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** HIGHLY CONFIDENTIAL **
UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TENNESSEE
GREENEVILLE DIVISION
Civil Action No. 2:14-CV-00196

-----x
DENTSPLY INTERNATIONAL, INC. and TULSA
DENTAL PRODUCTS LLC d/b/a TULSA DENTAL
SPECIALTIES,

Plaintiffs,

- against -

US ENDODONTICS, LLC,

Defendant.

-----x

September 30, 2014

8:35 a.m.

Videotaped Deposition of A. JON
GOLDBERG, Ph.D., taken by Plaintiffs,
pursuant to Notice, held at the offices of
Kenyon & Kenyon LLP, One Broadway, New
York, New York, before Todd DeSimone, a
Registered Professional Reporter and
Notary Public of the State of New York.

GOLD STANDARD EXHIBIT 2014
US ENDODONTICS v. GOLD STANDARD
CASE PGR2015-00019

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1
2 APPEARANCES:
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16 Attorneys for Defendant
17 BY: JEFFREY S. GINSBERG, ESQ.
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19 SLAVEN JESIC, ESQ.
20 sjestic@kenyon.com
21
22 ALSO PRESENT:
23
24 DMITRY ZVONKOV, Videographer
25

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 THE VIDEOGRAPHER: Good morning
3 My name is Dmitry Zvonkov with Veritext.
4 Today's date is September 30th, 2014. The
5 time on the video monitor is 8:35 a.m.
6 This deposition is being held
7 at the offices of Kenyon & Kenyon located
8 at One Broadway, New York, New York. The
9 caption of the case is Dentsply
10 International, Inc., et al, versus US
11 Endodontics LLC, in the U.S. District
12 Court for the Eastern District of
13 Tennessee. The name of the witness is
14 Dr. Jon Goldberg.
15 Will counsel please identify
16 themselves for the record.
17 MS. BRENNER-LEIFER: Elizabeth
18 Brenner-Leifer from Rothwell Figg Ernst &
19 Manbeck for plaintiff Dentsply.
20 MR. NOLAN: Jason Nolan from
21 Rothwell Figg Ernst & Manbeck for
22 plaintiff Dentsply.
23 MR. GINSBERG: Jeff Ginsberg of
24 Kenyon & Kenyon for defendant US
25 Endodontics and the witness.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 MR. JESIC: Slaven Jesic,
3 Kenyon & Kenyon, on behalf of US
4 Endodontics and the witness.
5 THE VIDEOGRAPHER: Will the
6 reporter please swear in the witness.
7 * * *
8 A. JON GOLDBERG, Ph.D.,
9 called as a witness, having been first
10 duly sworn, was examined and testified
11 as follows:
12 EXAMINATION BY MS. BRENNER-LEIFER:
13 Q. Good morning, Dr. Goldberg.
14 A. Good morning.
15 Q. Could you state your name and
16 residence for the record.
17 A. Yes, Jon Goldberg. West
18 Hartford, Connecticut.
19 (Goldberg Exhibit 1 marked for
20 identification.)
21 Q. And you understand you have
22 been subpoenaed for your deposition today?
23 I'm giving you Exhibit 1 which
24 is your deposition notice.
25 A. Okay.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 MR. GINSBERG: I don't believe
3 he was subpoenaed.
4 MS. BRENNER-LEIFER: I'm sorry,
5 the notice for his deposition, I'm sorry.
6 Q. And you are appearing here
7 pursuant to the notice of deposition?
8 A. Yes.
9 Q. You submitted an expert -- or
10 two expert reports in this case; is that
11 correct?
12 A. Yes.
13 Q. Have you been deposed before?
14 A. Yes.
15 Q. And when was that?
16 A. Oh, maybe seven, eight years
17 ago.
18 Q. And was that -- what kind of
19 case was that for?
20 A. It involved dental materials.
21 Q. And what was -- was it a patent
22 case?
23 A. It had to do with a license.
24 It was a patent, but it wasn't an
25 infringement issue.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. A licensing issue?
3 A. Yes.
4 Q. And what party did you testify
5 for?
6 A. The university had licensed a
7 patent to Pentron Corporation and I was
8 asked to --
9 MR. GINSBERG: I just want to
10 interrupt. I just want to caution you not
11 to reveal any confidential information
12 that may have been involved in that case.
13 You can answer, if you can, but I just
14 don't want you to reveal any confidential
15 information.
16 THE WITNESS: Thank you.
17 A. The university had licensed a
18 company. There was a dispute with another
19 company. And the company that had the
20 license from the university asked me to be
21 a witness on their behalf.
22 Q. Were you a fact witness or an
23 expert witness?
24 A. Can you distinguish?
25 Q. Did you submit an expert report

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 for that case?
3 A. I don't recall.
4 Q. You were just testifying as to
5 your own personal knowledge --
6 A. That's my recollection.
7 Q. -- of the facts in the case?
8 MR. GINSBERG: Dr. Goldberg,
9 please let Ms. Brenner-Leifer finish
10 asking her question before you begin
11 answering, that way the court reporter can
12 get down both the question and the answer.
13 THE WITNESS: Okay, thank you.
14 Q. Maybe this is a good time to go
15 over some preliminaries. Since you have
16 been deposed before I will just go over
17 this again since it has been you said
18 eight years.
19 You must answer my questions
20 truthfully. You are testifying under oath
21 today. You need to answer verbally and
22 avoid uh-huhs or huh-uhs or nods of your
23 head or shakes of your head which the
24 court reporter can't record very well.
25 It is important for the court

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 reporter and for our questioning today
3 that we try not to talk over each other,
4 so there is no rush, we have got some
5 time. And if you just take your time and
6 let me finish asking my question and then
7 answer, and I will do my best to do the
8 same and not to interrupt you too.
9 A. And I will do my best to do
10 that also.
11 Q. If you don't hear a question
12 that I ask, ask me to repeat it, or if you
13 don't understand a question that I'm
14 asking, you can ask me to clarify it. If
15 you don't ask me to clarify it, I will
16 just assume that you understand the
17 question.
18 Your attorney can object from
19 time to time about my questions. Unless
20 he instructs you not to answer my
21 questions, you have to answer the
22 question.
23 Do you have any questions for
24 me before we start?
25 A. No.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Do you take any medications
3 that might affect your memory?
4 A. No.
5 Q. Or any medications that might
6 affect your ability to answer truthfully
7 and accurately today?
8 A. No.
9 Q. Is there any reason why you
10 can't provide truthful and accurate
11 testimony here today?
12 A. No.
13 Q. How did you prepare for your
14 deposition?
15 A. Mainly reviewing the articles
16 that we had been preparing over the last
17 couple of months and reviewing the
18 questions -- the assumptions that the
19 attorneys had asked me to make and coming
20 up with particular opinions.
21 Q. What were those assumptions?
22 A. Well, for example, there are
23 some issues relative to what permanent
24 deformation might mean and what the
25 atmosphere was that these files are

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 heat-treated in. So they would ask me to
3 consider if this was what would be your
4 opinion, those sort of assumptions.
5 Q. And who did you meet with? Who
6 did you meet with to prepare for your
7 deposition?
8 A. Well, most of the deposition I
9 prepared on my own. I did meet with the
10 attorneys at Kenyon & Kenyon just prior to
11 this deposition.
12 Q. Yesterday?
13 A. Yesterday and on Sunday.
14 Q. You were starting to tell me
15 about your other depositions. Were you
16 deposed in any other cases?
17 A. Not that I recall.
18 Q. Have you ever testified at
19 trial or in a hearing?
20 A. Yes. There was another case
21 maybe 15 years ago. I don't recall the
22 particulars. But it was before a judge.
23 Q. Were you a fact witness in that
24 case?
25 A. I just don't recall. I wasn't

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 a party to the issue, if that's what you
3 are asking. So I was there to provide
4 information, but I'm not -- you would have
5 to explain to me what a fact witness is.
6 Q. Well, a fact witness is you are
7 testifying on your own personal knowledge
8 and experiences rather than your serving
9 as an expert on a particular subject.
10 A. Okay. I'm not sure I fully
11 appreciate the difference, but I was asked
12 to testify about dental materials.
13 Q. And that was a business
14 dispute, too?
15 A. I don't recall.
16 Q. What companies were involved in
17 that case?
18 A. I don't recall.
19 Q. Was Dentsply a party to that
20 case?
21 A. I don't recall who the parties
22 were.
23 (Goldberg Exhibit 2 marked for
24 identification.)
25 Q. Dr. Goldberg, we have handed

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 you what's been marked as Goldberg 2. I
3 believe it's a copy of your curriculum
4 vitae; is that correct?
5 A. Yes.
6 Q. Is this complete?
7 A. I would have to look through
8 it. It would be hard for me to tell if a
9 particular reference was missing or not.
10 I mean, generally -- let me just page
11 through.
12 (Witness perusing document.)
13 A. It appears to be.
14 Q. Did you prepare your curriculum
15 vitae?
16 A. Yes.
17 Q. So I just want to go through
18 your background.
19 A. Okay.
20 Q. You are a professor at the
21 University of Connecticut?
22 A. Yes.
23 Q. In the Dental School?
24 A. Yes.
25 Q. And what is the Department of

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Reconstructive Sciences, what does that
3 mean?
4 A. That's the department that
5 teaches dental restorations, filling
6 materials, caps, crowns, dentures. We
7 also do implants and interface with all
8 the specialties, endodontics,
9 periodontics, oral surgery, orthodontics,
10 because most cases involve input from
11 others.
12 Q. And you graduated from Drexel
13 in 1970?
14 A. Yes.
15 Q. And you got a bachelors in
16 metallurgical engineering?
17 A. Yes.
18 Q. And then you got a masters at
19 University of Michigan; is that correct?
20 A. No. I only have one masters
21 degree, and it is from the University of
22 Michigan in 1971.
23 Q. And then you got a Ph.D. there
24 also?
25 A. At the University of Michigan,

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 yes.
3 Q. And you spent, it looks like,
4 most of your education is in metallurgy?
5 A. And dental materials.
6 I should comment that my Ph.D.
7 thesis actually had to do with polymers.
8 So I'm familiar with polymers as well as
9 metals and dental materials.
10 Q. And did you -- it looks like
11 from your CV you just went straight
12 through school?
13 A. I'm sorry?
14 Q. It looks like you just went
15 straight through school. Did you have any
16 jobs in between?
17 MR. GINSBERG: Objection to the
18 form of the question. You can answer.
19 A. Yes. While at Drexel, it is a
20 cooperative school, so it is a five-year
21 program. Basically you go to normal
22 classes the first nine months and the last
23 nine months, in between you are six months
24 in school, six months working.
25 So I had a couple of years of

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 work experience during my undergraduate.
3 Q. Where did you work?
4 A. At the Philadelphia Navy Yard
5 and at Bethlehem Steel Plant in Indiana.
6 Q. My grandfather worked in the
7 mills in Youngstown, a little bit earlier
8 than that. I think he was retired by
9 then. So I have some familiarity with
10 what you do.
11 A. We could share stories, I'm
12 sure.
13 Q. Yeah, I'm sure you could.
14 So you worked for Bethlehem
15 Steel. So you were doing more industrial
16 metallurgy for companies in big
17 manufacturing?
18 MR. GINSBERG: Objection to the
19 form of the question. You can answer, if
20 you can.
21 A. Yes. So when I worked for
22 Bethlehem Steel, it was a brand new steel
23 plant in Indiana and I was asked to go out
24 and work with the chief metallurgist. It
25 was one of the first highly-automated

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 facilities.
3 So my job was to try to
4 confirm, specifically I was measuring
5 temperatures of steel in what's called a
6 hot rolling mill, so the steel gets rolled
7 down, they change temperatures, and all
8 the automation equipment is trying to
9 monitor the temperature changes and then
10 adjust the processing simultaneously with
11 that.
12 And my job was to actually go
13 down and manually record the temperatures,
14 compare that to what the automated devices
15 were monitoring.
16 Q. And did you have any other jobs
17 while you were in school?
18 A. Yes. I was at the Bethlehem
19 Steel -- I'm sorry, at the Philadelphia
20 Navy Shipyard.
21 Q. And what did you do there?
22 A. I also worked for the chief
23 metallurgist there, and our job was to do
24 failure analysis from components on ships.
25 So, for example, if a boiler

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 explodes, we would receive samples. We
3 would metallurgically prepare them and
4 then examine them to look at the
5 structure, and then the chief metallurgist
6 would do the interpretation. So I was
7 basically helping to prepare the samples.
8 Q. When you were in school, did
9 any of your studies involve nickel
10 titanium?
11 A. Yes, just limited, at Michigan
12 in the area of dental materials, we
13 studied different alloys. I should
14 correct that answer. I know we studied
15 titanium. I just don't recall back in
16 1970s if we were looking at nickel
17 titaniums at that same time.
18 Q. So your background is more in
19 metallurgy, not in the dental sciences?
20 You are at the dental school, but you are
21 not a dentist or an endodontist?
22 MR. GINSBERG: Objection to the
23 form of the question. You can answer, if
24 you can.
25 A. Yes. As you know, my Ph.D., I

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 did my Ph.D. in a combined program between
3 the Dental School and the Engineering
4 School. And at Michigan at that time they
5 were just like a block away from each
6 other. So my laboratory was actually in
7 the Dental School, and most of my time was
8 in the Dental School, and my training was
9 to understand material science, but then
10 understand the applications, in this case,
11 dentistry.
12 So I would take what are called
13 preclinical courses with the dental
14 students, that is you would be not working
15 on a patient, but in a laboratory, just
16 seeing what the lab technician or the
17 dentists were trying to achieve so we can
18 appreciate the applications.
19 Q. That makes sense.
20 On the second page of your
21 curriculum vitae, it has what looks like
22 your job experience.
23 A. Yes.
24 Q. Could you go through that for
25 me?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Sure. When you say job
3 experience, this doesn't include the co-op
4 experiences that I had as an
5 undergraduate.
6 So going from the bottom up, my
7 position, my job at the University of
8 Connecticut was my first job. It has been
9 my only job. I came on, I was an
10 assistant professor, which would be
11 typical rank for a beginning new faculty
12 member, and I have always essentially been
13 in the same department, but the department
14 name has changed over the time from
15 Restorative Dentistry to Reconstructive
16 Dentistry. At one point it also included
17 the term Biomaterials in the name of the
18 department.
19 Then in 1980 I was successfully
20 reviewed for promotion to associate
21 professor with tenure. So that would
22 indicate that I had achieved a certain
23 level of academic performance that would
24 warrant that promotion and tenure.
25 Then in 1982, I, at the time,

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 had an opportunity to do a sabbatical. So
3 I went to the National Center for Electron
4 Microscopy, which is at the Lawrence
5 Berkeley Laboratory, which, if you are not
6 familiar, is just above the hill from the
7 University of California at Berkeley.
8 They share a large campus.
9 Then in 1999 I was a visiting
10 scientist at the Department of
11 Biomaterials in relation to dentistry in
12 London at Queen Mary and Westfield
13 College. In 1986 I was promoted to
14 professor, again, which would indicate a
15 certain level of academic achievement.
16 And in '95 I formed and then
17 became the director of the Center For
18 Biomaterials. So this is a group of
19 faculty members within our department that
20 have an interest in biomaterials, and I
21 try to coordinate those efforts, oversee
22 lab space, and administrative, as well as
23 somewhat less now, but also some issues of
24 what research directions we may want to
25 take as a group.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 And specifically right now the
3 university is going through some major
4 renovations, so when I get back next week
5 I have meetings with the architects to
6 talk about how the labs might be designed.
7 Q. Do you teach dental students?
8 A. Yes.
9 Q. And do you teach a materials
10 class for dental students?
11 A. Yes.
12 Q. And have you done that since
13 you started as a professor?
14 A. Yes. If I can qualify that, I,
15 in addition, have taught what are called
16 residents. So when you say dental
17 students, those are people that are
18 working to get their dental degree. After
19 getting their dental degree, they
20 specialize, orthodontics, endodontics,
21 oral surgery, prosthodontics.
22 So in the past I have taught
23 dental materials to those groups, and
24 today I also help supervise research
25 projects for those students.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 In addition, I do teach at the
3 Engineering School at the main campus, the
4 University of Connecticut, and supervise
5 students in their research, typically
6 biomedical engineering students.
7 Q. When you did your Ph.D. in
8 dental materials in 1977, was that at the
9 Dental School?
10 A. Can you repeat the question,
11 please?
12 Q. When you did your Ph.D. in
13 dental materials in 1977, was that at the
14 Dental School?
15 MR. GINSBERG: Objection to the
16 form of the question.
17 A. So I did my degree from '70,
18 and I should clarify, I started in 1970 at
19 the Engineering School. After one year I
20 began my Ph.D., and that was a joint
21 degree between the Dental School and the
22 Engineering School. So I spent part of my
23 time in the Engineering School and part of
24 my time in the Dental School.
25 Q. Do you know what classes the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 dentistry students took in metallurgy or
3 materials when you were there?
4 MR. GINSBERG: Objection to the
5 form of the question.
6 A. Which school and what time
7 point?
8 Q. When you were at the University
9 of Michigan in the '70s and studying for
10 your own courses, are you aware of whether
11 the dental students took metallurgy or
12 materials science?
13 MR. GINSBERG: Objection to the
14 form of the question.
15 A. Yes. It was not referred to
16 that. Those courses in most dental
17 schools are called Dental Materials, but
18 include material science and metallurgy.
19 Q. I'm not sure I understood your
20 answer. You said it was not referred to
21 that. Could you please --
22 A. Correct. This other course in
23 the Dental School would be called Dental
24 Materials.
25 So Dental Materials, the way

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 that it was taught at Michigan was
3 students would learn about basic
4 materials, metals, polymers, ceramics,
5 composites. So in describing how metals
6 work, they are basically taught
7 metallurgy, but the course is not formally
8 called that.
9 And then they would be taught
10 what the application is and try to
11 understand the basics of the materials so
12 they can understand why that material
13 selected for that case, why it might have
14 gone wrong, why it is manipulated a
15 particular way.
16 Q. But the average dental student
17 when you were in school in the '70s
18 wouldn't have had all the extensive
19 metallurgy background that you had?
20 MR. GINSBERG: Objection to the
21 form of the question.
22 A. When you say average, you mean
23 nationally? At Michigan?
24 Q. Let's start at Michigan. Let
25 me rephrase my question.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 When you were in school doing
3 your Ph.D. and studying metallurgical
4 engineering in the '70s and you were
5 studying with dental students at some
6 points, right?
7 A. At some points, correct.
8 Q. So you are familiar with the
9 classes the dental students were taking?
10 A. No.
11 Q. Not all of them?
12 A. No. I was familiar with the
13 courses that I was taking with them, but
14 they took many other courses that I wasn't
15 taking.
16 Q. I guess the thrust of my
17 question is, when you were studying
18 metallurgical engineering, your studies of
19 metallurgical engineering were much more
20 extensive than the dental students?
21 A. Yes.
22 MR. GINSBERG: Objection to the
23 form of the question.
24 Q. The dental students only took a
25 couple of classes that would relate to

7 (Pages 22 - 25)

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 materials?
3 A. No. All dental students are
4 required to take Dental Materials. They
5 cover a wide range of materials. They
6 focus on the the application and they
7 understand -- they are taught basic
8 structures of materials.
9 I think what you are asking,
10 that's in contrast to an engineering
11 student like myself who might take
12 thermodynamics of materials.
13 Is that what you are asking me?
14 Q. Yeah.
15 A. Yes.
16 Q. Dr. Goldberg, do you receive
17 research grants from time to time?
18 A. Yes.
19 Q. And do you receive research
20 grants from any companies, private
21 companies?
22 A. I have in the past.
23 Q. What companies? Let's just
24 talk about the last five years.
25 A. Let me just think. None in the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 last five years.
3 Q. None?
4 A. Yes, from companies.
5 Q. Were they government grants?
6 MR. GINSBERG: Objection to the
7 form of the question.
8 A. Some were government grants,
9 yes.
10 Q. Could you tell me more
11 specifically what the government grants
12 were?
13 A. Sure, I would be glad to.
14 Right now my major federal
15 support, in fact, my only federal support
16 right now is a training grant. So the
17 National Institutes of Health would like
18 to maintain researchers and pipelines to
19 deal with the questions that are of
20 interest to them. So to do that they fund
21 either individuals or universities to
22 train these people.
23 So myself and a colleague,
24 Dr. Mina Mina, are co-directors of the
25 training grant in skeletal, cranial,

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 facial and oral biology. So that is the
3 kind of like biological aspects around the
4 oral cavity. It is a \$4 million grant.
5 Right now we probably have
6 actively funded 12 students, but maybe
7 there is another half dozen that have been
8 funded by us or will be funded by us. So
9 our job is to provide them research
10 training.
11 Q. Have you ever received any
12 research grants or stipends from Dentsply?
13 A. Not that I can recall.
14 Q. Have you ever received any
15 research grants or stipends from US
16 Endodontics?
17 A. No.
18 Q. Have you received any research
19 grants or stipends from any dental
20 companies?
21 A. Yes. But my hesitation is some
22 of those are in confidence, so I don't
23 know if I can describe them to you. I
24 probably shouldn't.
25 Q. Well, we can mark this

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 transcript confidential.
3 MR. GINSBERG: That won't cure
4 it. If he is subject to confidentiality
5 agreements that he is not permitted to
6 disclose the names, then I would caution
7 the witness not to disclose those names.
8 MS. BRENNER-LEIFER: I'm just
9 asking for the name of the company with
10 regard to financial bias.
11 MR. GINSBERG: And I repeat,
12 please listen, if he --
13 MS. BRENNER-LEIFER: I heard
14 what you said. I'm asking him more
15 questions.
16 MR. GINSBERG: I'm --
17 MS. BRENNER-LEIFER: I heard
18 what you said.
19 MR. GINSBERG: I'm going to
20 state the objection on the record.
21 MS. BRENNER-LEIFER: I heard
22 your objection. You already stated it.
23 Q. He does not want you to reveal
24 anything that's confidential. I'm just
25 probing to understand whether it is truly

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 confidential.
3 A. It is a court mandate. So I
4 don't know if that -- that to me is
5 different from confidential. In other
6 words, I might have a confidentiality
7 agreement which I think would not allow me
8 to start, but this was related to a legal
9 settlement.
10 Q. Have you received any financial
11 payments from any U.S. dental companies?
12 A. Yes.
13 Q. And can you just tell me the
14 name of the company? I don't need to know
15 anything specific.
16 A. I can tell you the name of one
17 of them was Ormco Corporation, it is an
18 orthodontic company.
19 Q. Could you spell that, please?
20 A. Ormco, O-r-m-c-o.
21 Q. Any other companies?
22 A. The other companies involved --
23 some of the support did involve this case
24 that I'm talking about, so I'm -- it was a
25 legal settlement. There was

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 confidentiality. I guess I'm not sure
3 what else I can say without breaking that
4 confidentiality.
5 Q. So that relates to payments
6 that related to work you did for the case?
7 A. No.
8 Q. I'm asking specifically about
9 any kind of research or financial support
10 you get for your work.
11 A. For this case?
12 Q. No, at the university or
13 otherwise in your normal business.
14 A. Right. So, first of all, I
15 don't receive the money personally. When
16 we get a grant, it goes to the university.
17 There was no support related to this case.
18 I have had support from
19 companies for my research at the
20 university, and that has gone to the
21 university to support the laboratory.
22 Q. Are you on any advisory boards
23 for companies?
24 A. No.
25 Q. Do you give talks from time to

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 time?
3 A. Yes.
4 Q. And do you receive money for
5 those talks?
6 A. It depends. Generally I don't.
7 Q. The university does?
8 A. No. Generally I talk at
9 academic and professional meetings or
10 academic societies, and they only pay my
11 expenses to give the talk.
12 Q. Have you ever given any talks
13 sponsoring a particular company for their
14 products?
15 A. I'm sorry, I didn't hear the
16 question.
17 Q. Have you ever given any talks
18 sponsoring a particular company for their
19 products?
20 MR. GINSBERG: Objection to the
21 form of the question.
22 A. I'm not sure what you mean by
23 sponsoring the company.
24 Q. Well, sponsoring a company's
25 products.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Oh, sponsoring a company's
3 products. When we developed the beta
4 titanium alloys for orthodontic
5 application, I was asked to give talks
6 describing the materials. So I did that.
7 But I wasn't paid for that.
8 And I also -- we did some
9 development work in fiber-reinforced
10 composites, and that company asked me to
11 go to certain dental meetings and give
12 talks about that. I don't recall if I was
13 paid or not, I don't believe so, I think
14 they just paid my expenses.
15 This was the concept that it
16 was new products, new materials, so
17 dentists and lab technicians would be
18 interested in understanding it, and I was
19 in a position to explain what the
20 rationale was for the materials, why they
21 had benefits, those sort of things.
22 Q. And what companies are you
23 referring to?
24 A. Those two cases were Ormco and
25 Pentron Corporation.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Was Ormco for the beta
3 titanium?
4 A. Yes.
5 Q. And could you spell the
6 other --
7 A. I'm sorry, I think that's what
8 was actually called the A Company. I just
9 don't recall. It was either A Company --
10 maybe it was Ormco. I just don't recall
11 which of those two. It is O-r-m-c-o. And
12 the other was just capital A Company.
13 Q. And what was the company for
14 the fiber-reinforced composites?
15 A. Pentron, P-e-n-t-r-o-n.
16 Q. Do you know anyone that works
17 at US Endo?
18 A. No.
19 Q. Do you know anyone that works
20 at Edge Endo?
21 A. No.
22 Q. Did you become an expert in
23 this case through their attorneys?
24 MR. GINSBERG: Objection to the
25 form of the question.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. I'm sorry, through which
3 attorneys?
4 Q. Through US Endo's attorneys.
5 A. Well, I assume that means
6 Kenyon & Kenyon, and yes, they were the
7 ones that contacted me.
8 (Goldberg Exhibit 3 marked for
9 identification.)
10 Q. Dr. Goldberg, we have marked
11 for the record as Exhibit 3 your
12 supplemental expert report.
13 A. Yes.
14 Q. When did you prepare this
15 report?
16 A. Within the last couple of
17 weeks.
18 Q. And what precipitated you to
19 prepare that report?
20 A. The attorneys at Kenyon &
21 Kenyon asked me to look at the section of
22 I think it was Sinclair or Luebke and
23 their definition of ordinary skill, and I
24 felt it was nonspecific, most notable it
25 would have allowed somebody with training

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 in a totally unrelated field to be
3 considered one of ordinary skill, so
4 working together we revised the
5 definition.
6 Q. Why didn't you include a
7 definition of a person of ordinary skill
8 in your first report?
9 A. I wasn't asked to do so.
10 Q. Had you given it any thought?
11 A. No.
12 Q. In your --
13 A. Let me say that whenever I'm
14 reading documents and it says person of
15 ordinary skill, then I'm thinking about
16 what that person should be. But as far as
17 modifying the definition, the attorneys
18 called me and specifically asked me to
19 look at that, and then in reading it
20 closely, the Sinclair and Luebke
21 definitions, I felt that it was
22 nonspecific, particularly as it relates to
23 allowing somebody with no training in
24 materials or dentistry to potentially be
25 considered one of ordinary skill.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. But when you wrote your first
3 report, your attorneys did not ask you to
4 define who a person of ordinary skill in
5 the art was?
6 A. I don't recall. But if it
7 wasn't in the report, then I imagine they
8 did not.
9 (Goldberg Exhibit 4 marked for
10 identification.)
11 Q. Dr. Goldberg, having offered a
12 supplemental report in this case and
13 having had an opportunity to supplement
14 your first report, do you feel that you've
15 now provided a complete summary of your
16 opinions for this case?
17 MR. GINSBERG: Objection to the
18 form of the question.
19 A. Yes, of the opinions I've been
20 asked to, I have.
21 Q. We have marked as Goldberg
22 Exhibit 4 your first expert report.
23 MR. GINSBERG: I will just
24 object. It is not his first expert
25 report. It is incomplete. It does not

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 include the exhibits.
3 And since we are getting into a
4 document that has been marked highly
5 confidential pursuant to the protective
6 order, I would like to designate this
7 transcript highly confidential pursuant to
8 the protective order.
9 Q. Could you look at the body of
10 this document and tell me if this part is
11 complete.
12 MR. GINSBERG: Objection to the
13 form of the question. And regarding
14 completeness, as I have stated, we object
15 to this document as it does not include
16 the exhibits.
17 (Witness perusing document.)
18 A. Other than the references, it
19 appears to be complete.
20 Q. You mean the prior art
21 references that were attached to your
22 report?
23 MR. GINSBERG: Objection.
24 A. All the references that were
25 attached to the report.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 MS. BRENNER-LEIFER: I would
3 like to take a five-minute break.
4 THE VIDEOGRAPHER: This ends
5 tape number one. We are off the record at
6 9:17.
7 (Recess taken.)
8 (Goldberg Exhibit 5 marked for
9 identification.)
10 THE VIDEOGRAPHER: This begins
11 tape number two in the deposition of
12 Dr. Jon Goldberg. We are on the record at
13 9:25.
14 BY MS. BRENNER-LEIFER:
15 Q. Dr. Goldberg, we have marked as
16 Exhibit 5 U.S. Patent 8,727,773. Do you
17 have that in front of you?
18 A. Yes.
19 Q. Do you recognize this as one of
20 the patents upon which you have given your
21 opinions in your report?
22 A. Yes.
23 Q. And you have expressed opinions
24 about both infringement and invalidity?
25 A. Yes.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And you have some -- also some
3 opinions about claim construction?
4 A. I was asked to consider, make
5 certain assumptions, and then what my
6 opinions would be about claim construction
7 given certain opinions, given certain
8 assumptions.
9 Q. So what were the assumptions
10 you were asked to give?
11 A. For which aspects of the
12 claims?
13 Q. Well, you just said you were
14 asked to -- you were asked to make certain
15 assumptions. What assumptions are you
16 talking about?
17 A. Okay. Well, the two that I
18 recall had to do with the definition of
19 what atmosphere was present during the
20 heat treatment. That's just one that I
21 recall offhand.
22 Q. Do you mean the atmosphere that
23 was present during the heat treatment of
24 what, in the patent?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form of the question.
3 A. Yes. I was asked to -- let me
4 start that again. I was asked to examine
5 whether or not -- how the claim should be
6 interpreted as far as the heat treatment,
7 particularly relative to what atmosphere
8 would be involved.
9 Q. Any other assumptions?
10 A. I just don't recall sitting
11 here. I know -- I just don't recall.
12 Q. Did your attorneys at Kenyon
13 explain to you the difference between an
14 independent and a dependent patent claim?
15 A. Yes.
16 Q. What's your understanding of
17 the difference?
18 A. My understanding is that -- let
19 me put it this way. A dependent claim is
20 limited by the claim that it is attached
21 to plus the additional information in the
22 dependent claim itself.
23 Q. You have the last page of the
24 patent in front of you?
25 A. Yes.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. In claim 1, which is at the
3 bottom of the column 9, do you see any
4 reference in claim 1 to atmosphere?
5 A. No.
6 Q. You don't see that as a
7 limitation in claim 1?
8 MR. GINSBERG: Objection to the
9 form of the question and to the extent
10 that it calls for a legal conclusion. You
11 can answer.
12 A. The atmosphere isn't
13 specifically described in the claim, but
14 my understanding is most of the phrases or
15 terms in the claim are defined by what's
16 described in the specification.
17 So in that case, if you look in
18 the specification, whenever heat treatment
19 is mentioned or an atmosphere is
20 mentioned, it's in a particular type of
21 atmosphere.
22 Q. Would you look at claim 2 of
23 the patent.
24 A. Yes.
25 Q. Is an atmosphere described in

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 that claim?
3 MR. GINSBERG: Objection to the
4 form of the question and to the extent
5 that it calls for a legal conclusion. You
6 can answer.
7 A. Well, that would -- claim 2
8 would include claim 1, and claim 1 does
9 mention the heat treatment, and the heat
10 treatment, the atmosphere for the heat
11 treatment is described in the
12 specification.
13 Q. And what about claim 3?
14 MR. GINSBERG: Same objections.
15 A. And same answer.
16 Q. Do you see any reference to
17 "atmosphere" in claim 3?
18 MR. GINSBERG: Same objections.
19 A. Again, 3 includes 1. 1
20 describes the heat treatment. And the
21 heat treatment atmosphere is described in
22 the specification.
23 Q. And what about claim 4?
24 MR. GINSBERG: Same objections.
25 Objection to the form of the question and

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 to the extent it calls for a legal
3 conclusion.
4 A. Yes, so claim 4 does say it's
5 in any atmosphere, but it is still part of
6 claim 1, which refers to the heat
7 treating, and in the specification the
8 atmosphere during those heat treatments
9 are described.
10 Q. So your understanding is claim
11 4, that it encompasses any atmosphere?
12 MR. GINSBERG: Objection to the
13 form of the question. Mischaracterizing
14 the witness' testimony, and I object to
15 the extent it calls for a legal
16 conclusion.
17 MS. BRENNER-LEIFER: It says it
18 right there.
19 MR. GINSBERG: Objection to the
20 extent it calls for a legal conclusion.
21 A. Can you repeat the question?
22 Q. So claim 4 explicitly states
23 any atmosphere, as you stated previously,
24 correct?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form.
3 A. Right. But, as I've said,
4 claim 4 would include claim 1.
5 Q. So is it your understanding
6 that claim 4 is actually narrower than any
7 atmosphere?
8 MR. GINSBERG: Objection to the
9 form of the question and to the extent it
10 calls for a legal conclusion.
11 A. I guess I'm not an expert in
12 independent versus dependent claims. I
13 mean, my understanding is that a dependent
14 claim would include the independent claim.
15 So in this case, whatever might be said in
16 4 still is also limited by what's in 1.
17 Q. And as you mentioned earlier,
18 claim 1 doesn't refer to any specific
19 atmosphere?
20 MR. GINSBERG: Objection to the
21 form of the question and to the extent
22 that it calls for a legal conclusion.
23 A. Again, as I said earlier, it
24 describes heat treating. One aspect of
25 heat treating is the atmosphere and that's

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 mentioned several times in the
3 specification.
4 Q. I understand there is
5 atmosphere as it is discussed in the
6 specification. But I'm asking you to
7 consider just the claims.
8 MR. GINSBERG: Objection. Wait
9 for a question.
10 Q. For instance, there is a
11 reference to argon in the specification,
12 correct?
13 A. You would have to point that
14 out to me. I just don't recall.
15 Q. Well, we don't need to do that
16 right now. But there is no specific
17 atmosphere recited in claim 1, and claim 4
18 specifically says "any atmosphere"; is
19 that correct?
20 MR. GINSBERG: Objection to the
21 form of the question.
22 A. Again, I'm not sure how these
23 independent and dependent claims formally
24 work.
25 My simple understanding is that

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 whatever is in claim 1 would also apply to
3 claim 4. So I guess I would say, I'm not
4 an attorney, but if one part is more
5 limiting, I don't think you could expand
6 it with another part. I think the
7 dependent claims have to limit more than
8 expand, but that's my legal opinion.
9 MR. GINSBERG: I object to you
10 giving a legal opinion.
11 Q. You don't need to do that. But
12 you are correct that the claim -- the
13 dependent claim has to narrow the
14 independent claim, and so claim 4 has to
15 be narrower than claim 1.
16 MR. GINSBERG: Objection to the
17 form of the question. Misstating the law.
18 I object to the legal characterization.
19 It is incorrect and I object to that
20 question, multiple grounds.
21 A. Can you repeat the question,
22 please?
23 Q. Actually, it wasn't a question.
24 So you can ignore all his objections
25 because there really wasn't a question

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 there.
3 MR. GINSBERG: I object to the
4 misstatement then.
5 Q. So looking at claim 5.
6 A. Yes.
7 Q. Claim 5 says "The method of
8 claim 4 wherein the atmosphere is
9 unreactive, ambient, or any other
10 acceptable heat treatment process."
11 MR. GINSBERG: Is that a
12 question?
13 Q. Do you see that?
14 A. I see that.
15 Q. And do you understand that
16 claim 5 further limits claim 4?
17 MR. GINSBERG: Objection to the
18 form of the question and to the extent
19 that it calls for a legal conclusion.
20 A. Yes, so 5 is dependent on 4,
21 and 4 is dependent on 1. I don't know if
22 I'm saying that correctly.
23 Q. So 5 gives examples of specific
24 atmospheres which can be unreactive or
25 ambient or any other acceptable heat

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 treatment process. You see that, right?
3 A. Yes.
4 Q. And you understand what that
5 means?
6 A. Yes.
7 Q. So I just want to make sure we
8 are on the same page with these claims
9 here, specifically claims 1 through 5, or
10 1 through 6 -- or 1 through 5. So claim 1
11 is a method for manufacturing or modifying
12 endodontic instrument.
13 And do you understand what an
14 endodontic instrument is?
15 MR. GINSBERG: Objection to the
16 form of the question.
17 A. Yes.
18 Q. How would you define endodontic
19 instrument?
20 MR. GINSBERG: I will object to
21 the extent it calls for a legal
22 conclusion. You can answer.
23 A. I imagine there is many
24 endodontic instruments, some of which I'm
25 not familiar with. I answered as, you

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 know, thinking a file would be an example,
3 but it is not inclusive of all
4 instruments.
5 Q. And claim 1 recites an
6 endodontic instrument for performing root
7 canal therapy. You see that?
8 A. Yes.
9 Q. And that would include a file?
10 A. It would include a file, yes.
11 If I can expand on that, in every case you
12 might not have to use a file, you might
13 use a reamer.
14 Q. So you understand claim 1 would
15 also include reamers?
16 MR. GINSBERG: Objection.
17 Calls for a legal conclusion.
18 A. Well, I can only repeat what it
19 says. It would be an instrument used in
20 performing root canal therapy on a tooth.
21 So I would think of instruments such as
22 files and reamers.
23 Q. What about a broach?
24 MR. GINSBERG: Objection to the
25 form of the question.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. I'm not sure exactly what that
3 is, but I believe it is a type of
4 endodontic instrument.
5 Q. The first limitation in claim 1
6 is (a). Do you see that paragraph?
7 A. Yes.
8 MR. GINSBERG: Objection to the
9 form.
10 Q. "Providing an elongate shank."
11 Do you understand what a shank is?
12 A. Yes.
13 Q. What is a shank?
14 MR. GINSBERG: Objection to the
15 form of the question to the extent it
16 calls for a legal conclusion.
17 A. In this context, they are
18 speaking about the part of the file other
19 than the handle, or the part of the
20 instrument other than the handle, but I'm
21 envisioning this being a file, and I note
22 you have pointed out that it's not
23 specifically limited to that.
24 Q. Would a reamer have a shank?
25 A. I believe so.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And limitation (a) says
3 "providing an elongate shank having a
4 cutting edge extending from a distal end
5 of the shank along an axial length of the
6 shank."
7 Do you see that?
8 A. Yes.
9 Q. Do you understand what that
10 means?
11 A. Yes.
12 Q. And what's a cutting edge?
13 MR. GINSBERG: Objection to the
14 form of the question, to the extent that
15 it calls for a legal conclusion.
16 A. I'm envisioning a file, so I
17 will answer the question based on that.
18 So the file has a twisted section where
19 the edges have been sharpened so that when
20 the file is turned or rotated, those
21 cutting edges remove part of the tissue
22 that's being removed during the endodontic
23 therapy.
24 Q. What is an obturator?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form of the question.
3 A. In what context?
4 Q. In the endodontic context.
5 A. I'm not sure what the obturator
6 is in endodontics. I'm not sure exactly
7 how those are used or what they would be.
8 Q. What is your experience working
9 with endodontic files?
10 A. Mainly reading articles and
11 reviews relative to the mechanical
12 properties and the structures of the
13 files.
14 Q. Have you ever done any of your
15 own research on files?
16 A. What I recall is an endodontic
17 resident coming to me asking how we might
18 measure some of the mechanical properties
19 of files. I gave him some advice as to
20 how that might be done. I don't recall if
21 we actually did that in my lab or not.
22 Q. Can you recall any other work
23 related to endodontic files?
24 A. Only in the sense that there is
25 lots of commonalities between orthodontic

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 nickel titaniums and endodontic nickel
3 titaniums, so when we have done work in
4 orthodontics, I have relied on references
5 from the endodontic field.
6 Q. And you teach classes in
7 orthodontics?
8 A. I teach materials, so right now
9 I teach materials to our dental students.
10 Part of that course is on orthodontic
11 dental materials. I used to specifically
12 teach the residents that included the
13 orthodontists.
14 Q. And what about endodontists?
15 A. They were also included in that
16 class.
17 Q. Did you teach any classes
18 specifically relating to endodontics?
19 A. Do you mean specifically and
20 only to the endodontic residents?
21 Q. No. I mean relating to the
22 subject of endodontics.
23 MR. GINSBERG: Objection to the
24 form of the question.
25 A. So I'm interpreting your

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 question to mean did I give a course that
3 was entirely focused on endodontics, and I
4 have not done that.
5 Q. Did you give any courses that
6 were partially focused on endodontics?
7 MR. GINSBERG: Objection.
8 A. Yes.
9 Q. What classes?
10 A. Dental Materials.
11 Q. And how did that relate to
12 endodontics?
13 A. Well, in Dental Materials we
14 teach about all the materials that are
15 used, so that would include the materials
16 used in endodontics.
17 Q. Going back to claim 1 in
18 limitation (a), there is a further
19 limitation that recites "the shank
20 comprising a superelastic nickel titanium
21 alloy."
22 Do you see that?
23 A. Yes.
24 Q. And what do you understand that
25 to mean?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 MR. GINSBERG: Objection to the
3 extent it calls for a legal conclusion.
4 You can answer.
5 A. Well, are you asking --
6 Q. Let me break down the question.
7 A. Yes, thank you.
8 Q. Are you familiar with the term
9 "superelastic"?
10 A. Yes.
11 Q. And what does that mean?
12 A. That means you deflect the
13 material that returns to its original
14 shape.
15 Q. Are there some properties of
16 nickel titanium alloy that are not
17 superelastic?
18 MR. GINSBERG: Objection to the
19 form of the question.
20 A. Yes, there are definitely
21 properties that are different than
22 superelasticity.
23 Q. And what other properties are
24 those?
25 A. I would think about the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 ultimate strength, the modulus of
3 elasticity. Those would be the first two
4 that I would think about.
5 Q. And what do you mean, ultimate
6 strength?
7 A. So ultimate strength is
8 referring to a typical stress-strain curve
9 which would be a measure of the stress and
10 strain, and the maximum value of stress on
11 those curves would be the ultimate
12 strength.
13 Q. And what do you mean by modulus
14 of elasticity?
15 A. That would be the slope of the
16 initial part of the stress-strain curve.
17 Q. And what do you mean by stress
18 and strain?
19 A. So stress would be a force
20 applied to a material divided by the
21 cross-section layer that is supporting
22 that stress.
23 And strain would be the amount
24 of deflection while under stress divided
25 by the original dimension.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Let's turn to step (b) of claim
3 1.
4 A. Okay.
5 Q. It says "after step (a),
6 heat-treating the entire shank at a
7 temperature from 400 degrees Celsius up
8 to, but not equal to, the melting point of
9 the superelastic nickel titanium alloy."
10 Do you see that?
11 A. Yes.
12 Q. It has several components,
13 heating, the shank, and a specific
14 temperature range. Do you see that?
15 MR. GINSBERG: Objection to the
16 extent you are mischaracterizing the step.
17 Q. Do you see that?
18 A. I see that step -- I see that
19 section (b), yes.
20 Q. And then after step (b) there
21 is a "wherein" clause that states "the
22 heat-treated shank has an angle greater
23 than 10 degrees of permanent deformation
24 after torque at 45 degrees of flexion when
25 tested in accordance with ISO Standard

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 3630-1."
3 Do you see that?
4 A. Yes.
5 Q. So breaking that down, it's
6 measuring degrees of permanent deformation
7 using a specific test, correct?
8 MR. GINSBERG: Objection to the
9 form.
10 A. Yes.
11 Q. And the test is set forth in
12 the ISO Standard 3630-1; you understand
13 that?
14 A. I understand that, but that's
15 not part of ISO Standard 3630.
16 Q. What do you mean, that's not
17 part of ISO?
18 A. Well, measuring the permanent
19 deformation.
20 Q. Okay. And are you familiar
21 with the term "permanent deformation"?
22 A. Yes.
23 Q. And how is that ordinarily
24 used?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form of the question.
3 A. Can you define what you mean by
4 ordinarily?
5 Q. Is that a term of art?
6 MR. GINSBERG: Objection to the
7 form.
8 A. I'm sorry, I'm just trying --
9 because obviously it can have many
10 meanings.
11 Q. Let me start over. Is
12 "permanent deformation" a term of art?
13 MR. GINSBERG: Objection to the
14 form of the question.
15 A. In dental materials?
16 Q. In metallurgy.
17 A. In metallurgy, yes.
18 Q. And is the term "permanent set"
19 also a term of art?
20 MR. GINSBERG: Objection to the
21 form of the question.
22 A. I would consider that more
23 commonly used in dental materials.
24 Q. Do they have different
25 meanings?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. It is just that you were asking
3 if they are commonly used, and I'm
4 explaining that I believe permanent set is
5 more commonly used in dental materials.
6 Permanent deformation is more commonly
7 used in metallurgy.
8 Q. Well, is the term "permanent
9 deformation" used in dental materials?
10 MR. GINSBERG: Objection to
11 form.
12 A. Yes.
13 Q. And is that a term of art when
14 used in dental materials?
15 A. Yes, in the context that we
16 have been discussing it.
17 Q. And what is the ordinary
18 meaning of permanent deformation when used
19 in the context of endodontics?
20 MR. GINSBERG: Objection to the
21 form of the question.
22 A. Well, in general, permanent
23 deformation would mean you deform a sample
24 and it doesn't return to its original
25 shape or dimensions.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And what does permanent set
3 mean?
4 MR. GINSBERG: Objection to
5 form.
6 A. Permanent set in dental
7 materials could have many meanings. It
8 could have to do, for example, probably
9 commonly used with curing of methacrylates
10 for dentures and removal of partial
11 dentures and composites.
12 So that term is commonly used
13 to describe that the material has cured or
14 hardened.
15 Q. So going back to step (b), step
16 (b) recites a temperature range of "400
17 degrees C up to, but not equal to, the
18 melting point of the superelastic nickel
19 titanium alloy."
20 Do you see that?
21 A. Yes.
22 Q. And you understand what that
23 means?
24 MR. GINSBERG: Objection to the
25 form of the question and to the extent it

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 calls for a legal conclusion.
3 A. I can just interpret that when
4 the heat treating process is done, the
5 temperature is within that range.
6 Q. Now looking at claim 2, claim 2
7 recites the method of claim 1 wherein the
8 temperature is from 475 degrees Celsius to
9 525 degrees Celsius.
10 Do you see that?
11 A. Yes.
12 Q. Do you see that recites a
13 narrower range?
14 MR. GINSBERG: Objection to the
15 form of the question and to the extent
16 that it is outside of the preliminary
17 injunction motion and the expert report.
18 A. Yes, I can see that 475 is
19 greater than 400, and assuming the alloy
20 doesn't melt, 525 would be below the
21 melting point.
22 Q. And do you understand that
23 claim 2 includes all the limitations of
24 claim 1 and is further limited to that
25 narrower temperature range?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 MR. GINSBERG: Objection.
3 Calls for a legal conclusion.
4 A. I'm not sure I'm following what
5 you are saying.
6 Q. Well, a little while ago you
7 were explaining to me how your general
8 understanding is that a dependent claim
9 incorporates the limitations of the
10 independent claim and then adds further
11 limitations, right?
12 A. Correct.
13 Q. And I'm just wanting to make
14 sure that you and I are on the same page
15 for claim 2 here.
16 Claim 2 incorporates the
17 limitations of claim 1 and further limits
18 it to a narrower temperature range?
19 MR. GINSBERG: Objection to the
20 extent it calls for a legal conclusion.
21 A. I'm understanding your
22 explanation, yes.
23 Q. You understand that that's what
24 claim 2 recites?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 extent it calls for a legal conclusion.
3 A. Well, I see that it recites
4 that temperature limitation and that it's
5 a dependent claim to claim 1.
6 Q. And looking at claim 3 at the
7 top of column 10, claim 3 is also a
8 dependent claim. It reads "the method of
9 claim 1," which makes it dependent, and
10 then it says "wherein," and then it says
11 "the shank is heat-treated for one to two
12 hours."
13 Do you see that?
14 MR. GINSBERG: Objection to the
15 form of the question.
16 A. Yes, I see that.
17 Q. Now, do you understand that
18 claim 3 further limits claim 1 to
19 encompass all of those limitations, but
20 just limits how long the heat treatment is
21 for?
22 MR. GINSBERG: Objection.
23 Calls for a legal conclusion.
24 A. I can understand your
25 interpretation, yes.

17 (Pages 62 - 65)

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And then going to claim 4,
3 claim 4 says "the method of claim 1,"
4 again, making it dependent, you understand
5 that, right? And then it says "wherein,"
6 and then it says "step (b)," which looking
7 at claim 1 refers to heat-treating from
8 this 400 degrees Celsius up to the melting
9 point; you understand that?
10 A. Yes.
11 Q. And then it further limits the
12 atmosphere?
13 MR. GINSBERG: Objection to the
14 form of the question.
15 Q. And it just says "any
16 atmosphere?"
17 MR. GINSBERG: Objection to the
18 form of the question and to the extent
19 that it calls for a legal conclusion.
20 You can answer, if you can.
21 A. Yes, I'm following your
22 interpretation.
23 Q. So you understand that claim
24 1 -- I'm sorry, so you understand that
25 claim 2 -- I'm sorry, let me start over.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Claim 4 -- you understand that
3 claim 4 further limits claim 1 by just
4 reciting the atmosphere?
5 MR. GINSBERG: Objection.
6 Calls for a legal conclusion.
7 A. Well, this gets back to the
8 questions and answers we had before, and I
9 don't want to misstate what I had said
10 before.
11 The atmosphere is discussed
12 throughout the specification. I don't
13 know the legal ramifications of expanding
14 an independent claim with a dependent
15 claim. I recognize that it's called a
16 dependent claim.
17 I'm just trying to explain what
18 I had said before, that there seems to be
19 a conflict between the definitions of the
20 atmospheres in those two. So I don't -- I
21 don't know how to interpret that.
22 Q. So in your view, if claim 4 is
23 interpreted to mean any atmosphere, it
24 would expand, not narrow, claim 1?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 extent it calls for a legal conclusion.
3 A. Again, I'm not sure of the
4 technicalities or how that would work. I
5 understand what a dependent claim is.
6 But, as I've stated before, I
7 have an opinion on what the heat-treating
8 should include as far as the atmosphere,
9 and that appears to be in contrast to the
10 specific independent claim.
11 Q. But you agree that claim 1 on
12 its face doesn't recite any atmosphere; is
13 that correct?
14 A. The words "atmosphere" are not
15 in the claim, correct.
16 Q. To read claim 1 to encompass a
17 specific atmosphere, you would have to
18 read something in from the specification,
19 right?
20 MR. GINSBERG: Objection, to
21 the extent it calls for a legal
22 conclusion.
23 A. My experience is that
24 everything in the claims is described in
25 the specification.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 I mean, you need to have some
3 background to understand what the claims
4 are, so that's how I interpret the
5 atmosphere and heat-treating, based on
6 what's in the specification.
7 Q. Looking at claim 6, claim 6
8 recites the method of claim 4 making it
9 dependent on claim 4; you understand that?
10 A. Yes.
11 Q. And it further recites "the
12 atmosphere is unreactive." What does
13 "unreactive" mean?
14 MR. GINSBERG: Objection to the
15 form of the question, to the extent it
16 calls for a legal conclusion.
17 A. In the context of heat-treating
18 these nickel titanium alloys, it would
19 mean that you would get some sort of oxide
20 or something on the surface if it was
21 reactive. If it was unreactive, you would
22 not expect that.
23 Q. And it just pertains to its
24 effects on the surface?
25 MR. GINSBERG: Objection to the

18 (Pages 66 - 69)

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form of the question and to the extent it
3 calls for a legal conclusion.
4 A. So I'm going to ask you to
5 clarify because there is different things
6 that can happen.
7 An oxide can be formed. The
8 gas could diffuse into the metal. It
9 could diffuse into the bulk of the metal.
10 So that you have to just clarify what
11 aspect of unreactive you are referring to.
12 I offered the one how it has
13 been used in the context of this case, and
14 that was the oxide formation.
15 Q. What does ambient mean?
16 MR. GINSBERG: Objection to the
17 form of the question, to the extent it
18 calls for a legal conclusion. It is
19 beyond the scope of the expert reports.
20 A. Again, in the context of this
21 case I would anticipate that's talking
22 about doing a heating with just using
23 whatever air or environment is around, so
24 that would typically mean in air.
25 Q. And then claims 5 and 6 both

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 recite another atmosphere, or actually
3 they both recite any other acceptable heat
4 treatment process.
5 Do you have an idea of what
6 that might mean?
7 A. No.
8 Q. No idea?
9 MR. GINSBERG: Asked and
10 answered.
11 A. No.
12 Q. Could you please turn to column
13 3 of the patent.
14 A. Okay.
15 Q. Beginning about line 48 there
16 is a paragraph that begins "Figure 6." Do
17 you see that?
18 A. Yes.
19 Q. I will read it to you.
20 "Figure 6 is a graph showing
21 the results of a study of angle of
22 permanent deformation after the flexion
23 test (ADP) reported in degrees of
24 deflection performed in accordance with
25 'ISO Standard 3630-1 Dentistry - Root

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Canal Instruments - Part 1: General
3 Requirements and ANSI/ADA Specification
4 No. 28, Endodontic files and reamers' for
5 untreated (Control) files, heat-treated
6 files (TT), and titanium nitride coated
7 files (Ti-N)."
8 Do you see that?
9 A. Yes.
10 Q. Would you turn to Figure 6,
11 please.
12 A. Could you just explain what ADP
13 is in parentheses in the second line?
14 Q. I believe that -- I believe
15 that is defined somewhere. I think it is
16 angle of deformation permanent, but I'm
17 not sure.
18 If you look at Figure 6, ADP is
19 on the Y axis.
20 A. Yes. But I haven't --
21 Q. And it is referred to as angle.
22 A. That's not a common
23 abbreviation, so I'm not sure what it
24 means.
25 Q. Well, I read Figure -- I read

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 that paragraph to mean angle of permanent
3 deflection after deflection test, which
4 they are abbreviating to mean ADP.
5 A. Okay.
6 MR. GINSBERG: There is no
7 question. It is an attorney statement.
8 Q. Now, look at Figure 6, please.
9 A. Okay.
10 Q. On the X axis, there is a
11 number of files which are numbered, and on
12 the Y axis there is -- there are numbers
13 expressed as angles.
14 Do you read that to mean angle
15 of deflection?
16 MR. GINSBERG: Objection to the
17 form of the question and to the attorney
18 characterization.
19 Q. Do you read that to mean angle
20 of permanent deformation?
21 A. As I said, ADP, I have never
22 seen that before as an abbreviation. So
23 I'm relying on your definition.
24 Q. Well, do you have another
25 possible interpretation?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. I don't, but I would say when I
3 first looked at that, it also confused me
4 then. I will just make that comment. So
5 I will assume it means angle of --
6 MR. GINSBERG: No, you don't
7 have to assume.
8 THE WITNESS: Okay.
9 Q. And looking at Figure 6, do you
10 understand that the box that is TT are the
11 heat-treated files?
12 A. Yes.
13 Q. And the control is the black
14 box on the left?
15 A. Yes.
16 Q. And do you see that the
17 heat-treated files have a much greater
18 angle of permanent deformation --
19 MR. GINSBERG: Objection to the
20 form of the question.
21 Q. -- for each of the files?
22 A. Can you repeat the question?
23 MS. BRENNER-LEIFER: Can you
24 read that back, please.
25 (The record was read.)

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 MR. GINSBERG: Objection to the
3 form of the question.
4 A. Yes, again, assuming -- I will
5 just, so you understand that I'm trying to
6 be clear, back when it says Figure 6 in
7 the context in column 3, it says "a graph
8 showing the results of a study of angle of
9 permanent deformation." Then it says, and
10 after that it says "reported in degrees of
11 deflection."
12 So I was just a little unclear
13 about, are we talking about how much it is
14 deflected or how much afterwards? And
15 using a new term didn't help. So that
16 sentence was just unclear to me as to
17 what's being tested. Because it says both
18 "reported in degrees of deflection" and
19 "results are in angle of permanent
20 deformation," it says two things.
21 Q. Let's turn to column 8. There
22 is an example 4 which I think correlates
23 to Figure 6.
24 A. Okay.
25 Q. So why don't you read that

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 paragraph and then I will ask you
3 questions on it.
4 A. Okay.
5 (Witness perusing document.)
6 A. I have read it.
7 Q. Now, looking at example 4, at
8 line 45, or line 46, it says "Ten of each
9 ISO size were untreated."
10 Those were control, right --
11 A. Uh-huh.
12 Q. -- files?
13 Those are the ones shown in the
14 first box, first one that is in the dark
15 black coloring. Do you see that?
16 A. Yes.
17 Q. And then it says "Ten of each
18 ISO size were heat-treated in a furnace in
19 an argon atmosphere at 500 degrees Celsius
20 for 75 minutes and then slowly cooled."
21 You see that?
22 A. Yes.
23 Q. And those are all the files --
24 and those are the ones that are
25 represented in the second column, TT?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Yes.
3 Q. Do you see that?
4 A. Yes.
5 Q. Then it says, there is a third
6 group, "Ten of each ISO size were coated
7 with titanium nitride using physical vapor
8 deposition with an inherent
9 heat-treatment."
10 Do you see that?
11 A. Yes.
12 Q. So they are heat-treated as
13 well and they also have a physical vapor
14 deposition. Do you see that?
15 MR. GINSBERG: Objection to the
16 form of the question.
17 A. I'm saying yes, but I don't
18 know what "an inherent" means in that
19 context.
20 Q. You have no idea what that
21 means?
22 A. No.
23 Q. Are you familiar with a
24 titanium nitride coating process?
25 A. No.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Are you familiar with a
3 physical vapor deposition process?
4 A. I know generally what vapor
5 deposition process is, but just generally.
6 Q. And would that involve heat?
7 A. I'm not sure. I would think so
8 because you are trying to generate some
9 vapor, that then is going to condense on
10 to the surface of the sample being
11 treated.
12 Q. And then it says these are
13 labeled Ti-N in Figure 6. Do you see
14 that?
15 A. Yes.
16 Q. So those are the ones in the
17 third column?
18 A. Yes.
19 Q. Do you see that?
20 A. Yes.
21 Q. So turning to Figure 6, the box
22 on the left for each file type is colored
23 black. It has standard deviation bar
24 there?
25 A. For the controls, yes.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. You see the small standard of
3 deviation, R there?
4 A. Yes.
5 Q. And for each of the files the
6 angle of permanent deformation is less
7 than 5?
8 A. I will just comment that even
9 as to the example, I'm really not trying
10 to give you a hard time, but this is just
11 not the way this test was designed, and so
12 the wording is a little confusing.
13 So that first sentence, again,
14 you know, as far as, what does it say, it
15 says "the angle of permanent deformation
16 after flexion defelecting a certain amount
17 of degrees was performed." It is just not
18 100 percent clear to me.
19 Q. Okay. Well, we will get into
20 the detail of the tests in a little bit.
21 But I just want to make sure we are on the
22 same page with understanding this figure.
23 Okay?
24 A. Sure.
25 Q. So this figure says -- reports

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 that the angle -- or the ADP for this test
3 is less than 5 for the untreated, right?
4 A. Correct.
5 Q. And for the ones that are TT,
6 the angle of permanent deformation or the
7 ADP is, for each of them, almost 30.
8 Do you see that?
9 A. Correct. And I take note that
10 you are helpful and you have defined what
11 ADP is, so I will go on that basis.
12 Q. And then in the third column
13 for each of the files is the Ti-N, and
14 that's the vapor deposition using some
15 kind of heat process.
16 MR. GINSBERG: Objection.
17 Q. And that is also reflecting an
18 increased ADP over control in some
19 intermediate range?
20 MR. GINSBERG: Objection.
21 A. I see that.
22 Q. You agree with that?
23 A. I see that. That's reported.
24 Q. And it ranges from about 15 to
25 25 for that third treatment process?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. I would read that more as 18 to
3 25.
4 Q. Okay, I'm happy with that. I'm
5 happy with that reading. Okay, thank you.
6 When you were responding to
7 Dr. Sinclair's report regarding
8 infringement, do you recall that you
9 reviewed an expert report by Dr. Sinclair?
10 MR. GINSBERG: Objection to the
11 form of the question.
12 A. If I recall, there were two
13 reports.
14 Q. And Dr. Sinclair's report
15 referred -- related to infringement?
16 A. Are you referring to his report
17 or his declarations?
18 Q. I'm referring to his report.
19 A. Okay.
20 Q. Did you look yourself at any US
21 Endo files?
22 A. I don't believe I have.
23 Q. Did counsel give you any
24 endodontic files to look at?
25 A. Yes, but I don't know if those

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 were US Endo files.
3 Q. What files did you look at?
4 A. They sent me some files and
5 asked me to hold on to them that we might
6 use for subsequent testing.
7 Q. You don't know what kind of
8 files they were?
9 A. I don't.
10 Q. And they were not used as a
11 basis for your expert report?
12 A. No.
13 Q. You did not consider those
14 files for --
15 A. Well, I mean, I saw the files,
16 but we didn't do any testing or analysis.
17 MS. BRENNER-LEIFER: I want to
18 take a five-minute break.
19 THE VIDEOGRAPHER: This ends
20 tape number two. We are off the record at
21 10:18.
22 (Recess taken.)
23 THE VIDEOGRAPHER: This begins
24 tape number three in the deposition of
25 Dr. Jon Goldberg. We are on the record at

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 10:31.
3 BY MS. BRENNER-LEIFER:
4 Q. Dr. Goldberg, are you familiar
5 with the terms "martensitic" and
6 "austenitic"?
7 A. Yes.
8 Q. What do they mean?
9 MR. GINSBERG: Objection to the
10 form to the extent it calls for a legal
11 conclusion. You can answer.
12 A. Those are general descriptions
13 of possible phases. It could be applied
14 to many different alloy systems.
15 Q. Are you familiar with the
16 phrase "martensitic transformation"?
17 MR. GINSBERG: Objection to
18 form.
19 A. As a general term, yes.
20 Q. And what does that mean?
21 A. It means that the lattice
22 structure or the crystal structure is
23 changing from martensitic to something
24 else.
25 Q. And what kind of change does

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 that undergo? Can you explain how that
3 change works?
4 A. Sure. It is a change in the
5 relative position of the atoms.
6 So these crystal structures
7 have three-dimensional patterns, and you
8 can define those patterns by the distances
9 between the atoms and the angles that are
10 made by those distances, and so that
11 changes from martensitic to something
12 else. So those distances or angles would
13 be changing.
14 Q. And with regard to nickel
15 titanium, what would it mean?
16 A. It would --
17 MR. GINSBERG: Objection to
18 form.
19 A. -- have the same general
20 meaning that the martensitic structure
21 would be transforming the atomic
22 arrangement, the distances between the
23 atoms and the angles that they make in
24 martensite phase would be changing to
25 something else.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 So the distances between the
3 atoms and the angles would be changing.
4 They are three-dimensional patterns, so
5 the three-dimensional pattern is changing,
6 if that's more helpful.
7 Q. So the crystal structure is
8 changing from a martensitic structure to
9 an austenitic structure?
10 A. It could. It could.
11 Q. Well, what other options are
12 there?
13 A. Well, for nickel titaniums
14 there is an R-phase, so it could be
15 changing to that.
16 Q. And is the R-phase a type of
17 martensitic phase?
18 A. Not in the context of nickel
19 titaniums. It is a, in some contexts is
20 referred to as martensitic. There are
21 many types of martensites.
22 But when you ask me about
23 nickel titanium, generally we would refer
24 to martensite as one phase, austenite as
25 another, and R as a third phase.

22 (Pages 82 - 85)

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. But if you are using the term
3 "martensitic" as an adjective, is an
4 R-phase a type of martensitic phase?
5 MR. GINSBERG: Objection to the
6 form of the question.
7 A. If I was talking in the context
8 of NiTi, I wouldn't use it that way. If I
9 was talking in the general context of
10 crystal structures, then yes, R would be
11 considered a martensite.
12 Q. Are you familiar with the
13 phrase "austenitic transformation
14 temperature"?
15 A. Yes.
16 Q. And what does that mean?
17 A. That would be the temperature
18 at which the austenite either begins to
19 form from another phase or goes from the
20 austenite to a different phase.
21 Q. And what's the different phase?
22 A. It would depend on the system.
23 Q. Okay. For nickel titanium.
24 A. For nickel titanium, the other
25 phases would be either martensite or the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 R-phase.
3 Q. And are superelastic alloys in
4 the martensitic phase when they are below
5 the austenitic transformation temperature?
6 MR. GINSBERG: Objection to the
7 form of the question.
8 A. That's a complex question. I
9 would really have to see the mechanical
10 property data to determine if something is
11 superelastic or not.
12 Q. Okay. Well, assuming it is
13 superelastic, would a superelastic alloy
14 be in the martensitic phase when it is
15 below the austenitic transformation
16 temperature?
17 MR. GINSBERG: Objection to the
18 form of the question.
19 A. Again, let me explain. In my
20 opinion, you can't just determine if
21 something is superelastic based on its
22 crystal structure. So you could have one
23 crystal structure that is superelastic and
24 a very similar one that is not.
25 So in my opinion, you need to

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 see the test that defines superelasticity.
3 I don't think you can infer it from the
4 structure alone.
5 Q. What test do you need to define
6 superelasticity?
7 A. There is some sort of
8 stress-strain curve or bending test where
9 you would deform the sample and see how
10 much it recovers.
11 Q. A material that is considered
12 to be martensitic doesn't have to be 100
13 percent martensite, correct?
14 MR. GINSBERG: Objection to the
15 form of the question.
16 A. That sounds a little
17 contradictory. If you say it is
18 martensite, then it is martensite. If it
19 is not martensite, then it is not
20 martensite.
21 Q. What if it is biphasic?
22 A. Then it would be two phases.
23 Q. And would it be partially
24 martensite?
25 A. Well, again, if we are talking

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 about the nickel titanium systems and you
3 are telling me that it is biphasic and one
4 of the phases is martensite, then yes, one
5 phase is martensite and there would be a
6 second phase.
7 Q. And what do you mean in your
8 report by biphasic?
9 A. Two phases.
10 Q. And how does the nickel
11 titanium have two phases?
12 MR. GINSBERG: Objection to the
13 form. You can answer.
14 A. So that's a little bit of a
15 complex question, but I think I can answer
16 simply.
17 So a phase is defined by the
18 atomic arrangements that I was talking
19 about, the angles and the distances, as
20 well as which atoms are in there. So, for
21 example, this might be a certain
22 arrangement and it is men and women. You
23 could have another arrangement where the
24 distances are a little different and maybe
25 it is all men or all women.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 So those differences in the
3 crystal structure define a phase. So we
4 call a phase men and women and then
5 another phase might be called men only.
6 Materials can have both of those
7 simultaneously in their structure.
8 Q. Okay. Now let's get back to
9 nickel titanium, not men and women.
10 A. Okay.
11 Q. I would like to keep it
12 concrete.
13 A. I was trying to make it simple.
14 Q. It is a lot more helpful if we
15 just talk about nickel titanium.
16 And the austenite phase is a
17 cubic crystal structure; is that right?
18 A. I believe so.
19 Q. And the R-phase is like a
20 rhombohedral structure?
21 A. Yes.
22 Q. And the martensite phase is --
23 what do you call that one?
24 A. Monoclinic.
25 Q. Monoclinical, which is similar

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 to rhombohedral?
3 MR. GINSBERG: Objection to the
4 form of the question.
5 A. So to keep it concrete, they
6 are all similar in that they are lattice
7 arrangements, but they are very specific
8 and different from each other, again, by
9 the distances between the atoms, which
10 atoms are present, and the angles.
11 Those define the lattice
12 structure. There is basically 14 possible
13 patterns, monoclinic, rhombohedral, and
14 cubic are three of those. So you
15 definitely can have two different
16 arrangements within the nitinol at the
17 same time.
18 Q. Now, if you are heat-treating
19 nickel titanium, and nitinol is the 50/50
20 composition?
21 MR. GINSBERG: Objection to the
22 form of the question.
23 A. Well, again, if we are going to
24 be concrete, I have to ask you, do you
25 mean weight basis or something else?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. It is atomic basis, right?
3 A. Atomic basis, yes.
4 Q. It is 50 percent --
5 A. Atomic, thank you.
6 Q. 50 percent nickel and 50
7 percent titanium?
8 A. Yes.
9 Q. And they call that nitinol in
10 the art?
11 A. Nitinol.
12 Q. Nitinol, thank you.
13 A. I'm going to have to qualify
14 that. You can vary that composition
15 somewhat off of the one-to-one ratio. It
16 doesn't actually have to be 50 to 50
17 exactly.
18 Q. Okay. Well, how much can you
19 vary it?
20 A. I would say as much as 3
21 percent, if you are just varying the
22 nickel titanium. But you can also
23 substitute other atoms that would also
24 affect the structure.
25 Q. Well, if you substitute other

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2 atoms, would it still be called nitinol?
3 A. Yes. I'm going to qualify it
4 by saying nitinol we use two different
5 ways. There is Nitinol with a capital N
6 which is the trade name of the nitinol
7 products, and nitinol with a small N which
8 is the generic form.
9 So the small N would include
10 slight variations, maybe as much as 3
11 percent, as I mentioned, as well as
12 possible additions, I'm going to estimate
13 as much as 1 percent of third elements.
14 Q. And do the superelastic
15 properties change if you vary that ratio
16 of nickel to titanium?
17 A. I would have to see, again, the
18 mechanical property data, but I would
19 expect with a certain degree of variation
20 and composition that you would affect the
21 properties, yes.
22 Q. And the austenitic temperature
23 is the temperature at which the martensite
24 phase ends and the austenite phase is 100
25 percent?

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2 A. Yes. I would say it a little
3 more specifically.
4 I would say if you are
5 referring to the temperature at which
6 austenite begins to form, then that would
7 be a transition from a lower temperature
8 form, either martensitic or R-phase to
9 martensite, at which case it is martensite
10 plus M or R.
11 The martensite temperature at
12 which that reaction is complete, then all
13 of the M or R phase would have transformed
14 to martensite and then it would be 100
15 percent martensite.
16 Q. What do you mean, martensite
17 plus M or R?
18 A. So those are two phases or
19 biphasic. So biphasic would mean two
20 phases, so M plus R would be two phases, M
21 plus austenite would be two phases, as
22 would austenite plus R also be two phases.
23 Q. So just to clarify, the
24 austenite start temperature is the
25 temperature upon which the austenite

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 crystal starts to form?
3 A. How are you defining austenite?
4 There is different ways to define that
5 temperature.
6 So there is one method, ASTM
7 method, that is defined as -- they use the
8 phrase "austenite start." So that
9 identifies that temperature using a
10 particular method and that's referred to
11 as the As or austenite start.
12 There are other ways of
13 defining what that temperature is.
14 Q. What is the standard way of
15 defining it?
16 A. Commonly it is with that ASTM
17 method.
18 Q. And the austenite finish
19 temperature is the temperature upon which
20 the austenite crystal is 100 percent?
21 A. Again, austenite finish is the
22 term associated with that ASTM method. So
23 per the ASTM method, that's the austenite
24 finish temperature. It is 100 percent
25 austenite when the reaction is 100 percent

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2 complete.
3 (Goldberg Exhibit 6 marked for
4 identification.)
5 Q. Dr. Goldberg, we have handed
6 you Exhibit 6, Goldberg Exhibit 6.
7 A. Yes.
8 Q. It is titled Heat Treatment
9 Protocol.
10 A. Yes.
11 Q. Created by Bobby Bennett.
12 A. Yes.
13 Q. Have you seen this document
14 before?
15 A. No.
16 Q. You have never seen this
17 document before?
18 A. No.
19 Q. You can put it aside, then.
20 (Goldberg Exhibit 7 marked for
21 identification.)
22 Q. Dr. Goldberg, I have handed you
23 what has been marked Goldberg Exhibit 7.
24 It is ASTM, it states --
25 entitled Standard Test Method for

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Transformation Temperature of Nickel
3 Titanium Alloys by Thermal Analysis.
4 Do you see that?
5 A. Yes.
6 Q. Have you seen this document
7 before?
8 A. I believe so. I know
9 Dr. Sinclair referred to it. At the time
10 I checked it. I think this was the one,
11 but I don't exactly remember, because
12 there is many, many ASTM methods, even
13 with some similar methods.
14 But I believe this was the one
15 Dr. Sinclair was referring to.
16 Q. Would you review this. I want
17 to ask you some questions. I want to give
18 you some time to look it over first.
19 A. There is a fair amount of
20 information. You want me to --
21 Q. Spend a few minutes looking at
22 it.
23 (Witness perusing document.)
24 A. Okay. I appreciate the time to
25 look it over.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Dr. Goldberg, have you ever
3 performed this method?
4 MR. GINSBERG: Objection to the
5 form.
6 A. Do you mean a DSC of nickel
7 titanium?
8 Q. Yes.
9 A. No.
10 Q. Have you ever read this before
11 today?
12 A. Yes, I believe this was the one
13 that was attached to Sinclair's report.
14 Q. Do you recognize this ASTM
15 standard as the standard in the industry
16 for performing DSCs?
17 MR. GINSBERG: Objection to the
18 form of the question.
19 A. It is referred to as the
20 standard method, and in industry typically
21 you would use the ASTM method if one
22 exists for the specific purpose that you
23 are trying to achieve.
24 So if you are trying to achieve
25 ASTM, As or Af values, then you would use

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 this.
3 Q. Just so we are on the same
4 page, the first paragraph of the ASTM
5 standard says Scope 1.1.
6 A. Yes.
7 Q. "This test method defines
8 procedures for determining the
9 transformation temperatures of nickel
10 titanium shape memory alloys."
11 A. Yes.
12 Q. And that's basically what this
13 standard refers to?
14 A. Yes, although I would have to
15 admit I was a little surprised to see that
16 shape memory since, again, that has to do
17 with the mechanical property. But I
18 accept that that would be the purpose
19 here.
20 Q. Would you turn to the second
21 page. Paragraph 10 is where the procedure
22 begins.
23 A. Yes.
24 Q. You prepare the sample, you
25 place it in the pan, you turn on some gas,

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2 use helium, and then you run a cooling and
3 heating temperature -- I'm sorry, a
4 cooling and heating program.
5 Paragraph 10.4.1 says you use
6 the heating and cooling rates of 10 plus
7 or minus 0.5 degrees Celsius per minute.
8 Do you see that?
9 A. Yes.
10 Q. Do you understand that the rate
11 of heating and cooling is important for a
12 DSC curve?
13 MR. GINSBERG: Objection to the
14 form of the question.
15 A. Again, it would depend on the
16 material, but I can understand that the
17 rating of heating and cooling could affect
18 the phases that are present, which would
19 affect the DSC curve.
20 Q. And then 10.4.2 says you heat
21 the sample from room temperature to a
22 temperature of at least Af plus 30 degrees
23 Celsius.
24 A. Yes, I see that.
25 Q. And then you hold the

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2 temperature for a time at that temperature
3 sufficient to equilibrate the sample with
4 the furnace, and then 10.4.3 says you cool
5 the temperature to a temperature of below
6 Mf minus 30 degrees Celsius, hold for a
7 time sufficient to equilibrate the sample
8 with the furnace and then heat the sample
9 to a temperature of at least Af plus 30
10 degrees Celsius.
11 Do you see that?
12 A. Yes.
13 Q. Do you understand what that
14 means?
15 A. Yes.
16 Q. And then the last paragraph,
17 10.5, says Data Acquisition, you record
18 the resulting curve from the heating and
19 cooling program from Af plus 30 degrees
20 Celsius to Mf minus 30 degrees Celsius.
21 Do you see that?
22 A. Yes.
23 Q. And then paragraph 11 is
24 entitled Graphical Data Reduction, and it
25 tells you how to obtain information from

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 the data that you just obtained, right?
3 A. Correct.
4 Q. So we are looking at Figure 1.
5 It refers to Figure 1. Do you see that?
6 A. Yes.
7 Q. And you have seen that figure
8 before?
9 A. Yes.
10 Q. 11.1 says "draw the baselines
11 for the cooling and heating portions of
12 the curve as shown in Figure 1."
13 Do you see that?
14 A. Yes.
15 Q. And where on the curve do you
16 see that baseline?
17 A. Do you want me to point, or how
18 do I relay that to you?
19 Q. Draw it.
20 A. On my --
21 Q. Yeah, draw it.
22 (The witness complies)
23 MR. GINSBERG: Could I see
24 that, please.
25 Q. So you drew a horizontal line

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2 where those curves would just basically go
3 horizontal?
4 A. I'm trying to draw a horizontal
5 line that I'm envisioning the peak is
6 resting on. So you see the peak, it comes
7 up and goes down. So to the extreme left
8 it is horizontal and there is nothing
9 happening. Then the peak begins, it goes
10 up and comes down, and the same thing in
11 the reverse.
12 So the baseline is basically
13 like the support that that curve would be
14 sitting on. That's what I'm trying to
15 represent.
16 Q. So you drew that for the top
17 curve and the bottom curve?
18 A. Yes.
19 Q. And then 11.2 says "draw the
20 tangents to the cooling and heating spikes
21 through the inflection point as shown in
22 Figure 1."
23 A. Yes.
24 Q. Can you show me on there what
25 they are referring to?

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2 A. Sure.
3 Q. Could you label them?
4 A. I'm going to do that, thank
5 you.
6 Q. Great.
7 (The witness complies)
8 A. I hope you won't hold my
9 handwriting against me.
10 Q. Okay. It looks pretty good to
11 me.
12 And then 11.3 says "obtain Ms,
13 Mf, As, and Af as the graphical
14 intersection of the baseline with the
15 extension of the line of maximum
16 inclination of the appropriate peak of the
17 curve is shown in Figure 1."
18 And are those already
19 identified on Figure 1?
20 A. They are identified, but it's
21 not showing -- there is no line from Mf or
22 Ms or As or Af to the graph. But it says
23 that it would be the intersection of that
24 tangent with the baseline. So I see that.
25 Q. Can you draw arrows where you

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 think those numbers are?
3 A. Yes. How about if I make a
4 circle, because it is a point we are
5 trying to identify?
6 Q. Perfect.
7 (The witness complies)
8 Q. So looking at the top line in
9 Figure 1, the circle you drew in the top
10 left is the Mf?
11 A. Correct.
12 Q. And would you just draw an
13 arrow there so it is clear.
14 A. Sure. I'm going to draw an
15 arrow from Mf to the circle that I drew.
16 Q. Great.
17 (The witness complies)
18 Q. And could you draw an arrow for
19 where you think the Ms temperature is.
20 A. Yes.
21 (The witness complies)
22 Q. And the same for the Af
23 temperature and As temperature.
24 (The witness complies)
25 Q. So what you did just now is the

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2 ASTM standard method for determining the
3 transformation temperatures for nickel
4 titanium alloy, right?
5 A. No. What I did was determined
6 Mf, Ms, As and Af per ASTM method.
7 Q. I thought that's what I just
8 said.
9 A. They are different.
10 Q. Okay. How are you clarifying
11 me? I'm just not sure what you are --
12 THE WITNESS: Can you repeat
13 her question, please.
14 (The record was read.)
15 A. Correct. So the transformation
16 temperature is a more general term. What
17 this does is determine specifically terms
18 that are defined as Mf, Ms, As and Af.
19 And what I'm making the
20 distinction, is there is different places
21 to identify where the reaction is actually
22 beginning and ending. The ASTM method is
23 one way of defining that.
24 Q. Okay. And that's the standard
25 in the industry?

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2 A. It is. But I would point you
3 to the appendix, X1.3, that says
4 "Transformation temperatures derived from
5 differential scanning," this method, may
6 not agree with those obtained from other
7 test methods. So there is other methods.
8 Q. Okay. In this diagram, Figure
9 1, which is the heating curve and which is
10 the cooling curve?
11 A. The peak pointing down is on
12 heating, the peak pointing up is on
13 cooling. And I would say normally those
14 are labeled that way, but they are not
15 here.
16 Q. And how is it that you can
17 tell?
18 A. Well, because I'm looking at
19 where Af and As are and Mf and Ms, and so
20 I would expect upon heating that the
21 highest peak would be for the As/Af points
22 which are higher there to the right, and
23 on cooling I would expect to see the Ms
24 and then Mf, and those are on the top
25 peak, and so Ms is at minus 37 and Mf is

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2 at minus 48, so they are cooling on that
3 peak. The As is at minus 18. The Af is
4 at minus 11. So that is heating.
5 Q. Is the cooling curve more
6 relevant than the heating curve?
7 MR. GINSBERG: Objection to the
8 form of the question.
9 A. In what context? I mean --
10 Q. If you are trying to determine
11 the composition of nickel titanium.
12 A. My experience, we would have
13 both the heating and the cooling.
14 Q. When you were talking earlier
15 about biphasic, I think you were talking
16 about a different graph, representational
17 graph.
18 But when you are looking at
19 this DSC, is there an area here you would
20 call biphasic?
21 A. On this diagram?
22 Q. Yeah.
23 A. No. Let me take that back, I'm
24 sorry. Oh, absolutely, yes, I'm sorry.
25 Q. How do you explain -- where

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2 would it be?
3 A. Underneath the curve. Because
4 it is transitioning either heating or
5 cooling from martensite to austenite, so
6 everywhere underneath the curve it is a
7 combination of both.
8 So it begins, if we look at the
9 top curve, this is presented -- well,
10 let's start at the bottom, either one is
11 okay. As you are heating starting
12 someplace before minus 18 C, the
13 transformation begins. So that would mean
14 that the material is austenite plus
15 martensite. And then somewhere to the
16 right of Af the transition ends and it is
17 all austenite.
18 Similarly, on the cooling
19 curve --
20 Q. I'm sorry, I just want to make
21 clear, when you are to the left of the As
22 temperature on the bottom curve, you are
23 in martensite phase?
24 MR. GINSBERG: Objection to the
25 form.

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2 A. I'm sorry?
3 Q. I'm looking at Figure 1.
4 A. Yes.
5 Q. When you are to the left of the
6 As temperature --
7 A. Meaning at a lower temperature?
8 Q. Right, to the left, you are at
9 a lower temperature, you are in the
10 martensitic phase?
11 A. Correct.
12 Q. And then at the As temperature
13 there starts to become a transformation
14 into the austenitic phase?
15 A. The transition begins where the
16 curve begins and then it transitions from
17 the martensite to austenite. So therefore
18 everywhere underneath that peak, that
19 transformation is continuing. It is going
20 from zero percent martensite -- I'm sorry,
21 100 percent martensite, zero percent
22 austenite, to at the other extreme of the
23 curve 100 percent austenite, zero percent
24 martensite.
25 So everywhere in between at

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2 some ratio are some relative portions of
3 austenite and martensite.
4 Q. Is that what you mean when you
5 use the term "biphasic"?
6 A. Biphasic, generally I mean
7 there are two phases present, but it came
8 from the interpretation of these curves.
9 So that meant that we are under
10 those curves or within those curves, so by
11 definition there is two phases present.
12 Q. And how does this crystal
13 structure from the martensitic structure
14 to the austenitic structure happen, is
15 that like a displacive transformation?
16 MR. GINSBERG: Objection to
17 form.
18 A. So I'm not 100 percent sure. I
19 think you are referring to -- what you are
20 referring to is displacement versus
21 diffusion, and in both cases what is
22 happening is the atoms are arranging from
23 one lattice arrangement to a different
24 lattice arrangement.
25 Q. And for nickel titanium, is

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2 this a diffusionless transformation?
3 MR. GINSBERG: Objection to
4 form.
5 A. I don't know for sure. I think
6 it would depend on the alloy. But many of
7 these are considered diffusionless.
8 That's by definition sometimes
9 how we define martensitic, that it is a
10 diffusionless transition. But any
11 reaction for which the atoms do not have
12 to move away from the position they are
13 currently in is referred to as a
14 diffusionless transition.
15 Q. Is the R-phase transition also
16 a diffusionless transition?
17 MR. GINSBERG: Objection to
18 form.
19 A. I don't know.
20 Q. When we were talking earlier
21 about permanent deformation, if a nickel
22 titanium alloy is superelastic nickel
23 titanium alloy, will it permanently deform
24 when it is in the austenitic phase?
25 MR. GINSBERG: Objection to

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2 form.
3 A. It is somewhat of a compound
4 question because, as I said earlier, I
5 don't think you can look at the crystal
6 structure alone, such as the austenitic
7 phase and infer what the mechanical
8 properties are.
9 So you are asking it -- the
10 main question is, is it permanently
11 deforming or not, and for that I would
12 just have to see the mechanical property
13 data. So I'm not trying to avoid your
14 question, but I have explained that I
15 don't think you can infer the mechanical
16 properties from the phase alone. You
17 would have to see the mechanical. You
18 would actually have to see the mechanical
19 properties.
20 Q. Okay. Well, if you have a
21 piece of nickel titanium alloy and you
22 bend it and it doesn't permanently deform,
23 would you conclude that it's in the
24 austenitic phase?
25 A. Again, I don't think you can

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2 make -- in my opinion, I don't think you
3 can make that clear a correlation between
4 the structure and the mechanical
5 properties data.
6 I think what's more typically
7 done is you do the mechanical property
8 analysis under different conditions. You
9 study the phases present under those
10 different conditions. Then you go back
11 and you would say okay, under these
12 conditions we had this mechanical
13 property, under these we had this.
14 Then given that kind of
15 calibration or that standard, you can then
16 go back and say all right, if I take an
17 unknown and I see what the lattice
18 structure is based on my previous data, I
19 can anticipate just like the other way, if
20 it had -- once I have that standard, I
21 have both, I can measure the mechanical
22 properties and infer what the structure
23 might be. But in my opinion, you need to
24 have those established.
25 Q. Did you review the bend testing

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2 conducted by Knight Mechanical on the US
3 Endo EdgeFiles?
4 A. Could I see the document?
5 There just were several -- lots of
6 documents and several with mechanical
7 properties.
8 So when you say Knight, I just
9 don't recall exactly which one. If I can
10 see the document, I would be glad.
11 Q. Well, let me step back for a
12 second. I will withdraw that question.
13 Looking at your expert
14 report --
15 MR. GINSBERG: Again, I will
16 just note for the record that he doesn't
17 have his expert report in front of him.
18 There is an incomplete version of the
19 report that doesn't include his exhibits.
20 Q. Looking at Goldberg Exhibit
21 4 --
22 A. I'm sorry?
23 Q. Goldberg Exhibit 4.
24 A. Okay.
25 Q. This is the body of your

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2 opinions for your expert report, correct?
3 A. Yes.
4 Q. There is no opinions in this
5 report about any bend testing conducted by
6 Knight Mechanical; is that correct?
7 A. I would have to page through,
8 but if you say that's the case, I would
9 accept that. I mean --
10 Q. I want you to confirm.
11 A. Okay.
12 (Witness perusing document.)
13 A. I can just say without going
14 all the way through --
15 MR. GINSBERG: She wants you to
16 confirm.
17 THE WITNESS: Okay.
18 (Witness perusing document.)
19 A. I do not see any specific
20 reference to the -- I'm sorry, is it
21 Knight or McKnight Mechanical property
22 data that you referred to?
23 Q. It is Knight Mechanical.
24 A. Knight Mechanical. But I do
25 see on page 9 that I'm talking about

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2 Sinclair's data and right underneath that
3 it has to do with the permanent
4 deformation.
5 So I might have been
6 considering his data at that point, but I
7 don't specifically mention McKnight.
8 Q. What paragraph are you looking
9 at?
10 A. 35, and then the subheading
11 above it. I mean, what just caught my
12 attention is I'm referring to Sinclair's
13 data and then that first paragraph has to
14 do with permanent deformation.
15 So I'm familiar that he did
16 report on the McKnight's data. I'm not
17 specifically commenting on it, but I'm
18 just seeing that mechanical properties, it
19 comes right under Sinclair's data. So
20 that's just catching my eye.
21 Q. Well, in paragraph 35 you are
22 just talking about the claim language, and
23 the same with 36.
24 A. Yes. And I'm just noting it
25 under the subheading of Dr. Sinclair's

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2 data. I mean, I had looked at that data
3 and I read his report, so I don't have any
4 specific reference to the McKnight data,
5 but I couldn't say that I'm not
6 considering all those when I'm developing
7 my opinions.
8 MS. BRENNER-LEIFER: We need to
9 change the tape, so this is a good time
10 for a break anyway.
11 THE VIDEOGRAPHER: This ends
12 tape number three. We are off the record
13 at 11:29.
14 (Recess taken.)
15 THE VIDEOGRAPHER: This begins
16 tape number four in the deposition of
17 Dr. Jon Goldberg. We are on the record at
18 11:44.
19 BY MS. BRENNER-LEIFER:
20 Q. Dr. Goldberg, could you go back
21 to Exhibit 7, which is ASTM standard.
22 A. Yes.
23 Q. Looking at the method that we
24 were just discussing in Figure 1 and
25 paragraph 11, the graphical data

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2 reduction, do you know why the ASTM
3 standard is to look at these points of
4 intersection where the tangent hits the
5 baseline to get these numbers?
6 A. Yes. That method is probably
7 more consistent across labs.
8 Q. So it is a standardization?
9 A. Well, it is a standard method,
10 and one reason why ASTM might select the
11 method is because it can be more
12 accurately produced across labs. That's
13 why they give that table on page 3 just
14 showing what the variability is typically
15 among Ms, Mf, As, whatever, four different
16 labs.
17 Q. So you mean that if two labs
18 are testing the same material, they will
19 be more consistent --
20 A. Yes.
21 Q. -- if you follow this method?
22 A. Correct.
23 MR. GINSBERG: Please let
24 Counsel finish the question before you
25 begin answering. Thank you.

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2 MS. BRENNER-LEIFER: And I
3 would ask you to let me finish my question
4 before you raise your objection, which you
5 have a bad habit of doing, too.
6 If everybody would let the
7 other person speak, this deposition would
8 go a lot smoother.
9 MR. GINSBERG: The record
10 speaks for itself.
11 Q. And do you know why the ASTM
12 does not look at where the tip of the
13 curve is at the baseline?
14 MR. GINSBERG: Objection to the
15 form of the question.
16 A. I don't know why they don't
17 look at the tip. I wasn't involved with
18 developing this standard, so I'm not sure
19 what the considerations were.
20 Like I said, the reason they
21 are adapting a method like this is so that
22 it can define values such as Ms, Mf, As,
23 Af, and more reliably get those reported
24 if the same test is done in different
25 laboratories.

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2 Q. And I know you said you never
3 did the DSC curve yourself --
4 A. For nickel titanium.
5 Q. For nickel titanium. But are
6 you aware that if you increase the heating
7 rate, it delays the onset of the tip of
8 the curve?
9 MR. GINSBERG: Objection to the
10 form of the question.
11 A. Can you repeat that question?
12 Q. If when you are running the DSC
13 curve and you have a rate of heating and
14 cooling, if you do a -- if you increase
15 the rate of heating, that will delay the
16 onset of the tip of the curve --
17 MR. GINSBERG: Objection.
18 Q. -- right?
19 MR. GINSBERG: I'm sorry, I
20 didn't let you finish. I thought you were
21 finished. Objection to the form of the
22 question.
23 You can answer.
24 A. I wasn't aware of that. But
25 just as the ASTM method describes what the

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2 heating and cooling rate should be, that's
3 because it can affect all the values.
4 Q. That's why there is a standard
5 heating and cooling rate?
6 A. Correct.
7 Q. Have you ever heard of the
8 Kissinger analysis?
9 A. No.
10 Q. If a nickel titanium alloy is
11 in this biphasic, as you referred to it,
12 where it is partially martensitic, if I'm
13 understanding your testimony correctly --
14 MR. GINSBERG: Objection to the
15 form of the question.
16 A. I'm sorry, I'm not
17 understanding what the question is.
18 Q. I believe your testimony
19 earlier was you referred to this biphasic
20 phase or --
21 A. Structure.
22 Q. -- structure where it is
23 partially martensitic and partially
24 austenitic?
25 A. No, I believe I said partially

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2 one phase and partially another phase. It
3 could be austenite and martensite. It
4 could also be martensite and R-phase. It
5 could be R plus A .
6 So it is two phases, the point
7 was, I was trying to describe it as two
8 phases.
9 Q. Well, if the nickel titanium is
10 partially martensitic, won't it behave
11 like it is martensitic?
12 MR. GINSBERG: Objection to the
13 form of the question.
14 A. That really depends on so many
15 factors, how much martensite, what the
16 other phase is present.
17 And when you say behave, I
18 don't know if you are talking about
19 mechanical behavior or thermal behavior.
20 So it is a difficult question to answer.
21 Q. If you have a piece of nickel
22 titanium alloy and you can permanently
23 deform it, would you conclude that it's at
24 least partially martensitic?
25 A. As I said before, in my

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2 opinion, I don't think you can infer
3 properties from structure or structures
4 from properties in these systems until you
5 have evidence of each.
6 As I said, the way I think it
7 would typically be done is you would
8 manipulate whatever variable and measure
9 the phases present and measure the
10 properties, and then once you had that
11 standardized calibration between structure
12 and properties, then you could take an
13 unknown and infer either structure or
14 properties from the other.
15 Q. If you heat an entire piece of
16 nickel titanium, should the atomic
17 arrangements be the same throughout that
18 shank, that piece?
19 MR. GINSBERG: Objection to the
20 form of the question.
21 A. So it would depend upon what
22 temperature range you are going through.
23 If it went through a transition, I would
24 expect that by definition would mean the
25 crystal structure would change.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. If you have a heat-treat piece
3 of nickel titanium alloy and you do the
4 DSC curve and you know it's not in that
5 transformation phase, it is either above
6 the Af temperature or below the Ms
7 temperature --
8 MR. GINSBERG: Objection to the
9 form.
10 Q. Would that crystal structure be
11 uniform throughout --
12 MR. GINSBERG: Objection to the
13 form of the question.
14 Q. -- the alloy?
15 A. It is a little complex when you
16 start asking those temperatures. I mean,
17 I'm not the one to do this, but there were
18 several issues in there and I wasn't able
19 to keep track.
20 MR. GINSBERG: Can I have the
21 question back, too, because I lost track.
22 MS. BRENNER-LEIFER: That's
23 because you kept interrupting my question.
24 MR. GINSBERG: You are pausing,
25 and I apologize that you think I'm

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 interrupting --
3 MS. BRENNER-LEIFER: You know,
4 you should just let me finish talking.
5 You need to be more patient and let me get
6 my question out.
7 MR. GINSBERG: Well, the
8 witness begins answering when you are
9 pausing. If you are finished asking your
10 question, I try to wait until you are
11 done, but sometimes there is long pauses,
12 so I apologize if I'm interrupting, but
13 when the witness starts answering, I want
14 to make sure that I get the appropriate
15 objection on the record.
16 Could I have the question back,
17 please.
18 (The record was read.)
19 A. If I can interrupt, what do you
20 mean by "heat-treated"? This is one
21 aspect. So that's one aspect.
22 THE WITNESS: You can continue.
23 (The record was read.)
24 A. That is another thing. I'm not
25 sure what you mean by "that transformation

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2 phase."
3 THE WITNESS: Thank you, if you
4 can continue.
5 (The record was read.)
6 A. So I think you meant to say
7 below the --
8 MR. GINSBERG: Well, you don't
9 have to correct the question. I object to
10 the form of the question.
11 A. On the one hand you asked above
12 the Af, so I will just, if you don't mind
13 me, above the Af it is going to be all
14 austenite.
15 Below the Ms it is going to be
16 a combination of martensite plus austenite
17 or possibly R-phase if that is present.
18 Below the Mf it is going to be all
19 martensite.
20 And if I can add to that, I'm
21 using Mf and Ms and the phrase "all
22 martensite," inferring that the reaction
23 is complete. I was just trying to help
24 you out with those relative temperatures.
25 I didn't mean to infer that at Mf it is

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2 100 percent martensite. That's the
3 temperature determined by the ASTM method,
4 but as we have been talking, there is
5 regions of the curve beyond those points.
6 I guess I would just add that
7 it is all austenite when the austenite
8 transition is complete and it is all
9 martensite when the martensite transition
10 is complete.
11 Q. And my question just went to
12 when you are saying it is complete
13 throughout the whole piece of nickel
14 titanium that you are holding.
15 A. I'm sorry, there is multiple
16 parts there.
17 Correct, if you are below the
18 end of the curve then it is 100 percent
19 martensite. If you are below the end of
20 the curve where that martensite transition
21 ends, then it is 100 percent martensite
22 throughout the piece.
23 (Goldberg Exhibit 8 marked for
24 identification.)
25 Q. Dr. Goldberg, I have marked as

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2 Exhibit 8 a reference you referred to in
3 your report as Walia. It is in the
4 Journal of Endodontics. It is dated 1988.
5 Have you reviewed this
6 reference?
7 A. Yes.
8 Q. And this reference is -- it
9 says "In this article we report the first
10 use of an entirely new metallurgical
11 system, Nitinol nickel-titanium
12 orthodontic wire alloy for the fabrication
13 of endodontic files."
14 A. I'm sorry, can you show me
15 where you are reading?
16 Q. Sure. On page 346.
17 A. Okay.
18 Q. On the second column, the first
19 full paragraph, right in the middle.
20 A. Okay, yes.
21 Q. "In this article, we report the
22 first use of an entirely new metallurgical
23 system" --
24 A. Second column, you said?
25 MR. GINSBERG: I'm not

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2 following either.
3 A. Oh, the middle of the column,
4 okay, okay. I'm sorry.
5 Q. Okay. I will start again.
6 "In this article" -- are you
7 following me?
8 A. Yes.
9 Q. "In this article, we report the
10 first use of an entirely new metallurgical
11 system, Nitinol nickel-titanium
12 orthodontic wire alloy for the fabrication
13 of endodontic files."
14 A. Yes.
15 Q. And is it your recollection
16 this is about the time when nickel
17 titanium began being in use for endodontic
18 files?
19 A. Yes.
20 Q. Approximately?
21 A. Yes.
22 Q. And on pages 346 and 347 it
23 describes the materials and methods used,
24 correct?
25 A. I will have to take a scan of

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 that.
3 (Witness perusing document.)
4 A. Okay. I have reviewed that.
5 Q. And in this report, Walia, et
6 al, are comparing Nitinol and stainless
7 steel wires, right?
8 A. Yes. I'm sorry, I think these
9 are actually in the form of files. Let me
10 just see here.
11 (Witness perusing document.)
12 Q. You are right, they fabricate
13 files.
14 A. Yes.
15 Q. Does Walia perform any heat
16 treatment on these files?
17 A. He doesn't describe any that he
18 has used, no. But I would just say that
19 he refers to ways that it could be
20 heat-treated.
21 Q. Where are you referring to,
22 please?
23 A. Page 351, the first column, I'm
24 in the middle, starting, the sentence
25 begins over on the right side of the

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2 column.
3 It begins "Moreover, it is
4 possible to alter the superelastic force
5 delivery of the the Japanese NiTi wire
6 alloy" -- the one that they are testing --
7 "and perhaps other new wires by means of
8 an appropriate heat treatment," reference
9 18. "It would be worthwhile to evaluate
10 root canal files fabricated from some
11 other recently introduced
12 nickel-titaniums," etc., is the second
13 reference there.
14 So while he doesn't do the
15 heat-treating, he is recognizing the
16 benefits and referring to the method,
17 reference 18.
18 Q. Well, he says it's possible to
19 alter superelastic force delivery of the
20 Japanese NiTi wire alloy, right?
21 A. Right.
22 Q. And that is not specifically
23 what he's testing?
24 A. I don't know that. And the
25 reason I don't know for sure is because

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2 Unitek, I'm familiar with the company, and
3 they would generally get their wires from
4 another company, and I think at this point
5 in time everybody was getting their NiTi
6 alloys from Japan.
7 Q. Well, the first sentence of
8 Materials and Methods says he is getting
9 from Unitek in California.
10 A. Correct. I would have to read
11 through it carefully, but I think what he
12 is saying here is that my understanding at
13 that point in time and probably to date to
14 some extent many of these NiTi wires were
15 coming, the blanks that were used, were
16 coming from Japan.
17 So I think he is just
18 referring -- let me just go back and read
19 the beginning of that paragraph that I
20 referred us to.
21 (Witness perusing document.)
22 Q. Dr. Goldberg, would you look at
23 that sentence you are reading again on
24 page 351. There is a reference 18.
25 A. Yes.

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2 Q. If you look at the references
3 at the bottom of the right-hand column, it
4 refers to Miura. And the name of that
5 reference is "The Superelastic Property of
6 the Japanese NiTi Wire Alloy Wire for Use
7 in Orthodontics."
8 A. Yes.
9 Q. Isn't Walia merely getting that
10 information from the Miura cite?
11 MR. GINSBERG: Objection to the
12 form of the question.
13 A. I don't know where they are
14 getting their information, but just go
15 back to the original question, and I'm
16 sorry if I diverted from that, you are
17 asking me if Walia teaches or does -- you
18 asked me if Walia does any heat
19 treatments, and my response is he doesn't
20 here, but he recognizes that desirable
21 properties might be achievable with heat
22 treatments, and he reports to reference 18
23 as a way that that might be done.
24 Q. Right. But he is saying that
25 you can heat-treat the wire, right?

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2 MR. GINSBERG: Objection.
3 A. Correct. But all files start
4 out as wires.
5 Q. But he is not suggesting you
6 heat-treat the file?
7 MR. GINSBERG: Objection to the
8 form of the question.
9 A. I don't read it that way. I
10 mean, I read it as he is reporting on
11 nickel titanium endodontic files, showing
12 their properties, and recognizing that
13 those properties could be altered just as
14 the nickel titanium properties were
15 altered in reference 18.
16 Q. Well, the next sentence after
17 that reference 18 says "It would be
18 worthwhile to evaluate root canal files
19 fabricated from some of these recently
20 introduced nickel titanium alloys."
21 So isn't he suggesting that you
22 could make a file from a Japanese NiTi
23 wire that was heat-treated?
24 MR. GINSBERG: Objection to the
25 form of the question.

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2 A. I'm sorry, can you repeat that?
3 I thought you were asking me about the
4 next sentence.
5 Q. They go together, I think.
6 A. Okay. So --
7 Q. He is talking about files
8 fabricated from some of these recently
9 introduced nickel titanium alloys.
10 A. Oh, I see what you are saying.
11 Well, I don't know if they are
12 actually available. He mentions beta
13 titanium and then he goes on to stainless
14 steel and Nitinol.
15 So I think the stainless steel
16 and the Nitinol and the beta titanium, the
17 Nitinol he is referring to here is
18 referring to an orthodontic application.
19 So, I mean, my interpretation
20 is he has measured these file properties
21 using this nickel titanium and he is
22 saying that there may be ways to alter the
23 properties, just as done in other dental
24 uses of nickel titanium, and in addition
25 to that he is saying there are other

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2 alloys that might be of interest to be
3 considered.
4 Q. But he doesn't explicitly
5 suggest heat-treating the file?
6 MR. GINSBERG: Objection to the
7 form of the question.
8 A. That's the way I read it, that
9 he is specifically saying -- I mean, this
10 whole paper is about the properties of the
11 files, and he tested these particular
12 files and he is noting that other nickel
13 titanium alloys such as those used in
14 orthodontics can have their properties
15 varied by the appropriate heat treatment.
16 So he is saying that might be
17 another thing we might want to consider,
18 heat-treating these to get different types
19 of properties.
20 Q. But he doesn't say that? I
21 don't see where -- point out to me --
22 please, Dr. Goldberg --
23 MS. BRENNER-LEIFER: And I
24 don't need your snarky comments.
25 MR. GINSBERG: I didn't make

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2 any comment.
3 MS. BRENNER-LEIFER: Yes, you
4 did. I don't need these, like
5 (indicating).
6 Q. You know, Dr. Goldberg, this is
7 very important, okay?
8 A. Yes, I appreciate it.
9 Q. And I don't see where he is
10 saying heat-treat the file. I want you to
11 be very specific with which sentence does
12 he say that.
13 A. First, to be fair, often you
14 can infer things without specifically
15 saying the exact words. I think we all
16 have that experience.
17 Q. Okay. Well --
18 MR. GINSBERG: Please don't
19 interrupt the witness when he is answering
20 your question.
21 A. Let me read through this
22 paragraph again, and I will try to explain
23 where I'm getting my interpretation or my
24 conclusion that he is recommending the
25 heat treatment.

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2 (Witness perusing document.)
3 A. So I'm just kind of
4 paraphrasing, the first sentence, he says
5 this represents only a first approach in
6 an entirely new field of endodontic
7 research. He is saying other nickel
8 titanium alloys have been recently
9 described, and he references 18, and
10 manufacturers have introduced several new
11 brands for which superelastic behavior and
12 other outstanding mechanical properties
13 are claimed.
14 Moreover -- so he is saying
15 this is a new field, isn't this
16 interesting, other fields are using nickel
17 titanium, and he is saying moreover, it is
18 possible to alter the superelastic force
19 behavior of NiTi wires by means of
20 appropriate heat treatment.
21 So to me he is saying we are
22 just beginning, we are just getting
23 started, this is the beginning of a new
24 phase, here are these alloys, and gee,
25 there are different alloys, there are

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2 heat-treating possibilities, let's see
3 what they do in other fields and let's use
4 that information to see where we can go
5 ahead since this is the first approach in
6 an entirely new field.
7 To me that's the inferral in
8 that whole paragraph, he is saying here we
9 have shown this, this is the first
10 approach, and as we would do in any paper
11 at this point, what should come next, what
12 else should be done, and that's what that
13 paragraph is suggesting.
14 So to me I interpret that as
15 suggesting other alloys, heat treatments,
16 here is some references, gee, won't it be
17 interesting to study those.
18 Just for your information,
19 reference 19 is my article.
20 (Goldberg Exhibit 9 marked for
21 identification.)
22 Q. Dr. Goldberg, I have handed you
23 what has been marked as Goldberg 9. It is
24 the Miura reference that was referenced in
25 the Walia article.

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2 A. Okay.
3 Q. Would you take a minute to
4 refresh your recollection about this
5 article so I can ask you questions.
6 A. Sure.
7 (Witness perusing document.)
8 A. Okay.
9 Q. Dr. Goldberg, this Miura
10 reference pertains to orthodontic wires,
11 correct?
12 A. Correct.
13 Q. Specifically the Japanese NiTi
14 wire?
15 A. Yes.
16 Q. And it doesn't relate at all to
17 endodontic files, right?
18 MR. GINSBERG: Objection.
19 Q. Those are not discussed, are
20 they?
21 MR. GINSBERG: Objection to the
22 form of the question.
23 A. Endodontic files are not
24 discussed. But I would add that we are at
25 this reference because it was referred to

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2 in the Walia paper.
3 Q. Superelastic -- excuse me,
4 superelasticity is a desirable property
5 for orthodontic wires?
6 A. It is a desirable property.
7 Q. It helps the teeth move?
8 A. Yes.
9 Q. Because the force of the wire
10 pulls the tooth?
11 A. Correct. I'm sorry, if I could
12 just add, all metals, even the stainless
13 steel that they are comparing it to, apply
14 forces. The benefit of the
15 superelasticity is that it is applying a
16 lower force and a more constant force.
17 Q. If you look at page 2 and 3 of
18 the reference, when they are looking at
19 the examination of the mechanical property
20 of the wire, specifically on page 3 in the
21 first column Miura says "the approved ADA
22 standard method is a cantilever type of
23 test"?
24 A. Yes.
25 Q. I'm sorry, I should have backed

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2 up.
3 On page 2, at the bottom of the
4 second column, he starts talking about the
5 bending tests.
6 A. Okay.
7 Q. Miura says they did not use the
8 ADA standard test, they designed their own
9 test.
10 A. Okay. Let me just read that a
11 second.
12 Q. It is in the --
13 A. Yeah, starting at "bending
14 test"?
15 Q. Right.
16 (Witness perusing document.)
17 Q. Miura uses a three-point
18 bending test.
19 A. I'm sorry, if I can just read
20 those two paragraphs. I will try to do it
21 quickly.
22 (Witness perusing document.)
23 A. Okay.
24 Q. So the bending test they use is
25 specific for orthodontic wires, correct?

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2 MR. GINSBERG: Objection to
3 form.
4 A. Which test are you talking
5 about? The three-point --
6 Q. The bending test that they use
7 that is also shown in Figure 2.
8 A. Yes, it is designed to simulate
9 an orthodontic situation. I would add --
10 I'm sorry, but I'm just trying to clarify,
11 so three-point bending tests are commonly
12 used in many areas. They are modifying a
13 three-point bending test by adding
14 orthodontic brackets to try to simulate
15 what the performance of these wires would
16 be in clinical usage. So it's unique to
17 what they want to demonstrate here.
18 But I would say that many
19 laboratories use three-point bending and
20 many laboratories even use this type of
21 arrangement where the bracket is attached
22 and the wire is put through to simulate
23 clinical situations.
24 So I just want to clarify, when
25 you said unique or different, it is

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2 different from the ADA method, which at
3 that time was a cantilever method, but
4 many labs would use similar, if not the
5 same, clinical simulations.
6 Q. And this three-point bend test
7 is different than the ISO standard for
8 endodontic files?
9 MR. GINSBERG: Objection to the
10 form of the question.
11 A. Yes, it is a different test
12 setup.
13 Q. If you turn to page 4, they
14 describe how the heat treatment is
15 performed.
16 A. Yes.
17 Q. Do you see that section?
18 A. Yes.
19 Q. And the heat treatment was
20 performed by immersion of the wire in a
21 nitrate salt bath?
22 A. Yes.
23 Q. Is that a common way of heat
24 treatment?
25 MR. GINSBERG: Objection to the

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2 form.
3 A. I don't even know in general
4 and I don't know specifically for nickel
5 titaniums if that's the common method.
6 Q. You don't know what the common
7 methods for heat treatment of nickel
8 titanium are?
9 MR. GINSBERG: Objection to the
10 form of the question.
11 A. No, because those -- no.
12 Q. And then at the end of the
13 first paragraph, in the second column, on
14 page 4, they say the bending tests were
15 conducted at a temperature of 37 degrees.
16 Do you see that?
17 A. Well, it says "the test was
18 conducted at a temperature." Is that
19 where you are reading?
20 Q. Yeah.
21 A. Okay.
22 Q. And they are talking about the
23 bending test, correct?
24 A. Correct.
25 Q. Again, because that simulates

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2 the mouth?
3 A. Correct.
4 Q. And that's also different from
5 the ISO standard?
6 A. The ISO standard for the
7 endodontic files, correct, that's
8 different, different temperature.
9 Q. The ISO standard for the
10 endodontic files is performed at what
11 temperature?
12 A. It is done in a lab, so room
13 temperature I believe is what it calls
14 for.
15 Q. Which would be somewhere around
16 20 degrees?
17 A. I would typically use 25
18 degrees. I think that's what Sinclair
19 uses. So I think that's what I had been
20 using.
21 Q. Would you look at Figure 3.
22 A. Yes.
23 Q. Figure 3 is a load deflection
24 curve produced by the three-point bending
25 test.

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2 A. Yes.
3 Q. And the solid line is the
4 Japanese NiTi. Do you see that?
5 A. Yes.
6 Q. And Figure 4 is the same test
7 using five different diameters of the
8 Japanese NiTi alloy wires, right?
9 A. Yes.
10 Q. And the 0.016 inches is one of
11 them; do you see that?
12 A. Yes.
13 Q. And just ballpark estimating,
14 at 2 millimeters the tip of the curve goes
15 somewhere maybe 700?
16 A. I'm sorry, are you looking at
17 Figure 3 or 4?
18 Q. 4.
19 A. Okay. And at 2 millimeters,
20 the tip of which curve?
21 Q. The 0.016 curve.
22 A. The tip of 0.016, yeah, that
23 looks like, yeah, maybe about 700 grams.
24 Q. Now, if you look at Figures 5,
25 6 and 7, they are varying the heat

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2 application on the 0.016 inch Japanese
3 NiTi alloy wire, right?
4 A. Well, they are varying the
5 temperature, as you go to Figure 5, 6, 7,
6 and within each of those they are varying
7 the time.
8 Q. And at 400 degrees -- 400
9 degrees did not have a significant effect
10 on the load deflection curve, did it?
11 MR. GINSBERG: Objection to the
12 form of the question. It is vague.
13 A. Let me just see how they
14 characterize it and then I will respond to
15 that.
16 (Witness perusing document.)
17 A. They characterize it as only a
18 small amount of heat-treatment effect was
19 noted. So they characterize the change as
20 small.
21 Q. And if you look at Figure 6, it
22 had the heat treatment at 500 degrees had
23 a greater effect on the load deflection
24 curve, correct?
25 A. Correct.

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2 Q. And if you heated it for longer
3 periods of time, the wire increased in
4 stiffness?
5 MR. GINSBERG: Objection to
6 form.
7 Q. Am I reading that correctly?
8 A. No, it is decreasing in
9 stiffness.
10 Q. Because it takes lesser load to
11 deflect at that 2 millimeters?
12 A. Yes. I would add that I would
13 probably be focused more on, in addition
14 to the peak, that the entire curve is
15 getting flatter. They are moving down.
16 So it is not just the peak.
17 Q. Are you referring to the peak
18 as the point at 2 millimeters?
19 A. Yes. So I'm agreeing it is
20 moving down, but I'm saying that most
21 readers would probably look at the entire
22 curve and not just the peak.
23 Q. And the top part of the curve
24 is when you are applying the load and the
25 bottom part is when you are releasing it,

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2 correct?
3 A. Correct.
4 Q. And then in Figure 7 you see
5 the greatest effect on the load deflection
6 curve, correct?
7 A. Correct.
8 Q. And this would have -- these
9 wires have become even less stiff?
10 MR. GINSBERG: Objection to the
11 form of the question.
12 A. Just in comparing these two, so
13 just so you understand what I'm looking
14 at, what I'm looking at is the slopes of
15 the curves, not just the peaks, and
16 comparing 6 to 7 I don't see that the
17 position of the curves changed too much.
18 Like the maximum, even at 2 millimeters,
19 is 500 and then the curves decrease. So I
20 would say the stiffnesses are comparable.
21 To me what is most notable
22 about Figure 7 is, as the author reports,
23 it is the loss of the spring-back
24 properties, meaning it is not going back
25 to its original shape. You notice in

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2 Figure 6 everything goes back towards the
3 origin, but in Figure 7, that's not the
4 case, and he is noting that by saying it
5 is losing its spring-back properties.
6 Q. So would you agree that Miura
7 shows that the effect of the heat
8 treatment depends on the temperature and
9 the length of time that you apply the
10 heat?
11 A. I'm sorry, say that again. I'm
12 sorry, I was looking at the figure.
13 MS. BRENNER-LEIFER: Can you
14 read it back.
15 (The record was read.)
16 A. Yes, he is showing change in
17 properties such as stiffness and the
18 amount of permanent deformation that are a
19 result of different time and temperature
20 processes.
21 Q. If you look at Figure 8 on page
22 6 --
23 A. If I can just have a moment to
24 read the legend and --
25 Q. Sure, please do.

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2 (Witness perusing document.)
3 A. I will just say, maybe it is in
4 the text, but in the legend when he says
5 range of superelasticity is indicated on
6 the graph, it is not clear to me how he is
7 indicating that.
8 I assume it is one of these
9 either cross-hatched vertical lines or
10 dots, but he doesn't describe that.
11 Q. Well, it is not clear to me
12 either. I just don't think it is clear.
13 MR. GINSBERG: Objection.
14 Q. But do you -- the way I read
15 Figure 8, and I just want you to agree or
16 maybe clarify that I'm reading it
17 correctly, he has three different diameter
18 wires and he labels them light, medium and
19 heavy, and I'm not really sure what that
20 means.
21 MR. GINSBERG: Objection. You
22 don't know what she means.
23 Q. I'm just asking, do you
24 agree -- do you know what that means?
25 A. I do not know what that means.

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2 Q. And then he has force ranges
3 for each of those, but he doesn't explain
4 how he got there.
5 A. I would have to look, but I'm
6 pretty sure that's the results of the
7 bending tests. I would anticipate that.
8 I'm glad to go read that section where he
9 discusses Figure 8.
10 Q. Great. Please do that.
11 A. Except I'm not seeing Figure 8
12 referred to anywhere in the text. If
13 somebody can help me find where he is
14 discussing Figure 8. Oh, the very end.
15 (Witness perusing document.)
16 A. No, wait a minute, wait a
17 minute.
18 (Witness perusing document.)
19 A. Okay, I can give you my
20 interpretation of what's going on here.
21 Q. Great.
22 A. So Figure 8 and Figure 9 relate
23 to a second study in effect. So they did
24 the three-point bending, which is depicted
25 in Figure 2, and the results are shown in

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2 the figures we've been discussing such as
3 5, 6 and 7.
4 Then what he says is okay,
5 these results look interesting, we are now
6 going to try this clinically. So what
7 they do in the second paragraph under
8 Clinical Applications for this Study,
9 meaning now a separate study, they take
10 these wires, 16-inch -- 16,000s, 18,000s
11 and 22,000s, and they form them into what
12 they refer to as an ideal arch. So that
13 is a shape of an arch that is typical to
14 the shape of your mouth or the teeth and
15 lining in your mouth.
16 I'm not quite sure what it
17 means when they say each size of wire was
18 fabricated at three force levels, light,
19 medium and heavy. So even here he doesn't
20 describe what that means.
21 But the point they are trying
22 to make is then they go on and show these
23 cases, and let's take a look just at
24 Figure 9A, and do you see that that tooth
25 in Figure 9A seems a little high relative

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2 to the plane of occlusion, where the
3 biting surfaces touch, but in Figure B
4 that tooth has now been moved down and is
5 aligned more with the adjacent and
6 opposing teeth --
7 Q. I had a tooth exactly like that
8 when I was 14.
9 A. There you go. Well, you in all
10 likelihood had that done with nitinol.
11 So what they are showing is,
12 hey, not only do we have these laboratory
13 tests that show favorable results, but we
14 made arches, put them into a patient, and
15 look, it moved the teeth.
16 I still don't know what heavy,
17 medium and light mean. But that's what
18 they are trying to determine. Heavy,
19 medium and light would typically mean the
20 amount of force that is imparted in an
21 orthodontic wire, but, again, without
22 further clarification, I would just be
23 speculating. But that's the gut intent of
24 Figures 8 and 9.
25 Q. So what Miura is interested in

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2 doing is making orthodontic wires where he
3 can adjust the amount of force --
4 MR. GINSBERG: Objection to
5 form.
6 Q. -- that might be used on the
7 tooth?
8 A. Correct. What he -- let me
9 start that again.
10 What is happening at this
11 point, this is 1986, is these new wires
12 are just being developed in Japan. So he
13 is anticipating that, hey, this might be
14 useful, let me look at the properties. He
15 looks at the bending properties and he
16 says, gee, I can vary other things,
17 stiffness, the amount of spring-back, the
18 amount of permanent deformation that I get
19 in these samples by varying the time or
20 temperatures that I subject these to.
21 So he shows this matrix of
22 mechanical properties, stiffness,
23 deflection, permanent deformation, as a
24 result of different time and temperature
25 treatments, and he says, gee, for our use

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2 in orthodontics, these particular
3 combinations looks useful, I'm going to
4 make it into an arch and demonstrate that
5 it is effective for orthodontics.
6 So that's what he is doing. He
7 is showing that it is useful, showing you
8 can manipulate the properties, and this
9 Figure 8 that you asked about, I'm
10 guessing that's really just a clinical
11 version, that's a clinical representation
12 of the bending curves. In other words, a
13 clinician would more typically maybe just
14 want to know, gee, how many grams are
15 being applied with which wire.
16 So that's the type -- that
17 presentation of the data looks like that
18 to me. So he is saying here is this new
19 alloy, here is how we vary the properties,
20 here is the heat treatments that are
21 necessary to get different
22 characteristics, and for this particular
23 application, I think whatever he used to
24 make heavy, medium and light, he did, and
25 he is demonstrating clinically it is

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2 effective.
3 MS. BRENNER-LEIFER: The
4 videographer needs to change the tape, so
5 let's go off the record.
6 THE VIDEOGRAPHER: This ends
7 tape number four. We are off the record
8 at 12:41.
9 (Luncheon recess: 12:41 p.m.)
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2 A F T E R N O O N S E S S I O N
3 1:31 p.m.
4 A. J O N G O L D B E R G, Ph.D.,
5 resumed.
6 (Goldberg Exhibit 10 marked for
7 identification.)
8 THE VIDEOGRAPHER: This begins
9 tape number five in the deposition of
10 Dr. Jon Goldberg. We are on the record at
11 1:31.
12 CONTINUED EXAMINATION
13 BY MS. BRENNER-LEIFER:
14 Q. Good afternoon, Dr. Goldberg.
15 A. Good afternoon.
16 Q. I have handed you what has been
17 marked as Goldberg Exhibit 10. It is an
18 article by Gregoire Kuhn which is relied
19 upon in your expert report entitled
20 Fatigue and Mechanical Properties of
21 Nickel Titanium Endodontic Instruments.
22 Would you just spend a minute
23 reviewing this reference so I can ask you
24 questions about it.
25 A. Sure, thank you.

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2 (Witness perusing document.)
3 A. Okay, thank you.
4 Q. Dr. Goldberg, this paper
5 relates to -- primarily to fatigue testing
6 of endodontic files, correct?
7 MR. GINSBERG: Objection to the
8 form of the question.
9 A. I wouldn't characterize it that
10 way. There is a considerable amount of
11 DSC measurements and the fatigue I believe
12 relates to the used files and then towards
13 the end they are showing the effect of
14 temperature treatments on new files. I
15 wouldn't characterize it as primarily
16 fatigue. In fact, I guess the fatigue is
17 the used files because I don't see a
18 description of fatigue testing per se.
19 Q. Well, I was referring to the
20 first page of the article, in the second
21 column, the paragraph preceding the
22 heading Materials and Methods, Kuhn writes
23 "The aim of this work is to show fatigue
24 characteristics of superelastic NiTi, and
25 subsequently the effect of the process

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2 history on fracture life."
3 Do you see that?
4 A. I do.
5 Q. So do you disagree that that is
6 the aim of this paper?
7 MR. GINSBERG: Objection to the
8 form of the question.
9 A. I would say that is the title.
10 That's what they are saying in the aim.
11 Before you even mentioned that,
12 I was just looking at the data and I think
13 the only data -- I'm assuming that fatigue
14 means used files and there is really not
15 too much on the used files it looks like,
16 just Figure 5.
17 Q. And the first paragraph of his
18 article in the first sentence Kuhn writes
19 "In endodontic treatments the risk with
20 traditional files (stainless steel) is
21 plastic deformation and fracture."
22 That means breaking files, is
23 that what it means?
24 MR. GINSBERG: Objection to the
25 form.

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2 A. Well, fracture would mean
3 breaking.
4 Q. And plastic deformation is
5 what?
6 A. Would be permanently deformed.
7 Q. Permanent deformation?
8 A. Yes.
9 Q. If you look at page 17 --
10 MR. GINSBERG: Do you mean 717?
11 MS. BRENNER-LEIFER: Yes,
12 thanks.
13 Q. Page 717, in the second column
14 under Bending Tests, Kuhn writes "To
15 perform bending tests we used a bending
16 machine" -- "a bending testing machine,"
17 but he doesn't describe the testing
18 machine he uses. Do you agree with that?
19 A. Yes.
20 Q. And in the first column on that
21 page under the heading Thermal Treatments,
22 he describes it, heat treatments that were
23 used as being heat treatments in salt
24 baths, do you see that?
25 A. Yes.

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2 Q. Do you have a problem with him
3 using salt baths for heat treatment?
4 MR. GINSBERG: I object to the
5 form of the question.
6 A. As I said, I'm not that
7 familiar with -- this came up with
8 something else, nitriding baths or
9 something. So I'm not that familiar, but
10 I know salt baths could be used. I really
11 wouldn't have an opinion if it is good or
12 bad.
13 Q. So are you familiar with the
14 process of heat treatment in salt baths?
15 A. No.
16 Q. So are you also familiar with
17 whether a water quench is common after
18 heat treatment in a salt bath?
19 A. That really depends on what you
20 are trying to achieve, which systems you
21 are using. I mean, that's part of the
22 process and if an author is doing that,
23 then I accept it on face value that there
24 is a reason that they are doing that.
25 Q. But you don't think he did it

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2 in a wrong way?
3 A. I couldn't have an opinion
4 because I'm not sure what he is trying to
5 do. I mean, in all honesty, I would read
6 this, I would see this is the method that
7 they are testing, okay, this is the
8 thermal treatments that they are providing
9 and then they are going to evaluate the
10 samples after that.
11 Q. And in the next section under
12 Methodologies, he is describing the DSC
13 testing.
14 A. Yes, I see that.
15 Q. Do you see the end of the first
16 full paragraph, Kuhn says that the start
17 and finish temperatures of each phase
18 transformation were determined from
19 tangent lines where the DSC curve deviates
20 from the adjacent baselines?
21 A. Yes.
22 Q. And that's what we saw as the
23 method being used in the ASTM standard,
24 correct?
25 A. Yes. But I see that and then I

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2 was looking for this when I was looking
3 through, I don't see any of those tangent
4 lines and he doesn't say it is the ASTM
5 method, but ASTM method does use tangents,
6 but I don't see any baselines or any
7 tangents in here.
8 In fact, I see him referring to
9 temperatures on the curve but I just
10 assumed that that was done with this
11 tangent method. So, I mean, that's --
12 most papers, if they are using ASTM, would
13 say ASTM F177 or whatever it would be.
14 Q. And going back to the paragraph
15 on bend testing, the last two sentences of
16 the second paragraph, Kuhn writes "We
17 obtained information." Are you following
18 me?
19 A. Yes.
20 Q. "We obtained information about
21 the elastic behavior (flexibility) of
22 files and about heat treatments in
23 clinical use. The results are discussed
24 only in a qualitative analysis and not a
25 quantitative analysis because of the shape

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2 of the instruments (range and machining
3 design) which prevents any calculation."
4 Do you see that?
5 A. Yes.
6 Q. So Kuhn specifically says his
7 analysis is qualitative and not
8 quantitative, right?
9 MR. GINSBERG: Objection to the
10 form of the question.
11 A. I would have to disagree
12 because this would not be -- I mean, what
13 he is doing, the data he is representing
14 in Figures 5 -- all the figures, that's
15 the data. So I could take a look at this
16 and, for example, in Figure 5 I could say
17 that, and I don't know if I'm exactly
18 right here, but say at 8 millimeters on
19 that bottom curve that's the solid line, I
20 could draw a line across and say at 8
21 millimeters the measure on the Y axis is
22 three newtons.
23 So while he may be describing
24 it qualitatively, I mean, the data is
25 definitely quantitative. I mean, even the

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2 DSC curves, I mean, he gives those
3 temperatures.
4 Q. But Kuhn himself says that his
5 analysis is qualitative?
6 MR. GINSBERG: Objection to the
7 form of the question.
8 A. Yes, he says that at the
9 beginning. Let me just see if I can find
10 any other examples.
11 (Witness perusing document.)
12 A. Well, I would agree that the
13 characterizations I am seeing are
14 qualitative. But, again, I would state
15 that the figures are quite quantitative.
16 Q. Well, he doesn't give any error
17 analysis in any of these tests, does he?
18 A. No.
19 Q. So you don't know what the
20 degree of error is in these test results,
21 do you?
22 A. I don't. But I assume that the
23 trends are legitimate because he is making
24 that qualitative comparison.
25 So, for example, in Figure 6,

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2 he is saying the curves go up or go down.
3 So I assume that he knows, or even though
4 it is qualitative he is saying they are
5 different. I don't think you need an
6 error analysis just to indicate a trend.
7 In other words, I assume what
8 he is saying is there is not so much
9 variability here that we see no
10 difference, he is saying the opposite,
11 that there is enough variability
12 regardless of the error bars to be able to
13 identify that trend.
14 Q. Could you turn to page 719, and
15 the left-hand column, about halfway
16 through the page, before Discussion, there
17 is a paragraph that begins "Figure 6."
18 A. Yes.
19 Q. "Figure 6 (A and B) demonstrate
20 that the annealing conditions strongly
21 affect the stress-strain behavior. For
22 heat treatments below recrystallization
23 temperature (Figure 6A), the specimens
24 generally show an increased flexibility."
25 Let's look at 6A. In this

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2 bending curve he takes a profile, the
3 profile file with a diameter 0.04, the
4 Conicity 0.04 Diameter 20. I believe
5 that's what it states in Table 1.
6 A. Yes.
7 Q. Are you following me?
8 A. Yes.
9 Q. And he has one that's
10 un-heat-treated which is the solid line,
11 another that is heat-treated for 400
12 degrees, and another one that is
13 heat-treated at 510 degrees, each for ten
14 minutes. Do you see that?
15 A. Yes.
16 Q. And when it is heat-treated at
17 400 degrees, the file that is heat-treated
18 for 400 degrees is the one on the lowest
19 curve, right?
20 A. Correct.
21 Q. And the 510 degrees is the
22 middle curve?
23 A. Correct.
24 Q. And the untreated is the solid
25 curve at the top, right?

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2 A. I see that.
3 Q. So the one that was treated at
4 510 degrees actually is less flexible than
5 the one that was treated at 400 degrees,
6 right?
7 A. Yes.
8 Q. And let's now turn to -- back
9 to page 719, that same paragraph we were
10 reading.
11 A. Yes.
12 Q. He continues, "On the other
13 hand, results show that after annealing at
14 a temperature above recrystallization, the
15 stiffness of the instruments increases."
16 Now, if you turn back to Figure
17 6B you see that there is still heat
18 treatment, but rather than become flexible
19 they are more stiff?
20 MR. GINSBERG: Objection to
21 form.
22 Q. Is that correct?
23 A. Yes.
24 Q. And the stiffest file is the
25 one that was treated at 700 degrees,

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2 right?
3 A. I see that.
4 Q. So it seems that what Kuhn is
5 showing in Figure 6A and 6B is that if you
6 heat-treat a file the stiffness and
7 flexibility are highly dependent on the
8 temperature?
9 MR. GINSBERG: Objection to
10 form.
11 A. Yes, among other things that
12 can be garnered from those curves, for
13 example, the peak value, the amount of
14 permanent deformation. I mean, there is
15 other information. He is focused on the
16 stiffness, but all these curves show many
17 things, like, as I said, the maximum
18 moment, for example, which would be the
19 peak, at the very tip of the curve.
20 Q. And it seems somewhat complex
21 whether when you heat-treat it, it is
22 going to be more or less stiff --
23 MR. GINSBERG: Objection to the
24 form.
25 Q. -- based on 6A or 6B, correct?

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2 MR. GINSBERG: Objection to the
3 form.
4 A. I'm sorry, can you repeat the
5 question?
6 MS. BRENNER-LEIFER: Could you
7 read back my question.
8 (The record was read.)
9 A. I guess the complexity is a
10 matter of definition. You know, in a
11 general sense, I would just say this shows
12 that a number of mechanical properties can
13 be affected by the heat treatment, that
14 those properties are affected one way when
15 the temperature is 510 or 400 and are
16 affected another way if they are 600 or
17 700. Personally I wouldn't consider these
18 curves complex to interpret.
19 Q. I don't mean the curves
20 themselves to be complex to interpret. I
21 just mean the trend is somewhat
22 complicated in terms of whether you -- all
23 of these are heat-treated.
24 A. Right.
25 Q. All of these files are

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2 heat-treated, right?
3 A. Right.
4 Q. And they are all heat-treated
5 at least 400 degrees?
6 A. Correct.
7 Q. And despite the fact that they
8 are all heat-treated at at least 400
9 degrees, some of them are more flexible
10 and some of them are less flexible?
11 A. That's correct. And he
12 explains that by differentiating one of
13 these as above the recrystallization, the
14 other is below. So he is trying to
15 explain there is a rationale why they may
16 be different.
17 Q. And what is the
18 recrystallization temperature?
19 A. Well, he doesn't say, but I'm
20 assuming that it is going to be somewhere
21 between 510 and 600.
22 Q. Now, is that recrystallization
23 temperature something that is standard for
24 nickel titanium or it depends on the
25 specific alloy?

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2 A. It depends on the alloy and the
3 previous treatment, processing of the
4 sample.
5 Q. So it is something you would
6 have to figure out empirically by testing
7 the alloy?
8 MR. GINSBERG: Objection to the
9 form of the question.
10 A. I think you would. I think you
11 would have to look at the given alloy. I
12 mean, what is complex is the metallurgy is
13 complex and the steps in the processing is
14 complex, so how it is cast, how the wires
15 are made, how much cold reduction, all of
16 those, what the dislocation density is,
17 what the grain size.
18 I don't want to belabor the
19 point but I want to point out that
20 metallurgy is complex. So I would
21 anticipate that the recrystallization
22 temperature would not always be the same.
23 It would depend upon those processing
24 parameters.
25 Q. Are these bending curves for

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2 these temperatures something that you
3 think you would be able to predict?
4 A. Predict on what basis? Given
5 what that I would then predict them?
6 Q. Well, just from general
7 principles for nickel titanium, are
8 these -- is this predictable behavior or
9 is this behavior that you just have to
10 learn by studying specifically?
11 MR. GINSBERG: Objection to the
12 form of the question.
13 A. My opinion would be, and I
14 think this is similar to what we have
15 talked about in the morning, because it is
16 so complex, in my opinion, it is difficult
17 to look at the structure and predict the
18 properties. So I would need to look at
19 the properties and know the structure and
20 then I could demonstrate the correlation.
21 Q. So it is not a very predictable
22 art?
23 MR. GINSBERG: Objection to the
24 form of the question.
25 A. No, I'm not saying that at all.

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2 In fact, what makes all materials a
3 science and not an art is we do this
4 calibration. We look at all the
5 structures. We measure the properties of
6 importance. That gives us knowledge as to
7 how to manipulate the properties, in this
8 case time and temperature of
9 heat-treating, to get the desired
10 properties.
11 Q. What do you mean, we do this
12 calibration?
13 A. I will use an example. Steel
14 cable --
15 Q. Let's just stick to NiTi.
16 Because if you give me another example, I
17 will have to bring you back to NiTi.
18 A. Gotcha. I apologize for that.
19 Let's take NiTi. So let's say I was
20 interested in increasing the stiffness.
21 So from previous literature, I would look
22 at the previous literature, everywhere I
23 could find information on NiTi and I would
24 see, okay, the property I wanted to change
25 is stiffness and I would look and see what

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2 people -- where people have studied
3 stiffness, what they have done to vary the
4 stiffness and what their explanation was.
5 So they might have done a heat
6 treatment. They saw an increase in
7 stiffness and they explained that by
8 saying that the grain size grew. So that
9 gives me a clue that I can manipulate that
10 property, here is the temperature range
11 that I should work in, and the underlying
12 mechanism is this grain size. So then I
13 would start and look at a particular grain
14 size, heat-treat that material, see the
15 new grain size, and then measure the
16 property, the stiffness, and armed with
17 that I would then go backwards and say
18 okay, I want a stiffness of X, I see what
19 happens with these different heat
20 treatments, it makes sense because I see
21 the grain size is moving in this
22 direction, therefore I'm going to pick
23 this temperature, that should give me the
24 property and I anticipate that this will
25 be the grain size.

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2 That's the way we did it when
3 we developed our titanium alloys.
4 Q. When you say "we," who is "we"?
5 A. Myself and my collaborator,
6 Charles Burstone.
7 Q. And when you say "our titanium
8 alloys," which titanium alloys are you
9 referring to specifically?
10 A. The beta titanium alloys that
11 were reference 19 in that previous article
12 you were looking at.
13 Q. Dr. Goldberg, just to confirm,
14 you agree that Dr. Kuhn does not specify
15 the bend test he is using in this paper,
16 right?
17 A. Correct.
18 Q. And he does not say that the
19 bend test used for Figure 6A and Figure 6B
20 was the ISO 3630-1 standard?
21 A. Correct, it does not say that.
22 Q. And he does not say that these
23 files permanently deform more than 10
24 degrees under the ISO 3630-1 standard
25 bending test, right?

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2 A. If I can just elaborate on
3 that, I mean, he does show permanent
4 deformation but he doesn't make the
5 specific comment, similar to what we are
6 saying. He makes qualitative comments,
7 but the figures show the quantitative
8 results.
9 Q. Where does he say that these
10 files show permanent deformation?
11 A. As I said, he doesn't say that
12 specifically, but I look at the figures
13 and I can see that information.
14 Q. Where do you see that in the
15 information?
16 A. In Figure 6A.
17 Q. Where in Figure 6A?
18 A. So if you take a look at the
19 control, do you see that the control
20 returns all the way back to 00?
21 Q. Yes.
22 A. Now take a look at the very
23 bottom line, the one that is 400 degrees
24 C, with thatches and dots. Do you see
25 that it doesn't come all the way back, in

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2 fact, it hits the axis somewhere between
3 maybe 1 and a half and 2?
4 Q. No, I don't see that.
5 A. Do you want me to point it out
6 to you?
7 Q. Are you talking about the 400?
8 A. The 400, yes.
9 Q. No, on mine it goes back
10 between about -- I see the line continuing
11 all the way almost to 0.5.
12 A. Oh, okay. My eyes must be
13 going out. So anywhere, somewhere other
14 than zero, the line hits the axis.
15 Q. Half a millimeter? I mean,
16 this is very hard to read. But I see that
17 line going to at least half a millimeter,
18 below half a millimeter.
19 A. So let's say it's -- we will
20 compromise and say it is 1 millimeter, or
21 I guess we could blow this up or
22 something. But the point is, it is not
23 zero. So that shows me that that heat
24 treatment lowers the stiffness, lowers the
25 maximum moment, and increases the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 permanent deformation.
3 Q. How can you increase permanent
4 deformation?
5 A. Well, because the sample that
6 is the control has no permanent
7 deformation. It clearly comes back to
8 zero. The one we are discussing does not
9 come all the way back to zero. You say it
10 is half. Maybe I say it is 1 and a half.
11 But it is clearly something other than
12 zero.
13 Q. Okay. So we have one file that
14 was bent?
15 A. Right.
16 Q. There is no degree of error
17 shown here, because there was only one
18 file tested?
19 A. Correct.
20 Q. And the bending test is not
21 specified?
22 A. Correct.
23 Q. And without any of that
24 information on the basis of one test you
25 feel comfortable that this demonstrates

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2 that you bend this file -- I mean, you
3 heat-treat this file to 400 degrees and
4 you are definitely getting permanent
5 deformation?
6 A. Yes, because Kuhn qualitatively
7 says he is seeing a change in these. He
8 is not saying there is no change.
9 Q. But he doesn't say --
10 MR. GINSBERG: You just cut off
11 the witness.
12 Q. -- qualitatively anything about
13 permanent deformation?
14 A. I'm sorry --
15 MR. GINSBERG: Please don't cut
16 off the witness when he is answering a
17 question.
18 A. Maybe we should start again
19 because I lost my train of thought here.
20 Q. Kuhn didn't say qualitatively
21 anything about permanent deformation, did
22 he?
23 A. Not in the text, correct.
24 Q. And Kuhn says he is only making
25 qualitative analysis, not quantitative

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2 analysis, correct?
3 A. That's what he says in his
4 text. But, again, the data is the data
5 and, as you can see, it is quite
6 quantitative.
7 Q. Quite quantitative, what does
8 that mean?
9 A. Well, he could have simply had
10 millimeters and -- he could have had these
11 numbers from zero to 9 and zero to 3.5 --
12 let me see if I could say this.
13 He could have just had
14 displacement and force and no scale bars.
15 That would have been qualitative. Then
16 you would just see the trends but you
17 don't know the actual values. What he is
18 reporting is quantitatively the results
19 and then discussing it qualitatively. But
20 the data is still there.
21 Q. Well, let's go back to what he
22 says on paragraph 717.
23 A. I'm sorry, I remember what I
24 was going to say before if this would be
25 helpful.

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2 Q. Okay.
3 A. So the reason that even though
4 it is one file and one test and the method
5 is not described, he has got a control.
6 It is the hard black line. So that
7 equalizes everything.
8 So same conditions, same test,
9 same whatever, he is telling me
10 qualitatively these curves are different
11 and I can see quantitatively that there
12 are. There is an increased -- there is a
13 decreased stiffness. There is a decreased
14 maximum moment, that's the Newton scale,
15 so the peaks are lower, and I can see and,
16 as you said, maybe it is 0.5, maybe it is
17 1.5 -- excuse me, let me get a drink.
18 MR. GINSBERG: Watch your mic.
19 I will get it for you.
20 THE WITNESS: I'm sorry.
21 A. So when I look at these, what I
22 see is increased stiffness, decreased
23 maximum moment, increasing permanent
24 deformation.
25 Q. Could we go back to page 717.

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2 A. Sure.
3 Q. The last sentence in that
4 paragraph under Bending Test, Kuhn writes
5 "The results are discussed only in a
6 qualitative analysis and not a
7 quantitative analysis because of the shape
8 of the instruments, range in machining
9 design, which prevents any calculation."
10 A. Correct.
11 Q. What do you think he means by
12 that?
13 MR. GINSBERG: Objection to
14 form.
15 A. I can't say what he was
16 thinking, but I read this as saying
17 because the geometries are complex, so, in
18 other words, when we typically would do a
19 testing, you know, we would have a uniform
20 cross-section, so that you could calculate
21 the effect of the area. That becomes
22 difficult with a file because of its odd
23 shape.
24 But even though -- so what he
25 is saying is he is not calculating stress,

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2 he is not calculating strain, he is not
3 calculating the common material properties
4 that we would calculate, but would need a
5 known cross-sectional area to measure.
6 So what we do in this
7 situation, this is what I consider more of
8 a clinical simulation, we don't measure
9 the stress or the strain because the area
10 is so complex, so this would be like
11 anytime else, we would compare two
12 products to show an endodontist the
13 effects of the two.
14 So he is showing me the data.
15 Clearly the data is quantitative. What he
16 can't calculate is the force per unit
17 area, so he is just showing the absolute
18 values, but those are quantitative values.
19 He may discuss them in a qualitative
20 sense, but the fact that he says they are
21 different says to me that quantitatively
22 he has made that determination.
23 Q. Figure 6A, you are putting a
24 big conclusion on Figure 6A, right?
25 MR. GINSBERG: Objection to the

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2 form of the question.
3 A. I wouldn't characterize it as a
4 big conclusion. As I said earlier, these
5 are not complex curves and we would run
6 tests like this typically to measure the
7 stiffness, the maximum moment, and if
8 there was any permanent deformation. That
9 would be the three parameters we would
10 routinely use in this type of curve.
11 Q. But you admitted earlier that
12 your eyes weren't so good and you couldn't
13 read that line very well.
14 A. Right. I will accept your
15 eyes. We will say 0.5.
16 Q. What if my eyes said it went
17 all the way back to zero, would you accept
18 it then?
19 A. I wouldn't.
20 MR. GINSBERG: Objection to the
21 form.
22 Q. Why?
23 A. Because to me it looks like it
24 is coming down somewhere between 1 and a
25 half and 2, maybe it is 1 and a half. You

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2 feel it is a half. But it is not zero.
3 The black line is zero. And I would just
4 say that's not a small value. Even if we
5 take 1 and they deflected 8, 1 out of 8 is
6 whatever percent that is, you know, 12
7 percent, 15 percent, whatever that number.
8 Q. And what if we blew up that
9 diagram really big and you saw that it
10 went back to zero, then what would you
11 conclude?
12 MR. GINSBERG: Objection to the
13 form of the question.
14 A. Well, if we would do that I
15 would have to see the curve.
16 Q. If we blew that diagram, Figure
17 6A, up really big and it went all the way
18 back to zero, would your conclusion
19 change?
20 MR. GINSBERG: Objection to
21 form.
22 A. Again, because I would have to
23 see the control as well. This is the
24 reason that he can't make it
25 quantitatively. What he is doing is he is

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2 comparing the two. So in that blowup we
3 would just have to see what the control
4 looked like, what each of those looked
5 like.
6 Q. Well, the control is right
7 there. I'm just saying if you took this
8 Figure 6A and you blew it up really big
9 and you saw that that bottom line went all
10 the way to zero, would your conclusion
11 change about permanent deformation?
12 A. I would -- I would have to see
13 it. I would just say it sure looks to me
14 like it is hitting that curve at 1 and a
15 half, so it is definitely hitting it by 1,
16 and even by your eyes at a half. I think
17 it is tracing along the bottom of that. I
18 would have to see the blowup to make that
19 conclusion -- to make a conclusion.
20 Q. But I just want to understand
21 that your conclusion about permanent
22 deformation depends on where that bottom
23 line intersects that zero mark, right?
24 A. Correct.
25 Q. And if it doesn't intersect at

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2 zero then you consider anything that
3 doesn't intersect at zero millimeters to
4 be permanent deformation?
5 MR. GINSBERG: Objection to the
6 form of the question.
7 A. Can you repeat that?
8 Q. Well, you said it doesn't
9 matter if it is 0.5 millimeters or 1.5
10 millimeters, it is still permanent
11 deformation?
12 A. Correct.
13 Q. So is it your opinion that
14 anything other than zero is permanent
15 deformation?
16 A. Yes.
17 Q. And if it is 0.5 millimeters,
18 can you extrapolate for how that file
19 would perform in this ASTM -- I'm sorry,
20 in this ISO 3630-1 standard?
21 A. So it is difficult. First of
22 all, we don't know the method here, so we
23 are comparing two different methods. It
24 is very difficult to take the results from
25 one method and predict what it will be in

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2 another.
3 But what I could do, this is
4 what I guess I could do something like
5 this, and this is definitely arm waving,
6 let's just for the sake of this discussion
7 of comparing it to ISO, the ISO method,
8 let's just say it is coming down at 1.
9 You said a half. I said 1 and a half.
10 Let's just for an example say it came down
11 at 1.
12 So whatever 1 divided by 8 is,
13 and I guess I should know this, it is 15
14 percent, 20 percent, some number. So I
15 would expect, just arm waving, same
16 percent change in a different test. So in
17 that ISO test you deflected 40 degrees.
18 So I don't know what the percentage is --
19 Q. I'm sorry, 45?
20 A. 45, okay. So you deflected 45
21 degrees. So here I'm saying, all right,
22 why don't we say the number is 15 percent,
23 and I'm just not sure what it is, so I
24 would expect 15 percent of 45, whatever
25 that number is, to be an estimate of the

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2 deformation you would get there.
3 So I'm kind of making a
4 percentage but really doing a very loose
5 prediction of saying that percentage would
6 be indicative of what you would see in
7 another test.
8 Q. But I'm a little bit confused,
9 because we see on this same diagram it
10 goes up to 8 millimeters.
11 A. Correct.
12 Q. For instance, for the
13 un-heat-treated one, the top line --
14 A. So can I --
15 Q. Whether you deflected 4
16 millimeters and 8 millimeters is a huge
17 difference on the force?
18 A. Right.
19 MR. GINSBERG: Objection to the
20 form.
21 Q. It is not linear?
22 A. Yes, I agree. And it is going
23 to be a different test in the ISO. But
24 just so we have a basis for discussion,
25 could someone divide 1 by 8 and see what

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2 that number is.
3 MR. GINSBERG: I think it is 12
4 and a half.
5 Q. Yeah, half of a quarter.
6 A. Right, okay, thank you. You
7 must have been good in math.
8 Q. No, I think he was good at
9 math.
10 A. So let's say it is 12 and a
11 half percent. So what I am saying is it
12 deflected 8 millimeters and permanently
13 deformed 12 and a half percent. I'm
14 making, admittedly, a very arm waving, if
15 I deflect a similar file, and this is a
16 bending test, so I kind of think it is
17 going to be not too different from ISO, if
18 I deflected 45 degrees, what is 12 and a
19 half percent of 45?
20 Q. Okay, we can do that math
21 later.
22 A. So whatever it is would be my
23 general prediction of what I would get
24 there. And I say that because the same
25 type file, they are both bending, and I'm

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2 seeing 12 and a half percent permanent
3 deformation here. So if you are forcing
4 me to make the prediction, I'm taking that
5 same percent and transferring it over to
6 the ISO and saying 45 percent of the
7 deflection, 45 degrees, that's how I would
8 determine what permanent deformation I
9 would see.
10 I would just add I would
11 definitely do the test.
12 Q. See, I will tell you, that
13 confuses me because if I -- this is not a
14 straight line here. These are all curves.
15 A. I'm sorry, but the axis is
16 linear. It is a straight line. The curve
17 is not straight.
18 Q. I'm talking the curve. The
19 curve --
20 A. That's right, but that's not
21 what we are talking about. We are talking
22 about on that linear scale of zero to 8,
23 we are not talking about any forces here,
24 no Newtons. We are talking about how much
25 does it recover.

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2 Q. I understand that. My question
3 is this: If I was using this same bending
4 test, we don't know what it is, if he is
5 only bending this, say, looking at the
6 bottom curve, he only bends it 4
7 millimeters, he might not get any
8 permanent deformation, right?
9 MR. GINSBERG: Objection to the
10 form of the question.
11 A. I couldn't predict that. I
12 mean, I assume -- there is nothing I can
13 assume. I anticipate it being less, but I
14 don't know if it would be zero. I would
15 assume that that permanent deformation --
16 this is getting difficult to assume. Yes,
17 if it was 4 millimeters, I would expect a
18 different amount of permanent deformation.
19 Q. But you wouldn't expect 15
20 percent?
21 MR. GINSBERG: Objection to
22 form.
23 A. It might be. I mean, that
24 would be my best guess, that it wouldn't
25 be at 1 and a half, it would then be 12

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2 percent, 12 and a half percent of 4. That
3 would be my guess. But I would -- really
4 you should do the test.
5 Q. So is permanent deformation
6 normally expressed as like a percentage of
7 your deflection?
8 MR. GINSBERG: Objection to
9 form.
10 A. In basic materials testing,
11 yes, that's the way that it is normally
12 done, as a percentage.
13 In these bending tests, what is
14 more common is you deflect it a certain
15 amount either in degrees and -- again,
16 this is the clinical simulation, so you
17 would deflect it the way that a clinician
18 might deflect it, and then you would
19 measure how stiff is it, what is the
20 maximum moment, how much does it recover,
21 and you might report that either in
22 degrees or in millimeters relative to how
23 much it was deflected. That's why the ISO
24 method defines, you know, how much to --
25 how much to deflect it.

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2 Q. So if you do a test where you
3 are deflecting 90 degrees instead of 45
4 degrees, would you expect the same
5 material to have the same percentage --
6 A. Yes.
7 Q. -- of recovery?
8 A. Yes.
9 Q. I want to make sure I answered
10 the question clearly -- that I asked the
11 question clearly.
12 A. Okay.
13 Q. If you put the sample in two
14 different bend testing, one was 45 degrees
15 and one was 90 degrees, you would expect
16 the same percentage of permanent
17 deformation?
18 A. Again, it is complex. It
19 depends upon many parameters. But as a
20 first estimate, yes.
21 Q. Well, what other parameters
22 does it depend on?
23 A. Dimensions of sample, what's
24 going on within the material. I mean,
25 just as you see the stiffness here, I'm

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2 not sure you could have predicted that
3 change in stiffness with those
4 temperatures. So you would just have to
5 see what it was.
6 If you would have asked me, I
7 would have said the same thing about the
8 stiffness. I'm not sure I can predict
9 that. That's why they do the test.
10 Q. And just so the record is
11 clear, when you said you couldn't predict
12 this, that you were pointing to Figure 6A?
13 A. Correct. I mean, I feel that
14 the reason they did the study is that he
15 didn't know what these results would have
16 been, so they did the annealing, or did
17 the heat treatment at 400 and 510 degrees
18 for 10 minutes and did the bend test and
19 looked at the results.
20 Q. Could you turn to page 720,
21 please.
22 A. Sure.
23 Q. I'm looking at the last
24 paragraph on the second column.
25 A. Okay.

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2 Q. Kuhn writes "Some suggestions."
3 Do you see that?
4 A. Yes.
5 Q. "Some suggestions could be
6 proposed to improve the lifetime of
7 endodontic files. These include applying
8 thermal treatments at approximately 400 C
9 (recovery) before machining to decrease
10 the work hardening of the alloy, choosing
11 machining conditions adapted to this NiTi
12 shape memory alloy, and electropolishing
13 by the manufacturer to reduce the
14 machining damage on the file surface."
15 Do you see that?
16 A. Yes.
17 Q. So Kuhn suggests applying a
18 thermal treatment before machining, right?
19 MR. GINSBERG: Objection to
20 form.
21 A. I was going to say even before
22 you asked your question, I'm not sure what
23 he means by "recovery" in parentheses.
24 Q. I'm not either. But would you
25 answer my question?

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2 A. Could you ask it again?
3 MS. BRENNER-LEIFER: Would you
4 please read back my question.
5 (The record was read.)
6 MR. GINSBERG: Are you asking
7 in the entire article or this paragraph?
8 Objection to form.
9 A. In this specific line, given
10 that I don't know what "recovery" means,
11 if we ignore "recovery," I would say it is
12 500 degrees before machining. But I don't
13 know what "recovery" means so that could
14 alter my answer, and that opinion is based
15 on reading that line.
16 MS. BRENNER-LEIFER: Our
17 videographer needs to change the tapes and
18 this is a good time to take a break.
19 THE VIDEOGRAPHER: This ends
20 tape number five. We are off the record
21 at 2:26.
22 (Recess taken.)
23 THE VIDEOGRAPHER: This begins
24 tape number six in the deposition of
25 Dr. Jon Goldberg. We are on the record at

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2 2:49.
3 BY MS. BRENNER-LEIFER:
4 Q. Could you go back to the Kuhn
5 reference, Goldberg 10.
6 A. I'm sorry, and what page?
7 Q. Goldberg Exhibit 10, page 718.
8 A. Yes.
9 Q. At the last paragraph on that
10 page, it talks about bending tests.
11 A. Uh-huh.
12 Q. Now, we don't know how they do
13 these bending tests, we only have very
14 limited information, right?
15 MR. GINSBERG: Objection to
16 form.
17 A. Right.
18 Q. So Dr. Kuhn says "At first, and
19 until 3 millimeters of strain, only the
20 tip of the instrument is bent. Then,
21 between 3 and 6 millimeters, the curvature
22 is in the middle of the file. Finally,
23 above 6 millimeters, the part that has the
24 maximum cross-sectional area near the
25 handle becomes deformed in turn."

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2 So do you understand Dr. Kuhn
3 to be saying as the file is being bent in
4 this machine, where in that file is the
5 curve happening?
6 A. Yes.
7 Q. And then the next paragraph he
8 says "As can be seen from the curves, the
9 samples deformed at room temperature
10 recover their original state, indicating
11 that the transformation temperature is
12 close to room temperature." Do you see
13 that?
14 A. Yes.
15 Q. How does that indicate that the
16 transformation temperature is close to
17 room temperature? Do you understand that?
18 A. No.
19 Q. And do you know what he means
20 by "the samples deformed at room
21 temperature recover their original state,"
22 do you know what he means by that?
23 A. Yes. It the going back to zero
24 but I'm not sure -- yeah, it looks like he
25 is referring to Figure 5. So if I look at

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2 Figure 5 and I see that.
3 Q. He doesn't refer to Figure 5.
4 A. Well, I was just trying to
5 figure out where he was looking and the
6 next closest reference is to Figure 5 and
7 he is saying --
8 Q. Well, let's go back --
9 MR. GINSBERG: He is not
10 finished with his answer. Were you
11 finished?
12 THE WITNESS: No.
13 A. What I am saying is I don't
14 know which data he is referring to there
15 so I was just trying to figure that out.
16 Q. Well, he doesn't refer to
17 Figure 5 in the first paragraph, right?
18 A. Correct.
19 Q. You understand he is referring
20 to all of the tests?
21 A. I don't know. It says bending
22 tests, so I was trying to figure out which
23 of the bending tests.
24 Q. So he could be referring to
25 Figures 5 and 6, right?

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2 MR. GINSBERG: Objection to
3 form.
4 A. I don't know. I mean, he makes
5 that general comment and I'm looking just
6 trying to figure out, but it's not clear.
7 Q. Thank you.
8 (Goldberg Exhibit 11 marked for
9 identification.)
10 Q. I'm going to ask you a few
11 questions about this patent, the McSpadden
12 patent. Before we do that, where did you
13 find all these prior art references?
14 A. Some I found, some were
15 provided by the attorneys.
16 Q. Which ones were provided by the
17 attorneys?
18 A. I don't exactly recall, quite
19 frankly, and there was a lot of
20 articles -- there was just a lot of
21 articles we were going through. So I know
22 some we didn't use, some they suggested
23 and we didn't use, some they suggested and
24 we did use, some I found, we used or may
25 not have used. So it is just hard for me

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2 to remember which ones. But I definitely
3 know that I identified some of the
4 articles.
5 Q. And how did you go about
6 finding articles?
7 A. So I was asked to give opinions
8 about the patents, the '773 and the '341,
9 so I did searches. I would typically use
10 either PubMed or SciFinder search engines
11 and put in key terms on the issues that I
12 was interested in studying.
13 Q. And what key terms?
14 A. Well, I don't remember exactly
15 which ones, but I would have used nickel
16 titanium or NiTi, something like that,
17 mechanical properties, heat treatment,
18 bending characteristics, endodontic
19 applications, orthodontic applications.
20 Some of this I just knew
21 because in our work with the beta titanium
22 alloys we typically compared to other
23 wires such as stainless steel and nickel
24 titaniums. So I was familiar with
25 Brantley, I know Bill Brantley and I know

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2 his lab. So I probably like just went on
3 and did a search for Brantley and looked
4 for which ones of his articles would have
5 been relevant.
6 Q. Could you spell Brantley?
7 A. B-r-a-n-t-l-e-y.
8 Q. And he is an expert in this
9 field?
10 MR. GINSBERG: Objection to the
11 form.
12 A. Yeah, he has a lot of
13 experience. He has done most of the
14 testing. Many of the articles that we
15 have here are from his lab.
16 Q. You consider him authoritative?
17 MR. GINSBERG: Objection to
18 form.
19 A. I think he has got to be
20 knowledgeable in this area, very
21 knowledgeable. He has done most of the
22 work.
23 Q. Is beta titanium superelastic?
24 A. No.
25 Q. It has orthodontic

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2 applications?
3 A. Yes.
4 Q. What do you use it for?
5 A. So in orthodontics there is two
6 broad classes of the device for the
7 braces. There is what is called the
8 attachment, so the brackets that gets
9 attached to the teeth.
10 Q. I remember.
11 A. You remember, okay, yeah, you
12 remember. So you may remember that you
13 went it once in a while and you said that
14 it hurt. What hurt was they were moving
15 an old wire or readjusting a wire and
16 putting in a new wire.
17 What the orthodontist is trying
18 to do is apply particular forces. So the
19 orthodontist, to do that, wants the wire
20 to, first of all, be a particular shape.
21 So they may bend it into a shape that they
22 want. And there is three standard wires
23 that are used, stainless steel, beta
24 titanium and nickel titanium. So it is
25 used to adjust -- to straighten teeth.

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2 Q. What are the advantages of beta
3 titanium?
4 A. Sure. So teeth move more
5 effectively if lower forces are applied.
6 The force that the device imparts is a
7 result of the geometry, such as its
8 cross-section, and the material
9 properties, particularly its modulus of
10 elasticity.
11 So in our work we identified
12 the need to have -- we knew lower forces
13 were desirable. We knew stainless steel
14 had a certain level of force. And we were
15 looking for material that could apply a
16 lower force.
17 I will just say, because I know
18 the story, others had attempted that but
19 were not commercially successful because
20 the difference, while statistically
21 improved, was not clinically significant.
22 So the beta titanium is clinically
23 significant in that it has a stiffness of
24 about half of what stainless steel is, so
25 that's what made it a success. And it is

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2 now one of the standard screen wires.
3 Q. What about alpha titanium, is
4 that superelastic?
5 A. I don't believe so.
6 Q. Is alpha titanium used in
7 orthodontic applications?
8 A. I don't believe so.
9 Q. Let's look at Exhibit 11 now,
10 which is U.S. Patent Publication Number
11 U.S. 2002/0137008. Inventor's name is
12 McSpadden. We can call this the McSpadden
13 patent. Is that okay?
14 A. I'm fine with that.
15 Q. Do you want to take a few
16 minutes to refresh your recollection about
17 this reference before I ask you questions?
18 A. Yes, thank you.
19 (Witness perusing document.)
20 A. Okay. I'm sorry for taking so
21 long, but the patents are a little more
22 involved. I have scanned through it, but
23 obviously it is complex, so I will wait
24 for your questions.
25 Q. I was just looking at the

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2 abstract of the patent which gives a
3 summary of what this patent is about. And
4 the abstract refers to a superelastic
5 alloy material selected to have a
6 relatively high loading plateau greater
7 than about 500 megapascal, is that what
8 that is?
9 A. Yes.
10 Q. What is a high loading plateau?
11 MR. GINSBERG: Objection to
12 form.
13 A. I'm not sure how they are using
14 it here. I would anticipate -- I'm not
15 sure how they are using it. In
16 orthodontic applications, that would be
17 like the plateau region of a superelastic
18 alloy when you are deflecting it.
19 Q. What does that mean?
20 A. So on the stress-strain curve
21 or the bending curve the material would
22 increase, and, again, this depends on the
23 test method and then there would be a
24 horizontal plateau region in the
25 stress-strain curve. That is what I --

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2 that is how it is used in orthodontics.
3 I haven't, you know, so I'm
4 anticipating what the use is here, but I
5 would have -- if you could point me to the
6 figures that they are getting this from,
7 but I assume that's what that means.
8 Q. Well, I can't point to a figure
9 that they are getting it from. I'm just
10 reading the abstract and asking you what
11 your understanding of high loading plateau
12 is. So that's it. You answered my
13 question.
14 At the end of the abstract they
15 say "The resulting file is also stiffer
16 than comparable files fabricated from
17 conventional NiTi alloys." And he seems
18 interested in having a high loading
19 plateau because it allows for the
20 formation of precision ground flutes in
21 cutting edges.
22 Do you see that on the
23 abstract?
24 A. Yes.
25 Q. And would you turn to the last

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 page of the patent, please. If you look
3 at the first claim, the claim is to an
4 endodontic instrument fabricated from an
5 alloy of nickel and titanium where the
6 nickel titanium alloy is selected to have
7 a loading plateau greater than about 500
8 megapascal.
9 Do you see that?
10 A. Yes.
11 Q. So that seems to be the point
12 of his patent; do you agree with me?
13 MR. GINSBERG: Objection to the
14 form of the question.
15 A. Well, that's the point of the
16 claim, but there is the whole
17 specification.
18 Q. Right. But that's what he is
19 interested in for his invention?
20 MR. GINSBERG: Objection to the
21 form of the question.
22 A. I mean, there is multiple
23 claims, so that's one point he is trying
24 to make, and that's what he is focused on
25 on the abstracts. He is looking at

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 manipulating the characteristics and these
3 are the ones that he has mentioned as
4 important to him.
5 Q. Machining and loading?
6 A. Correct.
7 Q. I'm sorry, the terms --
8 A. Correct. And he is changing --
9 if this is what I said it was, the plateau
10 region, so he is interested in
11 manipulating the stress-strain curve is
12 the way I would think about it.
13 Q. And do you understand why a
14 stiffer file would be machined better?
15 A. I didn't, until I just glanced
16 through this. Oh, why it would be
17 machined better? No. I would just assume
18 that a harder material can be more
19 accurately ground. I don't know. It just
20 kind of seems intuitive, not a
21 professional opinion.
22 (Goldberg Exhibit 12 marked for
23 identification.)
24 Q. Dr. Goldberg, we have just
25 handed you what has been marked as

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Goldberg Exhibit 11. It is the --
3 A. I'm sorry, mine is marked 12.
4 Q. Okay, 12, my apologies.
5 Exhibit 12 is a reference by a gentleman,
6 the last name K-h-i-e-r. Do you know how
7 to pronounce it?
8 A. I would pronounce it Khier, but
9 I'm not great at pronunciation.
10 Q. I was going to go with Khier
11 but then I thought you were going to
12 correct me. So let's go with Khier.
13 A. Okay.
14 Q. Do you want to take a minute to
15 review this reference before I ask you any
16 questions?
17 A. Yes, thank you.
18 (Witness perusing document.)
19 A. Okay, thank you, I appreciate
20 the time.
21 Q. Now, this Khier reference
22 pertains to orthodontic wires, right?
23 A. Correct.
24 Q. There is no reference to files,
25 correct?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Correct.
3 Q. And the orthodontic wires were
4 heated in air, right?
5 A. I don't know. If you can point
6 me to that description.
7 Q. I'm sure I can. Page 311,
8 column 2, last paragraph.
9 A. Yes. Actually, they were not
10 heated in air. They were heated in a
11 vacuum.
12 Q. Sealed and evacuated, is that
13 where you are getting that?
14 A. Yes.
15 Q. And if you look at column 1 on
16 page 311, they used an ADA cantilever test
17 for bend testing; is that right?
18 A. Yes.
19 Q. And they bent the specimens at
20 room temperature?
21 A. Yes.
22 Q. Which they define as 22 degrees
23 Celsius plus or minus 2 degrees Celsius?
24 A. Yes.
25 Q. Do you consider 22 degrees

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Celsius room temperature?
3 A. Well, as we've seen, there is a
4 range of temperatures that people consider
5 room temperature. So here they are
6 considering 22 degrees.
7 Q. You wouldn't disagree with
8 that, right?
9 A. Well, as I said, there is a
10 range. Dr. Sinclair uses 25. So it is at
11 least that range.
12 Q. Is there a set temperature for
13 an average dental office?
14 A. Gee, I don't know that. I
15 don't know the answer to that.
16 Q. So the bend testing was not
17 performed according to the ISO 3630-1,
18 right?
19 A. Actually, that version of the
20 ADA test is like the ISO test.
21 Q. Well, here they are bending to
22 80 degrees.
23 A. Yes, yes.
24 Q. First column under the
25 temperature.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Yes, correct.
3 Q. 80 degrees?
4 A. Uh-huh.
5 Q. So it is similar but it is not
6 the same?
7 A. The mechanics are the same.
8 You hold it at one end and deflect the
9 other. That's what I meant by the same.
10 So the span length will be different. The
11 amount of degrees would be different. But
12 it is -- the ISO test is a cantilever
13 test.
14 Q. So they are similar in that
15 they are cantilever tests?
16 A. Correct.
17 Q. But there are some differences?
18 A. Yes.
19 Q. Such as the degree of bend and
20 maybe some other particulars too?
21 A. Yes. I would have to
22 compare it. I'm just familiar with the
23 general loading parameters.
24 Q. Now, there are a lot of figures
25 in this reference. I'm going to give you

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 a pen because I think it might be helpful
3 to you. You don't have to use it, but I
4 found it helpful in my own analysis.
5 A. Okay.
6 Q. Maybe you won't need it. Do
7 you say it Nitinol or Nitinol?
8 A. Nitinol.
9 Q. Nitinol. That's what I
10 thought. Nitinol SE wires in Figure 1.
11 A. I'm sorry, Figure 1, okay.
12 Q. That's supposed to be a
13 superelastic wire, right?
14 A. Yes.
15 Q. And Figure 2 is the Sentinol
16 wires?
17 A. Yes.
18 Q. And those are also superelastic
19 wires?
20 A. Yes. I'm basing that on that's
21 how the authors characterized them. The
22 ones they are saying are superelastic are
23 Nitinol SE, Sentinol and NiTi.
24 Q. And the NiTi wires are in
25 Figure 3, right?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Yes.
3 Q. Now, we are looking at Figure 4
4 which is Nitinol wire, but not Nitinol
5 SE -- and they describe this as
6 non-superelastic wire, right?
7 A. Yes.
8 Q. And Figure 5 is Titanal wires?
9 A. Your guess is as good as mine
10 there.
11 Q. You mean the pronunciation?
12 A. The pronunciation, yes.
13 Q. And that's also described as a
14 non-superelastic wire, right?
15 A. Let me just look. Yes,
16 Nitinol, Titanal and the Orthonol alloys
17 are not superelastic, according to page
18 311.
19 Q. And Figure 6 shows the Orthonol
20 wires, right, and those are the --
21 A. Yes.
22 Q. -- non-superelastic?
23 And then Figure 7, 8 and 9 are
24 testing on the superelastic wires that are
25 heat-treated?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Yes.
3 Q. And Figures 10, 11 and 12 are
4 testing on Nitinol, Titanal and Orthonol
5 which are not superelastic and they are
6 heat-treated?
7 A. Correct.
8 Q. Now, would you look at Figure
9 1, please.
10 A. Okay.
11 Q. These are bending plots for
12 Nitinol wires of different diameter,
13 right?
14 A. Uh-huh.
15 Q. The 0.016 inch is the diameter
16 of the wire, right?
17 A. Yes.
18 Q. And in this plot that is the
19 plot with the circle, colored-in circle,
20 and that's the lowest plot on that --
21 A. Correct.
22 Q. -- bending plot, right?
23 Which, correct me if I'm wrong,
24 I'm trying to keep track of this stuff --
25 A. Okay.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. -- means that it's the most
3 flexible; is that right?
4 A. Can you repeat that question,
5 while I'm looking at this?
6 Q. Which means that it is the most
7 flexible, the wires that are tested here
8 in Figure 1, right?
9 A. These are orthodontic wires,
10 and in the orthodontic area we look
11 carefully at both the loading portion of
12 the curve and the unloading portion of the
13 curve.
14 And as far as stiffness, what
15 makes these superelastic -- and I'm not
16 trying to complicate things, but it is
17 complicated -- what makes them
18 superelastic is that plateau is difficult
19 to interpret flexibility. So some read it
20 as how low that plateau is, others read it
21 the slope of the plateau.
22 But to try to answer your
23 question, the 16,000s have the lowest
24 unloading plateau, and if I used unloading
25 plateau, which is what we would typically

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 use, I would say that that is the lowest
3 stiffness wire.
4 Q. Now, with the Kuhn reference,
5 we spent a lot of time looking at where
6 that lower -- the unloading plateau
7 intersected the X axis --
8 A. Yes, can I bring that out again
9 so I have that in front of me when you are
10 making that comment?
11 Q. Sure. I mostly wanted to
12 direct you to the unloading plateau for
13 the 0.016 inch wire in Figure 1 of Khier.
14 A. Yes.
15 Q. Now, that intersects
16 somewhere -- if you had to extrapolate
17 that line, you would agree it doesn't go
18 back to zero, right?
19 A. Correct.
20 Q. What number would you say it
21 goes back to?
22 A. I don't know, 17.
23 Q. Okay, I'm good with 17.
24 A. It starts, you know, maybe the
25 actual test got started at about 5.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Explain to me how the test can
3 start at 5.
4 A. Sure. Because it's sensitive
5 that they were using this ADA method with
6 torque meters, so those are handheld
7 instruments, and I can tell you from
8 experience, when you are beginning to take
9 those measurements, at least that initial
10 measurement when you are starting the
11 test, as you can see on here, it may not
12 all be 00. It is just that it is hard
13 manually to always line up the zero
14 bending moment with the zero angle.
15 That's why they are showing all
16 that variation around the axis. It is
17 just a result of this test, this manual
18 device. That is probably why they didn't
19 draw the initial lines all the way down to
20 00.
21 Q. Now, and when you are looking
22 at Figure 2 and Figure 3, it looks like
23 the 0.016 wire has the lowest curve for
24 those figures, too?
25 A. Correct.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. For the Sentinol wire, where
3 would you say that 0.016-inch wire
4 intersects on the Y -- I'm sorry, X axis
5 when it is unloaded?
6 A. When it is unloading, around 15
7 degrees.
8 Q. And for Figure 3, where would
9 you say the 0.016 inch NiTi superelastic
10 wire intersects the X axis on the
11 unloading curve?
12 A. 12 degrees.
13 Q. I think those are all excellent
14 estimates.
15 A. Thank you.
16 Q. Now, let's look at the Figure 4
17 and 5 for a second. These are the
18 non-superelastics and they are totally
19 different-shaped curves.
20 Can you explain why those
21 curves are so different for the
22 non-superelastic curves?
23 A. Yeah. First of all, I don't
24 know if I would use the term "totally."
25 I'm not 100 percent what that means. I

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 mean, because they have the same general
3 shape.
4 The difference I think you are
5 referring to is that the first three have
6 kind of -- the slope level is off, whereas
7 in these three it seems to be -- it is
8 continually increasing. The other
9 difference is at the unloading there is
10 more permanent deformation in these wires.
11 Q. Because they are not
12 superelastic, I guess?
13 MR. GINSBERG: Objection to the
14 form of the question.
15 A. Yeah --
16 MR. GINSBERG: Well, wait for a
17 question, Dr. Goldberg.
18 THE WITNESS: Okay.
19 Q. My question is, because they
20 are not superelastic?
21 A. Well, there could be other
22 reasons. Again, this is this issue of
23 structure versus the results. Even on the
24 superelastics, it looks like some of these
25 are showing permanent deformation. These

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 are showing more permanent deformation and
3 it is because these are not superelastic.
4 So the superelasticity, as he
5 has grouped the three, that would be the
6 difference. That is one of the
7 differences, the increased permanent
8 deformation and the non-superelastic.
9 Q. Now let's look at Figure 6, 7
10 and 8.
11 A. Okay.
12 Q. I'm sorry, 7, 8 and 9.
13 A. 7 --
14 Q. 7, 8 and 9 are the superelastic
15 wires that are heat-treated.
16 A. Heat-treated, right.
17 Q. So we just looked at the
18 non-heat-treated superelastic wires, and
19 we looked at specifically at the 0.016
20 inch wire.
21 A. Correct.
22 Q. Now, Figures 7, 8 and 9 are
23 those same wires and comparing them to --
24 comparing the heat treatments?
25 A. Correct.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Unfortunately, they don't show
3 the un-heat-treated in Figures 7, 8 and 9.
4 I just want to point that out to you.
5 In Figure 7 they have the
6 Nitinol SE superelastic wire and they have
7 two heat treatments at 500 degrees, either
8 10 minutes or 120 minutes, and then two
9 heat treatments at 600 degrees, either 10
10 or 120 minutes.
11 Are you following me?
12 A. Yes.
13 Q. Now, if you look at the first
14 curve, the 500 degree treatment for 10
15 minutes.
16 A. Okay.
17 Q. And you look at that unloading
18 curve, where would you estimate that
19 intersects that X axis?
20 A. 8 degrees.
21 Q. And what about the 500 at 120
22 minutes?
23 A. I would say 9 degrees.
24 Q. And what about the 600 for 10
25 minutes?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. 17 degrees.
3 Q. And what about the 600 for 120
4 minutes?
5 A. 30 degrees.
6 Q. Now, let's compare that with
7 Figure 1.
8 A. Figure 1, okay.
9 Q. Now, your estimate of where the
10 untreated Nitinol SE superelastic wire
11 intersected that X axis was 17 degrees,
12 right?
13 A. Correct.
14 Q. Which is the same number you
15 just gave me for the 600 degree at
16 10-minute treatment, right?
17 A. Right. But I would just
18 caution, as I mentioned, it is much -- it
19 is a little risky, in my opinion, taking
20 that unheated in Figure 1 and comparing it
21 over here.
22 I would almost always want to
23 see it on the same curve because -- I
24 would just make that caution.
25 Q. Because why?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Well, because it can't always
3 be assured that everything was the same.
4 I mean, the ones that are done on each
5 curve suggest to me, the way this would
6 typically be done, is these are all done
7 about the same time and they are showing
8 the relative pattern.
9 While it is the same method, I
10 can't be sure that I could pick that curve
11 up from this group and move it over to
12 this group. I mean, we could do that, but
13 I would just caution that it's not on the
14 same line.
15 Q. Right. Well, I mean, what they
16 are comparing in this plot for Figure 7
17 are four different heat treatments?
18 A. Correct.
19 Q. You would have to -- I mean,
20 they are not doing those all at the same
21 time in the same oven, there are different
22 temperatures and times, right?
23 A. Correct. What has been done
24 here is to demonstrate the effect of the
25 heat-treating. They are different

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 temperatures and different times and they
3 are showing you the trend and the results.
4 So you can see how those curves kind of
5 are following a pattern.
6 Q. And comparing it to Figure 1,
7 some of those heat-treated wires had less
8 permanent deformation than the untreated
9 wire, right?
10 MR. GINSBERG: Objection to
11 form, for the reasons stated.
12 A. That's what it appears. But
13 here is my caution, and I don't know this
14 to be the case, but remember I said there
15 was some uncertainty around that initial
16 region. And it looks like to me is they
17 have really made an attempt in Figure 7 to
18 have all the plots start at the same
19 point, and if we extrapolate those back,
20 it is going to be awfully close to 00.
21 So they are lining up those
22 plots to make that comparison. If I was
23 going to move the 1 from Figure 1 over, I
24 would do the same thing. I would move it
25 so that that initial point is around zero,

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 because that's clearly what they are doing
3 in Figure 7.
4 Q. So in Figure 1, do you see that
5 initial point to be around zero?
6 A. No. I think you asked me that
7 before and I said it was coming down at
8 about 5 degrees. I have a little mark on
9 here, so I think that's what you asked me.
10 Q. So if we shifted it 5
11 degrees --
12 A. To the left.
13 Q. -- then they would line up?
14 A. That's what I would do.
15 Q. So in Figure 1, if you shifted
16 all 5 degrees, then it would come down at
17 12 degrees, the lower one? You would
18 shift 17 to 12, right?
19 A. Correct.
20 Q. And then if you compared that
21 to Figure 7, you would still see that some
22 of these heated files had more permanent
23 deformation than the unheated files,
24 right?
25 MR. GINSBERG: Objection to

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form.
3 A. My conclusion there would be
4 that heat-treating definitely affects it.
5 The first couple, the ones that are 500
6 degrees, yes, that value is maybe 1 degree
7 backwards, but I would say it's really
8 similar to the control, but the pattern is
9 what is important, at 600 degrees clearly
10 we are seeing a shift towards the right.
11 So granted, if I made the
12 correction I'm suggesting, one of those
13 plots would be to the left of the origin
14 of the control by a degree --
15 Q. I just want to make sure this
16 is clear --
17 MR. GINSBERG: Please do not
18 interrupt the witness. He was answering
19 the question.
20 MS. BRENNER-LEIFER: I think he
21 answered it.
22 MR. GINSBERG: He was still
23 talking.
24 A. So I'm just trying to say that
25 two of those heat treatments, I would

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 really consider, you know, they are within
3 a degree of what the control would be.
4 But the 600 degrees clearly is to the
5 right.
6 Q. Okay. Well, when we went
7 through Figure 7, you gave me those X
8 intersection points as 8, 9, 17 and 20.
9 A. 30.
10 Q. Yeah, 30. And you just told me
11 that if we shifted Figure 1 5 degrees, it
12 would be 12. So it is more than 1 degree,
13 isn't it?
14 A. Correct. So let me see here.
15 What were the values I gave you?
16 Q. When we went through Figure 7,
17 you told me 8, 9, 17 and 30.
18 A. Correct, okay. So we are
19 shifting everything I said, what, 5
20 degrees?
21 Q. Right. The number you gave me
22 for Figure 1 was 17 degrees --
23 A. Right, so we are saying 12.
24 Q. And then you suggested we shift
25 it --

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. So it is 12.
3 Q. -- 5 degrees.
4 MR. GINSBERG: Objection to the
5 form of the question. Please let her
6 finish asking before you give your answer.
7 Q. So even shifting, as you
8 suggested, and comparing that shifted plot
9 where the untreated would hit at 12, both
10 of the 500 degree heat treatments would be
11 to the left of 12, one at 8, which is 4
12 degrees difference, and one at 9, which is
13 3 degrees difference, right?
14 MR. GINSBERG: Objection to the
15 form of the question. You can answer.
16 A. Yes. You are subtracting, if
17 I'm following you, 8 from 12 and 9 from
18 12.
19 Q. So even making your
20 adjustments, the heat-treated wires at 500
21 degrees showed less permanent deformation
22 than the untreated, right?
23 MR. GINSBERG: Objection to the
24 form of the question.
25 A. Yes. By this plot, the 8 and 9

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 is less than 12.
3 MS. BRENNER-LEIFER: We need to
4 change the tape. So we will take a
5 five-minute break.
6 THE VIDEOGRAPHER: This ends
7 tape number 6. We are off the record at
8 3:44.
9 (Recess taken.)
10 THE VIDEOGRAPHER: This begins
11 tape number seven in the deposition of
12 Dr. Jon Goldberg. We are on the record at
13 3:56.
14 BY MS. BRENNER-LEIFER:
15 Q. I have a couple of more figures
16 in this Khier reference I want to go
17 through. It is similar to what we did
18 with Figures 1 and 7. I want to look at
19 Figures 8 and 9 and compare them to 2 and
20 3.
21 A. 8 and 9, okay.
22 Q. It is on page 314.
23 A. Okay.
24 Q. So let's do our estimate of
25 where those unloading lines intersect the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 X axis, starting from --
3 A. I'm sorry, which figure are you
4 on? 8?
5 Q. Let's start with 8.
6 A. Okay.
7 Q. So there is the 500 at 10
8 minutes, which is the one with the bigger
9 dashed line.
10 A. I'm having a little trouble
11 finding it. Okay. I think I have it.
12 Q. Do you want to give me an
13 estimate where that --
14 A. The unloading curve?
15 Q. Uh-huh.
16 A. 11 degrees.
17 Q. Okay. And what about the 500
18 for 120 minutes?
19 A. I would say the same.
20 Q. Okay. And what about for the
21 600 at 10 minutes?
22 A. I would say 19.
23 Q. Okay. And what about the 600
24 for 120 minutes?
25 A. I don't know, 32.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Okay. Now, let's compare that
3 to Figure 2 where you gave me unloading, X
4 intercept at 12 degrees. That's what my
5 notes show.
6 A. Okay.
7 Q. Do you feel the need to make
8 any adjustment to that zero point?
9 A. Maybe 2 degrees.
10 Q. Which way?
11 A. To the left.
12 Q. So you want 12 to become 10?
13 A. Yes.
14 Q. Okay. So we are going to make
15 the untreated 10 for points of comparison.
16 A. Okay.
17 Q. So the 500 degree heated wires
18 at 10 and 120 minutes were -- you gave me
19 11 for both of those.
20 A. Yes.
21 Q. So would you agree that within
22 the error in estimation we are doing here,
23 that those are not -- it is hard to call
24 those different?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form of the question.
3 A. Again, I mean, those two values
4 are close. We don't have a measure of
5 standard deviation here. We have just
6 been going saying not statistically, just
7 what is the values.
8 So if that's the pattern,
9 whatever I said over here -- what did I
10 say, 10 -- one is 10, the other are 11.
11 We haven't been talking about error.
12 Q. Right. So do you want to say
13 that's not -- we don't see a significant
14 difference there?
15 MR. GINSBERG: Objection to the
16 form of the question, comparing two
17 graphs.
18 A. So let me just say, again, we
19 haven't been doing that. If you are
20 asking me to give an opinion about, you
21 know, when you say statistical, I hate to
22 get picky, but I teach the statistics, so
23 are you talking about a practical
24 difference or if it is a statistical
25 difference based on a number of samples?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. I didn't ask you statistical.
3 A. Oh, okay.
4 Q. I didn't say that.
5 A. Fine. So then I would say they
6 are different.
7 Q. You would say they are
8 different?
9 A. Yes.
10 Q. Okay. And how would you
11 consider them different?
12 MR. GINSBERG: Objection to the
13 form of the question.
14 A. What we have been doing up to
15 this point is just looking at whatever the
16 values were and commenting if one number
17 was higher or lower than the other. There
18 have been no discussion of error. It is
19 just based on these values, what are they.
20 And so I'm just looking now.
21 This number, I'm sorry, I have to keep
22 going back, was 10. So 11 is greater. I
23 mean, clearly 30 is even greater, or 19,
24 whatever numbers we had.
25 Q. Okay.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. So you are -- okay.
3 Q. Okay. So at 500 degrees heat
4 treatment, we see maybe a slight increase
5 in permanent deformation in that wire?
6 MR. GINSBERG: Objection to the
7 form of the question.
8 A. We see an increase of 1 degree.
9 Q. Okay, 1 degree. But it could
10 be a little bit different because we
11 already made a 2 degree adjustment in your
12 10?
13 A. Correct.
14 MR. GINSBERG: Objection to the
15 form of the question.
16 A. Yeah.
17 Q. And if we hadn't made that
18 adjustment, then it would have been
19 comparing 11 to 12?
20 A. It would have been comparing
21 the uncorrected value to a corrected
22 value.
23 Q. So if we do this estimated
24 correction, then the heat treatment showed
25 a 1 degree increase in permanent

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 deformation, and if we -- do you agree
3 with that?
4 A. Yes.
5 Q. And if we don't do the
6 correction, then the 500 degree treated
7 wire showed actually a 1 degree less in
8 permanent deformation?
9 MR. GINSBERG: Objection to
10 form.
11 A. Yes.
12 Q. And if you do the 600 degree
13 treatments at 10 and 120 minutes, you see
14 a more clear increase in permanent
15 deformation; would you agree with that?
16 A. I would say we are seeing a
17 larger difference.
18 Q. A larger difference, okay.
19 Now, let's look at Figure 9 and
20 go through the same process.
21 For the 500 degree treatment --
22 A. I'm sorry, for Figure 9, and it
23 is the NiTi we are doing now?
24 Q. Right.
25 A. 3 and 9?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Right.
3 A. Okay.
4 Q. So if we look at the 500
5 degrees Celsius for 10-minute treatment --
6 A. If I could just interrupt,
7 because I have the drawing here, can you
8 tell me what I gave as the value in Figure
9 3?
10 Q. Yeah. I think you gave 12.
11 A. It looks like it is almost 10
12 in my drawing.
13 Q. I have two numbers here. So we
14 will go with 10.
15 A. Okay.
16 Q. So we will give 10.
17 A. Okay.
18 Q. So let's look at Figure 9 now.
19 What is your estimate for the X intercept
20 for the 500 degrees Celsius, 10-minute
21 treatment?
22 A. Just doing what I have been
23 doing, following the pattern, I would say
24 10.
25 Q. And what about the 500 degrees

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Celsius for 120 minutes?
3 A. 13.
4 Q. What about 600 degrees Celsius
5 for 10 minutes?
6 A. 21.
7 Q. And what about 600 for 120
8 minutes?
9 A. 36.
10 Q. Now, when I look at Figure 3 --
11 oh, I know what -- actually, I think I
12 know my problem for a figure, why I had
13 two numbers here. So you just gave me the
14 number 10 for Figure 3.
15 A. Well, you gave me that number.
16 Q. Right. Well, I thought you had
17 told me before 12 and then you told me
18 that you want to make it more like 10.
19 A. Okay.
20 MR. GINSBERG: Objection to the
21 form.
22 Q. Now, do you think you need to
23 correct that -- make a correction for that
24 number?
25 A. No.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. I mean, for Figure 3, to
3 compare it to Figure 9.
4 A. Oh, a correction? Let me take
5 a look.
6 (Witness perusing document.)
7 A. No.
8 Q. So comparing that number 10
9 untreated to the -- which is the same as
10 the heat treatment at 500 degrees for 10
11 minutes.
12 MR. GINSBERG: Objection to the
13 form of the question.
14 A. I'm sorry, but the number I
15 wrote down -- let's see, correct, I'm
16 sorry, 10.
17 Q. Okay.
18 A. I'm sorry, you're right.
19 Q. Okay.
20 A. No, time out. Hold on one
21 second. I apologize, I was misreading.
22 I'm fine with 10.
23 Q. Okay. The reason why I was
24 confused is that my earlier notes, you
25 said for Figure 2, when we were looking at

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Figure 2 before, the first time you told
3 me 15, and then we had a conversation
4 about adjusting the number for Figure 2,
5 but I myself was looking at Figure 3.
6 So you told me 2 degrees, so I
7 adjusted from 12 to 10 because that's what
8 I was thinking. But when you said 2
9 degrees, were you thinking of adjusting
10 Figure 2 from 15, 2 degrees, to 13?
11 MR. JESIC: Objection to form.
12 A. I would just say the only notes
13 I have here are -- numbers I have are 10
14 and 12. I just don't recall.
15 Q. For Figure 2?
16 A. For Figure 2, yes.
17 Q. Okay. Well, why don't you look
18 at that Y intercept -- I mean the X
19 intercept again for the 0.016 inches for
20 Figure 2.
21 A. Okay.
22 Q. And what is the number you
23 estimate that for?
24 A. I have 12 written here. Maybe
25 it is more like 13.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And then you told me you wanted
3 to adjust it?
4 A. Right, 2 degrees.
5 Q. 2 degrees. So it would be 11?
6 A. 11.
7 Q. Okay. Which is the numbers
8 that you gave me for the 500 degree heat
9 treatments in Figure 8?
10 A. Correct.
11 Q. While you were making these
12 adjustments and then looking at Figures 7,
13 8 and 9, you made adjustments to this Y
14 axis based on where you thought it should
15 hit the zero at the Y intercept for the
16 top curve, right?
17 MR. GINSBERG: Objection to
18 form.
19 A. At the 00 --
20 Q. For the loading curve?
21 A. For the loading curve.
22 Q. Now, when you look at Figure 7,
23 for the loading curve, when you draw those
24 curves, would they intercept at 00?
25 A. It looks like it to me, because

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 of the shape of the curve.
3 Q. Okay. So we don't need to make
4 an adjustment to Figure 7 based on where
5 that loading curve would intercept.
6 A. Correct.
7 Q. What about Figure 8?
8 A. I would say those should be
9 shifted to the right, maybe, let's see,
10 that's 10, 2 or 3 degrees.
11 Q. And what about Figure 9?
12 A. Figure 9, I would say 4 degrees
13 to the right.
14 Q. This is getting very
15 complicated.
16 MR. GINSBERG: No question.
17 You don't have to answer.
18 Q. All the shifting is getting
19 very complicated and confusing.
20 MR. GINSBERG: Wait for a
21 question, Dr. Goldberg.
22 Q. Let me see if we can get it
23 straight, because we have done this a few
24 times now.
25 If we shift Figure 8 numbers 2

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2 to 3 degrees to the right, or I guess
3 bigger, right?
4 A. Right.
5 Q. So your 11's become 13's or
6 14's?
7 A. Uh-huh.
8 Q. The 19 becomes 21 or 22. And
9 your 32 becomes 34. And similarly, if we
10 shift your numbers in Figure 9, your 10
11 becomes 14?
12 A. Uh-huh.
13 Q. Your 13 becomes a 17. Your 21
14 becomes a 25. And your 36 becomes a 40.
15 Right? Are you with me?
16 A. I'm sorry, what's the question?
17 Q. Are you with me?
18 A. I'm not 100 percent sure,
19 because I've got an awfully marked-up page
20 here.
21 Q. Okay. I think you are
22 following me, though.
23 MR. GINSBERG: Objection to the
24 form.
25 Q. I think we are on the same

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 page, but I just want to make sure.
3 So going back to Figure 8, we
4 said we were comparing the Figure 2 we
5 shifted to 13 and we are comparing -- but
6 then we are shifting the other one to 13
7 too. So it comes out the same.
8 A. No.
9 Q. We shifted them the same way,
10 didn't we?
11 A. No.
12 Q. Okay. Which way did we shift
13 it?
14 A. In Figure 2 we shifted it to
15 the left 2 degrees. So it went from 12 or
16 13 down to 10 or 11.
17 Q. Okay. So we are comparing 11
18 for the untreated to 13 or 14 for the 500
19 at 10 degrees Celsius and the same number
20 for 500 degrees at 120 minutes.
21 So the 500 degrees treatment,
22 according to all of our estimations and
23 adjustments, would show a small increase
24 in permanent deformation?
25 MR. GINSBERG: Objection to the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 form of the question.
3 A. Well, if my numbers are the
4 same that you are looking at, we are going
5 from a 10 to an 11, so there is a 1 degree
6 increase for the 500 degree C, 10 minutes.
7 Q. Okay. And a larger increase
8 for the 600 degree treatments?
9 A. Yes.
10 Q. And for Figure 9 we see -- what
11 would you say the degree increase in
12 permanent deformation is for the 500
13 degree, 10-minute treatment as compared to
14 the untreated?
15 A. Okay, so give me a second. I
16 would say that's an increase from 10 to
17 14.
18 Q. So for both the Sentinol and
19 the NiTi wires we see a 1 to 2 degree
20 increase in permanent deformation if we do
21 a 500 degree heat treatment for 10
22 minutes, right?
23 A. Yes.
24 Q. But then when we look at the
25 Nitinol SE superelastic wire, we see -- we

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 still see, with all our adjustments and
3 estimates, a decrease in permanent
4 deformation for the 500 degree, 10-minute
5 heat treatment, right?
6 A. I don't have what the
7 adjustment from Figure 1, I don't think
8 we've done that.
9 Q. I thought we did a 5 degree
10 adjustment for Figure 1. That was the
11 first adjustment we did.
12 A. Okay. So let me just -- so
13 therefore --
14 Q. We adjusted it from 17 to 12.
15 A. To 12, okay, I'm sorry. 17
16 down to 12, okay. Okay, thank you.
17 Q. So just to make sure that my
18 question and answer was clear, that when
19 we see the heat treatment at 500 degrees
20 for the Nitinol SE wire, we see a decrease
21 in permanent deformation from about 12
22 degrees to 8 degrees for the 10-minute
23 treatment and 9 degrees for the 120-minute
24 treatment?
25 A. Yes. If we do this process of

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 carrying that curve to the other curves,
3 correct.
4 Q. So trying to put all this stuff
5 together, maybe we can make some
6 conclusions.
7 A. Okay.
8 Q. First, the permanent -- effect
9 of heat treatment on permanent deformation
10 depends on the kind of wire, even if it is
11 a superelastic wire, right?
12 A. Uh-huh.
13 Q. We saw that for the three
14 different wires?
15 A. Yeah.
16 Q. It depends on the temperature?
17 A. Yes.
18 Q. And it depends on how long you
19 heat-treat it, right?
20 A. I'm sorry, so the question?
21 Q. How long you treat it -- how
22 long you heat-treat it?
23 A. Affects the change in the
24 permanent deformation? I'm sorry, if you
25 could just put it in the form of a

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 question to me.
3 Q. I thought I had, but I will
4 restate it.
5 A. Okay.
6 Q. The effect of heat treatment on
7 permanent deformation for superelastic
8 wires depends on, what I see, three
9 things, one, the type of wire; do you
10 agree?
11 A. Yes.
12 Q. Two, the temperature you
13 heat-treat, right?
14 A. Yes.
15 Q. You agree with that?
16 A. Yes.
17 Q. And, three, the length of time
18 of the heat treatment?
19 A. Yes.
20 Q. And for at least the nitinol
21 wire, the heat treatment actually
22 decreases the permanent deformation that's
23 seen?
24 MR. GINSBERG: Objection to the
25 form of the question.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Yeah, the 500 degree does.
3 (Goldberg Exhibit 13 marked for
4 identification.)
5 Q. Dr. Goldberg, I have given you
6 what has been marked as Goldberg Exhibit
7 13, which is the Walak patent.
8 Do you want to take a minute to
9 look this over before I ask you questions?
10 A. Yes, thank you again.
11 (Witness perusing document.)
12 A. Okay, again, I appreciate the
13 time.
14 Q. Dr. Goldberg, this patent
15 relates to heart stents and catheter
16 guidewires, right?
17 A. Well, they are described as
18 medical devices, and those are two of the
19 examples they give.
20 Q. Do they describe any dental
21 applications in this patent?
22 A. I don't believe so.
23 Q. And the ISO 3630-1 testing
24 method pertains specifically to endodontic
25 files, right?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Correct. I'm sorry, I wasn't
3 listening to that, I apologize, because it
4 just caught my eye, under Other U.S.
5 Documents, is Sagaye, which is another
6 document that we used, and I don't recall
7 what applications were in that one.
8 MS. BRENNER-LEIFER: Could you
9 read back my question, please.
10 (The record was read.)
11 A. Yes.
12 Q. And because the Walak patent
13 pertains to stents and guidewires, there
14 is no bend testing according to the ISO
15 3630-1 method, right?
16 A. For stents? I'm sorry, I
17 wasn't sure what you were asking.
18 Q. And because the Walak patent
19 pertains to stents and guidewires, the
20 Walak patent doesn't describe any bend
21 testing according to the ISO 3630-1
22 method, right?
23 A. I'm going to answer that the
24 Walak doesn't refer to the ISO bend test
25 method.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And in the Walak patent, Walak
3 is interested in selectively using heat
4 treatment to affect a portion of the
5 stent's properties, right?
6 A. Yes.
7 MR. GINSBERG: Objection to the
8 form of the question.
9 (Goldberg Exhibit 14 marked for
10 identification.)
11 Q. Dr. Goldberg, I have handed you
12 Goldberg Exhibit 14, which is the Sagaye
13 patent, S-a-g-a-y-e -- well, I'm not quite
14 sure how you pronounce it, because my
15 colleague just pointed out there is two
16 spellings on here. It is either
17 S-a-g-a-y-e or S-a-g-a-e.
18 In any case, can we call it the
19 Sagaye patent?
20 A. That is fine with me.
21 Q. Do you want to take a minute to
22 look this over before I ask you questions?
23 A. Yes, sure, thank you.
24 (Witness perusing document.)
25 A. Okay, thank you.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Ready?
3 A. Yes.
4 Q. The Sagaye patent also pertains
5 to catheter guidewires, correct?
6 A. Yes.
7 Q. And it also doesn't have any
8 dental applications described, correct?
9 A. That's correct.
10 Q. And Sagaye also treats just a
11 portion of the guidewire, correct?
12 A. Correct.
13 Q. And Sagaye didn't test the
14 guidewires according to the ISO 3630-1
15 method, correct?
16 A. Correct.
17 (Goldberg Exhibit 15 marked for
18 identification.)
19 Q. Dr. Goldberg, we have marked as
20 Exhibit 15 the Gil reference entitled
21 "Relevant Aspects in the Clinical
22 Applications of NiTi Shape Memory Alloys."
23 Do you want to take a minute to
24 look this over?
25 A. Yes, thank you.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 (Witness perusing document.)
3 A. Okay, thank you.
4 Q. Does Gil discuss endodontic
5 files?
6 A. No.
7 Q. Does he discuss permanent
8 deformation of endo files?
9 A. No.
10 (Goldberg Exhibit 16 marked for
11 identification.)
12 Q. Dr. Goldberg, we have handed
13 you what has been marked as Exhibit 16,
14 which is the Schafer reference.
15 Could you take a minute to look
16 over this reference before I ask you
17 questions.
18 A. Yes.
19 (Witness perusing document.)
20 A. Okay, I think I'm ready.
21 Q. The Schafer reference is
22 directed to stainless steel endodontic
23 instruments, right?
24 A. Yes.
25 Q. It doesn't discuss nickel

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 titanium endodontic instruments?
3 A. No.
4 Q. And the Schafer reference also
5 doesn't discuss heat-treating nickel
6 titanium, right?
7 A. Correct.
8 (Goldberg Exhibit 17 marked for
9 identification.)
10 Q. I will hand you what has been
11 marked as Goldberg Exhibit 17. This is
12 the Tepel reference.
13 Do you want to take a minute to
14 look at this before I ask you questions?
15 A. Sure.
16 (Witness perusing document.)
17 A. Okay.
18 Q. Is the Tepel article comparing
19 properties of stainless steel endodontic
20 instruments to nickel titanium endodontic
21 instruments?
22 A. Yes.
23 Q. Does he express a preference
24 for stainless steel endodontic
25 instruments?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. I have to read more carefully,
3 but just looking at -- let me read the
4 abstract again.
5 (Witness perusing document.)
6 A. You know, based on the last
7 couple of sentences, I think he is saying,
8 you know, the different ones have
9 different parameters and you have to
10 consider all of them. I'm not sure I see
11 where he is expressing a preference for
12 stainless steel.
13 Q. Let's go to -- before we get to
14 this comparison, Tepel doesn't describe
15 any heat treatments for superelastic
16 nickel titanium files, does he?
17 A. Well, the first paragraph has
18 that Walia reference where they do talk
19 about heat-treating.
20 Q. I'm sorry, the first what?
21 A. So the first paragraph has the
22 reference 6, which is the Walia reference.
23 Q. The first paragraph?
24 A. Yes, the first paragraph in
25 Tepel has several references in giving

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 background material, and reference 6 is
3 the Walia reference, which is where they
4 do talk about potential heat-treating of
5 nickel titanium endodontic instruments.
6 So he is providing the
7 background, and just, you know, I'm
8 looking at the references as I'm reading,
9 and so he is referring readers to that
10 reference.
11 Q. Well, specifically he says "to
12 minimize undesirable changes of the curved
13 root canal, different root canal
14 instruments with a greater flexibility
15 have been developed during recent years."
16 And he cites to Walia for that
17 proposition, right?
18 A. Correct.
19 Q. But Tepel himself does not
20 discuss heat-treating endodontic
21 instruments, correct?
22 A. No, not in this article.
23 Q. Could you turn to page 144,
24 please.
25 Under the Discussion, he first

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 discusses resistance to bending. Do you
3 see that, the first two paragraphs --
4 A. Uh-huh.
5 Q. -- relate to resistance to
6 bending?
7 A. Uh-huh.
8 Q. And in the second paragraph, he
9 says "flexible stainless steel
10 instruments, especially those with a
11 modified non-cutting tip, performed better
12 than nickel titanium or titanium aluminum
13 instruments."
14 Do you see that?
15 A. Yes.
16 MR. GINSBERG: Objection to the
17 form, to the extent that you are not
18 reading the entire paragraph.
19 A. Well, I see that sentence.
20 Q. And then he says "resistance to
21 bending allows conclusions about whether
22 an instrument will follow the curved root
23 canal."
24 Do you see that?
25 A. Yes.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And then he says "this
3 parameter allows no prediction on whether
4 undesirable changes to the curved root
5 canal will appear."
6 Do you see that?
7 A. Yes.
8 Q. And then he concludes,
9 "therefore, resistance to bending has only
10 a limited clinical impact and this
11 parameter alone is non-appropriate
12 selection criteria for root canal
13 treatments."
14 Do you see that?
15 A. Yes.
16 MR. GINSBERG: It is
17 mischaracterizing the document. It
18 doesn't say that.
19 Q. "Root canal instruments." Do
20 you see that?
21 A. Yes, I see that.
22 Q. So he doesn't think that
23 resistance to bending is an appropriate
24 selection criterion for root canal
25 instruments?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Well, he is saying alone it is
3 not, and I would just comment that there
4 is considerable other literature that
5 suggests that that is important that there
6 be high flexibility.
7 MS. BRENNER-LEIFER: We need to
8 change the tape, so we will take a
9 five-minute break.
10 THE VIDEOGRAPHER: This ends
11 tape number seven. We are off the record
12 at 4:56.
13 (Recess taken.)
14 THE VIDEOGRAPHER: This begins
15 tape number eight in the deposition of
16 Dr. Jon Goldberg. We are on the record at
17 5:06.
18 BY MS. BRENNER-LEIFER:
19 Q. Dr. Goldberg, getting back to
20 the Tepel reference, on page 144, the next
21 parameter that Tepel discusses is
22 resistance to fracture.
23 A. Okay.
24 Q. And he says "except for the
25 nickel titanium instruments, visible

67 (Pages 262 - 265)

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 non-elastic deformation occurred before
3 fracture, which leads to an obvious
4 unwinding of the twisted instruments."
5 Do you understand what he is
6 talking about?
7 A. Can I read from the beginning
8 of that paragraph, please?
9 Q. Sure.
10 (Witness perusing document.)
11 A. Okay.
12 Q. Could you explain what he is
13 talking about, "visible non-elastic
14 deformation occurred before fracture,
15 which leads to an obvious unwinding of the
16 twisted instruments"?"
17 MR. GINSBERG: Objection to the
18 form of the question.
19 A. Well, it looks to me like what
20 they are doing is evaluating this property
21 of whether the files fail, and, if they
22 fail within the root canal, that would be
23 a serious problem.
24 So what he is saying here is
25 that all of the files other than the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 nickel titanium exhibited this --
3 exhibited deformation, permanent --
4 actually, non-elastic is permanent
5 deformation before they fractured.
6 And then I guess once they
7 fractured, the instrument which is being
8 twisted, untwisted. And that happened for
9 all of them except the nickel titanium.
10 Q. What does it mean when you say
11 the instrument is untwisted?
12 A. So in clinical application you
13 use either a hand or rotary instrument,
14 and what you do is rotate the file and
15 then that removes the root canal material.
16 So I believe what they are
17 referring to here is the possibility that
18 as you are doing that, it could fracture,
19 and they are saying that all the wires
20 except nickel titanium showed visible
21 permanent deformation when that happened.
22 In other words, they were
23 twisting and twisting, one end, say, the
24 tip would get caught, and it would break,
25 and so it would untwist because it is no

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 longer connected to the hand that is doing
3 the twisting up here. And that happened
4 for all the files except the nickel
5 titanium files.
6 Q. In the next paragraph, he says
7 "Moreover," do you see that sentence?
8 A. One second. Okay, down towards
9 the end of the paragraph?
10 Q. Right.
11 A. Uh-huh.
12 Q. He says "flexible stainless
13 steel instruments with modified
14 non-cutting tips caused less undesirable
15 changes of the curved root canal shape due
16 to instrumentation. Therefore, from a
17 clinical point of view, flexible stainless
18 steel instruments offer two major
19 advantages."
20 Do you understand that to be an
21 advantage?
22 MR. GINSBERG: Objection to the
23 form of the question.
24 A. Not completely. If you don't
25 mind, if I could just read that paragraph

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 and think about that for a second.
3 Q. Yeah, please.
4 (Witness perusing document.)
5 A. I'm sorry, I really can't give
6 you an opinion here because I'm not sure
7 what modified non-cutting tips are. I'm
8 just really unable to follow the logic
9 through the paragraph.
10 Q. Okay. Would you turn the page
11 to 145.
12 A. Yes.
13 Q. In the concluding paragraph
14 here in the first column, he says "When
15 the four parameters investigated in the
16 current and the previous studies (13 and
17 18), namely, resistance to bending,
18 resistance to fracture, cutting
19 efficiency, and instrumentation of curved
20 canals are evaluated with regard to their
21 usefulness for the clinician, the
22 conclusions can be drawn that resistance
23 to bending is the least relevant parameter
24 during clinical usage. Compared to this,
25 resistance to fracture has a greater

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 clinical importance, which, however, is
3 qualified by the fact that for the
4 instruments tested in this study,
5 fractures should not be a complication if
6 the instruments are used correctly.
7 Hence, in our opinion, the most important
8 parameters are cutting efficiency and
9 instrumentation of curved canals. These
10 two parameters allow the evaluation of
11 root canal instruments from a clinical
12 perspective, and therefore can serve as a
13 useful complement to the already existing
14 international standards."
15 Do you agree with his
16 conclusion in that paragraph?
17 MR. GINSBERG: Objection to the
18 form.
19 A. I would characterize this -- so
20 here is how I would say this in lay terms,
21 that as with many things, there is many
22 parameters to consider. He is looking at
23 all these together and saying you've got
24 to consider all of them, and he is giving
25 more weight to some than to the others,

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2 and the factors that he is coming up with
3 that he thinks are more important, these
4 two parameters, meaning I guess cutting
5 efficiency and instrumentation of curved
6 canals, he thinks are important and is
7 suggesting that they be considered for
8 inclusion in the international standards.
9 Q. And what are the international
10 standards?
11 A. Well, I assume standards like
12 ISO 3635.
13 I will just add, I'm looking
14 underneath, and the reference beneath it
15 is ISO 3630, so he must be referring to
16 that standard and he is arguing that these
17 test methods should be included.
18 Q. Back on 144, in the second
19 paragraph.
20 A. 144, which column?
21 Q. Second column, first full
22 paragraph, Differences.
23 A. Okay.
24 Q. And the next sentence that
25 begins "In previous investigations."

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Yep.
3 Q. He says "flexible stainless
4 steel instruments displayed higher cutting
5 efficiencies than conventional stainless
6 steel K files and reamers, especially
7 higher than nickel titanium and titanium
8 aluminum instruments."
9 Do you see that?
10 A. Yes.
11 Q. So he says from a cutting
12 efficiency standpoint, he thinks the
13 flexible stainless steel instruments are
14 better than the nickel titanium
15 instruments, right?
16 A. Well, he is saying they are
17 more efficient. I'm not sure what that
18 means. Maybe it means cutting better.
19 (Goldberg Exhibit 18 marked for
20 identification.)
21 Q. Dr. Goldberg, we have marked as
22 Goldberg 18 a chapter from a book entitled
23 Endodontic Therapy, by Franklin S. Weine.
24 It is the Sixth Edition. And I have
25 handed you Chapter 5.

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2 Do you want to take a minute
3 and look over this reference?
4 (Witness perusing document.)
5 A. I have paged through, but just
6 to be fair in my characterization, to be
7 reasonable, I'm not reading this, I'm just
8 paging through to just take a look at the
9 pages. It is 70 pages here.
10 Q. Dr. Goldberg, you cited
11 portions of this reference in your expert
12 report?
13 A. Yes.
14 Q. Specifically you cited pages
15 183, 184 and 209.
16 A. Okay.
17 Q. Is this a reference that you
18 found or your counsel found?
19 A. I don't recall. I think it was
20 the counsel.
21 Q. Did they provide you with the
22 whole chapter?
23 A. I'm sorry?
24 Q. Have you seen this whole
25 chapter before or just the portions that

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2 are cited here?
3 A. I have seen the whole chapter.
4 Q. You have seen the whole
5 chapter?
6 A. Yes.
7 Q. And why did you not provide the
8 whole chapter with your expert report?
9 A. Well, I provided the sections
10 that I thought were relevant. But if I
11 could see my expert report, that might
12 help me answer.
13 Q. You have the expert report.
14 MR. GINSBERG: Objection. He
15 has his expert report without the
16 exhibits. It is an incomplete report.
17 Q. I told you which ones are
18 cited, which ones were provided as
19 exhibits to your expert report.
20 A. Okay.
21 (Witness perusing document.)
22 MR. GINSBERG: Can I just have
23 the question back. I just lost it.
24 (The record was read.)
25 (Witness perusing document.)

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Okay, thank you.
3 Q. Can you answer the question
4 now?
5 A. Yes. I provided the pages that
6 I was referring to. I didn't know I was
7 supposed to send in the chapter or the
8 whole book. I mean, it is actually all
9 from a very large book.
10 Q. Yeah, true. Would you turn to
11 page 183, please.
12 A. Okay, I'm on 183.
13 Q. There is a section called
14 Precurving of Files.
15 A. Uh-huh.
16 Q. And in the second column on
17 that page, the second to last full
18 paragraph says "it is best to enter canals
19 only with files that have been
20 precurved" --
21 A. I'm sorry, I'm not quite with
22 you here.
23 Q. "For these reasons."
24 A. Page 183, second column?
25 Q. The paragraph beginning "For

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 these reasons."
3 A. Gotcha, okay.
4 Q. -- "it is best to enter canals
5 only with files that have been precurved."
6 Do you see that?
7 A. Yes.
8 Q. And then it describes methods
9 of precurving at the bottom of that page.
10 "One is placing an extremely
11 sharp curve near the tip of the
12 instrument. This is used when the
13 preoperative radiograph discloses a sharp
14 apical dilaceration or when an obstruction
15 is encountered" and describes how to
16 estimate the degree of curvature, and then
17 it says "The other precurve is gradual for
18 the entire length of the flutes and is to
19 be used in all other cases."
20 Do you see that at the end of
21 the paragraph?
22 A. Yes.
23 Q. And then at the bottom column,
24 it says "The curving may be imparted by
25 drawing the instrument across a metal

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 ruler, cotton pliers, or other sterile
3 instrument," right?
4 A. Yes.
5 Q. It doesn't describe
6 pre-heat-treating the file so that it
7 is -- so that it can be bent, does it?
8 A. Not in this section.
9 Q. And then the section says that
10 you have to resterilize the instrument
11 after you -- after you curve it, before
12 you use the instrument, right?
13 A. Yes.
14 Q. How are dental instruments
15 sterilized before they are used?
16 A. Different ways. Heat is one.
17 Ethylene oxide is another. I think it
18 depends on the specialty. Probably each
19 specialty has methods that are just more
20 appropriate for how they work.
21 Q. Is ethylene oxide a solution?
22 A. I think it is a solution. I'm
23 not sure.
24 Q. And when you say by heat, do
25 you mean in an autoclave or a small oven?

70 (Pages 274 - 277)

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2 A. I would say in an autoclave
3 would be most appropriate.
4 Q. And how long does that take?
5 A. I'm not sure.
6 Q. Could you turn to page 211,
7 please. Do you see the heading that says
8 Disadvantages of Flexible Files?
9 A. Yes.
10 Q. And in this section, the Weine
11 reference says that there are certain
12 disadvantages to flexible files; is that
13 correct?
14 A. Yes.
15 Q. And in the second column, the
16 Weine reference says that "The flexible
17 file systems, while being excellent for
18 maintaining curves, are very poor in
19 penetrating to the tip of these channels."
20 A. I'm sorry, I'm not --
21 Q. I'm sorry --
22 A. I got you. It is in the middle
23 of the paragraph. I'm sorry. Go ahead.
24 Q. I will restart.
25 The Weine reference says "The

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2 flexible file systems, while being
3 excellent for maintaining curves, are very
4 poor in penetrating to the tip of these
5 channels often lined by sclerotic dentin
6 deposits that make the walls very
7 irregular."
8 A. I'm sorry, I was at the
9 middle -- let's start again. But if you
10 could just tell me where you are starting
11 from.
12 Q. Sure. I'm in the second
13 column, the first big paragraph. I will
14 just start from the beginning.
15 "Three different functions must
16 be performed by instruments for treating
17 curved canals, and a single file system
18 rarely performs all of these. They are
19 (1) penetration, the ability to gain
20 access to the tip of a narrow canal; (2)
21 need for flaring and early flaring; and
22 (3) maintaining the shape of the curve.
23 The flexible file systems, while being
24 excellent for maintaining curves, are very
25 poor in penetrating to the tip of these

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 channels often lined by sclerotic dentin
3 deposits that make the walls very
4 irregular."
5 Do you agree with that
6 statement?
7 MR. GINSBERG: Objection to the
8 form.
9 A. This is really more of a
10 clinical. I understand what it is, but
11 this almost looks like a clinical opinion.
12 So I just don't have enough
13 experience actually -- I mean, I have
14 never actually done it. So I don't know
15 if I can give you an opinion there. I
16 understand what they are saying. They are
17 saying you need different types of
18 instruments to achieve the different
19 functions. So that makes sense to me.
20 Q. And he is saying that the
21 flexible files are very poor in
22 penetrating to the tip of these channels,
23 right?
24 A. Yes.
25 Q. And then he says "When flexible

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2 files were used in an attempt to traverse
3 such canals, many would buckle, just like
4 a wet noodle, particularly when the small
5 sizes, (nos. 08 and 10) were used."
6 Do you see that?
7 A. Yes.
8 Q. So he does -- he says that the
9 flexible files are very poor in
10 penetrating to the tip of the channels
11 because they buckle?
12 A. Yes.
13 Q. And then he says "Clearly for
14 this function" -- i.e., penetration --
15 "the older, unmodified tipped instruments
16 are superior," right?
17 MR. GINSBERG: Objection,
18 misreading the sentence.
19 A. No.
20 Q. Let me start again.
21 "Clearly, for this function,
22 the older, unmodified tipped instruments
23 are superior."
24 Do you see that?
25 A. Yes, I see that.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. And when he is saying "for this
3 function," he is referring to penetration,
4 right?
5 A. Yes.
6 Q. So he is stating an opinion
7 that the older, unmodified tipped
8 instruments are superior to the flexible
9 files for the function of penetrating?
10 A. Yes.
11 MS. BRENNER-LEIFER: It might
12 be useful to take a three-minute break
13 just so I can see if I have any other
14 questions.
15 MR. GINSBERG: Okay. I think
16 we have about seven minutes left.
17 MS. BRENNER-LEIFER: Okay.
18 THE VIDEOGRAPHER: We are off
19 the record at 5:36.
20 (Recess taken.)
21 THE VIDEOGRAPHER: We are back
22 on the record at 5:41.
23 MS. BRENNER-LEIFER: Counsel,
24 do you still maintain your position that
25 this deposition transcript needs to be

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 designated highly confidential? Because I
3 did not ask him about the confidential
4 document that was marked as an exhibit.
5 MR. GINSBERG: I do maintain
6 that. I will have to review the
7 transcript. I don't recall offhand. I
8 believe manufacturing parameters were
9 disclosed, but I will have to look at it.
10 And certainly there is confidential
11 exhibits that were introduced.
12 MS. BRENNER-LEIFER: Well,
13 aside from one exhibit, there is only one
14 exhibit that was confidential.
15 MR. GINSBERG: We will review
16 the transcript.
17 MS. BRENNER-LEIFER: Okay. I
18 have no further questions for you,
19 Dr. Goldberg. Thank you very much.
20 THE WITNESS: Thank you very
21 much.
22 MR. GINSBERG: I just have a
23 few questions for you, Dr. Goldberg.
24 EXAMINATION BY MR. GINSBERG:
25 Q. Can you take a look at Goldberg

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2 Exhibit 16, please. I think that was the
3 Schafer reference.
4 I believe Ms. Brenner-Leifer
5 asked you whether the Schafer article
6 discusses nickel titanium endodontic
7 files. Do you recall that?
8 A. Yes.
9 Q. Can I refer you to the first
10 page of this document and the second
11 column.
12 A. Okay.
13 Q. You see the sentence that
14 begins, in the first full paragraph, "This
15 increasing flexibility is achieved either
16 by different design features of the
17 instruments or by the use of nickel
18 titanium alloys." Do you see that?
19 A. Yes.
20 Q. Does this refresh your
21 recollection as to whether or not the
22 Schafer article discloses nickel titanium
23 endodontic instruments?
24 MS. BRENNER-LEIFER: Objection,
25 leading.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. Yes.
3 Q. And how does it refresh your
4 recollection?
5 A. Well, I can see right in the
6 introduction they are describing nickel
7 titanium alloys.
8 Q. Thank you.
9 Can we turn to Goldberg Exhibit
10 3, that's your supplemental expert report.
11 I would like to direct your attention to
12 paragraph 7.
13 Is paragraph 7 your definition
14 of what you believe a person of ordinary
15 skill in the art is?
16 A. Yes.
17 Q. Is the definition of person of
18 ordinary skill in the art that's disclosed
19 in paragraph 7 of Goldberg Exhibit 3 the
20 definition you had in mind when you
21 prepared your expert report dated
22 September 11th, 2014?
23 MS. BRENNER-LEIFER: Objection,
24 leading.
25 A. Yes.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 Q. Can we turn to Goldberg Exhibit
3 10. That's the Kuhn reference.
4 A. Okay.
5 Q. I believe Ms. Brenner-Leifer
6 spent some time on the first page, page
7 716, and specifically the sentence in the
8 second column, it is the second full
9 paragraph, that says "The aim of this work
10 is to show fatigue characteristics of
11 superelastic NiTi."
12 Do you see that?
13 A. No. The second full paragraph?
14 Q. Yeah, full paragraph.
15 A. Oh, the second. I see it, yes.
16 Q. Do you see that?
17 A. Yes.
18 Q. Does the Kuhn article describe
19 disclosing a superelastic nickel titanium
20 file?
21 MS. BRENNER-LEIFER: Objection,
22 leading.
23 A. Yes.
24 Q. Does the Kuhn article disclose
25 subjecting such file to heat treatment

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2 which results in permanent deformation?
3 MS. BRENNER-LEIFER: Objection,
4 leading.
5 A. Yes.
6 Q. Could you take a look at
7 paragraph 718.
8 A. I'm sorry, you mean page 718?
9 Q. I do mean page 718. Thank you,
10 Dr. Goldberg. And I would like to direct
11 your attention to the paragraphs under
12 Bending Tests.
13 A. Yes.
14 Q. Do you recall
15 Ms. Brenner-Leifer asked you some
16 questions about the second paragraph that
17 begins "As can be seen from the curves,
18 the samples deformed at room temperature
19 recovered their original state"; do you
20 see that?
21 A. Yes.
22 Q. Now, in Figure 6A, did the
23 curves disclosed recover their original
24 state?
25 A. The heat-treated ones do not.

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 The unused ones do.
3 MS. BRENNER-LEIFER: Objection,
4 leading.
5 Q. Now, in that paragraph, when it
6 says, going back to the paragraph under
7 Bending Test, "As can be seen from the
8 curves, the samples deformed at room
9 temperature recovered their original
10 state."
11 I could refer you to paragraph
12 5 -- I'm sorry, to Figure 5.
13 A. Figure 5, okay.
14 Q. Do those curves recover their
15 original state?
16 MS. BRENNER-LEIFER: Objection,
17 leading.
18 A. Yes.
19 Q. Does that review inform your
20 understanding of what that paragraph under
21 the Bending Test heading refers to when it
22 talks about the samples deformed at room
23 temperature recover their original state?
24 A. Yes, I believe it refers to
25 Figure 5.

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2 Q. Thank you.
3 Could we take a look at
4 Goldberg Exhibit 11, which I believe is
5 the McSpadden reference. Can I direct
6 your attention to paragraph 52.
7 A. Okay.
8 Q. And specifically I want to
9 direct your attention to the last sentence
10 of that paragraph that begins, and I will
11 just read it to you, "If desired, the
12 formed endodontic file (i.e., subsequent
13 to machining) may be further heat-treated
14 and/or annealed in order to achieve the
15 desired degree of superelasticity or other
16 material properties and/or to set a
17 desired file shape (straight, precurved or
18 pretwisted)."
19 Do you see that?
20 A. Yes.
21 Q. How would heat-treating a
22 superelastic NiTi file allow you to set a
23 desired file shape?
24 MS. BRENNER-LEIFER: Objection,
25 beyond the scope of direct. Objection,

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2 leading.
3 Q. You can answer.
4 A. It would allow the file to more
5 easily permanently deform, and that's what
6 you need to be able to bend and put in a
7 shape.
8 (Goldberg Exhibit 19 marked for
9 identification.)
10 Q. Dr. Goldberg, let me hand you
11 what has been marked Goldberg Exhibit 19.
12 Do you recall you were asked
13 some questions about Figure 6A of the Kuhn
14 article, which is Goldberg Exhibit 10?
15 A. Yes.
16 Q. And I believe when
17 Ms. Brenner-Leifer asked you where the
18 profile file that was heat-treated at 400
19 degrees, something to the effect that
20 showed permanent deformation, I believe
21 you mentioned at the 1.5 millimeter mark?
22 MS. BRENNER-LEIFER: Objection
23 to form.
24 A. Yes.
25 Q. Looking at the blown-up

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2 picture, does that help you identify where
3 it hits the X axis?
4 A. Yeah. It is actually 1.8.
5 MR. GINSBERG: I have no
6 further questions.
7 EXAMINATION BY MS. BRENNER-LEIFER:
8 Q. Dr. Goldberg, looking at
9 Exhibit 19, in that bottom curve for the
10 400 degree heat treatment, do you see how
11 that line extends to the left of 1.8 and
12 there is a longer line going from 1.6,
13 there is a point, there is a line from 1.4
14 to 1.2, there is another point indicating
15 part of the line at 1 and there is another
16 line extending all the way down to 0.6 and
17 there is another residual point at 0.3?
18 MR. GINSBERG: Objection to
19 the --
20 Q. Do you see that?
21 A. Yes.
22 Q. That is all part of the same
23 line, right?
24 A. Yes.
25 Q. And they all are approaching

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2 zero, right?
3 A. No. They approach zero at 1.8.
4 When you do this test, you are looking at
5 the force and the deflection, and this
6 would be in any of these sort of tests, it
7 gets down to zero, you might stop the test
8 there or you might continue it even though
9 it is zero.
10 So I would interpret all those
11 little bumps that you are seeing is that
12 it is at zero, but they are just
13 continuing to make readings along the way.
14 Q. But the millimeter --
15 MR. GINSBERG: Please let the
16 witness finish answering before you
17 interrupt him.
18 MS. BRENNER-LEIFER: He
19 answered me.
20 MR. GINSBERG: He was
21 continuing his answer.
22 A. The relevant point is where it
23 hits zero, and that's at 1.8 in this
24 blowup. So they are continuing to collect
25 data. It is different millimeters, 1.6,

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2 1.4, 1.2, but it is all at zero.
3 Q. Right. When it's deflected at
4 1 millimeter, you are just releasing the
5 force, right?
6 A. You are releasing the force
7 from 8 millimeters.
8 Q. Right. And it is continuing to
9 deflect lower than 1.8 millimeters, right?
10 That line is showing that it is deflecting
11 to below 1.8 millimeters, right? It is
12 recovering its shape below 1.8
13 millimeters?
14 A. No, the test is continuing, but
15 there is zero force, meaning it is
16 deformed.
17 Q. No. The force here on the X
18 axis --
19 A. Is zero.
20 Q. No. I'm looking at the X axis,
21 X, that's the bottom.
22 A. Right, that's not force.
23 That's millimeters.
24 Q. I know. That's the degree of
25 deformation, right?

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2 A. Correct.
3 Q. And that deformation is going
4 to continue going down, right?
5 A. It has reached zero at 1.8 and
6 it stays zero all the --
7 Q. It is zero --
8 A. Zero --
9 Q. Zero Newtons?
10 A. Zero Newtons, correct.
11 Q. When there is no force applied?
12 A. Right. That means it is
13 permanently bent at that point.
14 Q. There is no force applied
15 anymore?
16 A. Right, because it is bent.
17 Q. And then the number is at 1.8
18 millimeters and then it is continued to be
19 undeflected, right? That's why the line
20 continues down lower?
21 A. No.
22 Q. That doesn't make any sense,
23 that it continues down lower.
24 MR. GINSBERG: You are now
25 being argumentative, and I would ask you

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 to rephrase your question. I object to
3 the form.
4 Q. Can you explain that to me,
5 please?
6 A. I would be glad to.
7 So when you are doing these
8 tests, it can be either driven by force or
9 driven by the deflection.
10 So what's happening here -- if
11 I can use, you know, my finger -- they
12 deflected 8 and then they keep on bringing
13 it back. At 1.8 there is zero force,
14 meaning this is not pushing, meaning it's
15 still out here, but they continued the
16 test. So the values then become 1.60
17 Newtons, 1.40 Newtons.
18 Q. Right. As --
19 MR. GINSBERG: Please don't
20 interrupt the witness as he is answering.
21 A. As the tests continue. But it
22 is not the sample pushing against it. It
23 is that you keep on running the test.
24 Q. Right. So the wire continues
25 to unbend?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. No.
3 Q. You just did this (indicating).
4 A. No.
5 Q. We just saw your finger do this
6 (indicating). That's the --
7 MR. GINSBERG: You are now
8 being argumentative. You don't like the
9 answers that you are getting and you are
10 trying to trip up the witness. We are
11 going to play this in court.
12 MS. BRENNER-LEIFER: Your
13 objection is form.
14 MR. GINSBERG: I object to form
15 and this is an inappropriate line of
16 questioning.
17 MS. BRENNER-LEIFER: I am
18 allowed to ask questions following up.
19 MR. GINSBERG: Not the way you
20 are asking it.
21 A. I can say it again. The wire
22 is bent to 8 and it keeps on coming back.
23 But I'm now moving the dials on the
24 machine and I'm reading -- I'm driving
25 this by the number of degrees -- the

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 millimeters deflection.
3 At 1.8, I'm at 1.8, but there
4 is zero force, meaning the wire is not
5 pushing. I keep on moving the instrument,
6 1.4, 1.6, it stays there because the wire
7 is now in this permanently deformed
8 position. It can't push anymore. It is
9 just that I'm running this test down to
10 00.
11 Q. And isn't that wire continuing
12 to move?
13 A. No. It is permanently deformed
14 at 1.8.
15 Q. Then why are there marks below
16 1.8?
17 A. Because those are showing that
18 there was no force -- they keep on
19 monitoring back, turning back the
20 millimeters, 1.6, 1.4, and they are
21 recording zero, zero, zero, zero, zero,
22 meaning no force, meaning the wire is not
23 pushing anymore.
24 Q. But the wire is in that
25 position, right?

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 A. It is in this permanently bent
3 position at 1.8. It stays there.
4 Q. There is a mark, aren't they
5 not taking a measurement at 1.4?
6 A. They are, sure. Let's take
7 1.4.
8 Q. They are taking a measurement
9 at 1.4?
10 A. Right.
11 Q. And that means --
12 A. It means there is zero force.
13 Q. And 1.4 means the wire is 1.4
14 millimeters deflected?
15 A. No, the wire stays back here.
16 Q. Then I don't understand what
17 that measurement is of.
18 A. Well --
19 MR. GINSBERG: The witness
20 just --
21 MS. BRENNER-LEIFER: You know
22 what, I'm asking questions. You don't
23 like my questions, that's too bad. You
24 opened the box and showed him this, and
25 I'm entitled to ask the questions. I will

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1 GOLDBERG - HIGHLY CONFIDENTIAL
2 get to the answer -- I will continue to
3 ask my questions until I understand it to
4 my satisfaction.
5 Q. Now, these are fair questions.
6 Dr. Goldberg, explain to me how
7 you can get a point measured at 1.4
8 millimeters deflection when you are saying
9 there is not 1.4 millimeters deflection.
10 MR. GINSBERG: Objection to
11 form. Asked and answered.
12 A. Let me try to explain, if I
13 can, again. So I'm controlling the
14 deflection on the machine with the device.
15 Q. I understand, you are
16 controlling the force that pushes the
17 wire.
18 A. No.
19 MR. GINSBERG: Stop
20 interrupting the witness.
21 A. I'm controlling the deflection
22 and I'm reading whatever force is there.
23 So I turn it up to 8 and I measure the
24 force in Newtons. I keep on turning it
25 down, down, down, and I see the number

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2 going lower and lower and lower because
3 the wire is pushing against what was
4 holding it back and deflected it in the
5 first place.
6 At 1.8 it is zero. So I'm
7 holding it at 1.8 and there is zero force.
8 What that means is the next increment that
9 I take, there is zero force because the
10 sample has stopped recovering. It stopped
11 recovering. So I may run this machine all
12 the way down to zero and take readings at
13 1.4, 0.8, 0.5, 0.3, but the force is zero
14 because the wire is not pushing on it
15 anymore. It stays in the position that it
16 was at 1.8.
17 Q. Okay. I don't understand how
18 it can stay in position 1.8 when you just
19 told me it was moved to 1.4.
20 A. No, the wire wasn't, the
21 instrument was.
22 Q. Wasn't the instrument moving it
23 to 1.4?
24 A. No, it can't anymore because
25 the wire is now bent. It bent -- going up

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2 it makes a lot of sense, yes, you are
3 pushing it up. So here you are pushing
4 the wire up. Now I'm controlling with my
5 left hand the instrument coming down. It
6 is coming down, coming down, coming down.
7 The wire is bent at this point.
8 I keep on bringing the
9 instrument back, and I can read 1.4, 1.6,
10 1.8, and it is always zero, zero, zero,
11 because there is no force anymore, because
12 the wire is no longer against the animal.
13 MS. BRENNER-LEIFER: You know,
14 I can tell that you like his answers
15 because you are nodding, but you are not
16 testifying right now.
17 MR. GINSBERG: The witness is
18 looking at you. I'm not even saying
19 anything.
20 MS. BRENNER-LEIFER: I know.
21 You are nodding to approve of his
22 testimony, and I think that's wonderful
23 for you, but it is inappropriate in a
24 deposition to nod your head when the
25 witness is testifying to indicate that you

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1 GOLDBERG - HIGHLY CONFIDENTIAL
 2 like his answers.
 3 MR. GINSBERG: Look, I
 4 understand you don't like the answers here
 5 and you are very upset, but you should try
 6 to calm down and ask questions.
 7 MS. BRENNER-LEIFER: You know,
 8 I'm not too upset. What I'm upset about
 9 is your inappropriate conduct during the
 10 deposition, because you know you are not
 11 supposed to be nodding your head when the
 12 witness says the right answer and shaking
 13 your head when you don't like the answer
 14 or you don't like the question. That is
 15 inappropriate.
 16 MR. GINSBERG: Your conduct
 17 throughout today --
 18 MS. BRENNER-LEIFER: And I
 19 really wish we had a camera on you,
 20 because you would be thrown out.
 21 MR. GINSBERG: Your conduct
 22 today, you know, even in breaks, in
 23 speaking -- I don't need to put that on
 24 the record. All I could say is --
 25 MS. BRENNER-LEIFER: No, you

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1 GOLDBERG - HIGHLY CONFIDENTIAL
 2 don't need to put anything on the record,
 3 because there is not a person in this room
 4 who hasn't seen your head bobble all day.
 5 MR. GINSBERG: That is
 6 absolutely false.
 7 MS. BRENNER-LEIFER: It is
 8 bobbling right now.
 9 I'm done with my questions.
 10 Thank you.
 11 THE WITNESS: Thank you.
 12 THE VIDEOGRAPHER: This
 13 concludes today's proceedings. Total
 14 number of tapes used was eight. We are
 15 off the record at 6:02 p.m.
 16 (Time Noted: 6:02 p.m.)
 17
 18 _____
 A. JON GOLDBERG, Ph.D.
 19
 20 _____
 Subscribed and sworn to
 21 before me this _____
 day of _____, 2014.
 22
 23 _____
 Notary Public
 24
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CERTIFICATION

I, TODD DeSIMONE, a Notary Public for and within the State of New York, do hereby certify:
That the witness whose testimony as herein set forth, was duly sworn by me; and that the within transcript is a true record of the testimony given by said witness.
I further certify that I am not related to any of the parties to this action by blood or marriage, and that I am in no way interested in the outcome of this matter.
IN WITNESS WHEREOF, I have hereunto set my hand this 2nd day of October, 2014.

TODD DESIMONE

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ERRATA SHEET
VERITEXT/NEW YORK REPORTING, LLC

CASE NAME: DENTSPLY v. US ENDODONTICS
DATE OF DEPOSITION: 9/30/14
WITNESS' NAME: A. JON GOLDBERG, Ph.D.

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A. JON GOLDBERG, Ph.D.
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OF , 2014.
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