

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOTOROLA MOBILITY, LLC,

Petitioner,

IPR2022-01022

U.S. Patent No. 8,514,499

v.

LARGAN PRECISION CO., LTD.,

Patent Owner.

Deposition Upon Oral Examination:

Julie L. Bentley, PhD

Location: Regus Business Center
75 South Clinton Avenue, Suite 510
Rochester, New York 14604

Date: May 18, 2023

Time: 8:30 a.m.

Reported By: MARY ELIZABETH PHILLIPS
Alliance Court Reporting, Inc.
109 South Union Street, Suite 400
Rochester, New York 14607

A P P E A R A N C E S

Appearing on Behalf of Petitioner:

Andrew M. Mason, Esq.

Klarquist Sparkman, LLP

One World Trade Center, Suite 1600

121 S.W. Salmon Street

Portland, Oregon 97204

andrew.mason@klarquist.com

Also Present:

Frank Morton-Park, Patent Agent

Klarquist Sparkman, LLP

Appearing on Behalf of Patent Owner:

R. Parrish Freeman, Esq.

Maschoff Brennan, PLLC

1389 Center Drive, Suite 300

Park City, Utah 84098

pfreeman@mabr.com

* * *

JULIE L. BENTLEY, PHD - BY MR. MASON

THURSDAY, MAY 18, 2023;

(Proceedings in the above-titled matter
commencing at 8:47 a.m.)

* * *

JULIE L. BENTLEY, PHD,

called herein as a witness, first being sworn,
testified as follows:

EXAMINATION BY MR. MASON:

Q. Good morning, Dr. Bentley.

A. Good morning.

Q. Could I have you please state your name
and address for the record?

A. Sure. Julie Bentley, 5 Center Court Lane,
Penfield, New York.

Q. And what is your current occupation?

A. I am a full-time professor at the
University of Rochester. I also have my own
consulting company. So two jobs.

Q. Okay. Great. And are you the sole person
working at your consulting company?

A. It is a sole proprietorship. Yes, it's
just me.

Q. Okay. Great. Have you been deposed
before?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. I have.

3 Q. Do you know roughly how many times?

4 A. Eight, nine, ten, somewhere in there.

5 Q. Okay. And when was the most recent time
6 you were deposed?

7 A. Last August maybe.

8 Q. Okay. So sometime within the last year?

9 A. Yes.

10 Q. Okay. Great. And do you feel you
11 understand the deposition process?

12 A. I do.

13 Q. Okay. Great. Do you agree to testify
14 truthfully today?

15 A. I do.

16 Q. And do you agree to testify accurately
17 today?

18 A. I do.

19 Q. Okay. And is there anything that would
20 impair or impede your ability to testify truthfully
21 and accurately today?

22 A. No.

23 Q. Great. And do you understand that the
24 rules of the Patent Trial and Appeal Board forbid you
25 from talking to Largan counsel about the substance of

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 your testimony when we are on break today?

3 A. Yes.

4 Q. And do you agree to follow those rules?

5 A. I do.

6 (The following exhibit was marked at a previous
7 deposition: Number EXH 2001.)

8 Q. Great. I'll hand you -- you've probably
9 seen this before. That's exhibit -- what's been

10 marked as Exhibit 2001 in this matter. Is

11 Exhibit 2001 that I just handed to you your original
12 declaration in this matter?

13 A. Yes, this is my declaration.

14 Q. Okay. And am I correct that you submitted
15 two declarations in this matter?

16 A. Yes, there's this one and then there's a
17 supplemental.

18 Q. Perfect. Great. And did you -- can I
19 have you turn to I believe it's page 68 where your
20 signature is at the end? Your CV is there but before
21 the CV.

22 A. Yes.

23 Q. Okay. And is that your signature there on
24 page 68?

25 A. That's my electronic COVID signature that

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 I've been using for everything, yes.

3 Q. Okay. Great. And did you read this
4 declaration, Exhibit 2001, carefully before signing
5 it?

6 A. I did.

7 Q. Okay. And did you review that again in
8 preparing for this deposition?

9 A. I did.

10 Q. Okay. Are there any errors in the
11 declaration?

12 A. I did not see any.

13 Q. Okay. Great. And today can we refer to
14 Exhibit 2001 as your original declaration?

15 A. Sure.

16 (The following exhibit was marked at a previous
17 deposition: Number EXH 2036.)

18 Q. Okay. Great.

19 I'm also going to hand you, just so that
20 we've -- you've got it -- you can set 2001 aside. And
21 send you or hand you -- excuse me -- what's been
22 marked as Exhibit 2036. Is that your supplemental
23 declaration in this matter, Exhibit 2036?

24 A. It is.

25 Q. And on that last page of Exhibit 2036 is

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 that your signature?

3 A. It is.

4 Q. All right. And did you read or can we
5 refer to -- strike that.

6 Can we refer to Exhibit 2036 as your
7 supplemental declaration today?

8 A. Yes.

9 Q. Great. Did you read your supplemental
10 declaration carefully before signing it?

11 A. I did.

12 Q. And did you review it again before
13 preparing for this deposition?

14 A. I did.

15 Q. And are you aware of any errors in your
16 supplemental declaration?

17 A. I am not aware of any errors in this
18 supplemental.

19 Q. Okay. How did you prepare for today's
20 deposition?

21 MR. FREEMAN: Objection. I'll caution the
22 witness not to disclose the substance of any
23 attorney-client communication. Subject to that
24 admonition, the witness may answer.

25 A. I talked to counsel for a couple hours. I

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 took a look at my reports, just refreshed my memory.

3 It's been a while.

4 Q. Okay. All right. And do you know roughly
5 how long you spent preparing for today's deposition?

6 A. Again, I talked to counsel for a couple
7 hours, reviewed the reports for a few hours.

8 Q. Anything else on top of that?

9 A. No.

10 Q. Okay. Did you talk to anybody other than
11 Mr. Freeman here in preparation for your deposition?

12 A. I did not.

13 Q. Okay. Did you meet with any -- or strike
14 that.

15 Did you talk to anyone at Largan in
16 preparation for your deposition?

17 A. I did not.

18 Q. Okay. Could I just have you turn to
19 paragraph 28 of Exhibit 2001, your original
20 declaration?

21 A. 28?

22 Q. Yup. In paragraph 28 of your original
23 declaration, you provide a definition of a POSITA. Or
24 strike that.

25 In paragraph 28 of your original

JULIE L. BENTLEY, PHD - BY MR. MASON

declaration do you provide a definition of a person of
ordinary skill in the art?

A. I do.

Q. Okay. And are you familiar with the
shorthand of "POSITA" for person of ordinary skill in
the art?

A. I am. You can use POSITA.

Q. Okay. Great. Have you worked with
POSITAs at any point in your career?

A. So I train POSITAs. So my job at the
university is I teach optical design. So I've been
doing that for 25, 30 years now. So yes, I work with
them all the time.

Q. Okay. Great. So would an example then of
a POSITA be someone who has recently graduated from
your program? Is that fair to say?

A. That is fair to say. So they would have
had three, four, sometimes five years of experience.

Q. Okay. And by "experience" do you mean
experience actually designing lenses or are you
talking about -- yeah, what do you mean by
"experience" in that answer?

A. Experience in optical design, so designing
lenses, tolerancing lenses.

JULIE L. BENTLEY, PHD - BY MR. MASON

Q. Okay. And -- okay. And for this 499 patent that's in dispute here, do you understand that the first U.S. patent application was filed in 2012?

A. I don't remember dates off the top of my head. I'm sorry.

Q. Okay. That's fine. I'll represent to you that the first U.S. application was filed in 2012.

Do you understand that Largan also alleges priority to a 2011 Taiwanese patent application for the 499 patent?

MR. FREEMAN: Objection, scope.

A. Again, I don't remember dates off the top of my head, so...

Q. Okay. Do I understand correctly that you provide your definition of a POSITA for the year of 2011?

A. What do you mean by that?

Q. Is your definition of a POSITA at the time frame of September 2011? If I could invite you to paragraphs 27 and 28, that might help you recall.

A. Yes, I believe that this definition is valid now or in 2011, so...

Q. Okay. Okay. Yeah. And would the definition of a POSITA have changed materially in 2012

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 at the time of the first U.S. application?

3 A. I don't think it would. I don't see any
4 reason why it would.

5 Q. Okay. And your CV is attached there as
6 Exhibit A to the original declaration, so I guess that
7 would probably be right after page 68. Okay. And
8 does your CV begin on page A-1 of that original
9 declaration?

10 A. It does.

11 Q. Okay. And so I think you already
12 mentioned this, but am I correct that you've taught
13 courses at University of Rochester since 1998?

14 A. Yeah, I started as an adjunct in 1998
15 teaching part-time while I was working full-time.

16 Q. Okay.

17 A. So like I said, I've always had two jobs.
18 I just -- when my daughter was eight, I switched from
19 full-time working, part-time teaching to full-time
20 teaching, part-time working because then she qualified
21 for tuition benefits. And she just graduated on
22 Saturday. So I saved myself a lot of money.

23 Q. Congratulations.

24 A. Finance.

25 Q. Okay. Good. Saved her some money, yeah.

JULIE L. BENTLEY, PHD - BY MR. MASON

So great.

A. Yeah. So I've been teaching there in some form or another since 1998.

Q. Okay. Yeah. And then under that description of your work at University of Rochester, you list a number of courses; is that correct?

A. It is. I teach anywhere from one to three courses, sometimes three and a half a semester. So I'm what's known as "faculty of practice." I am not a tenured faculty. I'm more of a teach-what-I-do faculty, which is unusual.

Q. Yup. Great.

And would you expect a POSITA to have taken courses similar to those identified on page A-1 of your CV here?

A. Sometimes. Sometimes they will get on-the-job training.

Q. And do you regularly give your students kind of practice designs to work on --

A. Again --

Q. -- as part of the coursework?

A. -- I'm a faculty of practice, so my course is extremely demanding in terms of I give them real-world designs to work on. And, for example, this

JULIE L. BENTLEY, PHD - BY MR. MASON

last semester I had 61 students and they were each doing an individual project. They could pick anything they want to work on, whether it's a telescope, a cell phone lens, you know, an eye tracker for AR/VR. They could pick anything they want to work on. And I helped them figure out the design for that.

Q. And when you say "figure out the design," do you mean kind of picking a starting point and then how to optimize the design from there or what do you mean by make the design work?

A. So they can choose how they want to do this. They can -- I give them three options. They can start from scratch and build it up from one element all the way up to many elements.

The majority will pick a starting point, for example, a patent, a paper that they might read.

And then occasionally I get a student who is really interested in manufacturing. And they start with a final design and do the tolerancing and the analysis on how to build it. But I'd say 90 percent of them pick option two. It's the easier one.

Q. Okay. Yeah. And from my understanding, which is limited, is that kind of the most common approach too within the industry as well?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. It is.

3 Q. Okay. And then for that class, you know,
4 for example, someone who works on this from scratch,
5 do they spend the whole semester then working on and
6 optimizing that design?

7 A. So I start by giving them --

8 Q. What do you expect from them?

9 A. I start by giving them fairly scripted
10 homeworks that build up to this final project. And
11 they have about eight weeks. Depends on when they
12 start. Six to eight weeks.

13 Q. Okay.

14 A. The ones that want to do the really hard
15 ones I encourage to start early.

16 Q. Okay.

17 A. And then the rest of them six to eight
18 weeks.

19 Q. Okay. And is that the same case for those
20 who are working from a starting point design as well,
21 six to eight weeks?

22 A. It is. They all have that same start and
23 then they pick where they want to go. Some of them
24 want to start from scratch and they try and they
25 realize it's too hard. And then I help them find a

JULIE L. BENTLEY, PHD - BY MR. MASON

good starting point, so...

Q. Okay. Got it. And is that -- okay. So
six to eight weeks.

And do you know -- so are these designs
then similar to designs that they would be working on
in industry when they graduate from your program?

A. They are. We have over 100 industry
partners. And I would say --

Q. Wow.

A. -- 90 of them come specifically because of
this class that I teach. And they hire my students
because they had actually been trained in something
they can't get anywhere else in this country, so...

Q. Okay. That's pretty cool.

A. It is cool but it's a lot of work.

Q. 100 plus, that's a big number.

A. Yes.

Q. Got to keep churning out those students.

Okay. And then once they get out into
industry, I mean, what is a typical design -- do you
have an understanding of what a typical design cycle
is once they get out into industry and are working on
designs?

A. I do because I come from industry, so

1 JULIE L. BENTLEY, PHD - BY MR. MASON
2 that's what I did for many years. And then I still do
3 it through my consulting company.

4 Q. Got it. Okay. So for cell phones, for
5 example, or for lenses that would go into electronic
6 devices, what is a typical design cycle?

7 A. Typical design cycle? Can you --

8 Q. Yeah. For example, for a design that you
9 might expect, you know, your students who are -- one
10 of your students who's a couple years out of school
11 for the design that they're handed in terms of, you
12 know, here's, you know, roughly where we want you to
13 start and we want you to end at the design that has
14 these parameters.

15 MR. FREEMAN: Objection, scope.

16 A. I think it's highly dependent on the
17 project. Like some, you know, could take a few weeks.
18 Some could take years --

19 Q. Okay.

20 A. -- to do the analysis. I mean, I've been
21 working on one project for 12 years now.

22 Q. Oh, wow. Okay.

23 A. And then other ones I can do in a few
24 weeks. It's highly dependent on the project.

25 Q. Okay. I'm just trying to get a sense for

JULIE L. BENTLEY, PHD - BY MR. MASON

what your students are doing when they come out. That helps.

Let's see. On page A-3 of your CV do you also list -- I think you list some publications that you've done; is that correct?

A. I don't see anything -- are you talking about books?

Q. Yeah. Yes, that's where your books start.

A. Yes, I have two books on A-3 and I'm about to submit another manuscript hopefully next week.

Q. Oh, okay.

A. And another one probably by the end of the year, so...

Q. Okay. Great. Okay. And so is the first -- let me just see. The first book listed there is titled "Lens Design"; is that right?

A. It is.

Q. Okay. And you co-authored that "Lens Design" book with is it Craig Olson?

A. It is Steven Craig Olson, but yes.

Q. Okay.

A. He goes by Craig.

Q. And can you briefly describe that book titled "Lens Design"?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. I can. So it's part of an SPIE field
3 guide series. And so have you seen the field
4 guidebooks for like birding and things where they have
5 the pictures of the birds and you identify the birds?
6 Well, what we created at SPIE with this field guide
7 series is a series of books on different topics that
8 give you all of the key information.

9 Q. Oh, okay.

10 A. So it's -- you know, each page is a quick
11 blurb on, you know, what is f-number. Another page is
12 a quick blurb on what is vignetting. It gives you
13 information about that. A quick reference guide I
14 guess maybe.

15 Q. And when you say "quick reference guide,"
16 you mean just a quick reference guide for when you're
17 designing a lens system?

18 A. And you're like oh, I don't remember what
19 that was. Da, da, da, flip. Or it might be given to
20 newer users that can look up and go, "Oh, I really
21 want to know what this is." And then they get a
22 general definition.

23 Q. Got it.

24 A. I believe it is one of the top-selling
25 books in the field guide series.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Okay. Gotcha. So this "Lens Design,"
3 it's a lens design field guide?

4 A. It's a lens design field guide. There's
5 an illumination field guide. There's a photonics
6 field guide. There's a coating field guide. This one
7 is lens design.

8 Q. Gotcha. So it's a guide. It's a synopsis
9 of kind of known and existing information; is that a
10 fair summary?

11 A. That is an absolute fair summary. I did
12 not invent anything that's in there. It's all
13 knowledge gained over years and years of doing lens
14 design, what are the important things.

15 Q. Okay. Gotcha. So is this something maybe
16 that you would -- this "Lens Design" book something
17 that you would refer your students to, for example?

18 A. Yes. Absolutely. It's one of the top
19 ones on the list of books for them for class.

20 Q. Gotcha. And how can you -- yeah. Or
21 yeah, I think you've already answered this, but who is
22 the intended audience or what is the intended audience
23 for that book titled "Lens Design"?

24 A. Yeah, we kind of talked about this. I
25 mean, it's -- it's not going to be for -- well, I

JULIE L. BENTLEY, PHD - BY MR. MASON

mean, to be honest, Craig still pulls it out occasionally when he forgets something. He tells me -- I don't know that I've done that. But Craig's like -- so I started writing it by myself. But as I've just -- I've got multiple jobs, kids. So trying to finish it was challenging.

And so I was talking to Craig at a conference once and he said, "Well, I want it, so I'm going to help you finish it." So he came on at the end, did a bunch of the writing. And, you know, we've shipped it out and now he uses it, which I think is funny. So you've got power users like Craig who will use it, but it's also meant for new users.

Q. Okay. And how long roughly were you working on this book before it was published in 2012?

A. On and off probably seven or eight years.

Q. Okay. And can you describe kind of your process for writing this book?

MR. FREEMAN: Objection, scope.

A. For writing the book I wrote an outline in a weekend because I know the guy who -- I'm good friends with -- well, he just passed away, but I was good friends with the guy who started the field guide series. And he asked me to think about writing one

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 for lens design. And I said, "Oh, that would be
3 really cool."

4 And I sat down and wrote the outline in a
5 weekend. So I had all the material in all the right
6 places. Then just collecting all of the information
7 takes a lot longer.

8 Q. Gotcha. And where would you collect the
9 information from to put in the field guide?

10 MR. FREEMAN: Objection, scope.

11 A. My class notes. Stuff that -- primarily a
12 lot of it came -- the reason I did the outline so fast
13 was a lot of it was strictly out of my class. Here is
14 everything that I've taught. And it's an overlap of
15 two classes, little a bit of geometrical optics and
16 then lens design. And actually, a third advanced lens
17 design class. So it's kind of stuff from three.

18 Q. Okay. Great.

19 And I may have asked this, so I apologize,
20 but is this a book you would refer your students to,
21 for example, when they were starting out in the lens
22 design world?

23 A. It is.

24 Q. Okay. And then is the second book listed
25 there "Design Optics with CODE V" or --

JULIE L. BENTLEY, PHD - BY MR. MASON

A. "CODE Five."

Q. "CODE Five."

So the second book "Designing Optics with
CODE V," can you just quickly summarize that book?

MR. FREEMAN: Objection, scope.

A. So this book is a book intended for new --
the lens design field guide is kind of a little bit
more of a reference guide. This one is intended for
people that don't know the software and want to, you
know, take some of their lens design skills and learn
that software package.

It starts off with basic information. And
then in chapter 3 I think is entering a lens. So how
do you put a lens into the software package. How you
evaluate it. How you optimize it. How you tolerance
it. So it steps through those. And it's all done
with examples in CODE V.

Q. Okay. So the CODE V book then is more
focused on how to use the software such as CODE V or
maybe Zemax I think is another one I've heard; is that
correct?

A. So CODE V and Zemax are the two top
software packages. 99 percent of the people out there
use one or the other. The book I'm about to submit is

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 the same book only in Zemax --

3 Q. Oh.

4 A. -- designing lenses with Zemax. So
5 they're targeted at that software package.

6 Q. So this one is targeted at CODE V.

7 A. It is.

8 Q. And the Zemax one is forthcoming?

9 A. It is.

10 Q. And then if we look at the "Lens Design"
11 book we were talking about a few minutes ago, that's
12 kind of a summary of known information that you kind
13 of gather from your class notes and from other known
14 sources summarizing known techniques; is that fair?

15 A. I don't know if I would say known
16 techniques. I would say it's more known information
17 about lens design.

18 Q. Okay.

19 A. Like it's, again, a reference guide. What
20 does this term mean? What does that term mean?

21 Q. Okay. I think you mentioned -- in
22 describing your field guide, you mentioned this
23 concept of f-number. Does that -- or yeah. Or did
24 you mention focal length? I can't remember what
25 you -- in any event, are you familiar with the term

JULIE L. BENTLEY, PHD - BY MR. MASON

"f-number"?

A. I am. I did say f-number. Focal length is also in the field guide.

Q. Okay. And does a higher f-number indicate a slower system?

A. A higher f-number indicates a slower system. It comes from photography. So back in the old-school days of using real camera lenses, lenses with larger f-numbers, they have a smaller opening. And so you didn't get as much light in the system, so you had to keep the shutter open longer. And so slower means you can't take the picture as fast.

Q. Gotcha.

A. So larger f-number, smaller aperture, smaller system.

Q. Okay. And does a lower f-number indicate a faster system?

A. A lower f-number indicates a faster system for the opposite reason.

Q. Okay.

A. You can take the picture a lot faster.

Q. Okay. And then does f-number also correlate to -- strike that.

Are you familiar with the term "aperture"?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 I feel almost silly asking this.

3 A. I am.

4 Q. Okay. How does f-number correlate or
5 relate to aperture?

6 A. It depends on what you mean by "aperture."

7 Q. Okay.

8 A. So there's a lot of different apertures
9 defined in an optical system, so...

10 Q. Okay. If we're speaking generally, I'm
11 just trying to figure out in terms of faster, the
12 faster and slower systems you described, if I have a
13 higher aperture, does that mean it's a -- is that a
14 faster or slower system? Strike that.

15 The higher the aperture, what does that do
16 to the speed of the system? Actually, strike that.

17 If I have a higher aperture, what does
18 that do to the f-number?

19 A. I don't think I would ever say "higher
20 aperture." Do you mean larger?

21 Q. Larger.

22 A. Or smaller?

23 Q. That's what the raised eyebrow was.

24 So for a larger aperture, what would that
25 do to your f-number?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. So again, with the word "aperture," it's a
3 little dangerous. So there's semi-aperture, clear
4 aperture, aperture stop. Are you talking about the
5 aperture stop diameter?

6 Q. Yes. Does the aperture stop diameter --
7 is that what you would typically refer to when talking
8 about the amount of light coming into a system?

9 A. The aperture stop determines the amount of
10 light from like the central field point, yes.

11 Q. Okay. So yeah. So what does increasing
12 the aperture stop -- strike that.

13 What does a larger aperture stop do for
14 your f-number?

15 A. So a larger aperture stop diameter -- are
16 you fixing the focal length?

17 Q. Yeah, let's fix the focal length.

18 A. Because the f-number is related to
19 aperture stop diameter and the focal length. So if
20 the focal length is fixed, then as the aperture stop
21 diameter goes up, the system is faster and has a
22 smaller f-number.

23 Q. And then if your aperture decreases with a
24 fixed focal length, does your f-number go up?

25 A. Then the f-number goes up, yes.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Okay.

3 A. It goes the opposite. It confuses my
4 students all the time. It takes a while for them to
5 get the inverse relationship.

6 Q. So that's a good way to describe it.

7 A. It has an inverse relationship.

8 Q. So the aperture has an inverse
9 relationship to the f-number; is that correct?

10 A. Yes, that is correct, for fixed focal
11 length.

12 Q. For fixed, yeah. Okay. You can set aside
13 your original declaration for a moment.

14 Can I have you turn to your supplemental
15 declaration, Exhibit 2036? And specifically to
16 paragraph 7. And in paragraph 7 of your supplemental
17 declaration, do you conclude that KR872 is not
18 receptive to an f-number of 2.0?

19 A. I do conclude that.

20 Q. And is -- and in reaching that conclusion,
21 do you reference your paragraph 8 which describes
22 attempts to use CODE V to optimize KR872 with an
23 f-number of 2.0?

24 A. I believe that conclusion is based on 8,
25 but also on looking at the lens system itself too.

JULIE L. BENTLEY, PHD - BY MR. MASON

Q. Okay. And in your paragraph 8 analysis, did you just plug in that number of 2.0 into the KR872 design?

A. So in this analysis I took the description given in the KR872, the table of data, plugged it into both Zemax and CODE V and analyzed the system for a range of f-numbers. But for paragraph 8 this was an f/2.

Q. And when you say f/2, that's just an f-number of 2.0; is that correct?

A. An f/2 is an f-number of 2.0.

Q. There's a lot of different terminology and some of it is the same and some of it's different. So I may ask questions like that throughout the day --

A. That's fine.

Q. -- to make sure I'm on the same page.

So I guess my question is in paragraph 8, did you just simply -- in this description here for paragraph 8, did you simply just plug in an f-number of 2.0 into that KR872 design and attempt to optimize?

A. For paragraph 8 for the example shown here, the optimization, that was for an f/2, yes.

Q. Okay. And did you -- and when that returned ray errors, you concluded that KR872 would

JULIE L. BENTLEY, PHD - BY MR. MASON

not work with an f-number of 2.0; is that correct?

A. Again, that was part of the conclusion.

That was an example of one of the reasons you -- it was an example showing why you couldn't just put in an $f/2$ and then optimize.

Q. Okay. And yeah, did you perform -- in doing that analysis, did you actually set the f-number to 2.0 or did you set the aperture or what was your process for setting that f-number to 2.0 in paragraph 8?

A. So three of the key specifications that you have to enter in for any optical design are an aperture setting, whether it's entrance pupil diameter F-number or numerical aperture, field of view and wavelength. So I don't remember if I entered in $f/2$ or the equivalent entrance pupil diameter, but the system was $f/2$. I think it was f-number.

Q. Okay. And when you say entrance pupil diameters, is that referring to the aperture?

A. It can be if the aperture stop's in the front of the system. If it's in the middle of the system, the aperture stop is an image of the entrance pupil. Or the entrance pupil is an image of the aperture stop is probably a better way to say it. So

1 JULIE L. BENTLEY, PHD - BY MR. MASON
2 they're related.

3 Q. And one reason I ask is that I see at the
4 top of page 4 of that declaration it says aperture --
5 I think this is within the CODE V I think is what you
6 said, the CODE V output, it says "Aperture and field
7 at .9 of spec." And I'm just wondering what it's
8 referring to by "aperture" there.

9 A. So that is an -- as I mentioned, there's
10 three key parameters that you have to enter in to
11 trace a ray in any of these software programs,
12 aperture, field and wavelength. The aperture in that
13 sense is referring to whatever the setting you use to
14 specify the aperture, whether it's f-number, numerical
15 aperture or entrance pupil diameter I think are the
16 three key ways.

17 Q. Okay. And in generating this paragraph --
18 strike that.

19 And in generating these outputs -- strike
20 that.

21 And in generating this CODE V output here
22 in paragraph 8, did you try optimizing at a higher
23 f-number?

24 A. I don't remember if I tried. I know in my
25 original report I looked at a range of f-numbers with

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 both the 872 and the other one. I don't think I tried
3 optimizing these here in the supplemental.

4 Q. Okay. Yeah. And my question is just
5 focused on the supplemental. I might ask about the
6 modeling in the original declaration in a bit. So for
7 here my question is then, you know, for example, in
8 the paragraph 8 output for CODE V, did you try to
9 increase the number -- the f-number to a value where
10 it would optimize?

11 A. I don't remember doing that because I had
12 already done that. It will optimize when you can
13 trace rays. So in the original report, I tried to
14 find the f-number that would trace rays so that it
15 could optimize. So I think that analysis is in here.

16 Q. Okay. Yeah, but in generating these error
17 outputs in paragraph 8, you didn't try to step back
18 the f-number or I guess increase the f-number to a
19 point where it would actually trace rays?

20 A. Again, I don't think so. I don't remember
21 doing that. I know that, based on this error message,
22 CODE V tried. So when it says "aperture at .9 of
23 spec," that means that it's taking the f-number and
24 making it -- well, in this case it's inversely related
25 to the aperture, so it makes it larger trying to get

JULIE L. BENTLEY, PHD - BY MR. MASON

rays through. And it says I can't do it even at, you know, 90 percent.

Q. Okay. And when you say at 90 percent, does that mean it just basically increased -- or sorry -- reduced the aperture by 10 percent of what you specified?

A. It reduces the aperture by 10 percent and still tries to get rays through. And then it says nope, can't do that. And then it quits.

Q. Then it quits.

A. Which is a very bad place to be.

Q. Doesn't sound good.

And from there though, then you did not try to increase the f-number?

A. I may have. I don't remember. Like I said, I do remember doing a lot of the analysis in the original report where I looked at a whole range of f-numbers trying to understand where this patent -- like what the good f-number range for this patent was.

Q. But yeah, setting aside your original declaration and what you did there, in the supplemental declaration, the modeling here, do I correctly understand that you don't recall attempting to increase the f-number to a less problematic value

JULIE L. BENTLEY, PHD - BY MR. MASON

and then trying to get the rays to trace?

A. Again, I don't remember if I did or not.

I already had a feeling for what it was from before,
so...

Q. Okay. So is the answer yes, that -- is
your answer yes, that you don't recall trying to
increase that f-number to a point where it would trace
rays?

MR. FREEMAN: Objection, asked and
answered.

MR. MASON: I'll have you limit your
objections to form, Parrish, per the rules.

MR. FREEMAN: I'm supposed to tell you
what it is.

MR. MASON: Only if I ask though.

MR. FREEMAN: That's not my understanding.
I'll state it concisely per the rules.

MR. MASON: I think the rules are just
objection, form. Objection, scope. You're not
allowed to -- if I ask, then you have to state it
concisely.

MR. FREEMAN: Disagree.

MR. MASON: We can have a call with the
board briefly after this.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 MR. FREEMAN: Okay.

3 Q. So coming back to my --

4 MR. MASON: Can you repeat the last
5 question, Betsy?

6 (The reporter read the requested material.)

7 A. No, that is not my answer. I'm pretty
8 sure I said I do recall doing that in the original
9 report.

10 Q. Okay.

11 A. For this report I didn't create any
12 examples of, you know, different f-numbers that it
13 would not optimize over.

14 Q. Okay. Yeah. So for this example, this
15 example reflects an f-number that just wouldn't work
16 with the system; is that correct? And you didn't try
17 to -- in this example in paragraph 8 of your
18 supplemental declaration, you did not try to create a
19 model where the rays would trace; is that correct?

20 A. In this particular part of this report, I
21 was interested in creating -- testing out to see if
22 you could enter in an f-number of 2 and hit the go
23 button and see if it would go anywhere. And it did
24 not go anywhere.

25 Q. Okay. Gotcha.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. That was the point of paragraph 8.

3 Q. And that was it. And then you stopped at
4 that point when it wouldn't go anywhere; is that
5 correct?

6 A. That was the point that I was trying to
7 make. So yes, that is where I stopped.

8 Q. Okay. And is that the same case for
9 paragraph 9? It sounds like you performed a similar
10 analysis for the KR357 design; is that correct?

11 A. I did the same analysis with the other.

12 Q. And as with your paragraph 8 analysis, in
13 your paragraph 9 analysis did you just plug in the
14 desired f-number, hit optimize and see if it would
15 work?

16 A. I repeated what I did in paragraph 8 with
17 the other, the KR357 patent to see if it would work at
18 f/2. And by "work," optimize at f/2.

19 Q. And in that paragraph 9 analysis when it
20 would not optimize at an f-number of 2.0, did you
21 attempt any further alterations or optimizations?

22 A. For doing this analysis, no. But again, I
23 looked at 357 in the original report over a large
24 range of f-numbers and fields of view to try and
25 figure out what that patent could actually support.

JULIE L. BENTLEY, PHD - BY MR. MASON

Q. Okay. And in paragraph 7 did you conclude that KR872 and KR357 were designed for an f-number of 3 or 4?

A. I believe this is based on my original analysis in my original report in terms of looking to see when could you get rays through and start optimizing.

Q. Yeah. Okay. And yeah, so is the answer -- sorry. Strike that.

So in your paragraph 8 analysis of your supplemental declaration then, did you attempt to optimize KR872 at an f-number of 4.0?

A. So the example that I provided in paragraph 8 is just $f/2$.

Q. Okay. Okay. And in your analysis of -- and just kind of stepping back, referring to your analysis in both your original and supplemental declarations, did you attempt to optimize KR872 at an f-number of 4.0?

A. I don't remember off the top of my head. 872?

Q. Yeah.

A. So it looks like in paragraph 62 I have two pictures of the system with two different image

1 JULIE L. BENTLEY, PHD - BY MR. MASON
2 heights both at an f-number of 3. I know I went
3 through a series of f-numbers and a series of fields
4 of view. I don't know that I put them -- well, I
5 didn't put them all in the report.

6 Q. Okay.

7 A. I could have looked at an f-number of 4.
8 I just don't have it in here.

9 Q. One clarifying question: You're referring
10 to paragraph 62 of your original declaration; right?

11 A. Of the original declaration.

12 Q. And then you said -- is it accurate to say
13 that you don't recall one way or another whether you
14 tried optimizing KR872 at an f-number of 4.0?

15 A. So I don't think I tried optimizing any of
16 these. I didn't have a reason to optimize them. What
17 I was primarily looking at in paragraph 62 and 63, I
18 was trying to look to see if they would trace rays.
19 That would then give you the ability to optimize. In
20 the supplemental I specifically looked at okay, at an
21 f-number of 2 could you optimize.

22 Q. Okay. And in your original declaration,
23 that analysis, you just mentioned that you were
24 attempting to get CODE V to trace rays; is that
25 correct?

JULIE L. BENTLEY, PHD - BY MR. MASON

A. So I can try and explain what I mean if you want to look at the figure. It's up to you.

Q. Yeah. It's the figure in paragraph 62?

A. It's the figure in paragraph 62.

Q. Okay.

A. So if you look at the figure on the left, you'll see that the green rays just kind of take off to never-never land. That is not a good place to start any optimization.

Whereas in the one on the right, the rays are focused at the image plane. They look like they have, you know, at least an acceptable level of an image quality that you could start to do some optimization with.

So I was searching around. I think I probably looked at f/4 with a slightly larger field because the f-number and the field go opposite each other. So there's a range of examples you could put in here. I just picked one.

Q. Okay. And I might try and unpack that answer a little bit to make sure I understood it. Did you say that for the figure on the right in paragraph 62 it does trace rays?

A. So the on-axis bundle, which is the red

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 bundle, and the off-axis bundle, which is the green
3 bundle, they both -- like the entire bundle gets
4 through all of the lenses and they both hit the image
5 plane. That's at least a good place to start.

6 Q. Okay. Okay. And so from that, you know,
7 place, did you attempt further optimizations on the
8 design depicted in ray traces in the lower right-hand
9 of paragraph 62?

10 A. Further optimizations? Like did I try and
11 change the lens at all?

12 Q. Yeah.

13 A. I had no reason to.

14 Q. So after you produced this ray trace
15 output on the right-hand portion of paragraph 62, you
16 just decided to stop; is that correct?

17 A. I wasn't trying to optimize it. I was
18 trying to figure out -- this patent didn't give you an
19 f-number, so what f-number could you use it with.
20 That was my goal.

21 Q. Okay.

22 A. It's what I would do with my students.
23 So, for example, if this came to me with the ray trace
24 figure on the left, and that's what they wanted the
25 f-number and the field to be, I would tell them to

JULIE L. BENTLEY, PHD - BY MR. MASON

take that starting point and put it in the garbage can because it wasn't going to work.

And if they came to me with something on the right, I would say well, try it and see. You might have a chance to get it to work. So when I was doing the analysis, I was trying to understand with the missing information what that patent would likely be good for.

Q. Okay. And when you say what that patent might likely be good for, you mean what f-number and field of view would the KR872 kind of work with out of the box, so to speak?

A. Yes, that's what I mean. So what f-number? What field of view could you put into it? Does it get the rays through? Do you have a prayer at like trying to optimize this?

Q. Okay. Please. Okay. Got it.

And then from there, just looking at that lower -- for example, the lower right-hand corner, did you attempt -- once you identified possibly a working f-number, did you attempt to -- did you perform further optimizations -- strike that.

Looking at the figure in the lower right-hand of paragraph 62, once you determined a

JULIE L. BENTLEY, PHD - BY MR. MASON

reasonable f-number, did you try and reduce the f-number for that design?

A. Reduce the f-number by just changing it?

Q. No, not by just changing it but by going through by performing other optimizations to try and reduce the f-number.

A. I didn't try and optimize. In this report here I didn't try and optimize anything.

Q. Okay.

A. So there's not other optimizations.

Q. Gotcha.

A. I just was changing the field and the aperture trying to figure out without changing the lens what it supports.

Q. Okay. Okay. So yeah. So you didn't really want to make any major changes to this KR872 design. Your goal was to just figure out I guess as we stated before which f-number would work out of the box?

A. Yeah. I wasn't trying to -- I had no reason to try and change it. I was just trying to figure out the starting point, what it would work over, what f-number, what field of view it could support.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Okay. Yeah. And then your goal in this
3 original declaration was not to attempt to optimize
4 any of those designs further to see if you could
5 reduce the f-number; is that correct?

6 A. Yeah. I don't think that that -- I don't
7 see a reason why I would have been trying to do that.

8 Q. Okay. And is that the same case then too
9 for your analysis of the KR357 design in your original
10 declaration?

11 A. In terms of taking a look at, you know,
12 how much -- what field of view and f-number the
13 starting point could support?

14 Q. Correct.

15 A. Yeah, I looked at that. I changed the
16 f-number around, changed the field of view around. I
17 think somewhere in here. Yeah, it looks like I've got
18 some pictures from f/1.5, 2.5, f/4, different image
19 heights, trying to understand what that starting point
20 was good for.

21 Q. Let me make sure I understand. If we're
22 looking -- are you referring to kind of paragraphs 95
23 to 104?

24 A. Paragraph 95 of the original to 99. Yeah,
25 102.

JULIE L. BENTLEY, PHD - BY MR. MASON

Q. Are there also -- is there also some modeling and discussion of it in paragraph 103 and 104 of your original declaration? I just want to make sure I'm capturing all the KR357 modeling that you discussed.

A. I'm sorry. What's the question?

Q. Oh, yeah. Fair point. Well, is it correct that in paragraphs 95 to 104 of your original declaration, you did some CODE V modeling and analysis of the KR357 design?

A. In those paragraphs I was doing some analysis of both the f-number and field of view settings.

Q. And as with KR872, in performing that KR357 analysis, was your goal to simply determine what f-number and field would work with KR357 out of the box?

A. It was to determine what f-number and field of view that you could get rays to trace to use as a starting point for future optimization.

Q. Okay. And once you identified that, you know, starting point for future optimization for the KR357 design, did you attempt any further optimization?

JULIE L. BENTLEY, PHD - BY MR. MASON

A. I did not attempt any further optimization of these designs.

Q. Okay. And then summarizing kind of the same question just to make sure I understand for KR872. So for KR872 once you determined an f-number and field where you could get rays to trace, did you perform or attempt to perform any further optimization?

A. I did not try and attempt any other further optimization on that particular f-number and field of view setting. In the supplemental I did try to optimize it at f/2.

Q. And in the supplemental declaration you're referring to paragraphs 8 and 9; is that correct?

A. That is correct.

Q. And when you said you did try to optimize it at f/2, you only -- to the best of your recollection, is the only optimization you attempted at an f-number of just 2.0?

A. That is the only, yeah. I mean, you can kind of look at when the rays trace in the original declaration and figure out when you'd be able to get it to optimize.

Q. Okay.

JULIE L. BENTLEY, PHD - BY MR. MASON

A. So if I had gone to f/2.2, it still wouldn't work. If I had gone to f/3, it probably still wouldn't work depending on what the field of view setting was.

Q. Yeah, but in paragraph 62 you identify that an f-number of 3.0 with an image height of 1.5 millimeters would be a point from which you could at least optimize because the rays trace; is that correct?

A. I'm sorry. Where?

Q. Paragraph 62 of your original declaration.

A. So which f-number?

Q. Yeah. Sorry. The figure in the lower right-hand, does that say f-number of 3.0 and an image height of 1.5 millimeters?

A. So at that reduced image height and reduced f-number, yes, the rays get through. I think you could probably optimize from there. You're unlikely to get to f/2 and that field of view, but you could push the optimize button and it wouldn't give you an error message.

Q. And do I understand correctly that you did not even try to optimize that design? I just want to understand. And I think this is what you -- strike

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 that.

3 Am I correct that you didn't -- your goal
4 was not to try to optimize further from that design in
5 the lower right-hand corner of paragraph 62?

6 A. My goal -- I guess I didn't need to. I've
7 had students try this. It doesn't work.

8 Q. Oh, you had students try this specific
9 design?

10 A. I'm sure I have over the years.

11 Q. The KR872 design?

12 A. I'm sure I have.

13 Q. And what makes you sure you've had
14 students try to optimize the KR872 design?

15 A. Because I've seen -- patents like that are
16 usually the ones that I tell them to take and just put
17 that aside. Don't use that, because you're never
18 going to get to an f/2 design with that kind of
19 starting point. It's just not good enough.

20 Q. Okay. And did you -- in taking that KR872
21 starting point, did you attempt to reduce the f-number
22 using optimization?

23 A. Did I personally right here for this
24 report?

25 Q. Yeah.

JULIE L. BENTLEY, PHD - BY MR. MASON

A. No.

Q. Okay. And it's the same thing for the
KR357, did you attempt to reduce that f-number down to
2.0?

A. Again, I didn't.

MR. MASON: Okay. That's fine.

We can take a break. We've been going
about an hour. We can go off the record.

(The proceeding recessed at 9:46 a.m.)

(The proceedings reconvened at 10:00 a.m.;
appearances as before noted.)

JULIE L. BENTLEY, PHD, resumes;

CONTINUING EXAMINATION BY MR. MASON:

Q. Are you ready to resume your deposition,
Dr. Bentley?

A. I am.

Q. Great. Can I have you turn to
paragraph 57 of your original declaration? Let me
know when you're there.

A. I'm there.

Q. Okay.

A. I'm just taking a look.

Q. Great. On the top of page 31 at the end
of paragraph 57, do you have some ray traces that

JULIE L. BENTLEY, PHD - BY MR. MASON

you've provided there from CODE V?

A. I do.

Q. Okay. And just one general question. And in this original declaration, if we look in the upper left-hand corner of each ray trace, it indicates f-number and an image height; is that correct?

A. That is correct.

Q. Yeah. Did CODE V add that information?

A. When you say did CODE V add it or --

Q. Yeah. I'll ask that a better way. What I'm trying to get at is the output from CODE V, does that include the indication that the f-number is 1.5 and the image height is 3.0? Is that something that you added to these ray trace captures after the fact? I'm just wondering if this is part of the standard output of CODE V.

A. I mean, you can get that as part of the standard output, but I added the text onto the figure so I could keep track of what each one was.

Q. Okay. Okay. So yeah, I'm just trying to get a sense of what's the output from CODE V and what is what you added as an indicator after the fact.

A. Yeah, I grabbed the screenshot and pasted it into PowerPoint and added the f-number and the

JULIE L. BENTLEY, PHD - BY MR. MASON

image height so I could keep track of what was what for each one.

Q. So each of these ray traces in your original declaration you went in and manually added the f-number and the image height to each ray trace; is that correct?

A. I went in. I looked at the settings that were in the program and then added that to the figure, yes.

Q. In other words --

A. Because it doesn't come out on a regular figure.

Q. Okay. Yeah. So is it correct that you added those labels to each of these ray trace figures?

A. I added those labels to the figures so that we would know what f-number and image height they were traced at.

Q. Okay. Great. And for the -- you see the one that's labeled in paragraph 57 labeled f-number 2.5 and image height equals 3.0?

A. The third one? Yes.

Q. Correct. And did you use the lens data from Tables 1 and 2 of KR872 to generate this ray trace diagram?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. Using the optical prescription provided by
3 872, Table 1 and Table 2, yes.

4 Q. And did you optimize the system in any way
5 to obtain this ray trace diagram?

6 A. Again, I think I mentioned earlier I did
7 not optimize any of these examples. These are
8 straight out of typing them in from the pad here --

9 Q. Okay.

10 A. -- in this report.

11 Q. Okay. So yeah. So then did you manually
12 change this KR872 system to obtain any of these ray
13 trace diagrams?

14 A. I typed in the data from Table 1, which
15 has the radius, the thickness and the materials; Table
16 2, which has all the aspheric coefficients and the
17 conic constants. And then there weren't any -- as I
18 mentioned in paragraph 57, the f-number and the field
19 of view weren't given. So that's why I was checking a
20 few different f-numbers and fields of view.

21 Q. Okay. And in that third ray trace in
22 paragraph 57, the one with the f-number of 2.5 and an
23 image height of 3.0, do the lenses there appear
24 smaller than the lenses in the other two ray traces
25 provided here in paragraph 57?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. Are you talking about the physical

3 dimensionings of these elements --

4 Q. Yeah.

5 A. -- in these pictures?

6 Q. Well, yeah. What I'm referring to is you
7 see in the f-number 2.5 and image height 3.0, do you
8 see how the -- am I correct that it displays six
9 lenses there?

10 A. So what you're seeing is the reason that I
11 mentioned earlier I would take a look at this from a
12 student and just say, "Don't even bother. Walk away.
13 Go get a different one," because if you look careful,
14 the lenses are actually there. The rays are bending.
15 CODE V -- the lens system is so bad that CODE V is
16 having trouble trying to connect the
17 surface-by-surface description with an edge. And so
18 when that happens, it can't display what the lenses
19 actually look like.

20 So those of us that do this for a living
21 know that and we just ignore the fact that in all
22 three of these pictures, the lenses have completely
23 different sizes. It doesn't matter. What matters is
24 where the rays go.

25 Q. Okay.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. I know that bothers most people including
3 my students for a while until I get them to realize
4 that that's okay.

5 Q. Okay. And so you're saying that there
6 actually are lenses here but they're --

7 A. Yes.

8 Q. The CODE V itself chose not to show those
9 lenses?

10 A. CODE V is struggling because the lens
11 system is -- at that aperture and that field of view,
12 the lens system is so bad that the rays -- it's having
13 trouble trying to figure out how to connect the dots,
14 which would also lead it to have significant issues
15 trying to optimize.

16 Q. But my question is did you change a
17 setting in CODE V so that it only displays a portion
18 of each lens?

19 A. I did not.

20 Q. Okay.

21 A. So in CODE V there's what are called
22 automatic apertures. So it automatically calculates
23 what the apertures are to trace the rays. And then
24 when it does these lens viewing, it comes up with
25 another aperture to draw it at and that's where it's

1 JULIE L. BENTLEY, PHD - BY MR. MASON
2 breaking. But you can -- if you look at those green
3 rays that you were just highlighting with your pen
4 there, do you see how they bend?

5 Q. Yup.

6 A. That is where the surface is. So you
7 could, if you traced a bunch of rays, extend it out.
8 I could also go in and make it bigger. I just didn't
9 mess with it.

10 Q. So you could have changed the output from
11 CODE V such that it showed the full shape of the lens?

12 A. I could have, but then I'm not -- I didn't
13 want to enter any extra stuff of my own into this. I
14 want to analyze as given.

15 Q. Okay. So yeah. So the lens is there in
16 that third image and the lenses extend up to where
17 those green rays are bending or have little bumps in
18 them. Does that indicate where the lenses would be?

19 A. It's trying.

20 Q. Okay. Yeah.

21 MR. MASON: Could I have you just repeat
22 the previous answer before that last question, Betsy?

23 (The reporter read the requested material.)

24 Q. Yeah. And if we look at, for example, the
25 ray trace in paragraph 57 with an f-number of 2.0 and

JULIE L. BENTLEY, PHD - BY MR. MASON

an image height of 3.0, do the rays there trace
successfully?

A. I'm sorry. Which one?

Q. Oh, the f-number 2.0.

A. F-number 2.0.

Q. In the upper right-hand corner.

A. I don't even -- it's not even drawing an
image plane. At f/2.0 it can't get any of those rays
through.

Q. And so why for f/2.0 are we seeing the
full shape of the lens in the CODE V output but we're
not seeing the full shape of the lens at f-number 2.5?

A. You'd have to ask -- I mean, this is
the -- you can see all of these have exactly the same
radii, thickness, air spaces, material. It's just the
algorithm CODE V is using to plot those. I don't know
why.

Q. Okay.

A. I mean, the bottom line is as a user of
this software, if you saw any of these three, you'd
go, "Okay. This is not practical. You don't want to
use any of this." So if you're asking why doesn't it
work, it's giving you an indication that it doesn't
work.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Okay. Yeah. With these specific inputs.

3 A. With those inputs it's just not good.

4 Q. Yeah. And do you see -- so yeah. So all
5 of these in paragraph 57, am I correct that all of the
6 ray traces have an image height of 3.0?

7 A. They are being asked to have an image
8 height of 3.0. It's clearly not capable of doing
9 that.

10 Q. Well, yeah. So put differently -- I'm
11 just trying to think of a shorthand way to describe
12 these. So my question is, is it okay if I refer to
13 each of these three ray traces in paragraph 57 by
14 their f-number since they all have a different
15 f-number?

16 A. For?

17 Q. For purposes of this deposition.

18 A. Sure.

19 Q. Okay. So you see the ray traces for
20 f-number 1.5?

21 A. I do.

22 Q. And do you see the second lens element in
23 the ray traces for f/1.5?

24 A. I do.

25 Q. Okay. And is the image side surface of

JULIE L. BENTLEY, PHD - BY MR. MASON

that second lens element convex or concave?

A. I don't think you can tell. And it clearly lost its mind in drawing that. And if you look at it, the rays are bending outside of that surface.

So again, whatever these shapes are, CODE V is struggling to make a plot because it's being asked to trace this outside of its normal usable range. So the fact that it kind of looks -- I mean, it kind of looks flat. It just says I punt. I can't draw this shape. And when you slow it down enough to $f/2$ and a half, you can see that it's concave there.

Q. Okay. So is it fair to say that CODE V will not accurately represent the lenses for a given prescription if it's struggling to trace the rays for that prescription?

A. It may or may not. Some of these are right and some of them it clearly has a hard time connecting the dots.

Q. When you say some of them it does okay, what are you referring to when you say some of them it does okay?

A. Some of them look right and some of them when the rays are bending outside of where the surface

JULIE L. BENTLEY, PHD - BY MR. MASON

is, you can tell that okay, it's not drawing the surface right or the rays are bending above the element. Something happened.

Q. Yeah. All right. And among these three ray trace figures in paragraph 57, is there an example of one where it got it right? Can you point to an example of where CODE V depicted the lens correctly?

A. When you say "depicted the lens," like the entire shape?

Q. Yeah, depicted the shape of the lens according to the prescription that you input.

A. I guess I don't know what you're asking. I mean, the prescription -- if you want to know what the actual shape is, you go back to the prescription and you can look at it. And you can look to see is it convex, concave and look at the numbers.

Q. And does the actual prescription -- would you be able from that to tell what the shape of each lens would be at an image height of 3.0?

A. I'm struggling to understand the connection with the image height.

Q. Okay. Remove image height from that. But if you take the prescription that you entered from KR872, should you be able to generate something that

JULIE L. BENTLEY, PHD - BY MR. MASON

shows the shape of each lens in that system?

A. To generate a figure?

Q. Yeah.

A. If I put on hard apertures and add the stuff that I said I, you know, didn't want to add to it, I could draw each element outside of this ray trace figure.

Q. And so you would be able to --

A. And CODE V could do that accurately, yes.

Q. So CODE V could provide an accurate description of what the lens system would look based on that prescription in KR872; is that right?

A. It could provide an accurate picture of each element if you gave me what size you wanted to draw it at.

Q. And did you undertake that exercise for this original declaration?

A. I can't think of why I would have done that.

Q. Okay.

A. Like.

Q. Okay. And did you undertake that exercise for your supplemental declaration of taking the prescription from KR872 and generating an output

JULIE L. BENTLEY, PHD - BY MR. MASON

showing what each lens looks like?

A. I mean, you can kind of do that if you slow it down and you get it to the point where you can get the ray through. On page 34 in paragraph 62 it draws the lenses correctly. It's just a matter of getting the rays through.

Q. Yeah. But are you saying unless you can get the rays through, you cannot actually create an accurate representation of what each lens would look like based on the KR872 prescription?

A. If you want to guess at what the sizes are. So like when you trace the rays through at an image height of 3, you need to know what the sizes of the elements are. But if the rays don't get through, you can't determine what the sizes are.

Which is why, for example, on the left-hand side for the larger image height, the elements are not being drawn the right way because it just can't figure it out because the rays aren't -- the image quality is so bad, it can't get the rays through. But if you were to --

Q. You're referring to paragraph 62, the left-hand side?

A. Yeah.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Just making sure.

3 A. But if you handed me a table of okay, I
4 want to know what this lens looks like at this
5 diameter, I could hard-code that diameter in, override
6 the calculation that it's coming up with here, which
7 is clearly wrong, and draw a picture. So you could do
8 that.

9 Q. Yeah. And did you do that for the KR872
10 design in your analysis?

11 A. I didn't see a reason to.

12 Q. Okay. And did you do that for the KR357
13 design in your analysis in this case?

14 A. Again, I mean, I could have put apertures
15 on and off at some point. But I don't know why I
16 would have done that and I certainly didn't include
17 that in here.

18 Q. Okay. And did you attempt to trace the
19 KR872 design at an f-number of 3.0 and an image height
20 of 3.0?

21 A. F-number of 3, image height of 3?

22 Q. I said f-number of 4. So I'll restate the
23 question.

24 Did you attempt to trace rays with an
25 f-number of 4.0, an image height of 3.0 for the KR872

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 prescription?

3 A. I don't see anything in my report just
4 glancing at it here that has that combination, but I
5 don't remember.

6 Q. Okay. And for the KR357 prescription, did
7 you attempt to trace rays with an f-number of 4.0 and
8 an image height of 3.0?

9 A. So f-number of 4.0, image height 3.0, is
10 that what you're asking?

11 Q. Yes, f-number 4.0, image height 3.0 for
12 the KR357 prescription.

13 A. So for the KR357, paragraph 99 shows an
14 f-number of 4 and an image height of 1.9 where you
15 have pretty much nonsense going on. And so I reduced
16 the image height down to .95 to at least get a bundle
17 of rays through. I doubt it would have gone up to an
18 image height of 3 there because even at 1.9 it fails,
19 so...

20 Q. So for the KR357 design in your ray traces
21 in your original declaration, do those ray traces
22 accurately illustrate how the lenses in the KR357
23 system look?

24 A. Again, what do you mean by "look"?

25 Q. Yeah. I guess what's confusing about the

JULIE L. BENTLEY, PHD - BY MR. MASON

term "look"?

A. I don't know what you mean by "look."

Q. The appearance of the lens.

A. In what way?

Q. What is confusing about asking how the lens looks? For example, I think Figure 1 of KR357 shows a particular lens shape.

A. Okay.

Q. And the patent will often provide figures. If need be I can introduce a patent or hand you a patent. But can you agree that patents often show figures depicting lens systems?

A. They do.

Q. And they often show the shapes of the lenses in that system for a given prescription?

A. They do.

Q. Okay. And so what is confusing if I ask how the lenses look?

A. I just don't know what you mean by "look." Shape? Diameter? Thickness? Like what do you mean by "look"?

Q. Well, yeah, that's fair. How they appear. The general shape of the lens is depicted accurately. Does it accurately depict the lenses in that system?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. I'd rely on my code to do that.

3 Otherwise, it would be hard for me to do any of my
4 design analysis. I want it to look right.

5 Q. Okay. So they do -- okay. I think that
6 answers my -- I think that answers my question.

7 And so the outputs here of these ray
8 traces are accurate depictions of the lenses in the
9 KR357 system?

10 A. So, for example, the figure on the left.

11 Q. And we're now referring to paragraph is
12 that 99?

13 A. 99. The figure on the left when you see
14 the rays do this (indicating), I know that's an error.

15 Q. Yeah.

16 A. And that's an error introduced because I'm
17 trying to use this thing at a bigger image height or
18 faster f-number than it was designed for. And so the
19 program is physically not tracing rays correctly. And
20 I look at this and I don't pay attention to pretty
21 much anything there because I know it's not right.

22 So then I reduce the image height. And
23 now when I see that the rays go through, yes, I trust
24 what these look like on the right-hand one because
25 those are the correct shapes.

JULIE L. BENTLEY, PHD - BY MR. MASON

Q. Okay. For that particular image height?

A. For that image height and that f-number.

Q. Okay. And then -- and if I understand correctly, you did not try to -- for those ray traces on the right-hand side there in paragraph 99 of your original declaration, you did not attempt to further optimize the image height by increasing the field of view; is that correct?

A. I did not. It's so far away from where it needs to be. Yeah.

Q. Okay. No. No. I just want to make sure that yeah, you made no attempt to kind of push up that field of view?

A. I did not. It's not a small tweak. That's months of design time.

Q. Okay. Yeah. And I guess my point is you did not -- I understand you're stating that it's months of design time, but in this exercise here for this matter, you did not attempt to optimize for a higher image height in your CODE V analysis?

A. Based on my experience, I know how long it would take.

Q. Yeah. Yeah. My point is -- yeah, but you did not attempt to push up the image height in this

JULIE L. BENTLEY, PHD - BY MR. MASON

paragraph 99 ray trace on the right?

A. Increase the image height or optimize to increase the image height?

Q. Optimize to increase.

A. Because I did increase the image height just to see what it would do and it wasn't good.

Q. But you didn't go through an optimization process.

A. I did not go through an optimization process.

Q. And similarly for these ray traces in the ones that would properly trace in your original declaration, did you attempt to nudge down the f-number through an optimization process?

A. I think I stated earlier that I did not try and optimize any of the ones in this original declaration.

(The following exhibit was marked at a previous deposition: Number EXH 1004.)

Q. Gotcha. Okay.

Let's see. I'm handing you what's been marked as Exhibit 1004. And is Exhibit 1004 the KR872 patent that we have been discussing today, Dr. Bentley?

JULIE L. BENTLEY, PHD - BY MR. MASON

A. It looks like it, yes.

MR. MASON: You have that, Parrish?

MR. FREEMAN: I do.

MR. MASON: Okay. I'm assuming you have
copies of everything, but shout at me if you need one.

MR. FREEMAN: Okay.

Q. Okay. And this is the KR872 that we've
been referring to today and that you discuss in your
declarations; correct?

A. It is.

Q. Okay. If you look at the front page,
page 1 of -- strike that.

And can we refer to Exhibit 1004 as the
KR872 patent?

A. We can.

Q. So the front page of the Exhibit 1004, do
you see the sixth lens element there labeled 60?

A. I do.

Q. Okay. And is there a term in lens design
for referring to that shape of lens?

A. There's a bunch of terms. It's highly
aspheric. Occasionally, people will call it a
gullwing asphere because it looks like a gullwing.

Q. Okay. Can I see that?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. Looks like a bird. I don't know.

3 Q. Okay. So a gullwing or a highly aspheric
4 lens is how you might refer to it?

5 A. It's clearly not a sphere.

6 Q. Okay. So is there a common usage for this
7 type of gullwing asphere lens like the one shown as
8 element 60 in KR872?

9 A. When you say "common," common in?

10 Q. In lens design.

11 A. In lens design?

12 Q. Uh-huh.

13 A. Again, it's highly dependent on the type
14 of system you're designing, what it might be used for.

15 Q. Okay. Yeah. And what are some examples
16 of how it would be used?

17 A. For example, in, you know, the small
18 electronic devices with the aperture stop at the
19 front, it's used for distortion correction,
20 astigmatism correction, telecentricity correction.

21 Q. So in those instances it's used for
22 various types of corrections; is that fair to say?

23 A. Basically, these lenses -- for example, if
24 you go back to paragraph 99 in my original report, you
25 know, the -- this is the 357. The aperture stop is in

JULIE L. BENTLEY, PHD - BY MR. MASON

the middle. It's exceptionally long. You don't necessarily need as much of a gullwing to do what you need to do when you're trying to make it compact.

The aperture stop goes to the front, so you're going to need lens systems to control telecentricity and astigmatism and distortion because of the asymmetry about the stop.

Q. So when the stop is in front, then you really need that extreme shape of that gullwing asphere?

A. Depends on the field of view. For a small field of view, you don't necessarily need it. As you increase the field of view and you make it faster, then you need it. Again, there's -- when you say "common," in lens design there's no such thing as "common."

Q. Fair enough. Okay. But yeah, if I understand correctly, yeah, but if you're wanting to increase the field of view and you're wanting to make the lens faster and you have a stop at the front of your lens design system for small electronic devices as you said, then that gullwing shape really helps with field corrections; is that an accurate statement?

A. It does. You know it all interplays with

JULIE L. BENTLEY, PHD - BY MR. MASON

the rest of the system.

Q. Okay. And do these gullwing lenses -- do they have inflection points on them?

A. Again, it depends on the asphere. But yes, some of them have an inflection.

Q. Does this one on page 1 of KR872 have an inflection point on its object side?

A. As drawn?

Q. Uh-huh.

A. So I think this goes back to what we were talking about earlier. I can take any asphere and make it drawn out to some diameter. The question is, is it being used there.

Q. Yeah.

A. And there's no rays drawn on this picture, which is the number one key to if you can't see rays going through a patent lens drawing, you don't know that that's actually the right shapes.

Q. The right shapes. Okay. Maybe just setting aside KR872, if we talk in general about these gullwing aspheres that you discussed, is a usable inflection point important to those designs?

A. Again, it's highly dependent on the problem. What's the aperture? What's the field of

JULIE L. BENTLEY, PHD - BY MR. MASON

view? You know, are you trying to match to a particular sensor's chief ray angle? What are you trying to do with it?

Q. If I'm trying to increase the field of view and I'm trying to make a faster lens, will I want that gullwing asphere to have an inflection point on the image side?

A. It depends.

Q. Well, what does it depend on?

A. It depends on the shapes of the elements beforehand, the constraints that you put into the optimizer. Pretty much everything having to do with that design.

Q. Okay. Yeah. Well, and maybe another way to ask it is when used most effectively as a field corrector near the stop -- strike that.

When used most effectively as a field corrector nearest the image plane, do you want your gullwing aspheres to have inflection points?

A. Again, it's -- you know, it depends. I mean, we made lots of camera systems for many years without any aspheres and you figure out how to do it that way.

Q. I guess, yeah, is the gullwing asphere a

JULIE L. BENTLEY, PHD - BY MR. MASON

common lens in these small electronic devices that you mentioned?

MR. FREEMAN: Objection, form.

A. In a lot of the patents for a lot of the cell phone cameras and small, you know, webcams and things like that, there are highly aspheric surfaces in there. And again, depending on the f-number and the field of view, you know, yeah.

Q. Depending on the f-number and field of view, you want those -- those lenses are used commonly, the gullwing lens?

A. So depending on the f-number and the field of view, the gullwing lenses are -- sometimes there's one. Sometimes there's two. Sometimes there's three.

Q. And will a gullwing asphere be a gullwing asphere if it has no inflection points?

A. Again, "gullwing" is kind of a slang term. Maybe I shouldn't have given that to you.

Q. Yeah. Okay. I'm trying to work with your terminology.

A. I know.

(The following exhibit was marked for identification: Number EXH 1001.)

Q. And maybe what I -- yeah, we're using the

JULIE L. BENTLEY, PHD - BY MR. MASON

term "gullwing asphere," but I'm referring to the sixth lens element that's shown there in KR872. I can also put in front of you Exhibit 1001, which is the 499 patent. Does that also have what you called the gullwing asphere as the sixth lens element?

A. So this shape on the last surface is I think what we would refer to as a gullwing.

Q. So you're referring to the image side surface --

A. Image side surface.

Q. -- of the sixth lens element?

A. I don't know that the object side surface flips around completely.

Q. So this term "gullwing" is specific to a surface?

A. To a surface.

Q. So you're referring to Exhibit 1001, what's been labeled as 162? And that has a gullwing surface; is that correct?

A. That is correct.

Q. Okay. And in these types of applications -- and is that similar to the -- strike that.

Exhibit 1004, KR872, does the image side

JULIE L. BENTLEY, PHD - BY MR. MASON

surface of that sixth lens element also have a
gullwing surface?

A. So it has a surface that looks like that,
but there's no rays drawn. So you cannot actually
tell if it's using this part of the aperture. And
based on my analysis, you can't get any field through
there that uses that part of that.

So it's just part of the asphere
description whether or not it's being -- like when we
talk about gullwing aspheres, we talk about whether or
not they're being used for correction. I can't tell
here from this picture whether it's being used for the
correction.

Q. And when you say gullwing asphere is being
used, what do you mean by "being used"?

A. So when you go to the edge field point
here and you trace the rays back, this is the
external -- the largest field of view that goes in.
And that ray bundle samples that part of that surface.
And if you were to trace a point from here, it would
sample this part. If you trace a point from here, it
would sample this part. So each of the points on the
sensor are sampling different parts of this gullwing
and being used for correction. So it has a purpose.

JULIE L. BENTLEY, PHD - BY MR. MASON

Over here I can't tell what its purpose is. And I -- you know, based on just this figure, I think it's highly exaggerated because you would never mold a part to a point like that because it can't be molded that way. So it looks like it's -- I think it even says in here that it's exaggerated, like the figure.

I tell my students if you're going to come to me with a patent starting point, please, please, please make sure you get rays that trace through it so that you can use the figure as a guide because typing in this data is difficult. There's a lot of digits and they get it wrong. And they can use the figure as a guide because they can look at it and say oh, yeah, the rays go through exactly that way. The lenses look like that.

Q. The lenses have the shape, so we can sort of alter the design based on the shape of the lens?

A. Right. When they don't have rays trace through it, it's more often than not a disaster.

Q. Okay. And then coming back to the gullwing. So I think what you were -- I just want to make sure I understand what you were saying about the gullwing lens when used effectively. You're saying

JULIE L. BENTLEY, PHD - BY MR. MASON

when used effectively, you've got rays that trace through each portion of that gullwing shape.

A. Right.

Q. Okay. And is it important that that shape have that sort of curvature as you go out from the center to the edge of the lens?

A. That has a lot to do with, again -- do you have astigmatism in your glasses?

Q. I do.

A. The astigmatism correction for these large fields, it has to do with the chief ray angle that goes into the sensor coming in so it's not too tall so you lose light. It has to do with distortion. So you don't want your, you know, cell phone pictures to look highly distorted.

Q. Okay.

A. So that shape guides that ray bundle through it.

Q. Okay. Yeah. So you want to make sure that it kind of curves back towards the edge to capture that ray bundle; is that what you're saying?

A. It's not that easy. It's in combination with that surface, that surface, that surface (indicating).

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. I understand there's many surfaces.

3 A. And they all stack up. And they get just
4 the right point so they get this nice, pretty point
5 over here.

6 Q. Yeah. But, I mean, you call it a gullwing
7 because it curves back at the edge of the lens when
8 used effectively and you have the light passing
9 through that curved portion --

10 A. Yes.

11 Q. -- of the lens?

12 A. We call it a gullwing because it looks
13 like a gull.

14 Q. Okay.

15 A. Yeah.

16 Q. Okay. And do you know how long gullwing
17 lenses have been known and used in electronics design?

18 A. So when you asked me earlier a common use
19 for a gullwing, I think I've got a slide in my notes
20 where you can use a gullwing in the aperture stop to
21 correct higher-order spherical. So I think what
22 you're asking is how long have aspheres been known;
23 right? It depends on what you do with it.

24 Q. Okay. How long have aspheres been known?

25 A. I mean, I don't know.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Ten, twenty years?

3 A. I mean, I'm trying to think when they made
4 some of the first telescopes. They made parabolas.
5 Those are aspheres. These aspheres are pretty unique
6 in that they're the molded gullwing shapes. Those are
7 challenging. And so yeah, I don't know.

8 Q. So yeah. I mean, do you have a sense of
9 how long these molded gullwing shapes have been used
10 for lens assemblies for the small electronic devices
11 that you mentioned?

12 A. I don't.

13 Q. Would you say 15 years?

14 A. I wouldn't want to guess. I'd have to go
15 back and review the literature and see when they
16 started using them.

17 Q. Okay.

18 A. But again, it's not just this part that's
19 making it work. It's everything in concert; right?
20 And it's how they interplay.

21 Q. But is it fair to say that that gullwing
22 lens as the sixth element field corrector has a
23 critical role?

24 MR. FREEMAN: Objection, form.

25 A. But this element here is just as critical.

JULIE L. BENTLEY, PHD - BY MR. MASON

It's also a field corrector because the field, you know, there's a walk here too. It's how they play with each other.

Q. Gotcha. So both the fifth and the sixth lenses are -- are they referred to -- did you call them "field lenses"?

A. So this one's a field lens too. This one's a partial field lens (indicating). The only one that's truly not a field lens is the surface that's at the aperture stop.

Q. And as depicted in 872, that's Exhibit 1004 there, are both the fifth and sixth lens elements field lenses as depicted?

A. As depicted I can't tell anything because, as I mentioned, there's no rays traced. So I don't know what these lenses are doing. Like I can tell a lot from here because I can see the rays, so I know what they're doing.

Q. And this is probably asking a question you already answered, but I'll ask it anyway. On KR872, your modeling of that KR872 data did not attempt to adjust or optimize KR872 to generate ray traces with lens shapes as shown in Figure 1; is that correct?

A. I typed in the lens shapes as they're

JULIE L. BENTLEY, PHD - BY MR. MASON

given in the table. They don't match this figure.

Q. Right. Your image height and your --

A. No, they don't match that figure. I think it says in here that it's been exaggerated. And there's a couple surfaces that are -- clearly they don't match just even over a reduced aperture and f-number.

So this figure is not -- it doesn't match the table of data that you need to enter to actually try and use this, so...

Q. Okay. So when placed near the image plane, what does a field lens do on a multi-lens system? What role does it play?

A. Again, depends on what you're trying to do with the system. It can be a field flattener, so it can work on Petzval. It can correct astigmatism. It can work on distortion. It can try and control telecentricity.

MR. MASON: Let's go off the record. Take another little break.

(The proceeding recessed at 10:48 a.m.)

(The proceedings reconvened at 11:00 a.m.;
appearances as before noted.)

JULIE L. BENTLEY, PHD, resumes;

JULIE L. BENTLEY, PHD - BY MR. MASON

CONTINUING EXAMINATION BY MR. MASON:

Q. Are you ready to resume your deposition,
Dr. Bentley?

A. Yes.

Q. All right. Can I have you pick up again
Exhibit 1004? That's the KR872 patent.

A. Okay.

Q. And if you could turn to page 8 of that
patent, please. Do you see Figure 2 there on page 8
of KR872?

A. I do.

Q. And what does Figure 2 depict?

A. So these are aberration curves. So the
one on the left is Longitudinal Spherical Aberration.
Then there's Field Curves. And then there's
Distortion.

Q. So if we start with the one on the left,
the Longitudinal Spherical Aberration, does that show
good spherical aberration for this lens system at
3 millimeters?

A. "Good" is always an interesting, relative
term. It shows less than I'd say around 30 microns of
focus shift.

Q. Okay. And would you consider that to be a

JULIE L. BENTLEY, PHD - BY MR. MASON

well-performing lens?

A. Again, I'd need more criteria on like what the image sensor is and what the f-number is to compare that criteria with, you know, diffraction.

Q. I mean, does that longitudinal spherical aberration indicate poor performance in any way?

A. Same answer. Poor. Good. I need a little more context to actually, you know, say one way or the other.

Q. Okay. And what does this Longitudinal Spherical Aberration indicate? Where does this data come from?

A. So this axis, the vertical axis, goes from 0 to 1. So it's a normalized scale of the aperture. So again, we don't know what the f-number is, so it goes out to whatever f-number they say it does. I don't know what that is. And what it's showing is if you trace rays across the pupil, how much they're in and out of focus at the image plane.

Q. Okay. And how would you generate this type of diagram shown on the left-hand side of Figure 2?

A. In the software.

Q. Yeah. So this was generated by software?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. Oh, absolutely.

3 Q. Okay.

4 A. Yeah. These are called field curves. You
5 go up, you select field curves, and then it plots
6 them.

7 Q. Gotcha. And was this generated by CODE V
8 then?

9 A. CODE V.

10 Q. Sorry. I apologize. I'm going to screw
11 that up all day. Was this generated by CODE V?

12 A. Having written both books, I believe these
13 are CODE V plots.

14 Q. Okay. And so --

15 A. They have the same font.

16 Q. Okay. Got it. Fonts can tell a lot.

17 So your thought is that Figure 2 here
18 depicts an output from CODE V; is that correct?

19 A. Figure 2 I believe is an output from CODE
20 V.

21 Q. Okay. And then the middle figure there is
22 labeled Astigmatic Field Curves. What does that show?

23 A. So that is also showing a focus shift, but
24 this is as a function of the image height, so where
25 the rays are on the image. And there's a T and an S

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 curve, which is a tangential and a sagittal. So those
3 are two different types of rays in the pupil.

4 Q. And both the tangential and the sagittal
5 are shown there in Figure 2?

6 A. Yeah. This is hard to see here, but the
7 dashed line is the tangential, the T. And the solid
8 line is the sagittal.

9 Q. And what does this tell you about the lens
10 design here in KR872?

11 A. Again, there's about 25, 30 microns of
12 focus shift across the field.

13 Q. And where do you get that 25 microns from?

14 A. I'm taking -- so the bottom axis is in
15 millimeters. So the .025 is 25 microns. And so I'm
16 trying to take and figure out what the --

17 Q. What fraction of that .025 it is?

18 A. Yeah.

19 Q. So, I mean, given what you said, and I'm
20 just going off of what you said, it looks more like 5
21 or less than 5 microns?

22 A. Well, so I'm taking the edge of the T and
23 the edge of the T down here (indicating).

24 Q. Oh, okay.

25 A. And they both stick out like 10, 15.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Okay.

3 A. I'm just, you know, estimating.

4 Q. Yeah. And does this indicate -- I mean,
5 what does this tell you about the lens performance or
6 the lens -- does this tell you something about the
7 lens performance?

8 A. It tells you which parts of the field are
9 in focus on the image plane.

10 Q. Okay.

11 A. And where they're in focus.

12 Q. Okay. And would this type of curve be
13 considered higher performance?

14 MR. FREEMAN: Objection, form.

15 A. Again, highly dependent on what's the
16 f-number, what's the pixel size. Without that
17 information, I couldn't tell you if this was, you
18 know. It's not terrible, but it's also not so good
19 that I'm like oh, yeah, this is great. It's -- I
20 don't know.

21 Q. Okay. Does it indicate that the lens
22 actually can trace rays or create an image at an image
23 height of 3 millimeters?

24 A. So there is an image height here which is
25 the one that I used in my report. I'm like well, the

JULIE L. BENTLEY, PHD - BY MR. MASON

image height wasn't given, but the only thing in the entire report that gives you an image height idea is this thing that says 3 here.

The problem is that if you start generating the curves off of the prescription that's in here, they come nowhere near this level of performance. And you can only get to about, you know, not even half of that before you can't trace rays to evaluate the upper part of this curve.

Q. When you say "you can't trace rays to evaluate the upper part of this curve," do you mean when -- you mean when setting the f-number to be 2.5 or lower?

A. I think even setting it, you know, at f/4 or 5 or 6, I don't know if you can fully get 3-millimeter image height through there.

Q. Did you try that?

A. Probably.

Q. If you had tried it, would you have included it in your declaration?

A. I don't know that I was trying to -- that wasn't a point I was trying to make.

Q. What wasn't a point you were trying to make?

JULIE L. BENTLEY, PHD - BY MR. MASON

A. I'm trying to think why I would have included it.

Q. Why you would have tried to model it at an f-number of 4.0 and an image height of 3.0?

A. Yeah. I'm just trying to understand why the 4 and the 3 versus, you know, I tried a whole range of f-numbers and a whole range of image heights.

Q. Okay. And then on the right-hand side, the Distortion of Figure 2 in KR872, what does Distortion indicate?

A. So this is in percent. And so this is about oh, 3, 3 and a half percent distortion. So if you take a grid and image the grid through the lens system, it tells you whether the corners get stretched out or pushed in and how distorted it looks. And so this is about 3 percent, which is, you know, kind of just detectable by the eye.

Q. Okay. And that 3 percent is just detectable by the eye at the image height of 3 millimeters?

A. Yeah, at the image height of 3 millimeters.

Q. And when you get below say 2.25 or down by 1.5 millimeters on the image plane, it's not

JULIE L. BENTLEY, PHD - BY MR. MASON

detectable or less detectable; is that right?

A. It's less detectable. Modern camera systems are targeting things like 1 percent these days even though old-time film photography, a lot of those were around 3 to 4 percent.

Q. Do you know where small electronic device lens assemblies were in like the 2011 time frame in terms of distortion?

A. This is -- it's probably in this ballpark somewhere, 2 to 4 percent.

Q. Okay. And how about for the same time period astigmatic field curves, would this have been a reasonable astigmatic field curve shown in Figure 2 of KR872 in the 2011 time frame?

A. Again, with both the astigmatic and the longitudinal spherical aberration, I'd want to compare this to the depth of focus. And without an f-number, I can't calculate the depth of focus. So I can't tell if this is reasonable or not.

Q. Okay. And so for this data depicted in Figure 2 of KR872, do you need to have a traceable lens system in order to generate this data?

A. I do. So when I am working with my students, a good patent has a picture that looks like

JULIE L. BENTLEY, PHD - BY MR. MASON

the table and then you can replicate these curves. So this particular patent has a table that doesn't match the figure and you cannot replicate the curves.

Q. And was it understood that patents, at least in days past, would inject or sometimes have errors to --

A. Are you asking me if they intentionally mislead people?

Q. I'm asking was that a practice of patent drafters are you aware? I've heard this, so I'm asking you, have you heard that patents formerly had errors to force anyone picking up the patent to do a little work in order to implement the lens design?

A. I've certainly heard that. I don't tell my students that that's a common practice. I don't think it's a good idea to mislead people in patents.

Q. I would agree. But in 2010 was that still a practice by some patenting entities?

A. Again, I don't know.

Q. Strike that. I won't ask you if it was a practice. But was that something that was obviously -- I'm not asking whether you would do this yourself, but I'm asking was it understood or known in the industry that some people might include inaccurate

JULIE L. BENTLEY, PHD - BY MR. MASON

data in the patents so as to force designers to do a little extra work to actually create an optimized system using that patent?

MR. FREEMAN: Objection, scope.

A. I mean, I certainly heard it back, you know, back then, now. Again, it could also easily just be a typo. You don't know.

Q. Okay.

A. You know, if a sign gets switched, did somebody type it in wrong or is it intentional?

Q. Typos do happen.

A. Typos do happen. And I spent a good portion of this semester helping students fight typos. And when there's a typo, you can usually find a typo and carry on. I tried that here. I could not find typos. So I can't tell you why the picture, which says it's exaggerated, the curves, which, you know, the performance looks pretty good, and then the table data, none of them match.

Q. Yeah, but do I understand correctly that you did not attempt to modify any of the lens shapes provided by the table prescription based on this Figure 1 in KR872; is that correct?

A. Did I --

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 MR. FREEMAN: Objection, form.

3 A. I think you asked me earlier if I
4 attempted to optimize it. Did I attempt to do that?
5 No. Did I attempt to go in and try to figure out
6 what's wrong with the patent? Yes.

7 Q. My question is did you attempt to
8 adjust -- after entering the prescription data from
9 KR872 into CODE V, did you attempt to change the lens
10 shapes to correspond more to what is shown in Figure 1
11 of KR872?

12 A. I did, which is what you normally do when
13 you type in a patent. It doesn't ray trace. You've
14 got curves in here that say the performance looks like
15 it should be decent, so why isn't it ray tracing? So
16 then you go back in. You take a look at the figure
17 and you try to adjust some signs and things like that
18 to see if it matches.

19 But at some point, it was pretty clear
20 that the figure -- they definitely exaggerated parts
21 of the figure. There was no rays going through it.
22 So I couldn't use the figure to guide me to find the
23 problems with the table.

24 Q. And did you include any of those ray
25 traces or that modeling in which -- strike that.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Does your declaration include any of that
3 modeling where you attempted to modify the KR872 based
4 on the table data based on the KR872 figures?

5 A. I didn't include any of that because it
6 wasn't successful. It didn't get anywhere.

7 Q. Okay. Can I have you turn back to your
8 supplemental declaration. And could I have you turn
9 to paragraph 26. And do you see at the end of
10 paragraph 26, do you see the three images that have
11 been included in the declaration?

12 A. I do.

13 Q. And what are those three images?

14 A. These are x-ray images from three
15 different models, model numbers of Largan products.

16 Q. And did you take these x-ray images?

17 A. I did not take these x-ray images.

18 Q. Okay. And who provided these x-ray images
19 to you?

20 A. Largan provided these to me.

21 Q. Okay. And who at Largan did you speak to
22 in getting these x-ray images?

23 A. I think I got them through counsel. I
24 don't think I spoke with anyone directly.

25 Q. And then if we look -- let's just -- and

JULIE L. BENTLEY, PHD - BY MR. MASON

is it your understanding that these x-ray images depict lens systems in paragraph 26?

A. Yes, each one of these is a lens system.

Q. And can we look at the one in the middle that's labeled 60120?

A. Sure.

Q. Okay. And what are the -- are there lenses here -- at least as you understand it, are there lenses here in the 60120 image on page 15 of your supplemental declaration?

A. Are you asking where the lenses are versus the mechanics?

Q. Well, yeah. I'm just asking are there lenses in this system.

A. Oh, yeah. There's one, two, three, four, five, six lenses. There are different materials based on the different absorption in the x-ray.

Q. And just to make sure, you're pointing to those items that are kind of shaded gray in the middle of that 60120 system; is that correct?

A. Yes, I'm pointing.

Q. I'm sorry. The 60120 figure?

A. I'm pointing to these in the middle. There's spacers. There's mechanics.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. You said there's spacers and mechanics.

3 What do you mean by "mechanics"?

4 A. The outside mechanics that are holding all
5 the elements together.

6 Q. Okay. And if we look towards the middle
7 of that Figure 60120 on page 15, what is the black
8 space in between lenses?

9 A. Oh, this is air.

10 Q. Okay. That's air. And does that indicate
11 or is that spacing between the lenses, air spaces
12 between the lenses?

13 A. That indicates the air spaces as long as
14 you go right along the centerline, along the optical
15 axis.

16 Q. And is that air spacing important to the
17 performance --

18 MR. FREEMAN: Object to the form.

19 Q. -- of a design such as that depicted in
20 the 60120 on page 15?

21 MR. FREEMAN: Object to the form.

22 A. I mean, it's as important as the radii and
23 the materials and the center thicknesses. It's all
24 part of the prescription.

25 Q. And if the spaces between lenses shown in

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 60120 changed, would that impact the performance of
3 the lens?

4 A. So pick an air space.

5 Q. Yeah. I'm just saying if you were to
6 eliminate the air space between lenses 4 and 5 in the
7 image 60120 on page 15, would the lens perform as
8 expected?

9 A. Again, you'd have to have more specifics
10 to actually answer that question. I mean, if you
11 reduce this air space down, it's going to change
12 something on some level.

13 Q. Yeah. Is it your testimony that this air
14 space is not important, the specific distance between
15 the lenses is not important, an important
16 characteristic of the lens design?

17 MR. FREEMAN: Objection, form.

18 A. I think I said earlier it's just as
19 important as the radii, the thicknesses. It is
20 important.

21 Q. Okay.

22 A. It's just how important without -- if you
23 tell me how much you want to move it by and how much
24 you care about the performance change, I could tell
25 you whether or not...

JULIE L. BENTLEY, PHD - BY MR. MASON

Q. Yeah. Well, yeah. In handing a design to someone, if you specified a thickness -- or sorry. Strike that.

In handing a design to someone, if you specified a distance between two lenses and then that distance was eliminated or changed, would you expect that to impact the performance of your lens system?

A. It's all part of a tolerance analysis. So we go in and we check each parameter and find out how much you can change those, because you can't build anything perfectly. So there will always be some amount of difference. Question is, is it a nanometer? Is it a Micron? Is it a millimeter?

Q. Okay.

A. You want to be able to quantify how much it's going to change by.

Q. Okay. But the space -- okay.

But is it your testimony though that the spacing is not important?

MR. FREEMAN: Objection, form.

A. I think I just answered this question. The spacing is just as important as the radii, the thicknesses. And you need to go in and figure out how much you're changing it by and whether or not you

JULIE L. BENTLEY, PHD - BY MR. MASON

care.

Q. Okay. And so you indicated there are spacers in the 60120 figure on page 15. What did you mean by "spacers"?

A. So I believe the whitish elements, the lighter colored, are spacers that are spacing, for example, elements 4 to 5 and 5 to 6.

Q. And what role do those spacers play?

A. They're maintaining that air space to within some tolerance value.

Q. And what would happen if you removed those spacers?

A. Again, it depends on what the tolerance on that air space is.

Q. So you would expect this design to function if you removed those spacers in Figure 60120 here on page 15?

A. So if you remove the 4-5 spacer, it looks like it's thicker than the center thickness. So then the lenses would collide.

Q. Okay. And what would happen then if the lenses collide?

A. Well, not a good thing.

Q. Okay. All right.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. You generally don't want your lenses

3 crashing into each other.

4 Q. Okay. So at least for the 4-5 lens

5 spacer, if you remove the spacers, then your lenses

6 would collide?

7 A. Yeah.

8 Q. I'm just making sure I understand.

9 A. And even more so on the 5-6. If you take

10 the 5-6 out of there, then those middle points would

11 definitely touch.

12 Q. Okay. So those spacers, their purpose is

13 to maintain the spaces between the lenses to make sure

14 the lenses do not touch. Is that a fair summary?

15 A. In this optomechanical design. I mean,

16 you can easily extend this mold out like you do with

17 elements 1 and 2 where there's no spacer and then

18 extend out the edges here and contact them there. I

19 don't know why they did this the way they did.

20 There's lots of ways to do it.

21 Q. And my question is for this particular

22 design here, this 60120 design, they chose to use

23 spacers?

24 A. Yup.

25 Q. And is it the same thing in the 60122

1 JULIE L. BENTLEY, PHD - BY MR. MASON
2 design shown on the right-hand side of page 15? They
3 similarly have spacers?

4 A. It is.

5 Q. And those spacers in that figure also are
6 indicated by white?

7 A. I believe so, yes.

8 Q. Okay. And did you directly examine
9 these -- did you actually have these Largan product
10 models like in your lab or at your house, the 61020
11 model, for example, on page 15?

12 A. I don't have these specific ones of these
13 x-ray images, but I have a bunch in my office.

14 Q. But you don't have the ones for these
15 specific models?

16 A. No.

17 Q. Okay. And by "these specific models" I
18 mean -- let me just clarify. You don't have a
19 specific model of the 60 -- strike that.

20 You don't have a specific assembly of the
21 60079 model; is that correct?

22 A. I have a bunch of demo parts that I show
23 students. I don't remember what the model numbers
24 are. I'm sorry.

25 Q. Okay. But to the best of your

JULIE L. BENTLEY, PHD - BY MR. MASON

recollection, do you have the product that's known as
model 60120 in your possession?

A. Again, I couldn't tell you off the top of
my head which one it is, so...

Q. Okay. And what do you have --

A. Actually, they are.

Q. They are. Okay. And what do you have
those demo models for?

A. To show students because these are kind of
crazy lenses. They're little. And so, you know,
sometimes they don't understand what they're doing on
paper until they can physically hold something in
their hand and see it. And so I like to have demos.

Q. Okay.

(The following exhibit was marked for
identification: Number EXH 1035.)

Q. And Dr. Bentley, the court reporter has
handed you what's been marked as Exhibit 1035. And
does that show the excerpt of the 60120 model on
page 15 of your supplemental declaration with some
annotations added?

A. Yeah, it looks like the same thing.

Q. Okay. And if we look at the arrows
labeled 2, are those pointing to some of the lens

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 spacers that you were just discussing?

3 A. I think it's fair to call them lens

4 spacers, yes.

5 Q. Okay. And then what is number 1 pointing

6 to in this Exhibit 1035?

7 A. Are you pointing to the overall outside

8 housing?

9 Q. Yeah. Is that a housing?

10 A. I think what you're pointing to is that

11 whole structure. That's the housing.

12 Q. Okay. That's called the housing? And

13 number 1 is pointing to kind of near the central part

14 of that top housing?

15 A. Sure.

16 Q. And the housing extends kind of from front

17 to back on the top of the lens assembly, and then it

18 extends from front to back on the bottom portion of

19 the lens assembly; correct?

20 A. That's correct.

21 Q. And this figure only labels the top

22 portion of that housing; correct?

23 A. Yes. The assumption is it's rotationally

24 symmetric, so it's a big --

25 Q. Oh, okay. So it's actually circular?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. I'm sorry. I look at these things all day

3 long. So yes.

4 Q. I'm trying to understand these figures.

5 A. So imagine taking a lens and just cutting

6 it in half. What you're seeing is the slice. And

7 that's actually how we design. So we only look at

8 that slice. So every time you look at these figures,

9 right, so you can kind of like put them side by side.

10 So we see the cross-section.

11 Q. Okay. And what is that -- what is the

12 housing then just so I understand?

13 A. The housing -- for example, so if you take

14 a look at this, this part down here is smaller than

15 this element, which means that you're going to drop

16 the elements in from the right (indicating). So

17 imagine taking the housing, turning it like this, and

18 then you drop in this element. Then you drop in this

19 element. You drop in this element. You drop in this

20 element. You put the spacer in. The spacer is like a

21 washer. Imagine a washer.

22 Q. Okay.

23 A. Only it's a very fancy, complex-shaped

24 washer. And then you drop in another element, another

25 spacer, another element. And then somehow there must

JULIE L. BENTLEY, PHD - BY MR. MASON

be -- I can't tell from the x-ray. This thing is holding that last lens element in, so there must be two parts to this somehow threaded together. Maybe that's what this is here.

Q. The little ridge lines indicated on the upper right-hand corner?

A. Because somehow you have to be able to drop the element in and then you thread on very similar to you threading (indicating). You thread on so everything stays in place.

Q. And what role does the housing play?

A. It houses the elements. That's why we call it a housing. It holds everything together.

Q. Oh, yeah. Okay. So without the housing, like the lenses would just be --

A. They would just fall all over.

Q. Okay.

A. It's kind of like asking what role does the water bottle play.

Q. For the water.

A. It holds the water.

Q. And you have a big mess if you don't have the housing then.

A. Yes.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Okay. Okay. And then do you see all
3 those green arrows pointing to what are -- strike
4 that.

5 Do you see the green arrows pointing to
6 what are some more faint lines?

7 A. Yup. Those are little three-layer flare
8 and glare stops. They're basically -- so you're not
9 super young, so you've probably taken pictures with
10 those portable cameras; right? If you're standing
11 near the sun, you get a nice, bright ghost of the sun
12 on your image plate. You're like "Aw."

13 So these help with out-of-plane, bright
14 sources blocking the light that gets bounced around
15 and scattered from getting back to the detector. So
16 they're usually black. They absorb.

17 Q. They absorb?

18 A. Absorb light. They absorb errant light,
19 so light that you don't want that could come up and
20 then bounce around and get back to the detector. They
21 help absorb that.

22 Q. Okay. So they're kind of critical to sort
23 of eliminating that unwanted sunspot that you just
24 described?

25 A. Unwanted sunspot, ghost. So like on a

JULIE L. BENTLEY, PHD - BY MR. MASON

drawing like this, they have to be outside of any ray path because if they get into that ray path, then they actually could potentially vignette light. Some of them might be vignetting stops. I'd have to go look at the design.

For example, here you can tell that one of these surfaces has a vignetting stop because that ray doesn't fill that part of the aperture stop. So there is a vignetting stop at least in this particular patent. I'd have to go in here and find out if one of these are just glare stops or vignetting stops.

Q. To be clear, we've been mostly talking about Exhibit 1035, but in that last answer you briefly referred to the patent talking about the vignetting stop; is that correct?

A. Yes.

Q. Let me set the patent aside because I want to make sure I have a clean record.

A. Okay.

Q. And you can reference the patent if you need to, but I want to make sure the record reflects which document you're looking at so you're not misunderstood. But on these you're not sure --

A. I don't have enough information from any

JULIE L. BENTLEY, PHD - BY MR. MASON

x-ray if it's a glare stop, a vignetting stop.

Q. And you said a glare stop. And it's called a glare stop?

A. Flare stop, glare stop. There's a lot of names running around for these. Stray light blocker.

Q. Stray light blocker. All right. Okay. But yeah. And those are all those stops that you just discussed are all what's been labeled with number 3 by the green arrows --

A. It is.

Q. -- in Exhibit 1035.

Okay. I'm going to have the court reporter mark Exhibit 1036 as well.

(The following exhibit was marked for identification: Number EXH 1036.)

Q. All right. And this looks very similar obviously but to 1035 but does Exhibit -- strike that.

My question is does Exhibit 1036 accurately represent the 60122 image that you've included in paragraph 26 of your supplemental declaration?

A. With the annotations added.

Q. With the annotations.

A. Yes.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. So it's an accurate representation. And
3 for Exhibit 1036 do the blue arrows labeled 2 indicate
4 the top spacers in this image?

5 A. What do you mean by -- I mean, they're
6 rotationally symmetric. There's no top and bottom.

7 Q. Okay. Thank you.

8 A. Imagine taking this and taking the
9 cross-section. So it's all one spacer.

10 Q. I'm clearly geometrically challenged.

11 A. You're seeing a slice through here
12 (indicating).

13 Q. So my question is the arrows labeled 2
14 that are blue, do those indicate the spacers in this
15 system?

16 A. They do indicate the spacers.

17 Q. And do the spacers in this system play a
18 similar role to the spacers we discussed with respect
19 to Exhibit 1035?

20 A. Yes, I believe so. They look like they're
21 spacing the 4-5 and the 5-6.

22 Q. And if you removed one or both of those
23 spacers in Exhibit 1036, the lenses would collapse
24 onto each other; is that correct?

25 A. If you removed them and you don't change

1 JULIE L. BENTLEY, PHD - BY MR. MASON
2 the outer shape of these elements, yeah. I mean,
3 they're keeping -- they're like a washer. They're
4 keeping things apart. But there's no reason why you
5 couldn't design the lenses -- like --

6 Q. Yeah.

7 A. -- the other lenses in the front don't
8 have spacers.

9 Q. But I'm asking just for these spacers
10 here, they're keeping things apart.

11 A. For these spacers --

12 Q. They're keeping things in the spots where
13 they're supposed to be.

14 A. For the particular shapes of these lenses,
15 yes, they're keeping them apart.

16 Q. And then in Exhibit 1036, is the red arrow
17 labeled 1 also pointing to the housing for that image?

18 A. That is also pointing to the housing.

19 Q. And does that housing play a similar role
20 as the housing in Exhibit 1035?

21 A. Yes.

22 Q. Okay. And then the green arrows here
23 again labeled 3 in Exhibit 1036, are those also
24 pointing to a number of stops in this image?

25 A. They're pointing again to these flare

JULIE L. BENTLEY, PHD - BY MR. MASON

stops, glare stops, yes.

Q. And do those flare stops and glare stops play a similar role here for Exhibit 1036 system as they do for the system shown in Exhibit 1035?

A. They should. They should be, you know, light blocking. I don't see any reason why they wouldn't.

Q. Okay. Bear with me a second here.

And if we look to the 60120 image shown on page 15 of your supplemental declaration, did you model that system shown in CODE V?

A. This very specific system?

Q. Yup, that very specific system.

A. No. I don't think I have the full set of data. I got the data I needed to go through the claims, but I don't think I had the full set of aspheric coefficients to enter that into CODE V.

Q. And similarly for the 60122 image shown on page 15 of your supplemental declaration, did you model that specific system in CODE V?

A. I did not model that one either. I don't think I ever had the full prescription. Again, I asked for the set of data I needed to check against the claims.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. And who provided you that data?

3 A. I worked with counsel to get it.

4 Q. Did you speak with someone at Largan about
5 that data?

6 A. I don't believe so.

7 Q. Okay. And in doing any of this modeling
8 of the Largan products, did you speak to anyone at
9 Largan about the specific model numbers discussed in
10 your supplemental declaration?

11 MR. FREEMAN: Objection, form.

12 A. No, I don't think I spoke with anyone
13 there. I told counsel what data I needed to check
14 against the claim and I got it.

15 Q. Okay. Do you have the 499 patent there?
16 Or actually, you know what? You could probably even
17 just turn to page 15 in your supplemental declaration.
18 That would be easier for everyone.

19 And do you see spanning pages 15 and 16 of
20 your supplemental declaration you've got Claim 15 of
21 the 499 patent laid out there?

22 A. I do.

23 Q. And does implementing a lens that meets
24 these elements of Claim 15 of the 499 patent
25 necessarily result in good image quality?

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 MR. FREEMAN: Objection, form.

3 A. I don't know what you're asking.

4 Q. I guess maybe if I implemented a system
5 that had all these characteristics for Claim 15 of the
6 499 patent, would that necessarily have -- produce a
7 good image quality?

8 MR. FREEMAN: Objection to form.

9 A. Again, I'm not really sure I understand
10 the question. I can say that if you type in any of
11 the embodiments in this patent, they're all good.

12 Q. And I'm not asking about the embodiments.
13 My question I'm asking is could I implement a system
14 that had very bad image quality and still satisfy
15 Claim 15 of the 499 patent.

16 MR. FREEMAN: Objection, form.

17 A. But that's what the embodiments are. They
18 embody the claims.

19 Q. I am not asking about those embodiments,
20 but is it possible that I have a system with poor
21 image quality that satisfies these claim elements?

22 A. You can type anything in and move the
23 image plane and it's not going to work. That has an
24 out-of-focus image.

25 Q. Okay. So I could --

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. Again, I'm still not really sure I

3 understand what you're asking.

4 Q. So could I implement a system that had,

5 you know -- strike that.

6 You see all these elements listed for

7 Claim 15; right? A first lens element with positive

8 refractive power. Second lens element with negative

9 refractive power. You see all those elements listed

10 on pages 15 to 16 of your supplemental declaration?

11 A. I do.

12 Q. And does creating a system that simply

13 satisfies these requirements, does that necessarily

14 give you a lens assembly that creates a good image

15 quality --

16 MR. FREEMAN: Objection, form, scope.

17 Q. -- or do I need more information and data

18 that is included here in the claim to create good

19 image quality?

20 MR. FREEMAN: Objection, form, scope.

21 A. So the claims cover the structure of the

22 design which is what I teach. I teach students when

23 to use positive power, negative power, all of that.

24 That's what the claims are covering.

25 The embodiments give you the specific data

JULIE L. BENTLEY, PHD - BY MR. MASON

which, you know, hold to the claims and give you the good design. And there's lots of examples of them. So there's not one solution.

Q. Okay.

A. There's a range of solutions.

Q. And could I have a solution that meets these claim elements that actually does not even trace rays?

MR. FREEMAN: Objection, scope, form.

A. Again, you can just move the image plane and it will be out of focus.

Q. Okay. So it's possible to have a system that meets all the elements of these claims but cannot create a good image on the image plane; is that correct?

MR. FREEMAN: Objection, scope.

A. There's an infinite number of combinations of radius, thickness, material that give you all different design results. Again, I'm sorry. I don't understand exactly what you're asking.

Q. Yeah. What's confusing about my question?

A. Sorry. I've been following your questions all along. This one I'm not understanding.

Q. Yeah. Yeah. Well, and maybe --

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 A. I'm not trying to be difficult. I don't
3 understand what you're asking.

4 Q. There may be a better way to phrase it.
5 Does Claim 15 specify the spaces between the lenses?
6 And I'm just focusing on Claim 15 itself. I'm not
7 looking at anything else in the 499 patent. Does
8 Claim 15 specify the spacing between the lenses?

9 MR. FREEMAN: Objection, form, scope.

10 A. I'm trying to remember. Some of these
11 claims have spacing but I don't think 15 does. So no.
12 So 15 I don't think says anywhere in here the spacing.

13 Q. Okay. And so could someone create a
14 design that, you know, met all the elements of Claim
15 15 and then just had wildly variant spacing between
16 the lenses ultimately resulting in a system that just
17 does not create a good image?

18 MR. FREEMAN: Objection form scope.

19 A. So some of the spacings would create a
20 good image and some would not. That's also
21 tolerancing. I mean, when you have a final design,
22 there's some variation on the amount that the air
23 space can change by. So if you change it by more than
24 is acceptable, the image quality will drop.

25 Q. So you could have a system that met all

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 these requirements in Claim 15 but then, because the
3 spacing was off, you just did not have good image
4 quality; is that correct?

5 MR. FREEMAN: Objection, form, scope.

6 A. If you came up with a design that had good
7 image quality and you changed the air space by more
8 than the acceptable amount, the image quality would
9 drop.

10 Q. And could it drop to a point where the
11 rays don't trace?

12 A. I guess if you move it by meters, yes. I
13 mean, again, how much are you moving it by?

14 Q. Even moving it by millimeters. Can you
15 envision a scenario where you move it by millimeters
16 and the rays won't trace?

17 A. This lens has a focal length of
18 2 millimeters. So if you move an air space by more
19 than its focal length, it likely will have trouble.

20 Q. But that still will satisfy the claim;
21 correct? The system will satisfy the claim?

22 A. I don't think it would because I think
23 you're going to run into problems with things like the
24 YC over YD. I think when you just shift an air space
25 like that, you have to actually look at the rest of

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 this and make sure everything is okay.

3 Q. When you say "make sure everything is
4 okay," what do you mean by that?

5 A. Make sure. Go through each one of these
6 and make sure. So I think the YC over YD in that case
7 if you shifted it by millimeters, it would actually
8 come to a focus inside the lens. And so your chief
9 ray, you know, the YC and the YD distance would not be
10 inside the claim range.

11 Q. But isn't YC/YD just the critical point,
12 the height of the critical point on that sixth
13 element?

14 A. It is. But as we discussed earlier, it's
15 in the area that you use. If you look at any of these
16 x-ray images, the shape of the lenses outside of the
17 area where you trace the rays can do whatever it wants
18 for mounting. So the important part is where the rays
19 are inside that lens system.

20 Q. But you did not trace rays for any of
21 these lens systems for the Largan 60122, 60120 or
22 60079 models; is that correct?

23 A. I did not. But I specifically asked for
24 the YC and the YD points based on the ray trace when I
25 calculated the --

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Yeah, but you did not do that modeling or
3 ray tracing.

4 A. I didn't, no.

5 Q. Okay. Let me see. Oh, yeah. Could I --
6 let's see. Could I have you pull up Exhibit 1035
7 again?

8 A. Which is?

9 Q. The 60122. That's these annotated images.

10 A. Okay.

11 Q. So you have in front of you Exhibit 1035?

12 A. I do.

13 Q. And you see the six lenses in
14 Exhibit 1035?

15 A. I do.

16 Q. Okay. Are the surfaces of the fourth lens
17 aspheric?

18 A. One, two, three, four. They certainly
19 don't look like they'd fit to a sphere.

20 Q. Oh, they would not. Got it.

21 A. I think by nature they have to be an
22 asphere.

23 Q. Sorry. Yeah. So the answer to that
24 question -- or sorry. I'm going to phrase it again.
25 So is it your testimony then that the surfaces of the

JULIE L. BENTLEY, PHD - BY MR. MASON

fourth lens are aspheric?

A. Based on looking at this figure, I think they have to be aspheric, yes.

Q. And in Exhibit 1035 is the object side surface of the fifth lens convex?

A. Convex, yes.

Q. What is the focal length of the sixth lens element?

A. So I can't tell you what the focal length is of a picture like this, which is why I asked for that data specifically.

Q. Okay. And what is the focal length of the fifth lens element in Exhibit 1035?

A. Again, so are you talking about the exact focal length?

Q. Yes, I'm asking what the exact focal length of the fifth element is.

A. You can't tell what the exact focal length is off of an x-ray. You need radii, thickness, index data to calculate the focal length.

Q. So for Exhibit 1035, on those lenses you don't know the exact focal length of any of those lens elements; is that correct?

A. I got the focal lengths from Largan based

JULIE L. BENTLEY, PHD - BY MR. MASON

on the prescription, but I don't have them just
looking at an x-ray.

Q. Oh, yeah. So in your -- where in your
declaration do you indicate the focal lengths of those
lenses?

A. Should be in here somewhere. So which
specific one?

Q. Well, I'm wondering what the exact focal
length of the sixth lens element is.

A. The focal length of the sixth lens
element. I am not seeing a table of focal lengths.
But the claim is negative refracting power and you can
tell by looking at this that it has negative
refracting power.

Q. Is it your testimony that you don't know
the focal length of any of these lens elements in the
model 60120 discussed in your supplemental
declaration?

A. I'm trying to think if I have to have any
of the specific focal length values versus just
knowing the power. If I needed the specific focal
length, I'm sure I asked. But if I just needed to
look at the picture and figure out if it's positive or
negative power, you can do that from the x-ray.

1 JULIE L. BENTLEY, PHD - BY MR. MASON

2 Q. Oh, yeah. I'm not asking about the power.

3 I'm asking for the specific focal length of these

4 lenses. Yeah. That's fine. If you don't have it,

5 that's fine.

6 A. I'm not seeing it and I don't think I

7 needed it, so...

8 Q. Okay. Yeah. And you just didn't have

9 enough information on these models to know that focal

10 length for a given lens; is that correct?

11 A. I didn't need it. I got all the

12 information I needed to go through the claims.

13 Q. And that information came from counsel?

14 I'm not asking to divulge any other counsel

15 communications, but that information that you relied

16 on came from counsel; correct?

17 MR. FREEMAN: Objection, form.

18 A. I went through the claims and I decided

19 what I needed to know about the lens systems beyond

20 the x-ray images and asked for that data.

21 Q. Okay. And then you got that data from

22 Mr. Freeman here?

23 A. I believe I got that data from -- yes.

24 Q. And let's just look at page 15 of your

25 declaration there for the model 60120. What is the

JULIE L. BENTLEY, PHD - BY MR. MASON

distance from the object side surface of the first lens element to the image plane of this system?

A. Again, I'm trying to decide if that's something that was in this set of claim language and if it's in here. So that was the object side to the image plane?

Q. Yeah.

A. Yeah, I don't see any specific values in here for that. Again, I didn't need it.

Q. Okay. Yeah. And for model 60122 -- that's the one on the right-hand side -- what is the distance from the object side surface of the first lens element to the image plane?

A. Yeah. With respect to Claims 15 and 18, I don't think I needed that distance at all, so I didn't ask for it.

Q. And do you know for either model 60120 or model 60122 shown on page 15 of your supplemental declaration, do you know the specific thickness of either of the second lens elements?

A. Again, I just searched through here. I didn't see anything on CTs or air spaces that are in here. I'm trying to think if it's somewhere else. Yeah. No. Again, I don't think I needed it for

1 JULIE L. BENTLEY, PHD - BY MR. MASON
2 Claims 15 and 18, so it wasn't something I asked for.

3 Q. Okay. All right. We can go off the
4 record.

5 (The proceeding recessed at 12:01 p.m.)

6 (The proceedings reconvened at 12:44 p.m.;
7 appearances as before noted.)

8 JULIE L. BENTLEY, PHD, resumes;

9 CONTINUING EXAMINATION BY MR. MASON:

10 (The following exhibit was marked for
11 identification: Number EXH 1037.)

12 Q. Dr. Bentley, are you ready to resume your
13 deposition?

14 A. I am.

15 Q. Great. Placed in front of you is what's
16 been marked as Exhibit 1037. Do you see that?

17 A. I do.

18 Q. And is this a copy of the "Lens Design"
19 book listed on page A-3 of your CV that we discussed
20 earlier?

21 A. Yes, it is. Oh, it's even in color.

22 Q. The whole kit and caboodle. So this is a
23 copy of that book. And if you turn to the second
24 page, the copyright page, it's copyright 2012?

25 A. Yes.

JULIE L. BENTLEY, PHD - BY MR. MASON

Q. So you confirm that this is a true and accurate copy of your book as published in that year?

A. Yes.

Q. And again, this is the same "Lens Design" book that we discussed earlier today?

A. Yes.

Q. Okay. And that is listed on page A-3 of your CV; correct?

A. Yes.

MR. MASON: All right. Well, Parrish, I have no further questions.

MR. FREEMAN: Wow. Let's take a break.

(The proceeding recessed at 12:51 p.m.)

(The proceedings reconvened at 12:57 p.m.;
appearances as before noted.)

JULIE L. BENTLEY, PHD, resumes;

MR. FREEMAN: I do not have any questions on redirect. I would like the witness to read and sign.

MR. MASON: Great. Thank you.

(TIME: 12:57 p.m.)

* * *

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

W I T N E S S

Name	Examination by	Page

Julie L. Bentley, PhD	Mr. Mason	3-122

* * *

E X H I B I T S

Exhibit	Description	Marked	ID'ed

EXH 1035	Excerpt of 60120 model with annotations	99	99
EXH 1036	Excerpt of 60122 model with annotations	105	105
EXH 1037	Copy of "Lens Design" book by J. Bentley and C. Olson	121	121

(Exhibits retained by the Court Reporter to be returned to Mr. Mason)

* * *

EXHIBITS PREVIOUSLY MARKED

Exhibit	Description	Page

EXH 1001	Patent U.S. 8,514,499 B2	71
EXH 1004	KR872 patent	65
EXH 2001	Corrected Declaration of Julie L. Bentley, PhD in Support of Patent Owner Preliminary Response	5
EXH 2036	Supplemental Declaration of Julie L. Bentley, PhD	6

* * *

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

DOCUMENT REQUESTS

Request Page

(No Documents Requested)

* * *

CERTIFIED QUESTIONS

Question Page

(No Certified Questions)

* * *

A C K N O W L E D G M E N T

I, Julie L. Bentley, PhD, declare, swear
and aver that I have read my testimony contained
herein and that my answers are true and correct, with
any exceptions noted on the errata sheet, under
penalty of perjury.

Julie L. Bentley, PhD

I certify that this transcript was signed
in my presence by Julie L. Bentley, PhD on the _____
day of _____, 2023.

IN WITNESS WHEREOF, I have hereunto set my
hand and affixed my seal of office of _____
on this _____ day of _____, 2023.

Notary Public

My Commission Expires:

1
2 C E R T I F I C A T I O N
3 STATE OF NEW YORK:
4 COUNTY OF MONROE:

5 I, MARY ELIZABETH PHILLIPS, do hereby
6 certify that I reported in machine shorthand the
7 above-styled cause; and that the foregoing pages were
8 produced by computer-aided transcription (CAT) under
9 my personal supervision and constitute a true and
10 accurate record of the testimony in this proceeding;

11 I further certify that I am not an
12 attorney or counsel of any parties, nor a relative or
13 employee of any attorney or counsel connected with the
14 action, nor financially interested in the action;

15 WITNESS my hand in the City of Rochester,
16 County of Monroe, State of New York.
17
18
19
20

21 MARY ELIZABETH PHILLIPS,
22 Freelance Court Reporter and
23 Notary Public No. 10SE6156762
24 in and for Monroe County, New York
25