
April 2014

Transcript: One Advocate's 'Junk Science' is Another Advocate's Evidence: Forging New Paths in Forensic Science

Follow this and additional works at: <https://trace.tennessee.edu/tjlp>



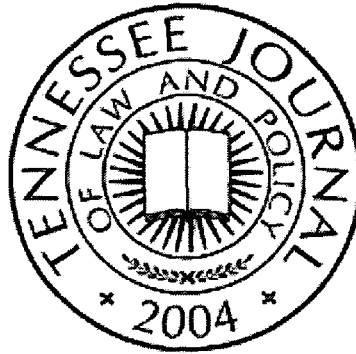
Part of the [Evidence Commons](#)

Recommended Citation

(2014) "Transcript: One Advocate's 'Junk Science' is Another Advocate's Evidence: Forging New Paths in Forensic Science," *Tennessee Journal of Law and Policy*. Vol. 6 : Iss. 2 , Article 5.

Available at: <https://trace.tennessee.edu/tjlp/vol6/iss2/5>

This Symposium Material is brought to you for free and open access by Volunteer, Open Access, Library Journals (VOL Journals), published in partnership with The University of Tennessee (UT) University Libraries. This article has been accepted for inclusion in Tennessee Journal of Law and Policy by an authorized editor. For more information, please visit <https://trace.tennessee.edu/tjlp>.



**TENNESSEE JOURNAL OF LAW AND POLICY
AND
CENTER FOR ADVOCACY AND DISPUTE RESOLUTION**

SYMPOSIUM

**“ONE ADVOCATE’S ‘JUNK SCIENCE’ IS
ANOTHER ADVOCATE’S EVIDENCE:
FORGING NEW PATHS IN FORENSIC SCIENCE”**

**FRIDAY, MARCH 26, 2010
MORNING SESSION**

THE UNIVERSITY OF TENNESSEE COLLEGE OF LAW

WELCOME AND INTRODUCTION

DEAN DOUG BLAZE: I'd like to welcome everyone to this exceptional program on forensic evidence. I'm particularly excited because we finally combined two of the (what I consider, but you'll understand my bias) crown jewels of the University—both the College of Law and Center for Advocacy and Dispute Resolution of the law school and Dr. Bass and the work of the Body Farm and forensic anthropology—as the focus to pull this whole program together. We're particularly excited that this has happened.

I think putting these two together reflects the depth and the level of participation that we have in this program. We have some wonderful folks that will be with us today, including Dr. Bass, Professor Berger, Professor Bunde, and a whole host of folks. I will not try to list everyone.

I want to recognize the one person who is primarily responsible for this program, and that's Professor Penny White, the Alvin E. Overton Distinguished Professor of Law, and also Director of our Center for Advocacy and Dispute Resolution. It was her vision, her leadership, and her academic and professional reputation, candidly, that allowed this program to be put together. I just want everyone to thank Penny for everything she has done.

She will be the first to admit that she was ably assisted by the leadership of the TENNESSEE JOURNAL OF LAW AND POLICY, most particularly the Editor-in-Chief, Sally Goade, and the Symposium Editor, Monica Rice. And before I turn it over to Monica, I would also be remiss if we did not thank Mark Ensley for assisting in putting together the materials, assisting Penny, Monica, and Sally, and also Micki Fox, who is never in here to be thanked. But Micki Fox, who is our CLE Director, puts the whole thing together and makes sure that the folks in Nashville approve the program.

Welcome, it's going to be an incredible day. I'm looking forward to it, and I will turn it over to Monica Rice to continue with the introductions.

SYMPOSIUM EDITOR MONICA RICE: Good morning and welcome to the 2010 TENNESSEE JOURNAL OF LAW AND POLICY, along with the Center for Advocacy and Dispute Resolution's Spring Symposium: "One Advocate's 'Junk Science' is Another Advocate's Evidence: Forging New Paths in Forensic Science." My name is Monica Rice, and I am the Symposium Editor for the TENNESSEE JOURNAL OF LAW AND POLICY. We are very, very pleased to have you all here today, and we are certain that you will enjoy the various presentations that have been prepared.

I would like to give you a brief synopsis of how the morning symposium will run. This morning we're honored to have Dr. Bill Bass deliver our morning keynote address. Dr. Bass is a U.S. forensic anthropologist renowned for his research on human osteology and human decomposition. He has assisted federal, local, and non-U.S. authorities in the identification of human remains. He currently plays an active role in the forensic anthropology research facility, commonly known to you all as "The Body Farm." He has written numerous works, including the best-selling books DEATH'S ACRE and BEYOND THE BODY FARM. We are delighted to have such a renowned expert present our morning keynote.

To respond to the morning keynote, we are pleased to have a panel of esteemed and highly educated scholars deliver presentations of their own. We will hear from Professor Bernard Raum of Levin College of Law at the University of Florida. Professor Raum is a former prosecutor, receiving his J.D. from the University of Florida and his Master's of Forensic Science from George Washington University. He currently teaches Forensic

Evidence at Levin College of Law. Professor Margaret Berger of Brooklyn Law School will also join the panel. She is widely recognized as one of the nation's leading authorities on scientific evidentiary issues, specifically DNA evidence. She will also present our lunch keynote address. Lastly, Dr. Terry Bunde, Professor of Chemistry and Acting Chair of Natural Sciences at Maryville College, specializing in Biochemistry, Organic Chemistry and Spectroscopy.

As you can see, we have so many experts sitting on our panel this morning that in order to give everyone an equal chance to state their views, we are going to give each an allotted time of twenty minutes to present. And we do have time cards. After the panel presentations, we will open the floor for questions. When you stand to ask a question, please state your name for our court reporter. I would also once again like to remind you to fill out your evaluations and your CLE forms. So, once again, thank you for joining us. Thank you.

KEYNOTE ADDRESS
CRIME SCENE INVESTIGATIONS:
A PRIMER FOR LEGAL ADVOCATES

Dr. Bill Bass

DR. BILL BASS: I'm really impressed that there are so many of you that got up this early in the morning to see death and destruction. I mean it just isn't every day we get to see that. I really didn't know what to show you all, but I have a series of slides. Probably some of the audience has seen one or two of these cases before. I put these together to show you how important science is to gather evidence for court cases and so forth.

Now, I'm going to show you something else by the way. This is a really different form of old technology. I'm

going to use a Kodak carousel projector, which you cannot buy anymore. They don't make these things anymore. I'm not going to use a laptop and so forth. Everybody says, "You need to use a laptop. My gosh." So, I am about 200 years out of date with what you all are doing now. But I'm going to show you a lot better color crime scenes than what you would see otherwise.

I want to introduce you all to yourselves really, starting with the Tennessee Highway Patrol at the UT Hospital. And to show you that this has been a while ago. You know, at one time, I had dark hair. But not every case is as good as the next case, and this is a case for teaching you something. This is a case that starts in Clarksville, Tennessee. Clarksville is a town Northwest of Nashville. Fort Campbell is the closest thing to Clarksville.

This is the disappearance of a girl named Kathy Nishiyama.¹ Kathy Nishiyama's father was Japanese. He worked at Fort Campbell. Kathy Nishiyama's mother was an American. She was a sixteen-year-old high school girl making a little extra money by working at the Bonanza Steakhouse on two or three nights during the week. One night she does not come home from work. Her mother calls the police to state that Kathy is missing. And there is a massive search made for Kathy, and they cannot find her.

They find Kathy Nishiyama's car pulled off the bypass around Clarksville. If you don't know Clarksville, it doesn't have a bypass like we talk about. It's a road that comes down along the Cumberland River there. The car is locked, and they cannot find Kathy. About six weeks go by—a month and a half.

Clarksville is in Montgomery County. Now, the county west of Montgomery is Houston County—named

¹ See generally *State v. Hartman*, 42 S.W.3d 44 (Tenn. 2001); *Hartman v. State*, 896 S.W.2d 94 (Tenn. 1995); *State v. Hartman*, 703 S.W.2d 106 (Tenn. 1985); Donald F. Paine, *State v. Hartman: In Memory of Kathy Nishiyama*, 44:2 Tenn. Bar J. 11 (2008).

after Sam Houston, who fought right up that way a few miles. Kathy, when she was living, never really went to Houston County—had no reason to. But they find a cranial vault. Now, the cranial vault is the top of the skull. It's this thing here without a face. It's very typical of what happens if you die outside, not only in Tennessee, but all throughout the United States.

If you die outside, where the animals can get to you—the dogs, the coyotes, in East Tennessee the bears—all of these canines are interested in decaying human bodies. And they will eat on a body. Now, all of these have troubles, though, with the skull because the skull is too big to get their teeth around. But the face is easy to break off. What you will get then is a cranial vault without a face. As we go on, we will show you this.

By the way, I thought you all might like to see a case of a woman who was eaten by her dogs. I thought this would be a good one for getting the morning started right. And you're going to find what happens to the animals when they chew on dead people out there. They will eat the ends of the bones. They do not eat the shaft of the bone because there isn't any marrow, and the marrow is in the end of the bones. Proximal means the end closest to the head. Distal means the end farthest from the head. What you will see then are a lot of bone splinters. I'm going to show you what this means to you in the legal profession.

Now, the only person missing in the Northwest, Middle Tennessee area at this time is Kathy Nishiyama. Again, though, she never went to Houston County, so they didn't think it was her, but they wanted to check it out. They called Mike Dover, who was a Tennessee Highway Patrol helicopter pilot, and they asked Mike to bring the skull over to me to take a look.

While they are out there and while Mike is coming from West Tennessee over to Knoxville, they go out to a farm and find some more bones. So they call Mike and

say, “Will you bring Dr. Bass back with you?” And so we are getting to fly out there. Now, before I show you this, I want to give you just a little bit more academics, so you will understand what is going on.

If you all don’t mind, take your finger and feel right here at the edge of your nose. Run it back and forth, and you’ll feel a lump under there on both sides. What you’re feeling is the root of the canine tooth. The canine tooth has the largest root for the size of the crown of any tooth in the body. Now, if you come forward from that, toward the center line, you can’t feel this, but you can take your tongue—switch from your finger to your tongue now—and feel the back of your front teeth. This is the central incisor, that’s a lateral incisor, and that was the canine. You felt the canine with your finger. Now feel the incisor with your tongue. Most of you in here are going to have a flat surface in the back.

I’m looking around now. I’m trying to find an Asian, and I don’t see that many Asians. But if you have an Asian, Japanese, Chinese, Southeast Asian, Eskimo, or American Indian, all five of those individuals have a common ancestry. This common ancestry has a genetic characteristic in the incisor teeth known as shovel-shaped incisors. On the back of the tooth you will have the edges coming back. If you held the tooth by the root, it would look like a little scoop shovel. These were named in the late 1800s when we had coal fire furnaces. It does look like a little scoop shovel. If you’ve ever—most of you have never done this—but if you’ve ever put coal in a furnace, you don’t want a flat shovel because the coal falls off the edges of the shovel. What you want are edges so that you can keep the coal in there. And this is a little shovel-shaped incisor. The shovel-shaped incisors are found in roughly about ninety-six percent or more of Japanese, Chinese, Southeast Asians, Eskimos, and American Indians. All of those in the same group.

Now, we have no teeth here, so we can't use that right at the moment. But they decided, "Let's bring Dr. Bass back with you." We get out there, flying off, and we make one pass through the woods just before it's too dark to see. And, lo and behold, we find the crown. This is the part above—this would be the gum line right here, above the—on the front—on the incisor. Note the light shining off the tooth right here. Note the light is not shining off here on the sides. The reason for that is the sides are coming back toward us. This is a shovel-shaped incisor. This is why it's important to know all of these things when you're looking at evidence, so you'll understand what's there.

Note the little arrow here is pointing to a filling in the tooth. Most of us do not have fillings in our incisor teeth. We have fillings in our pre-molars and our molar teeth, but very few of us have fillings in our incisor teeth. This again is where your education kicks in. Knowing that Kathy Nishiyama has a Japanese father and an American mother, I thought, "I will bet you that Kathy Nishiyama carries the genetic traits for shovel-shaped incisors."

With this, what we need is a dental record. And so I said, "Hey, I think that this is probably Kathy Nishiyama, but there's a dental record. Do you know who Kathy Nishiyama's dentist was?" One of them said, "Yes, we do." About 8:30 that night, they called Kathy Nishiyama's dentist and said, "Would you go down to your office? Will you make a copy of Kathy Nishiyama's dental records, and we're going to send a Tennessee Highway Patrol helicopter pilot over to pick these records up." And he does. He goes down and comes back with this record right here. Note tooth number nine, which is a filling in the shovel-shaped incisor.

Now, very, very seldom do you ever identify the individual in the field. Normally, it takes weeks, months—not like CSI where it's done in an hour. I have, in my lab—it's about two blocks that way—I have about twelve

to fifteen individuals that I can tell you the sex, the age, the stature, the handedness, and all the inertia, but I can't give them names. Sometimes—I hate to say never—but sometimes it's years before we can make a positive [identification] in the cases. You're looking at an extremely rare case here.

This is about 11:00 o'clock at night by the time Mike Dover has flown over and brought the records back. These are some of the detectives and some district attorneys. And this is a picture of Kathy Nishiyama—nice looking young lady. My job is not only to identify individuals, but it is to figure out what happened to them. Why is Kathy Nishiyama in this rural farm in a county she never went to?

We begin to look. This is the skull. The eye orbit is right down here, and this is a depressed fracture. What you're looking for is, was she shot? Was she stabbed? Was she bludgeoned? What is the manner of death leading up to this skull or this cranial vault that we have?

Now, going on, this is the right maxilla. That's the little thing you were feeling just a little while ago. This is the canine tooth, and that's the root of the canine. This was made famous by the saber tooth tiger by the way. If you have a dog, you want to go home and do a little homework: get your dog, lift his lip up, look in there, and you'll see that the canine tooth extends down below the occlusal plane. It's the biting plane of the teeth. Or if you have a cat, cats are the same way. They don't like this, but this is all in the name of science, you see.

Note this is the lateral incisor. The central incisor is missing. Let's turn that just a little: there's your canine again. This is the lateral incisor. Note the little chip here in the lateral incisor. Note the root here still in the bone. This would be the right maxilla. This is the upper jaw. This area in the bone—this is a little bit more academic, but you all are sharp or you wouldn't be here today. This is the

alveolar portion of the maxilla. The alveolar portion of the maxilla and the mandible, which is now shown here, contains the root of the teeth. Note the tip of the tooth right there.

This situation that you see here can occur in two cases. It can occur if you're in your car, you're driving too fast, have a wreck, your face goes forward, your teeth hit the steering wheel, and it breaks your teeth out, driving them into the mouth, breaking the root off. Or it can happen if you're in a fight where somebody kicks you in the mouth or hits you in the mouth.

Now we're beginning to get a feel for what's going on here. This is the back of the skull. This would be the left parietal. This is the right parietal. And I think all of you know that the bones of the skull come together along jagged lines like this, called suture lines.

These jagged lines like that, they're all normal. This is the occipital bone here. Remember, she was missing about six weeks when we found this. Note the dry, ligamentous soft tissue. These would be the ligaments that were hooked onto the back of the skull. But note the little black arrow that's pointed to a straight line going here, going there, and going down here. That straight line runs down through here to the right temporal bone. This would be the ear.

Kathy Nishiyama was lying on her left side here on the ground. The man that killed her, a man named Eddie Hartman, who died, by the way, two years ago in the state penitentiary in Nashville. Eddie Hartman literally stomped on the side of her skull and broke the temporal bone out. That's probably the blow that killed her. All these others—the blow to the forehead, the kicking out of the teeth, and everything like this—would not have killed her. But this is a massive blow here.

Now, you want to write a report so that the law enforcement agents, who are going to deal with this,

understand what you're saying. You want it clear enough that they can find out what's going on. I didn't mention that this was a notable fracture, but note that she had lost three teeth and not just the one that we had been looking at. Whenever you do something like this, you want to make what's called an element inventory. You want to record everything that is found. Note in this case that the shaded parts are those that are present. That's what we were looking at a little bit before. This is the maxilla that you saw.

Look at the long bones. This is the humerus. These are the bones of the upper arm. The shaft of the right humerus, the proximal end, is gone. That's the end closest to the skull. The distal end is gone. That's the farthest from the skull. But you have the shaft of the bone. Every bone that you see—this is the left femur, proximal end missing, distal end missing. This—if you didn't know anything else about this at all—your first clue there is that, hey, this individual was attacked by dogs in the process of the decaying period. What you get here is the evidence that you need where the dogs have chewed the ends of the bones off.

Note that we never found the right femur. Suppose I go home this afternoon and the phone rings and it's the Houston County Sheriff's Office saying, "Hey, we found another bone out here. Is this another bone of Kathy Nishiyama, or is this an area where you have a serial killer, who is throwing bodies?" This is why you want to keep these records.

By the way, records like this do come up. I testified about three months ago in Murfreesboro, Tennessee, in a case that I first went to in 1982—a man who was killed along the edges of the lake in that area. We had cold case files, and eventually the guy was convicted. I went over to testify, and he was found guilty.

Kathy Nishiyama had lots and lots of dental records and dental things that we were able to match. We were able to make a positive identification. Now, also to show what had happened to her—I testified three times in this case. I testified first in the criminal court case, in which they found Eddie Hartman guilty, and they gave him the death penalty. Now, you all know—you know this a lot better than I do—that on all death penalties there is appeal after appeal.

The second one I testified in was a civil court case in which Kathy Nishiyama's mother and father sued. I've got to bring in something else here now that I have not brought in before—sued the Sheriff of Dickson County. Why Dickson County? At this time, the Sheriff of Dickson County had a nephew who wore boots, and he wore leather jackets, and he would get drunk, and he would get in fights and he'd stomp on people and so forth. He was in jail for being drunk and disorderly.

There was a deputy in Williamson County, in Dickson County, who had a farm and he needed some help. So he goes to the sheriff and asks the sheriff, "Can I have a trustee to go out and work on my farm tomorrow?" The trustee said, "Well, why don't you take my nephew?" And this is Eddie Hartman. The deputy takes Eddie Hartman out, and they work all day. When they get done at the end of the day, the sheriff is tired. He says, "Here, take the keys of the patrol car and go back to jail."

In Monopoly, you go directly to jail, but in real life, you don't have to do this. We now know from the ensuing investigation that Eddie Hartman, on his way back to jail in Dickson County, did not go directly to jail. He went through Clarksville on the way. We know that he stopped three other people who, when this broke in the newspaper, called and said, "Hey, that guy stopped me that night." And he stopped Kathy Nishiyama. He likes what he sees.

He is driving a patrol car with blue lights, but he does not have a uniform and he does not have a badge. But Kathy Nishiyama, a sixteen-year-old high school girl, is trusting of society. Society is going to protect me. In this case, it did not. He puts her in the back of the patrol car. And the next time we find Kathy, she is in this farm out in Houston County.

How do I know this? Because it takes us six weeks from the time Kathy disappears until we find the skeletal material. It takes another six weeks for the police to figure out what happened. Then they begin investigating the situation in Dickson County. We find, when they impound that patrol car and take the back seat out of it, there's a necklace under the back seat that Kathy Nishiyama's mother identifies as a necklace that Kathy had on the night she disappeared. So you can see how these things go.

The third case I testified in was on one of the appeals where Eddie Hartman appealed his death sentence. To make a long story short, as I told you before, Eddie Hartman died in the state penitentiary in Nashville about two years, weighing over 400 pounds. He got in prison and literally ate himself to death. I mean, that's the story. But knowing the shovel-shaped incisor, knowing that is a genetic tract of mongoloid individuals—Japanese, Chinese, Southeast Asians—then you can begin to put this together.

The Dean said we're talking about the Body Farm. I thought maybe I would show you just a little bit from the Body Farm—something again that will help those of you who have investigators in your office. You need to know about this because this is an area in which an awful lot of good, positive data for making identifications is missed because people don't know what happens.

In the decaying process, one of the things that happens—and it doesn't happen every time, but it'll happen in certainly half of the cases and maybe a little bit more—is we have what's called skin slippage. The epidermal layer:

this is the outside layer of the skin on the finger. This is what the print is on, the epidual layer, which will separate from the underlying dermis somewhere between the third and seventh day.

Now you have the dead body lying right there, decaying away. Finally, somebody smells it and says, “Something is dead out here.” Then people start looking, and they find this dead body. Then they call the police. And the police—I don’t know—whoever goes and picks up your dead bodies for you, they go out. They don’t know that this occurs, but what’s happened in that process is that the epidermal layer of the hand has sloughed off. This is called de-gloving, by the way, in the forensic area. Your best means of identifying that individual is not on the body. It has sloughed off and is lying at the decay scene. I won’t say the death scene because they could have been killed somewhere else, but where they were thrown out and decayed. The best means of telling that individual is what you’re going to see now.

I’m going to take you through this process. This, again, occurs between the third and the seventh day of decay, depending on the temperature. It would be quicker in the summer than it would in the fall. It looks like your hand does when you get in the hot tub too long. Note that the epidermal layer right here is separating from the underlying dermis. Although you just had breakfast and you had all those goodies out there and so forth to eat, I want to bring in a few more things. I want to ask you now, so I’m going to see how good of an observer you are.

You see that little white thing right there. There’s one right there, and there’s one right here, and a couple right along in there. What are those little white things?

AUDIENCE: Maggots

DR. BASS: Maggots. That's right—maggots. Now note that the maggots are down underneath the epidermal layer, in between the epidermal layer, which is here, and the underlying dermis. Why are they down under there? Because maggots are eaten by birds. If you're a maggot, you don't want to be eaten by a bird. Your mother didn't hatch you as a maggot and tell you, "Watch those birds now. You know, you don't want to get eaten by a bird." This is a protective mechanism for the maggot. This is a defense mechanism, and he's down under the skin trying to protect himself. And the skin is going away, sloughing off now.

This was taken at night. By the way, maggots don't like sunlight. For those of you who are in law enforcement or those of you who are lawyers who like to get out to the scene and you get out there in the daylight, you won't see many maggots because maggots don't like sunlight. They are down inside the body where it's dark. But you go out at night, and you will see the maggots all over the head like this. Here's our—this is our glove coming off—a little piece here. Going a little bit further, here's our hand, and that's the thing we've been watching. The hand you don't see. But again, there's the hand and here's our glove, de-gloving right over here.

How did this get from here over to there? I don't know. That happened one night when I wasn't there. I think the maggots decided, "Let's confuse Dr. Bass." So they run across and they take that [the de-gloved epidermal layer] over there and they put it there.

Now when the people come along to pick up the body, they don't know this has happened. They take it in, and it's very difficult to get fingerprints off this. The FBI can do that, but it's expensive and it takes a while. But if you know what happens in this situation, what you need to do is have your criminal investigator go out to the scene and take a little folding chair if he wants to. He can sit.

It's not the most appetizing place to go. But I mean, you know, this is science. And look for something like this. Pick it up and see—does it feel like a leaf or . . . dry skin doesn't feel like a leaf. It feels a little different from that. I didn't bring any dry pieces to pass around this morning, but you just trust me. If you want me to, I will give you some that you can play with sometime.

Anyway, bring this back. Put it in warm water overnight. The next morning when you come in—don't you do this, but get your investigator to do this. And have him put on his rubber glove and you can slip this guy's finger over your finger and you can identify him that way. I've done about six or eight of these in my career, so, it's something that works. And I think it would work more often if the people involved in crime scene investigations knew what was happening.

Now I want to take you to another case. This is a case in Williamson County. Anybody here from Williamson County, by the way? Oh, okay. Franklin is the county seat of Williamson County. I had a case in Williamson County many years ago of a confederate colonel who was killed and who had dug up Colonel Shy. Looking at the bones, I said, "Colonel Shy was a twenty-four to twenty-eight-year-old white male," and I said, "who had been dead a year." Colonel Shy was a twenty-six-year-old white male. So far, I'm 100 percent. But Colonel Shy was dead 113 years. I only missed it by 112 years. Every lawyer in Tennessee knows this. They always ask me if I've ever made a mistake. And yes, it's a good one. But I thought, "Hmmm, that's why we have a body farm is because we just didn't know enough about what happens to decaying bodies." So I began to do research.

Now this is a case of a woman who had a brain tumor. She was going to Vanderbilt, being treated for a brain tumor. She wore overcoats in the summer, and she talked to things in the trees and so forth. The neighbors

hadn't seen her for about two weeks. They call up the Williamson County Sheriff's Office, and they go out and they find that the house is an absolute clutter. She has three big dogs, two German shepherds and a collie. And they have punched holes in the screen and are coming and going. There are bone fragments on the floor, so they send the things over to me to see if I can identify her.

I did not go at first to this case. Something else came up, which I will show you in just a minute. We went up and did another inspection. That would be a good term to say. When we come back and close this gate, this will be the end of the case. Then I hate to tell you this. You all thought when you graduated from college, your exams are all over and you're not going to have to worry about this. But remember that I was—I really still am—of UT faculty and retired. It's hard to believe I've been retired for fourteen years, but time flies when you're trying to make a living with no money.

Anyway, I'm going to give you a final exam question for the lawyers. I can see people feeling all hot palms already, but I've got an exam this morning. It's a nice house. This, by the way, on about twelve acres and it has fountains and a swimming pool in the back. One of the Williamson County Detectives [in slide]. She [the victim] has on this shirt. Now, if you are a crime scene investigator, you're trained and you want to look at all this good stuff and look if the zipper is up. If the zipper were down, it would lead you to believe that maybe she was molested. Not any indication here. But what I want to call your attention to is this dark stain right here. That's not blood. That is the volatile fatty acid stain. When a body decays, the soft tissue liquefies, and it leaches out on the ground and will kill the vegetation right around a dead body. You go and you will see all the grass and things like that are dead. It will stain your clothing and so forth.

This is the normal decaying process, but the police didn't know this when I got there. When I looked at that, I said, "Hey, when this woman died, she fell face forward on the floor." Well, you can't say that. Nobody saw that. Nobody saw this death scene. We are now about two weeks after the death. But I can tell you how she fell. Note that the volatile fatty acid stain is on the front of the garment and not on the back. So she falls forward; she is decaying away. The fluids run down and stain the front of the garment. They thought I was crazy—if you teach in an academic institution, you really don't know anything about crime scene investigation. But I'm going to prove my point here in just a little bit more.

Now, she was fifty-four years old, and she loved safety pins. As a matter of fact, if you are fifty-four—whether you are held together with safety pins or not—Velcro has come in since this time, so we're all held together by Velcro now. But remember, she was crazy, so she must have had a fetish for safety pins or something.

Now, the sum total of what we have: a cranial vault. Have you ever seen one of those before? Yeah. Doesn't that make you feel warm and fuzzy? You know, I have been here for thirty minutes, and I can see what's going on. Sometimes you take your whole course. All semester you study; you still don't know what's going on. And here you've been in here thirty minutes, and already you can see what's going on.

Now, the shafts of the bone—what's that tell you? Run over by a truck? No, eaten by dogs or eaten by animals. It could be coyotes, but in this case, it's dogs. Add a tooth. We'll go ahead and look at this a little bit more—a painted toenail. How do I know that's a toenail? Because I'm a forensic anthropologist. I know these things. Bear with me. I'm going to show you. I mean, I'm going to give you evidence to show you that this is a toenail.

She has on an apron. What's that stain on the apron? Volatile fatty acid stain. Do women wear their aprons on the front or the back? The front. You see how you can reconstruct a death scene, even though nobody was there? But you've got to know the process that occurs when a body decays in order to be able to figure these things out.

Going on down, she had on pants and so forth—dyed hair, rubber band around the hair. We've seen another view of that. We know she was eaten by dogs because you've got a cranial vault again, and these are the tooth marks right here. Tooth marks on the edge. Since this case, by the way, we've been able to tell you—we can't tell you the species of dog—but we can tell you how big the animals were. In this case, the dogs were contained in a house where they could come and go. But if you're outside and just visited by any kind of critter that comes along, what we have done—and this is done in gray here—we have measured the tooth marks on the skull. Obviously big dogs have a bigger mouth, and smaller dogs have a smaller mouth. The teeth are going to be different. We can tell you what size animal frequented that individual.

Remember two weeks became material down here in the bottom. Let's see—there's another maggot right there. We'll show you a couple of other things here as we're going along. This is the forehead here. That's the frontal sinus. The skull has three layers: a hard outer layer, a middle layer known as diploe, and a hard inner layer. So you can think of the skull as a sandwich. In some areas of the middle layer of the diploe, you have air spaces. These are called sinuses, and that's a frontal sinus. This is the dura mater, the rubbery sack that goes around a skull. This is the mastoid process. We felt—by the way, remember—we felt our teeth. If you want to, you can feel right back through here and you'll feel a lump that goes out. It will be bigger in males than it is in females. It's going to be

difficult to—ask her, when you get done, if you can feel her mastoid process. This is a good way of getting to know a lot more people in the audience. By the end of the day, you'll go, "Great, great," and so forth.

Now, the reason the mastoid process is gone here is because it sticks out. And if it sticks out, the dogs can bite it off. The dogs get their teeth on this and bite off the bone that sticks out. This would be one here, and this is the other over there. There's your right ear hole, mastoid process chewed off. Remember, two weeks dry soft tissue here, tooth marks, and so forth. We won't get there. A fly comes along. I doubt any of you knew Steve Symes, who was one of my doctoral students. Steve worked for the medical examiner's office over in Memphis for about twenty years and then teaches up at Mercer College now. Steve took the best crime scene photographs of any student I ever had. This fly comes along. This is a female blowfly, and she smells this decay down in here and she wonders if this is a good place to lay her eggs. Instead of shooing her away, he took a picture of her. That's not a stick-on fly for the lawyers to see. Now, again, the shaft [of the bone in the slide].

Now, we made a positive identification of her. Not too difficult because remember, she was a patient at Vanderbilt and had a brain tumor and lots and lots of CAT scans of the skull. And so what we did was a skull here. We can take more CAT scans, more x-rays, and you can compare the after-death CAT scans and x-rays with the before death. And we made a positive identification.

Write a report and send it in. About two weeks go by; the phone rings one day, and there's this woman on the other end of the phone from a bank in Nashville. She says, "I hear you've identified Ms. _____" and so forth. I said, "Yes." And she said, "Did you find a \$7,000 diamond ring?" I said, "Well, no. How do you know she had a \$7,000 diamond ring?" She said, "Well, she had a diamond

ring valued at \$7,000 by her bank. If our bank can't find it, we have to pay the estate \$7,000." You all kind-of know my personality already. I kind-of laughed, and I said, "Well, you know, she was eaten by her dogs." And there's deathly silence at the other end of the phone, like, how did I get mixed up in this thing? We talked a little bit, and I said, "I tell you what I'll do. I'll call the Williamson County Sheriff's Office, and I will have them send some deputies out to pick up all the dog feces that they can find." Three days go by. The phone rings, and the Williamson County Sheriff's Office has thirteen pounds of dog feces. They have six pounds in one plastic bag and seven pounds in another. Can you bring it over? Yes, they can bring it over.

Now, this is a big deal in the Anthropology Department. It just isn't every day we get thirteen pounds of dog feces coming into the Anthropology Department, you see. We're all excited, and Deputy Barney arrives, you know. Deputy Barney is bent out of shape. I mean you can look at him and tell that he is bent out of shape. You know he's been out there for three days picking up dog turds, and that's not in his job description.

I thought, "I've got to make this deputy feel better." I turned around to the class, and I said, "You know, Deputy somebody brought in thirteen pounds of dog feces. Now, tonight what we've got to do, we have to soak these. And tomorrow when you come in, we have to squeeze each one of those to see if there's a ring in there." You should have seen Deputy Barney's face light up. I mean there's somebody else in the world worse off than Deputy Barney, and they are graduate students in anthropology.

Now, when you all go home, when you go back to Williamson County and your boss asks you, "What did you see up there in the law school at UT?" you can say, "For the first time in my career, I saw a color slide of dog turds." How many of you have ever stopped to take a look at a dog

feces? Oh, well, good. We've got one person. We will give you an A. You can tell a lot from looking at this, as I will show you.

Note right here you can see—see right down here [on slide]. You see those little parallel lines there, and there are some here. Let's get another few. Let's do this one right here. You can see the little parallel lines right through there and right through here. Now, those parallel lines—this woman had on pantyhose when she died, and the dogs didn't take the pantyhose off when they ate her toes—ate her legs. This is the impression of the pantyhose into the dog feces. Note this one right here. That is a painted toenail. The reason I know is because it's hooked to a toe bone. Isn't that logic? I mean, those damned anthropologists. They can figure these things out, you know.

That's how I knew when I showed you that that was a painted toenail. I can show you where it came from. The second thing that you probably have never seen before, instead of putting the material in water and squeezing the dog feces, I should have asked you, "What's a good thing to do?" You all would have said, "Oh, x-ray," and I would have said, "Right." So, probably the first time you've ever seen an x-ray of thirteen pounds of dog feces [on slide].

Let's start with a paper clip. This is a bobby pin, a hair curler—all kinds of nuts, screws, bolts—look down here in the lower left-hand corner. I didn't know what this was when I first saw this, but this is a screw. There's some threading right there, right at the edge. Now, to make a long story short, we did not find the diamond ring in the thirteen pounds of dog feces. Where is it? I don't know.

Well, we thought, let's just go out there and take a look. Not that we could find it any better than can the deputies. This is when I went back and took the picture opening the gate, going up to this house. We're going to close the gate in just a minute, and remember we have an

exam question coming up. Let's see if you've learned anything this morning.

I found out what this was—where this came from. This woman, when she was living, had fallen down and broken her ulnar. This is the bone at your elbow here. The break was fairly bad. She went to the hospital and had an orthopedic surgeon put in a plate. He was afraid that the end of the bone would break off, so he drove a hole through the end of the bone and put the screw in to hold the end of the ulnar into the plate that he put in the arm. To show you how powerful a dog bite is, the dog not only bit through the bone, but bit through the screw there. One more view of this. You can see that there's a tooth there.

We never did find the \$7,000 diamond ring. For years, I lectured to a third-year vet school class over at the Veterinary College. And they asked me if I x-rayed the dogs. I said, "Well, no. They put the dogs up for adoption in the dog pound in Williamson County." But there wasn't anybody—this was front page news in Williamson County and in Franklin for a while—there wasn't anybody in Williamson County that wanted to adopt those dogs because every time they looked at you and wagged their tails, you would think they were sizing you up for a meal.

This was a case literally of, you know, she dies and the dogs get hungry. The dogs simply ate her in the process of going on. Now, there will be some of you in here that have cats and say, "Why, I don't have a dog because I love cats." Cats love lips though. I mean when you decay, the bacteria on the inside of the body builds up, and your lips begin to bubble, and cats just love that.

We're going to close the gate now and close this. I'm going to give you a quiz question. I want to show you this. Now, this is a death scene. I want you to tell me the sequence of events that occurred at this death scene. What you have is a nice East Tennessee possum—high legal authorities, and lawyers, and so forth. That's his tail down

here like this. Now, he's crossing an East Tennessee road. He's going too slowly, and he's hit. He's certainly called now "road kill." He's two inches thick and about three feet long, and along comes a Tennessee Highway Department and stripes him on the rear.

See, you have learned something. I have one question I want to ask you. Very seldom do you get this, but I'm going to see if you are interested in this. I have another set of slides. I'm supposed to go until ten minutes after 10:00, so you've got about another fifteen minutes. Do you want to see these? All right.

I want to ask you one question. How many of you know who the Big Bopper was? Oh, good. Great. I'm impressed. This is an age thing, which I will tell you, I'm a little bit older than some of you people. I was up at Webb School about three or four months ago, and I asked them, "How many of you know who the Big Bopper was?" There were two biology classes of twenty-five students in a class, and one person raised his hand. So, it is an age-related thing.

The Big Bopper, for those of you who didn't raise your hand, is the man who wrote *Chantilly Lace*. Most of you will know *Chantilly Lace*, and maybe some of you will know that the Big Bopper died on February the 3rd of 1959 in an airplane crash just outside of Clear Lake, Iowa with Buddy Holly, Ritchie Valens, and the pilot. The four people were in a Beechcraft Bonanza that crashed in the middle of the night. They took off in a blinding snowstorm—should not have been flying. The pilot got confused and did what the Kennedy boy did off Nantucket. He literally flew the airplane into the ground, and the Big Bopper died.

The Big Bopper was not autopsied. He was embalmed and brought back to Beaumont, Texas. The Big Bopper was a disk jockey in Beaumont, Texas. Beaumont is a town between Houston and the Louisiana border, so it's

right down about twenty miles in from the gulf. And the Big Bopper was buried.

He was buried in the horizontal marker section of the cemetery. This is where you had the flat gravestones so that they could mow the grass, but about three years ago, the Texas Historical Commission commissioned a life-sized statue of the Big Bopper to be placed on his grave, and the family had it delivered. If they accepted the monument, they were going to have to move the Big Bopper from the horizontal section of the cemetery to the monument section. His son called me.

When the Big Bopper died, Mrs. Bopper was seven months pregnant. Two months after her husband was killed, she had a son, Big Bopper—this is the Third. Big Bopper was a junior, and he called me and asked me two questions. He wanted to know two things. When they find the plane—the plane crashes, skids across an Iowa field and stops at a fencerow. The only person to exit the plane is the Big Bopper. He was sitting in the left rear seat of the aircraft, and he is thrown out of the plane. He is thrown across and over on the other side of the fence.

The family had often wondered whether their loved one had survived the crash and if he was going for help. The son was calling me to see whether if I did an autopsy for them, I could determine this. I said, “Yes, I think I can determine that.” Now, something else had occurred in the history of this case, and this was about two months after the crash. An Iowa farmer is out picking up airplane parts out of his field so he can plant his crop, and he finds a pistol. It’s a .22 caliber pistol. It was owned by Buddy Holly, and it had been fired a couple of times.

I don’t know how rumors get started, but in the Richardson family, you know, Aunt Suzy has watched CSI and she’s a crime scene investigator. She likes to tell these stories, and she said, “You know what, I’ll bet you that our loved one was shot.” Everybody is gathered around Aunt

Suzy and Uncle Frank sitting over there. Nobody is talking to him, so Uncle Frank has to get in. He comes over and he's supporting Aunt Suzy. So over the years, the rumor in the Richardson family was that their loved one had been shot.

The Big Bopper asked me two questions: "Did my father survive the crash, and was he going for help?" And number two, "Was he shot?" I said, "I think I can cover both of those." Now, in the next sixteen minutes, do you want to see the autopsy pictures? I will tell you that this is an x-ray autopsy. He was in remarkably good condition. I went down to look at little bones and fragments, and as you will see here, I get down there, and we open his casket. I'm not going to show you a likeness because the family asked me not to if you see this. Don't hold up your hand yes because you want to see what the Big Bopper looked like forty-nine years later. They wanted to know, "Was our loved one shot?"

Now, do you all want to see the x-rays of this? All right. I'm not going to tell you the answers to either one of these. I'm going to let you look at this, and I'm going to let you do a forensic anthropology examination this morning. Two questions that I want you to decide when we get done: Was the Big Bopper shot, and two, did the Big Bopper survive the crash and was he going for help?

You want to see these then? It just isn't every day you get a speaker that comes and offers what you want to look at, you know. I mean they show you on the stand most stuff you don't care anything about anyway. The Big Bopper is buried in the Forest Lawn Cemetery in Beaumont, Texas. If you want to stay as much like you are right now as far into the future as you can, you do not want to be buried in a wet environment. A wet environment is not conducive to preservation.

I looked up the water level in Beaumont, and it's twenty inches. That will be good. I mean, he's been buried

in water and so forth. Now, lots of media coverage of this. This is the horizontal marker section. There is his—Charles Perry Richardson, Jr., The Big Bopper. Note he was only twenty-nine years old. By the way, if you go back and look at his history, he wrote four or five other songs that were in the country western top ten in his career, so he wrote some songs that people listened to.

Lots of media coverage—ABC, NBC, FOX, all that group. The family didn't want them to take pictures of this, so the funeral director gave them some tents. What do you do when you don't want people to see what's going on? You all who are in law enforcement and the legal field are wonderful about this. You know, you have a wreck out there and people are lying on the edge of the Interstate. You cover them with a tarp, you know, so nobody can see them.

The Big Bopper's coffin is inside of a metal vault. Note the water down there. We've got water dripping out—and I thought, "This is not going to be good." It was so bad that they had to put in a sump pump to pump the water out so I could get down and run this chain underneath the vault so that we could lift it up.

Now, we get it [the coffin] up. We've got the water down, and we're lifting it up. We need to take it from here over to a work area in the back of the cemetery. To get there, we've got to go by all the news media—ABC, CBS, NBC, all these. And so we're going to put this on a little tractor—a trailer on the back of a tractor. You don't want people to be able to see this, so what do you do? You cover it with a blue tarp. I'm going to write a book one of these days, "Death is Under the Blue Tarp."

We get back there, and we're cleaning this off now. We're going to clean this all off. I'm not going to have time to talk about the difference between concrete vaults and metal vaults, but if you have questions, I'll see if I can't answer them for you. This is the casket; it's a

Batesville casket. I'm not selling Batesville caskets, but it was in such a good shape, they could have used it over, although Batesville gave them a new casket. This casket is now in a music museum somewhere south of Dallas, between Dallas and San Marcos, I think. I don't know my Texas landmarks that well, but anyway, we're going to get that out.

This is one—you have the fat bottom of the vault here. The casket sits on that. The principle of this is that if water gets in down here and it rises, this acts as a fail. As the water rises, the air in the top compresses and pushes the water back down. Remember your physics. I'm sure all of you remember that. Anyway, now this is a forty-eight-year-old casket. It has a little handle here that you use an Allen wrench on to open the top. The funeral director didn't have a wrench that would fit a forty-eight-year-old casket, and so, what do you do? You're about ready to get there, and all of a sudden you're astounded by this problem. Well, vice-grip pliers, they'll open anything.

We're going to start on the skull and then x-ray our way down. This is a skull. Note the fractures to the top of the skull—three fractures here. Note the right temporal bone is fractured, and there are multiple fractures of the face, which you can't see here.

I want to show you something else so you'll understand what's going on. You see this zipper handle right there. Can you see that? Okay. Am I in your way? I'll sit on the floor here if you want me to. You see that little dark area there and dark area here. In the funeral industry, when you have people like this that are so badly damaged that you put embalming fluids in the body, they will leak. And they [industry personnel] want to keep their embalming fluids in, so they have a rubber garment called a uniroyal. They put the uniroyal on the body, and they zip it up. But remember, this is the Big Bopper. The Big Bopper weighed about 270 pounds. This was not big enough to fit

the Big Bopper. It's the only one they had, and they couldn't get it zipped all the way up, so it's gapped at the top.

Now, going on down, this is the thoracic area. This is a typical deceleration fracture. This is where you're going forward at a rapid rate of speed and what you're in stops, but you keep going. And you start pushing in on your ribs here in the front. Where do they break? They break in the back, here along where the ribs attach to the spinal column.

Let's start up here. There are your handles of the garment. Note the fracture of the clavicle. Now, note a fracture here, all the way down. A little displacement there—fracture, fracture, fracture all the way down. Let's look at the other side. This would be the right, and this would be the left—fracture, fracture, fractures all the way down—displacement, displacement. We have twelve pairs of ribs, or twenty-four ribs, and every one of the twenty-four ribs is fractured.

Now, let's look at the spinal column. Going down the spinal column, your vertebra in the neck are known as the cervical vertebra. Those to which the ribs attach are called thoraces, and the five at the bottom are lumbar. This is the ninth thoracic vertebra, and that's the tenth. Note the displacement—it's fractured through the spinal column right there.

Going on down to the leg, this would be the right femur. This would be the knee. This is the tibia. Note the compound fracture of the tibia and the fibula. By the way, this is a sheering fracture that is often seen in people that jump off of buildings, or if you jump off a bridge, miss the water, and hit the ground. You literally sheer the end of your femur off, and that's what that is right there.

Then this is looking at the left-hand side. This is your femur, and that's your patella. That's the knee cap. The tibia and fibula fracture there. Now, this one—you

normally don't see this view of the foot. We now have a pretty good idea of what happened to the Big Bopper. But when you have your legs broken like that, when you are buried, your feet don't stick up. Your feet fall over on the side. We have a pretty good idea of what's happened to the Big Bopper, so instead of holding this and getting more x-rays—because we have to hold these things to get the mobile x-ray unit in there to get these pictures—[we can see] that's got a lump right there. That lump is the osteological evidence of a fracture through all five metatarsals of the foot. Every one of the foot bones is fractured across there.

Now, going on, this is where the Big Bopper is buried now. This is the plaque that the State has put up. They have not put up the monument yet, but there is that. Now, one of two questions. Did the Big Bopper survive the crash and was he going for help?

AUDIENCE: No.

DR. BASS: Okay, great. Now, was the Big Bopper shot?

AUDIENCE: No.

DR. BASS: No. I should have talked to you a little bit about being shot, but those of you with law enforcement and those of you in the legal field have probably dealt with gunshots. There's no indication of that [a gunshot wound] at all. No, he did not survive the crash. He was thrown out because of the momentum. When the plane crashes, he just keeps on going and goes through either the windshield of the plane or the cockpit of the plane. You see what you can do. If you go back and look, you can find things that somebody didn't think anybody needed to know before we got there.

Now, it's about eight minutes after 10:00, And at 10:10 I self-destruct, so we can take one question.

UNIDENTIFIED AUDIENCE MEMBER: What's the hardest thing you've been asked to do in forensic anthropology?

DR. BASS: What's the hardest thing people have asked me to do? Said a little bit differently, the hardest cases are those that you can't identify. They mainly occur with young females. We're in a period of culture now where children get on drugs. You get the young girl who gets on drugs—she's just, say, twelve, thirteen, fourteen, fifteen, in that area. She runs away from home. She does not write home. She needs to eat, so she gets into prostitution. When you and I got our jobs, we had resumes. We had all the good things that you've done and so forth. But if you're a prostitute, if you go to Memphis and you're the new girl in town, your business goes up. Everybody wants to have sex with Suzy.

As time goes by, people don't frequent Suzy as much, so Suzy's income begins to decrease. So she leaves Memphis and goes to Nashville. When she leaves Memphis, she doesn't go to Frank and Tom and say, "Hey, will you write me a letter of recommendation? Best sex I've ever had, you see." She goes to Nashville, and there's no paper trail. The same thing happens in Nashville, and then she moves to Knoxville. So she is here in town, with no paper trail to follow her at all. She is killed, and the Knoxville newspaper will write about it, but wherever she came from, they don't know she's dead. She's not writing home to her family, and so she's lost.

The next thing you go to is what the FBI has: a forensic data bank known as the National Crime Information Center, the NCIC. If you have a loved one that is missing, you give information on that individual, and you

send it in—but in this case now, the family doesn't know that this woman is missing—so there's nothing in the system. Now, I'm on the other end. I have this skeleton. I know who it is, and I send my data in, but it doesn't match because there's nobody that's put the information in on the other side. It's not that the system is wrong or anything like that. It's just that it's incomplete the way the culture is set up right now. I promise not to answer all of them so long.

EDITOR-IN-CHIEF SALLY GOADE: Dr. Bass will also be with us after the panel presentations when both the panel members and Dr. Bass will be able to answer your questions. I think he can sign a few books, but he may need a break. His books are for sale in the front also. Thank you, Dr. Bass.

DR. BASS: Thank you.

[Break]

MS. RICE: We're going to get started. Now is the time in the program when we will begin our panel reactions to the morning keynote. Starting that panel discussion will be Dr. Terry Bunde. I would like to let the panelists once again know that we are going to have an allotted time of twenty minutes for you each.

PANELIST'S RESPONSE

Dr. Terry Bunde

DR. TERRY BUNDE: Thank you for inviting me. I do appreciate the invitation, but I feel I must give you a disclaimer. I think Bryan [Hathorn] told someone about

my proclivity to long-winded speeches, so I'll keep an eye on the sign.

I was asked to look at this, and I have heard Dr. Bass many, many times. I knew probably what he was going to say, but he still surprises me every time I hear him. I want you to know that I am a biochemistry and organic chemistry professor. Make sure that doesn't say something dealing with stereochemistry, and you'll know you're in the right place.

I have spent the last eleven years of my career at Maryville College. I've been teaching for over thirty-five years, but I've spent the last eleven years teaching a science class to non-science majors in forensic science. I'm probably not responsible for turning out lawyers or judges, or turning out scientists, but I hope I'm turning out better jurors for you in your courtrooms. That's my goal at least for the next fifteen or so minutes.

This is a quotation probably many of you have seen from Donald Shelton's article on the CSI effect,² one of many that have come out since the popularity of those programs really began. If you don't know the statistics, 70,000,000 people in the United States on any given week watch at least one episode of CSI.³ These are people who are going to wind up in your juries. What Shelton observed is, as you can see, that people claim their science knowledge came not from their background in high school or college, but from the media. What they see on TV and what they see in the newspapers and magazines.⁴ And this so-called—what I would call—pseudoscientific knowledge

²Donald Shelton, *The 'CSI Effect': Does it really exist?*, 259 NAT'L INST. JUST. J. 1, 6 (2008) ("Every week, the ever-evolving scientific and informational age comes marching through the courtroom door in the psyche of almost every juror who takes a seat in the box.").

³*Id.* at 2.

⁴*Id.* at 1, 6.

comes marching into the courtroom any time juries are seated and a trial begins. That preconceived notion of what science is, is out there in the general public.

What it really comes down to, and why I spend so much of my career teaching non-science majors science, is that we have a serious problem in this country for science literacy. I told the organizers when they asked me to come and participate that that is what I could talk knowledgeably about. This is the definition that the National Academy of Sciences came up with a little over fourteen years ago for science literacy.⁵ I think it's really important to see that you can sum this definition up in a few words. We want people to be able to be consumers of scientific information. The last sentence really speaks to the folks you're going to see in a jury box.⁶

Scientific literacy also implies the capacity to pose and evaluate arguments based on evidence to apply conclusions from such arguments appropriately. When we begin to assess science literacy in the United States, or any other country, we have to think about this background. This is from the AMERICAN SCIENTIST over twenty years

⁵ Scientific literacy implies that a person can identify scientific issues underlying national and local decisions and express positions that are scientifically and technically informed. A literate citizen should be able to evaluate the quality of scientific information on the basis of its source and the methods used to generate it. Scientific literacy also implies the capacity to pose and evaluate arguments based on evidence and to apply conclusions from such arguments appropriately.

NATIONAL ACADEMY OF SCIENCES, NATIONAL SCIENCE EDUCATION STANDARDS (1996), *available at* <http://books.nap.edu/openbook/0309053269/gifmid/22.gif>.

⁶ *Id.*

ago.⁷ It told about an accident on a San Diego freeway where a fifty-pound bag of industrial pigment, iron oxide, fell off a truck and spilled onto the Interstate.

A hazardous response team was brought out in their hazmat suits, the full body armor. It took them eight hours to clean up the spill. Hively wrote about this, suggesting that anybody who has some knowledge of science, maybe even rudimentary knowledge, knows that iron oxide is rust.⁸ It's used in red barn paint. And that iron oxide posed absolutely no threat whatsoever. So while people were chilling their heels on this Interstate for eight hours waiting for them to open the Interstate back up, no one posed that question.

What Lienhard really said in this comment is that no one stepped up to say that there was more rust coming off the structural steel in the bridge a few miles up the road than ever came out of this bag. But it was knowledge that iron oxide is a chemical—all chemicals are “bad.” Therefore, we have to treat it as a hazardous spill.

I'm not going to ask for a show of hands. I won't give a final exam question as Dr. Bass proposed, but these are a few questions—there were many more—posed by a basic science literacy quiz given to Canadians. I always tell my students, “I use Canadian studies as an example because we can feel good about those dumb Canadians.” I hope I didn't offend anybody, but I'm sure my counterpart in Ottawa is doing the same thing with a study of Americans in science literacy.

One of those questions is particularly vexing for me as a chemist and a biochemist. It's not on the screen. The

⁷ John H. Lienhard, *Engines of our Ingenuity*, at <http://www.uh.edu/engines/epi341.htm> (citing William Hively, *How Much Science Does the Public Understand?* 76 AM. SCI. 439-44 (1988)).

⁸ *Id.*

question said, “Radioactive milk can be completely rendered harmless by boiling.” Eighty-six percent of the people called in the poll—1,000 people randomly chosen, without background and education necessarily, thought that was a true statement. Over half of them responded to the question that the Earth is at the center of the universe and not the other way around. We had people burned at the stake defending that one 500 years ago. This is the knowledge that the general public has about science. The last one is particularly interesting to my colleagues and my former students who are medical doctors when we go demanding an antibiotic for a viral infection. That misunderstanding of a basic sort of biomedical principle is rampant in the population.

This is a diagram I’m going to spend some time with and then go through the remainder of it and talk pretty quickly. This diagram gives me a chance to tell students something that most of us can’t get after we leave an educational institution and move on in our careers. That is, how is scientific information gathered? It is based on observation, followed by a deductive process going to a model. From that model, we propose by deduction some hypothesis. Think of that as the “If, and” statement that you had in your life. And that “If, and” statement allows us to do meaningful experimentation. It depends on what branch of science you are in, but that experiment could be everything from physics, to chemistry, to biology, to medical science. You name it, and we get another observation.

At this point, either that observation verifies the model that we’re working with, and that model notices upstairs in the world of ideas in our brain, not the world of facts around us, or it could be that the observation now suggests that we need a new model for the way in which we hold all this information, these observations, together. It was Thomas Kuhn, in his very famous book, *THE*

STRUCTURE OF SCIENTIFIC INFORMATION, who proposed that this is the point where you have revolutionary science.⁹

You have two competing models, two competing camps, and that must be resolved for a science to proceed. In many ways, creation science and evolution are good examples of this. That crisis of contradiction, Kuhn called it, leads to a paradigm shift. He wrote that word first and now it's used for everything. The idea is that we've got to move from the old model to the new one, so we can then do meaningful experimentation.

Now, why is this relevant and why am I teaching you science? Well, if you summarize that page in some way, you summarize it by saying that scientific statements are probabilistic and subject to change based on new observations, new experimental results, and new interpretations—I mean, new models. Scientific models and conclusions are based strongly on experimentation, statistical interpretation of results and the fit, if you will, with a particularly accepted model in some discipline. That's how scientific information is produced.

This verification step is really, really important. I can't go out today and publish a paper on something I dreamed up yesterday without some meaningful verification from previously existing facts or new information that I gather in my laboratory.

The term paradigm shift in Saks and Koehler's famous article in *SCIENCE MAGAZINE* in 2005 suggested that there is currently a paradigm shift in forensic science with sort-of small Fs and small Ss.¹⁰ Because DNA

⁹ THOMAS KUHN, *THE STRUCTURE OF SCIENTIFIC INFORMATION* (Univ. of Chicago Press 1996) (1964).

¹⁰ "Converging legal and scientific forces are pushing the traditional forensic identification sciences toward fundamental change. The assumption of discernible uniqueness that resides at the core of these fields is weakened by evidence of errors in proficiency testing and in actual cases. Changes in the law pertaining to the admissibility of

evidence and DNA technology have moved from biomedical and sort-of molecular biological research applications into the courtroom, allowing us to identify someone and individualize completely a DNA source, then this has caused the other forensic sciences to begin to be reexamined in a new light.

You've got changes in the law that occurred about the same time that you know much more about than I do in terms of allowing someone to testify in the courtroom. That scientifically based model of DNA evidence means that those jurors, who watch CSI, the 70,000,000 of them a week, are coming into the courtroom demanding DNA evidence in a burglary case and demanding DNA evidence in an auto crash case because they can understand that because someone on the TV explained it to them.

What they explained to them, as I tell my students, and I've taught about 300 of them in the last ten years, I tell them that the instruments that you see on the CSI shows came from companies that provide them free of charge so that you can see the eye candy with Perkin Elmer, Bechman instruments, and Agilent Technologies, and yet they don't necessarily use them the correct way. They don't get the answer in five minutes, but that eye candy attracts attention. My wife refuses to watch any of those shows with me because I make disparaging comments: "Oh, yeah, right. That's the right way it's done."

The point is that other forensic sciences are now not being called on the carpet. We're asking them to consider the scientific basis for those various techniques. Why is this a problem? Well, I think Robert Bohrer sums it up

expert evidence in court, together with the emergence of DNA typing as a model for a scientifically defensible approach to questions of shared identity, are driving the older forensic sciences toward a new paradigm." Michael J. Saks & Jonathan J. Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCIENCE MAGAZINE, Aug. 5, 2005, at 892.

better than I could.¹¹ I could just leave this slide up and leave, and I think the case is made. We have two different disciplines that have two very different ways of looking at the world. Science is very digital and focuses on measurement. Law is analogical and depends on precedent. Science is predictive, general, and replicable. Law is retrospective and particular. Science is objective and universal. The law is normative and contingent. That's the nature of the two beasts, and we're trying to resolve this in a courtroom with expert testimony.

The National Research Council ["NRC"] book¹²—if you haven't read it, I highly recommend that you do. It is an enormous undertaking of scholarship over the period of three years, looking at the state of forensic science; a pathway to the future was the topic. [The Report] came out last summer. The National Research Council gathered together many experts from all the different disciplines they could get to look at the forensic science that we use currently in our courtrooms and we use in criminal investigations. Some of those disciplines—because they come from a research scientific background like nuclear and mitochondrial DNA analysis and light toxicology and drug analysis, both of which had a valid research base before they were ever applied in courtrooms—those disciplines, because they come from this experimental background, have a very strong statistical population database to draw from to make comparisons.

¹¹ "Science is digital—it focuses on measurement; Law is analogical—it depends on precedent. Science is predictive, general, and replicable; Law is retrospective and particular. Science is objective and universal; Law is normative and contingent." Robert A. Bohrer, Law Professor, California Western School of Law, San Diego.

¹² COMMITTEE ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCES COMMUNITY, NATIONAL RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (2009).

As some of my former students who have gone on to work in the local TBI [Tennessee Bureau of Investigation] lab, one of whom testified in all of the trials so far in the [Shannon] Christian murder case, that when she was sitting in my classroom, she learned how science was done. She went off and got her Master's Degree in DNA molecular biology and then got a job with the TBI and has done a great job in hiring former graduates of Maryville College. I have a toxicologist there and two other DNA technicians there, all of whom are graduates of the college.

They went into this field because they liked the science, and notice they went into the toxicology and DNA areas. But there are other forensic sciences, as Dr. Bass alluded to, that depend on expert interpretation of patterns. These are things like fingerprints, writing samples, tool marks, fibers, hair, and fire debris. Just add to the list. It requires an expert like Dr. Bass with his many years of experience to be able to interpret that for you, as the counsel, and for the jury so that everyone understands that it's his expertise he is bringing to bear.

Now, Dr. Bass doesn't fall into that second category because of his many years of research in osteology; bringing together a database of human skeletons allows him to identify the gender, the age, the height, and the approximate handedness of that individual when presented only with bones. That experience is based on scientific research, but there are many things, like fingerprints, that have never been tested. How many times have any of you who practice law for a career heard someone testify, "The prints are an exact match"?

In order for that to be true, we have to get one basis statistic. How do we know there are not two people with exactly the same fingerprints? It would require an enormous amount of research to do that kind of study, but

it's never been done. The biggest study I know of is about 1,000 individuals who were looked at.

What's the basic information we're trying to exact from the scientific testimony? Well, we want whatever we use to be reliable and established in a systematic and scientific manner. Go back to the diagram. We've done model building exercises. It should be precise. That the method has been applied broadly by trained scientists. To me, that's somebody educated in the sciences. We look at the probative value of that method. Then, of course, in this day and age, we have to look at the admissibility of that evidence in a courtroom. All of you know *Frye*¹³ and *Kumho Tire*¹⁴ and *Daubert*¹⁵ and *McDaniel v. CSX*.¹⁶ But that's going to tell you whether or not the person doing that forensic science can testify as an expert in a trial. All of that depends on that evidence.

The probative value of that evidence gets more and more important as we're able to individualize that evidence. The National Research Council's study devoted a great deal of discussion to this very issue of moving from identification of evidence at a crime scene by some crime scene investigator—I collect the white powder—to the classification of that white powder in the field, provisionally, and then in the lab by scientifically based toxicological techniques like gas chromatography and mass spectrometry to classify it as a particular narcotic, let's say.

The idea would be, for probative value, to individualize that white powder to another white powder found on some individual to be able to say beyond any sort of scientific hesitancy that those two powders are the same.

¹³ *Frye v. United States*, 298 F. 1013 (D.C. Cir. 1923).

¹⁴ *Kumho Tire, Co. v. Carmichael*, 526 U.S. 137 (1999).

¹⁵ *Daubert v. Merrell Dow Pharm, Inc.*, 509 U.S. 579 (1993).

¹⁶ *McDaniel v. CSX Transp.*, 955 S.W.2d 257 (Tenn. 1997).

The irony, of course, as many of you know, is that it isn't the cocaine that identifies those two powders. It's the other stuff that's there in vanishingly small amounts that allows us to make that individualization assessment, but that step from classification to individualization means that the probative value of that scientific evidence goes up a lot.

What the NRC questioned in their study were some of the forensic sciences that make that step without having the scientific background and statistics to back it up. They questioned whether we can say that in terms of a courtroom. Their conclusions were—and I'm taking 100 pages and boiling it down to one slide—that many methods result in class evidence. That's as far as you can go. Some DNA can result in associated uncertainties, the level of scientific development, and statistical relevance.

Let me get to the conclusions since I have thirty seconds. What do I, as a scientist, not a forensic scientist, think? Well, the improvements are going to come from publicly funded research. We have to pay for these studies as a country—not a company—as a country. We have to put money where our thoughts are. We give thousands upon thousands of grants through the NIH [National Institute of Health] and the NSF [National Science Foundation], but only about eight of them ever wind up as forensic investigation. We need that research to be done.

Two, the ability to individualize evidence must be based on strong scientific principles and not past precedent. I am a fingerprint expert. I've done it for thirty years. I can individualize two prints. The science literacy of the population, from my perspective, from which you draw your jurors and will continue to draw your juries, has to be improved. That means I've got to do a better job educating college students, but our high schools have to do a better job educating high school students for people who don't go any further. Thank you very much.

MS. RICE: We're now going to move on to the next presentation with Professor Bernard Raum. Also, we're going to save time at the end of all presentations for a couple of questions.

PANELIST'S RESPONSE

Professor Bernard Raum

PROFESSOR RAUM: Good morning. It's a pleasure to be here. He's a UF [University of Florida] graduate.

DR. BUNDE: We're in hostile territory.

PROFESSOR RAUM: No, no, no. I start with the premise that we have to keep it in the SEC.¹⁷ We don't worry about the rest of the country. That includes sports. Hopefully, that's a comforting thought. Before I get into my talk, there are just a couple of things that, as I listened to the last presenter, I wanted to take note of very quickly.

First is the education of the people. A couple of years ago there was an individual who went around county fairs and big events. He was signing up people to petition for the banning of hydrogen hydroxide. People who signed the petition would walk away thinking, "Oh, my God. It's in everything. It's in the water we drink. It's in all—oh, my God." Of course, hydrogen hydroxide is a hydrogen atom with a hydroxyl. Okay, HO. It's water. H₂O. Hydrogen hydroxide. Try that some time to see what

¹⁷ SEC is an acronym for the Southeastern Conference. The Southeastern Conference is a college athletic conference headquartered in Birmingham, Alabama, which operates in the southeastern part of the United States. See generally http://www.secsports.com/the_sec/.

reaction you get. I recommend Thomas Kuhn's text.¹⁸ He's written a couple of books on this phenomenon, and he's a fantastic thinker if you really want to get into the mindset.

What else did I remember? Just a couple more things. With respect to the exact match, a conundrum. I always found it useful to take both fingerprints, put one up on the screen or on a chart and just overlay the other one. This way you can let the jury see for themselves. They make the final call. We don't worry about eleven points or nine points. There's the print. You figure it out. There it is, ladies and gentlemen. You can do this. That's where the problem may lie in fingerprints. If the jury is shown a good print and overlay, we don't need expert opinion.

Also, from my observation, the application of forensic science doesn't point to an individual. It excludes the rest of the population. That's what we really do. It's an exclusionary technique. Whatever is left, according to Sir Arthur Conan Doyle and Sherlock Holmes, must be the truth.¹⁹ And that's where we are. Also, the National Research Council and the American Academy of Scientists' Report is an excellent source, and I suggest you take a look at it.²⁰ I bring it up because in the chapter discussing education in the legal system, on page 236, they

¹⁸ See, e.g., THOMAS S. KUHN, *THE ESSENTIAL TENSION: SELECTED STUDIES IN SCIENTIFIC TRADITION AND CHANGE* (1977).

¹⁹ "It is an old maxim of mine that when you have eliminated the impossible, whatever remains, however improbable, must be the truth." SIR ARTHUR CONAN DOYLE, *The Adventure of the Beryl Coronet*, in *THE ADVENTURES OF SHERLOCK HOLMES* (1892).

²⁰ COMMITTEE ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCES COMMUNITY, NATIONAL RESEARCH COUNCIL, *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009).

mention my Florida Bar CLE²¹ as the kind of program that should be used to educate lawyers and judges. If you want to take the course, go ahead. It's online, but don't do it until June because we're putzing around with it. It's been there for a couple of years, but we're changing some stuff. Anyhow, I wanted to point that out to you.

Let me get to the meat of what I want to say here. I learned an interesting thing from Dr. Bass this morning. Well, let me show you something. We'll get expert witnesses and their evidence. What I have given in terms of the written materials to the law school for the journal is a checklist. This is an evidentiary checklist that every lawyer uses subconsciously or should be, every judge uses subconsciously or should be, to assess the admissibility of evidence. This one is particular to forensic evidence. It works every time and will ensure that you don't overlook anything. I suggest keeping this checklist with you at trial. Okay, I'll show you.

This is a great quote; I love it. "Jurors are quite capable of seeing through flaky testimony and pseudo scientific claptrap. We should not waste our valuable time watching witch doctors, voodoo practitioners, or brujas go through the entrails of dead chickens in a fruitless search for the truth."²² That's a great quote, and I understand now that apparently we can get the truth out of dog turds. I wasn't sure until today. Wait 'till I tell my wife. "What is this?" "Don't ask."

I'm going to jump ahead because I don't have a lot of time to talk. For the evidentiary checklist, the first thing to remember is that the trial judge is the referee.

²¹ See University of Florida Forensic Science Distance Education, http://www.forensicscience.ufl.edu/Index.php?/programs/noncred_lawyers (last visited May 4, 2010).

²² *People v. Williams*, 183 Cal. Rptr. 498, 502 (Cal. Ct. App. 1982) (Gardner, J. Concurring).

You need to know that. They make the call. They won't be reversed unless it's the abuse of discretion or they're plainly wrong. Judges aren't plainly wrong. Right? They're in an area that they know about. I mean, most of them don't know what we're talking about here, but they also get to decide who is an expert and judge the expert's qualifications. On a credibility assessment, the jury gets to do that ultimately, but it's the judge that likes to hear the testimony first.

Relevant evidence: Well, we don't need to go over that stuff. I don't have a lot of time. Okay, Rules of Evidence: Scientific, technical, or other specialized knowledge will substantially assist the trier of fact to understand what's going on.

This [slide] used to be where you got expert testimony. These road show guys, the snake oil sellers. These were the people, who for several generations and in Europe forever, touted their magical cures around. They were the experts, or the status, or the quality of the experts that we have. Out of these people came the term "charlatan."

It's derived from an Italian word, and it describes an Umbrian Village, which was known for its "quacks" in the street. I can't say it any plainer than that. Okay, that's where the word charlatan comes from. If you don't think there are charlatans in the practice of law, you haven't been in a courtroom. They're out there. Fortunately, a lot of people know who they are. But the juries don't; the judges don't. It's very problematic sometimes.

These rules are designed to improve that. The average forensic anthropologist is a little bit of a quirky guy, but basically, he's the truth. By the way, my paper was based on physical anthropology, forensic anthropology here in Tennessee. You know, that is actually me. You didn't recognize me. But there he is, and these are the kind

of experts that you see. The jury takes a look at that, and remember, the jury can see your experts too.

First impressions are critical in this situation. When jurors look at a witness, they make an initial determination as to whether they are going to give this person credibility within fifteen seconds. They either identify or they don't. That's from the time the witness is called to get to the witness stand. You have to remember how your witnesses are going to present themselves.

Some of them, like this person [slide], may say, "Oh, he's a little quirky guy. But yeah, okay." Now, this one, on the other hand, is going to cause you some problems, especially note the dead chicken. We don't want him on the witness stand going through the entrails of that chicken. That's what you're going to get out of Dr. McGootoo, who is the noted psychiatric expert. For those of you who have dealt with psychiatrists on the witness stand, it takes one to know one. Sorry, some of my best friends are psychiatrists and psychologists.

With respect to expert witnesses, what we start out with is difficulty in determining their qualifications. At least it used to be because information just wasn't available. The accuracy of the so-called science was left to the credibility and the judgment of the jury, and they had no tools or information with which to operate. The *U.S. v. Frye*²³ case is the first one to try to set some kind of rule. Basically, you read the case, there's nothing supporting it. There are no conclusions. It's like the D.C. Court of Appeals just said, "Well, this is what we think it is." That's typical for the D.C. Court of Appeals, for those of you who do practice there. There used to be not a lot of support for some of the things they used to do.

²³ *Frye v. United States*, 293 F.1013, 1014 (D.C. Cir 1923) (landmark case establishing an objective test for determining the admissibility of expert testimony).

Even after *Frye*, there was no evidentiary test that a court could use to conduct its own independent review of the validity. Then here comes *Daubert*.²⁴ *Daubert* is a really great case. I think it's the best opinion in a long time to address any of these kinds of issues, primarily because the emphasis in the *Daubert* decision was scientific validity. You already heard something on the use of the scientific method. I can tell you right now, Ladies and Gentlemen, for those of you who are new to the forensics area, that's going to be your first area of inquiry. How did these experts, your witness, and the other side's [reach opinions] because you want to prepare your witness to testify. Right? How did they apply the scientific method to produce the results that they're testifying from? If they can't answer that question and they can't demonstrate it and walk you through the process, there's a problem with their testimony and a problem with their methodology.

NFPA 921 is a guide put out by the National Fire Protection Association.²⁵ I can tell you right now, it's the Bible for fire and explosion investigation—the Bible. It focuses on procedures and describes the steps that need to be followed. Following the protocols that are established in here for investigative purposes will get your stuff in very, very quickly. Judges look at it. They don't want to do the hard work, so you give them this and say, "Well, we followed this procedure and protocol that are generally accepted in the relevant community."

Chapter Four, basic methodology—what do they start out with? A two-page explanation of the scientific method and how it applies.²⁶ There it is right there. We're not making this stuff up. This is the bedrock of all scientific and forensics evidence. It's no mistake that the *Daubert* decision tracks this very, very closely.

²⁴ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 592-94 (1993).

²⁵ NFPA 921: GUIDE FOR FIRE & EXPLOSION INVESTIGATIONS (2008).

²⁶ *Id.* at ch. 4.

The focus is on the principles and methodology, not the conclusions that the evidence generates. The true distinction between an expert and a non-expert is that the non-expert witness gives the results of a process of reasoning similar to everyday life. The expert gives a process of reasoning that can be mastered only by special sciences.

Now, I'm going to talk to you for just a couple of minutes about something you think you know. It's called the Opinion Rule or the Pure Opinion Rule in some states. Witnesses usually are required to speak to facts. Rule 7.02 says not necessarily.²⁷ Experts can rely upon questions of skill or science, and those who have made the subject matter of investigation the object of their particular study are competent to give their opinions in evidence.

If the jurors can draw their own conclusions, the expert testimony is not needed. And, of course, under the Tennessee rule, it has to be of substantial assistance. Otherwise, it's what? Not relevant under Rule 4.01.²⁸ Okay. These rules are very, very well intertwined.

Typically, qualified experts render an opinion based upon their own training, education, and experience. In addition, an expert, in drawing that opinion, may rely on input, opinion, or findings from other experts, as well as other facts, which were either brought to the expert's opinion by investigators or are based on the expert's firsthand knowledge. This is from Tennessee court opinions, so I'm talking about the law that is applied here.

If the expert's opinion is based upon facts deduced through the employment of a scientific theory, process, procedure, technique, or methodology, that theory, process, or methodology must apply within the relevant rules of

²⁷ FED. R. EVID. 7.02.

²⁸ FED. R. EVID. 4.01.

evidence. We take a look at the *McDaniel* factors,²⁹ which very closely track the *Daubert* opinion. Scientific method? As I said, that works, and I'm not going to go into the details of it, except to say that there is a completely defined process here. This is already in the slides that you saw here this morning, and you're going to see it again this afternoon.

Let's take a look at [*McDaniel* factor] number two: peer review or publication. There's the scientific method, which is the first process; then comes peer review or publication. The importance of peer review is that it gives other people in that discipline an opportunity to see what's out there and respond to it. The significance of peer review—and the usability of it—is only if it's published in what's called a refereed journal. If you have somebody that's publishing something out of the back of their pick-up truck, forget it. It's got to be a refereed journal, which means there's a process for the submission of documents. I belong to the American Academy of Forensic Scientists. It's a rigorous pre-publication review of experts in the particular field that the paper addresses. They will accept it, reject it, talk about it, tell you to make changes, or whatever. The end product has been peer reviewed before it even hits the press.

In the back of those journals, there are always responses. If somebody has a legitimate disagreement with a paper, they send it in to the editor—I disagree with this and here is why. It's published in the next edition. Peer review is not dispositive, and it doesn't automatically get you through the door. It's only the little added factor as we deal with circumstantial evidence in the accumulation of little disparate factors that would pull together to make a common sense decision.

²⁹ See *McDaniel v. CSX Transp., Inc.*, 955 S.W.2d 257, 262-64 (Tenn. 1997); see also *Daubert*, 509 U.S. at 592-94.

Nowhere in the federal Constitution or in the state constitution of any state in the United States does it require the suspension of common sense when the court gives you a judgment. You can always make a common sense argument.

The potential rate of error—most disciplines aren't subject to that unless it's a scientific lab-type presentation. As a consequence, you're not going to see this in most cases. In chemistry, physics, yes. There are rates of error, percentages, those types of things. If they're published, if they're known, then we need to know about those. Scientific significance or forensically significant means about ninety-five percent, and that's what we shoot for. Whether it comes in will not be a concern. The only thing we're really concerned about in potential rate of error is the existence of false positives. Does the test permit the occurrence of a false positive? If it does, how often? We need to know that.

False negatives don't usually bother us in forensics. It's just passed right over, but it is important in scientific research and in doing your analysis under the scientific method. It's a different thing, and you bring it in through the scientific analysis angle.

The general acceptance in the scientific community is *Frye*.³⁰ Okay, also NFPA.³¹ There are a couple of others you're going to hear about today. ASTM: American Society for Testing Materials. It's been around for over 100 years and [includes] manufacturers, scientists, researchers, and forensics. I'm a member of the ASTM E30 Committee, which is the forensic science committee. There are a whole bunch of ASTMs that are recognized as authoritative with respect to procedures and methodologies. If you can go into court and say, "We've complied with the

³⁰ See *Frye*, 293 F. at 1014.

³¹ See NFPA 921, *supra* note 9.

ASTM, and here it is.” Wham—you’re right there under *Frye* to begin with.

Qualification under the ASTM also does something else for you. It brings in the scientific method qualification too because that’s how all these things are reviewed to begin with and how they’re created. It also brings in peer review because there are people from all over the world in ASTM who participate in the formulation of these procedures. We get stuff all the time. Somebody’s proposed a change, modification, or a whole new procedure. It may take a year or two before everybody exchanges information by e-mail. They “Tweet,”³² and do all kinds of stuff, and finally there’s a consensus that is good.

By the way, I’m going to depart for just a second. With respect to psychiatric diagnoses, the psychiatric DSM Manuals,³³ they were created by a majority vote of people present and voting at whatever current meeting of the American Psychiatric Association. It’s not a unanimous vote by any stretch of the imagination. This is just something to think about when you’re talking about an example of peer review.

Widespread acceptance works, and I suggest that you try to ferret it out of what you’re doing. Also, there’s something called ASCLD. ASCLD is an organization called the American Society of Crime Lab Directors, and it is now the gold standard for crime labs because it conducts intensive review and certification processes for crime labs. Not all the crime labs in the United States are ASCLD certified. That’s a question you need to ask your own

³² Tweets are text-based posts used on the social networking website Twitter. They can be up to 140 characters displayed on the author’s profile page and delivered to the author’s subscribers, who are known as “followers.” See generally www.twitter.com.

³³ DSM is an acronym for Diagnostic and Statistical Manual of Mental Disorders. See generally <http://allpsych.com/disorders/dsm.html>.

expert and the experts on the other side. “Is your lab certified by ASCLD?” “No.” “It’s not?” ASCLD is the gold standard because it does periodic reviews, proficiency testing of the bench people, and they report the results. All this stuff is available. If you’re ASCLD certified, you’re going to have a good chance for getting it into evidence.

Research Independent of Litigation: This is also a keystone that ties back to the scientific method. Is this generally done, or is this done specifically for this case? There’s only one instance that I know of in a reported opinion where an expert was allowed to create his own test, analyze the evidence, and get it into evidence. That was John DeHaan, a national fire expert who wrote [the latest editions of] *KIRK’S FIRE INVESTIGATION*.³⁴ The evidence was admitted because of who John was. It stood on his national and international recognition as the expert in this area. Otherwise, it wouldn’t have been permitted. They figured, well, if anybody can do it, he can. And it came in, subject to cross-examination of course.

Is there anything else? The other thing is that you can forget all of this if the appellate courts in your jurisdiction have already ruled and said it’s admissible. You can just ask the court to take judicial notice of the process.

Oh, a couple of other things. Here are three texts. They’re not in the materials here, but I would suggest you write them down. You need to know statistics and how they’re created for scientists for research purposes. These two—I don’t own interests in any of them—this one is *FOUNDATIONS OF SOCIAL RESEARCH*.³⁵ It’s an older book. It’s probably out of print, but it’s on the bookshelves. This

³⁴ JOHN D. DE HAAN, *KIRK’S FIRE INVESTIGATION* (6th ed. 2006) (PAUL L. KIRK 1969). *See also* DAVID J. ICOVE & JOHN D. DEHAAN, *FORENSIC FIRE SCENE RECONSTRUCTION* (2d ed. 2008).

³⁵ *See* MICHAEL CROTTY, *FOUNDATIONS OF SOCIAL RESEARCH: MEANING AND PERSPECTIVE IN THE RESEARCH PROCESS* (1998).

[statistics book] is my textbook at George Washington University on statistics. It walks you through the process of testing design and biases of how a test is put together and how the questions are assembled. This is really, really valuable.

I can assure you that most of the newspapers don't use this kind of procedure when they put out these questionnaires to people. You get 700 people who are the only ones who are going to respond. It's not an unbiased search, so you're getting people who are focused on the issues anyhow. But this book will get you through it.

I recently had a case I was in the middle of, and there was a doctor on the witness stand the next day. He was asked on direct, "Well, how often does this happen in your experience?"

"Oh, about seventy-five percent of the time."

I'm sitting there like an idiot savant, thinking, "What can I do with this number?" I didn't ask him on cross about his diagnosis. I went right to it. "You mentioned a number, Doctor, seventy-five percent. Where did you get that number?"

Oh, my God, about fifteen minutes into that presentation he said, "I'm guessing."

"So, you were telling the jury information that you were just guessing. Is that correct?"

"Yes."

"Thank you. No further questions." I'm not going to give him a chance to rehabilitate. Of course, his lawyer had no idea how to clean it up.

MS. RICE: Our final panelist responds. This is Professor Margaret Berger.

PANELIST'S RESPONSE

Professor Margaret A. Berger

PROFESSOR MARGARET BERGER: Well, I feel that I just wandered into an alternative universe perhaps. I mean, I'm from New York, and I think we think of ourselves as tough and able to handle anything. But I must say I have never heard a presentation before 9:00 o'clock in the morning that was as gory and graphic as we heard from Dr. Bass this morning. I must say that my students, I don't think, are really exposed to that kind of presentation, but it was certainly fascinating. I've learned some things, and I guess I will find dogs a little more worrisome than I ever did. I love dogs. Anyway, I will take some of these lessons home with me.

I am supposed to comment on Dr. Bass's presentation, and I find it difficult to do. As I said, this is really a very different world. One thing, the CSI effect has been mentioned by both speakers—the 70,000,000 who are watching what's going on and thinking that they now are experts in forensic science. That, of course, is a very troubling problem. I think that, at least in my neck of the woods, one of the things that compounds that problem is that it's getting more and more expensive to have jury trials. We very often, in my area of the country, don't have them because people plead guilty because the sentencing rules really make it easier for those who agree to plead guilty. Therefore, we have far fewer trials than we used to, at least where I come from. A good deal of what happens occurs outside of the courtroom and also happens because of various decisions that people make that they may do better if they plead guilty than if they continue to insist upon their innocence.

One of the things also said this morning was about the fact that scientific statements are probabilistic. I think

that this is something that scientists would agree on and that many evidence professors would agree on. The only problem is that if there is any field that seems to cause people trouble, it's statistics. I don't know how all of you do with statistics at this law school, but statistics are absolutely a nightmare for many of the people who go to most law schools. We know that many people go to law school and not medical school because they hate math, and here they are being told that what you really need to know is statistics. Teaching statistics really seems to be a nightmare for most law schools that do not have required statistics courses. It's one of the things that has always been advocated, and it just doesn't happen because it's so difficult.

As a matter of fact, math is really very, very difficult for law students. I remember trying to do something in a classroom with something mathematical, and everyone got into a fight as to what you do in multiplying fractions. The people just started shouting at each other as to the way we should do this. Well, if that's the level of comprehension that you have in a law school class, you can imagine what happens when one is trying to examine expert testimony in a scientific way.

*Daubert*³⁶ has been floating around, but *Daubert* has been attacked in many ways. I'm going to talk about that some more when I give my talk.³⁷ The question of whether a test permits false positives or just false negatives is a very complicated question, and also one that is not easy for lawyers to handle.

Lawyers simply have not been trained to deal well with mathematical concepts. I don't know to what extent this is treated any differently at this law school, but at most

³⁶ See generally *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

³⁷ Professor Berger's lunch keynote address, *Evolving Trends in Forensic Science*, is printed separately in this issue.

law schools, it is a very, very difficult issue to raise with students. And it takes time. You cannot teach a statistics course in the midst of teaching a law school course and manage to get very far with it. So, I think one of the real problems for lawyers is: How do we manage to resolve these statistical kinds of problems? What do we need to know? How can we put it together? Is a checklist going to help us with asking the right questions? Well, what you really have is sort-of a clash of two very different cultures. We certainly heard that before from Dr. Bunde.

You have a legal culture that thinks there's an answer out there and wants some kind of a formula. And you have a scientific culture that says, "But wait a minute. You really have to observe. You really have to look at this and decide whether or not this is going to apply to this particular form of evidence." The answer is not always very clear, which is why the National Research Council Report about forensic science,³⁸ which I'm going to talk about later, is so important. It brings to the floor the kinds of questions that ordinarily lawyers do not necessarily want to raise and have not raised in the years in which they have been dealing with evidence.

We have sort of a weird timeframe, which you have to remember, which is that most of forensic evidence came into being really before we had some of the rules of evidence that we now have. We have a mismatch, not only in terms of culture, but in terms of timing. The real question is how then do we resolve these issues?

For instance, I heard Dr. Bass talk about getting fingerprints off what is left behind in the cases that he gets, and I really was curious as to—he said the FBI knows how to do that. How does he know that the FBI knows how to

³⁸ COMMITTEE ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCES COMMUNITY, NATIONAL RESEARCH COUNCIL, STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD (2009).

do that? That's really one of the questions that we have at the moment where fingerprint evidence is really under a good deal of attack: How does one determine whether something has really been made valid? What are the scientific methods that need to be applied? How do we verify that we are really dealing with a scientific truth and not just something that somebody in some discipline has decided to go and talk about?

One of the other things mentioned before was fire investigation. I'll talk more about this later too, but that is one of the areas where a good number of questions have been raised lately. Not about whether there was a fire—of course, there was a fire. And, of course, perhaps people died in the fire. But how do we know really that when the expert says an accelerant was used, that is actually the case? What proves that that accelerant was used? There have been a number of suggestions lately that a good deal of this testimony is absolutely not necessarily true. That yes, one can see patterns, but that there are other things that can cause the pattern, rather than an accelerant. How do we test these things? This is a very troublesome area.

The entire area of forensics is a very troublesome area because, as you know, it's the forensic evidence that often sends a person onto death row. We have had a fair number of cases as of late, over 250, where convictions have been overturned on the ground that the forensic evidence was wrong. That should give everyone some pause. In addition, it's not just that when the forensic evidence is wrong, you have someone going to prison or maybe death row. It also means that somebody is out there who hasn't been put into prison, who is the person who really committed the crime. That, in a way, is even more worrisome. You've got the wrong person, and therefore the right person, who wasn't identified, is still wandering around.

Forensics, at the moment, seems to me really one of the more troublesome disciplines around. I found it interesting to hear what all of you are saying or thinking about what is needed to correct this situation. I'm going to talk later about this report, which you can see lying there, and some of it contains very, very troubling findings that really affect everything that happens in a courtroom when one is depending on forensic interpretations.

What can I say that I think? I think that statistics are getting more and more important. I think it's understood that you need some kind of a statistical, probabilistic basis for the kinds of statements that people make in the courtroom, and it's very hard to figure out how to manage that in a law school. Obviously, colleges don't require statistics as something needed for graduation, and neither do law schools. Certainly, it would seem to me that that's one of the most important things that all of you really have to think about, unpleasant as it may be to think about. It is very difficult to teach a good statistics course. To teach a good statistics course embedded in an evidence course is really virtually impossible.

How does one get this information across to lawyers? A good trial lawyer sort-of intuitively knows statistics often without being able to explain exactly what it is that he or she is seeking to achieve. But to really manage to survive an active cross-examination, you may have to do something about statistics, whether you like it or not. As I said, there's no question that most law students hate statistics. I mean that's really not why they went to law school, to deal with math. Statistics, unfortunately, really is grounded in math.

One of the things to think about is whether you should forget about your ideas when you went to law school that it had nothing to do with this subject and to nevertheless see if you can't get some kind of a grounding

in how statistical thinking works—very, very helpful to a good lawyer.

I think I'm just about to the end of my time. Two minutes. Well, I don't know that I even want to use my two minutes. I'd really rather hear from all of you and whether you have some questions.

QUESTION AND ANSWER SESSION

MS. RICE: Before you ask a question, if you would, state your name for our court reporter. We will now open the floor for questions for all of our panelists.

JESSICA VANDYKE: My name is Jessica VanDyke, and I'm a second-year student here at the law school. Dr. Bunde, as well as all the panelists, discussed the CSI effect.³⁹ Do any of you have thoughts, as future trial attorneys, about what we can do in the legal profession to try to correct the CSI effect? Because the shows are becoming more popular; they obviously aren't going off the air. There are like twelve of them now, so what can we do to correct that in our profession?

PROF. BERGER: I think that's an excellent question, and I think it's a very difficult question. Obviously, one needs more science education, but people are very resistant to more science education. Science is not easy. It's hard, and it takes time. I think it is very difficult to overcome the CSI effect. I don't know whether really the problem can be dealt with at a law school level or if it's just part of the problem with American education altogether. It should be dealt with in elementary school or high school, but it is very late to start dealing with it in law school.

³⁹ See generally Shelton, *supra* note 2.

I guess the most that you can do is keep saying that the show is not real, but why people would believe you when these shows have millions of viewers is really very difficult. Judges could help a little if they were more sympathetic at times and gave better instructions to jurors as to what they should do. The ingrained thinking of Americans as to what science is, even though they're completely wrong about it, certainly isn't an easy problem to deal with.

PROF. RAUM: Can I take a stab at answering that question? You have to anticipate the issues that may come up in your individual case. I'm a former prosecutor, and I tend to approach things from the prosecutorial point of view, that is, in terms of framing a case. So you've got a basic idea. I think they always want DNA. They always want fingerprints. Very few crime scenes actually give you reproducible, forensically significant fingerprints. DNA is a little better, depending on how it's processed and who does the reading of the results because therein lies the devil. The devil is always in the details of the DNA analysis.

What you do is you've got your expert on the witness stand, your crime scene person, or the detective who led the investigation, and you ask him several questions. "Well, did you find any usable fingerprints?"

"Yes."

"Well, what does that mean?"

"Well, no, we didn't and here's why." Basically you have him explain in advance all the issues you'd anticipated.

Typically, I don't encourage anticipating defenses for issues, but this isn't a defense. This is anticipating a question that the jury is going to have because they're going to go in the jury room. At some point, they're going to write a question to the judge, and the judge is going to

say, “You have to decide the case on the testimony at trial.” That’s all the help the law can give them. But you, as the attorney, can get your witnesses to do that when you present your case. You can say, “Well, I know what these people are thinking about, so I’m going to deal with it.” You could ask, “How long does it take to get a fingerprint back from AFIS?”⁴⁰ Well, certainly not in five minutes on the computer with the guy’s picture and his criminal record. You know, does anybody know how that AFIS fingerprint process really works? Nobody?

First of all, the local guy, he’s got to digitize the print so the FBI can read it. They still use the old FBI designation system. They’re going to send that digitized print and that descriptive designation to the FBI. They will run it through their IAFIS database.⁴¹ That will kick out twenty to thirty, maybe fifty possible matches.

That information is going to be sent back to the local police investigator. They have to get copies of each one of those individual sets of fingerprints and do a hand comparison. The FBI will not do that unless it’s one of their own cases. They used to, but they won’t anymore because they had too many requests. When I was a prosecutor, the FBI did virtually everything we wanted, so it was great. We just interfaced with them, and they did the kind of tests we wanted. Whatever we wanted, we’d ask them to do this special stuff.

Juries come in with expectations. You have to answer those expectations. They want to know, did we find any usable DNA? Was it degraded? Of course, now we

⁴⁰ Automated Fingerprint Identification System (AFIS). Law enforcement agencies use AFIS to identify unknown fingerprints. The acronym can refer to automated fingerprint systems in general or the United States national AFIS: Integrated Automated Fingerprint System (IAFIS).

⁴¹ CJIS, Integrated Automated Fingerprint System, *available at* <http://www.fbi.gov/hq/cjisd/iafis.htm> (last visited May 5, 2010).

have the mini-STRs that are revolutionizing DNA in terms of degraded samples.⁴² They're starting to work quite well. John Butler up at the National Institute of Science and Technology pulled all that stuff together. It's a great website there.⁴³ NIST and John Butler. John is probably the international expert on this stuff now, and John has a huge website there. Go to it and start looking, and it will give you jumping off points.

Let me tell you something else: PUBMED.⁴⁴ How many of you have heard of PUBMED? Do you use it? All right. P-U-B-M-E-D. It will take you to the National Institute of Health Reference Library in Bethesda. It's all online. You will get extracts. It's a huge database like Lexis. Okay, I use Lexis instead of Westlaw. You can come up with the current writings, the current issues. You can sift through the literature and bring yourself up to date on specific, really small issues: a great source of information. Because remember, you don't have to know everything there is to know about a particular science. You only need to know for that day the background that the expert is going to be using for that case. You can just chop your research right down for the most part. You need an

⁴² See DNA Diagnostic Center, *DNA Diagnostics Systems: Forensics, Mini-STR Testing*, <http://www.forensicdnacenter.com/dna-ministr.html>. (last visited May 5, 2010) (Mini-STR is "a testing system that exploits the ability of specially designed primers that preferentially target the larger STR loci. While standard STR primers target longer sequences that include the STR loci, mini-STR primers 'zoom in' on the STR locus so that the resulting DNA product is smaller, thereby increasing the chances of successful amplification of the larger loci."); See also Leonard Klevan and Lisa Lane Schade, *Identifying Degraded DNA*, FORENSIC MAGAZINE, available at <http://www.forensicmag.com/articles.asp?pid=131>.

⁴³ See Mike Coble, et al, National Institute of Science Technology, <http://cstl.nist.gov/div831/strbase/miniSTR.htm> (last visited May 5, 2010).

⁴⁴ United States National Library of Medicine, PubMed.gov, <http://www.ncbi.nlm.nih.gov/PubMed> (last visited May 5, 2010).

overall course in forensics to have an idea of what is actually out there and what you can and cannot do with the various sciences, and you cannot get that from television.

KATHY MORANTA: My name is Kathy Moranta, and I'm a prosecutor. I guess I'm interested in hearing from the panel. I've read the National Institute of Science Report, but in everyday practice there have been challenges by defense attorneys so far to things like fingerprints. That's what I'm most concerned about. None of our judges have upheld any of those challenges. In terms of real practical handling cases, what would you have to say about fingerprints and using them. I think you suggested putting them on top of each other, and we do that. But what about allowing an expert to say something like, "Yes, I've excluded. Yes, this is a match"?

PROF. RAUM: Exclusions are easy to do with fingerprints. Inclusions aren't. As I said, forensic science is all about excluding. Everything we do in terms of analyzing, "Well, am I going to do this, or am I not going to do this? Am I going to drive this way today, or am I going to go that way?" Traffic is or isn't bad at these times. These are all shifting sands of knowledge. Juries do this too. They come to the court with their own background, and so do you in formulating your questions, views, and your opinions.

Keep in mind this is probability in action, but it's a very loose probability. Sometimes there is really bad statistical evidence for this particular probability statement, so keep in mind that's what jurors are going to do. "Well, this probably happened or didn't. Well, beyond a reasonable doubt—preponderance of the evidence." How do you quantify that stuff?

I came from a county where we had the Johns Hopkins Applied Physics Lab, and we had all kinds of

PhDs, chemists, and mathematicians. I never put them on my juries if I possibly could, because they don't think in a statistical basis. They think in absolutes. It either is or it isn't. Its 100 percent or it's zero. That's kind-of hard. Of course, there are a lot of people out there now, especially with all the political stuff that's going on in this country, that are coming out of the closet that have those ironclad opinions one way or the other. We know who they are now.

DR. GOADE: Thank you, Professor Raum. Professor Berger was asking about how Dr. Bass would know that the FBI could get the fingerprints in. We didn't have Dr. Bass at that time. We have him back, and I wonder if we could maybe get that and then see if we have any more questions.

DR. BASS: You want me to. . . .

DR. GOADE: Did you hear Professor Berger's question?

DR. BASS: I heard her question. That's right. I'm sorry to disturb your morning, by the way, with the gruesome pictures before 9:00 o'clock. They usually call you Friday night with a case, and they want you to come immediately. I have trouble with that in that I said, "Look. Why don't you just secure the crime scene until tomorrow because there's nothing better than sunlight to do a case?" I don't care how many lights you set up, it doesn't work as well as the sun, and you get animal activity where it's scattered all over. So, I say, "Just secure the scene and tomorrow will be" I mean, look, if the guy is already dead, it's not going to hurt him to be dead one more night, you know, until we can get there and do it right the first time.

The comment on the FBI doing fingerprints from the underlying dermis actually comes from Arthur Bohanan, who was a senior criminalist for the Knoxville

Police Department here in Knoxville. Art is a fingerprint expert. You say, “Whatever that means.” He has done his research and worked in the fingerprint area, and he has designed this super-glue method of recovering fingerprints. He told me that when you have cases in which the epidermal layer is missing, the FBI does have the technology to recover prints from the underlying dermis. Although this, I gather, is very difficult. I have never done this, and I’m passing along information from people in the area. I’m not a fingerprint expert. I would rather go see if I can find that skin and get a better print.

MANAGING EDITOR MEREDITH RAMBO: Could you expand some more on what an ASTM is and how those function? You mentioned that there was more than one that existed, and you would need to circle in on one.

PROF. RAUM: Hundreds and hundreds of ASTMs exist.⁴⁵ They’re out there to control just about every form of manufacturing and plant operation in the world. If you want to know the correct and accepted way to construct and operate an iron, there’s an ASTM on it under that particular isolated section. There’s a series of forensics ASTM standards. They’re in the science library here. You can go onto the ASTM site and see if any of them have been corrected, changed, or modified. If they have and it’s important to your case, you can buy that one. That information is available, but it’s spotty in a lot of areas. Now the big focus is on handwriting and document analysis the last couple of years, but they’re all out there. The standards are accepted because everybody on the forensics subcommittee has agreed on them—not everybody, but

⁴⁵ The American Society for Testing and Materials (ASTM) sets standards that govern many industries in the United States. *See generally* <http://www.astm.org> (last visited May 5, 2010).

people who have a vote, and that's a lot of people.⁴⁶ It's about 800 people who have a vote on the forensics subcommittee. It's constantly looking at the sites and the analysis.

DR. BUNDE: These are equivalent to what is referred to in the forensic science world as SOPs.⁴⁷ They're the standard operating procedure for this particular test, and it has stood the test of time. People have contributed to it and as Dr. Bass said, have come back and changed it to apply to new technology, new methods, and new equipment that come out. The latest standards will be the ones that most of the individuals agree to. It is a scientifically based technique, but it's not used just in forensics. As they said, it's used everywhere. If I have a student who wants to look for steroids, birth control steroids in urine or in a sewage treatment plant, there is a standard operating procedure from either the ASTM or other equivalent organizations that will tell you step by step what you must do to make this a scientifically defensible result

PROF. RAUM: There are also EPA [Environmental Protection Agency] standards

DR. BUNDE: Yes, exactly.

⁴⁶ See The American Society for Testing and Materials, Timothy Brooke, Staff Manager, Committee E30 on Forensic Sciences, *available at* <http://www.astm.org/COMMIT/COMMITTEE/E30.htm> (last visited May 5, 2010).

⁴⁷ Standard Operating Procedures (SOP) are guidelines that govern participants in a given field. In the present case, SOP refers to the ASTM standards set by the forensic subcommittee that govern the forensic sciences. See The American Society for Testing and Materials, *supra* note 7.

PROF. RAUM: Same concept. A lot of that is in mass spectroscopy and gas chromatography analysis.⁴⁸ A lot of that is coming to the courtroom. There are procedures for capturing that evidence, for packaging it, for taking it out of the box, for distilling it, and for loading it into the machines. There are procedures for all this different stuff, and they're out there. Lawyers don't know anything about these things, but I keep telling you they're critical in cases. I'm working on a case right now where the application of ASTMs and EPA standards are critical. And I can tell you, other than the experts and myself, nobody else in the case yet knows about these things—don't even know they exist, much less how they're applicable.

Can you imagine how surprised they're going to be? Because none of this is in writing. The experts get on the witness stand, and they start talking about this stuff. Then lawyers are like, "Oh, my God. I don't speak Chinese. We need an interpreter here." That stuff is out there, and it controls the process. You need to know about it. Oh, by the way, there's a statistics course you can take that I think you can get for like thirty bucks or forty bucks from the Great Classes.⁴⁹ Go online and Google that stuff. You can get a DVD that's got thirteen, sixteen lectures for like ninety-nine bucks. It will walk you through it. The stuff is out there. You've just got to find it. First of all, you have to know it exists.

There's an excellent textbook on forensics. I use it in both of my courses. It's INTRODUCTION TO FORENSIC

⁴⁸ See generally Douglas Frederic, GC/MS Analysis, SCIENTIFIC TESTIMONY, available at <http://www.scientific.org/tutorials/articles/gcms.html> (last visited May 5, 2010).

⁴⁹ See The Teaching Company, www.theGreatCourses.com (last visited May 5, 2010).

SCIENCES, third edition, by James and Nordby.⁵⁰ It is, for our purposes, the best surveyed forensics book in existence anywhere. It's out of Florida CRC Press. It's inexpensive, about eighty bucks. It's excellent.

DR. BUNDE: I feel I must defend my institution. Every student at Maryville College takes a statistics course—four hours—even English majors.

MS. RICE: Are there any more questions? We have time for one more, and please remember to state your name.

PHILLIP SMITH. Phillip Smith. I was wondering if you've heard of this. If it would be any help to jurors for judges—when the jury goes into deliberation—to ask those jurors to submit any questions concerning CSI-related matters to the court that pertain to that particular case? Then the court could get them information on whether it is true science or false science.

PROF. RAUM: Oh, God, that's a mine field, an absolute mine field. I'm sorry, but no. I mean, I wouldn't champion that in any respect whatsoever because you're going to have to try the *Daubert* trial.⁵¹ After the jury has heard all the evidence in the case, any additional information given is x-record.⁵² The appellate court is going to slam that one back on you really, really fast. It's completely flawed, but it's up to the lawyers to prepare and present their case. Keep in mind, the judges depend on the lawyers. They

⁵⁰ Stuart H. James and Jon J. Nordby, *FORENSIC SCIENCE: AN INTRODUCTION TO SCIENTIFIC AND INVESTIGATIVE TECHNIQUES*, (3d ed. 2009).

⁵¹ *Daubert v. Merrell Dow Pharm, Inc.*, 509 U.S. 579 (1993).

⁵² Professor Raum's reference to "x-record" means that any information given to the jurors once they retire would not be a part of the record.

depend on the lawyers to do a lot of the work for them. That's part of your responsibility as counsel. You come to court knowing what you're doing and prepared to make the presentation that the court needs to reach a fair and just judgment. This is all part of it. You can anticipate this stuff, and you can address it. The time to do it is when you've got witnesses on the witness stand because once they're gone, you can't make an argument. You can't take a position that's not supported by the evidence in the record, right?

PROF. BERGER: I think the question is more general as to whether you would allow jurors to ask questions after they hear a witness.

PROF. RAUM: That wasn't my understanding.

PROF. BERGER: No?

MR. SMITH: Well, I was just thinking, after these comments, are you saying that it would be worthwhile for the prosecution to do that—to try and identify those questions while in court?

PROF. RAUM: Oh, absolutely.

MR. SMITH: And bring all that out in court?

PROF. RAUM: Oh, absolutely. You've got your expert. You've got your questions: "Why didn't you take fingerprints? Why didn't you submit them?" Because they weren't readily visible. They were smears. They were there. But have somebody say, "Well, you know, we only get usable prints about 25 percent of the time." They need to know that, and you can do it with a witness. There are some states that do permit questioning by jurors of

witnesses on the witness stand. I don't prescribe to that at all because you wind up getting fishing expeditions, which pull away from the issues involved in the case. Also, you get improper questions, which require hearsay answers or further expert opinions. It's a nightmare. That's an absolute nightmare. Our system is clunky, but it's still the best out there. I don't want to toy with something that fundamental to the process.

MS. RICE: Let's give our panelists another round of applause. Also, if Dr. Bass will come forward . . . on behalf of the TENNESSEE JOURNAL OF LAW AND POLICY and the Center for Advocacy and Dispute Resolution, we would like to present you a token of appreciation for presenting our morning keynote.

DR. BASS: Thank you, thank you all very much.

MS. RICE: Also, to each of our panelists, we would like to present you with an additional token of appreciation.

