SUPERIOR COURT OF TEE DISTRICT OF COLUMBIA
Civil Division

MARY MGNTGOMENY, in her capacity as the Personal Representative of the Estate of HENRY LEE BRADLEY, deceased, Plaintiff, v. TRI-CONTINENTAL INDUSTRIES, INC., ET AL., Defendants.	CA No. 90-11383 Civ. I - J. Levie Cal. 3
MINNIE CARTER, in her capacity as the Personal Representative of the Estate of ROOSEVELT CARTER, deceased, Plaintiff, v. TRI-CONTINENTAL INDUSTRIES, INC., ET AL., Defendants.	CA No. 90-11384 Civ. I - J. Levie Cal. 3

Deposition of

DR. DAVID H. GARABRANT

(Caption continued on Page 2)

(Caption continued from Page 1)

SUPERIOR COURT OF THE DISTRICT OF COLUMBIA
Civil Division

----------X

STANLEY WARREN TAYLOR,

Plaintiff,

v. : CA No. 90-11385
: Civ. I - J. Levie
: Cal. 3

TRI-CONTINENTAL INDUSTRIES, INC.,
ET AL.,

Defendants.

----------X

Tuesday, May 31, 1994
Washington, D.C.

Deposition of

DR. DAVID H. GARABRANT

The witness, called for examination by counsel for the plaintiff, pursuant to notice, held at the offices of Paulson, Nace, Norwind & Sellinger, 1814 N Street, N.W., Washington, D.C. beginning at 10:15 o'clock a.m., before Elizabeth A. Jones, RPR, when were present on behalf of the respective parties:

For the Plaintiffs:

BARRY J. NACE, ESQ.
MARK LIGHTFOOT, ESQ.
Paulson, Nace, Norwind & Sellinger
1814 N Street, N.W.
Washington, D.C.
(202) 463-1999

For the Defendant,
Tri-Continental Industries:

JONATHAN STERN, ATTORNEY AT LAW
Katten, Muchin, Zavis & Dombroff
1025 Thomas Jefferson Street, N.W.
East Lobby, Suite 700
Washington, D.C. 20007-5201
(202) 625-3500

For the Defendant,
Steuart Petroleum:

JAMES JORDAN, ATTORNEY AT LAW
Jordan, Coyne & Savits
1030 Fifteenth Street, N.W.
Washington, D.C. 20005
(202) 371-6358

For the Defendants,
BP Exploration and Oil Inc.,
CITGO Petroleum Corporation
Tenneco Oil Company
Crown Central Petroleum Corp.,

JOSEPH P. ESPOSITO, ESQ.
Akin, Gump, Strauss, Hauer & Feld
1333 New Hampshire Avenue, N.W.
Suite 400
Washington, D.C. 20036
(202) 887-4000

For the Defendant,
Marathon Oil:

BARBARA MILNAMOW, ATTORNEY AT LAW
Spriggs & Hollingsworth
1350 I Street, N.W.
Washington, D.C. 20005-3305
(202) 898-5820

For the Defendant,
Mansfield Oil:

MELISSA HOGUE, ATTORNEY AT LAW
Lewis, Trichilo, Bancroft & McGavin, P.C.
4117 Chain Bridge Road
Suite 400
Fairfax, VA 22030
(703) 385-1000

Also Present:

Robert Hilliard, Esq.

CONTENTS

* * *

EXHIBITS

(Garabrant Exhibits 1, 2, 3 and 4 were marked for identification purposes prior to proceedings.)

Thereupon,

DR. DAVID H. GARABRANT

the witness, called for examination by counsel for the plaintiffs, and, after having been sworn by the notary, was examined and testified as follows:

EXAMINATION BY COUNSEL FOR THE PLAINTIFFS, MARY MONTGOMERY, MINNIE CARTER, and STANLEY WARREN TAYLOR,

BY MR. NACE:

Q Give us your full name.

A David Hay Garabrant.

Q And it's Dr. Garabrant?

A Yes.

Q I'm going to show you Exhibit 1 and perhaps you could tell us what that is.

A That's a copy of my C.V. dated October 1991.

Q Is there a more up-to-date C.V.?

A The most recent version I think is dated December 1993.

Q Do you have a copy of that with you?

A I did not bring one with me.

Q Can you tell me what additions or corrections or changes you would make?

A Essentially, there are a few publications that would be added to that, I'd have to compare the two to give you specific --

Q Let me ask it --

A -- details.

Q -- this way. Have you given a copy to Counsel?

A Yes, I have.

Q Obviously, we're going to go into this afternoon, so I'd like to have that at lunch break, bring that back. Would that be okay?

A Certainly.

MR. ESPOSITO: If we have it. I didn't realize we had a more current one, but I'll get it.

THE WITNESS: I'm almost certain you do,

MR. ESPOSITO: Okay.

THE WITNESS: And if you don't, we can have one faxed down --

MR. ESPOSITO: Okay.

THE WITNESS: -- from my office. That's easy enough.

BY MR. NACE:

Q Let me show you Exhibit 2 that's been provided to us. Can you tell us what that is?

A This is a list of the literature that I have reviewed in preparation for this deposition and in -- to prepare my opinions on the case.

Q All right. Now, in addition to that, let me show you Exhibit 4. You mentioned materials that you reviewed. Are those the additional materials that you reviewed?

MR. ESPOSITO: Is that 4, I think?

MR. NACE: 4.

THE WITNESS: Yes.

BY MR. NACE:

Q So between number 2 and number 4, would it be accurate to say that we have everything that you reviewed?

A I think so. There might be one or two references that are not listed on Exhibit 2 that I

have also reviewed, but that -- I think this is correct.

Q Well, I'd like to know what those one or two are, so.

A Well, uh --

Q Rather than find out at the time of trial, I'd like to know today, if you can help me out on that.

A A number of chapters from this textbook on Hematology by Ronald Hoffman.

Q Okay.

A I don't know if they're listed chapter by chapter. Yeah, they're not. I know one of them is not listed. So there are, there are a series of chapters from a hematology book. And other than that, I think that's it.

MR. NACE: All right. Let me take this Hematology chapter, and have you mark that as number 5, if you would. Put it on the back there.

(Garabrant Exhibit 5 was marked for identification purposes.)

BY MR. NACE:

Q Okay. Now, if I understand what you have said, Exhibit 5 would be some chapter from a book by Hoffman entitled Hematology. Apparently at least one or more of these are listed on the literature on Exhibit 2, and there's another chapter or so in here that was not listed on Exhibit 2; is that correct?

A I don't know if any of them are listed --

Q Or not listed, but --

A -- or not listed.

Q But this would --

A But they are all here.

Q They're all here. Okay. We'll get a copy of that made.

MR. NACE: Does anybody else want copies? We charge about $.30 a page.

MR. JORDAN: I do.

MR. NACE: I'll have a copy attached to that.

BY MR. NACE:

Q Anything else that you have reviewed that you're going to be relying upon?

A I do not think so.

Q All right. In front of you is a large gray manual and a large black manual. Tell us what's in there.

A These are copies of the references that are listed in Exhibit 2.

Q Okay. Have you made markings on those?

A Some of them, yes.

Q All right. And you also have next to it a book by whom?

A Martha Linet. That is listed on Exhibit 2.

Q All right. And a few tablets and so on. Tell us what that is, please.

A All right. I have my correspondence from Akin, Gump, which I was instructed to bring.

MR. NACE: Let's have that marked as Exhibit 6. I'm sure that's important.

THE WITNESS: Uh --

MR. NACE: Wait a minute.

(Garabrant Exhibit 6 was marked for identification purposes.)

BY MR. NACE:

Q Next?

A I have notes on various publications I reviewed, and I have a brief summary of the medical files of Mr. Carter, Mr. Taylor and Mr. Bradley.

Q Let's take them one at a time. Let me have the white tablet, which has some of your notes on it which are now six pages in length.

MR. NACE: Let's mark this as number 7 and why don't you, so we don't mess this up, put it on the back of the first page, put your label on there.

MR. ESPOSITO: Off the record.

(A brief discussion was held off the record.)

(Garabrant Exhibit 7 was marked for identification purposes.)

BY MR. NACE:

Q And now if I could see your other three you had, I think you described as synopsis on the medical backgrounds of Mr. Carter and Mr. Taylor and Mr. Bradley.

MR. NACE: And let's have those marked as 8, 9, and 10, in that order.

(Garabrant Exhibits 8, 9 and 10 were marked

for identification purposes.)

BY MR. NACE:

Q And you appear to have a few more notes in front of you. Tell us what that is, please.

A 1 have notes that I took from telephone conversations with Martin Hawley, John Spencer, and Scott Strickoff.

Q Okay. That's three pages?

A Three pages.

MR. NACE: Let's have those marked as 11, 12 and 13.

(Garabrant Exhibits 11, 12, and 13 were marked for identification purposes.)

BY MR. NACE:

Q And the notes seem to be multiplying. Are there some more over there?

A Yes.

Q What is that?

A I have notes that I have taken while I was reading the various materials listed on Exhibit 4.

Q Okay. There seem to be five pages.

MR. NACE: Let's have that marked as Exhibit

14, I believe it is.

(Garabrant Exhibit 14 was marked for identification purposes.)

BY MR. NACE:

Q It seems like you have nothing e se in rront of you.

A That's correct.

MR. NACE: Let's get a copy of that made while we're going through some of the stuff.

MR. LIGHTFOOT: Yeah.

MR. NACE: Let's do it now.

MR. LIGHTFOOT: Off the record.

(A brief discussion was held off the record.)

BY MR. NACE:

Q Let me show you what we've already had marked as Exhibit 3, which you'll see says Defendants' Designation of Expert Witnesses and you're listed on it as David Hay Garabrant.

Have you seen this before?

A I believe I have.

Q Would you take a look at it and make sure.

There's only about two pages there.

(The witness perused document.)

Okay. Having read it, does that accurately describe what testimony you intend to give in this case?

A Yes.

Q Okay. Doctor, have you ever testified before?

A Yes.

Q First of all, let me separate it.

In court?

A Yes.

Q In depositions, like we're doing today?

A Yes.

Q Any other kind of proceeding?

A No.

Q I notice you live in Michigan, don't you?

A Yes.

Q I know they have some other different proceedings up there. You never testified in any kind of arbitration hearing up there?

A No.

Q All right. One at a time then, Doctor, as far as court, how many times have you testified in court?

A Twice.

Q And how many times have you testified in depositions?

A I would estimate about 20 times.

Q The two court cases that you testified in, could you tell us just generally the nature of those cases?

A Yes. One was a case in which a group of workers who worked in an electronics plant claimed that solvents had caused neurologic problems and other health effects. The other case --

Q Before you get off of that one, who were you testifying for?

A For the defendant, one of the defendants.

Q And who was that?

A I think it was Dow Chemical Company.

Q Where was that case located, if you recall?

A Houston, Texas.

Q Do you remember the name of the case?

A Larkin versus Dow and some other -- I think it was just Larkin versus Dow.

Q Okay. How long ago was that, approximately?

A I know it was in January of either '90 -- '92, I think.

Q And what was the solvent?

A 1, 1, l-trichloroethane, I believe.

Q Take it a little bit slower for the reporter. I understood everything you said, but.

A 1, 1, l-trichloroethane.

Q Does that have a more common name?

A TCA.

Q And what was the neurological problem that it was alleged to have caused?

A There were a variety of them. Include -- primarily central nervous system abnormalities.

Q Was this at a manufacturing plant?

A Yes. They had worked in a manufacturing plant.

Q Of the product?

A Of -- no. They were making electronics --

Q Oh, I understand.

A -- parts using solvents in the process.

Q And I take it you then were testifying that the solvent did not cause the problems that they were complaining of; is that correct?

A Yes, more or less.

Q Do you remember the name of any of the attorneys in that case, specifically the plaintiff's attorney, the claimant's attorney?

A Not offhand. It will come to me.

Q Well, when it comes to you, would you just blurt it out for us?

A I want to say Maloney.

Q Okay. Pat Maloney?

A I think that's right.

Q Okay. And what was the second case?

A It was a case of multiple chemical sensitivity in which the plaintiff alleged that exposure to methacrylate had caused him to have multiple chemical sensitivity.

Q All right. Where was that?

A Miami.

Q Name of the case?

A Camacho versus BASF.
Q Plaintiff's attorney?
A Defense on that one.
Q You were testifying for the defense?
A Oh, I was testifying for the defense.
Q Right. And who was --
A Do I know the name of the plaintiff's attorney?
Q Any chance you know that?
A I do not remember.
Q Okay. And what was the, again, the allegation in that case by the Camacho?
A That exposure to methacrylate --
Q Caused what?
A -- caused multiple chemical sensitivity.
Q Okay. Approximately when was that that you testified?
A Either '92 or '93.
Q Okay. Do you remember what court it was in? Was it a federal court, state court?
A I think it was either a -- it was not federal. It was not state. It was either count --

some local court.

Q Right in Miami?

A Right in Miami.

Q Now, the 20 times that you said you testified by way of deposition, were they always for the defense?

A No.

Q Of those 20, how many were for the plaintiff?

A I would say about half.

Q Okay. When was the last time you did any work for the plaintiff?

A I've been deposed two or three times this year, and I know one or two of them were on behalf of plaintiffs.

Q Do you remember the names of any of the plaintiff's attorneys that you've been working with?

A Mr. Haadsma, H-A-A-D-S-M-A. I think his first name is James.

Q Where is he located?

A In Michigan.

Q Anyone else?

A I can't recall offhand.

Q Let's say it was ten of each, you said approximately half. Of the ten for the plaintiff, what products were involved?

A A number of them have involved occupational asthma related to isocyanates, I-S-O-C-Y-A-N-A-T-E-S. One of them involved asthma related to cutting fluids in a machining operation. That's all I can recall offhand.

Q So to your recollection, they all involved asthma in some form?

A I'm sure there were other cases as well. Those are the ones I can remember.

Q Okay. Did you testify with respect to the asthma cases that a product was the cause of the asthma?

A More that the circumstances at work caused the asthma. Not always able to specify a single product.

Q Did you ever narrow it down to a particular product?

A There have been instances where we have

identified a specific chemical or a family of chemicals such as the diisocyanates, TDI or MDI. I can't recall narrowing it down to -- are you asking one company's specific product?

Q No. Just a particular product.

A Oh, yes. A specific chemical, yes.

Q So you did testify that a specific chemical was probably the cause of the asthma?

A I have testified to that, yes.

Q Okay. With respect to the defense cases that you testified in, approximately ten, what were the products involved there?

Now, let me interrupt you. I assume you don't have a list of these --

A I do not have a list.

Q -- cases anywhere?

A No.

Q Okay. Go ahead then. Tell me what products were involved for the defense.

A I have testified on chlorpyrifos. I've testified on solvents, mixtures of solvents.

Q Including benzene?

A Probably not including benzene.

Q Okay.

A I've testified on multiple chemical sensitivity where there wasn't any clear exposure, so it's hard to specify a product. That's about the extent of my recollection.

Q How about benzene? Any benzene cases?

A I don't believe I've ever testified on benzene.

Q Or gasoline cases?

A I don't believe I've ever testified on gasoline.

Q What were some of the manufacturers that you were testifying on behalf of?

A Uh --

Q You were saying the chlorpyrifos did not cause something, I take it?

A Right. Chlorpyrifos was made by the Dow Chemical Company.

Q What were some of the other companies that you would have been testifying on behalf of in those various cases?

A To be honest with you, I can't remember any of those specific companies. Those are the products.

Q When was the last time that you testified in a deposition? You said you did one or two this year.

A I said I've done two --

Q Three --

A -- or three depositions this year, and one or two of those were for plaintiffs and the other was others would have been defense.

Q And who was that, just this year?

A I --

Q Don't remember?

A I don't remember.

Q Could you tell us what states you've actually given depositions in?

A Mostly in Michigan. We've talked about the one in Houston, the one in Miami. Other than that, I think that's all. I think it's just Michigan, Texas and Florida.

Q That's all you recall or that's all?

A No. Actually, I remember two in California when I was on the faculty at USC.

Q And were those for the defense or the plaintiff in California?

A They were both for plaintiffs.

Q Okay. And where in California?

A Los Angeles.

Q Okay. Do you remember the name of the plaintiff's attorney or the plaintiff or the defendants?

A I can remember the issues, but I can't remember the names of the people. One of them, the plaintiff, we're going back now probably almost ten years. One of them I want to say Carl Bradley was the plaintiff, and the defendant would have been one of the asbestos companies. I don't even know which one.

Q Have you testified in asbestos cases on occasion?

A I have testified in two asbestos cases.

Q For the plaintiff?

A One for the plaintiff and one for the defendant.

Q Okay. One was in California?

A Yes.

Q And where was the other one?

A The other was in Michigan this year, as a matter of fact.

Q When you do these cases, 1 take it you get paid, don't you?

A Yes.

Q How do you get paid? How much?

A I charge **$350** an hour.

Q Okay. For the plaintiff or the defendant?

A Yes.

Q For depositions or in court?

A For my time no matter what I do.

Q Okay. And what would you say your percentage of income is devoted or obtained from testifying and reviewing cases?

A It's small. I would have to estimate perhaps ten percent, no more than that.

Q You're a full-time employee of a university, aren't you?

A Yes, I am.

Q That's University of Michigan --

A Yes.

Q -- School of Medicine?

A My primary appointment is in the School of Public Health.

Q I see. Do you get to keep that money?

A Yes, I do.

Q So like today, you get to keep the money that you get paid?

A Yes.

Q It doesn't go back to the school?

A No.

Q Do you take vacation?

A I'm sorry?

Q Do you take vacation time for this?

A I take -- do I take vacation time for this?

Q Right.

MR. ESPOSITO: You mean for the deposition?

BY MR. NACE:

Q For the deposition.

A For today?

Q Yeah.

A No. Sometimes I do --

Q Sick leave?

A -- sometimes I don't.

No.

Q What do you take?

A I take a day of consulting time.

Q I see. Are you allowed so many days of consulting time?

A Yes.

Q About how many are you allowed?

A Ten percent of our time.

Q Okay. Is this written somewhere that you're allowed ten percent of your time for consulting purposes?

A Yes.

Q Does that consulting purpose include testimony?

A Uh --

Q As you understand it?

A As I understand it, it says we're allowed ten percent of our time for professional consulting.

Q I see. And now this is in some sort of a document, apparently. Can you tell me what it is?

A I think it's in my contract --

Q Okay.

A -- as I recall.

Q All right. Do you have a contract every year, a new one?

A I know they tell me how much they're going to pay me every year. I don't know whether that's a formal contract or not but I -- no. I don't think I -- I don't sign a new contract every year.

Q Okay. When was the last time you recall signing a contract?

A When I joined the University of Michigan.

Q Okay.

A Which would have been 1988.

Q All right. I take it you have a copy of that contract?

A I do not know whether I have a copy of that or not. I'm -- when I say I think I signed a contract, I'm not sure I signed a contract. I think I did. I would have to look and see if I have a copy.

Q Would you have any objection of us getting a copy from the University of Michigan?

MR. ESPOSITO: Well, we might, Barry. I

think discovery on something like that is passed, so.

MR. **NACE:** Is what?

MR. **ESPOSITO:** Passed. Gone. Over.

MR. **NACE:** I don't understand what you're saying.

MR. **ESPOSITO:** I think that under the order that the Court has established, your opportunity to do that is passed.

MR. NACE: My opportunity to get a copy of the contract of the man who's testifying today?

MR. **ESPOSITO:** (Nodded **head.)**

MR. **NACE:** All right.

BY MR. **NACE:**

Q Well, then, I'd like to have you search your records and you come up with a copy of the contract, okay?

MR. **ESPOSITO:** Well, same objection.

MR. **NACE:** How could that possibly be the same objection? Forget it.

MR. **ESPOSITO:** Okay. We will.

BY MR. NACE:

Q So you're not going to provide me with a

copy of that contract unless ordered to do so by the Court; is that correct?

MR. ESPOSITO: That's not -- that's exactly I think the case, that -- yeah.

BY MR. NACE:

Q Well, I'm asking you.

Are you willing to provide us a copy of the contract?

A I will do whatever the Court asks me to do.

Q All right. Can you think of anywhere else where there may be something written about how much time you can take off from your duties at the university --

A No.

Q -- for consulting purposes?

So if it's not in the contract, it doesn't exist; is that what you're saying?

A To my knowledge, that would be the only place.

Q All right. I understand you were board certified in internal medicine back in 1981, I believe it was?

A Yes.

Q All right. Have you practiced in the field of internal medicine since then?

A I would say that my practice is primarily occupational medicine. There is some overlap between the two fields, however.

Q I see. Do you treat patients now?

A I do.

Q How frequently do you treat patients?

A I have clinic every Monday and I see patients every Monday and we provide care for them.

Q About how many patients do you see every Monday?

A Two to three.

Q So you see two or three patients a week?

A Yes.

Q And you say "we provide care". What do you mean by "we provide care"?

A I -- my colleagues and I on the faculty run a residency training program in occupational medicine and I see patients with the residents, and we, as a team, provide care.

Error

An error occurred while processing this page. See the system log for more details.

see 25 or 30 people until a half day. And I'd do that two or three half days a week.

Q And since you started with the University of Michigan, it's been two or three a week?

A It has fluctuated, but that's what it's been stably now for the past year.

Q Now, have any of those patients that you've seen while at the University of Michigan been patients who had hematological problems?

A Yes.

Q How frequently does that occur?

A That's infrequent.

Q Well, what does that mean?

A Um --

Q One a week? One a month? One every year?

A Oh, I would say a few a year.

Q What's "a few" mean to you?

A Certainly less than ten.

Q Less than five?

A Could be, could be five, approximately; could be a few more. Certainly less than ten. I could be, could be three, four, five, six.

Q Have any of those hematological cases involved patients with leukemia?

A I don't think so.

Q Now, you're also apparently board certified in preventive medicine in 19821

A That's correct.

Q And could you tell me exactly what is preventive medicine?

A It is the medical specialty that is devoted to the prevention of disease.

Q You were also boarded in occupational medicine in 1982. Did you take two separate exams for the preventive medicine and the occupational medicine --

A Yes.

Q -- or is that in one sitting?

A It's a two-day examination. The first day, if you pass it, it gives you boards in preventive medicine. And then the second day, if you pass it, it gives you boards in occupational medicine.

Q You passed them both the first time --

A Yes.

Q -- you took them? Okay.

Were they oral and written?

A Just written.

Q Okay. Do you have to be recertified in either of those specialities?

A No.

Q Is there a recertification program, however, in either of those specialities?

A Not that I'm aware of.

Q All right. I also note that you're a member of a group of professional societies. They're listed on page four of your C.V., which is Exhibit 1, I believe. Tell me which of those you had to take exams for, tests?

(The witness perused document.)

A I didn't have to take tests to join any professional societies.

Q Some of those say elected to fellowship. Tell me how you're elected, what that process is?

A To the best of my recollection, the process is that you must apply and demonstrate that you have practiced substantially in the field, have

publications, and have a record of accomplishments in that specialty.

Q You fill out an application, submit the application with a fee, and you're accepted; is that correct?

A In my case, yes. I don't think that's true for everyone, however.

Q It's not true for everyone?

A That everyone who asks for fellowship gets --

Q Right.

A -- elected to fellowship?

Q Right.

A I don't believe so, no.

Q Do you know what percentage get elected?

A No.

Q Have you ever been rejected of any of those professional societies --

A No.

Q -- that you listed there?

A No.

Q Or any others?

A No.

Q Okay. You indicated that you're seeing now about two or three patients a week, and the clinic is on Monday.

A That is correct.

Q Is there anything else that you do on Mondays besides see those two or three patients?

A Yes.

Q What do you do?

A Typically on Monday I do office work until mid morning, then meet with the other faculty and residents for a seminar, and then go to clinic.

Q Okay. So actually the clinic is a half day?

A Yes.

Q All right. What about the rest of your week? How do you spend that?

A I spend it teaching, doing research, and doing administrative activities.

Q How much do you teach? Give me an idea of how much teaching you do every week.

A It's hard to put a number on it. In the past year, I think the school accredited me with

teaching about 14 credit hours.

Q How many courses would that be?

A A credit hour is one hour per week for a semester.

Q So you teach an hour a week every semester?

A It's not that easy to define it. I teach far more than that. I got 14 credit hours of teaching in the past year, so that's -- a contact hour a week for one semester is a credit hour of teaching.

Q Well, maybe I just don't understand this. How much time do you spend in class on a weekly basis teaching?

A In class?

Q In a class.

A In a classroom?

Q Classroom.

A Probably averages one to two hours a week.

Q Okay. And what else compromises your teaching other than that one or two hours per week?

A Direct supervision of residents, supervision of doctoral students, supervision of master's students. That's primarily it.

Q How much of your week is filled with that supervision of students and doctoral students?

A Including classroom teaching or excluding --

Q Well --

A -- the classroom teaching?

Q -- the classroom teaching, which you told me was an hour or two a week. I want to know how much more is spent with these students teaching.

A Probably in the order of a day and a half a week.

Q Okay. And the research, how much of your week is spent on research?

A It varies, but I would say about half.

Q Half a week?

A Half of my week.

Q Roughly two and a half days a week?

A Yes.

Q What kind of research do you do?

A I do occupational disease epidemiology.

Q Okay. And the -- which I'm sure we'll get into a li tle later -- but how about your administrative activities? How much of your week is

devoted to that?

A Whatever is left. I would guess it fills a couple of days a week.

Q Okay. What is it -- and probably a very naive question -- but what do you do for approximately two days a week that's considered administrative duties? I mean --

A Well, let's see. I'm --

Q -- about 40 percent of your time. I mean, what are you doing?

A I'm the director of the occupational medicine program, which means that the administration of our training grant in occupational medicine takes a fair amount of time in terms of getting residents appointed, managing the budget, making sure bills get paid. I recruit residents almost year round, interview residents, review their application materials. I have some duties, some responsibilities in scheduling clinic and making sure the clinic runs.

Our residents rotate out through industries. I'm responsible for affiliation agreements and contracts in the industries and other field rotations clinics,

UAW, OSHA where the residents rotate. I also direct our occupational health group under which occupational medicine is subsumed. I'm responsible for scheduling the faculty meetings and having the agenda, preparing documents for that meeting.

A fairly significant list of chores that result from those meetings are also mine that have to do with administration of staff, making sure we have the right office equipment, promotion of students, review of students' performance, counseling of students who are not doing well.

I serve on the departmental executive committee, which meets anywhere from once a month to once a week, depending on where we are in the academic year. That has responsibility for advising the department chairman on administrative decisions, faculty appointments and promotions, student progress, allocating space among the faculty, setting research directions, and long range goals for the department, and a variety of other tasks.

I'm also the director of the Center for Occupational Health and Safety Engineering, which is a

center that spans the Schools of Public Health, Engineering and Nursing. And I have to coordinate among five programs in occupational medicine, industrial hygiene, occupational safety, engineering, occupational health nursing, and hazardous substances academic training. I'm responsible for supervising the continuing education activities that are given through that center, budgeting, appointments of trainees and a variety of other activities.

That's a partial list.

Q Okay. Now, you also told me earlier that ten percent of your time, approximately, is spent on consulting?

A I am allowed to spend as much as ten percent of my time --

Q Do You --

A -- on consulting.

Q Do you spend ten percent or close to it?

A Again, it varies. I think I come in a little below that most years.

Q Eight percent, maybe something like that?

A That's a reasonable guess.

Q All right. Could you tell me some of the organizations that you consulted for?

A Let's see. Well, let's see. We've talked about legal work. I have done a number of projects for industry. I did a mortality study for Uniroyal Goodrich Tire Company. I've been a consultant to the United Auto Workers Ford National Joint Committee for Health and Safety. I wrote a review paper for the Chemical Manufacturer's Association last year. Those are some of the things.

Q What was that review paper on?

A The respiratory effects of diisocyanates.

Q Is that --

MR. NACE: Diisocyanates, did you get that?

THE WITNESS: D-I-I-S-O-C-Y-A-N-A-T-E-S.

BY MR. NACE:

Q Is that particular paper listed on your bibliography?

A No.

Q Why not?

A It's not published.

Q Okay. So the only thing that's on your

bibliography is what you published?

A That's correct.

Q All right. Have you written any papers in the field of gasoline or benzene that are not published?

A No.

Q You mentioned the industry and you gave me Uniroyal and Goodrich. Any other concerns that you've worked for, industrial concerns?

A The answer is yes. The question is trying to remember who. There have been a small number of companies that I've done contract work for.

Q Such as?

A Oh, I'm in the middle of a study for Kimberly Clark, looking at longitudinal study of pulmonary function.

Q All right. What else?

(The witness perused document.)

A I did some work for Alcoa a couple of years ago about informing their workers about health hazards from hand ing polychlorinatedbiphenyls. That's about all I can remember. No, one more. I've done some

consulting for Detroit Edison on electromagnetic fields and cancer.

Q Now, you were looking at your bibliography --

A Yes.

Q -- to come up with those answers?

A Yes.

Q Okay.

A Well, I should say that -- not to come up with the answers, but to jog my memory about the sorts of things I've given talks about and that helps me to remember.

Q Okay. You've also apparently done some work for Rohm & Haas, R-O-H-M & Haas, H-A-A-S?

A That's correct.

Q Okay. And Rohr, R-O-H-R, Industry?

A Yes.

Q Union Oil Company?

A Yes.

Q Those were one -- I'm going to say one shot deals?

A If I understand what you mean, I think so.

Q Yeah. They just gave you a sum of money to do a particular study; is that correct?

A That's correct.

Q All right. On your curriculum vitae under consulting positions you have "none" on page two. Would you kind of explain why you have "none" down there in view of what you just told me?

A I don't have any standing relationships as a consultant with anyone.

Q All right. So those organizations that you've done some consulting for would be listed where on your C.V.? Anywhere?

A No. They're not listed. I guess I need to ask you what you mean by "consulting". I'm not sure what you're asking --

Q Well --

A -- me.

Q You used the phrase here, "consulting position". What's that mean to you?

A Consulting positions mean long-term relationships where there's an agreement to serve as a consultant for someone.

Q Okay. For a period of time?
A Uh-huh.
Q As opposed to an individual study?
A I don't understand the question.
Q Well, I don't understand why if you don't have Rohm & Haas under consulting positions, for example. Just explain that to me. I'm trying to understand your --
A Oh, oh --
Q -- your thinking on this.
A Well, my Rohm & Haas study was a contract through the University of Southern California, and that was a contract between USC and Rohm & Haas. So I don't regard myself as a private consultant to Rohm & Haas.
Q Okay.
A So it was a research study --
Q I see.
A -- that they paid for.
Q Rohm & Haas paid Southern Cal.?
A That's correct.
Q Which in turn paid you a salary?

A That's correct.

Q All right.

A And the Union Oil Company study was also a contract and Rohr was a contract with USC.

Q I see. Were all these pieces of work with the company that you told me about, were they all doing epidemiological studies?

A Yes.

Q All right. As far as consulting with law firms, have you ever consulted with Akin, Gump?

A Yes.

Q Before this case?

A Yes.

Q About how many times?

A The Larkin case was with Akin, Gump. There have been probably two others. I don't know exactly.

Q Well, what would they involve? What kind of products?

A Mostly solvent related matters.

Q Including benzene?

A Um --

Q Or gasoline?

A I'm trying to think. The answer: I think there's one other one that involves gasoline and I think benzene is an issue in that as well.

Q And what case is that? Where is that case located?

A I don't even know.

Q You don't know?

A Yeah. I mean, that hasn't -- that's active now. I don't know -- I don't recall where it's actually --

Q What about the other case? I mean, besides the gasoline/benzene, what other products have you consulted with them on?

A I consulted with them on a case that involved butadiene.

Q Okay. Anything else besides butadiene and gasoline/benzene that you consulted with Akin, Gump on?

A That's all I can recall.

Q Okay. When was the first time that you can recall th t you consulted with Akin, Gump? How long ago?

A It would have been related to the Larkin case and I would guess that was 1991 or '92.

Q Since that time, have you always had some sort of relationship with Akin, Gump as, I mean, some case or some sort of consulting work with them?

A I don't think so, no.

Q Okay. The Larkin case, has that one gone to trial? Do you recall?

A That was the one in Houston.

Q Okay. And do you recall about how much you got paid for your consulting and your testifying in that case?

A I do not know how much I got paid.

Q You reported that somewhere, didn't you?

A I would have reported all of my income on my tax return, yes.

Q Okay. Do you have any problem consulting your tax return and letting us know how much you got paid from Akin, Gump for that case?

MR. ESPOSITO: We'd object to that as well.

MR. NACE: Well, I don't really --

MR. JORDAN: I join in the objection.

MR. NACE: -- care.

BY MR. NACE:

Q I mean, do you have any problem?

A I --

MR. ESPOSITO: I don't know that --

MR. NACE: Well --

MR. ESPOSITO: -- Dr. Garabrant does, but we do, because, Barry, you know, as you well know, we're past this and I also have some question as to the relevance of this. We're going to object.

MR. NACE: You're going to instruct him not to answer?

MR. JORDAN: There's no question pending.

MR. NACE: Well --

MR. JORDAN: -- you're asking -- go to income tax --

BY MR. NACE:

Q Would you provide me with the amounts that you reported on your income tax returns?

A If I were ordered to do so by the Court, I would.

Q Well, without an order, you wouldn't do so?

A Uh --

MR. ESPOSITO: It's beyond the time, Barry. We're going around the clock --

MR. NACE: How could this possibly be after the time? We're taking his deposition today.

MR. ESPOSITO: Uh-huh.

MR. NACE: We're entitled to know today.

MR. ESPOSITO: You're not entitled to know this.

MR. NACE: I'm not? Based on what?

MR. ESPOSITO: You're not entitled to have him go back and search records at this point.

MR. NACE: Based on what?

MR. ESPOSITO: Based on the rules. Based on the court order.

MR. NACE: Well, you tell me what -- enlighten me with the rules you're talking about and what order you're talking about --

MR. ESPOSITO: We --

MR. NACE: -- because we're not going to go through this all day.

MR. ESPOSITO: We're just going to object

and --

MR. NACE: Just going to object?

MR. ESPOSITO: Yeah.

MR. NACE: And you're going to continually instruct him not to answer those kinds of questions? Is --

MR. JORDAN: He's already answered the question. If the --

MR. NACE: Is this your --

MR. JORDAN: -- Court orders --

MR. NACE: Is this your witness, Mr. Jordan?

MR. JORDAN: Listen, I'm here -- I'm going to be here for three weeks. I have a right to put in my two cents worth. The witness says he will produce it if he's ordered to. I think we ought to get onto the next subject.

MR. NACE: Okay. You gave us your two cents worth.

MR. JORDAN: That's right.

BY MR. NACE:

Q All right. Now, you do keep your income tax forms, don't you?

MR. JORDAN: Objection.

BY MR. NACE:

Q They are accessible to you, aren't they?

A 1 have copies of my tax returns.

Q All right. Can you give us an approximation of how much you've been paid by Akin, Gump over the years?

A I do not have any idea how much I have been paid by Akin, Gump over the years.

Q Okay. With whom at Akin, Gump have you worked?

A I've worked with Mr. Esposito. I've worked with Jeff Sherwood, and I have worked with Mark Fitzsimmons.

Q All right. Are you still on the editorial board of the Journal of Occupational Medicine?

A No.

Q When did you leave that?

A 1 think it was in '92 or '93.

Q When was the last time you reviewed something for the Journal of the National Cancer Institute?

A Late last year.

Q How many times have you reviewed a scientific manuscript for the Journal of the National Cancer Institute?

A I would guess three to five times.

Q Over how many years?

A Two.

Q Okay. And over two years are you -- I'm sorry. When was the last time you did that?

A Last year.

Q Okay. When was the last time you reviewed something for the, scientific manuscript, for the Cancer Research?

A A couple of years ago.

Q How many times have you done that?

A I'd say five or so.

Q Okay. And how many times have you reviewed scientific manuscripts for the Journal of Occupational Medicine?

A There were a fair number of them.

Q What's that mean?

A I was on the editorial board. I used to get

them fairly often. I don't --

Q How often?

A Two, three, five a year.

Q Okay. When was the last time you had one from the Journal of Occupational Medicine to review?

A I don't think I've reviewed for them in the past year and a half or two years.

Q Why did you leave the editorial board?

A They got a new editor, and he wanted to bring in new people, and I stepped aside.

Q All right. On page four of your C.V. under teaching activities, you have down there that you are a "Ph.D. Thesis Committee Member for J. Krebs." What does that mean?

A Jane Krebs is a doctoral student who is working on her doctoral dissertation.

Q All right. So each of these "Thesis Committee Members" means the student is working on their doctoral?

A Yes.

Q You are one of several people that are working with he or she?

A Yes.

Q Okay. Now, if I understand it, your expertise is, in this case, anyway, is in the field of epidemiology; is that correct?

A Yes.

Q Do you consider yourself to be an expert in the field of hematology?

A No.

Q Animal pathology?

A No.

Q Anything other than epidemiology?

A I consider myself to be an expert in occupational medicine --

Q Okay.

A -- and in occupational disease epidemiology.

Q What is the difference between occupational disease epidemiology and epidemiology?

A Occupational disease epidemiology is the area that focuses on the study of patterns of disease in working populations. Epidemiology is somewhat broader.

Q All right. So just a subset of epidemiology

as far as you're concerned?

A Yes.

Q So you still consider yourself an expert in epidemiology?

A Yes.

Q And the subset that you mentioned --

A Yes.

Q -- in occupational medicine?

A Yes.

Q Have you had courses in epidemiology?

A Yes.

Q Approximately how many?

MR. STERN: You're asking teaching or taking?

MR. NACE: Taking.

THE WITNESS: I would guess somewhere between six and eight.

BY MR. NACE:

Q Okay. You've never taught epidemiology, have you?

A Yes.

Q Okay. Where have you taught epidemiology?

A University of Michigan.
Q How often do you teach that?
A I teach that course twice a year.
Q Okay. To students?
A Yes.
Q What's their level? Are they medical students? Graduate students? What are they?
A They're master's and doctoral students.
Q Okay. Now, do you have a Ph.D.?
A No.
Q All right. And you have a master's, though, right?
A Yes.
Q Okay. And that's in occupational medicine?
A No.
Q Physiology?
A Yes.
Q Okay. Well, on your C.V. it says "Physiology (Occupational Medicine)". Why did you say no to "occupational medicine'' and yes to "physiology"?
MR. ESPOSITO: Where are you referring to, Barry?

MR. NACE: I'm referring to education, the very last section of education.

THE WITNESS: The degree is in physiology. Occupational medicine is put on there to indicate that my area of study was occupational medicine. The degree was granted by -- it was the department of physiology at the Harvard School of Public Health.

BY MR. NACE:

Q All right. Well, you have two degrees then from the Harvard School of Public Health?

A Yes.

Q All right. Number one is the MPH?

A Yes.

Q Which is what?

A Master's of Public Health.

Q And the other one is MS, which is?

A Master of Science.

Q Okay. And were those each one-year programs in addition to your medical school program?

A Yes.

Q All right. Who were some of your epidemiology teachers at Harvard?

A Phillip Cole, Ken Rothman, Olli Miettinen, M-I-E-T-T-I-N-E-N, Richard Monson, George Hutchinson, I'm blocking out the lady's name who does all the Hodgkin's disease epidemiology. That's all I can recall offhand.

Q Do you consider each of them to be experts in the field of epidemiology?

A Yes.

Q Have you utilized any of their books in your teaching of epidemiology?

A Yes.

Q Whose?

A Rothman.

Q His most current book?

A Yes.

Q How many books would you say there are out there in epidemiology?

A It would be hard to define. There are certainly at least a few dozen.

Q Why did you choose Rothman's?

A I took his course, and I liked the way he taught, and I liked the way he made issues clear. And

it's reflected in his writing as well.

Q Now, have you had any courses in biostatistics?

A Yes.

Q How many?

A Seven.

Q At the Harvard School of Public Health?

A Some.

Q Where else?

A USC.

Q Okay.

A And some at Michigan, as well.

Q All right. Why did you go into the field of epidemiology?

A I enjoy it.

Q What is it about it that you enjoy?

A The problems are complex. They require mathematics which I enjoy. They relate to the real world. They allow me to solve problems that I think are important.

Q Now, you said it involves mathematics. You don't have any degree in mathematics, do you?

A No.

Q Could you define "epidemiology" for me?

A It's the study of patterns of disease in populations.

Q Okay. You consider yourself an epidemiologist?

A Yes.

Q I understand epidemiologists talk in terms of associations, usually, as opposed to causation; is that correct?

A I've heard people discuss associations and causation.

Q Okay. Well, can you get causation information out of epidemiological studies?

A Yes.

Q How do you do that?

A There are a number of things we look at to try to interpret whether a pattern of findings is consistent with causation.

Q Do you make causation determinations yourself, you personally?

A Yes.

Q Can you tell me, have you ever written in the field of epidemiology where you made causation findings?

A Yes.

Q Is that on your bibliography?

A Yes.

Q Would you just go through it and tell me some of those articles that you're talking about?

A The study of DDT and pancreas cancer: We devoted a fair amount of space to discussing whether the associations that we observed were causal or not.

(The witness perused document.)

Most of the studies that I've listed under publications deal with associations and try to interpret whether the associations are causal.

Do you want me to name them one by one?

Q Yeah.

A Um --

Q Just give us a number that you have on there.

A All right. Reading from pages seven through ten: Number 3, 5, 6, 8, 9, 12, 14, 15, 16, 17, 20,

21, 23, 25, 26, 27, 28, 31, 32.

Q While you're on that list there, number five --

MR. JORDAN: I'm just curious, have you finished, sir?

THE WITNESS: Yes, I am. Thank you.

MR. JORDAN: Thank you.

THE WITNESS: Yes.

BY MR. NACE:

Q What were your findings on that one?

A We found a significant excess of bladder cancer among female shoe workers.

Q And in that article, then, that you found, what, a statistical association?

A We found statistical evidence of an association between working in the shoe industry and bladder cancer among females.

Q And then did you go on from that statistical evidence and come up with a conclusion one way or the other about causation?

A We tried to interpret that finding with respect to causation.

Q What was your conclusion?

A I believe it was that the association was suggestive but the numbers were small and we could not be certain that it represented a causal association.

Q What did you use to try to go from the statistical data to causation?

A In that one study --

Q Yeah.

A -- or more general?

Q In that study.

A In that study, I believe we looked at the strength of the association, the statistical significance, whether there was consistency in the other groups studied in that research study, and whether it was consistent with other publications regarding cancer risks in shoe and leather workers.

Q Is that specifically how you did it in that case? In general, is there something else that you try to utilize to go from the statistical utilization to a causation?

A Um --

Q What else do you utilize is what I'm after?

A In general --

Q In general.

A -- the issues that I consider when I try to interpret whether statistical associations represent causal associations include whether the exposure or factor under study is specific and well defined; whether the outcome under study is specific and well defined; whether there's presence of a dose response relationship; whether there is biologic plausibility for the association, how strong the association is, whether it achieves statistical significance, how strong the association is; whether there is confounding by other factors and whether that confounding has been examined and excluded as an explanation; whether there is the possibility of bias in the study that might have led to the association; the timing of the exposure to the factor under study and the outcome; whether adequate latency has passed; whether the exposure preceded the outcome; and probably a few other factors.

Q Sounded like you try to utilize any kind of data that's available.

A No. I try to be rigorous in determining whether statistical associations have causal meaning by looking at all the aspects of an association that help to interpret whether it's causal.

Q You're trying to say that you use only the statistical data to go from statistical analysis to causation?

A I don't think I said that. No.

Q Well, I didn't think you did either the first time around. I thought you did the second time around.

What I'm trying to find out is, given that you use your education, your training, and your experience and there's some judgment involved in what all these statistical data mean, correct?

A Yes.

Q All right. What else do you use in addition to your education, your training, your experience in epidemiology to go from the data that you have, the statistical data to causation, and, for example, do you use animal data, animal studies?

A Animal studies are often relevant to that

interpretation.

Q Okay. You may use that; is that what you're saying?

A I may use that, yes.

Q What else might you use along those lines, in addition to animal studies?

A Well, I think I answered that question completely in the list of things I gave you. I can try and be a little more explicit: Other epidemiologic studies --

Q Right.

A -- animal studies, occasionally invitro studies, meaning not whole animal -- not whole living animals, occasionally toxicologic data that relates to mechanisms. So all of those things may be important in interpreting causality.

Q All right. When would you use only the statistical data to come up with an opinion about causality as opposed to the other things you mentioned, the chemical, the animal, the invitro? When would you just use the epidemiological data?

A I'm not sure I understand that question.

Q I'm not sure I can make it any more concise, but I'll try.

You just got done telling me that you use your statistical data, your epidemiological data, and that sometimes you might use animal data, you might use invitro data, you might use chemical data, you may have said something else that I forgot right now. And my question to you is: When would you exclude everything that might exist and use only your epidemiological data?

MR. STERN: Let me note an objection to the question. I think it misinterprets the previous answer. Either that or it's vague because the list included such things as biological plausibility. And I don't think you would include that in your statement of statistical data, so.

THE WITNESS: I'm not sure how to answer it other than to say that I would use all sources of data that I thought were relevant to the issue under consideration. I would not exclude data that I thought was relevant and fit under one of the categories that I listed.

BY MR. NACE:

Q Well, when, under what circumstances would you consider only the epidemiological data to be the only thing that was relevant?

MR. ESPOSITO: I'm going to object to that --

MR. JORDAN: I'm going to object. It's asked and answered, but.

THE WITNESS: I think I've answered that question. I would use all sources of data that I thought were relevant. If animal data existed that was relevant to the issue, I would use it. If mechanistic data existed that was relevant to the issue, I would use it.

BY MR. NACE:

Q All right. Maybe I should ask you then: How do you determine whether or not that the animal data is relevant?

A There are a number of factors that I look for. One is that it deals with the same factor under study, say the same chemical or the same exposure, whether the animal model has been demonstrated by

toxicologists to relate to the human species. You know, some animal species metabolize specific chemicals differently than humans and have different health effects than humans; whether the dosing of the animal had relevance to human exposure levels and factors such as that.

Q How would you know that, whether or not the dosing level, for example, was relevant to humans? What in your experience enables you to make that determination?

A I have studied toxicology. I have taken toxicology courses, and I have read toxicology literature fairly consistently over the past 15 years.

Q Do you think you're qualified to determine whether or not an animal study is well done?

A I'm qualified to read the literature critically and to make judgments on whether I think that the studies are relevant to humans.

Q I guess what I'm trying to get at is: How do you make that determination, you personally, as to whether or not that study is relevant to human beings, the animal studies, relevant to human beings?

A I think --
Q What criteria do you use?
A I think I answered that question.
MR. JORDAN: Asked and answered.
MR. NACE: I don't think so. Try it again. I don't think so.
MR. ESPOSITO: Well, he's listed at least three things --
MR. NACE: I don't want your answer. I want his answer.
MR. ESPOSITO: Well, you've gotten his.
MR. JORDAN: He's already said he's answered it. Why should he have to explain it again. He's answered it three times.
MR. NACE: I'm just not as smart as you, Mr. Jordan.
BY MR. NACE:
Q So if you could help me again.
A I believe I answered that question.
Q Can't think of anything else you would add to it?
A Not offhand.

Q Okay. Have you ever done an invitro study?
A Actually, one of my colleagues and I at USC jointly planned and did some invitro studies, yes.
Q On what?
A C3H10T1/2 cells.
Q And what were you doing with that?
A We were trying to induce transformation of those cells with trichloroethylene.
Q For what purpose? What were you trying to learn?
A To see if trichloroethylene would cause them to undergo transformation.
Q To what? Of anything?
A To loose the contact inhibition of growth.
Q Okay.
A That's one of the steps we think is important in carcinogenesis.
Q Now, there is a specialty in science that does invitro studies, correct?
A Which study?
Q Cell biologists, developmental biologists?
A Yes.

Q And certainly you don't consider yourself an expert in any of those specialties that do invitro studies, do you?

A No.

Q And you don't consider yourself an expert in doing animal studies either, do you?

A No.

Q And you don't consider yourself an expert in doing what you refer to, I believe, as chemical mechanistic studies?

A That is correct.

Q All right. Whether or not any of those studies that might be reported or well done is something that would be best left to someone other than you; isn't that correct?

A I certainly respect the opinions of people who have advance degrees and research experience in those fields.

Q Okay. Have you utilized any invitro studies, animal studies, or mechanistic studies to come to your conclusions that you will be expressing in this case?

A Yes.

Q Okay. When you say yes, tell me what those studies are.

A I need my --

Q By category,

A Well, I'd need my notes back.

Q Okay. Then we'll have to wait on that.

MR. NACE: Let's see if they're ready.

MR. LIGHTFOOT: She's still working on them.

MR. NACE: All right.

MR. LIGHTFOOT: Maybe she's done the notes.

MR. NACE: All right.

BY MR. NACE:

Q When you were asked to review the matters involved in this case, what specifically were you asked to do?

A I need to see my correspondence with Akin, Gump --

Q Okay.

A -- to remember that.

MR. JORDAN: Why don't we take a few minutes.

Mr. Nace, can we take a few minutes now? I mean, he's been working about an hour and a half here.

MR. NACE: Yeah. If you want it, you can certainly --

MR. JORDAN: I don't want to miss anything, though, so --

MR. NACE: I wouldn't think of going ahead without you --

MR. JORDAN: Thank you.

MR. NACE: -- present, Mr. Jordan.

(A brief recess was taken off the record.)

(Garabrant Exhibit 15 was marked for identification purposes.)

BY MR. NACE:

Q Doctor, I have here also an exhibit I marked as number 15, which is notice of deposition. And you were asked to produce in addition to the things we've seen so far under number one -- well, first of all, have you seen this previously, this document?

(The witness perused document.)

A I believe I have.

Q Okay. You were asked on number one to

produce before the deposition the following documents: A list of all proceedings in which he, meaning you, has testified or been deposed as an expert in the past four years and name the parties for whom you testified and whether the case involved allegations of injury from gasoline or benzene exposure.

I understand that you haven't done that,

A I have no such list.

Q Okay. And secondly, number two was: Compensation paid for testimony and research in the present cases, number of hours worked and the amount billed to date.

Do you have that information?

MR, ESPOSITO: We provided you on Friday, I believe, the invoices that went over in the packet that you got the literature list and the other materials reviewed list.

MR. NACE: We didn't get the compensation paid for testimony and research in the present cases,

MR. ESPOSITO: Yeah. Those are the invoices that I provided to you. And if you'd like another copy --

MR. LIGHTFOOT: They weren't in there.

MR. ESPOSITO: They were sent.

MR. LIGHTFOOT: Well, we got the package, but those weren't in there.

MR. NACE: Were not included in it.

MR. LIGHTFOOT: It doesn't matter.

MR. ESPOSITO: Here's more copies.

MR. NACE: Let's have these two documents which consist of a total of three pages marked as Exhibit 16.

MR. ESPOSITO: Are you marking them jointly?

MR. NACE: (Shook head.)

MR. ESPOSITO: The three pages?

MR. NACE: I'm not going to break it down. Just three pages.

MR. ESPOSITO: Okay.

(Garabrant Exhibit 16 was marked for identification purposes.)

BY MR. NACE:

Q I'm looking at Exhibit 16, which is a total of three pages. The first one is dated December 24, 1991 to Michael Marcus at Akin, Gump, Strauss, Hauer &

Feld, and the reference is Carter versus the District of Columbia.

Regardless of what it says, Carter versus D.C., does that involve all three of these cases that you're looking at?

A I believe so.

Q Okay. And the second page looks like it has some sort of printout. Would you just tell me what that is?

(The witness perused document.)

A Yeah. That looks like a spreadsheet in which I tallied up my expenses for my trip.

Q Okay. That is something that would have been produced by you?

A Yes.

Q Okay. What, do you have that on a computer somewhere, that information?

A I doubt that I do anymore. That was just a little spreadsheet I would have made up to add the expenses --

Q And what did you do? Wipe it out after that?

A Well, yeah. I usually -- yeah. I don't keep that.

Q You don't keep it?

A Not on, not on the machine, no.

Q Did you make hard copies?

A Yes.

Q You keep the hard copy?

A I probably have a copy of that attached to my copy of the invoice.

Q And then the third sheet has on it -- is stated -- well, it doesn't seem to be dated, but it has on a date of 04/07/94 for the first item and it says Carter v. Tri-Continental.

Did something happen to go from Carter versus D.C. to Carter versus Tri-Continental, or was that just a bookkeeping --

A That's probably what I thought the case was named.

Q I see. And, again, that applies to all three cases?

A Yes.

Q Where did you meet with Mr. Marcus on

December 12?

MR. ESPOSITO: What was the question?

BY MR. NACE:

Q Where did you meet with Mr. Marcus?

A From this -- you're talking about this bill from 19911

Q Right.

A I would guess I met in Washington, because I billed his firm for travel expenses.

Q All right. And then there's another meeting with Mr. Sherwood. That's also here in Washington, I believe? That's also here in Washington, the meeting?

MR. ESPOSITO: You're referring to the last one, right?

MR. NACE: Yeah.

MR. ESPOSITO: Last page.

THE WITNESS: On 04/12/94, I believe that is -- that was also in Washington.

BY MR. NACE:

Q Up until the end of that last bill, I think it's the single page that you have here, how much have you already billed Akin, Gump for what you've done on

these cases? What's your total there, approximately, within 1,000?

MR. ESPOSITO: The total of the two bills?

MR. NACE: Yeah.

THE WITNESS: The total of the two bills, it's approximately $10,800.

BY MR. NACE:

Q And has there been some time since April the 12th that you've also devoted to this case?

A Yes.

Q Approximately how many hours?

A I would estimate 25 hours, perhaps.

Q At 350 an hour?

A Yes.

Q And that would be time what, preparing for this deposition?

A Reviewing records and preparing for the deposition, yes.

Q When was the last time you -- before today -- that you met with any of the people at Akin, Gump to prepare for this deposition?

A Last week.

Q Where was that?

A In Washington.

Q Okay. So that would be on the next statement?

A I imagine so.

Q Okay. How much was that? A day?

A That was a day.

Q And the rest of the time was spent reviewing the records and so on?

A Yes.

Q All right. That's been another $8,750 or so, correct? I just took it 25 and multiply it by 350. That's the way you're going to bill him, right?

A What's the --

Q You said about 25 hours and about 350 per hour?

A Yes.

Q Okay. Doctor, do you subscribe to Lancet?

A No.

Q Do you have it available to you?

A Yes.

Q How about the British Journal of Hematology?

A What's the question?

Q Do you have that available to you?

A Yes.

Q I take it since you're an employee of the University of Michigan, you don't subscribe to any journals yourself, do you?

A I do subscribe to some journals.

Q Oh, which ones do you subscribe to?

A I subscribe to the Journal of the American Medical Association, the Journal of Occupational Medicine, the Journal of the National Cancer Institute, American Journal of Epidemiology, Environmental Health Perspectives. I think my subscription is current on Cancer Causes and Control, but I have missed a couple of issues, so I'm not sure now. There might be one or two more.

Q All right. And you do have available to you Lancet?

A Yes.

Q The British Journal of Hematology?

A Yes.

Q The American Journal of Industrial Medicine?

A Yes.

Q The Archives Environmental Health?

A Yes.

Q Environmental Research?

A I don't know that journal.

Q Okay. Leaving that one aside, the Environmental Research, would you consider the rest that you either have available to you that you mentioned or the ones that you subscribe to yourself as being authoritative sources in your field of epidemiology and occupational medicine?

A Some are authoritative in that area. Not all of them.

Q Which ones are not authoritative?

A In occupational medicine?

Q Occupational medicine or epidemiology.

A I guess I don't know what you mean by "authoritative". Some of them devote very little space to epidemiology and occupational medicine; some devote a lot.

So is "authoritative" based on devoting space --

Q What's it mean to you?

A An authority that is frequently cited by people who are skilled in the field.

Q Okay. Does that apply to those that we just mentioned?

A To some of them.

Q Which ones does that not apply to?

A Okay. Archives of Environmental Health sometimes has articles that I have less confidence in.

Q Okay. Any other one?

A The rest are pretty good journals.

Q All right. Well, would it be fair to say, then, that you consider all of those that you mentioned to be authoritative, although there may be some articles in each of those publications that you don't agree with?

A I think generally they are relied upon to provide reliable literature, although no journal is perfect.

Q You don't always agree with what's in every journal, correct?

A That's correct.

Q All right. I notice you sent us a list of

literature that you relied upon in Exhibit 2.

A Yes.

Q Do you consider all of those pieces of literature to be authoritative?

A No.

Q Okay. Then why did you include them on your list?

A I had two goals in mind in preparing that list. One was to include the articles that I do consider authoritative and the other was to include articles that were cited in materials I read pertaining to this case that I thought I would have to discuss.

Q Could you go through this list, Exhibit 2, and tell me which ones are not authoritative in your feeling, in your belief?

A Do you want a yes/no decision on each article --

Q Yeah.

A -- or can we put them on a continuous scale?

Q What do you mean by a continuous scale?

A Sort of ranging from less authoritative to

very authoritative.

Q Sure. Do you want to go through and rank them for me that way? Ten being most authoritative and zero being not authoritative. Why don't we do that.

A I think that would be useful.

(The witness perused document.)

Let's --

MR. JORDAN: Off the record a second.

(A brief discussion was held off the record.)

MR. NACE: Back on the record.

MR. ESPOSITO: Is there anything in particular that can --

MR. NACE: Yeah. I'd like to know which one he considers authoritative and which ones he doesn't. He wants to do it on a scale, I'm willing to go along with that, so.

THE WITNESS: All right.

BY MR. NACE:

Q However you want to do it, Doctor, is fine with me. I'll --

A I guess we'll have to go through them.

Q All right. Well, then, let's have you do it at lunch hour.

A All right.

Q Okay. So we don' take up your time right now.

Are you familiar with this book by Aksoy called Benzene Carcinogenicity (indicating)?

A I have never read that book.

Q Well, are you familiar with it?

A Uh, I --

Q Did you know it existed?

A I think I have seen the title of it in advertising from CRC Press.

Q And you've never read it?

A I have never read it.

Q Even though it deals with the subject that we're talking about in this case? You don't know that, though, do you, because you never read it?

MR. STERN: Objection.

MR. NACE: I'll withdraw that.

BY MR. NACE:

Q Have you ever heard of Muzaffer Aksoy?

A Yes.

Q Do you consider Muzaffer Aksoy to be an expert in the field of benzene carcinogenicity?

A I don't know his credentials. I do know he has published a number of studies on leukemia in shoe workers in Turkey.

Q Okay. Well, is he considered to be an expert in the field of benzene carcinogenicity among people such as yourself?

A I guess I'm not sure what you mean by "carcinogenicity". If that refers to animal studies of carcinogenicity related to benzene, it's not -- it's my impression that's not his area. If it has to do with epidemiology of leukemia related to benzene, yes. He is an expert in that area.

Q Okay. Are you familiar with this document by the U.S. Department of Health and Human Services entitled Toxicological Profile for Automotive Gasoline?

A I believe I have a copy of that.

Q Have you read it?

A I have not read it in its entirety. I think I've looked at sections of it.

Q It just came out a few months ago, November of '933

A (Witness nodded head). It's a draft. Yeah, I get those.

Q It's a draft, right.

Have you commented on it?

A Have I commented on it?

Q Yeah. It says "for public comment". I wondered if you had taken the time to comment on it to anybody?

A Have I given -- are you asking if I've given written comments back to ATSDR?

Q Written, verbal, anything?

A No.

Q Okay. Do you intend to?

A No.

Q All right. Are there portions of that with which you disagree?

A I'm not familiar with all the contents of that.

Q Okay. What you've seen of it, do you consider to be well done?

MR. ESPOSITO: Do you want to show him perhaps the copy?

THE WITNESS: Yeah. Might I just look at it quickly?

MR. NACE: Well, I'm not going to have you go through my notes that are on there. But I just want to know --

MR. JORDAN: I don't think it's fair to question him --

MR. NACE: Just in general. I just asked you in general.

MR. LIGHTFOOT: I've got another copy. I'll go get it.

MR. NACE: In general.

MR. ESPOSITO: Why don't we wait until Mark returns with the copy.

THE WITNESS: In general, the ATSDR toxicologic profiles are well done.

MR. NACE: Okay. That's all I want to know.

BY MR. NACE:

Q Now, Doctor, I'm trying to go through some of the things you gave me here. We copied this Hematology book by Hoffman. I assume that there was some reason why you picked a couple of these chapters out, and I'd like to ask you what it is about this book in these chapters that support your position that you're going to give me in this case?

A I chose to read those chapters just to review current knowledge about the leukemias relevant to this case.

Q I mean, do you believe that the statistical data that's available indicates that there is a statistically significant association between benzene and leukemia?

A There are a number of studies that show statistically significant associations between benzene and leukemia, and there are a number of studies that do not show a statistically significant association between benzene and leukemia.

Q Okay. Do you have an opinion then, with any reasonable degree of certainty as to whether or not benzene is capable of causing leukemia?

A Yes.

Q And what is that opinion?

A It is my opinion that benzene is capable of causing acute myelogenous leukemia.

Q AML?

A Yes.

Q Anything else that in your opinion it's capable of causing?

A I think the evidence is clear for AML. The evidence is not adequate for the other types of leukemia.

Q Specifically, is it your opinion, then, that it's not adequate, the evidence is not adequate for chronic lymphocytic leukemia or chronic myelogenous 1eukemia?

A Yes.

Q That would be CLL and CML?

A Yes.

Q When you say the evidence is not adequate, what does that mean?

A The evidence is not adequate to conclude that there is a causal association between benzene and

those two diseases --

Q And when you --

A -- or I should say those two categories of --

Q When you say you can't conclude, tell me what that means to you when you can't conclude? Why can't you conclude?

A It means that the associations that have been reported don't satisfy all of the considerations that we listed earlier in this deposition regarding consistency across studies, strength of association, dose response, and other considerations.

Q Now, for you to draw a conclusion, how, in your mind, how certain must you be that there is a causal relationship before you express an opinion that there is, in fact, a causal relationship? 100 percent certain?

A I wouldn't say 100 percent certain. I have to have a high degree of confidence that there is a causal relationship before I'd say it.

Q 95 percent?

A I can't put a number on it. Certainly

better than half.

Q How much better than half?

A I can't put a number on it. In my view, the evidence has to show a consistent pattern of results that satisfies many of the conditions that we listed earlier in this deposition.

Q For you to draw your conclusion that "A" causes "B", do you have to be satisfied that that's more likely than not that "A" causes "B" before you express that opinion, or do you need something more than that?

A I think to draw a scientific conclusion, I like better than the more likely than not criteria that you just mentioned.

Q You need something more than that?

A Yes.

Q What?

A I like to see consistency across studies. I like to see studies of dose response. I like to see that risk increases with latency. I like to see that the studies that show the association have properly excluded the roles of confounding and bias. I like to

see that the exposure precedes the disease. Those are, those are the important criteria.

My -- support for my opinion is strengthened if I see biological plausibility such as an animal model or a mechanism, although I don't consider those to be essential.

A Well, I don't think that you answered my question, Doctor, Maybe you did, and I don't mean anything by that. But I wanted to know how much you need above more likely than not.

MR. **STERN**: Objection. Asked and answered.

MR. ESPOSITO: He's told you he can't quantify it.

BY MR. **NACE**:

Q More likely than not is more than 50 percent, right, certainty in your mind?

A My interpretation **of** your term, "more likely than not" means anything greater than 50 percent.

Q Okay. You indicated that that wasn't enough for you to express an opinion, more than 50 percent. I want to know what above that you need, in your opinion. I mean, everybody's entitled to their own

view on it. I just want to know what your view is.

A Yeah. My view is it has to be considerably stronger than that.

Q And I'm trying to get from what you mean from "considerably stronger". 60, 70 percent? 80 percent? 95 percent? What?

MR. ESPOSITO: Objection. Asked and answered.

MR. NACE: Well, he hasn't answered it yet.

MR. ESPOSITO: Yes, he has.

MR. JORDAN: Yes, he has.

MR. ESPOSITO: He said that he can't put it into the terms that you want, Barry, for this deposition, but that he's answered in a way that an epidemiologist would answer it.

MR. NACE: Well, he also told me it has to be more than 50 percent. I'm trying to figure out what he means --

MR. JORDAN: That was your definition,

MR. NACE: Well, it was his definition, originally, if you read the record.

THE WITNESS: My -- first off, I think I

have answered your question. I will try to answer it again.

I don't think that 51 percent is adequate to say -- for me to conclude that something is causal. It has to be a conclusion that is supported by evidence that comes from a variety of different considerations. And I, and I've listed those considerations --

BY MR. NACE:

Q Yeah.

A -- for you twice now.

Q Yes, you have.

A And there's no way to put a number on how those considerations can be added together. It's not quantifiable.

Q In other words, 51 isn't enough, but some figure is, but you can't tell us what that figure is; is that what you're saying?

A I object to the entire characterization that it can be given a number. It can't be given a number.

Q What can't be given a number?

A The strength of the evidence that an association is causal cannot simply be given a number

51/49 or 60/40.

Q Well, what does it mean to you when you're asked to express an opinion within a reasonable degree of certainty?

A It means --

Q Well, you've been asked that over the years, haven't you?

A Uh, I --

MR. JORDAN: I --

THE WITNESS: -- think so.

MR. JORDAN: -- object. Let him answer one question at a time.

MR. NACE: I'm just trying to help him out on that.

BY MR. NACE:

Q You have been asked that question before, haven't you, Doctor?

MR. ESPOSITO: What's the question?

MR. STERN: Now there's three questions.

MR. NACE: I'll withdraw all of those.

BY MR. NACE:

Q Doctor --

MR. ESPOSITO: Why don't you start with one and --

BY MR. NACE:

Q -- have you been asked over the years to give an opinion within a reasonable degree of medical certainty or scientific certainty?

A I've been asked questions like that, yes.

Q What does that mean to you?

A I interpret that to mean based on my professional judgment, am I reasonably certain that my answer is correct.

Q Okay. And what does "reasonably certain" mean to you?

A Reasonably certain means that the evidence that is derived from a variety of different considerations all points toward the same conclusion.

MR. JORDAN: Off the record.

(A brief discussion was held off the record.)

BY MR. NACE:

Q So reasonably certain to you is that everything is pointing toward, in the same direction?

A I think I've answered that twice.

Q Was the answer yes?

A Reasonable medical certainty means that the evidence supporting a causal interpretation must be derived from a number of different considerations and they should point toward the same conclusion and that cannot be quantified with a single number.

Q Do they all have to point to the same conclusion or do they as a group point to a conclusion?

A As a group, they must point to that conclusion. They do not all have to point to that conclusion.

Q Okay. So you're unable to say that the evidence with respect to benzene points to the conclusion that it causes CLL; is that correct?

A I -- it is my opinion that the evidence regarding benzene and CLL is not adequate to conclude that there is a causal association.

Q Now you changed my question around, Doctor. I just want to know if the evidence -- if you answered my question -- if the evidence, is the fact that

you're unable to conclude that the evidence points to the direction of saying that there is a causal relationship between benzene and CLL?

A I don't know what you mean by "points to the conclusion."

Q I'm using the same wording that you used, Doctor, when you said "points to". That was your phrase. Not mine.

A I don't recall using that phrase.

Q Well, you used it several times so far. And I know you've forgotten where you testified last and that sort of thing, but I don't believe you've forgotten that.

MR. STERN: Objection.

MR. NACE: So --

MR. ESPOSITO: Badgering the witness. This is really --

MR. NACE: Let me --

MR. ESPOSITO: -- getting ridiculous, Barry.

MR. NACE: Let the record reflect that he's smiling, too.

Let me go back, Doctor, and try it again with you.

BY MR. NACE:

Q Is this an accurate statement, that you are unable to say that the evidence points to a causal relationship between benzene and CLL; yes or no?

MR. STERN: I'm going to object to the basis of the question --

MR. JORDAN: I object.

MR. STERN: -- as vague and ambiguous. And the witness has asked for some clarification as to what one of the phrases in the question means.

With that stated, you may go ahead, Doctor.

THE WITNESS: The evidence regarding benzene and CLL is inconclusive. There are studies that suggest an association. There are many studies that suggest no association. And, therefore, the evidence is not adequate to say that there is a causal association.

BY MR. NACE:

Q Is it also your opinion that it's not adequate to say that there is not a causal association?

MR. ESPOSITO: A lot of negatives in that

one. More than double. Would you rephrase that please, Barry?

MR. NACE: No, I like it the way it is.

THE WITNESS: Let me be sure I understand the question.

Was your question that the evidence is adequate to say that there is not a causal association --

MR. NACE: Correct.

THE WITNESS: -- between CLL and benzene?

MR. NACE: Correct.

THE WITNESS: You're asking whether the evidence is adequate to prove that something does not exist. It's a basic principle in science that we cannot prove that things don't exist. We can only look for them and find them or fail to find them. The evidence in this case is not adequate to say that we have found a causal association between benzene and CLL.

BY MR. NACE:

Q No. You can't say either way whether or not benzene does cause CLL or doesn't cause CLL; is that correct?

MR. JORDAN: Objection. He's already given you an opinion on it.

THE WITNESS: I can say --

MR. NACE: I want a yes or no to that question.

MR. ESPOSITO: He --

MR. NACE: Then you can explain all you want. I haven't stopped you from explaining at all today, but I'm entitled a yes or no to some of these questions, including that one.

THE WITNESS: I believe I --

MR. NACE: Do you remember the question? I'll have it read back if you don't remember it.

THE WITNESS: I believe I'm entitled to answer your questions fully within my judgment --

MR. NACE: Absolutely. I have no problem with you answering fully, but I'm also entitled to an answer when it's a yes or no question of a yes or no.

MR. ESPOSITO: And that one's not.

MR. NACE: If you can't answer yes or no, you tell me that. I'll accept that, if you can't answer yes or no.

Can you read that question back?

MR. JORDAN: You know, Barry, I think it's only fair --

MR. NACE: I think that's as fair as anybody --

MR. JORDAN: Oh, no. Listen to this. I have another point. I want this on the record. I think it's only fair to give the doctor a chance to answer one question at a time. There's now five pending. I think it would be fair to give the gentleman a chance to answer the question responsibly. If he can answer yes or no, let him try. If he can't, he'll tell you. But you can't badger him like you're doing.

MR. NACE: Jim, I'm not badgering him. I think you know that. Don't try that.

MR. JORDAN: I'm not trying anything. I'm making it for the record,

MR. NACE: Read the question back, please.

(The reporter read back the requested material from the record.)

BY MR. NACE:

Q Let me add, what I want you to do, Doctor, so we're all clear, I want you to answer that yes, no, I can't answer yes or no. And whatever you do, you can give a complete and full answer, but I want a yes, no, or I can't answer the question.

A I -- in spite of having had the question read back to me, I'm not sure I understand the question. Could you rephrase it.

Q I'll try if you'll tell me what you don't understand about it.

A The preamble that says something about you know. I'm not sure what that implies.

Q Okay. I'll try it. I mean, I'm trying to be as fair with you as I possibly can, despite what Mr. Jordan says over there. And I just want you to answer my question for me, Doctor, yes, or no, or I don't know, and then you can explain.

MR. ESPOSITO: Wait, wait, wait.

BY MR. NACE:

Q Here's the question.

MR. ESPOSITO: Now you're changing the choices again. First it was yes, or no, or I can't

answer that yes or no, and an explanation.

BY MR NACE:

Q Well, I'll give you a fourth one: Yes, no, I don't know, I can't answer yes or no.

Here's the question for you: Based on the evidence that's available, is it your opinion that you cannot express an opinion on whether or not there is a causation between benzene and CLL?

A It is my opinion that I can express an opinion on the relationship between benzene and CLL. And my opinion is that has not been demonstrated to be a causal association.

Q And would you agree that that does not mean that benzene does not cause CLL?

MR. JORDAN: Are you asking --

THE WITNESS: I've answered that question.

MR. NACE: No, you haven't.

BY MR. NACE:

Q Well, answer it again for me. Humor me.

A I answered that question previously by saying that you were asking to prove the nonexistence of something and a basic principle of science is that

we can't prove things don't exist. We only get to look to see if they do exist. And if we can't find them, we cannot conclude that they exist.

Q Doctor, do you intend to go into court in this case and say that benzene does not cause CLL?

A It is my opinion that the evidence is not adequate to conclude that benzene causes CLL.

Q We're playing games now, Doctor.

MR. STERN: Objection.

MR. JORDAN: Objection. Barry, he's answered the question.

MR. NACE: He has not answered the question.

MR. JORDAN: He's answered the question, and that's an improper question.

MR. NACE: I want you to --

MR. STERN: I don't think the reporter is getting this down. Let's go one at a time.

MR. JORDAN: Okay. First of all, he's answered the question and this is not a game here.

MR. NACE: I agree it's not a game. But we're playing games here --

MR. JORDAN: That's your --

MR. NACE: -- on your --

MR. JORDAN: -- opinion.

MR. NACE: -- side of the table.

MR. JORDAN: That's your opinion, sir.

MR. NACE: That's right. It is.

Now, Doctor -- everybody said what they want to say?

BY MR. NACE:

Q Doctor, I just want to know if you intend to go into court in this case as we sit here today, do you intend to go into court and express the following opinion: Benzene does not cause **CLL**, yes, no?

A I intend to go into court and testify as to my opinions regarding causation. And it is my opinion that the evidence is not adequate to conclude that benzene causes **CLL.**

Q That doesn't answer my question. Do you understand the question?

MR. JORDAN: I object. You're badgering the witnesses. He's answered it ten times.

MR. ESPOSITO: This is going around the same block, Barry. I'd like to suggest that you move on to

something productive.

MR. NACE: Doctor, let me advise you at this point that I think you're not answering the question. It's a very easy question to answer. It's a yes or no, And if I have to go and get a court order to answer that question, I certainly intend to do so.

MR. ESPOSITO: Well, we'll be going to court at the same time to address the badgering of this witness and the wasting of time.

MR, NACE: Make sure you understand the question, Doctor. Let's have that last question read back one more time.

(The reporter read back the requested information from the record.)

MR. ESPOSITO: Objection to the question.

MR, JORDAN: Objection.

MR. ESPOSITO: Asked and answered. Badgering.

BY MR. NACE:

Q Can you answer it?

A I have answered that question at leas- twice. I intend to go into court and give my opinion

regarding the causal relationship between benzene and CLL. And my answer is that the evidence is not adequate to conclude that benzene causes CLL.

Q Doctor, do you intend to go into court and express an opinion that benzene does not cause CML?

A I intend to express opinions if asked regarding the causation of CML. And it is my opinion that the evidence is not adequate to demonstrate that benzene causes CML.

(Someone entered the room.)

MR. ESPOSITO: Could we perhaps have identified on the record who the new person joining us is?

MR. NACE: Yeah. It's Robert Hilliard.

MR. ESPOSITO: And does Robert Hilliard have anything to do with this case?

MR. NACE: Esquire.

MR. ESPOSITO: Esquire. Does Mr. Hilliard have anything to do with this case?

MR. NACE: I don't know.

MR. ESPOSITO: You haven't named him as a witness yet.

MR. NACE: It's a public proceeding.

MR. ESPOSITO: I understand that, Barry, but --

MR. NACE: Good.

MR. STERN: He's advised that he's here for lunch with Mr. Nace.

MR, ESPOSITO: Oh.

BY MR. NACE:

Q Doctor, can you answer that question? I'll give you another chance before I go into court and ask, or have you answered the question?

A What is the question --

Q Do you intend --

A -- again?

Q -- to go into court in this case and testify that benzene does not cause CML, yes or no?

MR. ESPOSITO: Objection.

MR. JORDAN: Objection.

MR. ESPOSITO: Asked and answered. Badgering. Time wasting.

THE WITNESS: I have answered that question. If I am asked in court regarding the relationship

between benzene and CML, I will answer by saying that it is my opinion that the evidence is not adequate to conclude that benzene causes CML.

BY MR. NACE:

Q And, again, by "conclude", you mean to what degree? What do you mean by "conclude"?

MR. STERN: I'm going to object.

MR. ESPOSITO: -- explain that at length.

MR. STERN: That we've certainly been through before. That has been asked and answered.

Do you want the same answer again?

BY MR. NACE:

Q With respect to that particular answer that you just gave me, Doctor, I want to know what do you mean by "conclude".

A I mean by "conclude" to reach a conclusion.

Q How certain do you have to be with respect to that answer in order to reach a conclusion?

A I have answered that question a number of times already.

Q I confine this one to benzene and CML.

A Okay. In order to reach a conclusion, the

evidence derived from a number of different areas must point toward the association between benzene and CML being causal.

Q Is it your opinion that there is sufficient evidence to show that benzene does cause some leukemias?

MR. ESPOSITO: Objection. Asked and answered.

THE WITNESS: I've answered that and the answer is yes.

BY MR. NACE:

Q Which leukemias?

A Acute myelogenous leukemia.

Q Anything else?

A That family of leukemias.

Q Which means what?

A The leukemias that derive from the myelocytic series of cells.

Q Well, name them for me.

A They would be the leukemias myelogenous, erythroleukemia, the leukemias, the rare leukemias that derive from the platelet series, monecytic

leukemia, myelomonecytic leukemia, eosinophilic leukemia, E-O-S-I-N-O-P-H-I-L-I-C, and basophilic leukemia, B-A-S-O-P-H-I-L-I-C.

Q Doctor, what is the difference between chronic and acute myelogenous leukemia?

A There are a number of differences between those diseases. Chronic myelogenous leukemia is -- often has a time course that stretches over years. Whereas acute, if untreated, has a time course to death that lasts weeks to at most a few months. The appearance of the peripheral blood is dramatically different. The findings in the bone marrow are different.

Q Are different in the bone marrow?

A Are different,

Q In what way?

A In acute myelogenous leukemia, there is typically a predominance of immature myelogenous cells which may partially or almost totally replace the other cellular elements. There may be suppression of erythropoeisis and replacement of the lymphocytic series. Whereas in chronic myelogenous leukemia,

typically the cells look somewhat more mature peripherally and there is not as great a predominance in the bone marrow of the myelocytic series.

(The reporter changed the audiotape.)

BY MR. NACE:

Q Doctor, do you have the same cells affected if you're talking about acute or chronic myelogenous leukemia?

A You may.

Q Well, when may you not?

A In some cases, it appears not to be the exact same set of cells.

Q Where did you get that information from?

A From reading the scientific literature.

Q Like what?

A From this textbook, Hoffman, Hematology Basic Principles and Practice.

Q All right. Is most of your understanding of the principles involved with CML, AML and CLL derived from this particular book, that's Exhibit 5?

A My knowledge of AML, CML and CLL is derived from my medical education, my training in internal

medicine, and my readings over the past 22 years, including this textbook by Dr. Hoffman.

Q Which I think you've already indicated you consider to be authoritative, correct, in the field of hematology?

A I do consider it to be authoritative. I don't know whether I indicated that or not.

Q Okay. Well, can you tell me how the cell types differ between AML and CLL without looking at the textbook? Do you have that knowledge?

A Well, I do have that knowledge.

Q Well, tell me.

A I can look at the textbook if I wish, I believe.

Q Well, 1'11 let you do that. But I want to know if you can do that without looking at the textbook.

MR. ESPOSITO: Why don't you let him do that. This isn't a closed book/open book quiz.

MR. NACE: Well, it is --

MR. ESPOSITO: This is an expert we're offering for purposes of discussing cell type.

MR. NACE: It is a little bit, because we're testing his knowledge.

BY **MR. NACE:**

Q I want to know if you can do this without looking at the book that you brought. If you can't, that's all right. I'll just use it against you later in trial. You know that, But can you or can't you?

A I can.

Q All right. Now, if you want to look at that, why don't you look at the textbook -- you said you can't, right?

A I said I can.

Q Oh, you can.

A I can.

Q Oh, good. Go ahead and do it.

A What was the question again?

Q The question is: Tell me the difference between those cells, between the **AML** and the **CML**.

A There is some evidence to suggest that the **CML** series may have a little bit of overlap with some of the -- or they may express some of the phenotypic characteristics of the lymphatic series, whereas that

is somewhat less common in the AMLs.

Q Does that conclude your answer?

A Yes.

MR. NACE: Let's take a lunch break now.

(A recess was taken off the record.)

(Garabrant Exhibit 17 was marked for identification purposes.)

BY MR. NACE:

Q Okay. Doctor, I've been given Exhibit 17, which I understand is an up-to-date copy of your C.V.; is that correct?

A Yes.

Q All right. I want to ask you some questions about the individual cases. Somewhere you have in front of you, I believe, the sheets that dealt with individual cases, which would be exhibits --

A 8, 9 and 10.

Q Okay. Let's take it one at a time. Exhibit Number 8 apparently applies to Mr. Carter; is that correct?

A Yes.

Q All right, Now, do you agree with me that

Mr. Carter has AML?

A Yes. He has acute myelomonecytic leukemia.

Q All right. And you also apparently agree that AML can be caused by benzene, correct?

A Yes.

Q All right, Are you aware of anything else that causes AML besides benzene?

A Ionizing radiation will cause it.

Q Anything else?

A There is some literature to suggest that chemotherapeutic agents may also cause it.

Q Anything else?

A Smoking.

Q Okay. Anything else?

A I think those are the major risk factors that are well established.

Q All right. So there are four, correct?

A Yes.

Q Benzene, ionizing radiation, chemotherapeutic agents and smoking, correct?

A Yes.

Q Do you see anything in the record that shows

any exposure to ionizing radiation?

A No.

Q How about chemotherapeutic agents?

A No.

Q Smoking?

A Yes.

Q Benzene?

A I do not see anything in the records that indicate exposure to benzene. I saw exposure to gasoline but not benzene.

Q Well, if you're exposed to gasoline, then you're exposed to benzene, aren't you?

A It depends on which types of gasoline and how you use it.

Q Explain to me how it depends on how you use it.

A I guess we should go back and define "exposure". What I should have said is people who work near gasoline or in the presence of gasoline may not -- may actually not have exposure. If you are exposed to gasoline that contains benzene and "exposure" meaning that it enters your body, then,

yes, you would have exposure to benzene.

Q All right. In this case, do you believe that the gasoline contained benzene that Mr. Carter was exposed to?

A The records -- I guess my review of the various depositions and records indicates that that is a reasonable presumption that there was a small amount of benzene in the gasoline.

Q Well, is there anything you know of that would indicate in this case that there wasn't benzene within the gasoline that Mr. Carter or any of these other plaintiffs was exposed to?

A To the extent I understand the records, there was benzene in the gasoline.

Q Okay. In which case, then, he would have been exposed, Mr. Carter would have been exposed to benzene, correct?

A Insofar as he had exposure to gasoline, he would have been exposed to benzene.

Q All right. Now, is it your -- is there any other, as far as you can see, any other possible cause of his AML other than exposure to benzene and smoking?

A I think it's safe to say for the vast majority of cases of AML, there are a set of causes that are yet to be defined. And so we don't know what they are, but the answer is we can only explain a very small proportion of all the cases of AML, and that leads us to conclude there are causes yet to be identified.

Q Now, there are studies, I think you indicated earlier, that show that there are statistically significant associations between benzene and AML, correct?

A Yes.

Q All right. Looking at what you have written on your summary -- I take it you did this, didn't you?

A Yes, I did.

Q Okay. Is there anything on your summary that affects your opinion as to what did cause the AML on Mr. Carter?

A I'm not sure I understand the question.

Q Well, is there anything on this Exhibit 8 that you put down as being medical records summary that would assist you in telling you what did cause

his AML?

A I'm still not sure I understand the question.

Q Well, you prepared this, didn't you?

A Yes, I did.

Q I take it what you put in there was the information that you considered to be significant about his background, his history, his medical history?

A I put in there items that would help me to keep in mind the dates and sequences of events that I might need to rely on later.

Q Well, is there anything else that you think you need to rely on with respect to Mr. Carter?

A You mean with respect to his medical records?

Q Yeah.

A I think in essence, probably not, although it's conceivable. We'd have to go back to the original records to answer specific questions.

Q Well, is there anything, then, that you wrote down here that you typed in that helps you

formulate an opinion as to what did, in fact, cause his AML?

A I'm still not sure what you're asking me for,

Q Do you have an opinion as to what did cause his AML?

A Yes.

Q Within a reasonable degree of certainty?

A Well, I think within a reasonable degree of certainty, tobacco played a role in his AML and that other undefined, or I should say other unspecified factors that probably play a role, that disease probably played a role in his.

Q I see. Who would be better qualified to express an opinion on the cause of Mr. Carter's AML, you or a hematologist?

A It would depend on who the hematologist was. Certainly, with respect to causation in relation to benzene, I think I would be better qualified than most hematologists.

Q Why is that?

A Because I have expertise in the

interpretation of epidemiologic studies that the average hematologist doesn't have.

Q But you've already -- I think you've indicated to me that the epidemiological studies that you reviewed pointed in the direction to indicate that AML is caused by or can be caused by benzene, correct?

A I have said that benzene is a cause of AML.

Q Okay. But why not in this case?

A Because -- why not what in this case?

Q Why do you believe that benzene did not cause the AML in this case?

A Because it's my opinion from reading the records that Mr. Carter's exposure to benzene was extremely small.

Q How small?

A Down in the parts per billion range.

Q How did you come to that conclusion?

A Um --

Q Based on what?

A Based on my reading of the records of how benzene was used in the facilities in which he worked, based on my reading of the scientific literature on

the benzene exposure that are measurable among people who handle gasoline, and based upon my conversations with the other defense experts in this case who have calculated benzene exposures based on Mr. Carter's job and work habits.

Q Okay. What is it in the records that enables you to come to that opinion?

A To which opinion?

Q That you've expressed that benzene did not cause Mr. Carter's AML.

A There are a number of things. First off --

Q What are they?

A I was just trying to provide that. First off, that he did not handle pure benzene. He did not handle benzene in concentrated form. He handled gasoline which can -- typically contains a very small percentage of benzene.

Secondly, that the circumstances under which he handled the gasoline and the frequency with which he handled gasoline and the duration of his work with gasoline in conjunction with the low concentration of benzene in gasoline would be extremely unlikely to

lead to appreciable exposure.

Q Well, when you refer to "records", were you referring to the medical records or some other records?

A I'm referring to the deposition testimony and -- primarily the deposition testimony.

Q Whose deposition testimony?

A Mrs. Carter and the depositions of Dr. Schwartz. Let me make sure I get the right names on things.

(The witness perused document.)

Excuse me, yeah. Dr. Schwartz and Walter Taylor. I think those are the ones.

Q What was it about Mrs. Carter's deposition testimony that enabled you to come to this opinion? Specifically, what did she say?

A She talked about the number of years that -- I think I don't see her name on here. She talked about the number of years he worked for the D.C. Government, the sorts of tasks he did, that he would go out on the road to fix trucks, that he worked in the garage, that the garage was in disrepair, how he

handled gasoline.

Q Tell me how. Not, you know -- just state how. What is it on the record that tells you how he handled it?

A That he would fix fuel pumps; that he would wash parts in gasoline occasionally; that he would get it on his clothes sometimes; that he would smell like gasoline sometimes when he came home.

Q And that indicated that there wasn't enough exposure?

A That did not indicate to me that he worked with gasoline in a manner that is -- that would generate exposures that were orders of magnitude higher than that seen among other people who handled gasoline in their jobs.

Q What kind of exposure do you believe is necessary? Quantify it for me, in order to have a relationship between benzene in gasoline and AML?

A First off, I don't think there's any epidemiologic literature that supports that gasoline exposure is related to AML. So I'm not sure I can answer the question as you've raised it.

Q Well, tell me, then, what kind of benzene exposure you think he would have to have in order to have a relationship between AML and exposure to benzene in gasoline?

A I think I just answered that. The epidemiologic literature doesn't show that people who handle gasoline under any circumstances that have been studied are at increased risk of AML.

Q Well, you do believe, don't you, that some exposure to benzene can cause AML?

A Yes.

Q Okay. What is that exposure?

A In the studies where people handle benzene as a pure or a technical grade chemical or in solvent mixtures where it's in high concentration, typically, exposures up in the range above 50 parts per million have been clearly associated with AML.

Q Well, if we have 50 parts per million exposure to benzene, then you would conclude that the AML was probably caused by the benzene?

A Let me finish my answer.

Q Oh, I thought you had. Go ahead.

A 50 parts per million and above over a period of years.

Q How many years?

A Certainly more than a few.

Q What's that mean?

A More than say three or five.

Q Six?

A I would say in the range greater than five.

Q Five years, one day?

A That question supposes that epidemiology is done in a different manner than it actually can be conducted. We have to define groups of people to study. And typically groups of people have exposure that are put into categories of range. So we don't have any studies that look at the risk from five years and one day of exposure.

Q So if you've got 50 parts per million somewhere between three to five years, then you would conclude that there was a probable causation?

MR. ESPOSITO: I think that mischaracterizes his testimony. I thought he said a period of more than five years, Barry.

THE WITNESS: Yeah, I believe I said the epidemiology is clearest in showing an association between benzene exposure and AML among groups of people who have had exposure above 50 parts per million for a number of years, typically more than five years.

BY MR. NACE:

Q More than five?

A (Witness nodded head.)

Q All right. So if you have exposure of 50 parts per million for more than five years, you would say that benzene probably caused the AML?

A I --

MR. ESPOSITO: Are you asking about one particular --

MR. JORDAN: Particular person --

MR. ESPOSITO: -- individual, Barry, or just --

MR. NACE: Well, in regard to an individual.

MR. ESPOSITO: Okay. So you're focusing on an indiv dual.

THE WITNESS: I would say that under those

circumstances, benzene would be a risk factor. But to characterize that as saying it's the cause of AML would not be a correct statement.

BY MR. NACE:

Q Well, in the absence of other risk factors, would you agree, then, that it would probably be the cause?

A There is no situation in which the absence of other risk factors can be established. What I've already said is that there are other risk factors for leukemia, including AML, that we cannot specify. And we know that because we can only explain a very small proportion of all the AML that occurs. And that means that there are things yet to be discovered that cause that disease.

Q What --

A Let me --

Q Go ahead.

A I'm still speaking.

And so there is no situation in which a person has an absence of all other risk factors.

Q What I'm trying to say to you: If I came to

you and I had a client, a patient, who had had exposure of 50 parts per million for more than five years and we had no other evidence of any risk factor being, you know, there the person not exposed to any other risk factors, would you then be able to express an opinion within a reasonable degree of certainty that in that particular case the benzene probably caused the AML?

A I think the way you've worded it would mischaracterize the way I would say it.

Q Well, Doctor, I'm asking you whether you would say it the way I just phrased it?

A I wouldn't say it the way you just phrased it.

Q Okay. I know you're dying to tell me how you would say it, so go ahead and tell me.

MR. ESPOSITO: No, that's okay. You can wait --

BY MR. **NACE:**

Q Tell me how you would say it, Doctor.

MR. ESPOSITO: Wait for Mr. Nace to ask a real question.

THE WITNESS: Is that a question?

BY MR. NACE:

Q Sure. Tell me how you would say it.

A All right. I would say in a person who has had at least five years of exposure to benzene in which the exposure levels were above 50 parts per million, that benzene very likely increased their risk of AML.

Q Okay.

A Now that's conditional on appropriate latency between exposure and disease, and the absence of other clearer explanations such as having had anti-ionizing radiation exposure or chemotherapy for another tumor, et cetera, et cetera,

Q Can you tell me anything in the literature that suggests that before you can make that causal relationship, that you have to have an exposure for at least five years of 50 parts per million and no other known risk factor?

A I think that there are a number of studies that support that you have to have exposure, or I should say support that exposures in that range and in

that range of duration are associated with increased risk of AML.

Q That doesn't answer my question, Doctor.

Are you aware of any study that indicates that before you can say that there is a causal relations ip between benzene and AML, that you must have an exposure of at least 50 parts per million for at least five years?

A I don't understand that question.

Q What don't you understand about that question?

A I don't understand it.

Q Can you tell me what part, and I'll try to enlighten you more?

A I don't understand the question. It doesn't make sense to me.

MR. STERN: Let me note an objection, because I also don't understand it.

Do you mean, Mr. Nace, an expressed statement of that in the study?

MR. NACE: Do you want to ask?

MR. STERN: I'm asking €or clarification

because I don't understand the question.

MR. NACE: Okay.

BY MR. NACE:

Q Doctor, let me just try with you one more time. I've got a whole pile of literature here that you brought with you today. Is there anything in that literature, anything else that you're aware of that a indicates that you cannot come to a conclusion that benzene caused AML, if you don't have exposure of at least 50 parts per million for a period of five years?

A If I understand your question, the answer is yes. There's a huge amount of literature that studies people who have low levels of benzene exposure that fails to show any consistent pattern of increased risk of AML, which means that people who are exposed for -- to low level of benzene, in other words, substantially below 50 parts per million or for shorter periods of time than five years or both, are at no clearer increased risk of AML. And, therefore, the appropriate conclusion is you can't conclude that benzene played a role in their leukemia.

Q Can you tell me what that literature is?

Give me a couple of articles.

A Sure.

(The witness perused documents.)

Bender Minnesota Highway Maintenance Workers Study, Cancer Mortality from the American Journal of Industrial Medicine in 1989.

Q Okay.

A You want more?

Q Yeah.

(The witness perused documents.)

(A brief discussion was held off the record.)

THE WITNESS: Hurley, British Journal of Industrial Medicine in 1991, H-U-R-L-E-Y.

Wong, 1993 in Environmental Health Perspective.

Okay. There are three.

BY MR. NACE:

Q Are there more or are you just stopping with three?

A Those are three I can name for you in which they specify the benzene exposures. There are many others in which the benzene exposures are not

specified that involve refinery workers and petroleum distribution workers where the risks of AML are not elevated.

Q What kind of exposure do you get when you wash your hands in gasoline to benzene? Do you know?

A I'm not sure I understand your question.

Q You take your hands and you put your hands in a bucket of benzene and you clean tools --

MR. ESPOSITO: Bucket of benzene or bucket of gasoline?

BY MR. NACE:

Q I'm sorry. When you put your hands in a bucket of gasoline and you use it to wash tools and, you know, and you get your hands completely exposed to gasoline, how much benzene are you being exposed to?

A I can look that up if you want a number.

Q Yeah. I'd like to have a number.

A It's -- okay.

Q Then tell me the source of your number, also.

(The witness perused documents.)

A There are three studies that address that.

And one is by Miabach, M-I-A-B-A-C-H. Well, the reference is Miabach and Anjo 1981 in the Archives Environmental Health. And it's titled, Percutaneous penetration of benzene and benzene contained in solvents used in the rubber industry.

So that's one, but I --

Q Well, what's the amount? What's the figure?

A Well, I don't seem to have the reference. It was here when I put my notebooks together yesterday, but I can't seem to put my hands on it. So I don't have the number for you.

MR. ESPOSITO: Barry, just for the record, we have other experts who are being offered on the levels of exposure who will be coming up later in the deposition schedule.

MR. NACE: Does that mean he can't answer that question?

MR. ESPOSITO: Oh, no. Not at all.

MR. NACE: Well, then I guess I'm still waiting for the answer.

THE WITNESS: I'll be happy to give you an answer as soon as I can locate some of the references.

If you happen to have a copy of the Miabach article since mine is missing, I could give you an answer on that one.

MR. NACE: I didn't take it. Maybe Mr. Esposito took it yesterday.

MR. ESPOSITO: Off the record.

(A brief discussion was held off the record.)

THE WITNESS: Let's see, Hartle -- oops, excuse me. Blank, Penetration of benzene through human skin, in the Journal of Investigative Dermatology in 1985 gives a diffusion coefficient for benzene in gasoline of 14 times 10 to the minus 9 per centimeter squared per second. And so that works out to, for example, a person with 100 square centimeters of skin in contact with gasoline containing five percent benzene would absorb about 7 microliters of benzene through the skin. And so 7 microliters is 7 millionths of a liter. It's a very, very small --

Q Over what period of time?

A Um --

(The witness perused document.)

Have to calculate that out to be sure. They didn't say over what period of time.

MR. ESPOSITO: Do you need a calculator?

THE WITNESS: (Witness nodded head.)

(A brief discussion was held off the record.)

THE WITNESS: At the risk of not having my units right doing this ad hoc, it looks like about .6 microliters per minute.

BY MR. NACE:

Q .6 microliters would be how many milliliters?

A Six-ten thousandths.

Q Now, how did you arrive at that conclusion?

A I took the, I took the diffusion coefficient, which is -- oops, I take it back. I forgot to multiply by 14. Maybe we should work through it verbally.

Q Have you ever done this before --

A Actually --

Q -- calculation?

A Actually, I have, yes.

Q Okay. Go ahead, then.

A All right.

Q Work through it verbally.

A I just don't happen to know the numbers on this paper adequately to do it ad hoc.

The diffusion coefficient is 14 times 10 to the minus 9 per centimeter squared per second. And if we assume 100 centimeters squared, that means it's 14 times 10 to the minus 7 per second. And if we multiply by 60 to get minutes, I think it should -- I think it should come out to 8.4 microliters per minute.

However, I would say I would have to check these calculations not doing them during a deposition to be confident of them. I think the right conclusion is that the amount of benzene exposure that would occur by dermal absorption to gasoline from immersing a hand in gasoline would be in the microliter range. I don't know whether my exact number is exactly right.

Q What was your number of microliters?

A I think 8.4.

Q Microliters?

A Yeah. I would have to check that to be confident of the number.

Q So assuming those numbers are right, is that saying, then, that every time you put your hands into gasoline, that over a minute you're absorbing 8.4 microliters of benzene --

A Uh --

Q -- into the skin?

A That's -- yes. That's roughly what it's saying.

Q You indicated you talked to some other experts.

A Yes.

Q Who did you talk to?

(The witness perused documents.)

A I spoke with Martin Hawley, John Spencer, and Scott Strickoff.

Q And what did they tell you as far as whether or not there was sufficient exposure in this case?

A I'm not sure I understand what you mean by --

Q Well, did they --

A -- "sufficient exposure".
Q To cause AML.
A They did not address the issue of whether there was sufficient exposure to --
Q Okay.
A -- cause AML --
Q What issue did they address?
A -- in my conversation with them.
Scott Strickoff calculated the dermal absorption of benzene.
Q And what did he come up with?
A He came up with -- he came up with dermal absorption in the range of 200 micrograms per square centimeter per hour. And so we'd have to divide that by 60 to get micrograms per centimeter squared per minute, which would come out to --
MR. ESPOSITO: Let's find out if Mr. Nace wants that.
THE WITNESS: Is that --
MR. NACE: Oh --
THE WITNESS: -- that the answer you want?
MR. NACE: Yes. Just the key figure, yes.

MR. ESPOSITO: I could tell he was --

THE WITNESS: That would work out 3.3 micrograms per square centimeter per minute.

BY MR. NACE:

Q How does that aid you in the conclusion that you're drawing as to whether that is sufficient or not sufficient to exposure?

A That a -- well, an additional thing that Scott Strickoff did was to calculate the equivalent air born exposure. I should say the air born exposure that would give an equivalent body absorption as that amount of dermal exposure and calculated that over a year to come up with parts per million days per year. And his number came up with .39 parts per million days per year. That is a very low exposure that is well below the range of exposure that has been associated with AML.

Q And the range as associated with AML is what? How low?

A What I told you is above 50 parts per million for five or more years.

Q Okay.

A And so we're talking about 50 parts per million on average every day for a working year as being a part per million year.

Q In other words, what you're saying is if you don't have all these 50 parts per million per day for every day for five years, you can't develop AML from gasoline?

A That mischaracterizes what I said.

Q I was trying the best I could.

A Okay.

Q What's wrong with that? Why is that a mischaracterization?

A Because it says you can't develop it. I think what I said was more consistent with the view that people studied who have exposure in that range are clearly at increased risk.

Q Oh, well, what about below that range? Are they also at increased risk?

A It becomes less clear.

Q Less clear, but they are at increased risk?

A Well, it's difficult to conclude that they are at increased risk.

Q Well, how --

A The evidence becomes less clear.

Q How clear is it at your increased risk if you have 50 parts per million per year? Is that absolutely certain that you're at increased risk?

A 50 part per million years for a period --

Q Five years, yeah.

A -- of five or more years. I think there are a number of studies that would support that that causes a significantly increased risk, and that there is consistently --

Q Well, what --

A -- among the studies.

Q -- do you have to have to show that it causes not a significantly increased risk, but just an increased risk? What kind of exposure?

A The question can't be answered in that format.

Q I thought it was a pretty good question.

A I'm going to have to ask you to revise it --

Q Well, I --

A -- so I can answer it.

Q I'm just trying to get you to see how far down you can go before you can agree that you have an increased risk. How much part per million?

A Okay. There are a number of risk assessments that have been done that -- the lower limit where I think the data are reliable are down in the range of 50 to 60 parts per million years as a cumulative dose. In other words, so a person who has a 5 part per million exposure for 12 years would have 60 parts per million years of exposure. And the quantitative risk assessments I think show that there is evidence of increased risk above that level.

Q Five --

A Below --

Q Five, above the level of five parts per --

A Well --

Q -- million?

A -- I said 60 parts per million years. In other words, so you could say that was six for ten years or five for 12 years or 10 for six years. Below that, I don't think that the risk assessments are

adequate to show that there is any reliable evidence of increased risk of leukemia.

Q Yeah.

A And so we're in a range where there's clear evidence of excess risk at 50 parts per million and above for five or more years. There are risk assessments that support the interpretation that there is risk above 60 parts per million years, and then below that, I don't think there is any reliable evidence that there's an increased risk of AML.

Q What did you get from talking to Spencer about this case? How has that affected your opinions?

(The witness perused documents.)

A John Spencer quantitated the frequency of various tasks that were done and the benzene concentrations that were likely to be detected in performing those tasks.

Q And what did he find? What are the numbers?

A He concluded that changing fuel filters occurred between one and three times a day and took a few minutes for each change of fuel filters; that changing fuel pumps occurred as I've written it down,

less than one percent of the time; that the men were working, that repairing fuel lines occurred less than one percent of the time that they were working; and that cleaning parts in gasoline occurred only a modest number of days per year.

Q And whatever those number of modest days are per year and so on, it doesn't total, I take it, in your opinion doesn't total enough exposure?

A My opinion is when you take those frequencies of tasks and come up with reasonable assessments of the benzene exposures in those tasks, you can't come up with any appreciable exposure to benzene.

Q Okay. So whether those figures by Strickoff or Spencer are right or wrong, you really don't know, do you?

A Uh --

Q You don't know whether the calculations are right or wrong?

A I do not have their calculations --

Q All right.

A -- to review.

Q So you're assuming that what they gave you --

A However --

Q -- is correct?

A However, their assessments are consistent with my own reading of the scientific literature in which detailed exposure assessments of people who handled gasoline have been conducted. And there is a surprising consistency between Martin Hawley and John Spencer's calculations and what I read in the literature. So I am inclined to think that they are reliable.

Q All I'm trying to get at is you didn't make the calculations yourself. You're relying on somebody else to make these calculations about this particular case?

A Yes.

Q Okay. Now what was it that Harley [sic] gave you? What was his information?

A Martin Hawley.

Q All right, Hawley.

A He gave me the benzene concentrations both

as background levels and in breathing zones in both summer and winter that were modeled based on knowledge of the building sizes and air flows.

Q Well, you said that these figures that they were coming up with is basically consistent with what's in the literature, right?

A Yes.

Q So even without their information, you still would come to your same conclusions, wouldn't you, about whether or not the AML was caused in this case by benzene?

A Uh --

MR. ESPOSITO: You're asking if Mr. Carter's leukemia was caused by benzene?

MR. NACE: Yeah.

THE WITNESS: I'm not sure I understand the question.

BY MR. NACE:

Q Well, even if you didn't have that information from Hawley, Spencer or Strickoff, you still would come up with the same conclusion?

A Well, I have not considered the cases in the

absence of that information. That information regarding exposures that are estimated from the tasks and circumstances in which these men worked add to my view of the reliability of what I've read in the general -- in the medical literature or the scientific literature.

So I, so I think what they're saying is, you know, one of my criteria for judging validity of things I read in the literature is plausibility. And what I read in the literature is consistent with their calculations. So I guess that tells me that what I read in the literature is applicable to these cases.

Q That still didn't answer my question. All I'm saying is whether you have their information or not, you would come up with the same conclusion, wouldn't you? Or do you need their work to enable you to come up with your opinion?

A The answer is, I think it assists me because it gives me a feeling that the medical literature does apply to these cases.

Q And if you didn't have their work, you couldn't come up with a conclusion?

A I would be less confident of my conclusion.
Q As it is, you're 100 percent confident?
A No. I didn't say that.
Q Well, how confident are you?
A I am confident to a reasonable certainty that these are the exposures of these men --
Q And even --
A -- that these represent their exposure.
Q And even without their data, you'd still be reasonably confident, wouldn't you?
A You're asking me a hypothetical for --
Q Yeah.
A -- for a situation that I haven't considered. What would I do if there was no exposure assessment and no modeling of the exposures? I'm not in that situation.
Q You mean you --
A I have information that I have considered. I based my conclusions on it.
Q You mean you didn't have an opinion as to whether or not there was sufficient exposure by Mr. Carter to the benzene until you had this information

from Hawley, Spencer and Strickoff?

A I --

Q It's a yes or no.

A I think the answer is: I had an opinion. However, my opinion is -- I am more confident of my opinion having seen their or having discussed their exposure modeling and found it to be consistent with the scientific literature.

Q With or without their data, you have the same opinion, didn't you, which was, to wit: Within a reasonable degree of certainty, there wasn't sufficient exposure?

A I believe the answer is yes but with less confidence.

Q Okay. By the way, is there any other, maybe I should say malities other than leukemia that you believe are caused by benzene exposure?

A Yes.

Q What?

A Aplastic anemia.

Q Okay. What else? Anything else?

A Acute central nervous system affects,

dizziness, disorientation.

Q Any other cancers?

A No.

Q Any other bone marrow diseases?

A I don't know how finely you want to split the bone marrow diseases. If you want to make a distinction between aplastic anemia and pancytopenia, you might make that distinction or you might --

Q Well, would you?

A -- consider them.

I prefer to say aplastic anemia.

Q You don't make a distinction between the two?

A No.

Q Is it your belief, Doctor, that in order to develop AML from benzene, that we're all the same and we all have to have the same amount of exposure or we won't develop AML?

A There is no basis for concluding anything other than that.

Q Okay. Are you familiar with the Gaussian curve?

A Are you referring to Gaussian distribution?
Q Yes.
A Yes.
Q Do you think that applies in a situation involving benzene and AML?
A I don't understand the question.
Q Well, do you believe that there are different susceptibilities to benzene among different individuals?
A There is no basis for concluding that --
Q And you don't believe --
A -- to my knowledge.
Q And you don't believe that the Gaussian curve alone is a basis for that, for concluding that?
A Our knowledge is inadequate to know whether a Gaussian distribution of susceptibility is an appropriate assumption.
Q Can you tell me any other diseases that you're aware of that you would say that the Gaussian distribution curve would be an inappropriate assumption?
MR. ESPOSITO: I'm sorry. Inappropriate

assumption?

MR. NACE: Inappropriate assumption.

THE WITNESS: Cancer risk, in general. Virtually every cancer site you would say a Gaussian distribution of risk is an inappropriate distribution.

BY MR. NACE:

Q Is inappropriate or may be inappropriate?

A Is inappropriate.

Q Okay. Is that a statement that can be found in the literature somewhere?

A Yes.

Q Tell me where.

A Breslow & Day, Research Methods in Cancer Epidemiology, Volume I, Case control studies published by IARC in probably 1981.

Q Okay.

MR. NACE: Did you get that?

THE REPORTER: IARC?

THE WITNESS: I-A-R-C, International Agency for Research from Cancer.

Can I add a couple of things? Usually we think of cancer incidence or cancer mortality as rare events

and they fit a Poisson distribution better than a Gaussian distribution. So this idea of a Gaussian distribution would fit is clearly wrong for many diseases.

BY MR. NACE:

Q Who is the "we" that believes this? You said "we" believe this.

A Most people who study cancer incidence and mortality trends. So epidemiologists and statisticians. That's a common assumption.

Q I see. All right. Doctor, let me ask you about the Carter record, then, that you point out here. You have such things in here as: He drinks a pint of hard liquor a day, plus a six-pack on weekends.

Does that somehow affect your opinion as to the cause of his AML?

A Yes.

Q Why?

A It raises concern that some animal literature might apply that indicates that the concurrent dosing of animals with ethanol and benzene

changes the benzene metabolism and that that may affect the cancer risk. So the difficulty is in applying the animal literature. But it's a concern. So as I was reviewing the records, I wrote it down.

Q What you're saying is: If you drink alcohol or ingest alcohol -- I guess is a better way of putting it -- if you ingest alcohol and are exposed to benzene, you have a greater chance of developing AML than if you are exposed to benzene but don't ingest alcohol?

A What I've said is that the concurrent exposure, at least in animal studies, alters the metabolism of benzene.

Q Well, I know you said that. But can you draw the conclusion that I just gave you?

A I think not to a reasonable medical certainty.

Q All right.

A But it raises concern in my mind that this may have altered his risk.

Q So then you can't say with any reasonable degree of medical certainty that the ingestion of

alcohol would have anything to do with his AML?

A I cannot say that.

Q All right. Well, using the same criteria, is there anything on this Exhibit 8 that you can look at, other than smoking, hold the smoking aside, that you look at and you say, this being hepatomegaly or gouty arthritis or any of those things that you have listed there, in some way within a reasonable degree of certainty increased his risk of developing AML?

A No. There's nothing else on there.

Q Then you believe that tobacco increased his risk of having AML?

A Yes.

Q Do you have any knowledge as to how much tobacco needs to be ingested over what period of time in order to increase the risk of developing AML?

A I could look. Would you like me to do that?

Q Well, have you done that before today?

A I have reviewed a number of studies that address that issue and I could easily look at them if you would like me to.

Q Well, okay. Look at them and tell me.

(The witness perused documents.)

(A brief discussion was held off the record.)

THE WITNESS: The answer to the extent we know it is that the risk is increased in each of the three categories of tobacco use. In one study by Linda Brown in the American Journal of Epidemiology, 1992, it's roughly a 1.5 fold risk, regardless of the amount of smoking and regardless of the number of years smoked. It is higher in current smokers than ex-smokers, however.

So the answer is I can't specify a level below which there is no risk. The data support that any pattern of smoking is associated with increased risk of acute nonlymphocytic leukemia.

BY MR. NACE:

Q Is that statistically significant?

A The data on cigarette smoking only, cigarette smoking lumping all smokers together, is when we break them down into smaller groups by intensity of smoking or duration of smoking. The individual strata are not statistically significant.

Q What page are you looking at in the article?
A Pages 765 and 766.
Q Well, does Mr. Carter fall, from what you know, within a group that has a statistically significant increased exposure to developing AML if they've smoked, or doesn't he?
A The answer is yes, he does.
Q Okay. Because of what? What's the subcategory?
A Because people who smoked cigarettes have a risk of acute nonlymphocytic leukemia of 1.6 with a 95 percent confidence interval that goes from 1.0 to 2.7.
Q 85 percent confidence interval?
A I said 95.
Q Okay. I thought you said 85.
A Excuse me. I thought I said 95. I'm sorry.
Q So at 95 percent is 1. what? What's the confidence?
A 1.0 to 2.7.
Q And that's statistically significant?
A Yes.
Q By whose definition?

A Using the P value of .05 as the limit for statistical significance, that would be statistically significant.

Q Even though 1 is within the confidence limits?

A Well, the confidence limit is at 1.

Q I know.

A Which means that the P value is .05.

Q And where is that defined? In Rothman's book?

A From the Gaussian distribution.

Q No. That's not from the Gaussian distribution.

A Yes, it is. Sure. If you have a two-tailed test of significance such that each tail cuts off two and a half percent, the P value is .05 and those limits are the 95 percent confidence interval.

Q I'm not going to argue with you, Doctor, but you're saying because 1.0 is a lower bound, that it's 95 percent confidence?

A I'm saying --

Q I'm sorry. Because 1 is -- the lower bound

is 1.0, that is statistically significant of .05?

A When the lower bound of the 95 percent confidence is 1.0, which tells me that the P value is .05, is .05. That's what it means.

Q Was my statement correct?

A I don't know what your statement was. Could you say it again.

Q Yes. I said if the lower bound is 1.0, you're telling me that the finding is statistically significant at .05?

A You'll have to state that a little more specifically.

Q Why? Why didn't you understand that?

A Because I'm not sure what you meant by the lower bound as 1.0. The lower bound of the odds ratio?

Q No. Of the --

A Of the 95 percent --

Q Of the 95 percent confidence --

A -- interval?

Q -- interval --

A For the odds ratio --

Q -- yes.

A -- when it is 1.0, that says that the odds ratio is significantly different than 1.0 at the .05 level at -- with a P value of .05.

Q And can you tell me where that's defined that way, in any kind of epidemiological textbook that would define that, define it that way? Rothman?

A I can't cite you a page in Rothman. I think any of the introductory statistics books would do --

Q All right.

A -- that.

Colton, gee, Kleinbaum, and Morganstern I named five or six, Snedecor, Cochran, Armitage.

Q Okay.

A They would, they would show you that the lower limit of the 95 percent confidence interval is the point at which 2.5 percent of the distribution is cut off.

Q All right. Doctor, based on the data that you've given us about smoking and about AML, do you have an opinion as to which is more likely the cause of the AML in Mr. Carter?

A It is my opinion that smoking clearly has increased his risk of AML and that his exposure to gasoline has not clearly increased his risk in any way.

Q Okay. All right. I want to go to Mr. Taylor.

Other than the history of smoking, I'm looking at the notes that you took, which are Exhibit 9. Other than the history of smoking, is there anything else that you have found that you recorded on your summary that you believe is significant as to telling us what caused his CML?

A No.

Q Tell me what you understand the relationship is between the CML and AML, if any?

A I think we've partially discussed that.

Q Partially.

A Both arise from cells in the myelocytic series. CML often has a course that lasts for a number of years and then undergoes, and then the patient undergoes what's commonly called the blast crisis or a blast transformation where CML changes in

its clinical appearance and looks like AML.

Q Well, is it your view that you have to have CML before you get to AML?

A No.

Q But CML can change to AML in some instances; is that what you're saying?

MR. ESPOSITO: I object. That mischaracterizes his testimony.

THE WITNESS: What I said is that CML typically has a course of a few years and then the patient undergoes a transformation in which the disease develops many myeloblasts and looks like AML.

BY MR. NACE:

Q Well, it looks like AML. Is it AML at that point, or don't you know?

A Uh --

Q I mean, it may be outside of your expertise.

MR. JORDAN: Objection. How many questions are you going to ask him? If you'd give him a chance to answer, it --

MR. NACE: I'm trying to help him all the time. You know that.

MR. ESPOSITO: In addition, Barry, as you know, we do have experts coming up who you can depose on AML and CML.

MR. NACE: Well, are you going to tell me he's not going to testify on --

MR. JORDAN: Give him a chance to answer. We'll find out.

MR. NACE: No, I'm asking the attorney here. He's not going to testify --

MR. ESPOSITO: He's going to testify about what's in his 26B-4.

MR. NACE: Is he going to testify about the relationship between CML and AML?

MR. ESPOSITO: From an epidemiological standpoint.

MR. NACE: That's all?

MR. ESPOSITO: (Nodded head.)

MR. NACE: Shaking your head yes?

MR. ESPOSITO: Yes.

MR. NACE: Thank you.

MR. ESPOSITO: No. Is this way (indicating).

BY MR. NACE:

Q All right. I think you already said from an epidemiological standpoint, you don't believe that there is any statistically significant findings that connect CML with benzene; is that correct?

A I -- roughly, yes. I think what I said is I don't think that there's any causal association between benzene and CML.

Q Oh, well, are there statistically significant studies that show a statistical association between CML and benzene?

(The witness perused documents.)

A Let me be sure I understand the question. Would you ask it again so I answer it correctly?

Q Are there any studies that show a statistically significant association between CML and benzene?

A Not that I'm aware of and not of the materials I have reviewed.

Q Well, while I'm on that line, are there any epidemiological studies that show a statistically significant association between CLL and benzene?

(The witness perused documents.)

A No. Not among the studies I have reviewed and not to my knowledge.

Q Well, you have tried to review all the studies, haven't you?

A Yes.

Q So if there is a study out there that shows there's a statistically significant association between CLL and benzene, you just plain missed it; is that what you're saying?

A I guess the answer would be, I missed it and so did all the major reviews of this topic.

Q What are the major reviews that you're talking about?

A The reviews --

Q Identify them for me, if you would.

A Okay. The reviews of the scientific literature regarding benzene and leukemia.

Q By name, please.

A By name, Harlan Austin in 1988. If you need more citation than that, I'll have to flip to them.

Q Okay.

A Do you want me to do that?

Q Sure.

A Okay.

MR. ESPOSITO: Off the record.

(A brief discussion was held off the record.)

THE WITNESS: Yeah, they're on my index as well, although -- the only way I'm sure I've got the right one is to look at it and say, yeah, that's the one I reviewed.

BY MR. NACE:

Q I want you to be sure. I want you to be confident in what you're doing.

A Okay. Harlan Austin, American Journal of Epidemiology, March 1988. Brant, B-R-A-N-D-T, 1985 in Medical Oncology and Tumor Pharmico Therapy. Elizabeth Delzell in Occupational Medicine State of the Art Reviews in 1988. Phillip Enterline in Environment Health Perspectives Supplements in 1993. Malcolm Harrington in the American Journal of Industrial Medicine in 1987. Peter Infante in 19 -- in the Environmental Health Perspectives in 1983.

Peter Infante in Risk Analysis in 1984. Peter Infante in the American Journal of Industrial Medicine in 1985. Dennis Paustenbach in Environmental Health Perspective Supplements in 1993. Gerhard Raabe, R-A-A-B-E, in Environmental Health Perspective Supplements in 1993. David Savits in the Journal of Occupational Medicine in 1984.

Q Is that 1984 or 1964 for Savits?

A 1984. That's a typo. David Savits was a boy in 1964. I don't think he wrote it then. It was '84.

(A brief discussion was held off the record.)

THE WITNESS: Let's see, Herman Tyroler -- or, sorry. Gee, I've cut off his first name. Tyroler in Environmental Health Perspectives in 1976.

MR. JORDAN: Doctor, what was that last name?

THE WITNESS: Tyroler, T-Y-R-0-L-E-R. Vigliani, V-I-G-L-I-A-N-I, in Environmental Research in 1976. Otto Wong in the American Journal of Industrial Medicine in 1989.

I think that concludes my answer. I --

BY MR. NACE:

Q Why don't you have on this literature Wong's 1983 study listed?

A I don't know.

Q Is it in your book?

MR. JORDAN: He's got one of them on there, but maybe not the same year. He's got Wong a couple of times, four times, five times.

BY MR. NACE:

Q I specifically wanted the one in 1983. I wonder why it's not on here.

A I have Wong in '89. I've got him in '86, '87, '87, '93. I don't know why it's not on there, and I have forgotten to put it in my book. I believe I have reviewed that study.

Q Who --

A My apology.

Q Who prepared these books? You?

A I did.

Q Where did you get the literature? I mean, did you do the research yourself?

A Um --

Q Or were they sent to you by somebody else?

A Much of it I had on file from my interest in this. Some of it I got from my own medline search and someone sent to me.

Q This exhibit that deals with the literature, I forget the number, I think you indicated earlier that that has everything that's in your books?

A I -- yes, I did. And it was my belief that it did.

Q But there were a couple, I just tell you, there were a couple that weren't on our list.

A And that's --

Q So I think we're going to have to go through your books, not right this minute, but we'll go through them and see what else might have been inadvertently left off,

A That's an omission on my part if they're not on there. They should be on there. My apology,

MR. NACE: Let's take a break.

(A brief discussion was held off the record.)

BY MR. NACE:

Q Doctor, there's an exhibit, 1 think it's 15, if I can find it, that deals with your testimony, what it's going to be.

A Yes.

MR. ESPOSITO: Is that the 26-B4?

MR. NACE: That's it. You got it.

BY MR. NACE:

Q I'm going to go over some of that with you. It says you're going to testify about the science of epidemiology.

MR. ESPOSITO: He doesn't have -- you've got 15 as the notice of deposition.

MR. NACE: He's got the wrong one.

MR. STERN: I think it's number 3.

MR. JORDAN: Yes.

MR. NACE: There you go. You take it.

BY MR. NACE:

Q Number 3 there says you're going to testify about the science of epidemiology. I have to ask you what you're going to testify about.

A I'm going to testify as to what epidemiology

is and the sorts of scientific questions that can be answered by epidemiologic studies; how epidemiologic studies are conducted; the common problems that arise in conducting epidemiology studies; the interpretation of epidemiologic studies; and how to synthesize results from multiple studies. And I guess the last issue would be interpretation of causation from epidemiologic studies.

Q Okay. Do you agree that epidemiological studies deal with populations as opposed to individuals?

A Yes.

Q And if you have a statistically significant epidemiological study, that would not necessarily tell you whether or not a particular individual's mality was caused by the statistically significant association; is that correct?

A The way you phrased that makes it difficult for me to answer. I don't know how to answer it without asking you to rephrase it. Let me try to answer what I think you're asking and if I don't, stop me.

I take the view, as I think all epidemiologists do, that any disease has multiple causes. And so there's no one cause that makes a person get a disease. There's a set of causes that act in any one person. Epidemiology has, as one of its goals, the specification of what those causes are. The application of epidemiologic science to individuals requires knowledge in addition to epidemiology.

I don't know if that answered your question properly.

Q Uh-huh.

So even if you have a positive epidemiological study, that would not tell you that any one individual developed the illness because of the agent that was being studied in the epidemiological study, correct?

A Let me try to answer that in my own words. I think the answer is yes. In my own words, a positive association in an epidemiologic study by itself does not allow you to assign causation in an individual.

Q And a lack of a positive study does not enable you to say that that individual did not develop

the mality because of the lack of positive epidemiological study; is that correct?

A Well, there the answer is somewhat different. The lack of epidemiologic evidence of a causal association argues strongly against the factor being the cause in an individual.

Let me try and give you an example of that. If I have no evidence that say aspirin causes brain cancer, there's no epidemiologic evidence that aspirin causes brain cancer, or, in fact, in the hypothetical, if there were studies that failed to show evidence of an association, there would be no basis for attributing brain cancer to aspirin use in any individual, or at least no epidemiologic basis, which would be one of the critical lines of reasoning in attributing causation in an individual.

So a lack of epidemiologic support for an association is a strong argument against that association in an individual. Whereas, conversely, the presence of a strong association from epidemiologic studies supports but is not sufficient for the interpretation of causality in an individual.

Q Are you familiar with an epidemiologist named Mitchell?

A Named --

Q Mitchell.

A -- Mitchell?

Q Uh-huh.

A Does that person have a first or last name?

Q Yeah. I'll have to think of what it is, but from Harvard. Mitchell? How about Shapiro? Samuel Shapiro from Harvard, do you know him?

A No.

Q What is a positive epidemiological study?

A That term is commonly used to indicate that a study has found evidence of an association between some factor and some disease or --

Q At what level?

A -- outcome.

Q At what P value?

A To my knowledge, there's no agreement on the definition of positive that includes a p value.

Q So you can have a P value of .05 or .10 or a P value of .15 and as long as you define what your p

value is, you can decide whether it's a positive study or not, correct?

A When epidemiologists talk about studies, they commonly refer to positive studies as ones that show evidence of an association, whether it's significant or not. And, again, the context of how they're talking about it is probably more important than the term "positive study".

Q You mean you have a positive study that's not statistically significant?

A There are any number of references that I have just reviewed and listed for you that show positive associations between various types of leukemia and various exposure under study which are not statistically significant.

So a positive association or a positive study in my experience just means that there is some evidence of an association that -- whether it's statistically significant or not.

Q So if I had a study in which the relative risk was 2.0, and the confidence interval at .05 was .98 to 5.0, that might be a positive study?

A I would think epidemiologists might refer to that as a positive study because the odds ratio or the risk ratio is 2.0. That's evidence of an association, even though it's not significant, as you've described it.

Q And if you had a 1.5 relative risk on a large number of people in the study, but not statistically significant, that also could be considered positive?

A There are people who would discuss that as a positive study.

Q Would you?

A It would depend on the context in which I was discussing it. If we were doing exploratory studies and trying to identify new risks for some disease, we might tally up all the studies in which there was some evidence of a positive association and all the ones in which there was evidence of a negative association, those in which there was no evidence of an association, and talk about ones with the risk of 1.5 as positive.

Q If you have --

A The context is important.

Q You can have evidence of an association, then, even in the absence of a statistically significant finding?

A Of course.

Q What's the difference between a relative risk and an odds ratio?

A The relative risk is the more general term under which an odds ratio is one type of a measure of relative risk.

Q Well, how do they differ?

A A relative risk includes many different estimates of risk, such as exposure odds ratio, prevalence odds ratios, SMRs, PMRs, PIRs. All the measures of risk that you see in various epidemiologic studies are collectively referred to as relative risk.

Q Okay. Does a type of study in any way effect whether it's called a relative risk or an odds ratio?

A Yes.

Q In which studies do you have relative risk versus odds ratio and explain that for me?

A Again, the relative risk is the general term that applies to all measures of risk, okay. An odds ratio typically comes from a case control study. Because -- although it doesn't have to. But in most instances, it's from a case control study, because you're measuring the odds of exposure among cases over the odds of exposure among controls. And that ratio of odds is an odds ratio.

Q What does a confidence interval measure, then?

A A confidence interval measures the range around your point estimate within which the point estimate would fall if you did the study over and over and over again.

So, for example, if you have a point estimate of 2.0, and we'll say that that's an odds ratio derived from a case control study, you can calculate the interval within which if you did that study over and over and over again, 95 percent of the odds ratios would fall by chance alone. That's a confidence interval.

Q Or you could do it for 90 percent of the

time or 85 percent of the time, or whatever?

A Or 99 or any probability or I should say any interval that you would like to define.

Q It's relatively an arbitrary choice as to whether you take 95 or 90 or 85; isn't it?

A Yes.

Q What do you routinely use?

A It's customary in the scientific community to use either 99 or 95. And I use one of those. The issue in choosing is how confident one wants to be that the point estimate that you've observed did not occur by chance alone when, in fact, there was no association.

Q Well, if you had a point estimate and you wanted to be 51 percent sure, then what confidence interval would you use and what P value would you use?

A Let's see. If you wanted to know the range within, the point estimate would fall 51 percent of the time, you'd use a 51 percent confidence interval.

And what that would tell you is that you were -- you had 51 percent confidence that the results you observed did not occur by chance alone when, in fact,

there was no real association.

Q And you would say, then, it's more likely than not that it didn't occur by chance alone?

A That's correct.

Q And you would only be 51 percent sure of that?

A And you'd only be right 51 percent of the time.

Q Right. Okay.

A 49 percent of the time --

Q You'd be wrong.

A We're talking about doing studies, whole epidemiologic studies over and over and over again in independent populations, independent trials. If you set a 51 percent confidence interval, 49 percent of the time you would label as statistically significant things that occurred due to chance alone when there was no real association.

Q Is that called a type one error, type two error?

A That's a type one error, as I recall.

Q Sure?

A Pretty sure.

Q Well, I think what you're telling me, I hear you saying, correct me if I'm wrong. If you don't subscribe to the concept that when one does an epidemiological study, it's only, the data is only important if it's statistically significant at the point of a .5 level?

A I do not subscribe to the view that statistical significance has some special meaning. Many factors in studies are of equal weight or equal importance in interpreting the meaning of the findings. Statistical significance is one of them. we'd like to be confident that the point estimate we see is unlikely to be due to chance. The question of how confident, we could argue about.

Q All right. Do you agree with Ken Rothman that you can take the phrase "statistical significance" out of the lexicon of epidemiology and we'd all be better off?

A I think that that statement's a little extreme. It still has a use to convey in shorthand form our confidence that the results are unlikely to

have occurred by chance alone.

Q Yeah.

A But basically I agree with his overall opinion that we should not use statistical significance as dividing valid results from those that are unreliable.

Q In other words, even though you may not have statistical significance, there still could be a lot of valuable data in that study that can be of help to you in answering the ultimate question that you want to answer as to whether or not there is an association between two things --

A Yes.

Q -- correct?

You also say that -- it says here that you're going to testify that, "The medical and scientific literature fails to demonstrate a causal relationship between exposure to gasoline and three leukemias at issue, CML, CLL or AML."

The medical and scientific literature that you're referring to is what's in these two volumes, these black and gray volumes, correct?

A Yes.

Q And some that you may inadvertently have missed, such as Wong, 1983, correct?

A I will accept that that is correct, yes.

Q All right. But basically what we're talking about is what you have in these two volumes?

A It was my intention to bring everything in those two volumes, yes.

Q Is there anything in these two volumes, and I haven't sat down and taken a look at it, which I will do, but is there anything in here that is anything other than an epidemiological study?

A It is largely epidemiology. There are a few animal studies that I thought were worthy of inclusion, such as the one that shows that ethanol ingestion concurrently with benzene exposure increases the hematologic toxicity of benzene in mice. But large -- it is almost entirely epidemiology.

Q So when you refer to the science or to the medical and scientific literature with the exception of one or two animal studies, you're really referring to epidemiological literature?

A Let me try to give you as complete an answer as I can from memory.

There are a small number of animal studies. I would estimate no more than five.

Q Okay.

A There are three or four studies on the dermal absorption of benzene that are not epidemiologic studies. There are laboratory studies in either humans or animals. Other than that, I think it's all epidemiology.

Q All right.

A To the best of my recollection, it's all epidemiology. And, well, throw in risk assessment as a subset under epidemiology.

Q Okay. Then the next section says that: The medical and scientific literature fails to demonstrate, again, the relationship between CML and CLL and benzene exposure.

Again, you're talking about this same literature that's in these two, the black and the gray book?

A Yes.

Q Okay.

A Can I also make sure we include in that discussion the textbook of hematology that we have already labeled.

Q Okay. Fine. Now, and you kind of differentiate when you say that the medical and scientific literature fails to demonstrate a causal relationship between low dose exposure to benzene and AML. So I think you agree that it does show a -- well, I guess that's what confuses me a little bit. This is essentially epidemiological?

A Yes.

Q And the epidemiological literature deals with association by definition?

A Yes.

Q So the epidemiological literature doesn't tell you that there isn't a causal relationship, but you make a deduction from the literature that there isn't a causal relationship because of the epidemiological findings; is that correct?

A I think the question is a variation on questions we discussed this morning about trying to prove that something doesn't exist.

The epidemiology has looked for and has failed to find consistent evidence of an association between benzene and three types of leukemia, CML, ALL and CLL.

The epidemiologic literature also has looked for and does find evidence of an association between benzene exposure and AML, but that literature supports that that association exists only above certain cumulative amounts of exposure. And that amount is in the range of 60 parts per million years.

Q Well, maybe it was a bad question. That wasn't the thrust of my question to you.

A I'm sorry.

Q That's -- I'm sure it was my fault, Doctor. All I'm trying to establish here is that -- I think you will eventually agree with me. The phrase that is used here "medical and scientific literature" would indicate that there's -- I think it would indicate that there's a lot of things out there in the field of science in addition to epidemiology.

A There certainly are many fields of science that exist in the literature outside of the field of epidemiology.

Q Right. And yet really what you're relying on is not all of those other fields in the world of science, but you're really relying upon epidemiology to express your opinions?

A In essence, yes. However, I didn't want to word this in a manner where I would be unable to use industrial hygiene surveys that described exposure because it could be argued those are not epidemiology, or that I would be unable to use dermal absorption studies in humans because those are the laboratory investigations, not epidemiology.

So the issue was how to describe that my area is primarily concerned with the epidemiologic literature, but there are issues on the periphery of that that means I need to be allowed to consider industrial hygiene literature, toxicology literature, clinical medical literature, you know, and areas that are, that are not strictly epidemiologic science.

Q Well, there aren't any invitro studies included in your book, are there?

A I do not think so.

Q Have you done any research and tried to

determine the effect of benzene or gasoline on cells from an invitro standpoint?

A I have not -- first off, I have done no such research, personally, if that's your question.

Q Right.

A Are you asking about whether I reviewed that literature?

Q Yes. That's what --

A No. I have not reviewed that literature, no.

Q Have you even looked to see if there is such literature?

A My answer is somewhere between no and not in a systematic way. I may have seen one or two articles. But in essence that's not my area and I don't hold myself out to be an expert in the area of the invitro literature on the toxicity of benzene.

Q And if there are studies out there that deal with the mechanism, the chemical mechanism of how benzene or gasoline were to affect cells, you haven't looked at that either, have you?

A No, I have not.

Q Okay. So when we talk about the medical and scientific literature, we're really being very specific in referring to the medical and scientific literature that you have in these two books?

A Yes. With the exception that I may have forgotten to list or stick in one or two or three articles.

Q That we've already talked about?

A Yes.

Q I'm not trying to --

A The intention is yes. Everything that I have reviewed was intended to be in these books.

Q And all of the literature that you believe indicates that there is not a causal relationship between low dose exposure to benzene and AML is also included in those books?

A Yes.

Q And that would include the literature, the epidemiologic literature, correct?

A Yes.

Q And what other literature?

A Epidemiologic literature. I don't think

there is any other literature that would comment on that issue.

Q So when we refer to the medical and scientific literature, really it should say that the epidemiological literature failed to demonstrate a causal relationship between low dose exposure to benzene and AML, correct?

A Say that again, please.

Q Yeah. I'm just -- okay.

Where it says here that, "the medical and scientific literature fails to demonstrate a causal relationship between low dose exposure to benzene and AML", really the words "medical and scientific" should be replaced with the word "epidemiological"?

A I think that's reasonable.

Q And I'm just trying to be reasonable.

A Yes. Thank you.

Q All right. And when you say there that, "The scientific evidence does not support the proposition that the three leukemias at issue were caused by gasoline or benzene exposures from work as mechanics with DPW," we could replace the word

"scientific" with "epidemiological"?

A Yes.

Q Correct?

A Yes.

Q Now let me as,, you where it says nere that you will "explain the meaning of cancer clusters." What are cancer clusters?

A Cancer clusters are --

Q May I interrupt you?

A Yes.

Q And then I'll go back to this.

Is there a difference between "cancer clusters" and "clusters"?

A Disease -- if you mean disease clusters and cancer clusters, no. It's the same concept.

Q Maybe I should ask you first of all what a cluster is and then you can tell me what a cancer cluster is. Can you do it that way?

A Yes.

Q Okay. Thank you.

A A disease cluster is an occurrence of disease that people regard as being -- let me go back.

It's an occurrence of disease in space and time that people regard as being unusual or unlikely to have occurred by chance.

So in other words, a bunch of people who live on the same block who all came down with a disease, the same disease, is commonly regarded as a cluster of that disease.

Q So if you had 20 people on a block, I'm going to use your example, and 12 of them came down with a disease, you might not be able to get a very good epidemiological study out of that, correct, with just 20 people in it, but you would have a cluster that would help you decide whether or not there's a cause and effect relationship, is that correct?

A That's a compound question. I'll try to answer it. If 12 out of 20 people all came down with the same disease, you probably would get a good epidemiologic study out of it.

Q I was trying to give you an example where you could. Maybe -- go ahead.

A However, if you had two people with the same disease or three people on the same block where the

number of people who got the disease is very small, it is difficult, somewhere between difficult and impossible to do meaningful epidemiology to study that --

Q If you --

A -- because the number of observations is simply too small.

Q So if you have a disease that occurs once every 10,000 but suddenly you've got two or three out of ten people on a block, that might indicate a cluster?

A That would be regarded as a cluster by most lay people and some scientists.

Q Okay. Now follow that through to cancer cluster. Same thing?

A Yes.

Q All right. Well, how common is CLL in the population?

A How would you like to know? Age adjusted incidence?

Q As quickly as possible,

A Age adjusted incidence?

Q Age adjusted incidence? No. I'd just like to know how -- what percentage or how many people out of 10,000 in the United States develop CLL.

MR. ESPOSITO: The reporter I think wants to change her tape.

MR. NACE: Oh, you want to change it now? I'm sorry. Change your tape and then he can be thinking of that complex answer for me.

(The reporter changed the audiotape.)

BY MR. NACE:

Q Go ahead, Doctor.

A All right. I'll try to answer your question. The -- well, let me ask you a couple of questions before I answer. Do you want this in black males?

Q In what?

A Black males.

Q Oh, in what, black males, as opposed to --

A White males.

Q -- Caucasian males or black women or anything.

All right. Let's take black males. That's fine.

A Okay.

Q Tell me what you're looking at to get this information.

A I'm looking at the book by Martha Linet --

Q Okay and page?

A -- called The Leukemias page 40.

Q Okay. And this is for black males, the prevalence of CLL in the population?

A I was not going to give you prevalence. I was going to give you age adjusted incidence.

Q What does that mean?

A It means the number of new cases occurring adjusted to a standard population. Let me try to answer that fully. As I assume you know, the incidence rate of CLL rises dramatically with age starting as almost negligible at about age 30 in adult males and females and becoming an appreciable -- being a not uncommon disease by the time we reach our 80s.

And if I were to give you an age specific rate from that curve, that number two vary dramatically depending on which age group I picked, okay. Now, as the population of this country ages, the overall rate,

incidence rate, changes because the population is aging. In other words, we are older on average than Americans were 20 years ago. So the overall rate, the crude rate now, is higher than it was 20 years ago.

To compensate for that change, we adjust back to a standard population, and that's called age adjustment. So that if I compare the rate in 1990 to the rate in 1970, I can compare them as though they came from a population that had the same age structure, okay. So it removes time trends that are due to the aging of the population.

Q Okay. Let's do it that way.

A Okay. And so the answer is .9 -- oops. Sorry. 2.9 cases per 100,000 black males per year.

Q All right. Do you have the figure there for AML?

A For AML 2.0.

Q Per 100,000 again?

A Per 100,000 black males.

Q Okay. And CML?

A 1.7 per 100,000. And excuse me, I gave you males and females combined. So it's not black males

alone. It's black males and females.

Q Okay. For all three of those groups?

A For those three diseases, yes.

Q Okay. How about for the broad category of leukemia? Can you do that?

A Forgive me.

Q You messed it up. You want to do it again?

A I messed it up. Those numbers were for males alone.

Q They were, okay.

A I read it right the first time.

Q How about for leukemia in black males?

A All leukemia?

Q Yeah.

A Well, for all leukemia, it would simply be the sum of those four -- those three numbers plus that for ALL. So it would be .9 plus 2.9 plus 2.0 plus 1.7 is 7.5 cases per 100,000 black males per year.

Q Okay.

A Actually, that's not exactly accurate. We -- that misses whatever types of leukemia do not get classified into those four headings, but it's a rough

approximation. The true number will be slightly higher for all leukemia.

Q Okay. Now 7.9 per 100,000 strikes me as rare. Is that -- I mean, as a layman. Is that rare? Is that a common occurrence? How would you categorize that?

A Rare is a reasonable adjective, yeah.

Q All right. Now, what would you then call a cluster of leukemias? Say if you had a population of 50, what would be a cluster?

A I think a lay person's impression is that two rare events together in space or time is a cluster, is an unusual event. Whereas to an epidemiologist --

Q I'm asking you.

A One rare event in any one place is not a cluster. Two rare events in one place or in close timing in one place is not a cluster, because it's simply too small, too few observations, to be able to comment in any reliable way whether it's unlikely to be due to chance alone or -- yeah. That's the right way to say it.

Q Speaking hypothetically of a population of 50, would three be a cluster, three leukemias out of 50 in the population?

A It's still too small to be able to say much about. I think you have to get more cases, more observations to be able to say anything meaningful, more like five or six or seven before you can say anything other than: Well, we have a couple of rare events or three rare events in one spot.

Q Five or six out of 50 is about ten percent. Now, you would agree with that ten percent, five or six out of 50, as you increase the number. Let's say you went from 50 to 300. You wouldn't have to have 30 to have a cluster, would you?

A No.

Q What would you have? I mean, let me interrupt you because I think what you're saying is that as the numbers grow bigger, the clusters don't have to grow proportionately bigger?

A That's correct.

Q When you get to about 300, then I'm going to ask you maybe 1,000, I'm trying to get an idea around

300 what would you expect to see for a cluster for leukemias?

A I'm not sure I agree with the line of reasoning. The real -- I think the essence of what we're discussing is a calculation of the number of events you would expect to occur in this little population from which the observed cases have arose and comparing the observed to the expected. And I'm not sure that you --

Q I'm following you.

A Okay. You are.

Q Can I ask you a question now?

A Yes.

Q All right. What would you expect of leukemias in a population of 300 black males?

A You would have to know the ages of the 300 black males or at least the age distribution.

Q Well, you told me that. You said that the --

A No. In the males under -- let's try and define this hypothetical that we're coming up with. We have a population of 300 black males.

Q Right.

A Among whom three cases of leukemia have occurred, okay. In order to calculate the expected number of cases of leukemia, we would need to know a number of additional things. First is over what period of time did we observe this population of 300 men, If we observed them over one year and saw three cases, that is very different than observing three cases over 20 years, simply because the number of person years of observation varies by 20 fold.

If we saw three cases of chronic lymphocytic leukemia among men under age 30, that would be very different than among men age 70 to 80. So in order to calculate expected number, we need to know the age structure of the population and the period of observation of that population.

Now, we -- if you gave me that, we could calculate the expected number, And the right way to do that is to assume that cancer incidence occurs under the Poisson distribution, and we can apply that formula and actually calculate the expected number of events.

And let's assume that in a population of 300 men

observed for five years, the expected number is appreciably less than one case of leukemia and the observed number is three, You might say, gee, that three is unlikely to have occurred by chance.

Now, what I have been trying to say in my previous four or five answers is that even though you might make that calculation and say this is unlikely to have occurred by chance, there is very little one can do to further investigate three events to analyze whether the risk was related to exposure or not related to exposure or related to previous service in the Army or whatever factors you might want to study simply because the number of observations is very small.

Q Sounds pretty subjective, deciding whether or not there's a cluster.

A I think the point I'm trying to make is that while lay people might regard that as a cluster, I think as an epidemiologist, my view would be that this is too small a number of events to call this a cluster where the calculation of a probability that this could have occurred by chance has much meaning. It's simply a small number of events,

Q How many CLLs would you expect to find in a population let's say of 300 black males under the age of 60?

(The witness perused book.)

A I can't give you anything close to an exact answer. I can give you an estimate that by chance alone, we would expect to see less than 10 per 100,000 per year. So if we had a population of 300 men followed for ten years, that's 3,000 person years times 10 over 100,000, point, say .3, but certainly less than 1.; .3 could be wrong. It could be .2. It could be .5.

Q Well, obviously, you can't have .3 of a person.

A But you can have an expected number --

Q Okay.

A -- of .3.

Q All right. So if you saw, obviously, you saw one, you can't call that a cluster?

A That's -- that has been the point of my previous --

Q Okay. But what if you saw two?

A You still can't call it a cluster.

Q Three?

A I think that's still not enough to call it a cluster.

Q Four?

A You're in a gray area where you could start to say that's very unlikely to have occurred by chance. Five, yes, that's very, very unusual. That is a cluster of cases.

Q Uh-huh.

A And so to try to give you a full answer, the decision of whether it's a cluster is based not only on the probability that it could have occurred by chance alone, but also on the absolute number of events. And, you know, for some diseases where the expected number might be .01, a very, very rare disease. Seeing two would have a very low likelihood of occurring by chance alone, but it's still only two observations. In fact, they're incidents where the probability of seeing one event is extraordinarily unlikely for a very rare disease. But when you see one event, *you* don't say the P value is .0001. You

say it's only one event. That's not a cluster.

So this decision is based not only on probability, but on the number of observations.

Q Let me broaden it out to be leukemias in general, which you said, according to your book there, is 7.5 per 100,000.

A That is an approximation.

Q Okay. How many black males with leukemia would you expect to find in a population of 300 say over a 20-year period?

MR. ESPOSITO: All forms of leukemia? With all forms of leukemia?

MR. NACE: Yes.

(The witness perused book.)

THE WITNESS: I'm having difficulty coming up with an overall incidence rate for all leukemia.

BY MR. NACE:

Q Well, I think you said 7.5 per 100,000.

A We'll have to use that as a rough approximation.

Q All right.

A About .4 or 5 cases would be -- let me back

up. If that rate of 7.5 is correct and if we followed a group of 300 men for 20 years, we would expect to see .4 or 5 cases of leukemia occur in that group.

Q Less than one?

A Yes. Roughly a half of one.

Q Okay. What would be a cluster, in your view?

A I think I've answered that. I don't think two cases or three cases would constitute a cluster.

Q Well, what would?

A Again, there is some judgment in that. I would not be terribly suspicious about observing a number of cases until we got to certainly five, perhaps four at the most. I don't think three cases is enough to --

Q If I were to say bingo, at four you'd be waiting for one more number, right?

A At four I'd be concerned. At five I'd say this is clearly something very unusual.

Q Do you know how many mechanics work for the District of Columbia over a 20-year period of time?

A No.

Q Well, your conclusion is that this case doesn't involve a cancer cluster. According to what's in the 26-B4 answers that's in front of you, how can you come to that conclusion if you don't know how many people worked at that department at DPW as a mechanic?

A Because I think I've already answered that that conclusion is based not only on the probability that it could occur by chance, but the number of events observed. And three events observed for all leukemia lumped together, I do not regard as that unusual an occurrence, even if there had been only a small number of people from within which those three events arose.

Q So the three, the Bradley, Taylor and Carter, three cases that we're dealing with here, you look at those three and you say that's not enough, but if we had a fourth one, it might be enough and if we had a fifth one of leukemia, then we would be saying: Bingo. I'm very suspicious; we have a cluster?

A Certainly the more cases there were, the higher my suspicion would get.

Let -- I've neglected to give part of my answer to

the question. The three cases that we are discussing are different diseases. These are not the same disease.

Q They're all leukemias, aren't they?

A They are all leukemias, but --

Q And you're not an expert in hematology, are you?

A I was in the middle of my answer.

Q Well, I thought you were going on to something else.

MR. JORDAN: Why don't you let him answer the question.

MR. NACE: Oh, don't get so nervous, Mr. Jordan.

MR. JORDAN: I'd like to hear the answer.

MR. NACE: Gosh, you get -- you're getting old, you know that. You're getting crotchy in your old age.

MR. JORDAN: Listen, let the witness answer, Barry.

MR. NACE: My goodness. I can't believe how you jump in here --

MR. JORDAN: Let the witness finish the answer.

MR. NACE: Go ahead and answer the question.

THE WITNESS: If I might finish giving my answer --

MR. NACE: You certainly may, as I've allowed you to do all day, right, Doctor?

MR. JORDAN: I'll take exception to that, but that's okay.

BY MR. NACE:

Q Go ahead.

A AML, CML and CLL are different diseases, and they cannot be lumped together as one disease, any more than can all types of cancer be lumped together as one disease. We make distinctions among different types of cancer because the epidemiology of the different types of cancer is different and the causes of those different types of cancer are different. The same is true for the leukemias. The epidemiology of these diseases differs dramatically.

ALL is a disease that is most common in children. AML is a disease that is most common in young adults;

and CLL is a disease that is most common in elderly adults. They are different diseases.

To the extent we have been able to define risk factors, they have different sets of risk factors. And so it is not scientifically defensible to put these all into this same disease category and say these are three events of the same disease.

These are three events of three different diseases. And it is my view that seeing three events

Q Have you completed your answer for Mr. Jordan?

A I have --

MR. JORDAN: Thank you, Doctor.

THE WITNESS: -- completed my answer.

MR. NACE: Okay. Now --

MR. JORDAN: Not for Mr. Jordan, but for the question.

MR. NACE: That was for Mr. Jordan.

BY MR. NACE:

Q You indicated that you can't lump them

all together. You just did that for me. You said that there were 7.5 leukemias per 100,000 in black males, didn't you?

A You might have noted that in the textbook I was using, which is widely viewed as an authoritative textbook, the author does not lump them together and, in fact, provides no overall incidence or mortality rates for all leukemia. She makes the distinction that these are different diseases, which should not be lumped together, and, therefore, gives no data based on all of them combined.

Q She says that?

A She doesn't say that --

Q Oh.

A -- but, in fact, that's why I couldn't find summary rates for all leukemia, because it's not in here.

Q Do all the leukemias that exist appear on the same page on the same table?

A The four major types are presented in a series of tables so that their incidence rates may be compared and contrasted. They are also presented in a

series of graphs so that their incidence rates may be compared and contrasted.

Q You said that the epidemiological studies that are done are very different for each of the types of leukemias, correct --

A I said --

Q -- didn't you?

A I believe I said that the set of risk factors differ for the different types of leukemias.

Q Well, you did say that, but I think you also said that the epidemiological studies are different for each of the leukemias.

A I think we'll have to have my answer read back.

Q Well, is it --

MR. ESPOSITO: That wasn't in the last series of answers.

BY MR. NACE:

Q Let me just ask you again. Maybe it's the same answer. If it's not the same answer, then so be it.

Do the epidemiological studies vary for the

leukemias?

A I don't understand that question.

Q Okay.

A What do you mean "vary"?

Q Well, that's what I was going to ask you. I thought you said that.

But, Doctor, the same techniques are used in all of the studies, right?

A The same techniques are often applicable, but the findings varied.

Q So the epidemiological studies that you've been relying upon differentiate by cell type?

MR. ESPOSITO: Cell type or disease type?

MR. NACE: Cell type.

THE WITNESS: They differentiate among the four major clinical types, which are acute myelocytic, chronic myelocytic, acute lymphocytic and chronic lymphocytic.

BY MR. NACE:

Q Okay. But are the cell types the same in any of those four groups?

A I don't know what you mean by the "cell

types".

Q The type of cell that you get when you have any one of these four leukemias, are they the same for any of the groups, any of the four groups?

MR. ESPOSITO: Again, when you say that, Dr. Garabrant isn't being offered as an expert specifically on cell types, Barry, and that you will be deposing people who are.

BY MR. NACE:

Q What don't you know?

A I'm having difficulty understanding the question.

Q Okay.

A I think I know the answer, but I'm not sure what the question is.

Q Well, then try to give me the question with your answer, that you think you can answer.

MS. MILNAMOW: Objection. Pose a question and he'll answer.

MR. NACE: Go ahead, Doctor.

MR. ESPOSITO: No. We're not going to play that game,

BY MR. NACE:

Q Have you met any of the other individuals who are listed as experts in this case besides Hawley, Spencer and Strickoff, or whatever his name is?

MR. ESPOSITO: Objection. Mischaracterizes the prior testimony.

THE WITNESS: I do not believe I've met any of the experts --

MR. NACE: I'll go through them.

THE WITNESS: -- in the case, including the three you've just mentioned.

BY MR. NACE:

Q Do you know Dr. Bush, Harris Bush?

A I know of him. I have never met him.

Q Do you know whether or not you've ever testified in a case in which he was also testifying?

A I do not know that. I have a vague recollection he may have testified in Larkin, but I'm not even sure of that.

Q How about Dr. Peter Castloth [phonetic]? Do you know him?

A No, I do not.

Q You never heard of him before?

A No.

Q How about Morton Corn?

A I do know Dr. Corn.

Q How do you know Dr. Corn?

A He is the director of the educational resource center at John's Hopkins and I'm the director at Michigan, and we meet twice a year with all the other directors of the RCs.

Q To your knowledge, have you ever testified in the same case?

A No, we never have.

Q Do you know Dr. Harvey Golomb, G-O-L-O-M-B?

A I know of his name. I have never met him.

Q Have you ever testified in the same case, to your knowledge?

A No.

Q Do you know Dr. Harley?

A No.

Q Right up there in Michigan State, right around the corner from you? You don't know him?

A I do not.

Q Do you know Dr. Mayer, Robert Mayer?
A No.
Q Dr. Jerome Page?
A No.
Q Other than what you read in the depositions of Daum, Infante, Schwartz, Welsh and Taylor, do you have any understanding about the actual exposure to the benzene and the gasoline in these cases?
A Uh --
MR. ESPOSITO: Other than what he's already testified about?
MR. NACE: Well, I just want to know if there's anything else in addition to this.
MR. ESPOSITO: He already testified about talking to some of our experts on exposure. Are you asking in addition to that in what he's reviewed?
MR. NACE: Well, I don't know that they know about it.
BY MR. NACE:
Q But in addition to those people that you talked about earlier, Hawley, Spencer, and Strickoff or whatever his name is, do you have any other

knowledge about the exposure in these cases?

A My knowledge about the exposure in these cases is based on my review of the materials listed in the Exhibit 4 and my discussions over the telephone with the other defense experts, Hawley, Spencer, and Strickoff, and my reading of the scientific literature on the uses of gasoline and the typical exposures that occur in the handling and use of gasoline.

Q Doctor, do you consider leukemia to be a bone marrow disease?

A The -- yes. I --

Q If you were going to design a study to determine whether or not there was an association between bone marrow disease and gasoline, how would you do it, an epidemiological study?

A An epidemiological study. First off, I would try to define the disease or diseases I wished to study. And as I have already mentioned, I do not consider all leukemias to be a single disease.

So when we say leukemia is a bone marrow disease, that's an incorrect statement. The correct statement is the leukemias arise from the bone marrow. These

are different diseases.

Now, to answer your question, if I were going to study the relationship between gasoline and leukemia, I would define which --

Q No, no, no, no. We're going to do it, Doctor. The hypothetical I gave you was bone marrow diseases and gasoline. That's my hypothetical. How would you do it?

A Okay. Bone marrow diseases, if I can ask you a question, then, we are going to study a number of different diseases?

Q Correct.

A Okay. There are two basic approaches that are both theoretically valid. The choice of which is more economically and logistically favorable can only be based on events in the real world.

Let me outline the two hypothetical approaches. The two approaches are a cohort approach and a case controlled approach. In a cohort approach, we would seek to identify a population of people who had exposure to benzene over a range of concentrations and a range of durations, and to follow them forward in

time, and then to observe as time passed what happened to each individual, and to count up the number of people who got each of the diseases under study.

Q That's a cohort?

A As a cohort,

Q Prospective?

A Well, I've described that the sequence of events has to go from exposure forward to outcome, that, in fact, could be done retrospectively.

Q Okay.

A Okay. But still the sequence of events has to go forward from defining who's exposed to then observing who has what outcome.

We could then analyze the relationship between benzene exposure and each of those diseases using one or a number of different statistical methods, The most commonly used one would be the standardized mortality ratio or SMR analysis.

MR. ESPOSITO: I think Mr. Nace's hypothetical involved gasoline, did it not?

MR. NACE: It did.

THE WITNESS: Excuse me. I misunderstood. Where I said "benzene", please substitute "gasoline".

MR. NACE: I understood that.

BY MR. NACE:

Q Whether it's gasoline or benzene, you're going to set up the same way, aren't you?

A Yes.

Q Okay. Go ahead.

A All right. And so we could analyze those data using an SMR approach in which we calculate the incidence rate for each disease in various segments of the cohort under study. So we might pick a high exposure group and calculate the -- actually, I shouldn't have said mortality -- the standardized incidence rate, the SIR for each disease, pick a low exposure group, calculate the SIRs for each disease, and pick a nonexposed segment of the cohort and calculate the SIRs for each disease.

If we saw evidence that the standardized incidence ratios were varied across exposure, we might wish to infer or I should say that would support the conclusion that exposure was associated with whichever

disease we were looking at.

Q You got away from what I wanted you to do, Doctor. I just wanted you to do it for bone marrow disease, not bone marrow diseases.

A I do not know what you mean by "bone marrow disease".

Q Well, there are a lot of bone marrow diseases, aren't there?

A There certainly are and they include --

Q Aplastic anemia?

A Aplastic anemia, tuberculosis --

Q Okay.

A -- various leukemias. It would make no sense to me to study --

Q That's okay.

A -- bone marrow tuberculosis and aplastic anemia because they probably have little, if anything, in common --

Q That may be another study. We're just doing one study now, Doctor. We're just doing bone marrow disease and gasoline. That's all I want. Just the one simple little study.

A I would not do a study of a disease that was that poorly defined. I would want to specify what disease we were studying before I would undertake to do a study.

Q But, Doctor, I'm giving you a hypothetical and I'm setting the terms, and I'm the one that's paying you for it. And I come to you and I say, Doctor, I'm willing to pay to have you do a study here, and I want you to do an epidemiological study on bone marrow disease and gasoline.

MR. STERN: I'm going to --

MR. JORDAN: He doesn't want your money.

MR. ESPOSITO: Unlike a lot of people, Dr. Garabrant would tell you that you were misspending your money --

MR. NACE: Well --

MR. ESPOSITO: -- and to correct it, you should focus on a particular disease. And if you want a valuable answer here, I would suggest focusing that way, if you want to continue on this.

MR. NACE: Well, whether it's valuable or not is a matter of judgment, and I'm not getting into

that.

BY MR. NACE:

Q I just want you to give me how you would structure, how you would do it.

MR. ESPOSITO: I don't think that's a possible thing to be done.

MR. NACE: Oh, he can do it, gentlemen. Come on.

He knows you can do it.

MR. ESPOSITO: You're a lawyer. He's an epidemiologist. Why don't you listen to him on that.

MR. STERN: I want to --

MR. ESPOSITO: And I don't think we're going to continue on that.

MR. NACE: Sure we are.

MR. STERN: May I take a turn to note my --

MR. ESPOSITO: Sure.

MR. STERN: -- objection for the record.

I think the question is unanswerable. The witness has said that several times he would not design a study in the way you want him to. And I think the question is objectionable --

MR. NACE: That's why --

MR, STERN: -- for that reason.

MR. NACE: That's why we have hypothetical questions.

MR. STERN: No. That's not why.

BY MR. NACE:

Q Go ahead, Doctor. How would you do that?

A I would not undertake to do a study that I felt could not reach any reliable conclusion or any meaningful conclusion. To undertake a study of all bone marrow diseases lumped into one category would be to undertake something that could not have any meaningful interpretation.

Q How do you know that?

A Because I know enough about various bone marrow diseases to think that they have very diverse risk factors and some of them have no shared risk factors whatsoever.

Q Well, how do you know, Doctor? You haven't done this before. Now we're starting over from scratch, This is the first time this has been done. How do you know that you haven't got -- if you get a

relative risk of 20 from bone marrow diseases, that that might not be real?

A First off, we don't exist in a vacuum of medical knowledge. We do know something about the risk factors for many of the bone marrow diseases. To ignore that knowledge and to simply combine them would be a methodologic error --

Q When is that knowledge --

A -- that would be ill advised.

Q When did that knowledge become available? You said: We know. You said: We have knowledge about some of these bone marrow diseases. When did that become available?

A We'd have to go disease by disease and talk about the risk factors that we know and when we knew them.

Q When was the first time that we knew this information of any one of these individual bone marrow diseases? 10 years ago? 20 years ago? 50 years ago?

A Bone marrow, I should say tuberculosis of the bone, Bott's disease goes back easily 100 years, maybe 200. I don't know. It goes way back.

The effects of ionizing radiation on bone marrow function certainly go back to the 1940s and possibly well before that.

The knowledge of the various leukemias certainly goes back in some cases 30 or 40 years with suspicions regarding causal associations sometimes going back to before that. So as we go down disease by disease, we know different things and have known them for varying lengths of time. We know enough to say that it would -- that the various bone marrow diseases are different diseases and should not be lumped together in one study that is designed to examine their causes.

Q Well, if I told you that I want to know everything there was to know about bone marrow diseases and their relationship to gasoline, how would you do the study?

A I would advise you to do a cohort study in which you could study many separate outcomes.

Q Okay.

A And I have already given you the essential design el ments of that study.

Q How many people would you have in the study?

A That would depend on the incidence rate of each of the diseases we wished -- of each of the outcomes that we wished to study. And for a very common disease, we might get away with a few hundred people. For a very uncommon disease, we might need many tens of thousands or hundreds of thousands.

Q Well, for rare diseases that you've told me leukemias are, how many would you need in the study?

A I have to make ballpark estimates since I can't do those calculations here as we sit.

The published cohort mortality studies suggest that to have reasonably stable SMRs for each of the major types of leukemia, we certainly need at least a few hundred thousand person years of observation. So that's some tens of thousands of people followed for 20 or so years.

Q A few hundred thousand?

A Person years of observation.

Q Person years?

A That's the product of the number of people times the number of years they're observed.

Q Give me an estimate of the number of people

that that would include.

A I think I've answered that. I said some tens of thousands followed for 10 to 20 years.

Q Okay. Has such a study been done with respect to CLL and CML?

(The witness perused documents.)

A Yes.

Q Okay. What's the name of the study?

A "An Epidemiological Survey of Eight Oil Refineries in Briton", by Rushton and Alderson.

Q Rushton, R-U-S-H-T-O-N?

A Yes.

Q Okay. Any other ones?

(The witness perused documents.)

A That is by far the largest and to my knowledge, there is not another one that's even close in size.

Q Okay. Could I see that one, please?

(The witness handed document to Mr. Nace.)

You gave me two different articles, didn't you?

A They both pertain to the same study.

Q Okay.

A In fact, if I might add, a third here is the most recent update on that study. It's a study of almost 35,000 men followed for almost 40 years.

Q Okay. And is this third one that you just gave me going to be an accumulation of the other two?

A It is derived from that same population of 35,000 people followed for 40 years.

Q Doctor, if I'm looking at this right, what it's telling you is that 95 percent confidence, either the people that worked in the refinery either were protected because they worked in the refinery, or they had relatively increased risk if they worked in a refinery, and that's all you can get out of that; isn't that true? I'm looking at what you highlighted.

(The witness perused document.)

A To what are you referring?

Q The orange highlight. Right here, for example, it looks like all lymphatic. If he was a 95 percent confidence, if the figure is .48, that means if you worked at the refinery, you're protected from getting leukemia. But if the actual answer is, 1.31 then you're at risk of getting leukemia.

A Well, I think you misinterpreted the findings.

Q Tell me why.

A Well, the SMR is 83 for all lymphatic leukemia mortality. And what that says is that there was a slight deficit of mortality due to that type of leukemia. The confidence interval tells us that we have little confidence that that is different from no association whatsoever.

Q Little confidence that it's different from no association?

A Right. In other words, that's -- basically, there's no association at all. There's no evidence of increased risk. The SMR is slightly less than 100, meaning it looks like a slight protective effect, but I have no confidence that that's not due to chance alone.

So the proper interpretation of that finding is there is no evidence of increased risk of lymphatic leukemia mortality in those refinery workers.

Q Would you agree with me that it's just as likely that the truth is that the 95 percent

confidence range is .48 to 1.31, that .48 could be the real finding and 1.31 could be the real finding?

A I don't understand that question.

Q Well, how do you know that the lower bounds or the upper bounds is more likely to be correct?

A I still don't understand the question.

Q All right. Why don't you put these back in there so you don't lose them.

Excuse me, I have one more question on that. Did that break down leukemias into CLL and CML?

A Yes, it did.

Q What table are you looking at?

A Well, you were looking at table six. Let me look to see if there's a more appropriate table to look at. In refinery workers, the correct table is table six. And it does give you SMRs for each of the four major categories of leukemia, ALL, CLL, AML and CML.

Q Well, okay. Can you tell us what the exposure was?

A This s a study of roughly 35,000 workers who were employed in eight oil refineries in the

United Kingdom. They would have had exposures to the chemicals that are handled in oil refineries.

Q Can you tell if they were washing their tools in gasoline?

A I cannot tell you that.

MR. NACE: I'm going to want to make a copy of both of these books.

MR. ESPOSITO: We can make them for you and send them to you.

MR. NACE: Well, I think I'll let her (indicating) make them for me. A couple have already been left out, so I think I'll let her (indicating) make them for me.

MR. ESPOSITO: We can make them so that he can --

MR. NACE: Well, I know you can, but I want to have them marked as exhibits, if I have to do it that way and have them make it for me.

So why don't you figure out how you want to do it. I'm going to take a quick break. I'm probably done.

(A break was taken off the record.)

BY MR. NACE:

Q It strikes me that some of these risk factors that we've been talking about for the various diseases were even known before Mr. Jordan was born.

A I don't know when he was born --

MR. JORDAN: You'll be lucky if you live this long.

THE WITNESS: -- so I can't answer that.

MR. NACE: Okay. All right. That's really all I have. I want to get these taken to her.

MR. ESPOSITO: We'll -- off the record. But I do have a couple of questions, so why don't we take care of that.

MR. NACE: Okay. Go ahead.

EXAMINATION BY COUNSEL FOR THE DEFENDANTS, BP EXPLORATION AND OIL INC., CITGO PETROLEUM CORPORATION, TENNECO OIL COMPANY, AND CROWN CENTRAL PETROLEUM CORP.,

BY MR. ESPOSITO:

Q Dr. Garabrant, Mr. Nace asked you some questions concerning your 26-B4 statement and specifically references to medical and scientific literature. And he asked you whether the term

"epidemiological literature" should be substituted for "medical and scientific". Is there anything beyond purely epidemiological literature that you are considering or using in reaching these conclusions?

A Yes. My -- the materials upon which I re y in forming my opinions include the epidemiologic literature, the exposure assessment literature, meaning industrial hygiene surveys, and other assessments of exposure to gasoline and benzene. A few toxicology references that discuss the uptake distribution and metabolism of benzene and references that could arguably called medical but non-epidemiological in that they represent case reports of various types of leukemia among benzene workers.

And so all of those areas of literature are within the things I reviewed. And almost everything I reviewed is in my two notebooks of references.

Q And the other item that Mr. Nace asked you about is a statement that the scientific evidence does not support the proposition that the three leukemias at issue were caused by gasoline or benzene exposure

from work as mechanics with the DPW. Mr. Nace asked if the word "scientific" might be replaced by the word "epidemiologic".

Is there anything beyond epidemiologic evidence that you looked at or considered in drawing that conclusion?

A Yes. My review of the literature included the exposure assessment literature because that is a critical part of understanding disease risks related to exposure, and it included some of the literature that deals with dermal absorption as well as inhalation absorption of hydrocarbon vapors.

I'm not sure if that fully answers your question.

Q Well, beyond the literature, did you also consider anything that was provided to you by other experts?

A Yes, I did. I considered the opinions of Martin Hawley, John Spencer, and Scott Strickoff in reaching my conclusions.

MR. ESPOSITO: That's all I have.

Is that it?

MR. NACE: Well, if I ask any more

questions, you'll probably come back and try to give him some more answers. So I won't ask any more questions.

No. The final thing I want to do is I want these taken into the custody of the Court through the court reporter. I want to have a set made, and she'll have it, not me. Just make sure we have a complete set.

MR. ESPOSITO: Well, we're happy to do that.

MR. NACE: Well, I know you're happy to do it.

MR. ESPOSITO: You can trust us.

MR. NACE: I have a client to represent --

MR. JORDAN: Is there some hint of impropriety here?

MR. NACE: I don't know. I don't --

MR. ESPOSITO: We're not --

MR. NACE: I'm not saying anything like that, but I also have a client and I want to do the right thing for my client which is have these taken by the court reporter around marked and made a copy of it.

MR. ESPOSITO: It's fine that you mark it.

I don't have any problem with her marking it.

MR. NACE: And I want them to make a copy.

MR. ESPOSITO: Why?

MR. NACE: Because I'm not going to sit here and go through everything today, unless you want me to sit here and go through them all today. I'll do that.

MR. ESPOSITO: No. But I've never had an experience, Barry, in my career, and I realize it's not as long as some, but --

MR. JORDAN: You guys are picking on me --

MR. ESPOSITO: -- we're --

MR. NACE: Well, let me just put it this way. Is there something wrong with the way I want to do it under the court rules?

MR. ESPOSITO: Well, it's primarily a cost oriented thing, so are you going to pick up the freight on that?

MR. NACE: I am for my copy. If you don't want a copy, you don't have to have it. It's up to you.

MR. ESPOSITO: Well, we do want to have it.

I think everybody in this room wants a copy.

MR. NACE: Well, then they'll pick up their own copy. Is there anything wrong under the court rules with the way I want to do it?

MR. ESPOSITO: I don't think there's -- well --

MR. NACE: I mean, the rules are the rules are the rules, and that's the way I want to do it. And that's not reflecting on anybody. I just want to have the court reporter do it.

MR. STERN: I don't think the court rules reflect whether or not you can take documents that belong to a witness.

MR. JORDAN: Just because --

MR. ESPOSITO: I mean, you're entitled to have copies of them, and we're happy to do it for you.

MR. JORDAN: There's nothing in the court rules that say the court reporter will take custody of everything and copy it because there was two names left off a literature bibliography. I mean, it doesn't make any difference to me. I don't know why I'm defending --

MR. NACE: I don't know why you were either.

MR. JORDAN: But I think it's important that there is no court rule that I know of that says the court reporter has to take custody of everything.

MR. NACE: Mark them as an exhibit. Then she takes custody of them. Make it exhibit 18 and 19.

MR. ESPOSITO: Well, I think -- we'll do as we stated. She can mark them. We'll copy them, and we'll get you copies --

MR. NACE: No.

MR. ESPOSITO: -- in the original,

MR. NACE: No.

MR. ESPOSITO: You can say no, and I can say yes, and we can be here a long time.

MR. NACE: We'll be here a long time, because I'm going to have her take what he brought in here and make copies of it.

MR. ESPOSITO: I am totally unclear as to why.

MR. NACE: Because that's the way I want to do it. I don't have to explain everything to you. I'm sorry.

MR. ESPOSITO: On something like that, I think you do. I think you do. I mean, I think that --

MR. NACE: I don't think I do.

MR. ESPOSITO: We can -- we brought this. We brought copies, or we can --

MR. NACE: You didn't bring any copies.

MR. ESPOSITO: No. We can provide you with copies --

MR. NACE: If you provided --

MR. ESPOSITO: -- a list.

MR. NACE: If you provided me with copies, we would have sat here and compared them. But as it stands now, I want her, the court reporter, to mark these Exhibit 18 and 19 and take custody of them.

MR. JORDAN: I personally --

MS. MILNAMOW: After the court reporter makes copies, can Dr. Garabrant have his originals back?

MR. NACE: Absolutely.

THE WITNESS: I just want my originals back.

MR. ESPOSITO: Right. I understand.

MR. JORDAN: Madam Court Reporter, how do you do this? He wants you to take those with you and copy them.

THE REPORTER: I can take them and take them to my office. They copy them. They're supposed to be attached to the original, but if you wanted special arrangements for them to be returned to someone, I'm sure we could do it that way.

MR. STERN: Why don't we stipulate that the originals will be returned to the deponent.

MR. NACE: I have no problem with that. I said that already.

THE WITNESS: Can I ask you a question? Can I tear out the pages that have writing and keep the pads of paper? Do you have a stapler?

MR. ESPOSITO: You're entitled to keep those.

MR. JORDAN: They've already been copied.

THE WITNESS: Oh, you mean I can keep, just keep these exhibits?

MR. JORDAN: Yes.

THE WITNESS: Oh. I thought I was giving

these up.

MR. NACE: Let me make it clear on the record. I want her to keep a copy of all of the exhibits that we've had copied so far, The original that the witness has can go with him right now. I don't have any trouble with that. Attach a copy that you have been given here to the deposition. And I want you to do the same thing with these two new exhibits, 18 and 19. Make a copy. Attach a copy to the deposition and return the original to counsel.

MR. JORDAN: Madam Court Reporter, do you charge anything to copy? You just copy them and just charge a page copy?

THE REPORTER: Charge a page copy.

MS. MILNAMOW: And how much is that?

THE REPORTER: It's $1.00 Per page for the initial copy, which would be billed to you (indicating), and it would be $.50 -- all of our exhibits are $.50 a copy.

MR. ESPOSITO: Well, why don't we just have all that billed to Mr. Nace, if he's going to be insistent on that.

MR. JORDAN: $1.00 a page?

THE REPORTER: For him. $.50 a page for the rest of you.

MR. JORDAN: $.50 a page. I mean, that's highway robbery.

MS. MILNAMOW: Yeah, but if he's got -- for us, he'll get the originals back. We won't order a copies of these.

(A brief discussion was held off the record.)

(Garabrant Exhibits 18 and 19 were marked for identification purposes.)

(Thereupon, proceedings concluded at 5:35 p.m.)

* * *

I have read the foregoing pages 1 to 255 which contain a true and correct transcription of the answers made by me to the questions therein recorded.

DR. DAVID H. GARABRANT

CERTIFICATE OF NOTARY PUBLIC

I, Elizabeth A. Jones, the officer before whom the foregoing deposition was taken, do hereby certify that the witness whose testimony appears in the foregoing deposition was duly sworn by me; that the testimony of said witness was taken by me in stenotype and thereafter reduced to typewriting under my direction; that said deposition is a true record of the testimony given by said witness; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this deposition was taken; and, further, that I am not a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of the action.

_____
Notary Public in and for
the District of Columbia

My Commission Expires: