Page 67

A. Correct.
Q. In her anus?
A. Yes.
Q. In her vagina and in her mouth?
A. Correct.
Q. And so your autopsy reflects that there is no evidence inside her body of recent sexual activity?
A. Correct.
Q. And by recent sexual activity semen is produced by a male; correct?
A. Yes.
Q. And semen -- the evidence of semen inside a woman's body on any of the three orifices we've discussed, can remain there for how long a period of time?
A. Well, it depends on the medium it is in. But it can stay several days, yes.
Q. Several days.
A. Yes.
Q. It would also depend upon whether or not -- you say the medium whether that body is dead or alive, would it not?
A. Certainly.
Q. Certainly. Okay. So from your examination, you cannot detect any physical evidence that suggests

Page 68

that she had recent sexual activity?
A. Correct.
Q. And your performing those tests was part of the normal routine of any autopsy; is that correct?
A. Correct.
Q. You weren't asked to do anything special here?
A. Certainly not.
Q. And you did not?
A. Right.
Q. If it had been called for, you would have done something special; would you have not?
A. No. This is routine.
Q. This one was routine?
A. Yes.
Q. Okay. There was nothing that you saw either inside or outside the body, whether it would have been visible to those of us who are lay people or not, that gave you concern about your opinion as to what was the cause of death, did it?
A. Correct.
Q. Or as to what was the manner of death?
A. Can you rephrase that, please?
Q. Certainly, I'll try. Meaning that it was a homicide?
A. Yes.

Page 69

Q. There's nothing about what you saw that made you even hesitate to render that opinion?
A. Correct.
Q. Correct.
(Pause.)
MS. GUTIERREZ: Thank you, I have nothing further, thank you, Dr. Korell.
THE COURT: Redirect?
MS. MURPHY: Nothing, Your Honor.
THE COURT: Very good. May the doctor be excused?
MS. MURPHY: Yes, Your Honor.
THE COURT: Thank you, Doctor.
THE WITNESS: Thank you, Your Honor.
(The witness was excused.)
THE COURT: Next?
(Pause.)
MR. URICK: At this time the State will call Melissa Stangroom to the stand.
THE CLERK: Raise your right hand, please?
Whereupon,
MELISSA STANGROOM
a witness produced on call of the State, having first been duly sworn, was examined and testified as follows:
THE CLERK: Okay. Ma'am, you may lower your

Page 70

hand. You may be seated.
Will you please state your name and address for the record? And would you please spell your first and last name?
THE WITNESS: Melissa Stangroom, S-T-A-N-G-R-O-O-M. I am at the Maryland State Police Crime Laboratory, 1201 Reisterstown Road, Pikesville, Maryland.
THE CLERK: Thank you, ma'am.
THE COURT: Yes.
DIRECT EXAMINATION
BY MR URICK:
Q. Good morning, Ms. Stangroom.
A. Good morning.
Q. Where are you employed again?
A. The Maryland State Police Crime Laboratory.
Q. And how long have you been employed there?
A. Almost five years now.
Q. And what is your current position there?
A. I am a Forensic Chemist II in the Biology DNA Unit.
Q. And what are your job duties?
A. I analyze physical evidence that comes into the Crime Lab for the presence of blood and semen and other body fluids and then I perform DNA testing on them.
Q. What previous work experience have you had?

Page 71

A. I've been basically been working in a laboratory for the past ten years. I started out working in a clinical laboratory in a hospital setting in 1990, where I was a Laboratory Assistant, and I drew blood from patients.

I then went to the Washington Fertility Study Center in Washington, D.C., where I was a Medical Technologist that performed semen analysis for donor and fertility study purposes.

I've worked at Planned Parenthood in Washington, D.C., as a Medical Technologist, American Medical Laboratories as a Medical Technologist in the biology -- excuse me, in the microbiology department.

And I have also interned at the Northern Virginia Division of Forensic Science when I was in graduate school.

I'm also a part-time faculty member currently at Villa Julie College in Baltimore, Maryland, where I teach an introduction to forensic science class.

Q. What is your educational background?

A. I have a Bachelor of Science degree from the University of Buffalo in Medical Technology. And I have a Master of Science degree from the George Washington University in forensic science.

Q. And what type of training have you had in the

Page 72

field of forensic DNA analysis?

A. I've been to a number of workshops concentrating on forensic DNA analysis, one including a two-week training session in Quantico at the F.B.I. Academy.

I attend regular meetings in forensic science, as well.

Q. Do you belong to any professional organizations?

A. Yes, I do. I'm currently a member of the American Academy of Forensic Scientists, and a member of the Mid-Atlantic Association of Forensic Science.

Q. Has any court in the State of Maryland ever previously qualified you as an expert witness?

A. Yes. I've previously qualified here in Baltimore City, Prince George's County, Cecil County, Allegheny County, and New Castle County, Delaware.

Q. And have you been qualified as an expert in serology?

A. Yes, I have.

Q. And in DNA?

A. Yes, I have.

MR. URICK: At this time I'd like to offer Melissa Stangroom as an expert in the field of forensic DNA profiling.

Page 73

MS.GUTIERREZ: We would have stipulated to her expertise.

THE COURT: Very good. Then, Ms. Stangroom is qualified as an expert in forensic DNA analysis.

BY MR. URICK:

Q. Ms. Stangroom, if you could, just briefly tell the jury what DNA is?

A. DNA is the blueprint of life. It is found in all of our nucleated blood cells. All of our DNA is different with the exception of identical twins.

We inherit our DNA from our parents, so that we get half of our DNA from our mother and half of our DNA from our father.

DNA, because we all have different DNA's, is useful for forensic scientists, in identifying a perpetrator in a crime, for example.

Q. And where is DNA found in humans?

A. In the nucleated cell of the body. It doesn't matter if it's from a blood -- white blood cell that's from your blood or if it's found in a cheek cell from your cheek, it's going to all be the same DNA.

Q. By nucleated cell, do you mean a cell that has a nucleus?

A. Yes, I do. You can think of it -- the nucleus of the cell is the yolk of an egg. It's the central part

Page

of the cell.

Q. Now, there are cells in the body that do not have nucleuses?

A. Yes, the immature red cell is nucleated, but the mature circulating red blood cell in our blood actually is not nucleated. So, it's the white blood cells in our blood that the DNA -- has the DNA.

Q. Is it a generally accepted fact that everyone, other than identical siblings, will have different DNA?

A. Yes, that's true.

Q. In short, what is forensic DNA profiling?

A. Forensic DNA profiling is also known as "RFLP analysis" for short. It stands for restricted fragment length polymorphism. It's basically looking at certain areas of our DNA and comparing them among individuals.

Q. And would this be a new technology?

A. No, it's been around now since at least 1985.

Q. What other fields utilize RFLP analysis?

A. Primarily, the medical community uses it most often to diagnose diseases and to find traits that are related to one another, such as the gene that might be associated with breast cancer.

It's also used widely in the paternity laboratories, as well, to determine who a father, potential father might be.

Page 75

Q. Are there any other laboratories that might use it?
A. Yes. Many labs across the country utilize RFLP technology.
Q. Have you successfully completed any proficiency tests at the Maryland State Police?
A. Yes, I have.
Q. Can you explain what that means?
A. Proficiency testing is necessary to make sure that all of us working in the laboratory are doing the right job and we're up to par in the reports that we give out to the community.
And, it is required that I am proficiency tested twice a year at the State Police. And I have been, and I have successfully completed all of my proficiency tests.
Q. What is T-W-G-D-A-M?
A. That's an acronym that stands for TWGDAM. It's the technical working group on DNA analysis methods. And, basically, it's just a group of individuals, of scientists from laboratories across the country and Canada, that come together and talk about current advances and the current methodologies used in DNA analysis.
And they set forth guidelines for other

Page 76

laboratories around the country to follow. So they set standards for all of us as forensic chemists to follow while we're doing our DNA work.
Q. Does the Maryland State Police Crime Laboratory DNA Unit adhere to TWGDAM guidelines?
A. Yes, we do.
Q. Did there come a time when you were requested to conduct DNA profiling testing in the investigation of the death of Hae Lee Min with various suspects, including the defendant today, Adnan Syed?
A. Yes.
Q. Can you tell the members of the jury what samples were submitted to you for your analysis?
A. On September 24, 1999, I received in the State Police Crime Laboratory, a blood sample from Hae Min Lee, a blood sample from Adnan Syed, one blood sample from Jay Wilds, and a blood sample from a shirt.
And these items were received from Sal Bianca from the Baltimore City Crime Lab.
Q. And did you indicate when you received that evidence?
A. Yes. That was September 24th, 1999.
Q. If you would, please explain the procedures used by the laboratory to conduct your testing? In short, explain DNA and the testing performed?

Page 77

A. Okay. Basically, when I received the blood samples from the shirt, the first thing I'm going to do is cut the sample up, cut the blood stain up. In this case, it was, I believe, around the size of a quarter.
I cut it up and place it into a plastic small tube and add some chemicals. This is going to start my extraction phase of the analysis. In other words, I'm going to break open the nucleated cells and now take out the DNA from the cells and isolate that.
The next thing I'm going to do is cut the DNA up into fragments because I want to isolate the areas of variation. I want to only concentrate on the areas that we vary in and leave all the other DNA out.
Because in actuality, 99 percent of our DNA is the same. That's why we all have two arms and two legs, and one head.
Most of our DNA codes for the same thing, but there's the one percent of this variation that I'm going to zone in on and compare.
So I'm going to compare the DNA profiles that are found in the questioned sample to the DNA profiles that are found from the individual's -- the known blood standards that I had received from Hae Min Lee, Adnan Syed, and Jay Wilds.
Q. Were you able to reach a conclusion based on

Page 78

your testing and analysis of the evidence received?
A. Yes, I was.
Q. And what was conclusion? Pardon me. And upon what do you base your conclusion?
A. I have my report with me, I'd like to read from.
Q. If you would, please?
A. The DNA profiles obtained from the blood samples from the shirt match the DNA profiles from the known blood standards of the victim, Hae Min Lee. Hae Min Lee cannot be excluded as a possible donor of the DNA extracted from the blood samples from the shirt.
The probability of selecting an unrelated individual at random from the Caucasian and African-American populations having DNA profiles matching the blood samples from the shirt, is as follows:
This is from the F.B.I. database.
The Caucasian frequency is one in 1.7 billion. And the African-American frequency is one in 4.1 billion. The DNA profiles from the blood samples from the shirt do not match the blood samples obtained from the suspects Adnan Syed and Jay Wilds.
Q. What is a lumograph?
A. The lumograph is a piece of X-ray film that is my final product of my entire RFLP analysis. And it's

Page 79

what I bring to court to show the jury of my final work product.
Q. Would this be an appropriate time to show the jury the product?
A. Sure.
MR. URICK: Your Honor, I'm not certain if the two alternate witnesses over there can see the screen. They might want to move around a bit.
THE COURT: How about it, Jurors? Can you see the screen from there? You can move your chairs if it will make it easier.
Everybody see?
BY MR. URICK:
Q. Let's test one first just to make sure they focus.
A. This piece of X-ray film here is known as a lumograph. This is just what I said. It's a piece of X-ray film that I'm going to put into contact with my final RFLP product.
I'd like to briefly describe to you what each lane represents so you have an understanding of what we're looking at.
This first lane here, this is a size ladder or a size marker. This is like my ruler. All of these bar code looking things, these are my rulers that I'm going

Page 80

to use to measure all of the information in here. Because --
THE COURT: Ms. Stangroom, would you like a marker? A pointer?
THE WITNESS: Oh, yes, I would. Thank you.
Okay. So we have four rulers that I'm going to use to size all the information in between.
Remember I said you get half of your DNA from your mother and half of your DNA from your father, so that we are going to end up with two bands or two fragments. And these are represented by -- these are represented by, for example, in the first lane, marked "victim," you see a band here and a band here.
There's a lot of smearing going on, and that's because the victim was deceased and her blood sample was breaking down.
But if you look very closely, you can see a dark band here and a dark band here. That's her DNA profile at Chromosome Number 4. I'm going to be looking at six different areas on the DNA, so six different chromosomes. This represents one profile at one chromosome.
Moving on to the next lane, we have the suspect, Adnan Syed. He has a band here and a band here. Comparing the victim's banding pattern to his, you can

Page 81

see that the bands lie at different areas on the lumograph.
We have another internal marker, or an internal ruler, and then we move on to the next sample lane, and that's represented with the suspect Jay Wilds.
His sample bands are one up here and one down here. Again, his banding pattern is different than the other two individuals.
I have an empty lane next. And then down here is our sample lane, two bands that line up and match visually and mathematically with those bands from the victim.
And then I have in the very second lane AC is represented, that means my allelic control. That is one of my internal controls that I run on every single lumograph that I have. That is going to make sure that these two bands do not size appropriately, then I know something went wrong during my analysis, and the entire result is null or I throw it away.
In this case, these two bands sized what they were supposed to. It's a national control. All laboratories in the country use this. All forensic labs use this internal control.
I also have another standard down in this lane, and it's an in-house blood standard that I'm going to

Page

extract at the same time I extract my samples. So that if something goes wrong again, I have yet another standard to fall back on to prove that everything worked as it should have.
So summing this up, Chromosome Number 4, we have the victim matching the evidence, the two suspects being excluded.
Would you like me to show another one?
Q. Would it be helpful to show the jury more of those?
A. We can throw one more up on the screen.
Okay. This is another chromosome location. This is Chromosome Number 1. The first one I showed you is Chromosome Number 4.
Again, this is just to show you -- we've got a lot of degradation going on, but we have the top band of the victim is here, and her bottom band is down here.
The suspect's bands are here. Jay Wilds' bands are here. The evidence matches the victim. And I do this six times, but for time's sake, I just wanted to show you two.
Q. Thank you very much.
(Pause.)
BY MR. URICK:
Q. Are all of the procedures that you just

Page 83

described generally accepted in the scientific community?
A. Yes, they are.
Q. If any of the steps in the procedure did not work right, what results would be obtained?
A. I wouldn't get any results. A DNA profile cannot be created. I just would -- if something went wrong during my procedure, I wouldn't get any results.
Q. And is the case work and the conclusions drawn, subject to peer review?
A. Yes, they are. At least one other analyst, one other qualified analyst, usually my supervisor, looks at my work and has to agree with my conclusions before it's sent out.
Q. And again, to a reasonable degree of scientific certainty, what are your opinions concerning the conclusions of this case?
A. That Hae Min Lee cannot be excluded as a possible donor of the DNA extracted from the blood samples from the shirt.
MR. URICK: Witness with the defense.
THE COURT: Cross?
MS. GUTIERREZ: Yes.
CROSS-EXAMINATION
BY MS. GUTIERREZ:
Q. Ms. Stangroom, let me make sure I get this

Page 84

straight. You report your results by referring them to the probabilities of making an error; isn't that correct?
A. Are you talking about the frequencies that I read?
Q. Yes. The frequencies that you reported to us?
A. Actually, no, that's not true. The frequencies --
Q. Read it again please?
MR. URICK: Objection.
THE COURT: Sustained. Again, please let the witness finish her answer.
THE WITNESS: The frequencies, maybe I could explain it one more time.
The frequencies that I read off are the frequency of finding that DNA profile in the population. So other than Hae Min Lee having that profile, who else, how many other people would I have to look at in the population to find it again?
BY MS. GUTIERREZ:
Q. Okay. Now, Ms. Stangroom, you first told us, on Mr. Urick's questioning, that each of us are unique, other than identical twins, are we not?
A. Yes, that is true.
Q. So you wouldn't expect to find some other member of any group of population to have the same DNA as

Page 85

Hae Lee; correct?
A. That is true.
Q. Okay. So the frequency as you report it, is really a frequency for the rate of error, is it not?
A. No. It's not.
Q. Okay, fine. Now, Ms. Stangroom, you reported it as 1.7 billion, one in 1.7 billion?
A. That is correct.
Q. And that was for Caucasians; correct?
A. Yes.
Q. And one in 1.4 billion for African-Americans?
A. That's correct.
Q. And were you aware of who Hae Min Lee was?
A. No.
Q. You only had a sample of her blood; correct?
A. That is correct.
Q. That somebody else had collected; correct?
A. That's correct.
Q. And were you aware that she was not a Caucasian?
A. No.
Q. And that she was not an African-American?
A. No.
Q. The two other blood samples that you analyzed, ma'am, to which you found no correlation to the blood on

Page 86

the shirt -- correct?
A. That's correct.
Q. -- were listed to you as being suspects, were they not?
A. Yes.
Q. On paper work submitted to you from the Baltimore City Police Department; isn't that correct?
A. Yes.
Q. And there's nothing unusual about paperwork asking you to compare various types of blood to see if something matches; correct?
A. That's correct.
Q. And by the word "match" you understand what I mean by that; correct?
A. Yes.
Q. Your job, based on your experience, was to look at the blood stain on a shirt and see if any one of those three people, the victim, and two suspects matched -- their blood matched, whatever that means, the blood that was determined to be on the shirt; is that correct?
A. Yes.
Q. And that's why you performed every single thing that you just spent half an hour telling us about; correct?
A. That's correct.

Page 87

Q. You can't tell, in your analysis -- can't tell us when that blood, which you've essentially identified as belonging to the victim, got there, can you?
A. The time frame?
Q. Yes, ma'am?
A. No, I cannot.
Q. Okay. And you can't tell us how the blood on the shirt you've identified as belonging to Hae Min Lee got there?
A. No, I cannot.
Q. Or under what circumstances; is that correct?
A. Yes.
Q. All you can tell us is that between the three samples that you analyzed, it's Hae Min Lee's blood and not Adnan Syed's; correct?
A. I'm actually telling you more than just that.
Q. Well, are you telling us that, ma'am, yes or no?
A. That's one of the things I am reporting.
Q. You're also telling us that that blood is Hae Min Lee's and is not Jay Wilds'; is that correct?
A. That is correct.
Q. Now, you don't know who Adnan Syed is, do you?
A. No.
Q. Other than that you're in a trial that bears

Page 88

his name; is that correct?
A. That's correct.
Q. His name appeared on the summons issued to you to come and tell us these things, did it not?
A. Yes.
Q. And you don't know who Jay Wilds is, do you?
A. No.
Q. And you don't actually know, other than that his name appears listed as a suspect on the paperwork that was submitted to you; is that correct?
A. That's correct.
Q. And the first time this blood from the shirt, or from Hae Min Lee, or Adnan Syed, or Jay Wilds was submitted to you personally or to your office, was the 24th of September; is that correct?
A. That's correct.
Q. It wasn't submitted to you back in February, after February the 10th, 1999, was it?
A. No, I received it in September.
Q. Okay. And if it had been submitted earlier, you would have known about it, would you have not?
A. Yes.
Q. Okay. Samples that are submitted to your lab for analysis don't just get lost, do they?
A. No.

Page 89

Q. You take good care of them, don't you?
A. Yes.
Q. Okay. And all of the analysis that you've performed has been performed since September the 24th, 1999; right?
A. That's correct.
Q. Okay. Now, would it matter to your analysis to know that the shirt from which or against which you were to match the samples of Hae Min Lee, Adnan Syed, and Jay Wilds, came from Hae Min Lee's car?
A. Would it matter in my analysis?
Q. Yes, ma'am?
A. Not really, no.
Q. Not at all because all you are doing is matching blood samples with blood samples to see if they match on any level, are you not?
A. That's correct.
Q. And to exclude blood samples from being compared to other blood samples; is that correct?
A. That's correct.
Q. That's why when you reported your results, you reported it as at the end that Hae Min Lee could not be excluded as the source of the blood on the sample taken from a shirt; is that correct?
A. That's correct.

Page

Q. Okay. Now, you had not been -- you already knew, because it was reported to you that the blood on that shirt had already been identified as human blood prior to 9-24 -- were you not told that or given that information?
A. Just on the chain of custody it's noted that it was a blood sample.
Q. Okay. And so that meant to you, in your expertise, that some other scientist had determined that it was blood; correct?
A. That is correct.
Q. And that it was blood from a human being; correct?
A. That's correct, yes.
Q. And as differentiated as blood from some other species; is that correct?
A. It just said "blood sample."
Q. Okay. And that you had been given information that this was a criminal case; is that correct?
A. That is correct.
Q. Okay. And you had no control over the number of samples that might be submitted to you; is that correct?
A. Yes.
Q. If you had been given three suspects' names,

Page 91

you would have compared them all, would you have not?
A. Yes.
Q. Or four; is that correct?
A. Right.
Q. Or five even, or more; is that correct?
A. Yes.
Q. Is that correct?
A. Yes. That is correct.
Q. Okay. And you would have done anything that was asked of you, would you not?
A. Yes.
Q. Would you have not? Much like you did here; is that correct?
A. That's correct.
Q. So essentially what you can tell us is that the source, in layman's terms, the source of the blood in the line that you've outlined, indicates that the blood that had been predetermined to be human blood on the shirt found in Hae Min Lee's car, was her own; is that correct?
A. That is correct.
Q. Thank you.
MS. GUTIERREZ: Nothing further.
THE COURT: Any redirect?
REDIRECT EXAMINATION
BY MR. URICK:

Page 92

Q. You had started to say that you were actually saying more than the defense counsel was putting into her question. Please explain what you meant by that?
MS. GUTIERREZ: Objection.
THE COURT: Overruled.
THE WITNESS: I am not only saying that the blood sample matched Hae Min Lee, but I'm also going a step further and telling you that there were two people that it did not match, and that the frequency is also important in this case because it tells you how rare or common this type of a profile is in the population.
Yes. I did say that all of our DNA is unique, and that is very true. But because I'm only looking at six areas of the DNA, I'm not looking at our whole DNA profile, I have to assign it a statistical weight to help other people understand what that match really means.
And so I'm telling you that Hae Min Lee's blood matches the blood that was found on the t-shirt. And I'm assigning the weight to it by telling you that that DNA profile is found in the population approximately 1.7 billion in the Caucasian, and 4.1 billion in the African-American.
BY MR. URICK:
Q. So across just those six chromosomes you may another match, but this would be the frequency for those

Page 93

six?
A. That's correct.
Q. And, now, after you -- when you did your testing, did you use up the entire sample?
A. No, I did not. We --
Q. -- was there --
A. As a procedure in our Crime Lab, we always save a sample for retest, always.
Q. And could any party involved in a case request a test be done with that?
MS. GUTIERREZ: Objection.
THE WITNESS: Yes.
MR. URICK: Nothing further.
THE COURT: Recross?
RECROSS-EXAMINATION
BY MR. GUTIERREZ:
Q. Ms. Stangroom, how many billion people are currently in the world?
A. I believe it's almost six billion.
Q. Okay. And of those six billion people currently alive today, and alive for the last couple months, how many of them are Asian?
A. I am not sure.
Q. A large percentage, don't you think?
A. I'm not sure.

Page 94

MS. GUTIERREZ: Nothing further.
THE COURT: Okay. Thank you, ma'am. You are excused.
(The witness was excused.)
THE COURT: Next?
MR. URICK: May we approach?
THE COURT: Okay.
(Counsel and the defendant approached the bench, and the following ensued:)
MR. URICK: We would request a five or ten-minute recess at this time.
THE COURT: (Inaudible ) since you are getting more of a lunch out of it and screwing me out of a chance to have another witness on this morning.
MR. URICK: We would like to show the witness an exhibit so that when they come in they don't fumble with it. And also we would like to have a rest room break.
THE COURT: We're starting at 1:30, then. No, we're starting at 2:00. (Inaudible) prisoner up before 2:00. You've lost the witness break.
Step back.
(Counsel and the defendant returned to the trial table, and the following ensued:)
THE COURT: Members of the jury, if you would