

CLERK
SUPREME COURT OF VIRGINIA
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RICHMOND, VIRGINIA

IN THE
Supreme Court of Virginia
AT RICHMOND

Record Nos. 890579
and 890580

TIMOTHY WILSON SPENCER,

Appellant,

v.

COMMONWEALTH OF VIRGINIA,

Appellee.

JOINT APPENDIX - VOLUME II

Jeffrey L. Everhart
Attorney at Law
2512 West Cary Street
Richmond, VA 23220
(804) 355-7788

Donald R. Curry
Senior Assistant Attorney General
101 North Eighth Street
Richmond, VA 23219
(804) 786-4624

David J. Johnson
Senior Assistant Public Defender
900 East Main Street
Richmond, VA 23219
(804) 225-4330

Counsel for Appellant

Counsel for Appellee

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MR. DAVIS: Call Detective Leland
Kennedy, please.

LELAND W. KENNEDY, a witness called by the
Commonwealth, first being duly sworn, testified as
follows:

DIRECT EXAMINATION

BY MR. DAVIS:

Q Mr. Kennedy, would you state your
name and your occupation, please, sir?

A Detective Leland W. Kennedy. I work
with the Richmond Bureau of Police, assigned to the
Forensic Unit.

Q How long have you been a police
officer, sir?

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1 A Six-and-a-half years.

2 Q Sir, would you explain to the ladies
3 and gentlemen of the jury whether or not you have ever
4 qualified as an expert in fingerprinting in any Court
5 in the Commonwealth, or in this court, sir?

6 A Yes, I have. In this Court.

7 MR. EVERHART: We will stipulate
8 that, Your Honor. I am familiar with his
9 qualifications.

10 THE COURT: All right.

11 Q With regards to the fingerprints,
12 sir, would you explain to the ladies and gentlemen of
13 the jury if all parties, or all suspects leave
14 fingerprints at the scene of the crime? And if not,
15 why not?

16 A No. They don't. Approximately
17 one-tenth of crime scenes yield fingerprints. And
18 one-tenth of that yield useable prints for
19 identification purposes.

20 The reasons why you can't get
21 fingerprints is cold weather, you don't perspire as
22 much, gloves, somebody wears gloves. Wood surfaces
23 don't hold prints as well as glass or mirror-type
24 surfaces would. Those would be examples.

25 MR. DAVIS: Would you answer

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counsel's questions if he has any, please?

CROSS-EXAMINATION

BY MR. JOHNSON:

Q Good morning, Detective.

Sir, did you find any fingerprints
at this scene?

A Another detective did.

Q This case was one of those one in
ten where they do find useable prints, is that correct?

A There were some useable prints.

Q Did any of those useable prints
match up with Mr. Spencer?

A No, they did not.

MR. JOHNSON: Thank you.

THE COURT: All right. You may be
excused.

WITNESS STOOD ASIDE

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THE COURT: Your next witness.

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MR. DRISCOLL: Next witness for the

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Commonwealth will be Mary Jane Burton, please.

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MARY JANE BURTON, a witness called by the

17

Commonwealth, first being duly sworn, testified as

18

follows:

19

DIRECT EXAMINATION

20

BY MR. DRISCOLL:

21

Q What is your name, please?

22

A Mary Jane Burton.

23

Q Mrs. Burton, you have just recently

24

retired, is that correct?

25

A Yes. Yes, sir, I have.

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1 Q Before you retired, what was your
2 occupation?

3 A I was supervisor of the serology
4 section for the four forensic laboratories here in the
5 State of Virginia.

6 Q What exactly is the serology
7 section? What duties did you have?

8 A Well, as supervisor, I supervised
9 the other serologists in the section. I also routinely
10 examine items submitted for blood and body secretions.

11 Q How long were you employed at the
12 Virginia Consolidated Laboratories?

13 A For 15 years.

14 Q Before that, where were you
15 employed, and what were your duties?

16 A Before that, I was employed at the
17 Charlotte/Mecklenburg Crime Laboratories, in Charlotte,
18 North Carolina for two years. There, I did basically
19 the same things. Examinations of items and evidence
20 for blood and body secretions. Prior to Charlotte, I
21 was associated with the crime lab in Cincinnati, Ohio.

22 MR. EVERHART: Judge, we will be
23 glad-- I don't know if Mr. Driscoll wants
24 this in evidence. Anyway, we will be happy to
25 stipulate she is an expert in the field of

1 serology.

2 THE COURT: All right.

3 MR. DRISCOLL: Judge, that is
4 acceptable. Thank you.

5 THE COURT: All right.

6 Q Would you just briefly tell us what
7 a forensic scientist is?

8 A A forensic scientist is a person who
9 uses methods and techniques from all areas of science,
10 and applies them to matters pertaining to the law. For
11 instance, evidence recovered from various types of
12 investigations.

13 Q I am going to now show you a series
14 of exhibits. I am going to ask you whether or not you
15 have seen them before, and what tests, if any, you
16 performed on them.

17 First will be Commonwealth's Exhibit
18 No. 7, please. It is the skirt and slip of Dr.

19

20 A Yes, sir. I examined these for the
21 presence of stains.

22 Q What type of stains?

23 A Of both secretion and bloodstains.

24 MR. DRISCOLL: Commonwealth's
25 Exhibit No. 14, No. 9 and No. 12. If you will

1 hand them all to the witness.

2 A Yes, sir. This is the PERK kit I
3 received from the Medical Examiner.

4 Q Is that the PERK kit from the victim
5 in this case, Dr. [REDACTED]?

6 A Yes, sir, it is. And these are
7 stains that I prepared to take up to LIFECODES
8 laboratory. This is, these are known samples that were
9 submitted to me from the defendant. And these are
10 known samples from the victim's husband.

11 Q Now, did you run a series of tests
12 on each of those items to determine whether or not they
13 did contain secretions of any type?

14 A Yes, sir, I did.

15 Q Could you explain what is involved
16 as far as this testing and what your findings were?

17 A Yes, I can. I think, before I go
18 onto that, I want to explain to you a little bit about
19 why we want to look for stains, and what we do with the
20 stains when we find them.

21 I think most of you are familiar
22 with the fact that your blood can be typed. And you
23 may even know what your blood type is. Your blood type
24 might be Type A, or B, or AB, or O. And your blood is
25 typed by factors in it, and each factors are A, B, or

1 AB or O.

2 If you are a secretor, I can
3 identify these same factors in all of your body
4 secretions. By body secretions, I mean saliva, vaginal
5 fluid or seminal fluid, maybe tears or mucus. These
6 are body secretions. And if you are a secretor, these
7 same factors by which your blood is typed will be found
8 in all of your body secretions.

9 If you are a non-secretor, no matter
10 what your blood type is, none of these factors will be
11 found in any of your body secretions. Approximately
12 eight people out of ten are secretors. So in a case
13 where there is a possibility of a transfer of
14 secretions from one person to another, it is important
15 that we find these secretions, and that we proceed to
16 type these secretions in as many systems as we can.

17 Now the system I just talked to you
18 about is the ABO system. You are either A, B, or AB,
19 or O. But in addition to that, your body contains many
20 enzymes. Some of these enzymes are to help you digest
21 food. Others have various chemical, various chemical
22 things in your body. We are not interested in what
23 they do, but some of these enzymes are polymorphic.
24 They take a different form in different people. And
25 therefore, we can type these enzymes. Some of these

1 enzymes are not only found in blood, but they are found
2 in body secretions. So in the case of where secretions
3 are exchanged from one person to another, we try to
4 type these in these enzyme systems that would take a
5 different form in different people.

6 One of the systems that we can type
7 in seminal fluid and vaginal fluid is called a PGM
8 system. Whether you are a secretor or a non-secretor
9 is not important, if we are talking about the enzyme
10 systems. So whether you are a secretor for the ABO
11 system, it doesn't make any difference. Your
12 secretions will still have a PGM type.

13 In the PGM system, you are either
14 typed 1 or 2, or a combination of the two. We call it
15 2-1.

16
17 NOTE: The 2-1 is read as 2 dash 1.

18
19 A In addition to just the PGM system,
20 we can break this PGM system down. We can sub-type.
21 For instance, if you are a PGM 1, we can break this
22 down into a 1 plus or a 1 minus, or a 1 plus 1 minus.

23 If you are a PGM 2, we can break it
24 down into a PGM 2 plus or a 2 minus, or a 2 plus--
25 Wait a minute. 2 plus 2 minus.

1 If you are a PGM 2-1, we can break
2 it down to a 2 plus 1 plus, a 2 minus 1 minus, a 2
3 minus 1 plus, or a 2 plus 1 minus.

4 We can break it down. The reason we
5 want to do more things with these secretion stains is
6 the more systems we can type the stain in, the further
7 it narrows down the possibility that more people could
8 have contributed this stain.

9 So in other words, we are narrowing
10 down the number of people that could be included in the
11 group that had contributed that seminal fluid stain.

12 There is another section that we can
13 type in the seminal fluid and in secretions, and that
14 is called Pepidase A. In this system, again, you're
15 either a Type 1 or Type 2, or a Type 2-1. And in this
16 system, we cannot further sub-type it. So we try to do
17 as much as we can in each of these stains in order to
18 narrow down the population that could have contributed
19 that stain.

20 Q Let's go back a little slowly over
21 the individual items that you received and examined for
22 this case.

23 First, you received a PERK kit from
24 the victim, and that contained blood from the victim,
25 and it contained a number of swatches, or swabs, or

1 smears, is that correct?

2 A That's correct.

3 Q Did you examine these smears,
4 particularly the peri-anal, the cervical, the anal, and
5 the vaginal smears to determine whether or not there
6 was any presence of seminal fluid?

7 A Yes, sir, I did.

8 Q What is the source of that seminal
9 fluid?

10 A Seminal fluid is the male
11 spermazoids, the male reproductive cells carried in the
12 seminal fluid.

13 Q You found on each of those swabs and
14 smears from each of those regions the--

15 A I identified spermatozoa on the
16 vaginal, the anal, the cervical, and the peri-anal.
17 Peri-anal is the area right around the opening of the
18 anus for the anus.

19 Q Likewise, when you examined what has
20 been labeled Commonwealth's Exhibit No. 7, the skirt
21 and the slip of the victim, Dr. [REDACTED], did you test
22 and find whether or not there were any evidence, there
23 was any evidence of seminal fluid on those items?

24 A Yes, sir, there was. I identified
25 seminal fluid and spermatazoa on both, stains on the

1 slip and the skirt.

2 Q You received, as Commonwealth's
3 Exhibit No. 14, the PERK kit of this defendant, which
4 contained his blood and saliva samples. And you were
5 able to type his systems from that sample, is that
6 correct?

7 A That's correct.

8 Q Finally, you received Commonwealth's
9 Exhibit No. 9, the PERK kit of the husband of the
10 victim, is that correct?

11 A That's right.

12 Q From the information in that PERK
13 kit, were you able to type his blood and enzyme types?

14 A Yes, sir, I was.

15 Q Did you reduce your findings to a
16 chart or a transparency so that the members of the jury
17 can follow what your findings were?

18 A Yes, I did.

19 Q Do you have those with you now, and
20 would you like to use this overhead projector?

21 A Yes, I would.

22 MR. DRISCOLL: Judge, with your
23 permission, may we bring the screen forward
24 and begin the--

25 THE COURT: Yes, you may.

1 Can everyone see that?

2 A Okay. Now I talked to you about
3 being a secretor, that your ABO factors would be found
4 in all of your body secretions.

5 So in identifying whether a person
6 is a secretor, we use a combination of blood and saliva
7 from the person. We type the blood for the ABO
8 factors, and we type the saliva.

9 In this case, I found that the
10 victim was a non-secretor. That means that no matter
11 what her ABO type was, none of these factors would be
12 found in her body secretions. All right. I typed
13 them. Then I went ahead and typed in the PERK kit, the
14 Medical Examiner submitted peri-anal swabs. She
15 submitted anal swabs, vaginal swabs and cervical swabs.
16 I identified spermatazoa on each of these samples. And
17 I went ahead and determined the type in the ABO system,
18 and the PGM system, and the PGM sub-type, and the Pep-A
19 type.

20 Remember, the enzymes I talked
21 about, each of these systems are independent. They are
22 not related to one another. So I might be able to type
23 them in one system and not the other.

24 And in this case, I found that the
25 victim, on the peri-anal swabs, I found type O

1 secretions. Remember, the victim is a non-secretor.
2 So the fact that there were O secretors on the
3 peri-anal swab is foreign to her.

4 In the PGM type, I found 2-1. This
5 is the same type as the victim.

6 In the PGM sub-type, I found 2 plus
7 1 minus 1 plus. If you will look up here, you will see
8 the victim is a 2 plus 1 minus.

9 On the peri-anal swab, I found 2
10 plus 1 minus, and a 1 plus. Whenever we have three
11 factors in a sub-type result, that is a positive, a
12 positive identifying a combination of secretions.
13 Because one person can only have two factors.

14 For instance, the victim is a 2 plus
15 1 minus. So in the peri-anal swab, the 1 plus means
16 that that is contributed by someone else, by someone
17 else's secretions and is foreign to her.

18 The Pep-A type is 1. The victim is
19 a Pep-A 1.

20 Now, in the other three, in the anal
21 swab, the vaginal swab and the cervical swab, the
22 astericks there means I identified no blood group
23 factors, no factors, no A or B, or AB, or O, which
24 means that either the secretions were from a
25 non-secretor, or there was insufficient amount of

1 secretions for typing.

2 In the PGM type, I got 2-1, which
3 was the same as the victim, or it could be the same as,
4 if you notice up here on the peri-anal, the PGM type is
5 2-1, also. But we know there was a foreign type in
6 there from the PGM sub-type. Or there may be
7 insufficient there for picking it up. I was not able
8 to do the sub-typing in any of those three samples.

9 In all three cases, the Pep-A type
10 was 1. Down here, on the peri-anal swatches, the
11 Medical Examiner took a separate sample from the
12 peri-anal region. They were little cotton swatches.
13 Here again, I identified spermatazoa, seminal fluid on
14 it.

15 The ABO type was O. She is a
16 non-secretor. There should be no factors there present
17 from her.

18 The PGM type was 2-1, the sub-type
19 was 2 plus 1 minus, 1 plus. Here again, I know there
20 is a combination of secretions. We have the three
21 factors, the 2 plus, the 1 minus, and the 1 plus. And
22 the 1 plus is foreign to the victim.

23 Pep-A is 1.

24 The victim's husband is a
25 non-secretor. So his secretions could not have

1 contributed the seminal fluid in the peri-anal swab or
2 the peri-anal swatch, because he, again, is a
3 non-secretor. He is a 2 plus 1 plus. So here again,
4 he could not have contributed the seminal fluid.

5 The victim's skirt and slip. I
6 identified spermatazoa and seminal fluid on both of
7 these items, and I typed both secretions. Again, this
8 is foreign to the victim. She is a non-secretor.

9 I found PGM Type 1, which is foreign
10 to the victim. She is a Type 2-1. And I found on the
11 slip a 1 plus, which is foreign to the victim. I was
12 not able to sub-type the stain on the skirt. And in
13 both cases, I found the Pep-A type to be 1. You will
14 notice that on the slip, the PGM sub-type is 1 plus.
15 And if you will look up to the peri-anal swatch, the
16 foreign type in that PGM sub-type is 1 plus.

17 And this is the result of the blood
18 sample and saliva sample from the defendant. I found
19 that he is a type O secretor. Which means that in all
20 of his body secretions, we would find Type O.

21 His PGM type is 1; his sub-type is 1
22 plus, and his Pep-A type is 1.

23 Q Now, if we can, if you don't mind,
24 could you tell me whether or not the seminal fluid
25 found on that skirt and the slip is consistent with the

1 defendant's and inconsistent with the husband's?

2 A Yes, sir, it is.

3 Q Secondly, the seminal fluid that was
4 found on those vaginal and anal swatches or swabs, is
5 that consistent with the type of this defendant and
6 inconsistent with the type of the husband?

7 A The type on the peri-anal swab and
8 swatch are consistent with the, with the combination of
9 the victim and the defendant's, and not consistent with
10 the combination of the victim and her husband.

11 Q If you don't mind, could you turn
12 that off and return to the witness stand?

13 MR. DRISCOLL: Judge, would the
14 Court receive as Commonwealth's Exhibit No. 15
15 the transparency of Mrs. Burton?

16
17 NOTE: The above-referred-to
18 transparency was marked and filed as
19 Commonwealth's Exhibit No. 15.

20
21 Q Mrs. Burton, in addition to that
22 transparency, you have a typed copy on regular paper,
23 do you not?

24 A I left it up there.

25 Q Is that an accurate copy of what we

1 have just seen on the transparencies?

2 A Yes, sir. The transparency was made
3 from that.

4 MR. DRISCOLL: Judge, again, the
5 transparency would be Commonwealth's Exhibit
6 No. 15, and the paper type would be
7 Commonwealth's Exhibit No. 16.

8 THE COURT: All right.

9
10 NOTE: The above-referred-to typed
11 Serologist Report was marked and filed as
12 Commonwealth's Exhibit No. 16.

13
14 Q Mrs. Burton, did you, as part of
15 your study of this material, cut out swatches from the
16 skirt or the slip, the items which have been labeled
17 Commonwealth's Exhibit No. 7?

18 A Yes, I did. The slip.

19 Q This area of the slip where you cut
20 out a swatch, what did it contain?

21 A It contained seminal fluid.

22 Q What was done with that particular
23 swatch?

24 A That swatch, along with the
25 peri-anal swatches, that were labled CME-14 on my chart

1 there, I took to New York and personally handed those
2 over to Lorah McNalley, at LIFECODES.

3 Q This is the LIFECODES Corporation,
4 is that correct?

5 A LIFECODES, that's correct.

6 Q Can you recall the date and the
7 approximate time when you turned these items over to
8 Lorah McNalley for examination by LIFECODES?

9 A I turned them over to her on
10 November 5, 1987, at 4:15 P.M.

11 Q At that time, did you also tender to
12 her bloodstains of the victim, Dr. [REDACTED]?

13 A Yes, I did.

14 MR. DRISCOLL: If Your Honor please,
15 I have no further questions at this time.

16 THE COURT: Mr. Johnson?

17 MR. JOHNSON: Thank you.

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CROSS-EXAMINATION

BY MR. JOHNSON:

Q Good morning, Mrs. Burton.

A Hi.

Q Ma'am, do you have any idea how long seminal fluid can exist in the vagina?

A It varies from one person to another. It depends on their activity, their metabolism, a lot of things.

Q Is it more than several hours?

A In some cases, it could be.

Q In some cases, can it be several days?

A That would be rare, I would think.

Q Can that happen?

A It is possible.

Q Ma'am, you made the statement that the samples you examined were consistent with Timothy Spencer's blood type, is that correct?

A Uh huh.

Q What does consistent mean?

A It is the same type in all the systems that I typed it in.

Q You determined what Mr. Spencer's type was?

1 A Yes, sir, I did.

2 Q Can you give us an idea of what
3 percentage of the population would fit into that group?

4 A Approximately 13 percent of the
5 population.

6 Q 13 percent?

7 A 13 percent. That would be 13 people
8 out of 100. We have blood or secretion types of that
9 type.

10 Q I am not looking for precise
11 numbers. But then we are talking about a group that
12 contains millions of people?

13 A If you are talking about the world
14 population--

15 Q Let's talk about North America, this
16 country.

17 A I don't know what the population is.

18 MR. JOHNSON: Thank you. That is
19 all the questions I have.

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REDIRECT EXAMINATION

BY MR. DRISCOLL:

Q When you say 13 percent of the population, does that mean males, females or everyone?

A 13 percent of the total population.

Q Including children?

A Including children.

MR. JOHNSON: Just briefly, Your Honor.

RECROSS-EXAMINATION

BY MR. JOHNSON:

Q Ma'am, let's assume we are talking about many millions of people. Say there are 20 million black adults in the country, for purposes of argument--and I am talking about adults. If we are talking about males, we would cut that approximately in half, is that correct?

A I presume so.

Q Even if we take all those restrictions and 13 percent, we are talking about many hundreds of thousands of people?

A But how many would you find here in

1 Richmond?

2 Q I don't know. I don't think you
3 know either, do you?

4 MR. DRISCOLL: If Your Honor please,
5 this is turning into argumentative material.

6 MR. JOHNSON: I agree, Judge. Her
7 answer was argumentative. Maybe I could get a
8 different answer from her.

9 MR. DRISCOLL: If Your Honor please,
10 she indicated she is not a population
11 geneticist and cannot answer the questions in
12 her field. The question is improper, and I
13 object to him--

14 THE COURT: She has answered the
15 question as precise as she can. It is 13
16 percent of the population.

17 MR. JOHNSON: Mr. Driscoll then he
18 attempted to limit that in his redirect.

19 THE COURT: She said of everybody.
20 I think it might be--

21 MR. JOHNSON: Yes, sir. Mr.
22 Driscoll then tried to limit that by saying
23 black adults.

24 THE COURT: I really don't know.
25 Does this test determine race in any way?

1 THE WITNESS: No, sir, it does not.
2 THE COURT: It is 13 people, whether
3 it would be black or white.

4
5 BY MR. JOHNSON: (Continuing)

6 Q Then I am mistaken when I said--

7 A This is total population.

8 THE COURT: That's what she said,
9 very plainly. 13 percent of the total
10 population.

11 MR. JOHNSON: I am talking about
12 even bigger numbers.

13 THE COURT: I really don't know, Mr.
14 Johnson, what your problem is. She said 13
15 percent of the population, whether it be 250
16 million people or 100 people would fit in this
17 category. The fact she has used that, as I
18 recall, 13 people out of 100.

19 MR. JOHNSON: Yes, sir. That is
20 what I am trying to do on recross, on my,
21 which is--I am trying to clarify it, what Mr.
22 Driscoll said, he tried to limit it to adult
23 blacks.

24 MR. DRISCOLL: No, I didn't.

25 THE COURT: He didn't say anything

1 about blacks at all.

2 MR. JOHNSON: If I am mistaken,
3 fine. I just want to make sure the jury
4 understands.

5 THE COURT: If you want to ask
6 another question--

7 MR. JOHNSON: Yes, sir.

8

9 BY MR. JOHNSON: (Continuing)

10 Q We are talking about adult males, 13
11 percent of the population that fit into that group?

12 A We are talking about 13 percent of
13 the total population which fits into that group.

14 MR. JOHNSON: Thank you.

15 THE COURT: All right. Thank you,
16 Mrs. Burton. You may be excused.

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WITNESS STOOD ASIDE

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THE COURT: Ladies and gentlemen, I
@2.1.7.
see we have been going about two hours. I am
going to give you a break for about 20
minutes.

Sheriff, would you take charge of
the jury, make sure they have some coffee.

NOTE: At this time, the jury
retires from the courtroom at 11:26 a.m.

JURY OUT

NOTE: At this point recess is had
from 11:27 to 11:51 a.m., whereupon court
is reconvened; the defendant being present,
the hearing is resumed in the presence
of the jury, as follows:

THE COURT: All right, sheriff.
Return the jury.

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MR. DRISCOLL: Judge, the next witness will be Dr. Kevin McElfresh.

NOTE: The jury returns to the courtroom at 11:52 a.m.

JURY IN

THE COURT: Do counsel at the bar waive the polling of the jury?

MR. DAVIS: Commonwealth waives, Your Honor.

MR. EVERHART: Defense waives, Your Honor. Thank you.

THE COURT: Dr. McElfresh, if you will come forward, please.

1 KEVIN MCELFRISH, a witness called by the
2 Commonwealth, first being duly sworn, testified as
3 follows:

4 DIRECT EXAMINATION

5 BY MR. DRISCOLL:

6 Q Sir, what is your name, please, and
7 what is your occupation?

8 A My name is Kevin McElfresh. I am
9 the assistant manager of the forensic and paternity
10 laboratories at LIFECODES Laboratories, in Valhalla,
11 New York.

12 Q What does that position entail, as
13 far as your work responsibilities?

14 A My job is to oversee the day-to-day
15 operations of the forensic and paternity laboratories.
16 That is the casework as it moves through the
17 laboratories, and the processing of the casework. It
18 is also to evaluate the results of casework and write
19 the reports, and simply just send it through the
20 various agencies.

21 Q What is your field or fields of
22 study?

23 A My fields of study are molecular and
24 population genetics.

25 Q Can you give us the definition of

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1 those?

2 A Certainly. Genetics, itself, are
3 the study of how genes are responsible for heredity.
4 That is how different traits are passed from one
5 generation to the next.

6 Molecular genetics is the study of
7 that movement of traits from one generation to the next
8 at the molecular level.

9 Population genetics is the study of
10 inheritance, not from individual to individual, but in
11 populations. That is why a particular population would
12 have one particular characteristic, or how a
13 characteristic in a population might change over time.

14 Q If you don't mind, let's go through
15 your educational background. First the undergraduate
16 work, then the graduate work, any work you have done
17 since receiving your doctorate.

18 A All right. I have a bachelor of
19 science degree in biology with a minor in chemistry and
20 math from Florida International University in Miami,
21 Florida. I have a masters of science degree in
22 molecular, cellular, and developmental biology from
23 Iowa State University, in Ames, Iowa. And I have a
24 doctorate in molecular and population genetics from the
25 University of Georgia.

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1 Since I received my doctorate in
2 1984, I did post-doctral study in bio-technology,
3 bio-resources program at the University of Georgia. I
4 followed that by further post-doctral study at the
5 University of Florida, and then went to work for the
6 United States Department of Agriculture in the
7 Agricultural Research Sources as a geneticist. I
8 followed that by going to LIFECODES in November of
9 1987.

10 Q Do you hold any teaching positions,
11 whatsoever?

12 A Yes. I am an adjunct professor of
13 microbiology at the Medical College of New York, in
14 Valhalla, New York, which is a position where myself
15 and my colleagues from LIFECODES teach a course in
16 human genetics to medical students there.

17 Q Do you belong to any professional
18 societies?

19 A Yes. I am a member of the American
20 Association for the Advancement of Science, and also a
21 member of the American Association of Human Genetics.

22 Q Trying to remember back to my
23 college days, it seems professors publish.

24 Have you been involved in the
25 publication of any articles?

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1 A Yes. I have published at least nine
2 or ten articles in a variety of scientific journals,
3 and also just recently submitted two chapters in the
4 use of DNA for forensic purposes for publication in
5 books.

6 Q Now, when you say you publish in
7 journals, is that the same as submitting an article to
8 Readers Digest for publication, or is there some sort
9 of review before you can publish in one of these
10 scientific journals?

11 A It is very different than sending an
12 article into Readers Digest.

13 What you have to do, in terms of
14 science, is once you have finished a series of
15 experiments and reviewed your data and come to your
16 conclusions, you write these up in a research paper.
17 This is then submitted to the editor of the journal,
18 who, in turn, sends this paper to your peers in the
19 field, people who would be competent to judge your
20 work, and who are unknown to you. You may know them in
21 the field; you would not know that they were looking at
22 your particular paper.

23 In this case, it is called anonymous
24 peer review. These people can look at your article and
25 submit their comments back to the editor of the journal

1 and tell them that, you know, they really don't like
2 the study, it shouldn't be published, that the study
3 itself is worthy of being published if some changes are
4 made, or simply to publish the article.

5 . If it passes what is called peer
6 review, that is, other scientists in the field have
7 looked at your work and approved it, then it would be
8 published in that particular journal.

9 Q You have mentioned that you have a
10 couple of specialty fields. Does the DNA printing fall
11 within those fields?

12 A Certainly. Yes, it does.

13 Q Have you personally done--and I mean
14 being at the bench now--any of this DNA printing?

15 A Yes. Certainly.

16 Q How many times, roughly?

17 A In terms of working at LIFECODES, I
18 have done, perhaps, 100 or so cases involving the DNA
19 print technology.

20 Prior to working at LIFECODES, the
21 number that I have done would be well over one
22 thousand, I'm sure. The technology is the very same.
23 The use of it is simply-- I mean, the application is
24 slightly different, but the basic bench work would be
25 the same.

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1 Q When did you first begin doing this
2 type-bench work, the DNA printing process? As an
3 undergraduate, graduate, or what?

4 A In graduate school, I used it. More
5 specifically, I did several variations of this
6 technology as an undergraduate. When I was in
7 undergraduate school is when this technology was first
8 coming together and people were looking at it and
9 evaluating it then. Since that time, it's been an
10 intricate tool in a variety of my research projects.

11 Q Well, the technique itself is, an
12 undergraduate student or college student can do it. Is
13 it complicated at all?

14 A No. Certainly not. It is a very
15 standard technology that the people in the laboratory
16 and people who work for you in the laboratory would do
17 routinely on a day-to-day basis.

18 Q In addition to this thousand or so
19 times that you have fully done the test, do you
20 supervise others who do the DNA printing?

21 A Yes. The forensic laboratory has
22 six scientists in that lab, and there are three more
23 scientists in the paternity laboratory who do this test
24 on a day-to-day basis.

25 We process between 60 and 80

1 forensic cases each month, and between 80 and 100
2 paternity cases each month, all of them involving DNA
3 print technology. It is my job, actually, to supervise
4 those, the processing of that casework and review the
5 results.

6 Q Is it your job to review results in
7 each of the tests?

8 A Yes. Each of those tests, the
9 results are reviewed by myself as well as two other
10 PhD.'s on staff at LIFECODES to make sure that
11 everybody agrees with the results.

12 Q Can you give us a figure, an
13 average, I guess, of how many of these tests you review
14 each month?

15 A Something on the order of 100 to 150
16 tests a month.

17 Q Have you ever qualified in a Circuit
18 Court, or a Court of record such as this, anywhere?

19 A Yes, sir, I have.

20 Q How many times, and where were these
21 qualifications made?

22 A I have been accepted as an expert 17
23 times in 11 different states.

24 Q Is this in the fields of molecular
25 and population genetics?

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1 A Yes, it is.

2 Q This test that we are going to be
3 talking about, or this procedure, the DNA printing, is
4 it a tool which is used both to identify, as well as to
5 exclude an individual?

6 A Yes. Most definitely.

7 Q Has this been done by LIFECODES?

8 A Yes. As a matter of fact, just last
9 week, LIFECODES testified in a trial for the defense
10 where the defendant was excluded, and the charges were
11 dropped.

12 Q Where was that?

13 A That was in Westchester, New York.

14 MR. DRISCOLL: Judge, subject to the
15 cross-examination of defense counsel, I would
16 move the introduction of this witness as an
17 expert in the field of molecular and
18 population genetics.

19 THE COURT: All right. Any
20 questions, Mr. Johnson?

21 MR. JOHNSON: No, sir, judge.

22 THE COURT: All right. The Court
23 will admit it.

24 Q Dr. McElfresh, I have one document I
25 would like you to review before we begin this course on

1 DNA. Would you examine that document and tell us what
2 it is? '

3 A That's my curriculum vitae;
4 discusses my educational experience and background.

5 Q Does it also list the articles that
6 you have published and your activities in the
7 scientific field?

8 A Yes, it does.

9 MR. DRISCOLL: Judge, would the
10 Court receive that as Commonwealth's Exhibit
11 No. 17, please?

12 THE COURT: All right.

13
14 NOTE: The above-referred-to
15 curriculum vitae of Dr. Kevin McElfresh was
16 marked and filed as Commonwealth's Exhibit No.
17 17.

18
19 Q Doctor, we have used the term, now,
20 DNA. What exactly is that? Where does it come from?
21 How do you separate it? Could you give us an overview
22 before we get down to the specifics of this case?

23 A I would be glad to. I have a number
24 of visual aids that would help me with that discourse.
25 If you would like, I could use those.

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1 Q The overhead projector?

2 A The overhead projector and some
3 colored photographs, as well.

4 Q Would you like the overhead
5 projector first?

6 A Yes. I think that would probably be
7 the best place to start.

8 MR. DRISCOLL: Sheriff, if you could
9 bring the screen up again and help us.

10 A To begin answering your question
11 while he is setting up the screen, what I would like to
12 do--and so that you have the proper prespective to
13 understand what we are going to talk about, I am going
14 to go back and discuss a very brief history of the
15 field of genetics and population genetics to give you
16 an understanding of the breadth of the science and
17 where it comes from.

18 I will talk briefly about LIFECODES,
19 itself, the company that I work for, and what we have
20 done, and then go on and discuss DNA in particular and
21 how it could be used in this particular type of test.
22 Describing along the way a number of the
23 characteristics of that molecule that makes it most
24 useful for this type of testing, and, of course, those
25 are the very same characteristics that make it such an

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1 important molecule in genetics and how it can code for
2 that information that makes us all unique.

3 To begin, although this is a very
4 condensed overhead, if you will, there are several
5 important parts to talk about. And I will just give
6 you the important dates.

7 This date right here, 1866, is
8 probably the most important date in the field of
9 genetics. It is that year that Gregor Mendel, a monk
10 in Austria, published a paper in a scientific journal
11 describing how characteristics in a pea plant could be
12 inherited discretely, showing very specifically for the
13 first time that there was a way to pass those
14 characteristics from parent to child in a very precise
15 manner.

16 Traits, and the process of passing
17 those traits are now known as Mendel's Laws of
18 Genetics. They are as valid today as they were in
19 1866. We still, in the field of genetics, look at our
20 data and ask the general question, does it obey
21 Mendel's laws?

22 These are two very simple laws that
23 describe the inheritance of genetics. That is really
24 when the field of genetics got its foundation and began
25 to blossom into the science that we know today.

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1 Along the way, in about 1900,
2 although it is not listed here, two gentlemen by the
3 name of Hardy and Weinberg, discussed and formulated a
4 series of equations now known as the Hardy-Weinberg
5 Equilibrium that was built on the original work of
6 Gregor Mendel and allowed us to calculate how often we
7 might expect to find a trait in a population, given
8 certain parameters. That is now called the
9 Hardy-Weinberg Equilibrium. Those series of equations
10 are still at mind to date.

11 We will talk about that. We can
12 move now through the 1920's and on into the 1950's.
13 During that period of time, the molecule, DNA--or DNA
14 stands for, that is three, DNA's dioxyribonucleic acid,
15 which is, of course, we all refer to it as DNA. That
16 molecule, itself, was first isolated in the nucleus of
17 a cell. And every cell that we have, with the
18 exception of our red blood cells, has a nucleus wherein
19 the DNA is kind of in packages we call chromosomes.

20 And in 1953, Watson and Krick
21 actually deduced the physical structure of DNA. That
22 is how the molecule is put together and thereby deduced
23 how it could code for information. And DNA, it was
24 learned during that period of time, was the molecule
25 that was directly responsible for carrying that

1 used thousands of times, that you will find used
2 thousands of times in literally thousands of
3 laboratories around the world.

4 To give you some perspective. The
5 Southern Transfer Technique--and it is named Southern
6 Transfer after Ed Southern, this technology that we
7 will talk about, that I will show you--that paper is
8 the most cited scientific paper in the history of
9 science. It is cited annually some 24 hundred times in
10 virtually every scientific journal dealing with the
11 life sciences that you can name. That is the
12 importance and the breadth of use of this technology
13 and how broadly genetics is now applied to the various
14 disciplines in science.

15 All right. To just give you a quick
16 overview of LIFECODES and how we have set up our
17 investigations. LIFECODES was formed in 1982 as a
18 corporation. And the initial part of the research and
19 development for the application of the Southern
20 Technology towards forensic identification was begun.
21 We did a collaborative study with the New York Blood
22 Center, and began also applications of isolating DNA
23 and using it for identification from a variety of
24 things like tissues, and blood, and semen, and a
25 variety of other things associated with forensic work.

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1 In 1985, we isolated, and verified,
2 and validated our probe for sex determination--that is,
3 if we have an unknown DNA sample, we can tell you
4 whether that DNA came from a male or female. And that
5 is quite easy to do. Males have an X and a Y
6 chromosome, two particular packages of DNA, while
7 females have two X chromosomes. So we have a probe
8 that detects that Y chromosome, the difference between
9 male and females.

10 In 1986, we did a series of
11 environmental studies, how it affects DNA, different
12 substrait studies. If we find blood or semen on things
13 like rocks or fabric, how things like that might affect
14 evidence. And we began building our data base.

15 The data base is a collection of
16 prints that we discussed, that we can use to predict
17 Hardy-Weinberg Equilibrium to suggest how often we
18 might find a particular pattern in the DNA population.

19 In 1987, we did a series of aging
20 studies. That is how old it might be that we can still
21 recover it, not determining how old the person who had
22 the DNA, but, in fact, how old the bloodstain might be
23 that we could actually recover DNA from it, drying
24 time, and a number of studies to help process casework,
25 and began accepting casework.

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1 And we also did a series of blind
2 trial tests. I will discuss the results of those blind
3 trials.

4 Also, to give you an idea of the
5 staff at LIFECODES, we have a staff, including myself,
6 that has a very eminent set of qualifications. We have
7 our director of forensic science, who has a Ph.D in
8 bio-chemistry and worked with the New York Medical
9 Examiner's office for over 15 years. Our director of
10 DNA laboratory services is a Dr. Ivan Balasz, who is a
11 Ph.D in cell biology. The manager of the DNA
12 laboratory is Dr. Michael Baird. And then there is
13 myself.

14 The people who do the casework for
15 us are also eminently qualified to do the work that
16 they could. So that we have a laboratory staff that is
17 well trained and well versed in the fields of genetics
18 and population genetics.

19 Well, to give you the information
20 that I want to give you about what DNA is, and how it
21 is that it can be coded for this information, and how
22 it is that we can take the molecule apart and put it
23 back together. So specifically, I am going to use
24 these photographs to give you some idea of the concept
25 of DNA.

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1 This photograph, right here, is
2 simply an artist's rendering of the DNA molecule. The
3 important points are that this white ribbon that winds
4 around itself is the backbone of the molecule. That's
5 what holds everything together. Now, the backbones are
6 held together by these, what you might consider rungs
7 on a ladder. All right. So we have, in effect, a very
8 long ladder that is all twisted. Okay.

9 It is this molecule-- This is the
10 way DNA looks. This is the, a basic physical rendering
11 of the way the molecule actually looks, itself, this
12 twisted ladder.

13 What I want to do is, there are two
14 important points to be made from this ladder. First of
15 all, there is only one way to put the rungs of the
16 ladder together. The way that that is done is that
17 what you see are these rungs in the ladder have two
18 letters. And the two letters are A and T, and G and C.
19 That's a law. That is a law of genetics; that A always
20 binds with T, and G always binds with C.

21 Now, what that allows to happen, of
22 course, is there is only one precise way for those
23 rungs to fit together. In addition, we impose, on top
24 of that, the fact that this linear array of A's and
25 G's, and C's and T's read along the ladder is what

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1 codes for the information. A and G, and C and T can be
2 arranged in many different combinations to code to make
3 this and that, to make a nose, eyes and hair. That is
4 the very basics of genetics; the fact that A always
5 binds with T, G always binds with C. And that a linear
6 array of A's and T's, and G's and C's is how the
7 information is passed.

8 Now, that pair of molecular scissors
9 that I talked about can recognize a specific sequence
10 of A, T, G and C, or T T G C, or whatever. It can
11 recognize a specific sequence and cut, right at that
12 specific spot.

13 So now we have a method wherein we
14 can take the molecule apart and put it back together in
15 exactly one way, because the A's and T's, all have to
16 line-up with A over T, and G over C. They have to be
17 in the right order, or the alignment won't occur. And
18 we have a specific that the scissors cut into very
19 defined pieces in one area.

20 Just these two very simple straight
21 forward facets of the molecule that allow it to code
22 for the information and to be used in the way that it
23 is used and why it has become the basis of so much of
24 what you see and hear about in day-to-day life in terms
25 of biology and medicinal applications, and its

1 applications and its use in a variety of methodologies.

2 In fact, LIFECODES is a corporation
3 that uses DNA print technology not only for forensic
4 and paternity, but also for the purposes of cancer
5 diagnostics. A number of cancers are associated with a
6 change in the structure at the level of the tumor. We
7 can use it for human medical diagnostics, certain
8 viruses, and other diseases can be detected using DNA
9 print technology, and a variety of other things like
10 that. So it is not just one particular application
11 that our corporation is involved with.

12 Now, the final step in this is the
13 actual DNA print, itself. That is how we do the test.
14 And this is basically an overview of how the test is
15 done. And DNA, as I said, is contained in any cell
16 that has a nucleus. White blood cells, skin tissue,
17 organs, any number of things. Hair roots, hair,
18 itself, is mostly protein, but that root where it is
19 actually attached to your scalp contains cells that
20 have DNA in it. Any tissue that has cells in it can be
21 broken open, just like breaking open a fresh egg.

22 And if you use that egg analogy, you
23 have the egg and the yolk. And the yolk serves as the
24 cell nucleus. In the yolk part would be where the DNA
25 is. What we do is we purify the DNA by breaking open

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1 cells. And if we purify DNA from a dried stain or
2 something similar, we would simply solublize the
3 stain--that is, make it wet again and take those cells
4 that are now wet and break them open. The DNA would
5 pour out into a solution when the cells are broke open,
6 and we would remove the other cellular debris leaving
7 only the DNA.

8 These are very standard accepted
9 chemical proceedings done, actually, since the early
10 1920's and '30's when DNA was actually being
11 identified.

12 Q When you say standard and accepted,
13 are you talking about in the medical and scientific
14 community?

15 A Yes.

16 Q These are in the labs, worldwide?

17 A Yes. This technology, in terms of
18 isolating DNA, has changed very little. What we then
19 do is, we use, we take our purified DNA. And DNA, in
20 its pure form--to give you some sense of the length of
21 this molecule, there are, this twisted ladder has some
22 30 billion rungs to it. If you think about it, that
23 sort of makes sense. Human beings are an awfully
24 complex organism. And it takes an awful lot of
25 information to make a human being. That is exactly

1 what you might expect. So we have 30 billion rungs on
2 this ladder.

3 When we isolate DNA, it comes out,
4 looks like a ball of yarn. It folds all back up on
5 itself. What we have to do then is take that ball of
6 yarn, that long molecule of DNA, and cut it into pieces
7 that we can use. And we cut that with other molecular
8 scissors. In this case, our molecular scissors, we
9 refer it to as PST-1. It is simply a name for a
10 particular enzyme that cuts in a very particular spot.
11 We use this enzyme.

12 These enzymes, like PST-1, are
13 commercially available from chemical supply houses. We
14 cut our DNA into fragments. Okay. And we have an
15 enzyme called a restriction enzyme, our molecular
16 scissors. We cut the DNA into fragments. And these
17 fragments of DNA, with this particular pair of
18 molecular scissors, are very different from individual
19 to individual.

20 And something that is different from
21 individual to individual in science is called, at least
22 in biological science, is called a polymorphism. This
23 group is polymorphic for hair coloring. We have very
24 different hair coloring between individuals. Hence,
25 when we talk about DNA technology, we talk about

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1 restriction for restriction enzymes, fragments for the
2 fragments of DNA that we have been working with,
3 polymorphism. Because these fragments are different
4 between individuals.

5 We finish this analysis by
6 separating these fragments by size. To do that, we use
7 a process called eletroforesis. It is a very simple
8 technique. The DNA molecule, itself, has a very small
9 charge to it in an electrical field. This molecule
10 will move towards one of the poles, just like it is
11 charged to something. A battery, for instance.

12 What happens if we apply this DNA
13 into a gel-like substance, very much like Jello, into a
14 little well, and we apply a current to it. The very
15 large pieces of DNA will be very slow to move through
16 it, because this big piece of DNA has to get through
17 the gel. And it will move slowly, just as if you were
18 trying to carry a long stick through a thick set of
19 woods. There is a small piece of DNA which will move
20 quickly, attaching itself to the largest. All these
21 pieces of DNA we have created align themselves and cut
22 them with the scissors to cut up the ball of yarn.

23 Once we have done that, we then
24 apply the technology that Southern wrote about in 1975
25 to take our DNA, transfer it. Okay. We have this nice

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1 gel-like slab with all the DNA aligned in it. We have
2 this piece of notebook paper right on top of our gel
3 slab. And we put paper towels on top of that. What
4 this does, of course, is all the liquid in the gel-like
5 slab is picked up in the paper towels, but the DNA
6 sticks to the filter paper, because it has a charge on
7 it.

8 When we do that, the DNA is stuck in
9 that exact position on this filter paper. We have this
10 paper, piece of paper with the DNA stuck to it. At
11 this point, when the DNA sticks to that piece of filter
12 paper, it is irreversible. It is there forever. It
13 can't be changed. It can't be manipulated in any way.
14 This piece of DNA is stuck to the filter paper. We
15 have to visualize a pattern. We have to actually be
16 able to look at something. We do that with something
17 called a probe.

18 A DNA probe is simply a piece of
19 human DNA that has been cloned and characterized into
20 specific set of pieces of information. We know exactly
21 what this piece of DNA is. Not only do we know exactly
22 what this DNA is, we know all the sequences of the A's
23 the T's, and the G's and the C's. We know all of this.
24 In addition, we know exactly on what chromosome we have
25 23 chromosomes, 23 chromosomes. And we have a pair.

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1 Each one is a pair. We have got one member of that
 2 pair from our mother, and one member of that pair from
 3 our father. So we have 23 pairs. We know on what
 4 chromosome and where on that chromosome our DNA probe
 5 looks.

6 And in forensic work, we use three
 7 DNA probes. We look at three different chromosomes.
 8 We look at the XY pair, we look at Chromosome 2, and we
 9 look at Chromosome 17. These three areas happen to
 10 contain pieces of DNA that are very different between
 11 individuals, so they are very useful, of course, for
 12 doing identifications. You can think of the use of a
 13 DNA probe just like putting a plug in a socket, because
 14 we can only take that DNA apart. We can unzip it right
 15 down the middle of the ladder. We can take the A away
 16 from the G, and take a probe and plug it in in its
 17 place. Only in this case, the standard two or three
 18 pronged plug that you are used to using at home, we now
 19 have a plug that has 300 prongs on it. Okay. These
 20 300 prongs will only fit one very precise receptical.

21 The way we visualize our pattern is
 22 what we do, our DNA probe is radioactive. It is a very
 23 low level of radioactivity that we use. And this radio
 24 activity, once stuck in place, you can lay a piece of
 25 X-ray film right over top of it. It will expose the

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1 film, just like taking an X-ray picture of your lungs
2 at the doctor's office. And then on the X-ray film,
3 what you see is a series of black spots wherever the
4 probe is stuck on our piece of filter paper. It is a
5 very simple straight forward technology that is used in
6 thousands of laboratories around the world.

7 In fact, what I have just described
8 to you, in a word, is what Ed Southern published in
9 1975.

10 Now, to give you some feel for the
11 publications involved, our group, as well as other
12 groups from other laboratories have published, in terms
13 of forensic studies on a variety of sources, the Guste,
14 et al publication is from our laboratory, the Cantor,
15 et al publication.

16 What I want to point out to you is
17 that these citations that I have listed, the importance
18 of the journals, that they are listed in, you can see
19 that we have Nature, The Journal of Forensic Science,
20 Electroforesis. These are very eminent journals in the
21 field. All of them peer review journals. These
22 studies have been approved.

23 In addition, we have also done a
24 series of family studies that allow us to show how
25 these various genetic areas, these DNA probes, in fact

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1 are our specific genetic area, that they conform to
2 things like the Theory of Mendelian Inheritance, or
3 Mendel law, that we have done, Hardy-Weinberg studies,
4 things like that.

5 Again, you will see journals like
6 the Proceedings of the National Academy of the United
7 States of America where these results have been
8 published.

9 And finally, to give you some sense
10 of what kind of results we can obtain with these
11 studies are, we have participated in a series of blind
12 trials. Now, what this is, is the sheriff's office in
13 San Bernardino, California, took a series of
14 bloodstains from real trauma cases, car accidents and
15 the like, and blotted these stains onto cloth, this
16 blood onto cloth and shipped them to us, coded in
17 number. We knew nothing other than the fact that they
18 were bloodstains. They asked us to isolate the DNA and
19 answer the question, how many of them matched? That
20 is, how many times they had submitted the same stain to
21 us under a different number, and how many different
22 matched.

23 In addition, following that, the
24 Orange County Sheriff's Office, in California, did that
25 with blood stain and semen pairs, and again, asked us

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1 how many matched, how many didn't. The results of that
2 study are that in the first one, they submitted 22
3 bloodstains. Of those 22 stains, we obtained 16 DNA
4 prints. All right. That means that six of the stains
5 didn't give us any DNA, for whatever reason. There
6 wasn't enough stain, the material had actually degraded
7 beyond use. Of the 16 DNA prints that we obtained,
8 five matched. That is, of 16, there were ten pairs, or
9 five pairs, which was ten stains.

10 When we did the analysis from Orange
11 County, they shipped us 51 samples, we obtained 37 DNA
12 prints. 11 of those matched, and the rest did not
13 match. And when we sent that analysis back to those
14 people, the number of mistakes was 0.

15 There was a very important reason
16 for that. The reason has to do with the test, itself.
17 The DNA print test, the way it is done. And because of
18 the properties of the DNA molecule itself, if something
19 were to happen, if something happened that the DNA had
20 been badly damaged by the environment--which it can
21 be--or that it had been attacked by bacteria, which
22 exists in the environment, the DNA is degraded, you get
23 no results.

24 As you see, we did not get a DNA
25 print for every stain they sent us. Because for one

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1 reason or another, there wasn't enough for us to get.
2 It doesn't give us the possible answers or no answer at
3 all. Because the DNA was not suitable for one reason
4 or another, they matched--that is the two DNA samples
5 matched or a non-match. The two samples did not match.
6 And that is because of the properties of this DNA
7 molecule, the rungs on the ladder and the way it is put
8 together. It will be very stable for a long period of
9 time. But if subjected to environmental injury, it
10 will fall apart. And because of the nature of this
11 then, that is the way the results come out. You get no
12 results, a match or a non-match. Those are the three
13 possibilities.

14 Now, how do we know, for instance,
15 then that once we have a match, that we are looking at
16 something that is virtually unique? Well, we use our
17 data base of DNA print. We have done, we have gathered
18 samples from all over the country. They have actually
19 been submitted to us from blood centers in New York and
20 California, and all over North America for testing.
21 They have shipped us fresh blood samples. We take
22 these blood samples and isolate the DNA, do a DNA print
23 with our probes, and then we store it to see how many
24 of any particular DNA bands we might see. So that
25 anywhere along our gel, where all the DNA has been

1 isolated from longest to smallest, where we might have
2 seen a DNA band. And then using the Hardy-Weinberg
3 equilibrium, allows us to predict how often we might
4 see a DNA pattern. Now, that is population genetics.

5 The very simple analogy is that if I
6 were to ask you how long you would have to stand on a
7 street corner before you saw a Ford, well, the answer,
8 of course, is not very long at all. There are many
9 Fords around. If I were to ask you how long you would
10 have to stand on a street corner until you saw a Rolls
11 Royce, you would stand there a lot longer. You have
12 not counted, I am virtually certain, every Rolls Royce
13 in the country, or every Ford in the country. But we
14 know by looking at a sample of automobiles, we know for
15 a fact there are more Fords than Rolls Royces. We can
16 use that to project how often we might see something.

17 That is what a data base is. You
18 have a data base of cars, we have a DNA data base of
19 DNA. For the analysis, we simply look at DNA from
20 different sources, ask the question, does it match or
21 doesn't it match? If it does match, we have a very
22 straight forward method of measuring that distance that
23 the band has moved, from the very top, towards the very
24 bottom. And then using our data base to ascertain how
25 often we might expect to find that DNA print in the

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1 population. And that's really my job. That's what I
2 do. I look at the analysis handed to me by the
3 scientist in the lab.

4 They will do a preliminary analysis
5 and indicate to me what they think the results are. I
6 will confirm that and then go ahead and do the
7 population statistics of society with it.

8 That's the DNA print testing and how
9 it is done.

10 Q You indicated that these
11 probabilities use equations, and the equations go back
12 to around 1900, the turn of the century, is that
13 correct?

14 A That's correct.

15 Q Again, these probabilities that you
16 come up for these patterns, these, the recurrence of
17 the pattern in the population, that is used worldwide
18 in all labs and has been since the early 1900's?

19 A Yes. Population statistics has been
20 in use since the 1900's with the equations of Hardy and
21 Weinberg. It's been used in a variety of populations,
22 from fish populations to human populations, to a
23 variety of, for a variety of reasons based on ABO blood
24 typing, for instance, uses population statistics. Any
25 number of characteristics. You can build a data base

1 for that characteristic and then use a data base as a
2 foundation for predicting how often you would expect to
3 find a characteristic in the population.

4 Q You have indicated that, with the
5 exception of twins, the DNA in anybody is going to be
6 unique, is that right?

7 A That's correct. The DNA in
8 individuals, except for identical twins. Now,
9 identical twins are where one egg and one sperm came
10 together and then split into two before going onto make
11 the baby. So we have two identical children with the
12 same DNA. Fraternal twins are where you can have a
13 brother and a sister who are twins, are actually two
14 eggs and two sperm and just the same, for genetic
15 purposes, as if they had been born years apart.

16 Q If you use the term as you did,
17 virtually unique, DNA is virtually unique, is that
18 because of this identical twin situation?

19 A Yes. In large part, it is. We
20 know, scientifically, the DNA between individuals is
21 unique. You can look around the room and get a feel
22 for that. Again, it goes back to, in terms of science,
23 when we do scientific testing, we use statistics and
24 things like that, and population genetics to give us a
25 feel for the parameters associated with the DNA prints

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1 that we have developed.

2 However, in terms of what we know
3 from molecular biology, the DNA between individuals is
4 different.

5 Q Now, do you use these statistics,
6 one in so many whatever, because you have not tested
7 every individual in the world? Is that the reason for
8 the statistics?

9 A Yes. I mean, it is impossible for
10 us to test every human being in the world for their DNA
11 print pattern. So, of course, just as you wouldn't
12 count every Ford or every Rolls Royce in the country,
13 but you can gain a basic piece of knowledge as a data
14 base. That is exactly what we have done, because we
15 have not tested every person in the planet. We can see
16 that within the data base and the studies we have done,
17 these are the statistics associated with these
18 patterns.

19 Q Doctor, you have indicated that this
20 procedure, this technique, is used worldwide in all
21 labs. Is that the same technique--and I think you all
22 call it protocol--used in the LIFECODES lab?

23 A Yes. The technology that I have
24 just described is the basis of the protocol in the
25 LIFECODES laboratories, as well as protocols in

1 virtually every laboratory in the world. Again,
2 virtually, every laboratory that I know of.

3 Q What happens at LIFECODES if an
4 individual presents a swatch, some sort of stain for
5 analysis, for a DNA printing? What is your procedure
6 up there?

7 A Our procedure is once a sample is
8 received, either a piece of evidence or any sample is
9 submitted, it is given what we call an accession
10 number.

11 All this is, is a number that
12 LIFECODES assigns to that so we can always track it and
13 follow that one sample. And we set up, in addition to
14 that, in the forensic laboratory, what we call a chain
15 of custody. So that if a sample is hand-delivered or
16 delivered via Federal Express, however a sample is
17 delivered, it would be opened by our evidence
18 technician, or one of the scientists in the lab. They
19 would inventory the contents of the box sent to us,
20 assign numbers to the pieces of evidence, write these
21 down on a sheet of paper, and then sign for them so
22 that, in fact, they have received this piece of
23 evidence, it was in this condition when it arrived, and
24 you know, this is my signature to back up that
25 statement. And then that chain of custody would follow

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1 those samples through the laboratory as they were
2 processing.

3 Q In your particular lab, describe the
4 step-by-step procedure, and state for us whether or not
5 that has been reduced to writing, these steps that you
6 use.

7 A All right. The steps are virtually
8 as I have described them.

9 We have the isolation of the DNA,
10 and these have been all set forth in a very specific
11 set of protocols in terms of how much of any particular
12 one compound you would add to break open the cells, et
13 cetera. And again, these are all, this technology, and
14 the use of this technology is the same technology that
15 is used in the laboratories, worldwide.

16 Q Is it deemed reliable worldwide?

17 A Yes. Certainly. Again, the
18 evidence for that is specifically papers like the one
19 by Ed Southern, in 1975, that are cited as the way to
20 do this technology. And in scientific discussions, if
21 you say if I am talking with other scientists, I would
22 say, well, I did a Southern Transfer. He would say,
23 fine. What were your results? It would not be a
24 discussion of whether it worked.

25 The DNA, once it is isolated, is cut

1 into pieces using the molecular scissors, the
2 restriction enzyme which is commercially available and
3 quality controlled by the company who sells it in
4 addition to our own company, who again checks this
5 enzyme to make sure that it is exactly what we
6 purchased. The DNA is treated with the restriction
7 enzyme that is cut into pieces as a very exact protocol
8 for doing that again. All the same protocol. This is
9 all contained as part of Ed Southern's paper. We do
10 the actual Southern Transfer, itself, which is part of
11 the protocol, all of it reduced to a very specific
12 written set of guidelines. And then the filter paper,
13 itself, is reacted with the DNA probes.

14 Q This gives the pattern, is that
15 correct?

16 A That's correct.

17 Q How is a pattern analyzed? You say
18 it is brought to you. Any pattern in your lab is
19 brought to you for analysis. How is that done? What
20 do you look at?

21 A We have X-ray films that, you know,
22 all the X-ray films that you would be looking at a
23 picture, and we look at the pattern. And we do a
24 visual inspection of the pattern. Does it, or doesn't
25 it match? And by matched, I mean, does it look like

1 the other pattern? These patterns are distinct enough
2 and individual enough that if the pattern doesn't
3 match, it is very visually available.

4 Q In addition to the visual
5 observation to match up these patterns, is there any
6 other way of matching them up, or determining that they
7 are not a match?

8 A Yes. There is actually a
9 mathematical way of doing that. And what we include on
10 all of our gels where we separate that Jello-like
11 material where we separate the DNA by size, what we
12 include in that is what is called a set of standards.
13 And these are pieces of DNA's from a variety of
14 bacterial origins that we have, we know precisely the
15 size of these pieces of DNA.

16 So when we see this particular black
17 spot in this position, that is a representative of that
18 piece of DNA, we know how large that piece of DNA is.
19 And we can use that then to measure, as a ruler if you
20 will, the pieces of DNA from our known or unknown
21 samples.

22 In addition, we also have a set of
23 controls from a human cell line that we run that DNA
24 all the time. And when we see that pattern from that
25 human cell, we know that, in fact, all the conditions

1 of the tests were correct, and that the test was
2 performed accurately.

3 Q In this particular case, are you
4 aware of whether or not the DNA pattern of this
5 defendant was established at your lab?

6 A Yes.

7 Q Was material brought there from him?

8 A Yes, it was.

9 Q His blood?

10 A Yes, it was.

11 Q Was it assigned an accession number?

12 A Yes, it was.

13 Q Are you aware of that number?

14 A I believe that number was 7540.

15 That report that we issued would have that number on
16 it. And I could verify that. I am virtually certain
17 that is the number.

18 Q In addition, are you aware that a
19 slip containing seminal fluid was brought from the
20 crime scene of Dr. [REDACTED] home to your lab for
21 analysis for a DNA print?

22 A Yes, it was.

23 Q Further, are you aware that a DNA
24 print was made of the victim's, Dr. [REDACTED], DNA
25 pattern?

1 A Yes.

2 Q All of this work was done at your
3 lab, is that correct?

4 A That's correct.

5 Q Did it follow, in order to make the
6 determinations to compile this DNA print in each
7 instance, did you follow the protocol as you have just
8 described it?

9 A Yes. That was done by the
10 scientists in the laboratory.

11 Q Who were the scientists that
12 reported to you their results on the running of these
13 techniques to establish the DNA pattern?

14 A That was Ms. Lisa Bennett and Ms.
15 Lorah McNalley, who are the forensic scientists in the
16 laboratory that did that work.

17 Q Once they established the patterns
18 for the victim's DNA, for the defendant's DNA, and for
19 the DNA pattern found on the victim's skirt at the
20 crime scene, was that information presented to you for
21 analysis?

22 A Yes, it was.

23 Q Did you analyze those patterns?

24 A Yes.

25 Q Did you review the, what you call

1 the X-ray or the autorad that contained their findings?

2 A Yes, I did. That's part of my job.

3 Q Did you determine whether or not
4 there was a match between the pattern of this defendant
5 and the seminal fluid, or the DNA pattern left on the
6 victim's slip?

7 A Yes. The DNA from the defendant and
8 the DNA isolated from the slip. Those two patterns
9 matched.

10 Q Could you tell the members of this
11 jury how often that pattern, what the numbers are as
12 far as the recurrence of that pattern in the North
13 American population?

14 MR. JOHNSON: Judge, I have an
15 interjection at this point. I have not seen
16 those numbers. I believe they might be
17 updated. I don't know if they are or not. If
18 they are, I would like to see them, first. I
19 would like to have an opportunity to make a
20 motion out of the presence of the jury.

21 THE COURT: Ladies and gentlemen of
22 the jury, retire for a moment, please.

23
24 NOTE: At this time, the jury
25 retires to the juryroom at 12:49 p.m.

1 JURY OUT

2

3

MR. DAVIS: Can I, while they argue,
4 get some exhibits?

5

THE COURT: Yes.

6

7

MR. JOHNSON: Judge, if I might, the
8 data we are aware of indicates that, I think
9 the figure we are talking about is 1 in 705
10 million. I don't know if that is the same
figure.

10

11

MR. DRISCOLL: That is the figure
12 that will be used today.

12

13

MR. JOHNSON: That is fine. My
14 understanding was as the data base increases,
15 that can change. We haven't been made aware
16 of any change. That is the only objection I
17 have.

14

15

16

17

18

THE COURT: Is there any change?

19

THE WITNESS: There has been no
20 change since the last time.

20

21

MR. DRISCOLL: That is the figure
22 they are aware of.

22

23

MR. JOHNSON: That was the reason
24 for the objection.

24

25

THE COURT: Well, you are bound to

1 JURY OUT

2 have been aware of it. I don't know if that
3 would be the same figure.

4 MR. JOHNSON: Judge, our
5 understanding was it was going to change. We
6 have not been aware of any change.

7 THE COURT: Return the jury.

8
9 NOTE: At this time, the jury
10 returns to the courtroom at 12:51 p.m.

11
12 JURY IN

13
14 THE COURT: All right. Does counsel
15 at the Bar waive a polling of the jury?

16 MR. DAVIS: Commonwealth waives.

17 MR. EVERHART: Defense will waive.

18 THE COURT: Proceed.

19
20 BY MR. DRISCOLL: (Continuing)

21 Q Sir, you were being asked what the
22 frequency was of this pattern, the pattern of the
23 defendant, Mr. Spencer, in the North American
24 population.

25 A The frequency of that pattern in the

1 North American black population would be 1 in 705
2 million.

3 Q How many blacks are there in North
4 America, in the United States, roughly?

5 A By last census, the North American
6 adult males in the United States would be something on
7 the order of 10 to 20 million.

8 Q Sir, you have spoken of an autorad.
9 I show you two documents now.

10 Is this what is known as an autorad,
11 an autoradiograph?

12 A Yes. This is the X-ray film that is
13 developed in a case, and it is referred to as an
14 autorad or an autoradiograph, or simply the X-ray film.

15 Q You indicated that the number of,
16 lab number given for the DNA pattern of this defendant
17 was 7540. Do you have that?

18 A That's correct.

19 Q Do you have that? Are those numbers
20 or those documents in your hand now?

21 A Yes. Yes. This is the DNA pattern
22 labeled 7540.

23 MR. DRISCOLL: Judge, may I
24 introduce those two documents showing the
25 pattern of this defendant as Commonwealth's

1 Exhibit No. 18?

2 THE COURT: All right.

3
4 NOTE: The above-referred-to
5 autorads numbered 7540 was marked and filed as
6 Commonwealth's Exhibit No. 18.

7
8 Q Now, sir, you also indicated that
9 the blood of the victim was received and analyzed, the
10 DNA pattern established, and the DNA pattern was
11 established for the stain that was received from the
12 victim's slip.

13 Would you look at these and state
14 for the members of the jury whether or not the DNA
15 pattern for the seminal fluid on the the slip is shown
16 with the accession number 5872 and the pattern for the
17 victim DNA pattern with accession number 5871?

18 A Yes, it is.

19 MR. DRISCOLL: Would the Court
20 receive those two documents as one exhibit,
21 Commonwealth's Exhibit No. 19?

22
23 NOTE: The above-referred-to
24 autorads numbered 5872 and 5871 were marked
25 and filed as Commonwealth's Exhibit No. 19.

1

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Q Sir, you indicated that you are involved in quality control at your lab, as are all labs. In addition to the gel samples and the control samples, do you keep a book or a log of temperatures, and the quality of the machinery, and the updates on that?

8

9

10

11

12

13

14

15

A Oh, yes. There is a very specific set of policies in terms of reading the temperatures on all the necessary machinery. One of the nice advantages of this technology is that it requires very little machinery, but that there is a specific set of policies in terms of maintenance, as well as record keeping for the functioning of this machinery throughout the laboratories.

16

17

18

19

Q You have indicated that your lab has been involved in tests to see that you are accurate all the time. Have other institutions come to your lab in order to set up their own DNA pattern, labs?

20

21

22

23

24

25

A Yes. As a matter of fact, that is one of the functions of LIFECODES, is to actually train other law enforcement agencies, or other agencies involved with testing where DNA print technology would be useful. We can train them in how to do this technology. And we have trained scientists from the

1 FBI Academy, we have trained scientists from the State
2 of Virginia, the states of Georgia and Florida, and we
3 will be starting another training program in, actually
4 next week, for scientists from the states of Arizona
5 and Idaho.

6 MR. DRISCOLL: If Your Honor please,
7 may I introduce as Commonwealth's Exhibit No.
8 20 the artist's rendering of this DNA? There
9 are several of them. I would introduce them
10 as just one exhibit, please.

11 THE COURT: All right.

12
13 NOTE: The above-referred-to
14 artist's renditions of a DNA molecule were
15 marked and filed as Commonwealth's Exhibit No.
16 20.

17
18 MR. DRISCOLL: If Your Honor please,
19 I have no further questions.

20 THE COURT: All right, Mr. Johnson,
21 are you cross-examining?

22 MR. JOHNSON: Yes, sir.

23
24
25

1 CROSS-EXAMINATION

2 BY MR. JOHNSON:

3 Q Good afternoon, Doctor.

4 A Good afternoon.

5 Q Sir, this LIFECODES laboratory that
6 you work for, is that a private corporation?

7 A We are held by Quantum Chemical
8 Corporation. We are a privately owned corporation,
9 yes.

10 Q Privately owned corporation. You
11 are owned by a larger corporation?

12 A That's correct.

13 Q You are not a non-profit research
14 organization, anything like that?

15 A No, sir, we are not.

16 Q When you do this training that you
17 just spoke about, that is done, I assume, for some kind
18 of fee?

19 A Yes.

20 Q Again, for profit?

21 A Of course. We have to be able to
22 cover our costs.

23 Q To cover your costs?

24 A You know, a corporation is in
25 business.

1 Q Yes, sir. Now, you say that
2 LIFECODES put in several years of research and
3 development, getting ready to do this procedure, is
4 that correct?

5 A That's correct.

6 Q Was it something like four years of
7 research and development?

8 A Approximately four years, yes.

9 Q I take it that was expensive, wasn't
10 it?

11 A Very expensive, I am sure.

12 Q Do you have any idea how much money
13 was put into it?

14 A No, sir. I'm afraid I have no
15 concept of that.

16 Q Doctor, LIFECODES Laboratory did an
17 analysis of the sample of Timothy Spencer's blood, is
18 that correct?

19 A That's correct.

20 Q You did what we are calling the DNA
21 printing technique?

22 A That's correct.

23 Q Procedure?

24 A (Nodding head indicating yes).

25 Q Now, you showed us on the overhead

1 projector several steps that are normally done.

2 LIFECODES did those?

3 A That's correct.

4 Q Did you personally perform any of
5 those steps?

6 A The only steps that I personally
7 performed were the final analysis in terms of
8 population statistics.

9 Q So somebody else in your laboratory
10 did all the preliminary work and gave you the results,
11 and you interpret the results, is that correct?

12 A That's correct.

13 Q Now, you showed us on that overhead
14 projector a list of the various individuals that work
15 for LIFECODES. I notice the, you started at the top
16 with the director and with several people all who had
17 Ph.D.'s, working down through yourself.

18 Did any of those individuals
19 personally perform any work in this case?

20 A The individual who is my immediate
21 supervisor, Dr. Michael Baird, as well as Dr. Ivan
22 Balasz, who is our Director of Clinical Services,
23 performed the visual analysis, and then checked my work
24 in terms of the statistical analysis.

25 Q The visual analysis, you went in and

1 looked at the autorads?

2 A That's correct.

3 Q So again, they looked at the
4 finished product, something somebody else in your lab
5 had produced?

6 A That's correct.

7 Q Who were the individuals that
8 produced those results?

9 A That was Lorah McNalley and Lisa
10 Bennett.

11 Q Those are the ones whose names
12 appeared at the bottom of that transparency you showed
13 us, weren't they?

14 A Yes.

15 Q I believe that one of the ladies had
16 an undergraduate college degree, and the other had a
17 masters degree?

18 A One has a masters of science degree
19 in biology. The other has a masters of science degree
20 in criminal science, with DNA specialty.

21 Q So neither one of them have any kind
22 of Ph.D.'s?

23 A No, sir.

24 Q So this make them eminently
25 qualified to do the work they do.

1 A I am sure it does.

2 Q Sir, this procedure that Lorah
3 McNalley and Lisa-- What is her name?

4 A Lisa Bennett.

5 Q Lisa Bennett, how long does it take,
6 from beginning to end, from the time LIFECODES got the
7 sample from Timothy Spencer to the time you were able
8 to look at those autorads? How much time elapsed?

9 A The time is approximately four to
10 five weeks.

11 Q Four to five weeks?

12 A Yes.

13 Q How many of these DNA analyses would
14 LIFECODES be carrying on in a typical month?

15 A We process between 50 and 80 cases a
16 month.

17 Q 50 and 80 a month. Each of these
18 cases would take somewhere between four and five weeks
19 to do it?

20 A Something on that order, yes.

21 Q How many laboratory people do you
22 have doing those 50 to 80 a month?

23 A We have six laboratory scientists.

24 Q Six.

25 Dr. McElfresh, we saw a color photo

1 that looked like a photo, but actually it was an
2 artist's rendition of DNA--

3 A Yes.

4 Q --chromosomes, is that correct?

5 A Yes.

6 Q Do you know who prepared that?

7 A Graphic Artists.

8 Q Somebody was hired to do that?

9 A Yes.

10 Q Do you know when that person
11 prepared it, was he given a photograph of a DNA
12 chromosome?

13 A I am not sure what his source was.
14 But the pictures in the artist's rendition of the DNA
15 molecule are numerous throughout text books of biology,
16 et cetera. So there would have been ample.

17 Q Could he have been given an actual
18 picture of it?

19 A He couldn't have drawn that from an
20 actual picture of DNA. You can see a DNA molecule with
21 an electron microscope.

22 Q Give us some idea. You said that we
23 have all got DNA molecules in every cell except the red
24 blood cell?

25 A That's correct.

1 Q How large is a DNA molecule? A
2 better question is, how small is it?

3 A DNA, like I said, the molecule
4 itself has some 30 million base pairs. If you were to
5 stretch them out in their physical length they actually
6 exist in now, it would be a couple of feet long.

7 Q Doctor, the way they exist in the
8 body, not stretched out, how large is a DNA molecule?

9 A Packaged into the chromosomes, they
10 fit into the nucleus of a cell, which is quite small.
11 The physical size of it, the distance between one rung
12 on the ladder and the next rung on the ladder is
13 something on the order, is something on the order of 10
14 to the minus 8 centimeters. Obviously quite small to
15 have it packaged in the nucleus of that cell.

16 Q Each one of these small molecules,
17 you say we have 30 billion separate rungs?

18 A Yes.

19 Q What your procedure does is, it
20 tries to isolate these separate rungs, am I correct?

21 A Our procedure isolates the entire
22 molecule. Then we have very specific tools with which
23 we can take that isolated molecule and cut it into
24 specific pieces.

25 Q That autorad, the thing that looked

1 like X-ray film--

2 A Yes.

3 Q --that's not, that is actually not a
4 picture of DNA molecule, is it?

5 A It is a picture of the position of a
6 particular piece of DNA, yes.

7 Q Well actually, it is a picture of,
8 it is a radioactive image, isn't it?

9 A It's an X-ray image. It is a
10 photographic image.

11 Q Right. But what shows up on it is
12 an area that has been radiated, am I correct?

13 A What happens is, as the little bit
14 of radioactivity that exists right there decays, it
15 exposes the film. It is, in effect, taking a picture
16 of the light emitted from that particular spot of DNA
17 that--

18 Q That light would be emitted by a
19 radioactive probe?

20 A Yes. Yes.

21 Q So the theory is, you all stretch
22 out the DNA, you use your molecular scissors or cutting
23 agent, and you excise, cut these radioactive probes in
24 there. And in theory, they are only going to attach to
25 a certain pattern, is that correct?

1 A In fact, they only attach to a
2 specific pattern.

3 Q Can you see that pattern?

4 A You can visualize that pattern with
5 something called DNA sequencing.

6 Q Can you see the pattern, physically,
7 with your eye, or with an electron microscope?

8 A Not with my eye. But with an
9 electron microscope. But we can, however, take that
10 piece of DNA. And for the appropriate probe, this has
11 been done, and actually cut it into each individual
12 rung on that ladder and look to see that that's an A
13 and a T, and a G and a C and that actually produces a
14 pattern on the X-ray film that you can see.

15 Q Can you see the patterns themselves,
16 or is what you are seeing the radioactive image on the
17 X-ray film?

18 A What you are seeing on the X-ray
19 film is that image created by the decay of the radio
20 activity.

21 Q Then you are stating that is because
22 that probe has attached there?

23 A That's correct.

24 Q All these, these things you showed
25 us on the overhead projector and the artist's

1 rendering, do you have in your possession, or is it
2 possible to get a picture of that probe attached to
3 that rung?

4 A Not with anything that I have in my
5 possession, no. Again, there are many specific ways to
6 visualize that in a laboratory. That has been done as
7 part of the characterization of that probe.

8 Q Doctor, obviously, you know a lot
9 about DNA.

10 Isn't it a fact that somewhere in
11 the neighborhood of 90 percent of the DNA in the body
12 that science has not identified the purpose or use of,
13 or function of that DNA?

14 A That is approximately correct, yes.

15 Q How long have we been aware of the
16 existence of DNA?

17 A We have been aware of the existence
18 of DNA since early in the century. We have yet, it was
19 not until the mid-1970's, that we had the tools in our
20 possession to make it possible to begin the very
21 careful detailed specific study of what all the parts
22 of the DNA are.

23 Q As we sit here today, science has
24 been able to identify the use or purpose of 10 percent
25 of DNA in the human body?

1 A 10 percent, or slightly more.

2 Q 10 to 15 percent?

3 A 10 to 15 percent, that's fine.

4 Q Dr. McElfresh, you said all the
5 technology your company is using, uses in the DNA
6 printing, it is not new, is it?

7 A No. Not at all.

8 Q It has been around for a while?

9 A Yes. Certainly.

10 Q Mr. Driscoll asked you a lot about
11 thousands of laboratories around the world and the
12 country. These laboratories, how many of them are
13 doing what you are doing, specifically DNA testing for
14 forensic purposes?

15 A There is a laboratory in Maryland
16 that does this, there is a laboratory in California
17 that does DNA testing for forensic purposes. There are
18 a couple of small departments, or actually it is an
19 individual in a university who will for, you know, a
20 specific case, do this type of a test.

21 Q As far as laboratories go, three?

22 A Commercial laboratories, there are
23 three that do this test for forensic purposes.

24 Q So although there are thousands that
25 use it for other purposes--

- 1 A That's correct.
- 2 Q --there are three that are doing it
3 for the purpose you are doing it?
- 4 A Yes.
- 5 Q Dr. McElfresh, when you get the
6 finished product from your laboratory people, you then
7 use some, I guess your work as a population geneticist
8 to make a prediction, is that correct?
- 9 A Yes.
- 10 Q I am using the right word, it is a
11 prediction?
- 12 A Yes. We predict, based on our data
13 base, how often we would expect to find this in the
14 population.
- 15 Q How large was your data base when
16 you made this?
- 17 A The data base for this particular
18 probe was anywhere between two hundred and
19 approximately one thousand data points, depending on
20 the probe.
- 21 Q Two hundred to one thousand. So
22 basically, depending on the probe, you are saying you
23 all have examined two hundred to one thousand samples,
24 and you haven't found two of the same, is that correct?
- 25 A Well, in addition, I have maybe not

1 found two of the same, but we are able to use those
2 equations that were established back in 1900 to show
3 given that information, we would ever only expect to
4 find that particular DNA print pattern with the number
5 that I indicated.

6 Q You take the data you got from your
7 laboratory people, you plug it into this formula and
8 into that formula, also goes your data base, which is
9 two hundred to one thousand samples. And you come up
10 with a figure of 705 million to 1?

11 A That's correct. Yes.

12 Q Doctor, let me ask you this. If in
13 that two hundred to one thousand sample, let's say you
14 got to your one thousand and one, if there were two of
15 the same that were different individuals, what would
16 that do to your math?

17 A Actually, what you have done is--
18 The way that question has been asked, actually, is not
19 the correct way in which the math is done.

20 Okay. Let me set it in this context
21 for you. When we do an equation, the way we do our
22 population statistics is like I indicated earlier,
23 exactly like you would do the population statistics in
24 terms of counting cars.

25 We have three probes, three

1 different genetic systems. Remember, I indicated one
2 is for the XY pair of chromosomes, one is for
3 Chromosome 2, one is for Chromosome 17.

4 Now, for each probe, as I indicated,
5 there is a certain number of data points that we have
6 in our data base. Within that data base then, there
7 are a certain number of patterns that are possible.
8 Remember, we are limited by the physical constraints of
9 space. That is how long our particular gel is by how
10 many possible patterns you could develop.

11 Now, granted, that number is so
12 large that it is possible to do this kind of work. But
13 what we do-- The way that number is generated, is that
14 the first probe is examined, we then develop a
15 statistic for that probe. We look at the next probe.
16 We develop the statistic for that probe. That is how
17 long we might have to stand around before we might see
18 another pattern that would approach this pattern we are
19 looking at now.

20 What we do in our data base, also,
21 is that we don't have the data base, how many times we
22 have ever seen this one DNA pattern. What we ask the
23 question of the data base is, is that no matter where
24 else another DNA band might have been seen, how many
25 times might we ever see a DNA band in this particular

1 pattern?

2 All right. Remember it is a pattern
3 that we are really looking at here, so that you could
4 have a pattern with two bands very close together and
5 another pattern with bands very far apart. These are
6 not matching patterns, but this band and this band may
7 be very similar in position. And we take a very
8 conservative approach, and we lump anything within two
9 percent of each other in measurement together and call
10 it the same, for the purposes of statistics.

11 So we ask the computer, first, how
12 often have you ever seen a band--no matter where else
13 you have seen a band--have you ever seen a band within
14 two percent of what we are looking at now? Then we go
15 to the computer and ask it, again, how often have you
16 ever seen a band within two percent of this other band,
17 no matter where else was the other band. We are not
18 asking the computer, just specifically. We are just
19 saying, just give us specific points. And using that
20 in our formula to predict how often we might see a
21 combined pattern-- Not how often we might see just
22 that original pattern that we saw, but how often we
23 have ever seen a band in that particular pattern.

24 So if we saw more data, that is if
25 we had the one more person that indicated the one more

1 data point that had had a band within that two percent
2 of that particular band we have seen, it might bring
3 actually the size of the data base down. One data
4 point will not change the numbers significantly at all.

5 Q I guess I don't understand. You
6 have told the ladies and gentlemen of the jury that the
7 odds are 705 million to 1 against two persons having
8 the pattern that Spencer has; is that correct?

9 A That's correct.

10 Q You are saying that if another--
11 Let me ask you this. If another person, in fact,
12 showed up in your data base with the same pattern as
13 Mr. Spencer, are you saying that the odds would still
14 be 705 million to 1?

15 A Well, within the number of people we
16 have tested in our data base, that is the number that
17 we have generated. Now, obviously, as I indicated, we
18 use these statistics, because we haven't tested every
19 person in the population, or on the planet.

20 Q I understand. My question is, if in
21 your data base there was another individual with the
22 same person as Mr. Spencer, would that affect the
23 number, 705 million to 1?

24 A Okay. Again, if you have those
25 patterns set-- All right. We don't ask the data base

1 to look at that pattern. We ask the data base, how
2 often has it ever seen any band in this position, or
3 within two percent of this position? I mean, the odds
4 of seeing that pattern are so great that (A), we have
5 never seen a duplicate pattern, and (B)--

6 Q I understand that you have never
7 seen it. But your data base consists of two hundred to
8 one thousand samples, is that correct?

9 A Yes.

10 Q In that two hundred to one thousand
11 samples, you have never seen it?

12 A That's correct.

13 Q You talked about a two percent
14 figure? What is that? A margin for error, something
15 like that?

16 A It is something that we impose as an
17 outside limit of our resolution. That is a very
18 conservative estimate of our capability to absolutely
19 pinpoint the precise exact spot of that band with the
20 current capabilities of measurement. That is simply a
21 number we use so that we can proceed with calculations.

22 Q Am I correct then in calling it a
23 margin for error?

24 A Yes, you are. I am afraid that it
25 is a limit of an outside limit of resolution. Okay.

1 Something we can say, we can tell this difference. And
2 the studies that have been done within our laboratory
3 to show that is a reasonable maximum difference.

4 Q So that if it is off by less than
5 two percent, is it still assumed to be accurate? It is
6 acceptable to my understanding?

7 A No. What we are saying is that,
8 what you are asking about is resolution. And what
9 resolution is, it is the ability to tell the difference
10 between two things that are very close.

11 Now, in our studies done in our
12 laboratory, our resolution--that is the ability to tell
13 the difference between two things, is actually 0.6
14 percent. Okay. So something that is 0.6 percent
15 different, we would be able to tell it. But for the
16 purposes of calculating statistics, we use two percent,
17 which would be the maximum resolution that would be
18 allowable in a system like this. Or maximum, the
19 maximum amount of difference you could have without
20 being able to detect it.

21 Q About that 0.6 percent. You are
22 saying if the difference is more than that, you would
23 be able to tell it, is that correct?

24 A That's correct.

25 Q What if it is less than that?

1 A It would appear as similar.

2 Q Is that a margin for error?

3 A Calling it a margin for error isn't
4 correct. It is an ability to resolve a difference, not
5 a margin of error.

6 Q For your purposes, if the difference
7 is less than 0.6 percent, there is no difference?

8 A That's correct.

9 I should point out, of course, that
10 the differences in human DNA are so great that for one,
11 and the reason, of course, we use many genetic systems
12 is the fact that if there were to be a difference as
13 small as 0.6 percent in a DNA pattern for one genetic
14 probe--and it was, in fact, different individuals--we
15 would see such a great difference, we would see a
16 difference much greater than that in yet a second
17 genetic system, and yet a third genetic system.

18 Again, studies done in our
19 laboratory, as well as others, show that the
20 differences in a human's DNA are so great for these
21 positions that we look at, that an exclusion--that is
22 two different DNA samples--will be detected in two out
23 of three of the genetic systems with the third genetic
24 system of-- If the third genetic system, I should say,
25 fell within that 0.6 percent region.

1 In fact, our paternity laboratory,
2 which does studies day-in and day-out, in terms of
3 looking at patterns and being able to tell that the
4 child's band is the same as or different than any of
5 the parents' bands, sees that difference between
6 children, three out of three times, virtually 99
7 percent of the time followed by another, almost the
8 entire rest of the percentage, in two out of three
9 times. In fact, the guidelines for determining an
10 exclusion are that you see it two out of three times,
11 because it is so visible and so available.

12 Q Doctor, your laboratory is in New
13 York state, is that correct?

14 A That's correct.

15 Q You came down here to testify in
16 this trial?

17 A That's correct.

18 Q Do you testify in a lot of trials?

19 A That is the nature of my job,
20 because of what I am required to do.

21 Q Doctor, when you testify at a trial
22 like today, is it on your own time, or on LIFECODES'
23 time?

24 A It's on LIFECODES' time.

25 Q As you are here today, you are being

1 paid for your time by LIFECODES?

2 A That's correct.

3 MR. JOHNSON: That's all the
4 questions I have.

5 MR. DRISCOLL: Doctor, just one
6 question, with the Court's permission.

7

8

9

10 REDIRECT EXAMINATION

11 BY MR. DRISCOLL:

12 Q This data base that was discussed.
13 What is the standard in the medical and scientific
14 community for a data base such as you have?

15 A The standard is actually adopted by
16 the American Association of Blood Banks, which set up
17 standards and now has a standard for paternity testing
18 using DNA and data bases. And their standard is for
19 two hundred data points in the data base. They feel
20 that below that, the statistical calculations would
21 have too wide a margin. But that above two hundred
22 individuals, the margin, in terms of statistical
23 accuracy, that is so good, that more than two hundred
24 individuals would not change your numbers.

25 Q You are anywhere up to one thousand?

1 A Yes, sir.

2 MR. DRISCOLL: Thank you.

3

4

5

6

REXCROSS-EXAMINATION

7

BY MR. JOHNSON:

8

Q Doctor, those standards you are

9

talking about, you said they were set up to govern

10

paternity testing?

11

A That is the only one they govern.

12

They have no guidelines in terms of data bases for

13

other scientific tsting. They are not interested in

14

that.

15

Q They don't have a data base standard

16

in terms of using this for criminal forensic purposes?

17

A No. Nobody has those standards.

18

But it is a useful and valid guideline to follow and

19

used as a criteria for judgment.

20

Q For those purposes, you set your own

21

standards?

22

A Well, again, we can set our own

23

standard. But we use that as a guideline by which to

24

set our standard. Obviously, we have more data points

25

than that guideline suggests.

1 Q LIFECODES does DNA paternity
2 testing, don't they?

3 A Yes.

4 Q Do you also testify in paternity
5 cases?

6 A I have not personally testified in a
7 paternity case, but my colleagues have. Yes, we would
8 testify in paternity cases.

9 MR. JOHNSON: Thank you. That's all
10 the questions I have.

11 THE COURT: All right, Doctor, you
12 may be excused.

13

14

15

16

WITNESS STOOD ASIDE

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THE COURT: All right, gentlemen. I

1 notice it is 20 minutes after 1:00. Sheriff--
2 Ladies and gentlemen of the jury, we
3 will take a lunch break. Will quarter after
4 2:00 be all right? Will that give you plenty
5 of time? All right quarter after 2:00.

6 Now, sheriff, so they might-- It is
7 a pretty day, I guess. It looks like the sun
8 is out. They might want to walk around. I
9 don't want any televisions on. And if any of
10 them are on the courthouse grounds, let me
11 know. I hope the press will cooperate with
12 the Court so we can be and not get upset. I
13 want them to get out for the comfort of the
14 jurors. Let them walk a around, get some
15 fresh air.

16
17 NOTE: At this time, the jury
18 retires to the juryroom at 1:23 p.m.

19
20 JURY OUT

21
22 THE COURT: Sheriff, you may remove
23 the prisoner. Everyone remain seated, please.

24 All right. Court will stand in
25 recess until 2:15.