it leads when carried out to its logical conclusion. A good example of such a situation is the aforementioned case of the prosecutor who argued that seven fingerprints identified by two print examiners make a total of fourteen little traces of the burglar defendant. The reduction ad absurdum of that case is the notion that a third print examiner would up the ante to twenty-one clues, or that a dozen examiners identifying a single fingerprint would make for 12 traces of the suspect. The clues multiply like bunny rabbits. The mind boggles. Think of where the Bad Scientist is trying to lead you and look to the dark at the end of the tunnel.

The final fallback is to common sense, the bane of Bad Scientists the world over. It was Thomas Huxley who said, "Science is simply common sense at its best--that is, rigidly accurate in observation and merciless to fallacy in logic." This is where juries trod on the best laid plans of eloquent attorneys. They step back for a moment and resort to instinct, to common sense. Lawyers, especially those True Believers who do the prosecuting, are notoriously bad at feigning common sense. They are better at reduction ad absurdum. Cops, on the other hand, are excellent at instinct and common sense, but poor on seeing the absurdity of a proposition's logical conclusion.

Lastly, one needs to stand one's ground. And this means more than just Do Not Testify To Methods Beyond Your Expertise or Do Not Selectively Ignore Evidence To The Contrary or Do Not Overstate Your Qualifications. Standing your ground means you have to get in the face of anyone who even hints at being a Bad Scientist. You'll need to gently redirect the novice Bad Scientist at times, showing him the light and letting him know where you stand. With the more seasoned advocates (prosecution OR defense), you may need a chainsaw to carve out your turf in the Bad Scientist's office, be it a medical examiner's office, a lawyer's office, or a supervisor's office. Draw the line. Let them know that Enough Is Enough. After all, you're the bastard child of both Science and Forensics. They'll expect you to be incorrigible. J. Robert Oppenheimer said it best when he wrote: "The scientist is free, and must be free to ask any question, to doubt any assertion, to seek any evidence, to correct any errors."