COMMONWEALTH OF PENNSYLVANIA

PUBLIC UTILITY COMMISSION

ORIGINAL

7

Letter of Notification of Philadelphia Electric Company relative to reconstructing and rebuilding of the existing 138 kv line to operate as a Woodbourne-Heaton 230-kv line in Montgomery and Bucks Counties.	:	Docket No. A-110550F055
Further hearing.	:	

Pages 736 through 962

Room 1306
State Office Building
Broad & Spring Garden Streets
Philadelphia, Pennsylvania

Wednesday, October 16, 1991

Met, pursuant to adjournment, at 10:10 a.m.

BEFORE:

HERBERT SMOLEN, Administrative Law Judge

APPEARANCES:

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C O N T E N T S

E X H I B I T S

P R O C E E D I N G S

ADMINISTRATIVE LAW JUDGE SMOLEN: This is a further hearing in Docket A-110550F055.

I note for the record that the appearances remain the same as yesterday's hearing, except that Jesse A. Dillon, Esquire has entered an appearance on behalf of PP&L, an intervenor.

Before proceeding with the regular evidentiary portion of the hearing, I want to state for the record that under date of October 3, 1991, received in this office on October 7, 1991, the Administrative Law Judge received a letter from an attorney representing Langhorne Borough, in which the position of Langhorne Borough is expressed.

As is customary, such letters are placed in a special documents folder in each case, which contains letters in general from the public, expressing views on matters before the Commission.

And the special documents folder is created in this type of case as well as others where there are various letters.

I do note that there is no notation in this letter that copies were served on the parties of record.

I am going to issue a ruling in writing directing that this letter be placed in the special documents

folder in this case, and also directing counsel who sent this letter, the attorney who sent this letter, to serve it on all parties.

I may also have other items in that order pertaining to this letter.

Having stated that, let's proceed with the witness, Mr. Sugarman.

MR. SUGARMAN: Thank you, Your Honor. I would like to call Dr. Liboff at this time.

JUDGE SMOLEN: All right.

Please take the stand, Dr. Liboff.

Whereupon,

ABRAHAM R. LIBOFF

having been duly sworn, testified as follows:

JUDGE SMOLEN: Please take a seat, and state your name.

THE WITNESS: My name is Abraham R. Liboff, L-I-B-O-F-F; I reside at 345 Berwyn Road, B-E-R-W-Y-N Road, in the city of Birmingham, Michigan.

JUDGE SMOLEN: Thank you.

Mr. Sugarman?

MR. SUGARMAN: Thank you.

DIRECT EXAMINATION

BY MR. SUGARMAN:

Q. Dr. Liboff, have you prepared testimony in connection and for the purposes of your testimony here today and submitted it in writing to the Public Utility Commission?

A. Yes, I have.

Q. I show you a document entitled Testimony Submitted to the Pennsylvania Public Utility Commission.

MR. SUGARMAN: And I'll ask that it be marked as Liboff Statement 1.

JUDGE SMOLEN: So marked for identification.

MS. McCLOSKEY: Your Honor, could we mark this Protestant's Statement 2?

JUDGE SMOLEN: Well, it may be easier for record reference. Let's mark it Protestant's Statement 2. I think the first one was marked --

MS. McCLOSKEY: Protestant's Statement 1.

JUDGE SMOLEN: All right. Then let's make this Protestant's Statement 2.

(Whereupon, the document was marked as Protestant's Statement No. 2 for identification.)

(Document handed to witness.)

BY MR. SUGARMAN:

Q. Dr. Liboff, is Protestant's Statement No. 2 a statement which you prepared in preparation for your testimony here today?

A. Yes, it is.

Q. And is it in fact the testimony that you would give today with -- well, let me ask you this. Are there any additions or corrections that you wish to make to that statement?

A. This statement basically moves through an area that deals with the research that has been conducted in this field.

The only thing it lacks is perhaps some material on the state of the funding of research in this field, which I have at other testimonies provided to similar bodies.

Q. And have you in your deposition last week described your testimony in that area to counsel for PECO?

A. I believe I did. I haven't seen the testimony since it was --

MR. SUGARMAN: Your Honor, we don't have the transcript of Dr. Liboff's deposition from last Wednesday, although we had ordered it expedited. I understand that PECO has it, but we don't have it.

We did have a call from the court reporter on Monday stating that she was going to mail it to us Federal Express, but we haven't received it.

JUDGE SMOLEN: All right.

BY MR. SUGARMAN:

Q. I'm going to show you a document.

(Document handed to witness.

Is this testimony that you presented or prepared in connection with an appearance before the Wisconsin Public Service Commission?

A. Yes, this is an additional few paragraphs that relate some of my attitudes towards the research funding in this area of bioelectric magnetics research.

Q. And is that the additional testimony which you stated to Mr. Smith, who examined you on behalf of PECO, that we intended to offer as an addition to your testimony here this morning?

A. Yes.

Q. Now, with that additional page --

MR. SUGARMAN: And, Your Honor, I need copies of it for everybody.

JUDGE SMOLEN: Is there a problem with this funding matter?

MR. WATSON: Your Honor, I don't know what this particular document says. The subject matter was brought

up in the deposition, but --

JUDGE SMOLEN: Hasn't it been supplied?

MR. WATSON: But this particular piece of paper, I have never seen it.

MR. SUGARMAN: Your Honor, Dr. Liboff brought it with him this morning from Michigan. The substance of it was described to PECO in the deposition last Wednesday. And at that time we told them that we would supplement the testimony with that.

JUDGE SMOLEN: Well, why don't you show it to him, and we'll see what Mr. Watson has to say.

(Document handed to Counsel Watson.)

(Pause.)

JUDGE SMOLEN: Go ahead, Mr. Watson, we're on the record.

MR. WATSON: I believe what occurred in the deposition was that Dr. Liboff was asked whether this was a complete copy of his testimony that was prefiled according to Your Honor's Order.

And I think he said that to the best of his ability right then he thought that it was.

Then he was asked, is the copy of your testimony that you have in front of you, is that the copy that was provided to you by Mr. Sugarman, and he says that is mine.

Then the question was asked, does it have a page seven. He says no. And then Dr. Liboff asked were you interested in the same areas that had been the areas that might have been left out.

And the next thing is Mr. Sugarman -- there's some exchange that's not too clear. Mr. Sugarman says he'll reserve ten minutes at the end of the deposition to ask him about it if we don't want to.

And so at that point we asked him about it. And then he talks a little bit about the subject matter of this, which was mainly relating to funding, although it adds a whole bunch of conclusions here.

JUDGE SMOLEN: Do the conclusions differ in any respect, in your view, with respect to the prepared testimony?

MR. WATSON: I don't know, Your Honor. I think I'd have to go through this. I mean, it's a full page of text. And I think we'd have to go through and check and see what's new and what isn't.

I gather this is material that is added after the original filing for some purpose. I don't know why it wasn't in there before.

JUDGE SMOLEN: Well, again, not having seen it, and I don't want to see it yet, and no other counsel have seen it yet, is the topic funding for research as far as

you know?

MR. WATSON: Well, that is a topic, but there are a lot of other statements in here, conclusions that I think go beyond funding. And we just need time to address it.

I mean, the fact that it was inquired into during the deposition, or brought up by them during the deposition, and one question was asked, we just don't have the chance yet to compare and see what's in it now.

JUDGE SMOLEN: Are you suggesting that we defer this until later in the day?

MR. WATSON: Depending on how much time we have, yes, Your Honor.

I think what we would like is at least an opportunity to read this, to compare it to what's in the deposition, to develop whatever cross examination questions we may have about it.

And I don't know whether we can do that today or not. I guess it depends on what happens during the remainder of the day.

JUDGE SMOLEN: Well, we have Dr. Liboff here for today.

MR. WATSON: Yes, Your Honor. If this had been prefiled, we wouldn't have any complaint.

JUDGE SMOLEN: I understand. It is a problem.

MR. WATSON: And if this had been given to us in this form last week we wouldn't have at least as much of a complaint.

But the problem is, just seeing it for the first time it's hard to evaluate it right here on the spot.

JUDGE SMOLEN: Any suggestions? Go ahead, Mr. Sugarman.

MR. SUGARMAN: Your Honor, I had a question --

MR. WATSON: I had one other piece of information on this, if I could.

JUDGE SMOLEN: Go ahead.

MR. WATSON: It may have been difficult to find this, so I'm not faulting anyone. But just in terms of timing, we were asked if we could have a copy of whatever the Wisconsin testimony was, which I gather this is an excerpt from some testimony in a case in Wisconsin. And I think Dr. Liboff kindly offered to do it if he could find a copy in his office. But I believe they weren't at his office at the time, so we ended up not getting it and not seeing it until now.

JUDGE SMOLEN: Go ahead.

MR. SUGARMAN: Your Honor, what the history of this is is that Dr. Liboff, I think, can speak for himself, but he intended to give this testimony as a part of the written testimony, and somehow it got deleted.

Mr. Smith is the one, and Mr. Bonney are the ones that called it to our attention by asking us --

JUDGE SMOLEN: I understand. But that's a deposition. A deposition is not a hearing.

MR. SUGARMAN: No, no, I'm only going to this point; that they asked us not just at the deposition but also in writing, was the testimony complete. And Dr. Liboff figured out when he went back and looked at it that indeed that page had not been included.

Now, the implication that I draw from that is that since they asked the question several times, is the testimony complete, that they were aware. Because Dr. Liboff has given --

JUDGE SMOLEN: Well, they may be aware, but not aware of what was going to be said.

MR. SUGARMAN: No, I mean of this very testimony, is what I'm saying.

JUDGE SMOLEN: Mr. Sugarman, you know Counsel on discovery may ask loads and loads of questions, and indeed to ask loads and loads of questions. That doesn't mean that they intend to introduce of record the items about which they ask.

MR. SUGARMAN: That's true. But Dr. Liboff did give them notice last Wednesday of not only what the subject matter was, but also what his opinions were, and

gave them a paraphrase of what is that additional page.

And again, I'm disadvantaged that I don't have the transcript of that deposition although I ordered it, and PECO has it.

So I can't directly respond to what they're saying about the deposition. I was hoping I would have it by yesterday. I didn't know they had it until this morning.

And so to respond to what they're attributing to the transcript, I would suggest that we put in Dr. Liboff's statements in the transcript of the deposition in lieu of that page on that subject. Because I know that he paraphrased that page. And they can't say they didn't have that.

MR. WATSON: Your Honor, in the first place, we're not saying anything about what the deposition says about this, because we haven't had a chance to prepare what Dr. Liboff said, and it would take some time to do that.

Secondly, we asked him a standard question, is this your testimony, is this your complete testimony. It's a standard deposition question to see if somehow we didn't get a copy of something that was filed, or whatever, or missed something.

And we had no knowledge that the testimony was incomplete, and we had no way of knowing. I mean, it's not testimony that we had any contact on other than just

receiving it dated August 28th, and there's been a long time to have found that there was something missing. It certainly could have been supplied. We could have taken it into account during the course of this.

JUDGE SMOLEN: What I'm going to do is I'm going to defer ruling on this at this time, and we're going to take the original statement, Protestant's Statement No. 2, which consists of six pages of testimony, and I'm going to give Mr. Watson an opportunity, and his associates an opportunity to look at it, and we'll deal with it later in today's proceeding.

MR. SUGARMAN: Your Honor, can I just take a minute off the record to get the name of the court reporter so that we can contact her and find out why we're not getting the transcript?

JUDGE SMOLEN: Yes, sure.

MR. WATSON: I might say, Your Honor, just to note --

JUDGE SMOLEN: All right, let's stay on the record then.

MR. WATSON: Yes. I got a phone call from the court reporter on Friday night at home, somewhat panicked, saying she was not able to complete the transcript, and what should she do. And I said you should work to complete it, and Fed-Ex what you can to us.

So we got part of the transcript sent to us by Fed-Ex, which arrived in our offices on Saturday. And I asked her to call me on Saturday; she did.

And I asked her when she completed to go out to the airport and to put it on one of these package expresses, and then it came in Saturday night about eleven o'clock.

And I don't know what other arrangements she may have made, but that's the arrangements we made to get our copy.

JUDGE SMOLEN: Thank you.

Let's proceed now with the witness.

MR. SUGARMAN: Thank you, Your Honor.

BY MR. SUGARMAN:

Q. Now, Dr. Liboff, with the exception of page seven, which is being deferred at this time --

MR. WATSON: Excuse me, Mr. Sugarman, I'm sorry to interrupt, but this would be a better time. Could we get a copy of that?

(Document handed to Counsel Watson.)

MR. SUGARMAN: We need to make copies of it, because it's the only one we have here.

MR. WATSON: This is the only one?

MR. SUGARMAN: That's the only one we have here, yes. We need to make copies of it. But you can have it.

JUDGE SMOLEN: There's a machine here.

BY MR. SUGARMAN:

Q. Dr. Liboff, with the exception of page seven, which is being deferred at this time, is Protestant's Statement No. 2 your testimony that you would give here orally today if you were to testify on direct examination orally?

A. Yes, it is.

Q. And do you, in fact, adopt it as your testimony?

A. Yes.

MR. SUGARMAN: Your Honor, I would move that Protestant's Statement No. 2 be admitted as Dr. Liboff's direct testimony.

JUDGE SMOLEN: It's admitted subject to any timely motions which may be made.

MR. SUGARMAN: Thank you, Your Honor.

(Whereupon, the document marked as Protestant's Statement No. 2 was received in evidence.)

MR. SUGARMAN: At this time, Dr. Liboff is available for cross examination.

JUDGE SMOLEN: Mr. Watson.

MR. WATSON: Thank you.

CROSS EXAMINATION

BY MR. WATSON:

Q. Good morning again, Dr. Liboff.

A. Good morning, Mr. Watson.

Q. I've certainly heard of you, so it's good to meet you.

A. Likewise.

Q. To talk about this interesting subject.

I'd like to begin with a few questions about your background, which is the usual starting point.

Your bachelor's degree was in physics, is that correct?

A. That's correct.

Q. And I guess you're one of the first witnesses in this area. For the record, can you tell us what physics is basically the study of?

A. It's the application of a body of principles that go back to Newton's time and are still being gathered to all phenomena in nature.

Q. Basically, what does it explain?

A. It explains mostly fundamental principles. That is to say, principles that are perhaps more basic than questions of application, in the sense that the physics community normally moves towards explanations

that are global as opposed to, for example, engineering applications, or applications in chemistry.

Q. Is it an experimental or a theoretical science?

A. It is certainly both, judging from the great physicists of the nineteenth and twentieth centuries especially. They're equally important, the theoreticians as well as the experimentalists.

Q. Talking about more global ideas as distinguished from applications; for example, the law of gravity would be a global idea compared, say, to a particular piece of machinery might work? Is that the kind of distinction you're drawing?

A. That's what I'm trying to say, that one can express laws in simple statements like Newton's Law of Gravity or $E=MC^2$.

And to the extent that one can do this in ways that encompass everything under that area, this becomes one of the missions in physics, as it were; as opposed to, say, designing a clock, which might vary, depending upon machine skills and other things.

Q. Okay. Now, physics has some areas of specialty within that larger field of study?

A. That's certainly true.

Q. For example, is there an area called

astrophysics?

A. There is an area called astrophysics. And if I could list, geophysics, nuclear physics, atomic physics, solid state physics, which is now known as condensed matter physics.

There are subdivisions relating to biology in biophysics; there are areas in medicine now called medical-physics.

It basically has to do with how many areas the physicist is interested in trying to explain.

Q. So it covers a wide variety of subjects?

A. Well, the physics community has been accused of being one which looks at all areas. And I think that to an extent that's true. The only area we haven't gotten into is economics.

Q. That's probably good, for a lot of reasons.

(Laughter.)

A. For us too.

Q. Okay. Now, you have also, beyond the degree, an advance degree, or two advanced degrees in physics? You have a master's degree in physics?

A. I have a master's degree in physics, and I also have the Ph.D.

Q. And that's also in physics?

A. That's also in physics, yes.

Q. Now, these bachelor's, master's and Ph.D.'s, are they in -- does your degree say physics, or does it say something like astrophysics or nuclear physics, or do they just say physics?

A. All three degrees are physics.

Q. They weren't, for example, biophysics or atmospheric physics, or any of those?

A. That's correct.

Q. Now, just exploring further in the outset here, areas which you've had courses of education, have you taken courses beyond the undergraduate level in the field of immunology?

A. I have not.

Q. Teratology?

A. I have not.

Q. Molecular genetics?

A. No.

Q. Cellular biology?

A. No.

Q. Pathology?

A. I have not.

Q. Epidemiology?

A. No.

Q. Biochemistry?

A. I've sat in on a course on biochemistry, but I

have not taken it, I think, in the spirit of what you're saying. It was not formally taken.

Q. Okay. Oncology?

A. No.

Q. Have you had any courses beyond undergraduate courses in biology?

A. That's a -- I have taken courses in biophysics. And of course I teach biophysics.

Q. Now, I believe you said in your testimony that you're director of the medical-physics program at Oakland University?

A. That's right.

Q. And Oakland University is located where?

A. About twenty or thirty miles north of the city of Detroit, in Oakland County.

Q. So the Oakland is a name associated with the county, it doesn't have anything to do with the city in California that we know better.

A. No, it's in Michigan.

Q. An independent university?

A. It's a state university.

Q. A state university. Does Oakland University have a medical school?

A. It does not.

Q. And I think it's pretty clear, but for the

record, you're not a medical doctor?

A. I am not an M.D., that's right.

Q. Now, are any of the faculty members in your medical-physics program, are they medical doctors?

A. Well, you'll have to be more specific about what you mean by faculty members.

Q. People that are just on the faculty of that particular program, listed, paid for by the school.

A. Well, if we take the list of people that are on our faculty, we have a number of M.D.s.

Q. But full-time professors --

A. Yes.

Q. -- in the medical program, are any of them M.D.s?

A. Yes.

Q. We may have some confusion here. Do you recall at your deposition being asked about the medical-physics program --

MR. SUGARMAN: Would you show it to him, please?

MR. WATSON: Yes, I'll be happy to.

THE WITNESS: Well, I recall the question. It's not necessary to bring the document to me.

BY MR. WATSON:

Q. Yes, there's just some confusion here.

MR. SUGARMAN: Would you show him the transcript,

please?

JUDGE SMOLEN: Show him the transcript. Whether the witness wants to see it or not, present it to him.

(Laughter.)

BY MR. WATSON:

Q. Dr. Liboff, you're going to have to look at this whether you want to or not.

(Laughter.)

(Document handed to witness.)

Q. I just want to clarify this here.

JUDGE SMOLEN: Well, let's have the question out loud, if you want to ask one.

MR. WATSON: Well, I was just going to show him where it was, and then I'll ask him the question.

JUDGE SMOLEN: All right.

(Pause.)

THE WITNESS: I'm distinguishing in my answer between those people who are members of the physics department and those who are members of the medical-physics faculty.

You asked me in your question, I believe, how many people who are on the medical-physics faculty are M.D.s.

We have a physics department in which there are no M.D.s. But the physics department cooperates with both Henry Ford Hospital and William Beaumont Hospital and

Sinai Hospital, and there are individuals at these hospitals who are radiation oncologists, neurosurgeons, neurologists and the like, who are full professors on our faculty. But not the physics faculty.

BY MR. WATSON:

Q. Okay.

A. They are professors in our medical-physics faculty.

Q. And do they work full time on the medical-physics faculty?

A. No, they do not.

Q. Okay. Now, in your testimony, Dr. Liboff, I believe you make reference to doing work for the U.S. Navy and the Sylvania Corporation on magnetic materials.

A. Yes. The navy work was initiated in 1948, and the work at Sylvania, I believe -- I'm not sure of the exact date. It was 1950 or '51.

Q. All right. Well, I was just going to ask you, did that work involve biological materials?

A. Not in any way.

Q. Now, I assume, Dr. Liboff, that, given your work and area of research, that you are familiar with the scientific concept of replication?

A. Yes.

Q. I'm sure this may sound a bit fundamental to

you, but I believe you may be the first witness who is talking in this area, so I'm going to ask you a few questions about this just to get the basics down and on the record.

JUDGE SMOLEN: You're doing it to educate the judge, which is good.

(Laughter.)

JUDGE SMOLEN: And other counsel.

MR. SUGARMAN: And other counsel, Your Honor.

BY MR. WATSON:

Q. Dr. Liboff, if laboratory reports an experiential result, and then a second laboratory does the same experiment and finds the same result, in basic terms, is that what is known as replication of an experiment?

A. That's a very complex question. And I think if you wanted me to explain it I would explain it perhaps differently.

So the mere -- let's use replication without quotations. The mere replication of an experiment from one laboratory to the next does not necessarily fulfill the demands of what scientific replication are about.

One of the keys, I think, in scientific replication, in the larger sense, has to do with a large picture, not a specific experiment.

The problem with specific experiments is that they

almost -- it's impossible for one laboratory to replicate another experiment in terms of all the necessary experimental parameters.

You would have to go down to the time of day and the temperature and the people walking in the street, and a hundred and one parameters that no one knows when they do an experiment are important or not.

So the concept of replication is a much more complex thing than merely doing an experiment or repeating it.

Because I can say I repeated somebody else's work, but this doesn't necessarily mean that I followed the protocol completely.

So what people, especially in the biomedical area, do -- because in the biomedical area this is a more important thing usually than in the physics area.

What they normally do is that they will spend considerable time giving the methods -- I'm sorry, not the methods. I have a cold, which you probably can see.

JUDGE SMOLEN: Don't replicate it over here.

(Laughter.)

THE WITNESS: I desperately want to give it away though.

(Laughter.)

THE WITNESS: In the biomedical area especially,

the experimentalist laboratory worker will normally, when the data is presented, provide as many details about the way in which the experiment was done, with the hope that somebody in Asbershon [phonetic] or China, whatever, who wishes to replicate it can then look at the original document and proceed to replication.

But on the other hand, I have seen articles in which the work "replication" was used in the title, where if you read the article carefully it was obvious that the people who claimed they were replicating the original experiment missed something which to me seemed obvious. So it's a sometimes thing.

But where it comes out is in -- where it really becomes much clearer is when there is a body of work and you can add up the pluses and minuses and see the net effect in a larger sense.

BY MR. WATSON:

Q. I think I understand. Let me see if I can get it a bit clearer for me in practical terms.

To truly replicate something you would have to have all of the conditions the same, is that right?

A. Yes.

Q. Sure. But I think you're also saying then that scientists have some -- they also use the work in general terms sometimes, not with that precise definition

in mind, where they basically repeat as close as they can to the experiment.

And they sometimes refer to that as replication, although technically it doesn't meet that standard, is that right?

A. Well, it becomes almost a matter of advocacy as opposed to truth. Because it depends what side of the fence you're on.

If you're in the camp of those that believe that the original effect is true, then you will normally, very often, claim that the failed attempt at replication is not really replication.

On the other hand, if you're among those who are trying to argue against an original experiment of some sort, then your experiment, aimed at trying to replicate, quotes, may turn out to be negative. And because of that, this can be used as argument against the original experiment.

So some of the thinking that goes into what happens at the beginning of a scientific time when there is a development of new concepts, of new paradigms, or new discoveries, is often laced with arguments which are pro and con, depending on which camp people are in. It's very close to politics.

Q. Are there situations where even though there

wasn't an exact replication in the terms you first described, where everything was exactly the same, the experiment was done at one time and place, and then another experiment was done at a later time and place, and there might have been some differences known or not known, but you basically still got the same results; and maybe then in a third place you still again got the same result. Has that also happened?

A. Yes. I gave an example, as I remember, in my deposition relating to that there's a famous experiment called the calcium efflux experiment, which was initiated by a group of people at Dr. Adey's laboratory in California in 1973 or four, which involved the loss of calcium ions from sliced chick brain tissue.

And in the course of that experiment there was an efflux of calcium that was observed as a result of applying a specific field.

This experiment, when it was done again by another group, it resulted in an influx of calcium

Now, coming back to this question of advocacy, what happened there was that some people took the fact that an influx of calcium occurred as opposed to an efflux to argue against the believability, or credibility of the first experiment.

There were others, myself included, who felt that

if the first experiment was done carefully, and the second experiment was done carefully, then one conclusion that could be drawn is that there were changes in the calcium which might manifest themselves as either influx or efflux.

What I'm suggesting is that* one of the things that's happened in the bio-electromagnetics community is that a number of the conclusions that are drawn by the people who do this work is very often analyzed in details which take away from the basic evidence showing that there is an effect, and instead what one finds is that these experiments are held up to criticism, saying, well, we didn't see the efflux, we saw an influx. This is a moot point to me.

I'm not sure if that answers your question, but it gets at the question, I think, of to what extent replication occurs in these cases.

Q. So what you're saying there in part is, don't look too carefully at the details of the experiment. Is that the message?

A. No, no, no, no, no. I would never say that, of course. One has to look as carefully as one can, with as large a magnifying glass as you possibly can muster.

What I'm saying is that the conclusions by those who advocate there are no effects will very often take

the guise of looking at an experiment and saying that because it didn't go exactly the same way in the second experiment as it did the first time, therefore there must be something wrong with all the experiments; as opposed to the concept that says when you apply a field and you see an effect, whether it's a plus effect or a minus effect, this is indicating of something happening. That something happening is the critical thing.

Q. Now, what about people who might argue for some particular effect? Did they do the same thing?

A. Yes. There is no question about in looking at particular effects, there's also a spectrum of possibilities of results that will also result in differences of opinion in the same way.

Q. So they may be advocating that there's a particular effect, and then a follow-up study comes along that doesn't find an effect, and they point to the detailed differences and say, this is not a replication of my study, and therefore you haven't shown that there is no effect? Has that happened?

A. You've stated it very well.

Q. Now, do attempts at replication, in sort of the broad use of that term as you've described it, sometimes reveal flaws in the original experimental design or controls?

A. I'm not sure I understand your question. Let me ask it -- let me answer it --

Q. Let me try to rephrase it and see if I can be more specific.

A. Yes.

Q. In the interest of time I'll try to ask better questions.

Are there situations where an experimenter may do a piece of research, then a second experimenter may do the research and learn something about the process of doing this research where he might discover that a mistake was made in the first experiment, in the design of it or the controls?

A. That certainly occurs, yes.

Q. You learn something doing it the second time sometimes then?

A. Not only that, if I can expand on what you're saying, the second time an experiment is done it's usually done better than the first time.

I think the sort of experimentalist who claims to replicate an experiment, and then tries not to go beyond merely replication, is in a sense wasting the effort.

If a person is trying to replicate something, that person, a scientist normally would try to go beyond the first experiment.

So the learning process is more than just finding flaws in the first experiment, but it is refining the experiment to a greater degree.

The one who does the experiment first is normally the one who doesn't use all the available skills and techniques, and whatever, because that first person is the one that's breaking the ground.

The other individuals, of course, already have the road map provided by the first person, so they can afford to use an Accura instead of a Chevette, or something.

Q. And would it be a fair implication from what you're saying that when we have more than just two or three experiments on a particular subject, when we have more than that we're likely to know more about the subject and the association, if any, between what was studied and the results?

A. Yes, Mr. Watson, this goes to what I mentioned earlier, that in the way science moves you need a body of work to make decisions.

Q. Thank you, Dr. Liboff.

MR. WATSON: Was that good for a starting point, Your Honor? I'm going to just cut to something else.

JUDGE SMOLEN: Off the record for a moment.

Tp 1-B

(Discussion off the record.)

JUDGE SMOLEN: All right, back on the record.

Go ahead, Mr. Watson.

MR. WATSON: Thank you, Your Honor.

BY MR. WATSON:

Q. Then Dr. Liboff, I'd like to ask you now to help us a little bit with some of the background information about the fields that you discussed in your testimony.

This transmission line would create what are known as 60-Hz sinusoidal fields, is that correct?

A. That's correct, yes.

Q. And that's S-I-N-U-S-O-I-D-A-L, is that correct?

A. Yes.

Q. All right. Now, there are also kinds of fields known as pulse fields, is that correct?

A. That's correct.

Q. Now, this transmission line will have 60-Hz sinusoidal fields rather than pulsed fields, is that correct?

A. In principle it will, yes. This is not to say that with improper operation you may have transience or glitches or pulses that the engineers recognize.

Q. Now, basically, sinusoidal fields and pulse fields have differences in their characteristics, is that right?

A. Yes, they do.

Q. Now, would it be accurate to say -- correct me if I'm wrong -- that pulse fields and sinusoidal fields are different at least in one way in the sense that a pulse field will contain many frequencies in it?

A. That is an accurate statement.

Q. And so some of the fields that are in a pulsed field could be at frequencies that are higher than lower than 60 Hz?

A. If it's a pulsed field, there will be a spectrum of frequencies which are higher than 60 Hz; include frequencies which are higher than 60 Hz.

Q. Could they also be lower?

A. It depends upon the repetition rate of the pulsed signal. If the pulsed signal was being repeated, not replicated but repeated, say, at 10 Hz, such that it went on and off every tenth of a second, you would also have a frequency that would be dominant in the free analysis that would be of 10 Hz.

So you would have a frequency less than 60 Hz also.

Q. Okay. What if we had a pulsed field with 60 repetitions per second, would that be exactly the same as a 60-Hz field?

A. Exactly the same, no.

Q. Would there be frequencies higher or lower than 60 Hz in that --

A. There would be --

Q. -- pulse?

A. If it was repeated at 60 Hz, but not at lower frequencies, one would find a 60-Hz frequency, the sinusoidal frequency, plus a whole host of frequencies that were different than that.

Q. When you say different, could you give us some examples on the up and down side?

A. I don't know the --

Q. A range.

A. Well, that would depend upon how much rise time, that is to say how quickly the pulse reaches the maximum and it falls again.

The rule of thumb is that the faster the rise time in a pulse the higher the frequency components that will be present.

So that the one example that people in the bioelectromagnetics area are very conscious of are the pulsed signals that are supplied by a company called Electro-Biology, Incorporated that's used for various biological applications and medical applications.

And I think I gave a number in the deposition. I don't know what it was. It was probably of the order of

100 kHz, or something like that.

Q. A hundred to 400 kHz for the EBI sound about right?

A. That sounds right, yes. They claim for entrepreneurial reasons that they also have frequencies that are higher. But people have looked at that don't find frequencies higher than, let's say, half a millihertz.

Q. And we have experiments, would it be fair to say, in this area using both 60 Hz fields and using pulsed fields; is that fair to say?

A. If you wanted to make the comparison which I think you -- if I can correct you, perhaps, in terms of your question, what we have are sinusoidal applications and pulsed applications.

Because the 60 Hz by itself is not really, it doesn't translate into a comparison. It's the sinusoidal and the pulsed fields.

Q. So we have --

A. The sinusoidal -- excuse me, Mr. Watson.

Q. Excuse me.

A. -- include frequencies which include 60 Hz. The sinusoidal fields that you're talking about include fields which have frequencies of 60 Hz. But there are others.

Q. Okay. And how would those compare to pulsed

fields?

A. In what regard?

Q. In terms of the frequencies that are present.

A. They would bear the same relationship as the discussion we've just had concerning the limitation of a 60 Hz sinusoidal wave to a specific frequency, 60 Hz, as compared to a spectrum of frequencies that is included in the pulsed signals.

Q. So for example, if I were going to look at an experiment in this area, I'd look down to see what type of field was used -- again, based on what you say, I'd be well-advised to determine whether it's a 60 Hz field as distinguished from the pulsed field before I went further?

A. It depends.

MR. SUGARMAN: I object to that question, because you said a study or experiment in this area. And I think "in this area" is too broad. I don't know what it means. This area of what? E/MF?

MR. WATSON: Well, I thought the witness understood --

MR. SUGARMAN: Well, he may be making an assumption, is my concern. And I think that the question is objectionable, because the witness should be asked the question -- or he doesn't have to make an assumption as

to what "this area" means. It's easy enough for you to define what "this area" is.

JUDGE SMOLEN: Mr. Watson, would you clarify the question, or maybe you want to restate it.

MR. WATSON: I'll clarify it to refer to experiments in which something is exposed to 60 Hz fields or pulsed fields.

JUDGE SMOLEN: Does the witness understand the question?

THE WITNESS: Yes, I do.

JUDGE SMOLEN: All right. You may answer it.

THE WITNESS: My question to your question was, in what regard. In other words, the difference between the sinusoidal exposure -- let's call it the sinusoidal exposure; this is the term that many experimentalists use -- as opposed to a pulsed exposure, is manifest in the way you've described it.

There are obviously signals which basically are totally different in the way you design them. But they're not completely different.

Because in both cases they do provide -- for example, electromagnetic energy that is impinging on the system.

If I can just take a minute of the Court's time, I can say that in the microwave area, which I know we're

know we're not talking about here, it has been common to compare sinusoidal signals, say at very high frequencies, and pulsed signals.

Because the thing which is the most important thing is, say, the total energy absorbed. It doesn't matter as much in these cases at very high frequencies what the shape of the signal is, because what people believe is important is the total amount of energy that's supplied to the biological material being exposed.

And the ELF area, in the 60 Hz area, we still don't have a good feeling as to what it is that is the mediator or the interactor of these effects that are seen.

And it would be premature to really rule out the possibility that the sine wave and the pulsed wave bear some common denominator that might be comparable, even though it appears as if the sine wave and the pulsed wave appear to be different.

They both are electromagnetic, they're both periodic; and given the fact of the periodicity, and the fact that you're dealing with electromagnetic radiation, there is that similarity.

Q. Would it also be premature to assume that they have the same properties in terms of their interaction with biological material?

A. I would agree with you on that, yes.

Q. Dr. Liboff, in your testimony, let me refer you to your expression, I guess, in the opinion that exposure to magnetic fields can result in biological change.

MR. SUGARMAN: Would you provide the reference to the testimony, please?

MR. WATSON: I think there are probably a lot of them, and he's probably pretty familiar with it.

MR. SUGARMAN: Well, I don't think he said "can."

MR. WATSON: Well, if you'll let me finish --

JUDGE SMOLEN: All right, let's finish the question.

BY MR. WATSON:

Q. Dr. Liboff, take a look, for example, at page five, paragraph two, lines one, two, three.

A. Yes. I agree with that statement that biological systems are affected by weak ELF magnetic fields.

Q. Okay. And that opinion, would it be fair to say, is based on your understanding of the laboratory evidence?

(Pause.)

A. What do you mean, sir, by laboratory evidence? Because --

Q. I'll be happy to explain. I'm sort of drawing

a distinction between laboratory experimental evidence on the one hand and, say, epidemiological studies on the other.

A. You mean the totality of laboratory evidence in this research field?

Q. Yes.

A. Yes, it certainly is built on that.

Q. Your opinion is based on that?

A. Yes.

Q. All right. Now, I believe you also expressed the opinion that exposure to 60-Hz magnetic fields is a medical hazard to humans?

A. I said it was a hazard. I didn't use the word "medical." Yes.

Q. And would it be fair to say from your testimony -- I think you're in the same general area on page five, paragraph two -- that that opinion, that hazard is based on your gradual acceptance of the epidemiological data?

A. In part.

Q. Well, let me refer you to page five, paragraph two.

A. Yes.

(Pause.)

Yes, I see it.

Q. I believe you say there that "this is also a hazard to humans; this opinion is based upon my gradual acceptance of the epidemiologic data, with each new report strengthening the ones before it."

A. That is true.

Q. Now, just to be clear, are you saying that the laboratory experiments themselves establish a hazard to humans as distinguished from simply a biologic effect?

A. Not free-standing.

Q. Now, is there a difference basically between showing a biologic effect and showing a health hazard?

A. Yes, there is.

Q. And again, this may sound basic; but for the record, could you tell us what the difference is?

A. One example that's very often given is there are all sorts of biological effects that under simple conditions need not be hazardous.

One can take a bit of sugar on your tongue, and providing you're young enough and not overweight and not diabetic, it's not hazardous.

Or you can have a biological effect merely by going from an air-conditioned room out into the sun. And in your body you can measure physiological changes that result from this change in the physical background.

And again, I don't think anybody would think of

this as hazardous under reasonable circumstances.

On the other hand, hazard to me reflects a situation where there is some measured level of illness, or in the extreme case death, that might result in a correlative way with a specific parameter.

There are people who, for example, cannot take sugar on the tongue, and they might respond critically to an effect like this. And that would be a hazard for them.

There are also people who, for one reason or another, might not be able to take a very severe change in temperature. For those people that might also be a hazard.

Q. Now, I believe we've also talked, just made reference to, epidemiology. And I would ask you, would it be fair to describe that field as the study of patterns of disease in populations?

A. Quite frankly, I've never thought of a definition before. It sounds right, but you're the first one that's ever asked me about that.

Q. Okay.

A. I guess it could be used for things other than disease though, perhaps.

(Pause.)

I'm not sure.

Q. That's fine. Dr. Liboff, would it be a fair characterization to say that you don't know a mechanism by which E/MF will create biological effects, but you've put forth an hypothesis for that?

A. That's how I normally talk about the modeling that I've done. It's hypothetical.

Q. And I believe you have said in your testimony on page one, I think down at the last line and going over to page two, that under the known physical mechanisms of interaction between energy and biological material, energy of 60-Hz fields is simply too small to invoke any mechanism. Is that a correct statement?

JUDGE SMOLEN: Where are you reading?

MR. WATSON: I'm not reading it. In fact, we can just go right to his language.

JUDGE SMOLEN: I thought you were reading from his testimony.

MR. WATSON: Well, no, I wasn't, actually, Your Honor.

JUDGE SMOLEN: Oh, okay.

MR. WATSON: But I now have it. I was simply referring to an area and sort of attempting to --

JUDGE SMOLEN: I thought you were referencing it. Go ahead.

BY MR. WATSON:

Q. Maybe we can simplify this. If we could go to the bottom of the first page, Dr. Liboff. And you see the last line, it says power input. Do you find that?

A. Yes, I remember the line well.

Q. Okay. And are you referring there -- well, could you read the line? Let's get that in writing, and then I'll ask the question.

A. Out of context then, "The power input of these signals is simply too small in invoke any conceivable physical mechanism."

Q. Okay. Now I'd like to now try to see if we can put that into context and ask you a couple questions about that.

One is, is that one of the reasons that has caused you to put forth an hypothesis for a mechanism?

A. Is the fact that the signal is too small to be thought of as a reasonable -- I'm not sure that was the motivation. But the lack of an available mechanism was what motivated me, yes.

Q. So correct me if I'm mischaracterizing this. I'm trying to understand it. So we start out with the power input of the signals too small to invoke a physical mechanism, you need to come up with a hypothesis to explain?

A. Yes. And as I explained it, if I can just amplify a little bit, that's the use of my word "weak." The word "weak" in physics has a rather specific meaning. It is a signal that is so small that one normally cannot find a good physical reason why it works.

And it need not be in biology, because there are weak signals in many areas of physics.

And when I characterize a signal as weak, what I'm suggesting is that these signals are so small as to essentially lack any available physical mechanism to understand why they should be efficacious.

Q. I understand. Now, would it also be accurate to say that no one has identified a mechanism? And by mechanism here I mean an established mechanism as distinguished from a hypothesis.

A. Well, you're asking the wrong man. Because I have a mechanism, and I'm an advocate of it. And many people are basically in agreement that the mechanism, or the hypothesis that I've put forward probably at the present time represents the best approach to these problems.

Especially in view of what's happened in the last few years. Because my original mechanism -- I'm sorry. My original hypothesis, which was put forward in 1984 or 1985, has been acted upon by others, namely, people in

the Soviet Union and around the world, in ways that indicate that they're building upon the basic concept.

And so people such as Chiabrera in Italy, and Lednev in the Soviet Union, and others, are using the same basic idea to build towards a model that hopefully will be forthcoming in maybe a year or two.

Q. I believe you have in other circumstances described your ion cyclotron resonance idea as a hypothesis and distinguished it from a theory, is that correct?

A. Yes. The attempt presently is to build a theory out of that hypothesis.

Q. So the basic order is you go from hypothesis to theory, and beyond?

A. In this particular case it's the path that you follow. And as I say, there are now a number of people who are sort of coming into this area with models and mechanisms that they hope will be the crowning touch on a theory.

And if it's done correctly and after a decade or whatever, people have no real objections, and there is a consensus, then it would be called a theory.

Q. Now, is it fair to say that a hypothesis is an idea around which you design experiments to test whether that hypothesis is correct or not?

A. It's one statement that I would use to discuss

a hypothesis. It need not be an experiment though. You might have hypotheses which are theoretical.

Q. Is this one both experimental and theoretical?

A. Yes, this definitely has experimental ramifications. But there are also many theoretical ramifications that might not easily lend themselves to laboratory work.

Q. Now, I believe when you originally introduced this hypothesis you called it a wild concept?

A. You may have something in front of you. That's one of my favorite adjectives, so it's likely that I did call my own work wild, yes.

(Laughter.)

A. It's possible. I don't remember myself quoting -- I don't remember saying that, but it's very likely.

Where did I say that?

Q. You said it in Australia.

A. Okay.

Q. You testified in Australia.

A. That was so far away that I thought nobody in this country would hear me.

(Laughter.)

A. Wild in the sense -- since you asked the question.

Q. Yes, go ahead.

A. Wild in the sense that it was a radical idea.

MR. SUGARMAN: Was what?

THE WITNESS: A radical idea.

BY MR. WATSON:

Q. That idea has engendered some, that hypothesis has engendered some debate in the scientific community. Would that be fair to say?

A. Yes, it has.

Q. And people have published peer-reviewed articles, for example, stating that this hypothesis was mechanically impossible?

A. Yes, they have.

(Pause.)

I must add though that in my original publication I pointed that out.

Q. Now, you've personally conducted quite a few experiments on your ICR hypothesis, is that correct?

A. That's correct.

Q. ICR standing for ion cyclotron resonance.

A. Yes.

Q. Now, you did some experiments on rats that were designed around the ICR hypothesis?

A. That's correct.

Q. And there was, at least on the rat study, an

attempt to reproduce that result at least once by another researcher?

A. I think in the deposition this was talked about. And I believe I said -- correct me if I'm wrong, but I believe I said something to the effect that this was not a published experiment, but that a report had appeared through the grapevine that somebody had attempted to replicate the experiment and it had failed.

Q. Okay.

A. Now, I know the group that had tried this. It's a group at the University of Rochester. I wasn't aware that they had completed the work though.

Q. Okay. Is this a pretty good group of researchers?

(Pause.)

A. One of the lead scientists from that group, prior to initiating the experiments, called me with some questions that I felt indicated a lack of understanding as to how to provide the magnetic fields.

I suspect that these people are good at animal handling and maintenance, and even the animal behavioral characteristics that have to be studied in this type of experiment.

But where I felt that they might not have been up to snuff is in the area of where they applied and

maintained and understood the magnetic fields.

Q. Did you, after that initial conversation, have a chance to look at how they actually did it?

A. No, I did not. They never contacted me again. And as I say, I've never seen a report of theirs in the literature or heard any report that has taken place.

They've been doing this work, I think, for three years. We did the work in approximately six months or something like that.

So I don't understand what the delay is. But whatever it is.

Q. Now, I believe you also did some experiments on diatoms?

A. I took part in a larger group that was working with diatoms, yes.

Q. And a diatom is a single-celled organism, is that right?

A. It's a single-cell organism that creeps along at the bottom of the pond or on a rock, or whatever; and it's a microscopic, single-celled organism, yes.

Q. Where do you find these things? Did you say ponds, the bottoms of ponds?

A. They're found in both fresh water and seawater bodies of water, and they're equivalent to a more common word that you hear often, plankton. The things that

whales eat by the droves.

And apparently, and I have to rely upon colleagues who have told me this, plankton come in two varieties, one of which are swimming varieties and the other are walking varieties.

And the type that we used were the walking variety. I think it's called benthic. And these diatoms look like a coffee bean, so they have the word coffee-ophonous [phonetic] attached to their latin name.

Q. We're sort of into molecular sushi at this point, I guess.

A. What did you say, sir?

Q. I said we're sort of into molecular sushi at this point.

Now, have the researchers at the University of Rochester attempted to repeat your diatom experiments?

A. I know that they're doing the work. I'm not sure what level of completion they are at. There was, I think, one abstract presented on this work. I'm not sure of the amount of -- whether they have gone to publication with this yet.

Q. And did you hear at some point that they were not able to repeat the same results?

A. Yes, I heard that.

Q. Now, Dr. Parkinson, at the University of

Michigan, has also attempted to repeat your diatom experiments?

A. Yes, he has.

Q. And was he able to achieve the same basic results?

A. He was not. I'm much more familiar with his work, because he's closer to my university, he's at the University of Michigan, than the Rochester group. And also, he tends to be more open with his results than the Rochester group is.

And Dr. Parkinson has not been able to replicate the work. But there is some question as to whether or not the same conditions applied.

In other words, getting back to what we discussed on replication an hour ago or so, there is a difference in what our laboratory believes was done by us and what Dr. Parkinson believes was done in his laboratory in terms of how we handled these diatoms.

Q. Was there also some question about the source of the diatoms, whether they were different types of diatoms?

A. I'll have to defer on that. I know that there has been an argument -- not an argument, but discussion, as to different sources, different repositories of diatoms.

But I believe that at least some of the work that entails replication may have used the same source of diatoms.

Q. Which would implicitly mean that some of it may not?

A. Some of --

Q. Some of the work may not have used the same source of diatoms?

A. That's possible.

Q. Now, I believe you also conducted research on human lymphocytes?

A. Yes.

Q. Now, there have been some attempts to reproduce those results?

A. Yes, there have.

Q. And was there a group in London that did this?

A. Yes.

Q. And did they get the same basic results as you did?

A. No, they did not.

Q. And a group at the University of Western Ontario, did they also attempt to get the same results?

A. They're also in London. London, Ontario as opposed to London, England.

Q. Oh, I see.

A. Yes. Yes, they --

Q. So this is the same group?

A. No, no, there are two groups.

Q. Oh, there are two groups?

A. I should be very specific.

Q. All right.

A. There are two groups, both of which came from London, different Londons, that have not been able to replicate the lymphocyte work.

Q. The first one is London, England?

A. London, England.

Q. And the second one is London --

A. London, Ontario.

Q. Ontario, okay.

A. Yes.

Q. Now, there was a group at Berkeley that also looked at this issue and attempted to repeat these results?

A. Well, this goes to the definition of replication. They did not replicate -- did not attempt to replicate our experiment exactly, because they didn't use the same experimental apparatus.

However, giving that group the benefit of the doubt in terms of their being able to design proper exposure coils, in effect they did manage to replicate our

work on the cyclotron resonance.

This was mentioned in an article in Science, which unfortunately I don't have, which occurred some time ago, in which it was pointed out that under the cyclotron resonance conditions they also saw large swings in calcium efflux, which was what we reported.

Subsequently this was also observed by the group in Berkeley. And I've had occasion to talk to both individuals who worked on that group, and one sent me a letter in which he congratulated me, saying that they had seen the same effects.

Q. And was Dr. Walleczek --

A. Dr. Walleczek --

Q. -- one of the researchers at Berkeley?

A. Dr. Walleczek was a visiting professor from the Max Planck Institute who went to Berkeley for a year to work with a Dr. Liburdy in Dr. Liburdy's lab.

And Dr. Walleczek, who has in essence replicated my lymphocyte study, is now, I think, at Dr. Adey's laboratory in London, England.

Q. Now, when Dr. Walleczek was at Berkeley and attempted to replicate your study, did his group add another variable called mitogenic stimulation?

A. Yes. They added a mitogen; which mitogens come in a number of varieties. But the specific one they

added is called con-A, C-O-N capital A. And when they did that, they obtained very consistent results.

This differed from my experiment, if I can add, in the sense that we did not add the con-A to our results, to our experiments.

And so the original disparity between the two laboratories -- which was interesting, but it was not, in my eyes, a critical disparity, simply because of the fact that what we had was resonance fields applied to human lymphocytes, resulting in very large swings in calcium in the lymphocytes in both cases.

In the one case, however, I did not add the con-A, and in the other case, they did add the con-A.

We now have resolved that difference, Walleczek and I, with the likelihood that I may have used a larger density of cells, such that the cells were what could be self-stimulating by virtue of contact, which would have been equivalent to adding an external mitogen.

So this is our current explanation. It need not be the final explanation, but it is interesting that in one case is using a stimulant and the other case is not using a stimulant, we both have seen this effect.

Q. Could you just for the record define "mitogen"?

A. Mitogen is a -- there are a number of

chemicals which had been observed to act so as to cause, in this case, human lymphocytes to proliferate, to reproduce, to basically become larger in number.

When one removes lymphocytes from the human, in humans, and puts these into a cell culture, or a system where you're trying to observe effects, the thing about lymphocytes as opposed to many other cells is that they will not reproduce if just left in a Petri dish for days.

In fact, I think experimenters usually think of the lifetime of the lymphocytes they take from humans as being maybe a week, or something like that.

However, it was found twenty or thirty years ago that there are substances that can be added to human lymphocytes in culture in a laboratory which would effectively make these cells reproduce.

So in mitogens, they're called mitogens because what they are doing is stimulating mitogenesis; the splitting of cells.

Q. Do you know how they cause that to occur?

A. Theories are -- and I don't think that these are consistently understood. But the basic idea is that the mitogen couples to what is called a receptor on the surface of a cell which may act to move calcium into the cell in such a way as to trigger the mechanism of mitogenesis.

It's very well known in all sorts of different cells in culture that accompanying the process of cell proliferation, or cell division, there apparently is a calcium pulse that is present.

And it's interesting that it occurs even in human fertilization or animal fertilization when the ovum is penetrated by a sperm cell, the fertilization process, in a way, does not necessarily begin when the sperm cell enters, but when that calcium signal develops.

The calcium signal develops sometime after the sperm cell enters. But once that occurs, then the system is on its way towards division, or the rest of the developmental process.

If you look at other cells which are not necessarily ova, such as fibroblasts or epithelial cells, or cells of almost any variety, you'll find that there is similarly a calcium pulse that has to be applied.

So in some way, the mitogen that's added tickles this calcium pulse into occurring.

That's, I think, conventional wisdom. I don't know that I necessarily believe that. I have no other explanation, but that's what I'm told.

Q. Now, just to make sure I understand that, did Dr. Walleczek see results with fields when he did not use the mitogen? Did he have the same results as you did

when he didn't use the mitogens?

A. He did not. He needed the mitogen in order to see the cyclotron resonance effect.

Tp 2-A

Q. Now, you also conducted some research on embryonic chicks?

A. Yes, chicks.

Q. And there hasn't been any attempt to repeat those results that you're aware of?

A. Not under cyclotron resonance conditions there haven't, if that's what you mean.

Q. Yes, I'm asking --

A. Yes.

Q. -- these in the context --

A. Yes. There have been no attempts yet made.

Q. And would the same be true for your research on rabbits?

A. No -- well, there's a problem with talking about the replication of work in connection with the rabbits.

The rabbit work that was done was done as part of an entrepreneurial situation where a company that we licensed patents based upon cyclotron resonance were able to move towards a device that would be used for repairing bone.

And in the course of doing those experiments --

one of the experiments done was on rabbit, in addition to many other experiments which this company has not published.

It is my understanding, although I don't have paper proof of this, that those rabbit experiments had been done in a number of other institutions.

Q. Okay. Now, referring to this company, is that the one in Phoenix?

A. Yes.

Q. Okay. And would it be fair to say that you're not familiar with the details of that company's experiments?

A. Well, they come in two classes. Some of the experiments I was involved in doing, in other cases they do these experiments in a proprietary way and myself and my colleagues have not been invited in.

Q. Now, you also conducted some experiments on yeast to test the ion cyclotron resonance theory; or hypothesis, excuse me?

(Pause.)

A. Yes, we have public -- we have not published anything on the yeast. And I'm loath to say anything more about those. Just to say that we have worked on these.

Q. And you're planning on publishing something?

A. As a matter of fact, we have a document which is circulating, yes.

Q. And you don't want to announce it here?

A. Well, there are three authors, and the problem is --

Q. I'm not pressing you.

A. -- that Dr. McCloud, Dr. Smith and I don't always see eye to eye. And so we'd have to adjust the document among ourselves before we release it.

Q. I don't think we'll interfere with that science.

Now, I believe you make reference in your testimony to some recent research you've conducted on human lymphoma cells?

A. Yes.

Q. And that's only been presented in abstract form at this point?

A. It's been presented in one abstract already at a meeting of the BRAGS, which is Bioelectrical Repair and Growth Society. The meeting was just held, literally, only a few weeks ago in Phoenix.

I have a second abstract dealing with the human lymphoma cells which is due to appear in -- which is going to take place in Milwaukee.

And when the deposition was taken I gave a copy of

this abstract to Mr. Smith. I'm not quite sure whether or not the abstract had been accepted by the group to whom I had sent the abstract.

Q. And have any other researchers yet attempted to repeat the results of your lymphoma studies?

A. Well, --

Q. Well, let me rephrase that. Somebody might have started, etcetera. So let me ask it this way.

Have any other researchers published any results of any studies dealing with an attempt to repeat your work --

A. In the cyclotron resonance area, --

Q. -- in the cyclotron resonance area?

A. -- no.

Q. Okay.

A. People have worked with lymphomas though before.

Q. Right.

Now, you referred to some work by Reva Goodman in your testimony.

A. Yes, I did.

Q. And that was research on protein synthesis?

A. It was research on protein synthesis as evidence directly, in direction conditions. But also on RNA stimulation. So she's done this a number of

different ways.

Q. Now, would it be fair to say, or maybe you've said it in the past, that you're not an expert in the type of work that Dr. Goodman does?

A. Oh, I would say that, definitely, yes.

Q. And do you know if her research has been replicated in other labs, or the results have been reproduced in other labs?

(Pause.)

A. To the best of my knowledge, I don't think that claim has been made yet. I don't think that replication has occurred elsewhere.

Q. Okay.

A. But there, if I can interrupt, sir, in looking at Reva Goodman's work, what she has done -- let me say it this way. I first heard her present her work in 1981. Now, at that time she was working with insect salivary gland and using pulses.

Now, since that time, Dr. Goodman has gone on to human cells and has looked at three or four different types of RNA expression under different types of fields.

She has done, in a sense, perhaps five or six experiments over the course of the time between 1981 or two and the present.

Also, there is a consensus in the community that

although her work has not yet been replicated, there is a consensus, I think, that says that her work is by and large accepted by -- and perhaps it's the people I speak to.

But the sense I have in speaking to people is that it's assumed that what Reva is seeing, what Dr. Goodman is seeing, are effects that are consistent. She sees consistent effects over these years.

Q. Now, I believe we talked earlier about calcium efflux research?

A. Yes.

Q. And you referred to some work on calcium efflux in your testimony. And I believe you cited a Baywyn experiment.

A. Yes. The famous paper was by Baywyn, Kazmarek and Adey. That's K-A-Z-M-A-R-E-K, and Adey, A-D-E-Y. And that was published, I believe, in 1974.

Q. Now, in basic terms, would it be fair to say that that's an experiment where researchers had some type of control group, and the exposed group they exposed to material, they exposed first to radioactive calcium, and then to E/MF, and they compared how much calcium leaked out of the tissues?

A. I'm not sure the way you said it is -- you're stating it in a way that it -- perhaps I can expand and

see if what --

Q. Yes, I'm just trying to get down to the basics in what they were doing.

A. If I can explain. What was done was to take chick brain and profuse the chick brain with calcium 45, so as to have calcium 45 move into the tissue.

And then divide slices of this chick brain, which is radioactively labeled, into experimentals and controls, into two groups.

And then the experimentals were exposed to this whatever field they were using, and the controls were not; and then comparisons made as to how much of the radioactive calcium had essentially leaked into the environment.

Q. All right, thank you. That makes it clear.

Now, did Dr. Carl Blackman basically try to reproduce this experiment?

A. That's putting it mildly. What people accused Carl Blackman of doing is making a cottage industry of that experiment. He did it for nine or ten years, or something like that.

Q. I was at a meeting recently where somebody asked him that at lunch.

A. Whether there was a cottage industry?

Q. Yes.

(Laughter.)

Q. Now, is he the one that you were referring to earlier that produced the result that rather than less calcium leaking out he had more calcium leaking out?

A. I think this has been shown in a number of different laboratories. And Carl certainly had experimental results showing this. I think even in Adey's laboratory they saw opposite results.

Q. Okay. And the Rochester group tried this too, didn't they?

A. Well, conversations I had with the Rochester group about this proved to be difficult to understand, because they had convinced me at one point, if I can just respond to your question in a way that is very brutal, brutally frank, they had convinced me that there was a technique in the way the brain was being sliced so that there was something different about the controls than the experimentals.

When I heard this, I heard this from Dr. Miller. And I asked him if he was -- Dr. Morton Miller. And I specifically asked him, are you sure of this; and he said, yes, we are.

Anyway, I went back and I spoke to Dr. Blackman. And Dr. Blackman told me that he had been trying to tell Dr. Miller that this was never the case; that somehow

this became ingrained into the social fabric of this type of experiment, and that of course they randomized the way they took the brain slices.

This led me to think that whatever approach that was taken by this Rochester group, they somehow had less than a total grasp as to what was going on.

And so when you asked me earlier about their attempts at replication of diatoms and lymphocytes, for the most -- and the rat experiment; their lack of replication in a way, to my mind, reflects a way of doing science that is not the way I do it.

That's brutally frank, I guess.

Q. Are you suggesting that perhaps they were motivated to produce a particular result or to question somebody else's result?

A. That's too pat an explanation. I don't think people -- there's nothing malicious or malevolent involved here. I just think it's a way of doing science.

I can think of many instances when I've had a negative opinion about something, and when I do the experiment I'm surprised if the answer comes out the other way.

And it takes a certain fortitude, inner fortitude, a certain strength to realize that your prior thinking was too narrow.

And for one reason or another, that group has never made that crossing. They have never been able to appreciate that there are subtleties that they are not measuring.

Q. Well, these studies involving calcium efflux, would it be fair to say that it would be difficult to extrapolate these directly to humans?

A. That's a very good question.

(Pause.)

Let me answer you this way. I certainly could not make the extrapolation.

Q. Fair enough.

A. Okay.

Q. Now, I believe you did some experimental research that you referred to in your report regarding DNA synthesis.

A. That's correct.

Q. Now, would it be accurate to say that the results that you found had not been reproduced?

A. No, that's not true.

Q. So they have?

A. Yes, Takahashi did that.

Q. Okay.

A. Published in experentio.

Q. Okay.

A. That report has -- that publication of mine has been cited literally hundreds of times.

Q. Okay.

A. It's an accepted fact. It is now also accepted by virtue of the fact that it was the first experiment to indicate that there was more than a Faraday effect possibly involved, but that the magnetic component might play a role in these effects.

Q. What were the fields that you used in your experiment?

A. They were high. They were -- I think that they were -- the lowest field that I used was of the order of a few hundred mG, and the largest fields may have been as high as 16 G.

Q. Okay.

A. So they covered a much larger range of field strength than I currently work with.

Q. And what were the frequencies?

A. The frequencies covered the range 15 hertz to 4,000 hertz.

Q. Were they sinusoidal, or something else, in your experiment?

A. They were almost 90 percent sinusoidal. We did do some experiments involving pulsed signals, however.

Q. All right. Now, this Takahashi paper, did that one use pulse fields?

A. That used pulse fields.

Q. Now, Dr. Liboff, I believe you were talking earlier about, I guess, objectivity and subjectivity in looking at research reports.

A. Would you repeat that question?

Q. You were talking about objectivity and subjectivity in examining research results.

MR. SUGARMAN: I object. I don't remember him talking --

THE WITNESS: I didn't --

MR. SUGARMAN: -- about objectivity and subjectivity.

JUDGE SMOLEN: Well, the witness answered that he didn't.

THE WITNESS: I did not remember in those words, I don't think.

BY MR. WATSON:

Q. Let me refer you to page three of Protestant's Statement No. 2.

(Pause.)

You see in the middle paragraph there, it begins with, "My opinion," and ends with the word "correlations"?

A. In the middle paragraph? How far down?

Q. Well, I'm just asking you to look at that paragraph talking about --

A. Yes.

Q. -- non-scientific evaluations, hysterical non-scientific evaluations, etcetera. Do you see the general subject matter?

A. Yes.

Q. Okay. I'm just trying to understand that area.

Let me ask you this. When we discuss your own research, would it be fair to say that you may be somewhat subjective in your interpretation of the possible implications of that research?

A. I don't think so. Everybody who looks at his own research to an extent is subjective, in the sense that it's a position that you're arguing on your own behalf.

On the other hand, if you're in science long enough, you can sort of separate out the wheat from the chaff, as it were, and put your own work into context.

As I said earlier, when I first suggested the cyclotron resonance hypothesis, I think I gave four explanations as to why it was problematic.

In reviews of work that I have done for journals

and the like, including BEMS, one of my arguments is that it's up to a scientist to not only present work that is new and exciting, perhaps, but also to give the reader a sort of a pathway through the different flaws and problems that may exist. I've always tried to do that.

Q. Have you said, taken a position that in evaluating scientific research, anything that is not totally objective must be considered non-scientific?

A. I don't remember saying that. I might have said it. Where is that said?

Q. I think we may have a transcript error. But in fairness, I'm going to show you this statement.

A. Everything that is totally non-objective?

Q. Well, take a look at this. I'll refer you to, start at seventeen.

(Document handed to witness.)

That's where your answer starts. The question starts at eleven. Read as much of it as you like.

(Witness perusing document.)

A. It's the opposite way. You turned it around. What I said --

Q. No, I don't think I -- excuse me. I don't think I turned it around. I'm just asking is this --

A. May I read what I said?

Q. Sure. Is it correctly transcribed? That's

what I'm asking.

(Witness perusing document.)

Look at line 20, and the word "subjective."

A. No, it doesn't look like anything I said. What you're saying, which is written here, is that anything which is not totally subjective has to be considered non-scientific. That doesn't make any sense.

Q. Right.

A. But the first sentence is the important one. That's the critical one. It says, "I think it's a non-scientific evaluation," in response to a question asked, "because it obviously reflects an interest which is not totally objective."

So if you have an interest in something which is not objective, that means it's non-scientific.

Q. let me ask you, on the next sentence, --

A. Yes.

Q. -- so we get this straight. And there will be a chance to make corrections, I'm sure. But in the sentence it reads, "Anything which is not totally subjective has to be considered non-scientific."

Would it more accurately reflect your view if the word "subjective" was changed to "objective"?

A. That's a strong --

MR. SUGARMAN: Your Honor, I'm going to object to

this, questioning him on a transcript that we reserve the right to read and sign.

He hasn't seen it. It's been delivered to the opposing party, but not to us. And now he's being asked to take a statement that he's already said is not what he said in his deposition, and reconstruct it and ask him if he agrees with it.

JUDGE SMOLEN: Even without the deposition, the question could be posed. And I think it was posed.

MR. WATSON: And I'm not posing it as a transcript correction, I'm just trying to show him the material. I could take the transcript away and simply ask him, would you agree with the following statement, and I would stick the work "objective" in there. And I'll be happy to do that.

JUDGE SMOLEN: I think you did that.

MR. WATSON: I think I did.

MR. SUGARMAN: I have no problem with his doing it that way.

JUDGE SMOLEN: I think he did.

MR. SUGARMAN: Yes. My point is that in using the transcript, the implication is created that somehow the transcript, that Dr. Liboff made the statement which Mr. Watson is asking him about by way of correction previously.

And I don't want there to be any implication that he ever made that statement, even as corrected.

MR. WATSON: Actually, I'm not -- in fact, quite the opposite. I'm suggesting that there's probably a transcript error, and I'm trying to find out what his real opinion is. I'm not suggesting that he made this statement in the first place at all.

JUDGE SMOLEN: Let me say this to both counsel, that if this were part of the record in this case, the administrative law judge, and anyone who would be reading this record, could take this statement as it appears in the record as the statement of this witness, unless and until someone, within the rules, would file an appropriate motion to correct the transcript.

MR. SUGARMAN: But that's different.

JUDGE SMOLEN: That would be if it were in the record of the case. This is not in the record of the case, this is a deposition.

MR. WATSON: Right.

JUDGE SMOLEN: And Mr. Watson has said that there's really no disagreement. He wants to ask that question, or whatever other question he wants to, without reference to this deposition.

Is that correct, Mr. Watson?

MR. WATSON: Yes, Your Honor.

MR. SUGARMAN: And I have no objection to his doing that.

JUDGE SMOLEN: Well, let's take it away from the witness, if you want to, and ask the question, and let's go on.

(Document handed to Counsel Watson.)

BY MR. WATSON:

Q. Dr. Liboff, would you agree with the following statement: Anything which is not totally objective has to be considered non-scientific.

A. Not completely. Because even though I a moment ago said that there is a need for objectivity, and I've tried to achieve that in my work in science, it's impossible to achieve in a way that makes it totally applicable all the time.

So one has to use a sort of a gray scale and hope that people are more objective than they are subjective when they do their work.

The question also goes to the heart of what sort of subjectivity are you talking about. If there's subjectivity for gain, or there's subjectivity for self-advancement, or there's subjectivity just because one is stubborn and doesn't want to give up the principle; in a way, all of these are somewhat different.

I've argued scientific matters with people who

have held their opinions because once they gave their opinions they didn't want to be made fools of and had to retract their ideas.

On the other hand, it's different to argue with somebody who is in the employ of somebody else and holds the opinion because he knows that's where his bread is buttered.

So subjectivity has a different meaning depending upon how you're going to talk about it.

Q. And would it be fair to say, in your view, that it's hard to know as an individual scientist, or whatever field, whether you're truly being objective, because you're the judge of your own objectivity?

A. I would agree with that, yes.

Q. Now, I believe that you referred to an article that you published in Science where you set forth your theory on ICR?

A. No, it wasn't published in Science.

Q. Oh, I'm sorry. Where was that published?

A. Journal of Biological Physics. It also went into a book which covered a conference I attended in Sicily.

Q. Now, let's go back to your DNA synthesis. That article, was that one published in Science?

A. Yes.

Q. Now, in that article, did you say there that changes in E/MF, at least in the earth's geomagnetic field, could explain how species die off?

A. Yes. I said something to that account. It amounted to a paragraph at the very end of a paper.

(Pause.)

Would you like me to explain that?

Q. I think I want to ask you a couple questions about it.

A. Sure.

Q. Perhaps you remember addressing this before, but I'm going to ask you about it here. Did you take the position that this same theory about changes in E/MF might explain why the dinosaurs went extinct?

A. I did not use that language.

Q. You didn't; I see.

A. No, I used -- the example I gave were radia-laria [phonetic], which are another creature in the ocean, or in the oceans, I guess, that people who study species extinction have used in the past to measure when there was a major change in extinctions.

And the single-celled creatures were referred to in the Science article. Subsequently, I did use the word "dinosaurs," but I'm not sure where. I'm not sure if it was in a publication or a talk.

Because for a while I gave a number of talks which I thought had a very nice title. The title was "From Diatoms to Dinosaurs."

It had a nice ring to it, so I was giving this at a number of classrooms and lectures. Not at scientific meetings, however.

Q. That is a pretty catchy title.

A. I thought so.

Q. I was an English student myself, and I always liked "From Beowulf to Virginia Wolfe."

(Laughter.)

So I can understand in your area that's a good title; it piques the interest.

A. Unfortunately not. I only gave it twice.

(Laughter.)

Q. Well, it probably takes a lot to get scientists excited.

JUDGE SMOLEN: The only party that's making hay out of this is the court reporter, because they're getting a longer transcript.

(Laughter.)

BY MR. WATSON:

Q. Okay, I guess we have to get serious again. Let's talk a little bit about the study that you referred to by Nancy Wertheimer [phonetic] on reproductive

effects. Do you recall referring to that?

A. Yes, that was her second major epidemiological study, yes.

Q. I'm referring to the one though that dealt with reproduction effects.

A. Electric blankets, yes.

Q. Okay. Now, do you consider that --

MR. SUGARMAN: Do you have the reference to that in his testimony, please?

MR. WATSON: Yes, it's on page four, the fourth paragraph. At least that's one place.

MR. SUGARMAN: You're not asking him about the work that's referenced on page three of his testimony?

MR. WATSON: No, I'm asking him this one.

MR. SUGARMAN: Okay. I just want to make it clear. He referenced two of them. That's why I asked the question.

MR. WATSON: Yes, okay.

BY MR. WATSON:

Q. Do you have that, Dr. Liboff?

A. I have the line in my testimony, yes.

Q. On page four?

A. On page four.

Q. All right, that's the one I'm talking about. Let me ask you this. Is that study an important

one for your opinion in this case?

A. It's an important one because it -- the thing about Dr. Wertheimer that I found amazing was that in an unfunded, and with not the very best tools, she has been able to initiate two separate epidemiological areas that are now being investigated by a lot of other people, a lot more money, with much better tools. By that I mean big computers and the like.

And the first one was published, as you know, in 1979, dealing with this question of leukemia and cancer, and so forth.

The second one, which came a few years later, was also a sort of a bombshell, which has sent ripples over this community. And it deals with the question of reproductive effects.

And in the sense that it represents one good scientist's attempts to just do some work in this area, and an attempt on her part to look at things that other people apparently have not looked or not done properly, or whatever, it has influenced me. There's no question about that.

Q. Okay. Now, she's a psychologist, is that correct?

A. As I understand it, she has a Ph.D. in psychology, yes.

Q. Now, you're familiar with a report written by the scientific advisory panel of the New York Power Lines Project, is that correct?

A. Yes. The final report, which is -- the first author of which was Aahlbom, A-A-H-L-B-O-M; is that the one you're referring to?

Q. Yes, I think so.

A. Yes, okay.

Q. And you've previously, I believe, expressed the opinion that that report was basically done by a committee, and was on the whole pretty fair?

A. Well, I've said different things about it. Because there are parts of it that I found have been -- that I'm rather supportive of.

But others, I think, in that report, are -- there are components of that report that I don't necessarily agree with.

For example, the director of the project, Dr. Carpenter, has reflected a similar sort of variation on how the -- and he was the one who was the chairman of the board.

You could almost see through some of the statements he made that there were considerable problems with putting together a single report to cover the diverse experiments.

Q. This was a committee of scientists, wasn't it, that was involved here?

A. A committee of scientists. But not only that, it covered a range of experimental and epidemiological phenomena that were not, in a sense, capable of being analyzed by one or two people. This committee had very diverse backgrounds.

Q. Now, when that committee looked at this Wertheimer study that you referred to, did they conclude that the claims of Wertheimer and Leaper [phonetic] from this study were unjustified?

A. I remember the exact wording. I know that the work that had been done for that New York State report, in an attempt to reexamine the Wertheimer work, was done by the lead investigator, Dr. David Savitz.

And the question has arisen as to whether Dr. Savitz, with a lot more money, verified what Dr. Wertheimer had claimed.

Q. Are you on the reproductive study?

A. Oh, we're talking about --

Q. I think I --

MR. SUGARMAN: You're talking about the New York characterization --

MR. WATSON: Let me start over.

THE WITNESS: Okay.

MR. WATSON: I may have fuzzed it at the beginning.

BY MR. WATSON:

Q. I'm basically talking about the Wertheimer reproductive study that you --

A. Oh, I'm sorry.

Q. That one that you cite.

A. I'm sorry.

Q. Where you talked about over here, I believe, on page four. And as to what one -- well, let me re-ask the question, because I think you were probably reacting to a different question then.

A. Yes.

Q. The New York Power Lines Panel, do you agree with their conclusion that the claims of Wertheimer and Leaper, that this study was basically -- the Wertheimer and Leaper --

A. I understand what you're saying.

Q. Let me try it again.

A. Sure.

Q. That was a messy question, to say the least.

Do you agree with the New York Power Lines Panel's conclusion that the Wertheimer reproductive study claims were not justified?

MR. SUGARMAN: Would you show him then, and show

us, the New York statement to that effect? You're characterizing it.

MR. WATSON: Well, let me step back and ask this.

BY MR. WATSON:

Q. Are you aware of the conclusion of the New York Power Lines Panel about the Wertheimer reproductive study?

A. I don't recall it.

Q. You don't recall it?

A. No.

Q. All right.

A. What puzzles me about your question, and the last question you asked, sir, is that it seems to me the two would have overlapped in time to some extent.

The New York State Power Lines study was completed in '86, I believe, something like that; late '85, early '86. And her work on the reproductive -- the electric blanket study, as I call it, I think overlapped considerably with that report.

So it's hard for me to understand how there could have been a negative statement in that report about her work.

I do remember, however, attending a meeting in New York, at the New York Academy of Sciences, where her work was debated with one of the gentlemen from the Rochester

group that you talked about before, and where one of these Rochester gentlemen waved around some of the New York State material which had not yet been released to the public and caused a bit of an embarrassment to many people by effectively displaying this in the public while even though this report had never been made public before.

This was while he was debating Nancy Wertheimer. And that was the first time I had heard Wertheimer talking about this electric blanket thing, electric blanket study.

So I have a feeling that the two overlapped considerably in terms of timing. But I'm not sure that the New York State study had that much which could be said about Wertheimer's work on reproduction.

Q. Understood.

(Material stricken from the record.)

BY MR. WATSON:

Q. Well, I'll just move on. Now, I believe you say in your testimony that some --

MR. SUGARMAN: Well, wait a minute. Your Honor, I don't want to leave it in the record that there were findings. All we have is Mr. Watson's statement --

MR. WATSON: It's not in the record.

JUDGE SMOLEN: It's a statement of Counsel, it's

not testimony.

MR. WATSON: It's just my statement. This is no evidence that there are any findings at all. The witness said he doesn't remember them. So I think there isn't anything right now in the record. I sure can't cite myself.

JUDGE SMOLEN: That's right.

MR. SUGARMAN: I would like to move that the statement of Mr. Watson that he's going to ask some other witness about the findings be struck, even though it's a statement of Counsel.

When somebody in the Commission staff reads Mr. Watson's statement, he will assume, or she will assume that there are findings.

And the witness has not testified to that, and Mr. Watson is unwilling to produce and display the document to which he claims to be alluding.

JUDGE SMOLEN: I'm going to resolve this.

MR. WATSON: I don't care, Your Honor.

JUDGE SMOLEN: Professor Liboff, were there findings from the New York study, whatever they may be? Don't tell us you don't recall what the findings were, but do you know whether there were findings?

THE WITNESS: Not pertaining to this reproductive study of Wertheimer's.

MR. SUGARMAN: When you say "not," do you mean there were no findings, or are you saying you don't remember?

THE WITNESS: I do not recall anything in that final report by Aahlbom at all which represented the sum total of the New York State Power Lines Commission's work that went to the heart of whether or not the Wertheimer work was correct or not, the work dealing with electric blankets was correct or not.

JUDGE SMOLEN: Does that satisfy you?

MR. SUGARMAN: Yes. But I move to strike Mr. Watson's statement that there were findings.

MR. WATSON: My position is, I don't care, Your Honor.

JUDGE SMOLEN: Strike it. Let's go on.

(Laughter.)

JUDGE SMOLEN: Strike the statement of Counsel only relating to alleged findings from the New York State report.

(Whereupon, the statement was stricken from the record.)

JUDGE SMOLEN: Go ahead.

BY MR. WATSON:

Q. Now, I believe, Dr. Liboff, on page four, paragraph four, the last sentence, you say that there's

some supporting parallel evidence to the Wertheimer study that has been published using chick eggs and fish eggs, is that right?

JUDGE SMOLEN: Excuse me. That's your deposition, probably.

Let's go off the record.

(Discussion off the record.)

Tp 2-B

JUDGE SMOLEN: Let's go back on the record.

THE WITNESS: The question asked of me was whether I wrote or said in my testimony that there was evidence indicating changes in chick eggs and fish eggs.

JUDGE SMOLEN: All right. Now you can respond to it.

THE WITNESS: And the answer is yes.

JUDGE SMOLEN: All right.

BY MR. WATSON:

Q. And I believe you identified the chick egg research that was done by the Madrid group, including Delgado and Veda.

A. And mainly Jocelyn Leal, L-E-A-L. As well as a navy group that had the Appalachian Project Hen House.

Q. Now, could you tell me whether the Madrid group used sinusoidal fields or pulsed fields in their research?

A. They mainly used pulsed fields.

Q. Were those the ones around which they recorded some results?

A. Yes.

Q. And the other group you said was --

A. The Project Hen House --

Q. Project Hen House.

A. -- represented an attempt to verify the work that had been observed in Leal's laboratory. And this was a navy-financed project which included six laboratories around the world, including the Madrid laboratory.

Q. And did they use sinusoidal fields or pulsed fields?

A. They used pulsed fields.

Q. Now, I believe you've referred to work by Winters?

A. Is there work in here referred to by Winters, you're asking?

Q. I think there is.

A. Yes, on page six.

Q. Let me ask you, are you generally familiar with the work by Winters?

A. Yes, as a matter of fact I have been to his laboratory on a number of occasions and looked at data, and things like that.

Q. And then I believe he and Phillips did some

work that was reported in this New York Power Lines project?

A. Yes. A moment ago I told you about the debate at the New York Academy of Sciences. It was at that -- it was that work that had not yet been released which was held up by the gentleman from Rochester in a way that was not proper.

And it was the Phillips or Winters -- it was the Winters-Phillips research.

Q. Now, they were basically doing cloning work, is that right?

A. Yes, they were looking at clones. But the interesting thing about the way they did their experiment was the way in which they tried to differentiate between the electric and magnetic field effects.

They ran three sorts of experiments, one with only an electric field, one with only a magnetic field, and one with both electric and magnetic fields. And I think this is the first time an experiment like this was tried.

Q. Now, do you consider yourself an expert in this cloning research area?

A. Oh, I'm not.

Q. And I believe in your testimony on page four in the last paragraph you make some reference to the results of Barry Wilson on melatonin?

A. Yes.

Q. And does this work deal with endocrine changes connected to the, related to the pineal gland?

A. Yes, it does.

Q. I believe in your testimony you say with reference to Dr. Wilson's research that the possibility exists that one of the pathways affected may result in breast cancer?

A. This is what Dr. Wilson says.

Q. Now, are you able to describe this possible pathway?

A. No.

Q. Now, did you get your information about Wilson's statements about his study from talking to Wilson, or talking to somebody else?

A. Both.

Q. Both?

A. I --

Q. Was the other person you talked to Dr. Tenforde?

A. I heard Tenforde at a meeting in Monterey a few months ago discuss this work in Dr. Wilson's presence.

I've also been in meetings where Dr. Wilson has presented this work on a number of occasions. And

Dr. Wilson has also published this work in a number of peer-reviewed areas.

And not only that, but another gentleman, a man called Reiter, of the University of Texas, has seen similar effects.

Only that, the interesting thing is that Dr. Reiter has seen effects at cyclotron resonance frequencies.

So that's an experiment in cyclotron resonance that did not originate in my laboratory, but in somebody else's lab.

Q. Now, has Dr. Reiter published a peer-reviewed article on this?

A. Yes. I believe it was given to Mr. Smith at the time of the deposition. There was an article that was published in Neuro-Science Letters.

Q. Are you familiar with a work by Dr. Wilson, along with Dr. Anderson and Dr. Stevens, a 1990 book which discusses this same issue?

A. Yes. That's a book in which I have a chapter written.

Q. And that book is entitled "Extremely Low Frequency Electromagnetic Fields, The Question of Cancer"?

A. That's right.

Q. And do you understand that Dr. Anderson, with Steven Wilson, conclude the book by saying it's not their intent to argue that ELF exposure increases cancer risk?

A. I remember words to that effect. I don't remember the exact quote; yes.

Q. You also refer to some research results by Graham and Cohen.

A. Some very recent research, yes.

Q. Has that been published yet?

A. It's only appeared as an abstract.

Q. Now, and I believe you just referred a few minutes ago to Dr. Russell Reiter?

A. Yes.

Q. And I believe you say that he has asserted that, in your testimony -- let's try page five. I'm at the fifth line down.

A. Yes.

Q. I believe you say that he's asserted that at least some sleep disorders should be regarded as caused by the electromagnetic environment?

A. That's true.

Q. Now, did you do your own analysis on sleep disorders, or are you relying on his statements?

A. I'm relying about Dr. Reiter. This occurred this year at a meeting in Atlanta when he mentioned that

in a talk.

Q. And has he published a paper on that that you've seen?

A. I don't believe he's published on the question of sleep disorders. He has published on the question of melatonin deficiency.

Q. Now, his melatonin studies, do they deal with rats?

A. I always have to think. Yes, those were rats.

Q. What is melatonin's role in the biologic processes of rats?

A. The melatonin --

MR. SUGARMAN: Could I just hear that question again?

JUDGE SMOLEN: Let the reporter read it back.

(Whereupon, the reporter read from the record as requested.)

THE WITNESS: To the best of my knowledge, the role of melatonin in the biological processes of rats is the same as it is in humans.

In both cases, again to the best of my knowledge, the role of melatonin is connected to the sleep/wake cycle, such that when the ambient light, let's say, is removed through the evening hours there's a very large change in the output of melatonin, which is connected to

-- which comes from the pineal gland.

And it's a favorite for many biochemists because it is one of those substances that undergo such a large change that it's easily measurable.

The original work on melatonin changes came out of Germany before Wilson and Reiter approached it. And there there were two people, one of whom was Peter Sen, and the other a man called Vollrath, V-O-L-L-R-A-T-H, who studied rats and found that under conditions of changed local magnetic fields the melatonin output could be changed considerably.

I might add, since we're talking about replication, that a group contacted me from the NIH when I was at the navy and asked whether I would like to participate in an attempt to replicate Vollrath's work. And I did not. We could not replicate the work.

But subjectivity being what it is, everyone assumed that we had done something wrong. In other words, the experiment by Vollrath was taken to be probably correct.

And I think the consensus that I can find in the community that looks at these experiments thinks that indeed the Vollrath-Sen-Wilson-Reiter work is in essence right; that melatonin apparently changes following applications of magnetic signals in a way which is analogous

to what happens when light is used as a cue for the animal to produce or not produce melatonin.

That is to say, the magnetic field in these conditions somehow mimics or is connected to the role of light.

Q. Now, is the pineal gland part of the endocrine system, if you know?

A. I don't know. But I assume it must be, yes.

Q. Now, I believe you also discussed on page two, the third paragraph, of your testimony, some research on cell cycles by Maran [phonetic]?

A. Yes.

Q. Now, do you know if those research results have been reproduced?

A. I don't think so. I think the thing about the Maran work, however, is the fact that that also was a longstanding series of experiments that went on for many, many years.

And the believability in that case doesn't stem so much from the fact that other people have yet to do it, as much as the fact that the team was an excellent team.

They had a chemist, a biologist and a physicist as part of that team. And they stayed with the experiment for, I don't know how many years, but it was more than five or six. And it was peer-reviewed; and the work is

basically universally accepted.

Q. Now, that research dealt with the length of cell cycles, is that right? Just in general.

A. It dealt with how long it takes for an organism to divide.

Q. And that research was done on slime molds?

A. Yes. It's a amoeba; it's a self-aggregating amoeba, which unlike the amoebas that we're given in high school to look at under a microscope, these are amoeba that aggregate into stalks, and then break apart, and then re-aggregate. It's a very complex system, although they're still amoeba.

Q. So it would be pretty hard to draw direct implications for human health in this particular experiment?

A. Again, I would not be the one to try and do that.

Q. Now, we've talked a lot about the magnetic fields. But I believe we had some reference to electric fields.

Are you taking a position one way or the other on whether electric fields are hazardous to humans?

A. No, I prefer to stay out of that area, mainly because -- if I can just spend a few seconds discussing the road map in this case -- magnetic fields have the

virtue, at low frequencies at any rate, that when one applies a field to a cell or to an animal or to a human, the field that pervades the inner part of the cell or goes to the human, is exactly the same as the field that one applies.

There is no diminution or change or attenuation of the field as it enters the living system.

However, when one uses electric fields, it is usually quite difficult to get a measure of the actual electric field that is present inside of the cell or animal or human being, because of the fact that living systems have materials which are conducting in them, and they tend to effectively change the level of the field from inside to outside.

Now, this -- although many people have done experiments with electric fields, I've always been frustrated in attempting to design experiments like that because it's hard to devise a parameter that will give a good measure of what the actual field is inside the cell or whatever.

So I have just stayed on the sidelines and watched people yell at each other.

Q. All right. Now, --

A. There are some people who believe electric fields do this, and other people who claim that they

don't. But as far as I'm concerned, the jury is still out.

Q. Now, on page two of your testimony --

JUDGE SMOLEN: Let me interrupt for a minute.

Are you saying that if an object is within an electromagnetic field, it's the same force wherever they are within that particular field?

THE WITNESS: No, we have to change our words, Judge.

JUDGE SMOLEN: All right.

THE WITNESS: Don't use the word "electromagnetic," use the word "magnetic."

JUDGE SMOLEN: Magnetic; excuse me.

THE WITNESS: Within a magnetic field, if you design the experiments properly -- because it can still be screwed up.

If you design your experiments properly, it is likely that you can estimate the field inside the system precisely, if you know the field outside.

When one tries to do an equivalent thing with an electric field, the problem becomes quite difficult. In fact, the electric power industry, and EPRI [phonetic] in particular, has spent, I think, millions of dollars in trying to estimate the fields inside of humans.

MR. SUGARMAN: Electric fields?

THE WITNESS: Electric fields.

JUDGE SMOLEN: Well, let me just get back to magnetic field. In other words, there is some definitive line that where an object is on one side of the line within a magnetic field, that object is subjected to the magnetic field; and if it moves slightly outside that particular line it is not subjected to any magnetic field whatsoever?

THE WITNESS: No, that's not precisely what I said. The problem with trying to extrapolate what I just said to power lines is that the magnetic field associated with power lines is not a constant field, but changes as it moves from the power line out towards the right of way and beyond.

Now, if at any one point, let's say it's a hundred feet away from the line, or fifty, or twenty, if one measures the field in air, the magnetic field in air at that point, and you place a human being into that field, it will be the same field inside the human as it was in air.

So you are therefore allowed to take the value of field that you measure without the presence of the human, and use that when the human is placed in the field in a theoretical way.

However, if you're measuring the electric field,

which --

JUDGE SMOLEN: Well, all right. I don't want to interrupt you, but I want to understand the magnetic field.

THE WITNESS: Okay. The magnetic field permeates everything. If, on the other hand, our bodies were made of steel or iron, nickel, cobalt, something like that, the fields inside of us, the magnetic fields inside of us, would be radically different from what they are in air next to us.

Because we don't have any magnetic, or nothing to speak of, inside of our bodies, the magnetic fields are the same.

JUDGE SMOLEN: It seems to me that you said that the force of a magnetic field remains the same as long as an object is within that force?

THE WITNESS: We can't use the word "force" here.

JUDGE SMOLEN: Well, what word should we use?

THE WITNESS: "Field."

JUDGE SMOLEN: "Field;" excuse me. Is that correct?

THE WITNESS: Yes.

JUDGE SMOLEN: All right.

MR. SUGARMAN: Your Honor, can I add something, I think by way of clarification?

JUDGE SMOLEN: Go ahead.

MR. SUGARMAN: What the professor is saying is that because --

MR. WATSON: Your Honor --

JUDGE SMOLEN: Now wait a minute, the professor can say what he's saying.

MR. WATSON: I have a little problem with that.

MR. SUGARMAN: May I rephrase your question, just to clarify?

MR. WATSON: Well, maybe I could continue cross examination, Your Honor.

JUDGE SMOLEN: All right, let's just cross-examine. Do it on redirect.

MR. SUGARMAN: My point is, I think Your Honor is asking a slightly different question from what he's answering.

JUDGE SMOLEN: This witness is sophisticated enough and knowledgeable enough --

MR. SUGARMAN: Extremely so.

JUDGE SMOLEN: -- to know a basic question.

MR. SUGARMAN: Absolutely.

JUDGE SMOLEN: I'm trying to get clear in my mind whether or not a magnetic force remains the same so long as that force is applied within a certain area, and beyond that area there is no force whatsoever; or does

that force diminish.

THE WITNESS: The answer is no, there is no line beyond which the magnetic field disappears.

JUDGE SMOLEN: Okay.

THE WITNESS: I believe that goes to the heart of the question.

JUDGE SMOLEN: All right. That's what I was looking for.

THE WITNESS: Yes.

JUDGE SMOLEN: Now, does that mean the magnetic force in the same --

THE WITNESS: Magnetic field, Your Honor.

JUDGE SMOLEN: Excuse me, field; the magnetic field is of the same intensity to infinity?

THE WITNESS: If the source if a power line, the answer is no. It falls off from the power line, outward from the power line.

JUDGE SMOLEN: Does the --

THE WITNESS: The magnetic field --

JUDGE SMOLEN: Falls off?

THE WITNESS: -- falls off.

JUDGE SMOLEN: All right.

THE WITNESS: And falls off very rapidly. And as a matter of fact, there is, I believe, written testimony in connection with this hearing that was produced by

either Boeggeman, Mr. Boeggeman, or Mr. --

JUDGE SMOLEN: Yes, early in the case.

THE WITNESS: Or whatever; in which there is a very nice picture of the magnetic field that is drawn from the center of the right of way in both directions.

And if you remember, that picture has the shape of a bell curve. It has a shape which rises in the middle and falls off symmetrically in both directions.

And even though you can go out to great distances, I'm not sure what the highest -- if you used feet, as I remember, to go out left and right of this line.

But in principle, you could find non-zero levels of a magnetic field miles away. You could not measure them anymore, because you'd also have local sources that would add to the field. But in principle the field goes out to infinity.

JUDGE SMOLEN: All right, enough on that from my point of view at this point.

THE WITNESS: Okay.

JUDGE SMOLEN: Go ahead, Mr. Watson.

BY MR. WATSON:

Q. Dr. Liboff, on page two of your testimony, lines, about six or seven down from the top, I believe you say that biological systems contain certain receptor -- well, let me read your exact language; "biological

systems contain receptors or sensors designed to recognize these small signals."

A. Yes, again this is out of context. But I do say that "biological systems contain receptors or sensors designed to recognize these systems."

If you wanted to place it in context to what I had written before, one would have to add a word like, in that biological systems "perforce" or "must" contain receptors or sensors.

It's an implied statement that does not necessarily mean that anybody has ever observed sensors or receptors that are capable of detecting a magnetic field. But it represents an explanation as to how magnetic fields could interact with biological systems.

Q. How they could; we just haven't identified them?

A. That's correct.

Q. Now, let me refer you to page four of your testimony, third paragraph, last sentence. And I assume that I'm reading this, since your entire testimony is here, the whole thing's already in; I'm just referring you to this because I'm going to ask you a question.

So if you'll look at this entire picture, therefore the sum of it all is that a variety of physiological processes are exquisitely sensitive to weak ELF magnetic

fields, and that one of these pathways apparently leads to cancer in humans; did I read that correct?

A. That's correct.

Q. Did you carefully select the word "apparently"?

A. I thought you were going to ask me about "exquisitely."

(Laughter.)

A. Yes, it's a fair characterization. It's a carefully applied word.

Q. So would it be fair to say from your careful selection of the word "apparently" that you are presuming, as you referred to earlier, that such a pathway must exist?

A. I'm not sure I'm saying that. What I'm saying is that on the face of it.

Q. Okay.

A. "Apparently" to me means on the face of it, it appears, it seems; it seems likely.

Q. Okay. But again, no researcher has identified such a pathway at this point?

A. Well, again, sir, I just suggest that that is out of context, because that sentence represents the sum of some statements that I made above which make it apparent to me, as opposed to making it a laboratory

statement, or even an epidemiological statement.

If I can expand a minute, what I am suggesting is that --

Q. I was just asking whether --

JUDGE SMOLEN: Let the witness finish.

If you have not concluded your previous sentence, go ahead.

THE WITNESS: What I was trying, and I have been saying now for some time, in this testimony and in other contexts, is that I see data which is coming in from laboratory studies, experimental cell studies, let's say, which by itself does not show hazard.

I see data coming in from work on trying to repair bone; I see reports of epidemiologists who are looking at cancer.

And I look at these not individually, but I'm looking at this as a sum story.

The point is that in all three cases one has a common denominator. The common denominator is ELF magnetic signals.

And it seems to me that if I have three different types of results, all of which are problematic, because the weak magnetic fields are not supposed to do anything, but there are three disparate, different types of results.

And in a way, that strengthens each of the results.

Q. I see. Well, let me just ask you this. I'm really just asking you the question, in simple terms, has there been any researcher that has identified this pathway that you're referring to here; anybody who's said, here's the pathway?

A. No sir, I have not been able to find such.

Q. Okay. Now, Dr. Liboff, you believe, do you not, that more research should be conducted on E/MF?

A. Oh, yes.

Q. And I believe you expressed the view in the past that this research should not be placed in the hands of the Department of Energy to administer?

A. I did not quite say it like that.

Q. Okay. Well, tell us what you did say.

A. I said that the primary source of funding should not be the Department of Energy.

Q. And did you reach that conclusion because you felt that D.O.E., in your view, would succumb too easily to political pressure? Is that what you said?

A. Unfortunately, yes. And I can only give the best example I can give, a personal happening. I was supported by the Department of Energy, oh, three, four years ago, approximately.

And at that time I had begun making some public appearances, as people called in connection with expert witnesses, and this witnessing in this area, and appearances before zoning boards, and whatever.

And apparently the Department of Energy people heard about it, and they cautioned me about making public statements.

And this is a remarkable thing, because I've taken government research money before, and no one has ever told me what I do with my own time.

In other words, if you're doing research for the government, it's none of their damn business how you report this work externally.

If you work for the government, it is. If you're a member of state or local of federal government, of course, there's a constraint on you.

But as a university scientist, no one's going to tell me what to say.

And I was shocked at the fact that the Department of Energy felt so, either beleaguered or frightened, or whatever, in connection with the things that I was saying innocently.

Ard I was not saying, by the way, at that time that there were hazards. I was just reporting that there were biological effects.

But they felt compelled to actually warn me. And since then I've heard others say the same thing.

I can only come to the conclusion that the Department of Energy, whatever its motives -- and it may be that they just want to run a tight ship. They don't want to have their people blabbing all over the country about this or that.

Whatever their motivation, it is totally wrong. A scientist should not be compelled to report the views of whoever is funding them.

If you work for the government, it's fine. If you work for private industry, it's okay. But not as an independent university scientist.

Q. Do you think this was just one person who worked there expressing his or her private view to you, or do you think it was an official message?

A. Well, the person told me, don't -- in effect, I didn't tell you this. But why would a person have come out and said it?

It could have been a very, very personal opinion. But the fact is that others have reported similar things involving the fear -- and I don't know what the fear is personally; but the fear that somehow -- or I don't know if the fear is justified, I should say..

But somehow the feeling that the public should not

be informed of these dangers because somehow this is going to provide all sorts of problems for the electric power industry, for the defense industry, or the Defense Department, people like that.

It seems to me the public has a right to know, if there's information available, what's going on.

Q. Who do you think in the government is trying to convey that message?

A. I can't possibly begin to think who in our government would restrict, or whatever. I don't think it's even necessarily any one person.

I just think what happened was that the Department of Energy has a background which is rooted in military. For years the Department of Energy was the agency that -- well, it used to be called the Atomic Energy Commission, which dealt with the nuclear energy, ionizing radiation, and things like that.

And after a while I guess the way that agency runs is that, as I say, they like to run a tight ship, where they're used to dealing with people who are not going to go around making arguments, in the case of atomic energy, that atomic energy is bad for you.

Q. Did they take any action against you, do you feel, as a result of your making statements?

A. I can't prove anything, but I can tell you

that I was never funded again; and that furthermore, I was told that they could not fund me.

Q. They could not?

A. They could not. The ostensible reason was that I'm a university scientist. They find it easier to fund people who are in the military or who are in other government agencies.

And yet I consider myself a leader in the field, and I cannot find research money from the Department of Energy.

Q. What about the Department of Defense, do you think they should be in charge of research funding in this area?

A. Well, actually, the navy for years was a supporter of my research. And I don't think that in many respects the office of Naval Research, if you use that particular part of the navy, is a very, very liberal group when it comes to supporting research in a way that does not provide constraints.

I don't think that the Department of Defense is the answer either. I think that this work should be housed in the National Institutes of Health or the National Science Foundation.

Q. What about the Environmental Protection Agency being in charge of E/MF research?

A. Now, EPA has a small problem, that if you'll look at the way their budget is fashioned, the EPA's research effort is mainly intramural.

That is to say, they do their work in-house. Which means that none of the EPA people, or scientists, working in this area can come and testify before hearings like this.

This has come to me recently, this feeling that somehow the amount of information which is coming forth is being filtered by the process.

It may not be a process that is deliberate, mendacious or malevolent, but it is a process that effectively has stopped information from coming to groups.

The reason I know this is because I just receive too many calls from citizens groups asking for me to come forth as an expert witness. And it makes no sense to me. There are hundreds of members in the BEMS group.

And when I ask people who have testified before, they've told me that, well, they're looking for a government job, or they're trying to keep their grant, or things like that.

The level of intimidation in this area has been quite high.

Q. Have you suggested that perhaps EPA should not be in charge of this area because they might succumb to

political pressures?

A. I didn't say it like that. What I said is that there was a scientific report that was fashioned by EPA scientists, along with outside scientists. And this report came to be known as the EPA Report.

It's a thick document, and most people that are in this field know about it.

It's a document that basically is a wonderful bibliography. It's the best bibliography in this area I have ever seen.

And what it did was to essentially do three things. It was a wonderful bibliography in terms of looking up various reports. It commented on these various reports. So there was a little editorializing, if you want to call it that.

And it also came to a conclusion concerning the fact that magnetic fields should be classified as a Class B1 carcinogen.

I'm not sure what the classification was, but the word carcinogen was in there.

When this came out as a -- before the actual imprinature [phonetic] of the EPA was place on this document, the story is that Mr. Sununu was approached by a number of people who pointed out that the total number of --

MR. WATSON: Your Honor --

MR. SUGARMAN: He asked the question, Your Honor.

THE WITNESS: I'm answering the question.

JUDGE SMOLEN: Wait, wait. We'll let the witness finish.

MR. WATSON: I'm sorry, Your Honor.

JUDGE SMOLEN: Let the witness finish.

Go ahead.

THE WITNESS: I'll be brief. You asked me whether or not --

BY MR. WATSON:

Q. Whether or not the EPA ought to be in charge of this.

A. And what happened was, the story is -- I bear no firsthand knowledge of this -- that there was a high level decision made to appoint a board that would smooth out this question of whether or not the magnetic fields were carcinogenic.

And as such a board was appointed, which has seen fit to criticize the first report.

In a way I don't understand that, because here was a scientific report made by scientists. And it seems to me that there should be no political manipulation of scientific reports.

Q. In fact though, wasn't that panel appointed

under the auspices of the Environmental Protection Agency's Science Advisory Board?

A. Yes, it was.

Q. And isn't that a normal process that EPA uses regularly when it issues reports like this?

A. Not usually do you find the president's science advisor trying to pack the number of people on that board. And of course that happened, as you know.

What happened was that Bromley, the presidential science advisor, tried to get certain people onto that Science Advisory Board.

Q. Are you suggesting that you talked to Dr. Bromley, or that you know this to be a fact from firsthand knowledge?

A. Well, I have seen a memo that was published in a number of places by Dr. Bromley urging that this board be composed of certain people whom he suggested.

Q. Were those people appointed?

A. They were not.

(Pause.)

Tp 3-A

JUDGE SMOLEN: Are we going on into a different topic now in the cross examination? How much more do you have?

MR. WATSON: If you're asking is there a logical break point here --

JUDGE SMOLEN: Is this a logical point to break for lunch?

MR. WATSON: It would be fine, Your Honor.

JUDGE SMOLEN: All right. Because it's one o'clock, and the witness has been on a long time, and the reporter's been working hard. It's time for us to take lunch.

MR. WATSON: Fine.

JUDGE SMOLEN: All right, we will recess until two o'clock.

(Whereupon, at 1:00 p.m., the hearing was adjourned, to reconvene at 2:00 p.m., this same day.)

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AFTERNOON SESSION

(2:10 p.m.)

JUDGE SMOLEN: I think we're ready to resume cross examination of the witness by Mr. Watson.

MR. WATSON: Thank you, Your Honor.

Whereupon,

ABRAHAM R. LIBOFF

having previously been duly sworn, testified further as follows:

CROSS EXAMINATION (Continued)

BY MR. WATSON:

Q. Dr. Liboff, do I correctly recall that you said before we broke that the two agencies that you think ought to be involved in administering the E/MF research funds would be the National Science Foundation and the National Institutes of Health, and then made some statement about whether the Science Foundation should do it?

MR. SUGARMAN: Your Honor, I didn't hear the first word of that question, the first word after did he correctly remember. Is he saying the agencies, or two agencies that should be involved in the research? I didn't hear the question.

JUDGE SMOLEN: Well, then we'll have the reporter

read it back.

(Whereupon, the reporter read from the record as requested.)

MR. SUGARMAN: I'm going to object to that question, because it's unclear as to whether the witness is being asked to say that they are the only two agencies, or the two agencies that he --

JUDGE SMOLEN: He's not being asked either. He asked whether he recalled testifying in a certain fashion. He either recalls or he doesn't.

You may answer.

THE WITNESS: I don't think I said that before lunch. I did say that in the deposition, however. That may be where you're lifting that from.

I have pointed out that -- first of all, when I say these agencies should be involved, or the way you said it, should be involved, what I'm really getting at is that the primary effort should be focused in agencies such as that, as opposed to the primary effort being focused at either the EPA or DOE.

I think the NIH should be doing the bulk of the research funding.

The NSF is a little more difficult to involve in a logical way, even though they can presumably get involved in some of the research, because, for example, the

National Science Foundation would never involve itself in epidemiological research. It's too, quote, too clinically oriented for the National Science Foundation.

But the NIH does epidemiological research.

BY MR. WATSON:

Q. Okay. Now, I believe that you referred in your testimony, perhaps in various places, to epidemiological research.

A. Yes.

Q. To begin with, could you tell me about how many epidemiological studies you're referring to?

A. In the course of --

(Pause.)

Let me just answer that in a very careful way. I think there are approximately forty to fifty studies that have been done. But the analysis of these studies has centered on perhaps nine or ten. I'm not sure of the exact number.

By that I mean some studies are regarded as more carefully done, and not subject to as much criticism as others.

And it's not that they come at any particular time or sequence. The group I'm using to assess the epidemiological results are basically the same groups that are utilized by the epidemiological review groups at Oak

Ridge, the epidemiological groups at the National Institute of Occupational Safety and Health, and also Dr. David Savitz, who is a rather careful observer.

The arguments, for example, that I've seen that say there are as many negative epidemiological results as positive, which apparently is one of the arguments used against the likelihood of human hazard, I have been told by colleagues at the Oak Ridge National Laboratory and by the groups I've mentioned, normally are restricted to something like less than a dozen.

Now, the most recent indication of this was a talk I heard by Dr. Savitz in Madison, Wisconsin less than a week ago, in which he was asked that question, and he said that his analysis used a small number of epidemiological results.

This is what I base my understanding on.

Q. Let me ask you again, if I can. Can you just tell me the approximate number, or the exact number if you know it, or the approximate number if you don't know the exact number, of epidemiological studies that you're referring to?

A. I thought I just answered that question. I said that there was something like nine or ten studies.

Q. Nine or ten?

A. Yes. And I've given you the reason why I've

based my work on that.

Q. Now, I believe that you said earlier that the staff draft EPA report had a pretty good bibliography. Best bibliography, was that it?

A. In my opinion it is probably the best bibliography I've seen of this entire field. All I know is that my students are using it as a place to get references.

Q. And have you independently read and reviewed the epidemiological studies in that EPA bibliography?

A. Not all of them. I have looked at the original Wertheimer work, I looked at the Savitz work and attended a number of talks by the group that Savitz originally was connected with.

And there was one other report that I looked at a little more carefully, but I've forgotten the author. So I haven't done an exhaustive study of that.

Q. Let me refer you to your testimony on page three, Dr. Liboff.

A. Yes.

Q. It would be the paragraph in the middle of the page.

A. Yes.

Q. And I'm particularly going to focus you on the portion about six or some lines down. It begins,

"Indeed, every positive study." Do you see that?

A. Yes.

Q. Now, I believe you refer there to evaluations that you say have resulted in a sort of hysterical non-scientific evaluation of the epidemiological data. Is that the subject matter of that portion of that paragraph?

A. Those are the adjectives I employed, yes.

Q. Let me ask you this. If the evaluations of the epidemiological studies actually were, in your view, valid and scientific, would that cause you to reassess your conclusions regarding what the epidemiological literature means?

A. I don't understand the question.

Q. Well, I believe you said that there have been hysterical and non-scientific evaluations of the epidemiological literature. And so I'm asking you if in your view there were evaluations that were in essence non-hysterical and scientific, that that would cause you to reassess your conclusions regarding what this literature means.

A. That's not the opposite of what I said though. You see, what you're suggesting by your question is that if competent epidemiologists provided reviews that were scientific and non-hysterical, then would I change my

opinion.

My opinion is not based upon individuals in the epidemiological area who are making these reviews. What I'm referring to here are people who are not epidemiologists. And there's a difference.

Q. I see.

A. What I'm suggesting is that, for example, Professor Adair, at Yale University, has said remarkably that these studies must be wrong because there is no explanation for them.

And if you read the beginning of that paragraph, what you see is what I'm trying to say, is that because the nature of the epidemiological results don't make sense in a larger sense, they are therefore regarded as wrong by certain members of the community.

And it's that that I'm getting at. I'm not getting at the analysis of the epidemiology by people who are epidemiologists at all.

Q. I understand. The Dr. Adair that you refer to, is he the individual that holds the sterling chair of physics at Yale?

A. Yes, he has a prestigious chair in physics at Yale University, yes.

Q. Okay.

A. But he has gone on record as saying that there

must be something wrong with these results because they don't make any sense. And I call that non-scientific. Even though it comes from a person holding the sterling chair of physics.

Q. All right. Now, let me see if I can get some understanding of what you mean a little more by non-scientific criticisms as distinguished from perhaps hysterical.

Let me ask you this. Can you tell me what you mean by a non-scientific evaluation, just in this area? What principles are involved?

A. Let me back up and say that if there are epidemiologists doing statistical surveys and performing the things that they do, there is a discipline or community in that area that works according to scientific principles.

It would be inappropriate for me to say that a specific study is right or wrong, because I'm outside that community.

But this is not -- when the shoe is on the other foot, what's happened is that we find that various members of the power community have looked to experts outside the epidemiological area very often to analyze the epidemiological results, claiming, for example in the case of Dr. Adair, that here we have an answer that is

preposterous and therefore there must be something wrong with the way the epidemiologists did their work.

I would call that a non-scientific evaluation of an epidemiological report.

Q. Well, would it be a fair characterization of what Dr. Adair was attempting to do to say that he was applying at least what appeared to be in his view a sense of reasonableness in rejecting these results he thought inconsistent with physics?

MR. SUGARMAN: Your Honor, unless Dr. Lair [phonetic], whoever he is, is going to be brought in here to testify, I object to Mr. Watson trying to paraphrase what Dr. Lair was trying to say in some unnamed context.

I think it's fair to ask the witness, is he aware of an opinion by Lair. In fact he volunteered it. But to ask the witness, allowing Mr. Watson to put in what Dr. Lair's reasoning or thinking might be, it seems to me is inappropriate, unless he's going to be a witness.

JUDGE SMOLEN: Well, I think the witness testified as to what Dr. Lair's reasoning was.

MR. SUGARMAN: Well, the witness testified as to what Dr. Lair said; I agree with you. I stand corrected on that.

What Mr. Watson is now trying to do, Your Honor, with the question -- I'm not sure, Your Honor, what the

question was -- what was Dr. Lair getting at, interpreting what he said.

JUDGE SMOLEN: No, I think he asked whether or not that type of an approach is a reasonable one.

Is that what you asked?

MR. SUGARMAN: No.

MR. WATSON: I asked him if Dr. Adair's approach was based, his approach to this, which he volunteered to describe, was based upon him saying that the results of the epidemiology were not reasonable because they didn't comport with his understanding of physics.

MR. SUGARMAN: That's a different question. I don't object to that question.

JUDGE SMOLEN: All right, then if that's your question, let the witness answer it.

THE WITNESS: I can answer best by going to the paragraph before in my testimony. And let me read from that.

"Essentially a weak electric or a weak magnetic field is one that is so small that there is no good physical reason to presuppose any sort of physical interaction with living systems. The magnetic fields associated with electric power lines fit precisely into this weak category. They are so small that he immediate reaction of the physical scientists is to deny any likelihood of

interaction."

I then go on to say, "My opinion is that the basic unlikelihood of these phenomena is the reason why the original epidemiological work by Nancy Wertheimer, and now by others, suggesting a connection between leukemia deaths and power lines field has been vigorously denied."

Now, Dr. Adair -- and it's Adair, by the way, A-D-A-I-R, not Lair.

JUDGE SMOLEN: All right, Dr. Adair.

THE WITNESS: What I'm getting at in that statement is that it is Dr. Adair and others who prefer not to treat epidemiology as a real discipline, but somehow presumed to have such cosmic knowledge about them that they're able to make generalizing statements and say this must be wrong because I know better.

And that's what essentially he's saying. I call that non-scientific. It's not reasonable.

BY MR. WATSON:

Q. I think I understand what you're saying. Can't you, though, take what things you do know and apply a rule of reason in looking at these studies?

A. Once I do that, I'm going to prejudge the result that the epidemiological people are giving me. And that's a very fundamental issue on this problem.

We have data that's coming out of the

epidemiological community, and then the people who claim to know better say it's impossible, therefore it has to be rejected.

I can't do that. I have to regard these statements and facts and statistics as coming from people who are reputably trained, who have good credentials. And I can't argue that somehow what they're doing is less important than what I do.

Q. Now, was that --

A. Let me just add to this. The fact is that in 1980, about 1980, I did not believe that magnetic fields, sinusoidal magnetic fields could affect DNA synthesis in cells.

And when I originally went to the navy I almost laughed at the project. I said, why bother, nothing is going to happen.

And the point is that you can come with a prejudgment on various experiments and concepts, and really what you have to do is to be flexible enough to allow yourself to flow into the material that is made available in the laboratory and by various investigators.

And I suggest that the word "non-scientific" here means just that. It means the scientist really has to have an open mind.

Q. Now, can this same non-scientific approach

occur when somebody would look at the epidemiological data and conclude that there must be something going on here, and therefore see all the results in those eyes?

A. It's possible.

Q. In other words --

A. It's possible that --

Q. -- does this cut both ways?

A. It's possible that you could cut both ways. An individual might see things through a certain, with a certain tilt, as they say in politics.

I might add to that, by the way, interestingly enough, when Nancy Wertheimer did her original research she was not looking for a magnetic field correlation. She stumbled upon it. She was looking at the cause of leukemia deaths, and she had other parameters. And it was just as a coincidence that she found the wire code correlation.

Q. She had had quite an interest though in electric utilities before she did that study, hadn't she?

A. I'm not familiar with that. Are you suggesting that she had somehow interacted with electric utilities prior to 1979?

Q. I'm just asking you if you know.

A. I don't know, no.

Q. Now, I believe you also say in this same

paragraph here on this subject that critics have spent a lot of energy searching out variables and etcetera. The words are there, I'm not changing them, I'm just referring to that part of if. They're already in the record.

With reference to that, are you referring there to, for example, people looking for confounders in these epidemiological studies?

A. In part, yes, yes. The word "confounder" is one that appears quite often in the lay literature surrounding this area.

Q. And so your point is that there's a lot of effort devoted to searching for confounders and hidden variables?

A. Yes. I think even among the people who are scientifically inclined. Because the criticism has been so intense that many epidemiologists have then basically tried to be so above-board in the way they approach this project as to eliminate so-called confounders.

Q. And are you saying that this continued searching and looking for confounders or hidden variables is a good thing, or not a good thing?

A. Oh, it has to be a good thing.

Q. Now, you've referred earlier to the EPA staff's draft report, have you not?

A. Yes.

Q. And I believe you've also referred to the scientific panel under the Science Advisory Board that reviewed that?

A. We spoke about that, and we got into the subject of Dr. Bromley and the attempts to try to fix that board, and so forth.

Q. I'm just referencing that so there's a --

A. Yes.

Q. -- point here.

Now, did you review the scientific panel's evaluation of the EPA staff draft report?

A. I ran across it by accident.

MR. SUGARMAN: I object. I don't know that there is any scientific panel evaluation. And I think the witness should be shown it if there is.

To my knowledge, there's a draft. But whether that draft is currently approved by anybody, I don't know.

If you have a document that is an evaluation, I think you should show it to the witness.

JUDGE SMOLEN: The question was did he review something.

MR. WATSON: That's right.

MR. SUGARMAN: But the assumption is that there is one.

JUDGE SMOLEN: Well, why don't you ask that question then.

MR. SUGARMAN: Why don't you ask that question then.

JUDGE SMOLEN: Step backwards.

MR. WATSON: I think he testified that there was such a panel.

MR. SUGARMAN: Objection. He never testified to that.

JUDGE SMOLEN: Let's ask him.

MR. SUGARMAN: And you know very well there isn't one.

JUDGE SMOLEN: All right, don't argue. I've ruled on it. Let's not get into bickering.

MR. SUGARMAN: This is another example of --

JUDGE SMOLEN: Please, Mr. Sugarman, no bickering. This is cross examination, there's latitude in cross examination.

MR. SUGARMAN: I agree, Your Honor.

JUDGE SMOLEN: You can object, and I'll rule. And you don't have to characterize Counsel's behavior.

Now, there's a question. Go ahead.

BY MR. WATSON:

Q. Dr. Liboff, do you know if there was a scientific panel that was put together under the auspices of

the EPA Scientific Advisory Board to review the EPA staff draft?

A. Yes.

Q. You know. And was there such a panel?

MR. SUGARMAN: I object.

JUDGE SMOLEN: To was there such a panel?

MR. SUGARMAN: I object to that. Because it's deliberately intended to be obfuscatory. There is such a panel. And the question was there such a panel is unanswerable.

JUDGE SMOLEN: Change the tense.

MR. SUGARMAN: It's a deliberate attempt to put something in the past.

JUDGE SMOLEN: All right, if you make an objection, I'll rule on the objection. But I don't want anymore of these outbursts on the record. We're just wasting a lot of time. You have an objection, I sustained the objection, he's going to rephrase the question. Let's go on.

BY MR. WATSON:

Q. Do you know if such a panel exists?

A. Yes.

Q. Do you know whether one exists or not?

A. I do know that it exists.

Q. That it does exist?

A. Yes.

Q. Okay.

MR. SUGARMAN: Your Honor, can Counsel be instructed to drop his gestures that are intended to --

JUDGE SMOLEN: No, he cannot. Let's go ahead.

BY MR. WATSON:

Q. Now, Dr. Liboff, did that panel issue a review document on this EPA staff draft that you've seen?

MR. SUGARMAN: I object, unless the term "review document" is defined.

JUDGE SMOLEN: Overruled.

THE WITNESS: A series of documents have been prepared, starting, I believe, in January of this year, which I've seen one of them. But it's my understanding that this is a continuing process.

And there is a problem with trying to identify a document per se, since there is a series of them. I saw one such document, which I believe was issued sometime in the summer, maybe in June.

MR. SUGARMAN: Your Honor, can it be clarified as to whether there are separate reports or drafts of the same report?

JUDGE SMOLEN: You can do it on redirect.

MR. SUGARMAN: Okay.

BY MR. WATSON:

Q. Do you recall in looking at the report, whichever one you examined, whether this scientific panel had reached any conclusions?

MR. SUGARMAN: I object to that, Your Honor. It's not a report. It's a draft of a document, as the witness has previously testified.

MR. WATSON: I asked him if it was --

MR. SUGARMAN: It's a continuous effort to --

MR. WATSON: -- a draft that he looked at, Your Honor.

MR. SUGARMAN: It's a continuous effort to manufacture a conclusion that doesn't exist, and Counsel knows it.

JUDGE SMOLEN: Just a minute. This is cross examination.

MR. SUGARMAN: And I object to it.

JUDGE SMOLEN: He can ask leading questions, --

MR. SUGARMAN: I agree with that.

JUDGE SMOLEN: -- and if the witness doesn't agree, he can not agree.

MR. SUGARMAN: I agree with that.

JUDGE SMOLEN: Overruled.

You can answer the question.

THE WITNESS: Would you repeat it please?

MR. WATSON: I think we should have the reporter read it.

JUDGE SMOLEN: Let's have the reporter read it back.

(Whereupon, the reporter read from the record as requested.)

THE WITNESS: Yes.

BY MR. WATSON:

Q. Do you know if anyone on CIRRPC reviewed the EPA draft?

A. This was asked me at the deposition, as I remember, and I wasn't familiar at that time, nor am I now, with the acronym CIRRPC.

It seems to me that some people on this SAB, Scientific Advisory Board we were just talking about, were members of this other committee that might have been called CIRRPC.

Q. And do you know whether the National Institutes of Health reviewed the EPA staff draft or commented on it?

A. I don't know that.

(Pause.)

I must add, the questions you're asking go to my original comment, however. Since there has not been any final report, it's not likely that I would form any

opinion as to who reviews what until something appears in the literature that is some final statement.

Q. But do you know whether the agency comments through the CIRRPC Committee are or are not final?

MR. SUGARMAN: What agency?

MR. WATSON: CIRRPC.

MR. SUGARMAN: Well, Your Honor, the witness has --

THE WITNESS: I don't know what CIRRPC is.

MR. SUGARMAN: -- indicated he doesn't know of such a committee.

MR. WATSON: Let me say again what --

JUDGE SMOLEN: He didn't say he didn't know of such a committee, he said he didn't understand what CIRRPC meant.

MR. WATSON: That's the Committee on Interagency Radiation Research and Policy Coordination.

BY MR. WATSON:

Q. Are you familiar with that group?

A. Vaguely.

Q. Okay. Do you know whether they have submitted final comments on the EPA staff draft report?

A. To the best of my knowledge, I just don't know.

Q. All right. Dr. Liboff, do you agree with

PAUSE that this line should not be energized?

A. Yes.

Q. Now, in your testimony you say that there may be specific values of the earth's magnetic field for which 60 Hz exposure will be particularly hazardous, is that right?

A. It's based upon two things.

JUDGE SMOLEN: Well, give an answer. Is that what you said?

THE WITNESS: Well --

JUDGE SMOLEN: Did you answer yes first and then your explanation.

BY MR. WATSON:

Q. I'm just asking, really, first, did you say that.

A. Yes.

Q. I think I can find your reference.

A. Yes.

JUDGE SMOLEN: All right, yes. Now you can continue with your explanation.

BY MR. WATSON:

Q. And so what I'd like --

MR. WATSON: Is it my turn, or did he want to follow up?

JUDGE SMOLEN: No, the witness had an explanation.

He answered yes to your question, and he had an explanation. So let the witness, if he has one, continue.

THE WITNESS: It's based upon two things. First the ion cyclotron resonance hypothesis. But it's also based upon some recent experiments that are now in the abstract process.

BY MR. WATSON:

Q. Okay. Now, the earth has a magnetic field, correct?

A. Yes, it does.

Q. And that's a DC magnetic field as distinguished from an AC magnetic field?

A. Compared to the varying magnetic fields that we're talking about, the earth's field is steady; it's a DC field.

Q. And our use of electricity as opposed to steady, or direct current, it is alternating current. Is that a fair statement?

A. I used the word "time varying."

Q. Time varying?

A. Yes.

Q. Is that commonly called, though, AC, or alternating current?

A. It can be called that, yes.

Q. Now, this line will create 60 Hz sinusoidal AC fields. Is that a fair characterization?

A. That's true.

Q. Now, is it your testimony that it's the combination of these earth's magnetic fields and the 60 Hz sinusoidal AC fields that presents a danger?

A. In part. What I've said before, and still maintain, is that the thing that we understand best of all is that when these 60-Hz fields are in combination with local DC fields, we can to a large extent almost predict that there will be biological effects for certain values of the earth's magnetic field.

However, the part that we don't yet have a good handle on is the role of the intensity of the 60-Hz AC field. That is to say, it is not included in my predictions, in my cyclotron resonance predictions.

The peak value of the AC intensity as measured in milligause is another parameter that we, I think, has to be taken into account in assessing potential hazard.

And the most logical thing to do is to suggest that in lieu of anything else, what one should do is to try to minimize the intensity of the AC fields.

This is independent of the argument about the relationship between the frequency and the DC or geomagnetic field.

Q. Now, is this combination only a danger at specific values of the earth's field?

A. I never use the word "danger."

Q. Okay. I don't mean to mischaracterize. Why don't you put in whatever words you think are a fair characterization.

A. I think there are biological effects which occur at certain combinations of AC -- I'm sorry; certain combinations of frequency, in this case 60 Hz, and the local geomagnetic field.

So whatever biological effect that one will find which possibly could go to a hazardous condition would be found under these combinations of frequency and magnetic field.

I'm also saying, however, that there is an additional potential problem relating to the intensity of the AC signal.

Q. Now, do you know if those values exist in the area along this line, those earth magnetic field values? Have you done a study of that?

A. No, I have not.

Q. And would it be accurate to say that when you wrote your testimony at that point you didn't have the data on what the magnetic fields on this line would be?

A. I hadn't looked at them in a long while. I

had seen them some time ago.

Q. Did you recall them at the time you were doing your testimony?

A. No.

MR. WATSON: Your Honor, that's all we have of Dr. Liboff.

JUDGE SMOLEN: Ms. Burket, do you have any questions?

MS. BURKET: No, I don't, Your Honor.

JUDGE SMOLEN: How about counsel for PP&L?

MR. DILLON: No questions, Your Honor.

JUDGE SMOLEN: Ms. McCloskey?

MS. McCLOSKEY: I have no questions, Your Honor.

JUDGE SMOLEN: All right.

Redirect?

MR. SUGARMAN: Thank you, Your Honor.

REDIRECT EXAMINATION

BY MR. SUGARMAN:

Q. Dr. Liboff, let me start with the beginning. Mr. Watson asked you to describe physics. And would you describe the branch of physics in which you have specialized over the last number of years?

A. For approximately twenty years now, more than twenty years, I have been in a field that can be

described as biophysics.

Q. And would you describe what your discipline has been within biophysics, or as part of biophysics?

A. It has mainly involved itself with research in the area of bio-electromagnetism.

Q. And can you describe to His Honor what is the field of bio-electromagnetism, what does it concern itself with and how does it function?

A. It is a classification of an area of science that has not heretofore existed, because it depends upon a number of scientific disciplines, each of which is not sufficient to describe the effects and the interactions in total.

So you find in that field not only ex-physicist, but ex-biologists; you find mathematicians, you find electrical engineers, you find endocrinologists, or toxicologists, a number of medical doctors, epidemiologists, and people who bring a number of different specialties to this new classification called bio-electromagnetics.

In a sense, the area of research has been codified by the fact that there is at least one society that's called the Bio-Electromagnetic Society, which has roughly 500 members, that has been in existence now, I think, something like thirteen years.

Q. Mr. Watson asked you a series of questions

about whether you could extrapolate certain results from some of the studies. And I don't remember which ones they were now. But you remember there were two where he asked you could you extrapolate -- do you remember those questions?

(Pause.)

Could you extrapolate from the studies to human health effects?

A. Well, the one, I think, was on the question of whether if one works with cells in a Petri dish, for example, to what extent is that -- how can you extrapolate that to human health.

And I think I answered that it would be difficult for me to make the extrapolation myself.

And the other one was, I believe, had to do with a slime mold, if I'm not mistaken. And there it was even perhaps more difficult to make the extrapolation to human health.

And there are many other cases where you see bioelectromagnetic effects in vitro, in a laboratory setting; and the question is, would an effect there be thought of as perhaps something that could reflect itself in humans.

Q. Now, Mr. Watson also asked you about whether the experimental studies established the health hazard

that you gave an opinion about, whether the laboratory experiments themselves established a health hazard.

And if I remember correctly, your answer was, not freestanding. Do you remember that question and answer?

A. Yes, I think I used the word "freestanding" because if you look at this material by itself, then it becomes very difficult to draw any sort of important conclusion.

But my sense of what happens in this bio-electromagnetics community is that various inputs like this are weighted to the point where if enough biological studies are available, and enough material which may be in a totally different area is available, then conclusions are drawn which, although not proving, say, potential hazard, certainly tend to provide a basis on which such discussions concerning hazard might be more detailed in terms of taking these as real possibilities.

Q. And given your testimony as to the presence of people with various training, that is, I think you referred to electrical engineering, physics, biologists, physicians, and maybe other disciplines, a moment ago, how within the field of bio-electromagnetics do the bio-electromagneticians interact with respect to the work done by the different source disciplines, if I can call them that?

A. For the most part the people who come to this field who, let's say, might be people in biology, begin using engineering terms.

And when a biologist, for example, gets up and delivers a paper at the Bio-Electromagnetic Society, it's uncommon for anybody to get up and question that person's ability to talk about engineering matters.

Because what has happened is that the discipline itself has formed a sort of a molding together, or a badgination [phonetic] of so many different disciplines from other areas that it becomes a unique discipline in its own right.

Tp 3-B

So one finds at BEMS meetings a tendency for everyone to listen to everybody else, and in many cases to do work which would be otherwise not thought to be the case if one was an endocrinologist or an engineer, or whatever.

Q. And how do you take into account the work of the epidemiologists, and how are you able to form opinions based on their work and on the work of those that did the studies that you described a couple moments ago?

A. Well, I do some reading myself, I attend the meetings at which these subjects are reported upon, within the context of the BEMS, mainly, the

Bio-Electromagnetic Society.

I also, since I know, I guess, most people in this community, I'm not afraid to pick up the phone or to approach somebody when I have questions dealing with these matters.

And usually if there is a question as to the nature of a result, or whether or not there's credibility or non-believability, I believe I have the recourse of going to people who have done the work and discussing this with them, the firsthand matter of the way they obtained their results and what the deficiencies of a particular study are, and so forth.

Q. Is it customary within the discipline of bio-electromagnetics for authorities such as yourself to rely on each other and their understandings and interpretations of each in that regard?

MR. WATSON: Your Honor, objection; leading.

JUDGE SMOLEN: It's a leading question.

BY MR. SUGARMAN:

Q. What is the practice within the discipline with respect to the discipline of bio-electromagnetics with respect to the interaction of the different disciplines?

A. There is a mutual reliance.

Q. And with respect to the epidemiology, you've

testified that you relied primarily on the studies that were recognized by two groups of, I think you said evaluation groups; one was Oak Ridge, and the other one was what?

MR. WATSON: Your Honor, I object to that. The record speaks for itself, whatever he testified to. I don't have any problem with him referencing the subject matter, but he's putting the content of his interpretation of the testimony.

MR. SUGARMAN: I don't mean to impose my interpretation. I'll rephrase the question.

BY MR. SUGARMAN:

Q. Would you just identify the groups that you spoke of and explain how you rely upon them, or how you've consulted them?

A. I've been in contact with, for example, Tim Aldrich and Clay Easterly, who are rather good friends of mine. And I've known these colleagues for a number of years who are at the Oak Ridge National Laboratories who are the epidemiologists who survey this work.

I have been in contact at meetings with David Savitz; I have known Nancy Wertheimer for eleven years.

Most recently I have been involved with

discussions with Dr. Joseph Bowman, of the National Institute of Scientific -- the National Institute of Occupational Safety and Health.

And in the same context, as an example of the interaction, I've been asked to come and give a talk at the epidemiological section of NIOSH. Which is indicative of the fact that there are no bounds in terms of the epidemiological community and the bio-electromagnetics area from listening to physicists and the like.

One of the other speakers there this month is going to be Bill Kawney [phonetic]. Dr. Kawney is a recognized electrical engineer in this area as well.

So the boundaries that you normally think of in terms of these disciplines have tended to be broken down in this new discipline of bio-electromagnetics.

Q. Could you compare in terms of the way the discipline functions, so that His Honor and the Commission can understand, could you compare the functioning of the related disciplines in bio-electromagnetics to the functioning of physicians as it relates to operations, by way of an analogy?

A. I think what you're --

MR. WATSON: Objection, Your Honor.

JUDGE SMOLEN: I'm going to sustain the objection. The question suggests an answer.

MR. SUGARMAN: Well, I was saying compare. It may be different, it may be the same.

MR. WATSON: Well, Your Honor, I would suggest that there's no foundation for this. This expert, I think, has stated his qualifications. And among those he excluded was the physician.

JUDGE SMOLEN: Yes.

MR. WATSON: And so I don't think he can compare a physician, which is he is not doing an operation with, with some other matter.

MR. SUGARMAN: Well, I'll lay a foundation. It's very easy to lay a foundation.

JUDGE SMOLEN: Then I will sustain that objection. You go ahead; if there are anymore objections, the objection will be made, and I'll rule.

MR. SUGARMAN: Thank you.

BY MR. SUGARMAN:

Q. Dr. Liboff, in response to Mr. Watson earlier you were describing a relationship between, or the participation of physicians in the work of your department. Do you recall that testimony?

A. Yes.

Q. And would you describe how that relationship functions without regard to the question I had asked you a moment ago, but in --

A. I understand.

Q. -- response to Mr. Watson's question.

A. I understand what you're saying.

There is a basis for interdisciplinary --

JUDGE SMOLEN: Let me interrupt. I don't want to interrupt your answer, but --

THE WITNESS: Please.

JUDGE SMOLEN: The witness has really anticipated the question, because it didn't come out fully, and the record doesn't have a question and it will have an answer.

Did you complete your full question?

MR. SUGARMAN: I did, I believe.

MR. WATSON: I think he referred to my question, and I don't think I have a pending question, Your Honor. So I'm not clear what he's answering.

MR. SUGARMAN: I meant the question that Mr. Watson asked on cross examination related to the participation of physicians in the work of Dr. Liboff's department.

JUDGE SMOLEN: All right, you're asking this witness to explain the participation of --

MR. SUGARMAN: Exactly.

JUDGE SMOLEN: -- physicians in your society, right?

MR. SUGARMAN: Right.

THE WITNESS: No. As I understood the question it was not in the society --

BY MR. SUGARMAN:

Q. Not in the society, --

A. -- but in my faculty.

Q. -- in the department.

A. My department; my medical-physics occupation.

There we have physicians who work next to physicists and mathematicians in areas, neurology and the like. And they're in a -- for example, when one today undergoes an MRI scan, the nature of the procedure is partially medical, but it's also partially physical.

The physicist cannot have a total understanding of a clinical problem. But on the other hand, the clinician cannot apply the principles of the MRI without depending upon the physicist.

So there's a mutual interlocking of disciplinary backgrounds, which only comes about because there's something new which was not there, say, twenty years ago.

Q. Now, in those relationships, have you had occasion to become familiar with the interaction that takes place in regard to addressing concerns about a patient; that is to say, about treating a patient?

A. I've not only been present when such things

are discussed, but I've actually been involved in doing this myself.

Q. And can you relate the work of bio-electromagnetics as it relates to transmission lines? Can you compare that in terms of the collegial approach as it compares to the collegial approach in the MRI utilization?

A. This collegial approach that you're talking about, which to me means a meeting of a group of people who may come from different disciplines, is particularly the case in the area of bio-electromagnetics.

No one comes into the area of bio-electromagnetics born into the area. You have to basically live in it and adopt all the other disciplines and at least know a little bit about all of them in order to survive in this field.

I might add that there are now attempts to try to provide educational backgrounds for students who would be interested in going into this field.

But at present I don't think that there is any such thing as a degree in bio-electromagnetics, for example.

Q. All right. Now, this relates to -- and I'm going to come back to the question that Mr. Watson asked you in cross examination, and your response, as to the

basis of your conclusion, given your testimony which you explained on redirect, that the laboratory experiments do not establish the hazards as a freestanding matter.

And given the interdisciplinary, or the collegial character of bio-electromagnetism as a discipline, can you explain why and how as a scientist you referred on cross examination to the three different types of results as the basis of your conclusion that magnetic fields have an adverse health effect?

MR. WATSON: Your Honor, I object. It's compounding, it's leading.

JUDGE SMOLEN: Well, it certainly is compound, and it clearly is leading. Can you simplify it?

MR. SUGARMAN: Yes, I'll simplify it.

BY MR. SUGARMAN:

Q. In light of your prior answers that you've just given, can you describe to His Honor how and why scientifically you rely upon the three different types of results that you described earlier to support your conclusion that --

JUDGE SMOLEN: Well, you don't have to repeat the conclusion.

MR. SUGARMAN: Oh.

BY MR. SUGARMAN:

Q. To support your conclusion with respect to the

effect of magnetic fields on health.

JUDGE SMOLEN: Very good.

THE WITNESS: This is the basis for most of my opinion. It is based not on any one type of evidence, but rather on evidence which apparently, if you'll look at it in its own context, it appears to be disparate. But there is a connectedness.

The three areas that I have talked about, I think for about a year now, are the areas of bone cell bone repair, which is therapeutic modality that's used, using ELF magnetic fields; a host of cell work which studies ELF magnetic fields; running from work on lymphocytes, lymphomas, the amoeba we talked about, the fish eggs, the RNA measurements of Goodman, and maybe a dozen other types of experiments, as a group of experiments all employing ELF magnetic fields; and finally, the epidemiological results, which constitute a third type of evidence.

And what I have been acutely conscious of because of the fact that, like others who are in this field, we see this entire picture, what's happened to me is that I think of each of these three areas as connected, even though if you are looking at any one experiment you could not make the extrapolation, as I mentioned earlier to Mr. Watson, that one could extrapolate this to a hazard condition.

The common thread running through each of these three areas, that each deals with ELF weak magnetic fields. That is to say, time-varying magnetic fields which have low frequencies, and where the magnitude of the magnetic field is very small; so small as to make skeptics like Professor Adair claim that there can't be any sort of effects.

But the fact is that if you are involved with the field, you know there were effects, because you know that you have seen the effects, and you have known respected colleagues who have also seen these effects.

They're not supposed to be there, because physically, as yet, there is no explanation.

You have the bone therapy -- by the way, which is not explained by any mechanism either, even though hundreds of thousands of people have already been treated using these devices.

You have the bone therapy, the cell work, and the epi work. And what I have suggested is that since we are talking about weak ELF fields in each case, and since there seems to be evidence in each of these three cases, there very well could be a connection in the three cases.

If one pursues this concept, then one comes to the conclusion that the epi work is much stronger, and it appears to be, if you just assume that the epi work

exists by itself.

The fact of the matter, viewed by myself, who is a BEMS person, is that the epi work is supported by work in the cells, supported by work in bone therapy, and basically supported by dozens of other examples which are taken from lab work and from clinical work. And to me, that's a very strong argument.

BY MR. SUGARMAN:

Q. Now, Mr. Watson asked you about whether pathways have been established; and you indicated, correct me if I'm wrong, that pathways had not been established?

A. He asked me, I believe, that had the pathways been established in the case of melatonin deficiency or dysfunction, leading to cancer.

And I replied, to the best of my knowledge this pathway has not been established.

Q. In scientific history and scientific practice, is it necessary to know the pathway before reaching a conclusion, a scientific conclusion as to whether there is a cause and effect?

A. No. I'm sure that there are many examples in which there is a cause, and then there is some unknown pathway, and then there's some sort of resulting physiological effect.

The example that everyone who teaches this sort of

thing uses is aspirin.

Q. Aspirin?

A. Aspirin has been known for a long time. Exactly how it alleviates a headache is not known.

Q. Is it known today?

A. I don't believe the headache-curing properties are known. But what is better understood is its blood-thinning properties.

Q. And has it been -- and this may be an obvious question; but has it been recommended by science, or concluded by -- that's such an obvious question. Let me ask you this.

Has the scientific community accepted that aspirin has an effect on headaches despite not knowing the pathway?

MR. WATSON: Your Honor, objection. This is beyond his area of expertise.

JUDGE SMOLEN: Yes.

MR. SUGARMAN: It's not, Your Honor, because the cross examination as to the effect that pathways are not known; and the implication was that if pathways are not known in some cases, then cause and effect is not established.

JUDGE SMOLEN: The witness has already testified to the effect that you don't need a pathway.

Is that right?

THE WITNESS: Yes, sir.

JUDGE SMOLEN: And aspirin is clearly not within the Commission's jurisdiction, except that the ALJs use it a lot.

(Laughter.)

MR. SUGARMAN: Well, Your Honor, I would suggest you consider Tylenol too.

(Laughter.)

JUDGE SMOLEN: That's better on the stomach.

MR. SUGARMAN: Right.

JUDGE SMOLEN: But not as good for the heart.

MR. SUGARMAN: Right.

(Laughter.)

MR. SUGARMAN: All I'm trying to do is establish --

JUDGE SMOLEN: I know what you're trying to do.

MR. SUGARMAN: I was trying to ask the witness whether the scientific community, not just the lay people, not just the world at large, but does the scientific community concur? Is there a consensus in the scientific community that you don't need a pathway to establish cause and effect.

JUDGE SMOLEN: I think you asked that. I think it was asked and answered.

MR. WATSON: Yes.

MR. SUGARMAN: All right.

MR. WATSON: And I object to this. It's leading; and secondly, the witness is not an expert on all science.

MR. SUGARMAN: He doesn't have to be.

MR. WATSON: And therefore I don't think he can testify as to the --

JUDGE SMOLEN: Wait a minute, I think that was asked and answered.

MR. WATSON: He hasn't purported to be.

MR. SUGARMAN: He doesn't have to be. He's an expert on the scientific method.

JUDGE SMOLEN: Wait a minute, I think we're arguing over nothing here. It was asked and answered.

MR. SUGARMAN: All right. My question goes to scientific method. I will ask it a different way.

BY MR. SUGARMAN:

Q. Is there a consensus, without respect to aspirin specifically, but with respect to scientific method and scientific practice -- which Mr. Watson asked you about at some length this morning.

Is there a consensus within the scientific community to reach conclusions about cause and effect without knowing pathways?

MR. WATSON: Objection, Your Honor; it's leading. Secondly --

MR. SUGARMAN: It's not leading. It's either yes or no. How can that be leading?

JUDGE SMOLEN: It's leading because it is answer yes or no.

MR. WATSON: Exactly right.

(Laughter.)

JUDGE SMOLEN: You've taken the ruling out of my hands.

(Laughter.)

MR. SUGARMAN: No, Your Honor, it's only leading if it suggests one answer or the other. To ask a yes or not question is not leading.

JUDGE SMOLEN: Well, it is suggesting an answer though. You don't need a pathway.

MR. SUGARMAN: I wasn't suggesting an answer.

JUDGE SMOLEN: Yes you were. In my view you were. So I sustain the objection.

MR. SUGARMAN: I'll rephrase the question then.

JUDGE SMOLEN: All right.

BY MR. SUGARMAN:

Q. What is the scientific -- what is the consensus, if there is one, within the scientific community with respect to the need for a pathway in order to reach

a conclusion on cause and effect?

MR. WATSON: Your Honor, I object. This expert has not come on and even in any way purported to qualify himself as an expert in all fields of science. Only within his own area.

JUDGE SMOLEN: Well, would you qualify within the field that this witness is an expert in?

MR. SUGARMAN: Within the field. I'll ask the question within the field of physics, and within the field of biophysics.

Shall I restate the whole question?

JUDGE SMOLEN: The witness understands the question, I'm sure.

MR. WATSON: This is fine. If he just limited it to that, I have no problem.

MR. SUGARMAN: Okay.

JUDGE SMOLEN: Do you remember the question? Surely you do. We'll give you an aspirin.

(Laughter.)

THE WITNESS: Actually, within the area of physics, that's a bad example of what you're trying to say.

JUDGE SMOLEN: Well, answer it anyway.

THE WITNESS: In physics, normally pathways are demanded. And for that reason, when one goes into the cyclotron resonance hypothesis, more is asked of the

scientist.

But in the biological community, and in the biophysics area that I have seen, the question is really --

MR. WATSON: I think this goes to --

THE WITNESS: -- efficaciousness.

JUDGE SMOLEN: No, no, let him go.

THE WITNESS: You want an efficacious solution. A person has a headache, you're trying to cure cancer, whatever. You don't have to be a clinician to understand that the most important thing is to do something to help the patient.

So AIDS people are given AZT, or whatever. No one has the foggiest notion how AZT might help or not help. The fact is that, the rule of thumb is efficaciousness.

So pathways become less of a -- of less interest to clinicians and of more interest to scientists.

I hope this answers what --

BY MR. SUGARMAN:

Q. Okay. His Honor was asking you earlier about the interpretation of some testimony that you gave in response to Mr. Watson about the difference between electric fields and magnetic fields.

And the question His Honor was asking was related to whether the fields differ from point to point, or whether there's a wall at which they either are or

aren't.

A. Yes, I remember that.

Q. I believe you answered that question. But could you very quickly just restate, so it's clear, what your answer is to that question?

MR. WATSON: Objection, Your Honor; repetitive, asked and answered.

JUDGE SMOLEN: Well, I'm going to permit this. I'll permit it.

THE WITNESS: Along the -- the way I think of a power line is as a -- in this case, as I remember it, there is a three-phase configuration.

Without getting too involved in the details, one can think of the power line as a single line, for example, in which all three phases are combined, all three wires are combined; and surrounding that a cylinder.

And the cylinder effectively gives you the level of magnetic field surrounding the axis of this power line.

JUDGE SMOLEN: If you're outside the cylinder, you're no longer in the field, is that correct?

THE WITNESS: No, it's not about --

JUDGE SMOLEN: Okay.

THE WITNESS: This is what I was trying to explain before.

JUDGE SMOLEN: Right.

THE WITNESS: The cylinder only gives you the level of magnetic field. Over that entire cylinder, the level of that magnetic field, let's say, is 100 mG.

But then if you go out to a larger cylinder, the level might fall to 40 mG. And if you go 300 feet away it might be 2 mG.

No matter how large this cylinder is made, there will be a magnetic field which stretches out, effectively, to infinity.

JUDGE SMOLEN: No matter how infinitesimal --

THE WITNESS: That's right.

JUDGE SMOLEN: -- the field is?

THE WITNESS: There will be a field there. Practically speaking, you might not be able to measure it. But one should think of a magnetic field caused by a wire as extending to infinity.

I must caution the Bench, however, there. I deliberately simplified the nature of the transmission line. Because the transmission line actually consists of a number of current carriers.

And so what was done, I think, by the computer code that was used in this case to judge the magnetic field was to take into account the contributions from each of these lines, and then you get a sum effect. So

that at 100 feet you'd have a certain milligause level, at 200 feet a certain lower milligause level, and so forth. But that field never disappears completely.

BY MR. SUGARMAN:

Q. All right. Now, you also, in response to Mr. Watson at that time, were explaining the difference between magnetic fields and electric fields.

And you were referring to the human, the difference as it relates to the field outside and inside the humans.

And without comparing again, because I think that's what got us off the track, what was it that you were trying to say about the nature of magnetic fields as it relates to the human versus the air outside the human?

A. That the magnetic field outside the human is the same as inside the human.

Q. So taking, in response to His Honor's question, say, 40 feet from -- in the 40-foot cylinder that you described.

A. Yes.

Q. The inner cylinder, all right? Would it be the case that the amount of magnetic field would be the same on the edges of that 40-foot cylinder whether or not there's a human there? And if the human were standing on that 40-foot it would be the same inside him as outside

him?

A. That's right.

Q. Is that what you were trying to say before?

A. That's what I was trying to say.

Q. Okay. Whereas with electric fields --

A. With electric fields there is an attenuation, usually, of the field inside of the human, because of the conducting fluids that we have inside of us.

Q. In other words, we have our own electrical conductors that would interact with the electric field somehow?

A. We have our own electrical conductors that distort the electric field. But these cannot distort the magnetic field.

Q. Okay. Now, coming back to the question of the effect of the magnetic fields on human health, have you published your conclusion with respect to the effect of electromagnetic fields on human health?

A. I have written about this.

Q. Has it been published?

A. Yes, it has.

Q. And in what form has it been published?

A. I had one article, which was a review article, in which I discuss this material in the book by Wilson, Stevens and Anderson that was referred to by Mr. Watson.

I think the name of the book is "ELF Fields, The Question of Cancer," or something like that.

Q. And what is the conclusion that you expressed in that article, in that book?

A. I made the argument in that chapter in that book that one could look to the ion cyclotron resonance mechanism, or hypothesis, as a potential explanation for the untoward effects that had been reported by epidemiologists. That is, a combination --

Q. By "untoward," what do you mean?

A. The question is relating to increased leukemia incidence in the vicinity of power lines.

Q. All right. Now, Mr. Watson asked you about replication both in general and, I'll call it, quasi-replication, or whatever you want to call it, efforts to repeat or somehow modify the experiments without confining to whether they were efforts to exactly repeat.

He asked you about the rabbit work, and you mentioned the company in Phoenix which has licensed your technology?

A. That's right.

Q. First of all, what is the technology designed to do that they have licensed?

A. The primary patent that we have suggests that the flow or passage of ions across membranes is

determined by these cyclotron resonance conditions.

And so by tuning to specific ions we have suggested that it is in principle possible to control the flow of ions across membranes.

Q. And is this a branch or a subset of the effects of electromagnetic fields?

A. Yes, it certainly is a subset --

Q. The application, I should say.

A. -- of bio-electromagnetism, yes.

Q. And has that company -- you indicated to Mr. Watson that you're not aware of the details of their work. Have you been furnished any information as to the results of their work with respect to your work on the effects of electromagnetic fields on biological systems?

A. Well, I know that they have been applying these fields to humans in the course of an FDA study. And that without knowing the exact performance specifications, I am told that the application of this principle with a device that they have manufactured to go on humans, and there's about a hundred humans under treatment, has been successful.

MR. WATSON: Your Honor, I move to strike that. That's rank hearsay. There's no way we can cross-examine on the results that he says he's been told.

MR. SUGARMAN: Well, Your Honor, there must have

been fifty times that Mr. Watson asked him what he had been told about various studies. An expert is entitled to consider hearsay information that goes to the weight.

JUDGE SMOLEN: Well, he's entitled to consider hearsay information in reaching his conclusions.

MR. SUGARMAN: Right.

JUDGE SMOLEN: But here you are attempting to put in the validity of the conclusions.

MR. SUGARMAN: I understand what Your Honor is saying.

JUDGE SMOLEN: Which is a little different.

MR. SUGARMAN: Let me rephrase the question.

JUDGE SMOLEN: All right. So the objection is sustained. Rephrase the question.

BY MR. SUGARMAN:

Mr. Watson asked you in regard to the opinions that you expressed in your testimony on the effects, on your ion resonance hypothesis, whether it has been confirmed. Do you remember those questions?

A. Yes.

Q. And he asked you about information that you had received from others, and you've become aware of through hearsay, on whether your thesis had been confirmed. Do you remember those questions?

Q. Now, have you received, in addition to the

specific questions that he asked you which related to some of the sources of information, and you didn't try to go beyond his questions, but Mr. Watson asked you whether you were aware of the work down there in Phoenix.

I'm going to ask you whether you're aware of the results, and whether those results, as reported to you, have tended to confirm your hypothesis with respect to ion resonance.

A. Yes.

MR. WATSON: Same objection, Your Honor. That's exactly the same thing. It gets to the same place. We have no way of knowing his reported results in some experiment involving some patent that he has.

MR. SUGARMAN: First of all, it's not some patent. Any kind of rhetoric like that is inappropriate. But you asked him about it.

Your Honor, Mr. Watson asked him about it on cross, whether he was aware of the work that was being done on these rabbit work.

Mr. Watson said, is that the work that's being done in Phoenix, and he asked the witness to comment on it.

He also asked the witness at least fifty questions --

JUDGE SMOLEN: Oh, I don't think he ever asked the

witness to comment on anything. That's not the nature of cross examination.

MR. SUGARMAN: I'll rephrase my characterization. He asked the witness questions about the work that was being done in Phoenix.

He also asked the witness at least fifty questions about other work done in other laboratories by other people, both by name and otherwise, as to the four or five different experiments, or types of experiments, which Dr. Liboff has performed himself; and asked in each of those cases whether other laboratories had correlated it.

Now, if I'm not going to be permitted to ask on redirect about the same subject, then I would move to strike all the questions that Mr. Watson had asked.

JUDGE SMOLEN: Well, I'm not sure that the Phoenix study is an attempt to corroborate this witness's hypothesis.

MR. SUGARMAN: The same as all the ones that Mr. Watson asked him about. The very same. But he didn't ask him for the results of the Phoenix study, because he didn't want to hear the results.

MR. WATSON: Well, Your Honor, I didn't ask him the results because we asked in the deposition, have you reviewed those data, and he said, not personally I have

not done so. So we couldn't get the information, therefore we couldn't ask him about it.

MR. SUGARMAN: Your Honor --

MR. WATSON: And now --

JUDGE SMOLEN: One voice.

MR. WATSON: And now it's coming as some attempt to resurrect it. But I believe Dr. Liboff said in the deposition he hadn't personally reviewed the data. That was the answer. And so we didn't ask him about it because we obviously saw that he hadn't read it.

MR. SUGARMAN: Your Honor, that's just as disingenuous as everything else.

JUDGE SMOLEN: Oh, come on.

MR. SUGARMAN: Honestly, Your Honor.

JUDGE SMOLEN: Just answer with --

MR. SUGARMAN: He asked him at least fifty questions this morning about results of the work that the witness had not personally reviewed it. At least fifty questions.

JUDGE SMOLEN: Let's start from scratch in this case right now. I'm going to sustain this objection and I'm going to let you rephrase the question.

MR. SUGARMAN: Thank you, Your Honor.

JUDGE SMOLEN: Let's do it again and see what you do with it this time.

BY MR. SUGARMAN:

Q. Has it been reported to you -- Mr. Watson asked you a series of questions about reports that you had received about work done in London, England; London, Ontario; Rochester, New York; Berkeley, California; and other laboratories around the world.

Now, he asked you about the results of that work. Now, I want to ask you about the results of the work that was done in Phoenix and the reports that you have received relating to that work in the same vein.

A. There have been many confirmations of the cyclotron resonance work in experiments done since this concept was introduced, since this hypothesis was introduced.

This morning I spoke in answer to questions on some of the negative studies. But the fact is there have been a lot of positive results.

There was a positive result reported in Neuro-Science Letters by Dr. Reiter in which melatonin was changed at calcium cyclotron resonance conditions.

The work at Iatra-Med [phonetic] that you're referring to in your question represents on the whole a positive confirmation of my model.

As I said, I don't have the details, but it has proceeded to the point where the owners of the company

have told me that they expect no problem in going forward with FDA approval.

And since the device is based upon a cyclotron resonance mechanism, I have to assume that that's a confirmation.

I also have had -- we've also had a confirmation of the diatom results that were mentioned this morning in work done by a person called Dr. Jude Reese, at Bitell [phonetic] National Laboratories, who repeated some of the work that we had done on diatoms.

We've also had confirmation of this work by the Berkeley group. Even though there is a difference in some details of the experiment having to do with mitogens, that were discussed this morning, the basic fact of the matter is that when human lymphocytes are exposed to cyclotron resonance combinations there are very large swings in calcium efflux.

And this goes to the heard of what I discovered a couple of years ago. And so that to me represents by and large a pretty good confirmation.

I've also heard from Frank Pradio, at the University of Western Ontario, that although he did not obtain the results on lymphocytes, he has other evidence now showing that he does get cyclotron resonance effects under other conditions.

So I take this to mean that there is some negative evidence which basically doesn't find cyclotron resonance effects, but there is much that does.

MR. WATSON: Your Honor, I'm going to move to strike all of the answer except the portion that addresses the question of the people at Phoenix.

JUDGE SMOLEN: I'm going to overrule. Let's go to the next question.

BY MR. SUGARMAN:

Q. Now, you've characterized the Rochester group, and you've said that they don't do science the way you do. And you said you were being blunt.

But I want to ask you, do you have an opinion as to -- and maybe it was implicit. But I want to know explicitly so it's not left unclear.

When you say have a way of doing science which is not the way you do it, do you have an opinion as to the relative merits of the way they do science versus the way you do science? Is it the same, is it better or is it worse?

A. Mr. Sugarman, I'd rather not answer that question.

Q. Okay. Mr. Watson showed you a copy of the transcript of, or a portion of the transcript of your testimony last week --

JUDGE SMOLEN: You mean his deposition?

MR. SUGARMAN: The deposition, yes. Thank you, Your Honor.

Do you have the reference, the one about the totally subjective, or whatever? Can you give me a page reference?

MR. WATSON: I was just going to ask you for it.

MR. SUGARMAN: I had written down 184. But the problem I have is the deposition ends at 161.

(Laughter.)

MR. WATSON: Let me see a minute if we can find it for you.

(Pause.)

MR. SUGARMAN: Here it is, 145.

JUDGE SMOLEN: All right, we're at page 145.

MR. WATSON: Yes, lines 19 and 20.

MR. SUGARMAN: Seventeen through 20, yes.

(Document handed to witness.)

BY MR. SUGARMAN:

Q. Dr. Liboff, in the transcript it's cited as follows: "I think it's a non-scientific," referring to an article in the Battle Creek Inquirer, by Dr. -- what's his name?

A. Kohl.

Q. Kohl. You were asked, "Is that an example of

a hysterical non-scientific evaluation of the epidemiological data." That was the question.

Your answer; "Not completely. I think it's a non-scientific evaluation because it obviously reflects an interest which is not totally objective."

Do you agree with that statement?

A. Yes, I said that.

Q. Okay. And is that still your opinion?

A. Yes.

Q. All right. Now, the next sentence, as transcribed, reads, quote, "Anything which is not totally subjective has to be considered non-scientific," end of quote.

Now, do you hold that opinion?

A. I do not.

Q. Did you say that?

A. I did not say that.

Q. Now, if the word "not" were removed, so that the sentence reads, "Anything which is totally subjective has to be considered non-scientific," would that represent your opinion?

A. That represents my opinion, yes.

Q. "Anything which is totally subjective has to be considered non-scientific"?

A. Yes.

Q. Okay, thank you.

Do you think that's what you probably said last week, to the best of your recollection?

A. I don't -- I can't recall.

Q. Now, Mr. Watson asked you whether you agree with PAUSE that the line should not be energized?

A. Yes.

Q. And your answer was yes. Would you state the basis of your agreement in that regard?

A. I've looked at the calculations on the magnetic fields at the edge of the right of way, and I conclude that even under a moderate load the magnetic field is just surprisingly high.

And I've been asked a number of times to come and get involved in situations like this where a line is either under consideration, or other aspects of the line, and I don't believe I've ever seen a case where I believe the numbers I saw were, at the edge of the right of way, something like 50, 60 mG. They're very, very high.

I think that as a rule one finds from transmission lines magnetic fields at the right of way, which includes in this case, as I understand it, the yards of people's homes, fields which are 10 mG and below.

The fields in this case are just too large. They're abnormally large.

I couldn't help but wonder if -- this is obviously an expedient thing to do, to take an existing right of way with some poles that can be used and to put a line on it. But if one were trying to put a 230-kv line in from scratch, there would be a much larger right of way.

So I find myself more than a little disturbed about the level of the magnetic field that would result in people's homes and yards.

Q. Now, you were asked about confounders in the epidemiological literature, and you expressed the opinion in response to Mr. Watson that you thought that looking for confounders was good?

A. I did.

Q. And a confounder -- if I'm using the wrong combination of words, would you please correct me? But as I understand it, if somebody were to find the nature of --

MR. SUGARMAN: Well, let me rephrase it, if I may, Your Honor.

BY MR. SUGARMAN:

Q. Would you explain to His Honor what confounders are in epidemiology?

A. You have two variables that you're trying to see if there's a connection between. In this case there is the connection of, say, childhood leukemia; and the

other variable is often wire code, a whole set of circumstances dealing with wires.

Q. Is that another way of saying electromagnetic fields?

A. Well, that's a separate question, in a way. Let me just finish this question that --

JUDGE SMOLEN: You're talking about some study which was performed using wire codes?

THE WITNESS: Yes. Most of the people who deal with the discussion of this area talk about the wire codes.

Now, the way I view correlations in epidemiology or in a laboratory, or in any other context, is that there are two variables and you're trying to get a relationship between these two variables; leukemia death and the nature of the wire code.

A confounder would be something that basically fools the epidemiologists, so that that person thinks that what he's studying is wire code, for example, but he's really studying, as one study suggested, traffic density nearby.

Or another example would be the level of income. Presumably, if you're rich enough to buy a big house, you're going to buy one where there's no power line nearby.

I don't mean any disrespect for the power company in that, in a sense, but it's a fact of life that from an aesthetic standpoint one would rather not be near a power line.

So it's conceivable that some of these epi studies have resulted in correlations in which the leukemia deaths might be confounded, not with the power line, but with what the power line really relates to; traffic density, income, or questions like that. Or perhaps formaldehyde, or some chemical basis that is connected with the poles, maybe to the pitch on the poles that is a chemical thing.

Now, on the other hand, the confounder may be something else which is magnetic. And that's an interesting aspect of this confounding.

BU

In other words, what I'm suggesting is that the wire code may be only an incident parameter. It may reflect the magnetic field in a sort of loose way, but it might be that there are parameters dealing with a magnetic field, that once you tease them out and understand them, then you can make a very strong correlation between a certain type of magnetic field and leukemia deaths.

Tp 4-A

So the confounder concept can be used both ways. It can be used to essentially tear down the problem of magnetic fields causing cancer, or it can be used

ultimately to make the problem more possible.

BY MR. SUGARMAN:

Q. All right. So would it be fair to describe confounders as the same thing as hidden variables in lay terminology?

A. That's a good term.

Q. Okay. So again, for an example, the tobacco dispute, the tobacco companies assert that the real cause of the cancer is not the smoking, but some other environmental factor, whatever, related to the people?

A. Yes. There was a famous --

Q. Is that an example of the debate that --

A. Let me illustrate what you're saying, because that's a -- I hadn't thought about that. That's a very good example, because at one point in the '50s, I think, or the '60s, there was an attempt to show that tobacco leaves were essentially radioactive, because they contained polonium, radioactive polonium.

And so many studies were done in which tobacco leaves were examined to see how radioactive they were. And people claimed for a while that what was happening is that the smoking of radioactive materials was the basic cause of the cancer and not the tobacco per se. That's a confounder.

Q. Okay. Now, with respect to the

epidemiological studies that you referred to in your direct testimony, and that you were asked about on cross, and specifically, the Wertheimer and Savitz studies, has anybody purported in the literature to identify a confounder or confounders which, to use your word, destroy or demolish the correlation between E/MF and cancer?

A. Well, the very --

MR. WATSON: Objection, Your Honor. It assumes facts not in evidence. There's no testimony that there is a correlation there by Dr. Liboff.

And in any event, the two studies referred to used wire codes, which are not the same as measured magnetic fields.

So there is also an assumption in the question of facts that are not in evidence and not established.

JUDGE SMOLEN: All right, stop. I'm going to give you a chance, but -- say what you want to say.

MR. SUGARMAN: I just want to say that every time I raised an objection to Mr. Watson assuming facts in his questions, I was overruled.

And if I mis-assumed a fact in my question, I assert that I have the same license that Mr. Watson does.

JUDGE SMOLEN: There's a different standard on cross examination and on redirect.

MR. SUGARMAN: I know there is.

JUDGE SMOLEN: Therefore I'm going to sustain the objection. You're not precluded from questioning on this area, but try it a different way.

MR. SUGARMAN: All right, I'll rephrase the question.

BY MR. SUGARMAN:

Q. In your direct testimony, did you characterize the Wertheimer and Savitz epidemiological work?

A. I don't remember now, but I did discuss it. I forgot the contents.

Q. Well, let me show you your direct testimony on page three, and the first full paragraph, the first six lines of the first full paragraph.

(Document handed to witness.)

A. Page three?

Q. Yes.

A. Okay. Oh, yes, okay.

Q. Okay. Now, do you recall Mr. Watson asking you about the Wertheimer study and your response that Savitz, as you say in your direct testimony, in essence verified it?

MR. WATSON: Your Honor, objection. I didn't ask him about that Wertheimer study. There was some confusion over the reference to it.

JUDGE SMOLEN: You're asking about a study by

Wertheimer on the next page.

MR. WATSON: That's correct, Your Honor.

JUDGE SMOLEN: On page four.

MR. WATSON: That's correct, Your Honor. And so this is beyond the scope of cross.

JUDGE SMOLEN: All right.

MR. WATSON: And I didn't ask him about the Savitz study either.

MR. SUGARMAN: All right, I will withdraw the question and go on to another subject.

BY MR. SUGARMAN:

Q. Now, you testified in response to Mr. Watson that the -- what do you call it, the line code?

A. Wire code.

Q. The wire code was related to some -- was at issue, or was the variable that was utilized in some of these studies. Do you recall that testimony in response to him?

A. That's right.

Q. Now, does the use of the wire code, in your opinion, affect the relevance of the studies where wire code was used as the variable for electromagnetic fields, or in regard to electromagnetism?

A. The wire code serves to provide a possible connection to magnetic fields, which has been looked at

in terms of individuals going into homes and simultaneously, as they measure wire code, also measure magnetic fields in the homes.

And the argument is that the measurement of magnetic fields does not correlate with leukemia, whereas the wire code does.

But if one looks at that data, I regard that as incomplete in the sense that there are maybe six or seven different ways of measuring magnetic field; and there is nothing to say that any one measurement of magnetic fields should correlate.

So it's a hard thing to explain, but perhaps I could give an example. If I were to say that -- and the reason I know the example is because I gave this to some students a week or two ago.

If I were to say that the height of waves was correlated with the number of canoe capsizes -- it's a good example, in a way, because waves, of course, are present in electromagnetism and in water.

And somebody went out and decided to measure the number of canoe capsizes as a function of the height of waves, all they had to do was point their canoe in the direction that was perpendicular to the wave fronts.

And if you've ever been in a canoe, you know that the canoe tends to be more stable when the canoe is

pointing at 90 degrees to the waves.

On the other hand, if your canoe was moving parallel to the waves, there's a great chance of capsizing.

So just measuring the height of the waves in that case would not give you a clear indication of capsizing. You would have to point the canoe in the direction that was consistent with not capsizing to begin with.

So what I'm saying is that just because a number of groups have gone into homes and measured magnetic fields and claimed that in all of them wire code correlates with cancer, these measurements of magnetic fields do not correlate with cancer, this is insufficient evidence to convince me that it is not the magnetic field. Because one can conceive of seven different types of magnetic fields that might conceivably be measured.

Q. Now, Mr. Watson asked you about the New York final report of the scientific inquiry as related to the Wertheimer study regarding pregnancy and cancer and electromagnetic fields.

A. I was asked that question.

Q. Am I stating it correctly?

A. There was some confusion about that.

Q. Yes. And you indicated that to the best of your recollection they were being done on overlapping time frames?

MR. WATSON: Your Honor, objection. I think we have the same problem before, that he wasn't asked about Wertheimer and any cancer studies on direct. He was only asked about the reproductive study on the next page.

MR. SUGARMAN: That's what I meant, the reproductive. Oh, I'm sorry, I meant the reproductive study. Excuse me.

BY MR. SUGARMAN:

Q. You indicated that to the best of your recollection that they were overlapping in time, is that correct?

A. What I don't remember --

Q. The reproductive study.

A. -- in that report is a specific mention of the Wertheimer work on reproductive studies. There were measurements of reproductive studies done by some specific investigators; at least one I can remember. But I don't remember any conclusion concerning the Wertheimer work. The Wertheimer work connected to electric blankets.

Q. All right. And you were asked by Mr. Watson as to your knowledge of some science review panel that was appointed by the EPA to review the EPA study?

A. Yes.

Q. Has the EPA study been published in final form

at this time?

A. Neither the EPA study nor the various review documents have been finalized.

Q. At the time that the EPA draft study was published, had it been peer-reviewed at that time?

A. No.

Q. Who had prepared the study?

A. A panel of both EPA scientists and some external scientists.

Q. The scientists, or the members of the review panel, was the membership of that body affected, or was it changed after the intervention of the president's science advisor, as indicated by the memorandum that you described?

A. I have some confusion, quite frankly, as to what happened. There was a brouhaha that made the newspapers and people talked about in terms of the way in which that panel was going to be selected.

There was one group that was suggested by Dr. Bromley. But I think in questioning this morning, Dr. Watson asked me if that panel was ever empaneled, and I think the answer I gave was that to the best of my knowledge it was not empaneled.

So there was another group that was somehow formed after this that was not the Bromley group, but some other

group.

JUDGE SMOLEN: Let me just say, I don't know if Mr. Watson is Dr. Watson or not.

(Laughter.)

MR. SUGARMAN: He didn't object, so I decided to let it go.

JUDGE SMOLEN: There's a jurist doctor, so you can call him Dr. Watson.

MR. WATSON: I thought I got a promotion. I appreciated it.

JUDGE SMOLEN: Well, I know Sherlock Holmes is next to you.

(Laughter.)

THE WITNESS: By the way, among the members of that panel that was suggested by Dr. Bromley was Dr. Adair, who we were talking about earlier.

So the suggestions by Dr. Bromley were obviously stacked to really come to a prior conclusion before the panel even met.

What Dr. Bromley apparently had tried to do was to put people together that had a totally negative view of this whole area.

MR. WATSON: Your Honor, I'm going to move to strike that as beyond the scope.

JUDGE SMOLEN: It's not responsive, really, to the

question, so I'll grant the motion. Go ahead.

MR. SUGARMAN: I don't have any further questions, Your Honor. Thank you.

JUDGE SMOLEN: Before we get to Mr. Watson, any other counsel have any questions on recross of this witness based upon his redirect?

MR. DILLON: No.

MS. McCLOSKEY: No.

MS. BURKET: No.

JUDGE SMOLEN: All right.

Mr. Watson?

RECROSS EXAMINATION

BY MR. WATSON:

Q. Dr. Liboff, I believe you just discussed on redirect confounders.

A. Yes.

Q. You recall that?

A. Yes.

Q. And would it be fair to say that you referred to confounders as possibly being something else that might be magnetic? That's a possibility of a confounder in these studies?

A. I didn't say it that way.

Q. Okay, well, let me --

A. It's in the spirit of what I said, yes.

Q. So would it be accurate to say that when you say that you're looking for confounders in one of these studies that one of the confounders that might confuse the results might be some other source other than a power line that might have magnetic properties?

A. Might be, among others, yes.

Q. Might be?

A. But it could be connected to the power line also. For example, the orientation of the power line geographically.

Q. Okay. So it doesn't necessarily have to be, but that is a possibility?

A. It's a possibility?

Q. That's a fair way to say it?

A. It could be some other magnetic parameter that is not connected to the power line.

Q. Do you know, in these studies, were these studies done in homes?

A. Yes. The ones that many people have talked about were studies done in homes.

Q. And do you know if in those homes there was any other source of magnetic fields other than the power line itself?

A. Yes, there were fields that were emanating

from household appliances, for example.

Q. How about household wiring?

A. And household wiring, which is always -- which can be a potent source of magnetic field in the house.

Q. Okay. Now, as of last week, October 9th, when I think you had your deposition taken, did you know the voltage of this line?

A. I think I responded to you, to Mr. Smith at that time, that I hadn't looked at the documentation. But what I did when I got home that night was to look it up again. It's a 230-kv proposed line.

MR. SUGARMAN: Do you have the page number?

MR. WATSON: Yes, page 39. Since I asked about it, I should, in fairness, show it to the witness.

Page 39, on line -- the question, I think, actually starts on page 38, line 24. And the place I'm referring to goes down to page 39, line five.

(Document handed to witness.)

BY MR. WATSON:

Q. Doctor, if you'll just read the question and answer.

A. In response to whether I know the voltage class or the transmission line involved in this case, I said, "I do not."

And your next question was, "All right, thank

you."

Q. All right, thank you.

A. And I said it's, I know it's an upgrade; and previously, either in disrepair or not in use.

Q. Okay, thank you.

And up to that time, Dr. Liboff, did you know the electric and magnetic field values associated with the line?

A. I had looked at the testimony of -- I don't know why I have difficulty remembering the gentleman's name' Boeggeman, I believe. And I had forgotten it at the time that I did the deposition.

JUDGE SMOLEN: You forgot the name at the time? What did you forget?

THE WITNESS: Oh, I forgot the values.

JUDGE SMOLEN: The values, okay.

THE WITNESS: I had a vague idea that they were large, that's all.

BY MR. WATSON:

Q. Page 39, line 14 through 16. Could you just read that for us, please?

A. "Do you know what the electric field or magnetic field values associated with this line will be?"

I answered, "No, I do not."

Q. Thank you.

MR. SUGARMAN: Your Honor, I could do it on redirect, but he's excerpting certain questions --

JUDGE SMOLEN: That's cross examination and use of depositions.

MR. SUGARMAN: Okay. But he's missing the context.

JUDGE SMOLEN: That's the way we use depositions.

MR. SUGARMAN: I would request that the entire context be given at this time.

MR. WATSON: Your Honor, I think I'm entitled to do cross examination any way I want.

JUDGE SMOLEN: Yes.

MR. WATSON: And if Mr. Sugarman wants to do redirect --

MR. SUGARMAN: It's just a waste of time.

JUDGE SMOLEN: Go ahead and read it.

MR. SUGARMAN: I just want my objection noted, because --

JUDGE SMOLEN: It's noted.

MR. SUGARMAN: -- I don't want this dialogue to be excerpted for the Commission as if there's not additional questions and answers in the transcript which are relevant to it to understand it; which Mr. Watson is deliberately not including.

MR. WATSON: I think the record speaks for itself,

Your Honor.

JUDGE SMOLEN: Yes.

(Pause.)

Anything more?

MR. WATSON: Nothing.

JUDGE SMOLEN: Oh, all right.

MR. SUGARMAN: Well, at least it will be close in the record.

FURTHER REDIRECT EXAMINATION

BY MR. SUGARMAN:

Q. Dr. Liboff, I call your attention to the same two pages that Mr. Watson was asking you about, pages 38 and 39.

(Document handed to witness.)

And I direct your attention to, starting right at the top; would you just --

A. I answer the question --

Q. Starting on page 37.

MR. WATSON: Can we have the reference?

THE WITNESS: Page 37, line 24. The question asked of me: "Other than the scientific literature on E/MF, have you reviewed any materials in connection with this case?"

Answer: "I have been exposed to material, but

whether I have reviewed them sufficiently to be conversant with them is another matter."

"Which materials have you been exposed to?"

"Various documents that have been sent to me by Mr. Sugarman's office."

"Could you give me any ideas of what some of these are?"

Answer: "The documents relating to the administrative judge's materials that are sent out dealing with the specifics of the right of way and power line sizes, length of line, the other participants in the case, matters like that. Many of them I looked at, but I just don't commit them to memory or reviewed them in any detailed way."

I think that was in the past tense, not in the present tense.

Q. Didn't?

A. Didn't, yes.

Q. Go ahead, keep going.

A. "Have you reviewed any testimony of other witnesses in this case?"

Answer: "I may have. I don't remember though."

Q. Keep going.

A. Question: "You said a moment ago that some of the materials that you had reviewed included some

information on such things as the voltage class of the line."

Answer: "I did not review them, sir. I did not review them, I looked at them."

Q. Okay. And then will you keep going?

A. Question: "I'm sorry. Yes, thank you. The documents that you had looked at included that type of information. Just to get an idea of what you're talking about when you say you looked at them, for example, do you know the voltage class of the transmission line involved in this case?"

Answer: "I do not."

Q. Keep going.

A. Question: "All right, thank you."

Answer: "I know that it's an upgrade and that it's a line which was previously either in disrepair or not in use following a railroad right of way, and there are issues concerning how close the various homes are, among the people who had retained Mr. Sugarman, are among to this proposed line. I think the voltage line itself is over 100 kilovolts, as I remember."

Q. Thank you.

Now, Dr. Liboff, as you testified, or indicated in response to Mr. Watson, would you describe the status of your knowledge of the line, and your practice with

respect to retaining the details?

MR. WATSON: Objection, Your Honor. The question just was, did he know the voltage.

MR. SUGARMAN: That was one of the questions.

MR. WATSON: This goes beyond it. He's launching into materials beyond the scope of recross.

JUDGE SMOLEN: You had the witness read into the record what he reviewed, what he had.

MR. SUGARMAN: Right.

JUDGE SMOLEN: Now, what was your question now?

MR. SUGARMAN: And the fact that he had a general knowledge of the situation at the time of his deposition.

JUDGE SMOLEN: I know. But what's the question?

MR. SUGARMAN: All I'm asking him is whether it's his practice to retain in his memory the details of each individual line that he gets involved with.

JUDGE SMOLEN: You can answer that question. Is it your practice to retain the details of each individual line with which you get involved.

THE WITNESS: It is not, sir.

JUDGE SMOLEN: All right.

BY MR. SUGARMAN:

Q. Did Mr. Smith show you any documents that you had seen before, or not seen before, to refresh your recollection during your deposition in that regard?

A. I don't believe so.

Q. Thank you.

MR. SUGARMAN: No further questions.

JUDGE SMOLEN: Anything more?

MR. WATSON: No.

JUDGE SMOLEN: By any other counsel?

(No response.)

JUDGE SMOLEN: Then the witness is excused.

Thank you very much for appearing and testifying today. And I hope you feel better and catch that plane on time.

THE WITNESS: Thank you.

(Witness excused.)

JUDGE SMOLEN: Off the record.

(Discussion off the record.)

JUDGE SMOLEN: Back on the record.

Have you closed your direct case, Mr. Sugarman?

MR. SUGARMAN: I have. I have two motions to make.

JUDGE SMOLEN: All right, we'll hear those. But you've closed your direct case?

MR. SUGARMAN: Yes.

JUDGE SMOLEN: All right. And you want to make your motions now?

MR. SUGARMAN: Yes. One motion is to join as

protestants the individuals who testified who were not formally named as protestants.

JUDGE SMOLEN: Well, I got that in writing from you to add. And I haven't received any response yet. But I have a question on it.

Are you really just asking that the caption of this case be changed? And I'm not sure that once a case has commenced we can change a caption since it relates back to the commonwealth court case.

The names that you've added, or that you've motioned to add, they testified, did they not?

MR. SUGARMAN: Yes, they did.

JUDGE SMOLEN: And again, I'm not certain that we can change a caption. The caption of the case is captioned, "Letter of Notification." We certainly cannot change a caption with respect to the commonwealth court case, which actually had names in it. Did it not?

MR. SUGARMAN: Well, the caption in the commonwealth court had one name.

JUDGE SMOLEN: But wasn't there an et al in it?

MR. SUGARMAN: It had an et al, right.

JUDGE SMOLEN: But there was a list of names.

MR. SUGARMAN: Once it's remanded to the Commission, the Commission can add or subtract parties.

JUDGE SMOLEN: Well, the caption of this case

doesn't have names in it. The caption is captioned, "Letter of Notification."

MR. SUGARMAN: Right. There's no need to change the caption. I'm only asking that they be made formal protestants, that's all.

JUDGE SMOLEN: Well, I didn't get an answer yet.

MR. BONNEY: If I could just respond orally, Your Honor.

JUDGE SMOLEN: Yes.

MR. BONNEY: We have no basic objection to those people that testified being added to the list of protestants if they were not previously on the list; with one qualification.

There were some people on the list that we received, that I believe Mr. Sugarman filed, who did not testify.

And particularly, I recall the name of an attorney for, I believe, Southampton Township named Mr. Marte; M-A-R-T-E, I believe it's spelled.

And he did not testify; and I believe there were some others that did not testify. I would have objected to his testifying.

JUDGE SMOLEN: Are you asking that they be deleted as protestants?

MR. BONNEY: Those people that did not testify,

yes.

JUDGE SMOLEN: Well, why don't you file something on it.

And I want to ask Counsel, what is the --

MR. BONNEY: If I can just --

JUDGE SMOLEN: Go ahead.

MR. BONNEY: I don't think it's his -- I gather from what Mr. Sugarman said that it's not his intention to add those people that did not testify, as protestants.

MR. SUGARMAN: No.

JUDGE SMOLEN: Well, I'm asking plainly. What do you want the administrative law judge to do with the posture of this case in connection with these protestants?

They haven't filed a protest. You mean add them as signatories, nunc pro tunc, as though they had signed the original protest in the case, or your original document?

MR. SUGARMAN: No, not nunc pro tunc.

JUDGE SMOLEN: Well, what do you want the record to show?

MR. SUGARMAN: That they be admitted as additional protestants.

MR. BONNEY: We have no objection to that as far as the people who testified.

MR. SUGARMAN: I'll settle for that.

JUDGE SMOLEN: All right. Do you want me to do anything with it?

MR. SUGARMAN: No, I think it's on the record. As long as Your Honor will order it.

JUDGE SMOLEN: It's by agreement of counsel. Those parties to whom you have referred to in your motion to add names of protestants is granted in accordance with the agreement of counsel.

Do you want to put those names on the record?

MR. SUGARMAN: I don't have them at this moment, Your Honor.

JUDGE SMOLEN: Well, all right. Well, then maybe the next time you can, because so far it's only a pleading.

MR. SUGARMAN: Thank you, Your Honor.

The other motion I would make is that the prehearing order be amended to provide for the submission of written testimony by the applicant as regards the expert witnesses that they intend to produce.

At the time Your Honor originally issued the prehearing order, I misunderstood the order, and --

JUDGE SMOLEN: You're talking about rebuttal witnesses now?

MR. SUGARMAN: Well, they're called rebuttal

witnesses. But I don't think it's fair in this case. And I understand that this is the Commission's terminology. I'm not quarreling with Your Honor.

By fair in this case, what I mean is, I don't think that terminology applies here. It is clear that we presented a case in chief, and had nothing from PECO in advance.

This issue is characterized by PECO and by the Commission as being intensely technical, and characterized by Your Honor --

JUDGE SMOLEN: Now wait a minute, let me interrupt. Didn't you have prepared direct testimony from PECO in this case?

MR. SUGARMAN: No.

MR. BONNEY: Yes, Your Honor, testimony by two witnesses, Mr. Boeggeman and Mr. Oddemann.

MR. SUGARMAN: Well, I was saying, that testimony said nothing about the subject of E/MF. I mean, I say nothing; it identified the amount of E/MF on the line.

JUDGE SMOLEN: All right, okay. Well, let's see what they have to say. You said you would like to have, let's see what the Company said.

MR. SUGARMAN: I just want to make sure they don't argue with my characterization.

JUDGE SMOLEN: I'm not sure that they're going to

present any witnesses. Let's find out first.

MR. SUGARMAN: Well, before you do, can I just say why I think I need it?

JUDGE SMOLEN: Go ahead.

MR. SUGARMAN: Not to contradict the fact that Boeggeman and Oddemann presented prepared testimony, but it had no opinions about E/MF.

It wasn't qualified, and they weren't qualified, and I was precluded from cross-examining them regarding the question of whether electromagnetic fields have an adverse health effect, or whether they even change biological systems. All of that was to be covered later.

And my point is that whatever the Commission's normal procedures are, the testimony in this case by the applicant was so void of any substantive testimony with respect to electromagnetic fields that, in effect, we were the first party to present evidence on it.

And it would be in the same spirit as Your Honor ordered us to present direct testimony.

JUDGE SMOLEN: All right, let me find out from the Company.

Does the Company intend to present expert witnesses in this field?

MR. BONNEY: Yes, Your Honor, we do.

JUDGE SMOLEN: All right. Is the Company prepared

to file and distribute prefiled direct testimony of your experts?

MR. BONNEY: No, we're not, Your Honor. We've been relying on your prehearing order and the multiple times that we've referenced oral rebuttal testimony as far as the scheduling in this case.

I think it's a little late in the game, considering in particular that you're order was in July, to now suggest that we should suggest written testimony on this.

I would also point out that the reason our initial direct testimony was, as Mr. Sugarman said, void of substantive testimony regarding E/MF, is because we don't have the burden of proof in this case.

We are responding to the testimony that's being presented by the protestants and by the other parties in this case, particularly the OCA.

And it's quite obvious, in fact I spelled it out in my cover letter, my transmittal letter, that we were not presenting testimony on that, but would reserve that for rebuttal.

JUDGE SMOLEN: Are you saying you're not going to present rebuttal testimony to the witnesses presented by Mr. Sugarman?

MR. BONNEY: No, we are, Your Honor.

JUDGE SMOLEN: And you mentioned something about

OCA.

MR. BONNEY: And to the OCA as well; we may. We intended to do that orally, which was consistent not only with your prehearing order, but with every one of the many schedule changes that we've had in this case.

The other thing is, if we are --

JUDGE SMOLEN: We have had, as you know, Mr. Bonney, in various rate cases, prefiled rebuttal testimony, in rate cases.

MR. BONNEY: Certainly.

JUDGE SMOLEN: Now, the next hearing is, what, Monday? Not next week, but the week after, is that right?

MR. BONNEY: That's correct. Your Honor, there is absolutely no way we could be prepared to file written testimony before that date. We were planning on that date as the date to prepare our case.

We hope to have some idea of where we're going to be going, but if we're talking now about preparing written testimony, that's a different matter.

And I would request that if you're going to order us --

JUDGE SMOLEN: Yes, we can modify the schedule.

MR. BONNEY: -- that we modify the schedule accordingly.

JUDGE SMOLEN: I'm just wondering, what does OCA have to say?

MS. McCLOSKEY: Yes, I would like to join in Mr. Sugarman's motion requesting that the Company file written rebuttal testimony.

It's obvious from the cross examination of OCA witnesses and Mr. Sugarman's today that this is an extremely complex area, and that Mr. Sugarman and the intervenors are going to be disadvantaged by having to hear the testimony for the first time orally.

Also, the Company has had the OCA's testimony since the end of August. And I'm sure that they've been preparing their response to that.

And although we have a continuing interrogatory as to what that response is going to be, we have received no information from the Company as to who will be exactly testifying in response to the OCA, or any summary or indication of what that testimony will be. And that's an interrogatory that's been outstanding since July.

And I believe now that we are operating at a tremendous disadvantage.

JUDGE SMOLEN: Does the Law Bureau have any position?

MS. BURKET: I was going to make an argument, but --

JUDGE SMOLEN: Well, make it if you want to make it.

MS. BURKET: Well, what I was going to do is remind everyone that this is a Letter of Notification proceeding, and how everything started.

And PECO had to prove and satisfy certain standards under our regulation, which they did. And they presented witnesses accordingly on their direct testimony, and then we had the, what do you call it, the rebuttal.

JUDGE SMOLEN: The direct testimony.

MS. BURKET: Yes.

JUDGE SMOLEN: Go ahead.

MS. BURKET: So we've done that. And I guess I would agree that this subject matter is complex, and that prefiled testimony would make the proceeding fairer.

But I would suggest that the hearing date be rescheduled.

JUDGE SMOLEN: Be modified, yes.

MS. BURKET: So that there should be more time for preparation of testimony.

JUDGE SMOLEN: Does PP&L have any position?

MR. DILLON: Only, Your Honor, that if there is -- we take no position on the issue, but if there is to be prefiled testimony, we would also request an extension of

the hearing so that we could have our independent experts review such prepared testimony.

JUDGE SMOLEN: How much time would you need?

MR. BONNEY: I'd prefer Mr. Watson, since he's sitting here --

JUDGE SMOLEN: Well, sure, why don't you confer for a minute. I want to get my calendar.

Let's take a short recess.

(Recess.)

JUDGE SMOLEN: Back on the record.

Have you reached a verdict?

MR. BONNEY: Yes. I would just like to say a couple things before we get to the question of if there's going to be written testimony, when we would be in a position to file that.

I think the request for us to file written rebuttal testimony is untimely. And if you talk about prejudice, we're talking about a case here, we're trying to decide an issue about a line that's needed to supply power to people.

We would like to have this question resolved expeditiously, and we continue to push the schedule back. I think that works to our detriment.

And I would just point out in that regard that the protestants, in a pleading filed immediately following

the issuance of the decision by Commonwealth Court Judge Palladino, requested that the hearings be held within 30 days of that order, or some months ago.

So I think the whole question of whether we should file written testimony or not was decided a long time ago. And to ask for a reconsideration of that question at this time is untimely.

With respect to how much time we would need if we are so ordered, we are going to need a significant amount of time.

And by that I'd say a minimum of 30 days, because our witnesses are unavailable to prepare written testimony between now and that time.

Basically, there's a lot more work that goes into preparing a written document in advance than there is in preparing oral testimony. And we have relied on your orders scheduling the oral testimony.

Your Honor, Mr. Watson has something to add with respect to one of the witnesses we intend to call in particular.

JUDGE SMOLEN: I want this proceeding to proceed on a fair, equal footing basis.

Now, having stated that, let's hear what Mr. Watson has to say.

MR. WATSON: This more relates to timing than that

question. But maybe I can just focus on that part of it.

Obviously we have to reassess where we are after the testimony concluded today on the part of the applicant, and determine, in the final analysis, what we might do in terms of the substance of rebuttal.

But one thing we certainly know --

JUDGE SMOLEN: Well, wait a minute. You would have to do that anyway --

MR. WATSON: That's right.

JUDGE SMOLEN: -- by the twenty-eighth even if it were oral.

MR. WATSON: That's right.

JUDGE SMOLEN: So go ahead.

MR. WATSON: So once we nail that down, one thing we know for sure out of that process, I think, right now, is that there is one witness that we've, I think, previously designated to call. That's a Mr. Silva.

I have had occasion to talk to Mr. Silva about another matter, and his availability. And he has made it clear to me that he is basically not available to do anything else because of his time being booked doing studies, etcetera, until roughly mid-December. I might be able to gain a few days, but not much more.

We would certainly, obviously, make the time, some way, to work with him between now and then. But he would

be --

JUDGE SMOLEN: You mean for his personal appearance?

MR. WATSON: Yes, to get him to do something in writing. And I have asked him, quite frankly, for written testimony in connection with another matter entirely, and that's why I happen to know what his particular availability is.

JUDGE SMOLEN: Well, was it your intention to have him in on the twenty-eighth, twenty-ninth and thirtieth of this month?

MR. WATSON: Yes, Your Honor, just to have him come in and do it. But if we have to go to the point of trying to get something in writing, obviously that takes longer.

JUDGE SMOLEN: Well, that's true. But those three days are apparently set aside for him.

MR. WATSON: I think he was set aside for one day.

JUDGE SMOLEN: Well, one day.

MR. WATSON: That's all he was available for. And certainly, I guess, one of the things we could try to do is to --

JUDGE SMOLEN: Get that testimony prepared on that one day.

MR. WATSON: Do preparation with him on that one

day, if we can.

JUDGE SMOLEN: Yes.

MR. WATSON: If he can get it done and written on that day.

JUDGE SMOLEN: Well, that's what I was driving at.

MR. WATSON: And then we would be looking at a testimony date.

JUDGE SMOLEN: Yes.

MR. WATSON: And based upon his schedule, Your Honor, I think the first available time that he has is around the 15th of December.

JUDGE SMOLEN: What about other rebuttal witnesses, or is he the sole one that you are now contemplating using?

MR. WATSON: No, I would say we probably have a couple of others, Your Honor. And we would just have to -- we certainly have him available for the time that Your Honor has scheduled for us to present our rebuttal testimony.

But in terms of preparing written testimony, and whether there would be adequate time to do so, I can't say unless we call him and say, you know, are you available between so and so time and so and so time to do this, and we see how much time we have, whether they have time to get these things written.

I think we just have to call him, Your Honor. What we did is reserve the time for him to appear here and testimony, based on our understanding of the order.

JUDGE SMOLEN: Does anyone have any suggestions? I'm inclined to direct the preparation of written testimony so that the proceeding proceed on an even keel and a fair basis, and giving all parties the opportunity to review expert testimony prior to the time they have to cross-examine.

MR. WATSON: I understand, Your Honor. And I think --

JUDGE SMOLEN: Now, that's one half of the problem. The second half is the scheduling problem.

Now, go ahead.

MR. WATSON: And I think that's really what's involved here, is what the price in terms of scheduling is going to be; if Your Honor wants to change the order and have prefiled direct, what the scheduling consequence of that will be.

We only have the information on one part of it; we'd have to find out from the other experts what that would be.

I can't say that I -- I just don't know their schedules well enough to know that right now.

JUDGE SMOLEN: Do we want to then conclude today

and give you an opportunity to check with your witnesses, and then we can get together on some conference call later this week? I guess it would have to be Thursday or Friday. I'm with Mr. Sugarman in another case on the twenty-first and the twenty-second in Phoenixville.

So Friday of this week; are two days sufficient time?

MR. WATSON: I think so. Your Honor, I guess the best thing I could say is that what we would represent to do is that we would make an effort to reach them as expeditiously as possible.

JUDGE SMOLEN: Right.

MR. WATSON: That as soon as we have reached the experts and found out information about their schedule, that --

JUDGE SMOLEN: Mr. Bonney has in the past been kind enough to initiate conference calls.

MR. WATSON: Right.

JUDGE SMOLEN: And I would request that he do so in this instance with the ALJ, as well as the other parties, and we can at least hear the report as to the availability of your experts.

MR. WATSON: Yes, I think that's the best we can do under the circumstances.

JUDGE SMOLEN: All right.

MR. BONNEY: Shall we set a time for the call on Friday?

MR. SUGARMAN: I don't know my calendar. I know I have to be out of town in the morning. I think I'm available in the afternoon. We can work it out.

JUDGE SMOLEN: Well, let me ask this, Mr. Sugarman. There's going to be written direct testimony. Do you really care when you're going to get it?

MR. SUGARMAN: Do I care when I'm going to get it?

JUDGE SMOLEN: Yes. As long as you get it sufficiently in advance of a scheduled hearing date.

MR. SUGARMAN: Right.

JUDGE SMOLEN: How much time do you need in advance of a scheduled hearing date.

MR. SUGARMAN: It depends on when it is.

JUDGE SMOLEN: Okay.

MR. SUGARMAN: But to be safe, let's say ten days.

JUDGE SMOLEN: You see, I have a problem in the afternoon on the eighteenth, and you say you're only available on the eighteenth.

MR. SUGARMAN: Well, I'll make myself available in the morning.

JUDGE SMOLEN: Okay.

MR. SUGARMAN: I'll figure out a way to do it.

JUDGE SMOLEN: Then you'll try to initiate that call.

MR. BONNEY: Ten o'clock?

JUDGE SMOLEN: At ten o'clock, or whenever.

MR. SUGARMAN: Well, wait a minute, that's the one time I can't. I've got a court thing at ten o'clock. So if we made it like nine thirty or eleven o'clock.

JUDGE SMOLEN: Well, make it at eleven. Are you going to be out by eleven?

MR. SUGARMAN: I don't think so. I'll be out, but I won't be in the city, but I'll call in from where I am. I'll be in Bucks County, but I'll call in from there.

JUDGE SMOLEN: I don't care what time, as long as we can get everyone.

MR. SUGARMAN: Say eleven.

MR. BONNEY: Eleven o'clock.

JUDGE SMOLEN: Eleven o'clock on Friday. All right?

MR. SUGARMAN: All right.

JUDGE SMOLEN: All right.

Before we conclude then, the upshot of our conversations now is that the twenty-eight, twenty-ninth and thirtieth will be cancelled, since we're going to have written testimony, or rebuttal testimony by the Company in writing. So we're not going to have hearings on the

twenty-eighth, twenty-ninth and thirtieth. Is that clear to everyone?

(No response.)

JUDGE SMOLEN: Okay, then we'll adjourn today's session; conference call initiated by Mr. Bonney on October 18th at approximately eleven a.m.

MS. BURKET: Your Honor, can I say one thing?

JUDGE SMOLEN: Yes.

MS. BURKET: I was going to request that as long as we're having PECO's rebuttal evidence come in as direct testimony from experts, written testimony, I'd like to make a suggestion that that also be --

JUDGE SMOLEN: Surrebuttal?

MS. BURKET: -- for surrebuttal if there's experts presented, so we can get that out of the way.

JUDGE SMOLEN: Well, that may mean a return visit. Well, that's up to Mr. Sugarman. Satisfied; written surrebuttal.

MS. BURKET: I think that's fair.

JUDGE SMOLEN: Make it all fair; fair to everyone. The OCA has no problem?

MS. McCLOSKEY: I have no problem with that, Your Honor.

JUDGE SMOLEN: All right, so that's the case, expert testimony, testimony by experts, is to be in

prepared written form, whether it's rebuttal, surrebuttal, rejoinder, surrejoinder; whatever comes after that, I don't really remember. Sur-surrebuttal, or whatever.

MR. SUGARMAN: Can I ask if Ms. Burket is going to present any testimony?

MS. BURKET: I'm not planning to.

JUDGE SMOLEN: All right. So the hearing is adjourned. We'll discuss this in a conference call on October 18th. The hearings of October 28th, 29th and 30th are cancelled.

(Whereupon, at 4:35 p.m., the hearing was concluded.)

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C E R T I F I C A T E

I hereby certify, as the stenographic reporter, that the foregoing proceedings were taken stenographically by me, and thereafter reduced to typewriting by me, or under my direction; and that this transcript is a true and accurate record to the best of my ability.

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