

## TESTIMONY OF JAMES C. CADIGAN

Mr. DULLES. Would you mind standing and raising your right hand?

Do you swear the testimony you give before the Commission is the truth, the whole truth, and nothing but the truth, so help you God?

Mr. CADIGAN. Yes, sir.

Mr. DULLES. Thank you.

Mr. EISENBERG. Mr. Cadigan, can you state your full name and position?

Mr. CADIGAN. James C. Cadigan, special agent of the FBI, assigned as an examiner of questioned documents in the laboratory here in Washington.

Mr. EISENBERG. What is your education, Mr. Cadigan?

Mr. CADIGAN. I have a Master of Science degree from Boston College in Newton, Mass. Upon being appointed in the FBI, I was given on-the-job training, which consisted of working with various examiners, conducting experiments, reading books, attending lectures, and so forth.

Mr. EISENBERG. Mr. Cadigan, how long have you been in the questioned document field?

Mr. CADIGAN. Twenty-three and a half years.

Mr. EISENBERG. And during that time have you examined papers to determine their possible origin?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Can you estimate the number of such examinations you have conducted?

Mr. CADIGAN. No; not with any degree of accuracy, except many, many specimens, many, many comparisons.

Mr. EISENBERG. Have you testified on that subject in court?

Mr. CADIGAN. Yes, sir.

Mr. EISENBERG. Many times?

Mr. CADIGAN. I won't say many, no; because most of the testimony I have given in court relates to other phases of the work. Strictly on paper, I would say not more than two or three times.

Mr. EISENBERG. But you have made more than two or three examinations of paper?

Mr. CADIGAN. Oh, yes; far more.

Mr. DULLES. Running into the hundreds and thousands?

Mr. CADIGAN. Yes, sir.

Mr. EISENBERG. Mr. Chairman, may I have this witness admitted as an expert witness?

Mr. DULLES. He shall be admitted as an expert on this subject.

Mr. EISENBERG. Mr. Cadigan, I hand you an object made of paper, Commission Exhibit 142, also known as Commission Exhibit 626, and ask you if you are familiar with this object?

Mr. CADIGAN. Yes; I am.

Mr. EISENBERG. And did you examine this object, this paper bag, to determine its origin, possible origin?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Can you tell us how you conducted that examination?

Mr. CADIGAN. Yes.

I first saw this paper bag on November 23, 1963, in the FBI laboratory, along with the sample of paper and tape from the Texas School Book Depository obtained November 22, 1963, which is FBI Exhibit D-1.

Mr. EISENBERG. Is that the sample that you are referring to, that you are holding in your hand?

Mr. CADIGAN. Yes.

Mr. EISENBERG. And that is marked, as you said, "Paper sample from first floor Texas School Book Depository" and has certain other markings including the words "shipping department"?

Mr. CADIGAN. Yes.

Mr. EISENBERG. May I have this admitted, Mr. Chairman?

Mr. DULLES. That may be admitted.

Mr. EISENBERG. That will be No. 677.

Mr. DULLES. 677 may be admitted.

(Commission Exhibit No. 677 was marked, and received in evidence.)

Mr. EISENBERG. Did you find out from precisely what portion of the Texas School Book Depository Building this was obtained, Mr. Cadigan?

Mr. CADIGAN. Yes; this comes from the first floor, main floor of the Texas School Book Depository, referred to as the shipping room, the whole floor.

Mr. EISENBERG. Now, did you—who supplied you with this sample, this Exhibit 677?

Mr. CADIGAN. This exhibit was brought to the laboratory by Special Agent Drain of our Dallas office, who brought all of this evidence in for examination.

Mr. EISENBERG. Did you attempt to determine whether Exhibit 142 had the same origin as the paper in Exhibit 677, or might have had the same origin?

Mr. CADIGAN. Yes; I examined the two papers—do you wish me to state my opinion?

Mr. EISENBERG. Yes; please.

Mr. CADIGAN. Well, initially, I was requested to compare the two papers to see if they could have originated from the same source. I first measured the paper and the tape samples. Then I looked at them visually by natural light, then incident light and transmitted light.

Mr. EISENBERG. What do you mean by transmitted light?

Mr. CADIGAN. Well, light coming right on through the paper.

Mr. EISENBERG. Then——

Mr. DULLES. Natural light?

Mr. CADIGAN. Yes; natural light.

Mr. DULLES. As distinct from electric light?

Mr. CADIGAN. Both. In the room I am in you can go over to the window for natural light and use ceiling light for artificial light which has a little different property than the outside light.

Mr. DULLES. Yes.

Mr. CADIGAN. I looked at the papers under various lighting conditions——

Mr. EISENBERG. Excuse me a minute, Mr. Cadigan, by "transmitted light" you mean the light transmitted when you hold the object between the light source and your own eyes?

Mr. CADIGAN. Yes; then I put it under the microscope, and again looked at it from the standpoint of the surface, paper structure, the color, any imperfections. I further noted that on both of the tapes——

Mr. EISENBERG. 142 is the paper bag.

Mr. CADIGAN. On 142 and on the tape on 677 there were a series of marks right down about the center of the tape.

Mr. EISENBERG. Can you see those visually with the unaided eye, or only under a microscope?

Mr. CADIGAN. I can see them visually. The microscope makes it look clearer.

Mr. DULLES. What are you pointing to now?

Mr. EISENBERG. This line here.

Mr. DULLES. Where is this?

Mr. CADIGAN. These are a series of lines running right here about a half-inch high, they are very closely spaced.

Mr. DULLES. Oh, yes; these are perpendicular lines.

Mr. CADIGAN. Yes, sir.

Mr. DULLES. Would you like to see these, Mr. Murray?

Mr. MURRAY. Yes; thank you.

Mr. DULLES. They are quite clear, about a tenth of an inch apart or less than that.

Mr. CADIGAN. Well, actually they are  $24\frac{1}{2}$  spaces per inch, which would be about 25 lines per inch.

Mr. MURRAY. Pockmarks?

Mr. CADIGAN. A series of little short marks right close together.

Mr. MURRAY. Oh, yes.

Mr. DULLES. And they run along about how far on this particular exhibit?

Mr. CADIGAN. They run the whole length of the tape.

Mr. MURRAY. A comb design.

Mr. EISENBERG. Comb in the sense that it is a series of——

Mr. MURRAY. Comb or rake.

Mr. EISENBERG. Could you circle that on 677, and mark the portion "A"? Can you still make out the lines on Exhibit 640?

Mr. CADIGAN. Oh, yes.

Mr. EISENBERG. Could you circle a portion of the lines on 640 and mark it—I am sorry, that is 142.

Mr. CADIGAN. I have marked it.

Mr. EISENBERG. Mr. Dulles, would you care to look at it?

Mr. DULLES. And—oh, yes—and they go over a good deal further than your circle?

Mr. CADIGAN. Yes, sir.

Mr. DULLES. They run right across.

Mr. CADIGAN. I might explain that these are made by a wheel in the paper-tape dispenser. [Referring to an object in the room.] It is not quite this size, but it is similar to this and it has horizontal markings running all around the wheel.

As you pull the operating handle that pulls the paper tape from the roll through the machine and over the wetting brush, the wheel, in the process leaves these markings on the tape.

Mr. EISENBERG. Excuse me, Mr. Cadigan, would this be in the type of tape dispenser which is operated not merely by a handle—by a handpull—to the tape from the dispenser, but is operated—that is operated by a lever?

Mr. CADIGAN. Yes; a lever, a handle.

Mr. EISENBERG. And a given quantity of tape is dispensed, which you can cut off or not as you choose—if you want to, you can pull some more tape and cut it off, is that correct?

Mr. CADIGAN. That is correct.

Mr. EISENBERG. And this wheel, as I understand it, when you pull the lever this wheel forces the paper out?

Mr. CADIGAN. It turns, and it is really pulling the paper from the roll and pushing it out from the slot.

Mr. EISENBERG. That has a slight knurl which grasps the paper?

Mr. CADIGAN. It has a slight ridge all around it which is the cause of these marks on the paper tape.

Mr. EISENBERG. Okay.

Mr. DULLES. Is that a defect in the mark or a peculiar—

Mr. CADIGAN. Oh, no; it is designed that way. Those little, you might say, in effect, teeth, go into the paper and pull it through smoothly.

Mr. EISENBERG. If I went into Woolworths and bought a roll of gummed tape, would it have those marks on it?

Mr. CADIGAN. No.

Mr. EISENBERG. Because it only gets the marks when you put it in the dispensing machine that you have in commercial establishments?

Mr. CADIGAN. That is correct.

Mr. EISENBERG. Would it be common to have this type of dispensing machine in a home, by the way?

Mr. CADIGAN. I doubt very much that you would find it in a home.

Mr. EISENBERG. Now, within a commercial establishment, are there more than one type of dispensing machines?

Mr. CADIGAN. Oh, yes.

Mr. EISENBERG. Are there types that won't produce these lines at all?

Mr. CADIGAN. Yes. I might point out, too, that the number of lines per inch will vary depending on the diameter of that wheel. In this particular instance I found that there were  $24\frac{1}{2}$  spaces, which would be 25 lines per inch, on both.

Mr. EISENBERG. I believe that is 142, the bag you are handling, and 677, the sample?

Mr. CADIGAN. Yes; the markings on the manila tape in both 142 and 677 were the same. Now, at that time I also had—

Mr. DULLES. Could we get just before you continue there, would you identify what 142 is and 677 is?

Mr. EISENBERG. 142 is an apparently homemade paper bag which was found in

the southeast corner of the sixth floor of the TSBD following the assassination, and which, for the record, is a bag which may have been used to carry this rifle. 139, which was used to commit the assassination. 677 is a sample of paper and tape—and parenthetically, tape was used in the construction of 142—677 is a sample of paper and tape obtained from the Texas School Book Depository on November 22, 1963, that is, the very day of the assassination.

Mr. DULLES. Obtained by whom, by the FBI?

Mr. CADIGAN. This was obtained by the Dallas police.

Mr. EISENBERG. And forwarded to you by the Dallas—

Mr. CADIGAN. By the Dallas police through our Dallas office.

Mr. DULLES. It was obtained after the assassination on that date?

Mr. CADIGAN. Yes, sir; the night of November 22

At the same time, on November 23, we had an agent come in from Chicago with samples of paper from Klein's, with the possibility, it was thought, that the paper sack—

Mr. DULLES. Identify Klein's just for the record.

Mr. CADIGAN. Klein's Sporting Goods Store in Chicago, from which the Italian rifle was bought.

Mr. EISENBERG. That is Exhibit 139?

Mr. CADIGAN. Exhibit 139. The agent brought in these paper samples from Klein's for comparison purposes, and the paper tape, this manila gummed tape, had these knurl markings measuring 30 per inch.

Mr. EISENBERG. That is the gummed tape you obtained from Klein's?

Mr. CADIGAN. Yes. It was not identical with this, but merely, you might say, illustrate that the markings will differ depending on the wheel, and if your wheel has 30 lines per inch and your other sample is 24 or 25 lines per inch, you know they didn't come from the same tape dispenser.

Mr. EISENBERG. Mr. Cadigan, do these wheels differ as to their diameter across the bearing surface, the length across the rolling knurled surface?

Mr. CADIGAN. I imagine there would be a difference.

I have made no precise measurement but I imagine they vary within tolerances of a quarter- or half-inch in width.

Mr. EISENBERG. Would the length of the lines produced on 142 be the same—the paper bag—the same as the length of the lines produced on 677?

Mr. CADIGAN. Yes.

Mr. DULLES. At what period in connection with the manufacture of the paper are those lines put on or—

Mr. CADIGAN. These are put on after the paper is complete.

Mr. DULLES. After paper is completely manufactured?

Mr. CADIGAN. Yes, sir; that is right.

Mr. DULLES. And put on by the dispensing machine?

Mr. CADIGAN. No; the individual buys gummed tape in rolls.

Mr. DULLES. Yes.

Mr. CADIGAN. Three-inch rolls or inch-and-a-half rolls. He then puts it on a tape-dispensing machine.

Mr. DULLES. In his particular organization?

Mr. CADIGAN. Yes; or his factory or shipping department or wrapping room.

Mr. DULLES. I understand.

Mr. CADIGAN. Once it is in that machine then that wheel will mark the tape going through the dispenser just before it wets it and you paste it down.

Mr. DULLES. Just before, generally just before it is used, then these markings are put on by the dispensing machine.

Mr. CADIGAN. Yes, sir.

After examining the papers, comparing them visually and under the microscope, I examined them under ultraviolet light. This is merely one additional step.

Here again I found that both of them fluoresced the same way.

Mr. EISENBERG. Could you explain the meaning of that?

Mr. CADIGAN. Yes. Paper, along with many substances, has the property of absorbing or reflecting ultraviolet light rays differently. You can take two

samples of paper and put them under an ultraviolet light, and they may appear to be the same or they may be markedly different.

Mr. EISENBERG. You mean even if they look the same under visual light?

Mr. CADIGAN. Visually they may look the same and yet under ultraviolet light there may be very dramatic differences.

Mr. EISENBERG. What causes those differences?

Mr. CADIGAN. Well, the chemicals that are in the paper itself; I think probably a very common example are the markings on shirts, so-called invisible dyes which, visually, you do not see, but you put them under ultraviolet light and the chemical is such that it glows brilliantly.

So, it is basically a chemical or chemicals in there, in this case, in the paper being examined under the ultraviolet, which gives a certain visual appearance, which you can say, it is the same or it is different.

In all of the observations and physical tests, that I made, I found that for Exhibit 142, the bag, and the paper sample, Commission Exhibit 677, the results were the same.

Mr. EISENBERG. Can you just review those? That was the ultraviolet light—

Mr. CADIGAN. Well, briefly, it would be the thickness of both the paper and the tape, the color under various lighting conditions of both the paper and the tape, the width of the tape, the knurled markings on the surface of the tape, the texture of the fiber, the felting pattern. I hadn't mentioned this before, but if you hold a piece of paper up to the light, you see light and dark areas caused by the way the fibers felt right at the beginning stages of paper manufacture.

There are light and dark areas, and these are called the felting pattern. This is something that will vary depending on how the paper is made, the thickness of the paper, the way that the fibers moved on the papermaking machine, and here again I found that they were the same for both the known sample, Commission Exhibit 677, and the paper bag, Commission Exhibit 142.

Mr. EISENBERG. In all these cases, did you make the examination both of the tape and the paper in each of the bag and the sample?

Mr. CADIGAN. Oh, yes.

Mr. EISENBERG. And they were all identical?

Mr. CADIGAN. Yes.

Mr. EISENBERG. You mentioned before the thickness. How did you measure the thickness of the tape and paper?

Mr. CADIGAN. With a micrometer.

Mr. EISENBERG. How sensitive is it?

Mr. CADIGAN. It reads to four places.

Mr. EISENBERG. How sensitive?

Mr. CADIGAN. Four decimal places.

Mr. EISENBERG. Is that one-hundredths?

Mr. CADIGAN. That would be one ten-thousandths.

Mr. EISENBERG. And they were identical in that measurement?

Mr. CADIGAN. Yes; I measured both the paper sack, Exhibit 142, and the known paper sample, Exhibit 677, at 0.0057 inch, that is fifty-seven ten-thousandths.

Mr. EISENBERG. Go ahead, Mr. Cadigan.

Mr. CADIGAN. Do you want me to discuss this replica sack yet?

Mr. EISENBERG. You mentioned a replica bag?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Could you explain what that is?

Mr. CADIGAN. Yes; this is Commission Exhibit 364. It is a paper sack similar to Commission Exhibit 142. It was made at the Texas School Book Depository on December 1, 1963, by special agents of the FBI in Dallas to show to prospective witnesses, because Commission's Exhibit 142 was dark and stained from the latent fingerprint treatment and they thought that this would—it wouldn't be fair to the witness to ask "Did you see a bag like that?" So they went to the Texas School Book Depository and constructed from paper and tape a similar bag.

Mr. EISENBERG. This was made December 1?

Mr. CADIGAN. December 1, of 1963.

Mr. EISENBERG. Or some 9 or 10 days after the assassination?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Was the paper obtained from the same source?

Mr. CADIGAN. Yes; from the same room.

Mr. EISENBERG. The same room.

Did you examine this paper to see how it compared—that is, the paper in the replica bag, which has already been admitted as Commission Exhibit 364—to see how it compared with the paper in the bag found on the sixth floor of the TSBD, which is Commission's Exhibit 142?

Mr. CADIGAN. Yes.

Mr. EISENBERG. What was your conclusion?

Mr. CADIGAN. That they were different in color, visual color, felting—that is, the pattern that you see through transmitted light, and they were different under ultraviolet light.

Mr. EISENBERG. So that these two papers, which were obtained within 9 or 10 days from the same source, could be distinguished by you?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Have you brought an ultraviolet light source with you?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Could you show the Commission the difference between the three papers?

(Discussion off the record.)

Mr. EISENBERG. Now, we have been unable to find a plug for this ultraviolet machine, so we will temporarily or perhaps permanently bypass this examination. But did you find that two of the papers look the same under the ultraviolet and a third looked different when you examined it under ultraviolet?

Mr. CADIGAN. Yes; that is correct.

Mr. EISENBERG. Which two were the identical and which was the different one?

Mr. CADIGAN. Well—Commission Exhibit 142 and Commission Exhibit 677—I observed them to have the same appearance under ultraviolet light, and that appearance was different from Commission Exhibit 364.

Mr. DULLES. Can you identify these three exhibits, because otherwise I think it will be very difficult to get into the record.

Mr. EISENBERG. Yes, sir; 142 being the bag found on the sixth floor of the TSBD, 677 being the sample obtained that day from the shipping room in the Texas School Depository, and 364 being a replica made some ten days later out of paper obtained some 10 days later.

Did that complete your examination of the gross or physical characteristics, as opposed to the microscopic characteristics?

Mr. CADIGAN. Yes; that in essence was the extent of the examination I made at that time.

Mr. EISENBERG. Did you go on to examine for microscopic characteristics?

Mr. CADIGAN. Yes; I believe I mentioned that at the time I had examined these papers under the microscope.

Mr. EISENBERG. You mentioned that at the time?

Mr. CADIGAN. Yes; earlier this morning.

Mr. EISENBERG. Yes.

Could you tell us what the results were of your examination under the microscope?

Mr. CADIGAN. Again, I found that the paper sack found on the sixth floor, Commission Exhibit 142, and the sample, secured 11-22, Commission Exhibit 677, had the same observable characteristics both under the microscope and all the visual tests that I could conduct.

Mr. EISENBERG. Could you go into detail as to what you did see under the microscope?

Mr. CADIGAN. Well, I think perhaps this photograph, I have an enlarged photograph, one side being the—

Mr. DULLES. Which side is that?

Mr. EISENBERG. One side marked K-2, and the other Q-10?

Mr. CADIGAN. Yes; K-2 corresponds to the known paper sample 677.

Mr. EISENBERG. Obtained from the TSBD?

Mr. DULLES. What date?

Mr. CADIGAN. November 22.

Mr. DULLES. On the day of the assassination?

Mr. CADIGAN. Yes. And the Q-10 marking is the same as the paper bag found on the sixth floor, Commission Exhibit 142.

Mr. EISENBERG. Did you take this photograph or was it taken under your supervision?

Mr. CADIGAN. I had it made.

Mr. EISENBERG. Mr. Chairman, may I have it in evidence?

Mr. DULLES. Admitted.

Mr. CADIGAN. I would like to point out this is only one phase of the examination and this is a black-and-white photograph. In your examination under the microscope you are looking at the surface and memorizing everything about that surface your mind can retain by putting the two pieces of paper together and studying them back and forth. I don't wish to imply that that photograph represents all I can see in a microscope, because it doesn't.

Mr. EISENBERG. We understand that. May I have this, Mr. Reporter, marked as 678.

(Commission Exhibit No. 678 was marked, and received in evidence.)

Mr. DULLES. That has already been admitted.

Mr. EISENBERG. Yes. Now, what is the magnification in this Exhibit 678?

Mr. CADIGAN. It is about 50 times enlarged.

Mr. EISENBERG. And had you treated the paper chemically before you made this photograph?

Mr. CADIGAN. No.

Mr. EISENBERG. Can you tell us a little bit about that photograph and what it shows?

Mr. CADIGAN. Well, actually all this shows is an enlarged area, a very small area, I might point out. It merely shows the surface structure, shows some of the fibers, and shows an imperfection. The dark line down the center of the photograph is actually a fold in both papers, merely to bring them close together so that they can be seen together.

But it gives you some idea of the surface texture, how the fibers lie in there. In this instance you have two little imperfections in these fiber bundles here, you can't see the brown-colored fibers that are actually present.

Mr. DULLES. That imperfection, however, would not be repeated, would it?

Mr. CADIGAN. Oh, no; it is purely accidental.

Mr. DULLES. They are accidental.

Mr. CADIGAN. They are bundles of fibers in the paper itself.

Mr. EISENBERG. In your opinion were the two samples identical in the characteristics shown in this photomicrograph?

Mr. CADIGAN. Yes; they have the same appearance.

Mr. EISENBERG. Did you also break down the papers to test them, to determine the morphology of the fiber?

Mr. CADIGAN. Yes. Subsequently, I ran a fiber analysis of the paper, the known paper sample from the Texas School Book Depository, Commission Exhibit 677, and the paper bag, Commission Exhibit 142, and on the same day I had our spectrographic section run a spectrographic test on these same papers.

Mr. DULLES. Do I understand correctly, though, you have testified that a sample taken 10 days later was different—or approximately 10 days later?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Approximately 10 days.

Mr. CADIGAN. Yes; this was a sample taken December 1. I could tell that it was different from this sample, 677, taken on the day of the assassination, and different from the bag, Exhibit 142.

Mr. DULLES. Do you happen to know whether another roll was put in the machine between the 22d and the 1st of December?

Mr. CADIGAN. May we go off the record?

(Discussion off the record.)

Mr. EISENBERG. On the record.

Do you know whether the Dallas office of the FBI has attempted to make a determination as to whether the replica paper bag, the paper in the replica

paper bag, prepared on December 1, Commission No. 364, was, or may have been, or wasn't taken from the same roll as the replica piece of paper or the sample piece of paper, Exhibit 677, which was obtained from the Depository November 22?

Mr. CADIGAN. Yes.

Mr. EISENBERG. And can you tell us what you understand the results of their investigation to have been?

Mr. CADIGAN. Yes; they were unable to determine whether the paper from the replica sack, Exhibit 364, came from the same roll or a different roll as the known sample obtained November 22, Commission Exhibit 677.

I understand that in the fall, the Depository is busy, and could very well have changed rolls, but no records are kept along that line.

Mr. DULLES. Changed rolls in that time, 10-day period?

Mr. CADIGAN. Yes, sir. Actually there were 4 working days in that period.

Mr. DULLES. Yes. But am I not correct that there probably or maybe certainly, I would like to have your view on that, was no change in the roll between the day before the assassination and the night of the assassination, that is between paper bag, Exhibit No. 142, and the specimen that was taken on the night of the day of the assassination?

Mr. CADIGAN. I can't tell you that, sir. I have no way of knowing, because these papers are similar in all observable physical characteristics, and they are different from a sample obtained on December 1. I would suspect that this were true. But I can't—

Mr. DULLES. I realize that.

Mr. CADIGAN. I cannot make a positive statement on that.

Mr. EISENBERG. Have you any information as to whether the paper during the period between November 22 and December 1 used in the TSBD—whether it was the same or different rolls—would have come from the same ultimate manufacturer?

Mr. CADIGAN. It is my understanding that they received a shipment of 58 rolls of paper that were shipped March 19, 1963, from the St. Regis Paper Mill in Jacksonville, Fla., and which lasted them until January of 1964. This would mean on an average, in a 9-month period, a little more than six rolls a month.

Mr. EISENBERG. The inference would therefore be that if the—although the papers in the replica bag obtained on December 1 and the paper in the sample obtained on November 22 are distinguishable by you, they came from the same manufacturer, and—is that correct?

Mr. CADIGAN. That is correct.

Mr. EISENBERG. And, therefore, that the state of your science is such that you can distinguish even rolls of paper made by the same manufacturer and assumedly made within a reasonably close time, is that correct also?

Mr. CADIGAN. I don't know what period of time is involved here. But I can distinguish at least in this case between paper from the same shipment from the same mill.

Mr. EISENBERG. Could you proceed now to discuss the morphology of the fiber as you examined it under a microscope?

Mr. CADIGAN. Well, I might state briefly what a fiber analysis is. We put samples of paper back into their, you might say, original state, in the form of fiber suspension.

You cook samples of paper for a couple of minutes in weak sodium hydroxide solution. Then you wash it, add water and shake it vigorously, and you get a suspension of fibers in the water. Samples of those fibers are put on glass slides and are stained by various reagents.

Then you examine them under a high-power comparison microscope or a binocular microscope under approximately 120 times magnification. In this particular case I used two different stains.

First a malachite green stain. This merely determines if there are any unbleached fibers, or if they are all bleached. I found that on both Commission Exhibit 677, the paper sample obtained on November 22, and the paper sack, Commission Exhibit 142, that they are almost 100 percent unbleached fibers.

Then I stained other samples, with a stain known as Herzberg stain. It is

an iodine-iodide stain, which will distinguish between rag fibers, chemical wood fibers, and ground wood fibers by different coloring. The chemical wood is stained blue, rag fibers are stained red, ground wood stained yellow.

I made and studied specimens or slides of fibers from Commission Exhibit 677, the known sample, and from Commission Exhibit 142, the paper sack, to see if the fiber composition is similar. What that means is, is this chemical wood, is it coniferous or deciduous, are there any rag fibers in there or are there any ground wood fibers in there, and I found here the fiber composition was similar and essentially it is a coniferous woodlike pine. There were a few stray rag fibers, which I think were probably accidental, and a few stray ground wood fragments in there.

Mr. DULLES. Let me get clearly what is similar, that is the paper bag, Exhibit—

Mr. CADIGAN. 142; the paper comprising that sack and the paper comprising the known sample obtained November 22, Exhibit 677.

Mr. DULLES. Right.

Mr. CADIGAN. The papers I also found were similar in fiber composition, therefore, in addition to the visual characteristics, microscopic and UV characteristics.

Mr. EISENBERG. "UV" being ultraviolet?

Mr. CADIGAN. Yes, sir. Then I had a spectrographic examination made of the paper from the sack, 142, and the known sample secured November 22, Commission Exhibit 677.

Spectrographic tests involve, of course, burning the substance and capturing the light on a photographic plate to determine what metallic ions are present. This was done by our spectrographic section, and again the paper of Commission Exhibit 677, the paper sample, secured November 22, was found to be similar spectrographically to the paper of the sack, Commission Exhibit 142.

Now, these were additional tests, the original examinations, under visual and ultraviolet light were made by me on November 23, 1963. Fiber analysis and the spectrographic examination were conducted on March 25, 1964.

Mr. EISENBERG. Have you now reviewed all the points in which you compared the paper sack obtained from the TSBD, Exhibit 142, and the known sample obtained on November 22, Exhibit 677?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Did you find any points of nonidentity?

Mr. CADIGAN. No; I found none.

Mr. EISENBERG. They were identical on every point on which you measured them?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Mr. Cadigan, did you notice when you looked at the bag whether there were—that is the bag found on the sixth floor, Exhibit 142—whether it had any bulges or unusual creases?

Mr. CADIGAN. I was also requested at that time to examine the bag to determine if there were any significant markings or scratches or abrasions or anything by which it could be associated with the rifle, Commission Exhibit 139, that is, could I find any markings that I could tie to that rifle.

Mr. EISENBERG. Yes?

Mr. CADIGAN. And I couldn't find any such markings.

Mr. EISENBERG. Now, was there an absence of markings which would be inconsistent with the rifle having been carried in the bag?

Mr. CADIGAN. No; I don't see—actually, I don't know the condition of the rifle. If it were in fact contained in this bag, it could have been wrapped in cloth or just the metal parts wrapped in a thick layer of cloth, or if the gun was in the bag, perhaps it wasn't moved too much. I did observe some scratch marks and abrasions but was unable to associate them with this gun. The scratch marks in the paper could come from any place. They could have come from many places. There were no marks on this bag that I could say were caused by that rifle or any other rifle or any other given instrument.

Mr. EISENBERG. Was there any absence of markings or absence of bulges or

absence of creases which would cause you to say that the rifle was not carried in the paper bag?

Mr. CADIGAN. No.

Mr. EISENBERG. That is whether it had been wrapped or not wrapped?

Mr. CADIGAN. That is something I can't say.

Mr. DULLES. Would the scratches indicate there was a hard object inside the bag, as distinct from a soft object that would make no abrasions or scratches?

Mr. CADIGAN. Well, if you were to characterize it that way, yes. I mean there were a few scratches here. What caused them, I can't say. A hard object; yes. Whether that hard object was part of a gun—

Mr. DULLES. I understand.

Mr. CADIGAN. And so forth—

Mr. EISENBERG. I am not sure you understood a question I asked one or two questions ago.

I just want to make clear here if the gun was not wrapped in a cloth—let's assume hypothetically that the gun was not wrapped in a cloth and was, also hypothetically, inserted into this paper bag. Is there any absence of marks which would lead you to believe that this hypothesis I just made couldn't be—that is, that it couldn't be inserted, without a covering, into the paper bag without leaving more markings than were present?

Mr. CADIGAN. No. The absence of markings to me wouldn't mean much. I was looking for markings I could associate. The absence of marks, the significance of them, I don't know.

Mr. EISENBERG. Now, getting back to the paper bag, 142, and the tape thereon, just for a second, and the tape found on the, obtained from the, TSBD on November 22, Exhibit 677, were the widths of the tapes the same?

Mr. CADIGAN. Similar. They were not exactly the same; no.

Mr. EISENBERG. Can you explain that?

Mr. CADIGAN. Yes; the width of the tape on the paper sack, Exhibit 142, I measured at 3 inches, and the width of the manila tape on Exhibit 677 obtained the night of November 22, I measured as 2.975. There is twenty-five one-thousandths of an inch difference.

Mr. EISENBERG. Would that lead you to believe that they couldn't have come from the same roll?

Mr. CADIGAN. No; certainly not.

Mr. EISENBERG. Not enough of a variation to lead to that conclusion?

Mr. CADIGAN. That is correct.

Mr. EISENBERG. How wide do these rolls come in your experience, in what widths do they come?

Mr. CADIGAN. Normally they are supplied in, I believe, 1-, 1½-, 2-, 2½-, and 3-inch widths.

Mr. EISENBERG. So this was basically of a 3-inch width variety out of several possible alternatives?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Is there any other information you would like to give us or any other testimony you would like to give us on the subject of the origin of the paper in the 142 bag?

Mr. CADIGAN. Well, possibly the comparisons made of paper samples from Jaggars Chiles-Stovall and from the William B. Riley Co.

Mr. EISENBERG. These are, you have mentioned two companies at which Oswald was employed at one time?

Mr. CADIGAN. Yes.

Mr. EISENBERG. You obtained paper from these companies, did you?

Mr. CADIGAN. Yes, sir.

Mr. EISENBERG. And you matched them to see if they matched—you tested them to see if they matched the paper in the bag 142, is that correct?

Mr. CADIGAN. Yes; that is correct.

Mr. EISENBERG. And your conclusion was what?

Mr. CADIGAN. That they were different.

Mr. EISENBERG. Yes. Anything else?

Mr. CADIGAN. That is about it.

Mr. EISENBERG. Mr. Chairman—

Mr. DULLES. Mr. Murray, do you have any questions?

Mr. MURRAY. I don't believe I have, Mr. Commissioner, but I would like to mention this off the record, if I may.

(Discussion off the record.)

Mr. EISENBERG. We have now the ultraviolet machine set up.

Could you just show us the difference in fluorescence?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Can you explain what you have set up here, Mr. Cadigan?

Mr. CADIGAN. This is a portable ultraviolet viewer I used to examine the papers and I think probably what is most noticeable is in the manila tapes. The tape on the right is the sample secured November 22. The tape at the top is from the bag 142, and then the one in the, you might say, lower left, toward the bottom, is the tape that was secured December 1.

Mr. EISENBERG. You are referring to positions in the bottom of the ultraviolet machine?

Mr. CADIGAN. Yes; relative position.

Mr. DULLES. The one at the left is the one taken from the paper sack, isn't it?

Mr. CADIGAN. Top left; yes; that would be from 142.

Mr. DULLES. 142, and the other is——

Mr. CADIGAN. The one on the right is 677.

Mr. DULLES. What am I supposed to see?

Mr. CADIGAN. A difference in the appearance, difference in color.

Mr. DULLES. What do you mean? I see the violet and I see the white.

Mr. CADIGAN. Well, if you look at the two tape samples——

Mr. DULLES. This tape sample on upper left hand is covered up by this one. I wonder whether you shouldn't take out the later one?

Mr. CADIGAN. Yes; I think probably that would be better.

Mr. EISENBERG. Why don't you show Mr. Dulles the paper bag, 142, and the sample obtained November 22?

Mr. DULLES. Yes; those are the two we are most interested in.

Mr. CADIGAN. The observation I would make there is that the color of the tape on Exhibit 142, the sack, and the color of the paper of the sack 142, under UV, is the same as the color of the tape on 677 and the color of the paper.

Mr. DULLES. I agree on that.

Mr. EISENBERG. Let the record show that Mr. Dulles makes the statement as he is looking in the machine. Mr. Cadigan, why don't you compare it——

Mr. CADIGAN. By comparison——

Mr. DULLES. This is only as to color, that is all I saw. I saw some markings on it.

Mr. CADIGAN. That is right. This is only for color appearance under the ultraviolet light.

Mr. EISENBERG. Why don't you compare the sack found at the TSBD and the replica sack obtained 10 days later?

Mr. CADIGAN. Here again all that should be observed is the color under UV of both the paper and tape of the sample and the paper and tape of Exhibit 364.

Mr. DULLES. 364 is the paper bag, isn't it?

Mr. CADIGAN. 364 is the replica sack obtained on December 1.

Mr. EISENBERG. Ten days later.

Mr. DULLES. That is on the left?

Mr. CADIGAN. Yes.

Mr. DULLES. And the other is the sack?

Mr. CADIGAN. No; the other on your right is the sample of paper obtained on November 22.

Mr. DULLES. November 22, just after the assassination?

Mr. CADIGAN. Yes.

Mr. DULLES. There is a clear distinction here. The sample to the right, that is, as I understand it, paper obtained on the evening of November 22, has a more, a deeper violet shade, and on the other hand, the tape is much lighter than the tape on the sample obtained 10 days later. That is to say that the sample 10 days later is darker as to the tape but lighter as to the paper.

Would you like the opportunity, Mr. Murray?

Mr. MURRAY. No, thank you.

Mr. EISENBERG. We are putting in the sack and 364, the 10-day later sample.

Mr. DULLES. Sack and 10-day later sample. Which is on which side?

Mr. CADIGAN. The sack is on the left and the replica bag obtained on December 1 is on the right.

Mr. DULLES. Yes. I find there that the sample obtained 10 days later, and the sack which is on the left, that the sample obtained 10 days later shows a lighter shade of purple than the sack, and that the tape shows a darker shade of, I would call it, almost gray as against almost white for the tape which is on the sack.

Mr. EISENBERG. I have no further questions, Mr. Dulles.

Mr. DULLES. Have you anything that you feel you should add, anything in this general field that would help the Commission?

Mr. CADIGAN. No, sir; not as it relates to this paper and these paper bags.

Mr. EISENBERG. You will be called later for testimony on handwriting—I suppose you will be the person to testify?

Mr. CADIGAN. Whenever you want me I will be available.

Mr. EISENBERG. Did you examine the tape for microscopic—to determine the morphology of the fibers in the paper?

Mr. CADIGAN. No.

Mr. EISENBERG. Can you tell us why?

Mr. CADIGAN. I didn't feel it was necessary.

Mr. EISENBERG. I wonder whether you could do that, Mr. Cadigan, and send us a letter as to the results?

Mr. CADIGAN. Certainly.

(The letter referred to was later supplied and is set forth at the end of this testimony.)

Mr. EISENBERG. And also, did you notice how the glue had been applied to the tapes?

Mr. CADIGAN. Yes; you might say glue was applied all the way across the tapes.

Mr. EISENBERG. There are no discernible differences in them?

Mr. CADIGAN. The glue on the tapes would be applied with a brush at the time of manufacture.

Mr. EISENBERG. Is there more than one way of applying glue?

Mr. CADIGAN. Oh, yes. On some tapes, if you look at them either before or after they are used you will see a continuous line running right down the tape where they have used a wheel applicator, merely a difference in manufacturing methods.

Mr. EISENBERG. But you found a brush applicator?

Mr. CADIGAN. Yes.

Mr. EISENBERG. Will the same manufacturer use two different methods?

Mr. CADIGAN. He might or might not.

Mr. EISENBERG. In your experience, is it likely that he would use two different methods?

Mr. CADIGAN. I really couldn't say.

Mr. DULLES. Mr. Cadigan, I thank you very much for your most interesting and helpful testimony.

(Whereupon, at 1:50 p.m., the President's Commission recessed.)

(Following is the text of a letter relating to the fiber composition of the gummed tapes in Exhibits 142 and 677.)

UNITED STATES DEPARTMENT OF JUSTICE,  
FEDERAL BUREAU OF INVESTIGATION,  
Washington, D.C., April 8, 1964.  
[By Courier Service].

HON. J. LEE RANKIN,  
General Counsel, the President's Commission, 200 Maryland Avenue NE.,  
Washington, D.C.

DEAR MR. RANKIN: During the testimony of Special Agent James C. Cadigan on April 3, 1964, before the President's Commission, Mr. Melvin Eisenberg of your staff orally requested Special Agent Cadigan to make a fiber analysis of

the gummed tape on the paper sack found on the sixth floor of the Texas School Book Depository Building, Commission Exhibit 142, and of the sample of gummed tape in Commission Exhibit 677 obtained November 22, 1963, at the Texas School Book Depository Building.

Fiber analysis of the two gummed tapes in Commission Exhibits 142 and 677 revealed that they were similar in fiber composition.

Sincerely yours,

J. EDGAR HOOVER.

*Tuesday, April 21, 1964*

**TESTIMONY OF DR. ROBERT ROEDER SHAW, DR. CHARLES FRANCIS GREGORY, GOV. JOHN BOWDEN CONNALLY, JR., AND MRS. JOHN BOWDEN CONNALLY, JR.**

The President's Commission met at 1:30 p.m., on April 21, 1964, at 200 Maryland Avenue NE., Washington, D.C.

Present were Chief Justice Earl Warren, Chairman; Senator Richard B. Russell, Senator John Sherman Cooper, Representative Hale Boggs, John J. McCloy, and Allen W. Dulles, members.

Also present present were J. Lee Rankin, general counsel; Francis W. H. Adams, assistant counsel; Joseph A. Ball, assistant counsel; David W. Belin, assistant counsel; Norman Redlich, assistant counsel; Arlen Specter, assistant counsel; Charles Murray and Charles Rhyne, observers; and Waggoner Carr, attorney general of Texas.

**TESTIMONY OF DR. ROBERT ROEDER SHAW**

Senator COOPER. The Commission will come to order.

Dr. Shaw, you understand that the purpose of this inquiry is taken under the order of the President appointing the Commission on the assassination of President Kennedy to investigate all the facts relating to his assassination.

Dr. SHAW. I do.

Senator COOPER. And report to the public.

Do you solemnly swear the testimony you are about to give before this Commission will be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. SHAW. I do.

Senator COOPER. Do you desire an attorney to be with you?

Dr. SHAW. No.

Mr. SPECTER. Will you state your full name for the record, please?

Dr. SHAW. Robert Roeder Shaw.

Mr. SPECTER. What is your profession, please?

Dr. SHAW. Physician and surgeon.

Mr. SPECTER. Will you outline briefly your educational background?

Dr. SHAW. I received my B.A. degree from the University of Michigan in 1927, and my M.D. degree from the same institution in 1933.

Following that I served 2 years at the Roosevelt Hospital in New York City from July 1934, to July 1936, in training in general surgery. I had then 2 years of training in thoracic surgery at the University Hospital, Ann Arbor, Mich., from July 1936 to July 1938.

On August 1, 1938, I entered private practice limiting my practice to thoracic surgery in Dallas, Tex.

Mr. DULLES. What kind of surgery?

Dr. SHAW. Thoracic surgery or surgery of the chest.