UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORESIGHT DIAGNOSTICS, INC.,

Petitioner,

vs. No. IPR2023-00224

PERSONALIS, INC.,

Patent Owner.

_____/

DEPOSITION OF HENRY MORRICE FURNEAUX, PH.D.

Remote Zoom Proceedings

Hartford, Connecticut

Tuesday, December 12, 2023

REPORTED BY:

LESLIE ROCKWOOD ROSAS, RPR, CSR 3462

Pages 1 - 171 Job No. 6346424

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Foresight EX1223
Foresight v Personalis
IPR2023-00317

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Deposition of HENRY MORRICE FURNEAUX, PH.D., taken on behalf of Petitioner, Remote Zoom Proceedings from Hartford, Connecticut, beginning at 9:02 Eastern Standard Time and ending at 3:00 p.m. Eastern Standard Time, on Tuesday, December 12, 2023, before Leslie Rockwood Rosas, RPR, Certified Shorthand Reporter No. 3462.

APPEARANCES:

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APPEARANCES (Continued):

Also Present:
Stephen Moore, Esq., Personalis

I N D E X

Tuesday, December 12, 2023

WITNESS	EXAMINATION
HENRY MORRICE FURNEAUX, PH.D.	
BY MR. KRAUSE	8

QUESTIONS WITNESS INSTRUCTED NOT TO ANSWER:
(None)

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DEPOSITION EXHIBITS

HENRY MORRICE FURNEAUX, PH.D.

NUMBER	DESCRIPTION	IDENTIFIED
Exhibit 1208	Exemplary Chart of Personalis' NeXT Personal Test Practicing Claim 1 of U.S. Patent No. 11,384,394, Personalis EX2012-001 - 005	46
Exhibit 1209	Genome Assembly NCBI36	101
Exhibit 1210	Sequence Coverage	104

PREVIOUSLY MARKED EXHIBITS REFERENCED HEREIN:

EXHIBIT	PAGE
2031	15
2008	40
2012	48

Hartford, Connecticut; Tuesday, December 12, 2023
9:02 Eastern Standard Time

PROCEEDINGS

--oOo-- 09:01:30

THE REPORTER: You do solemnly state and affirm that you will well and truly tell the truth, the whole truth and nothing, but the truth?

THE WITNESS: Correct.

THE REPORTER: Thank you, sir. 09:02:14

We are on the record at 9:02 a.m.

MR. KRAUSE: And you have Andrew Krause from Irell Manella LLP on behalf of Petitioner Foresight Diagnostics, and I'll let my co-counsel introduce themselves. 09:02:30

MR. NAINI: This is Amir Naini of Naini PC for Foresight Diagnostics.

MR. LUMAN: My name is Nate Luman. I'm from the law firm of Knobbe Martens. I represent Personalis in this matter, and I'm joined today by Steve Moore, who is 09:02:42 counsel at Personalis.

THE REPORTER: Thank you, Counsel. You may proceed.

///

/// 09:02:52

EXAMINATION

BY MR. KRAUSE:

Q. Good morning, Professor.

A. Good morning.

Q. Could you state -- 09:02:58

A. I'm sorry. Go ahead.

Q. Could you state your name for the record.

A. My name is Dr. Henry M. Furneaux, F-U-R-N-E-A-U-X.

Q. And have you been deposed before? 09:03:09

A. Yes, I have. Yes.

Q. About how many times?

A. I would say a handful is what's coming to mind. Four or five.

Q. And when was the most recent time you were 09:03:21 deposed?

A. Oh, that would be -- that would be in January of -- I think of this year. The beginning of January -- yeah, January '23, I'm fairly confident.

Q. Okay. Yeah, so I won't spend a lot of time 09:03:38 going over the groundwork, and obviously, we're on Zoom, and we'll try to not speak over each other. I know we just had an issue. It will happen. We'll do our best.

A. Yeah, I know. It's classic. I was wondering if you have any rules in terms of what I should do with my 09:03:55

equipment and so forth.

Q. Yeah, so that was going to be my next question is: Is there anyone in the room with you?

A. No. I'm in the top floor at 146 Kenya Street, which is my laboratory, and this is my little office 09:04:08 area. It's right next to the lab. Part of the lab, really.

Q. And I can see a desktop computer, but other than that, do you have any electronic devices out there?

A. Yeah, I mean, routinely I actually -- I 09:04:20 routinely use two separate computers, two Mac computers. Obviously, one is a backup. It's currently not -- it's on, but it's not -- there's nothing on the screen. It's dead.

You can see a wee bit in the left-hand corner, 09:04:36 as you look in there, that little blue thing. And I have my computer here, which is a nice big screen.

I have my iPhone, which is sitting here.

What I would suggest is I'm going to put it in a corner of my desk, which is quite far away. It's hard 09:04:55 for you to see that.

I'm going to put it over here face down, wrong side up. And I'm not expecting any calls. My kids do call a lot, but they've been instructed not to, but, you know, you never know. 09:05:11

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1 Q. Very good.
2 And on the main desktop computer, other than
3 this Zoom, do you have anything open currently?
4 A. Yeah, yeah, absolutely. What I have right now
5 is I've got Safari up and running, which I'm guessing 09:05:22
6 I'll need. For some reason, system settings is on, but I
7 don't think that's important.
8 I've got email on. Would you like me to turn
9 that off or?
10 Q. Yes. 09:05:35
11 A. Okay, sure. Let me set about doing that kind of
12 thing.
13 Where is force quit? Oh, here it is. All
14 right. I'm force quitting mail. Very good. This tells
15 me -- oh, I've got messages open as well. Force quit 09:05:54
16 that. Got Microsoft Word open. I'll force quit that.
17 And I'm left with Acrobat, which I figure I'll
18 need. Safari, system settings, you never know. Zoom,
19 and then Finder.
20 Does that sound good? 09:06:14
21 Q. That sounds good.
22 And to confirm on your desk, open on your
23 computer, anywhere else in the room, you don't have any
24 materials currently out really to --
25 A. No, just aside: I have a note pad that I use. 09:06:24

1 call it a declaration, but a first statement of some kind
2 towards the end of January if my memory serves me
3 correct. That's the best I can come up with.
4 Q. Yeah, I think I can help you.
5 So I believe you submitted a declaration in 09:08:10
6 approximately the March to April 2023 time frame. So
7 then you would have been contacted in January 2023.
8 Is that your best recollection?
9 A. That sounds -- that sounds consistent with my
10 memory, yeah. 09:08:25
11 Q. And before that first contact in January 2023,
12 what did you know about Personalis?
13 A. Well, embarrassingly, not very much at all. And
14 I would have to say in general, what I do is, you know, I
15 look at my Twitter feed every morning for science news in 09:08:51
16 general. I'm sort of vaguely aware of companies coming
17 and going. But not to disparage my counsel colleagues
18 here, you know, companies come and go so one doesn't pay
19 that much interest in what's going on.
20 So the name rang a bell. I wouldn't say I 09:09:10
21 immediately knew exactly what was going on.
22 Q. And so in January 2023, based on your frequent
23 review of science news, you didn't know much, if
24 anything, about Personalis' products?
25 MR. LUMAN: Mischaracterizes testimony. 09:09:27

1 Excuse me for a second. I'll put it away into the lab.
2 Okay.
3 MR. KRAUSE: Perfect.
4 (Interruption in proceedings.)
5 Q. BY MR. KRAUSE: So we'll both try for the sake 09:06:52
6 of the reporter to just pause when somebody's talking and
7 wait to just make sure we have a clean and clear record
8 here.
9 But so you understand that the oath that you
10 just took is the same oath that you would take and the 09:07:04
11 testimony has the same gravity as it would as if we were
12 before a judge and a jury?
13 A. Uh-huh. Fully aware of that, yes.
14 Q. Is there any reason you can't testify
15 truthfully, accurately, and completely today? 09:07:18
16 A. None that I'm aware of.
17 Q. And you understand that you've been retained as
18 an expert on behalf of Personalis in these proceedings;
19 is that correct?
20 A. That is correct. 09:07:32
21 Q. When were you first contacted by Personalis to
22 work on this case?
23 A. I think that would be probably late January
24 of -- of this year. I think what might tie that down is
25 the first -- there was a first -- I'm not sure if you 09:07:55

1 THE WITNESS: Yeah. I think you're going a wee
2 bit too far there. I mean, the name rang a bell. And as
3 I'm sure everyone here is well aware, there's lots of
4 companies popping up and disappearing. You know,
5 Illumina is the gold standard that one would think, oh, 09:09:45
6 yeah, so they're going to be around for a while.
7 I'm generally aware of activity in the area, of
8 course. There's going to be, hopefully, advances and so
9 forth that would be useful.
10 But, yeah, that -- and that's generally the 09:10:00
11 nature of these kinds of conversations. In fact, I
12 generally find an advantage that I don't really know what
13 a company is doing, and therefore, I'm able to evaluate
14 the scientific questions, obviously never on a completely
15 unbiased way, but in the best unbiased way that I can. 09:10:18
16 And I'm talking about biased in view of
17 knowledge of what a particular company's trying to do or
18 has done.
19 Q. BY MR. KRAUSE: But at best, you had a very
20 surface-level understanding of what Personalis was doing 09:10:37
21 as of January 2023. Is that fair?
22 A. I think that's quite fair. And what typically
23 happens is in the conversation, it will be pointed out to
24 me what the -- what the major discussion point is at that
25 point in the proceedings, and of course, whether I could 09:10:52

1 aid in that discussion, and then that tends to be the
2 major focus of that conversation.
3 Q. And you're being compensated for your time for
4 your work on this case; is that correct?
5 A. I hope so, yes. 09:11:08
6 Q. Is Personalis current on your invoices?
7 A. Well, I'm not really the best businessperson in
8 the world. My daughter actually looks after my billing
9 and so forth. My input is I click in my time on the
10 phone, and she deals with the -- with the billing. So I 09:11:29
11 couldn't tell you right now.
12 I think we -- I think she billed for September
13 or August? We're very slow here in those kinds of
14 things.
15 Q. But ultimately, you expect to be paid on your 09:11:51
16 invoices; is that correct?
17 A. Oh, yeah. Yes. I think we all share that hope
18 in general, yes.
19 Q. Great.
20 But even though you're being compensated, is it 09:12:02
21 fair to say that you approached your work on this case
22 without any preconceived notions of the outcome that you
23 should reach in your opinions?
24 A. Oh, absolutely. That's -- this is the nature of
25 this contribution. Absolutely. 09:12:14

1 Q. All right. I'm going to -- I guess we'll find
2 out if the Exhibit Share is working.
3 A. Oh, good. All righty.
4 Q. So I'm introducing what's been previously marked
5 as Exhibit 2031 in these proceedings. And let me know 09:12:53
6 when you receive it.
7 A. Should I -- should I refresh this window?
8 Because it says folder is empty. So I'm guessing I
9 should maybe --
10 Q. Yeah, I believe it's best if you refresh, and 09:13:09
11 then you down -- if you download it, then it will work
12 much more smoothly than using the viewer.
13 A. Okay. Oh, yeah. No, I would like to download
14 it, but right now it's saying -- oh, we're good. We're
15 good. I've got a -- I've got a PDF 2031. 09:13:23
16 Okay. I'm going to proceed and see if I can
17 download that. You should click on here; is that
18 correct? Press download. Nothing is happening.
19 MR. LUMAN: Andrew, I clicked on it, too, and
20 I've got a wheel that's spinning. I think it's going to 09:13:55
21 download, but...
22 MR. KRAUSE: It was slow uploading here, so
23 hopefully --
24 MR. LUMAN: All right.
25 MR. KRAUSE: -- the internet wakes up a little 09:14:03

1 bit.
2 THE WITNESS: We've all seen these funs and
3 games before.
4 I've double-clicked on it, and I'm now in a
5 Safari window rather than in Adobe. I'm a little leery 09:14:15
6 of that because I won't be able to probably manipulate it
7 in terms of the size; is that right? Oh, actually, I
8 can.
9 THE REPORTER: Counsel, do you want to go off
10 the record? 09:14:30
11 MR. KRAUSE: Yeah, let's go off the record
12 briefly.
13 (Discussion off the record.)
14 THE REPORTER: Back on the record, Counsel.
15 MR. LUMAN: And I'll state to keep track of 09:18:44
16 time, we started at 9:02. We went off at 9:14. It's now
17 9:18.
18 MR. KRAUSE: Very good.
19 Q. So Dr. Furneauz --
20 A. Yes. 09:18:56
21 Q. -- you now have in front of you what's been
22 previously marked as Personalis Exhibit 2031; is that
23 correct?
24 A. Yeah. It says here in the bottom right-hand
25 corner, it says "EX 2031." 09:19:10

1 Q. And this is a declaration that you submitted in
2 IPR Numbers 2023-00224 and IPR 2023-00317; is that
3 correct?
4 A. That's entirely correct.
5 Q. And so this is a single declaration that was 09:19:28
6 submitted in two proceedings, and those proceedings
7 involved patents 11,384,394 and 11,408,033; is that
8 correct?
9 A. That's correct.
10 Q. And to make our lives easier, is it okay with 09:19:43
11 you if we call those the '394 and '033 patents?
12 A. Oh, absolutely.
13 Q. And you reviewed your declaration carefully
14 before you signed it. Is that fair?
15 A. Oh, yeah. I mean, I reviewed it to the best of 09:20:04
16 my ability, yes, with appropriate care.
17 Q. And sitting here right now, are there any
18 corrections you'd like to make to it?
19 A. I'm not aware of any typos that I've seen, for
20 example. Like all documents, it can always be improved, 09:20:21
21 but perhaps this testimony is an opportunity to verify
22 issues.
23 Q. Sitting here right now, are there any
24 substantive corrections or modifications you want to make
25 to your declaration? 09:20:38

A. None that I'm immediately aware of sitting here right now.
Q. And can you tell me a little bit about the process for preparing your declaration.
MR. LUMAN: And I'll just caution the witness 09:20:50
not to reveal any attorney-client privileged communications in answering that question.
THE WITNESS: Oh, sure. I -- I'm aware of that.
Yeah. I think, you know, I've done this before, and in my perspective, these declarations are very much a 09:21:05
collaborative effort in that I'm not a legal expert. I have no knowledge of legal proceedings.
And so in the conversations that are required to produce this report, it's important for me that the legal team is able to translate the legal concepts into a 09:21:31
format where I can look at in the scientific light and say, "Oh, okay, so the question here is X. What's the evidence for X? What's the evidence against X? What are the other folks saying? Is that true? Is it substantiated?" All of these kinds of concerns. 09:21:57
And so typically what happens is we go backwards and forwards, and as I said, it's a collaborative effort, and eventually come up with this document, in which I've been made clear as to what the scientific question is, to the best of everyone's ability, and therefore, I'm now in 09:22:18

a position to be able to opine clearly.
But to reiterate, the legal underpinnings of this are an area that's well out of my bailiwick.
Q. BY MR. KRAUSE: I see.
At a general level, what was your overall 09:22:40
assignment in your work in this declaration?
A. Well, in this particular circumstance, on your side, if I may use that terminology -- perhaps I can call you Andrew. Is that permissible?
Q. Either is fine. 09:22:56
A. Whatever is fine.
On your side, in this particular case, your side is asserting things which the legal team on Personalis' side is rejecting, and which is what one would expect. Even I know that about a legal proceeding. 09:23:13
And so my job is to evaluate the solidity of the assertions on your side and thus be able to evaluate where the truth lies in a -- again, strictly in a scientific arena.
And I think it's fair to say -- and people often 09:23:37
say that science is a very definitive, quantitative discipline -- there are opinions on either side. And it's not up to me. This is the nature of a legal proceeding. It's up to someone else, which I presume in this case will be the Board, they eventually decide which 09:23:57

of these opinions hold the most merit.
This is how I view this particular exercise.
Q. Is it fair to say that your assignment was to disagree with the opinions of Dr. Quackenbush? Is that a fair summary? 09:24:14
A. No, I wouldn't put it that way. When I -- when I take on a case, I -- I look first simply is at the scientific principles involved. And it's -- it's -- it is generally the case. We're dealing with two adversaries. There's going to be differences in opinion. 09:24:30
And my opinion is sort of to say, "Okay, so what do you actually think about this? Does this -- is this really as substantiated as these folks think it is?"
And, yeah, I would agree we're in one sense typically what one finds -- and this is probably because 09:24:47
of the realization to take on a particular case, that your opinions tend to be more in favor of the position of the folks you're working with than the other folks.
But that's -- you know, you advance towards that level. And it very much depends on the original 09:25:06
conversation.
And some conversations I've had on some patents, it's very clear, even in that preliminary conversation, "Oh, no, these folks are simply saying something that's quite ridiculous." 09:25:23

So this is, you know, if you like in a sports analogy, it's a slam-dunk. There are no complexities, de-complexities involved in this particular arena.
Q. Is it fair to say in your declaration you didn't independently search the prior art to confirm the alleged 09:25:39
novelty and non-obviousness of the Personalis inventions?
MR. LUMAN: Objection. Form.
THE WITNESS: So perhaps you'd better say that question again. When -- when -- when Nate has something to say, I tend to want to listen more carefully to your 09:25:56
question.
Q. BY MR. KRAUSE: Come back to that in a second. Let's switch gears slightly.
So did you prepare for your deposition today?
A. Oh, well, yes, we did. It was -- it was a fun 09:26:10
time, you know.
Q. And what did you do to prepare?
A. Well, I think -- here my memory is pretty good because it was just last week. I think I had a couple of Zoom sessions with Nate specifically, and I think it was 09:26:27
just Nate early -- what are we? Oh, yeah, December 4th and December -- December 7th springs to mind.
Those were checking in. I did a fairly somewhere between shallow and deep read of the original declaration, reacquainting myself with what was going on, 09:26:54

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1 trying to get back into the groove.
2 We had some -- and those things were about, I
3 would say, an hour each or hour and a half, something
4 like that. Just getting stuff squared away.
5 But over this weekend, we had fairly intense 09:27:11
6 sessions. I think Nate's idea was to get me into the
7 groove of starting these proceedings in somewhat similar
8 fashion. You could call it a dress rehearsal, really.
9 And we -- in particular, I was most interested
10 in establishing the areas in the declaration that could 09:27:31
11 potentially be confusing to a layperson.
12 The challenge in these declarations is to -- is
13 to -- is to cross two worlds, a layperson's world -- but
14 also you've got to be careful -- and sometimes all of us
15 make mistakes -- you've got to be careful that when you 09:27:51
16 do that layperson routine, you're actually still quite
17 scientifically rigorous. And that can be a challenge.
18 Some kinds of things I think are going to work
19 in communicating to lay folks sometimes can be -- wind up
20 a little bit more confusing than simply going down a -- a 09:28:09
21 more rigorous scientific presentation.
22 And I think it's fair to say that in our
23 discussions on Saturday -- was it Saturday? No, no,
24 sorry. Sunday and yesterday, some things came to light
25 that I think I can improve on. So I think that's the 09:28:28

1 benefit of doing these prep sessions.
2 Q. So overall, it was about four prep sessions. It
3 was the 4th, the 7th, Sunday, and yesterday?
4 A. Yeah. I mean, Saturday and Sunday were -- I'm
5 speculating -- I don't really know what Nate thinks -- 09:28:43
6 but I'm thinking he was thinking of this in terms of a
7 dry run, which was an excellent idea.
8 I think we ran from 9:00 our time here in the
9 East Coast to about 4:00. Something like the real thing.
10 I thought that was a great idea, you know, from our 09:29:01
11 perspectives.
12 Q. And other than Mr. Luman, was anybody else
13 present at those meetings?
14 A. Oh, yeah, in those -- in those longer sessions,
15 Steve, who's the inhouse counsel for Personalis, he 09:29:13
16 dropped in occasionally just to see -- I would imagine
17 just to see how things are going.
18 Q. And no one from the Weil firm?
19 A. Yeah, I mean, I know Derek well. We've worked
20 on a number of projects. And so he was the original 09:29:33
21 introductory contact.
22 Again, I'm speculating, but I presume that
23 Personalis was looking around for someone, and they
24 contacted Derek, and then, of course, Derek thought, "Oh,
25 this is ideal for Henry. This is right up his," you 09:29:51

1 know, "bailiwick." I'm guessing. I don't -- totally
2 speculating at this point.
3 But he was no longer -- we worked -- Derek and
4 myself worked a little bit on that first statement. But
5 in this new phase, since the preparation of this 09:30:09
6 declaration, it's been all Nate and a little bit of Steve
7 checking in.
8 Q. Very good.
9 So if we could turn on your declaration at
10 paragraph 43. 09:30:22
11 A. How do I get to it easily? Can I just find 43?
12 Q. If you teach for "Materials Considered," that
13 might be the fastest way.
14 A. Oh, okay. I search for what?
15 Q. "Materials Considered." 09:30:37
16 A. Oh, materials. It didn't find it.
17 Q. Page PDF --
18 A. Yeah, I know. I understand. My typing is, as a
19 Nate will tell you, is legendary.
20 All right. I've got it. In my examination of 09:30:59
21 materials used in preparing this report? Is that where
22 we are?
23 Q. It doesn't sound exactly what's written, but I
24 think it sounds like possibly an accurate paraphrase. So
25 we have Section 4, paragraph 43, page 23. 09:31:15

1 A. Well, sorry. I've got to go to the next
2 materials, then. What page should I be on?
3 Q. It's PDF 29, and on the numbering, it's 23.
4 A. Let me just go to page 29. That's maybe the
5 best way to go. That's a PDF page number; right? 09:31:41
6 Q. Correct.
7 A. Okay. All righty. I'm on page 29. Paragraph
8 56.
9 Q. 43.
10 A. Well, there's some confusion here because I'm on 09:31:56
11 page 29, and I'm looking at paragraph --
12 Q. I think the issue -- so the PDF page numbers are
13 different. We'll use the numbers on the bottom of the
14 page as --
15 A. Oh, that would be perfect. Thank you. So what 09:32:10
16 is that number?
17 Q. Page 23 on the bottom of the page.
18 A. Okay. All righty. That makes sense.
19 25, 24, 23. Okay. "Materials Considered," yes.
20 Q. And so in forming your opinions in this case, is 09:32:26
21 it fair to say that you reviewed the materials cited here
22 and nothing else?
23 A. Now let me just double-check. The two patents,
24 yes. Dr. Q's declarations, yes. And there was two of
25 those; right? 09:32:50

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1 Q. Correct.
2 A. Board's decisions, yes. And I guess the
3 materials cited in the declaration, yeah. Yeah.
4 Q. And so --
5 A. I think that's correct, yeah. 09:33:03
6 Q. So if something's not cited in your declaration,
7 it's fair to say that it wasn't a basis for your opinion;
8 is that correct?
9 A. Oh, I don't -- I don't want to entrap myself
10 like that. I would have to review and make sure that 09:33:17
11 what you said is correct. I'm tacitly thinking that's
12 correct, but I always can stand to be corrected.
13 Q. All right. And the materials cited in your
14 declaration, did you search for and identify any of those
15 documents? 09:33:38
16 A. It depends. There's a mixture there. I think,
17 if I'm recollecting this, I think it is your side that
18 suggested the major prior art that I looked at. I'm just
19 going one out. For example, the Leary paper I think was
20 proposed by your side, and aren't I correct? 09:33:59
21 Q. Yeah, that's fair.
22 So setting aside obviously documents that were
23 already existing in this case, such as the Board's
24 decisions, Dr. Quackenbush's declaration --
25 A. Oh, setting aside that. I see. 09:34:20

1 Q. Were any of the new exhibits urged by
2 Personalis, did you look at that?
3 A. Yeah. I mean, that will be a mixture. Of
4 course, you know, upon examining just, for example, the
5 Leary paper, there were things that came to my mind, and 09:34:35
6 I started, you know, looking around -- this is my normal
7 habit -- to see, okay, so what was done before? Who did
8 this? What was happening? General stuff.
9 And I'm always quite careful just to review the
10 material prior to the priority date. I think that's 09:34:54
11 quite important. Because I don't want to get a picture
12 that would be altered by an understanding of, you know,
13 what happened next; right? After the period that we're
14 engaged in.
15 It's somewhat a difficult task to put yourself 09:35:08
16 back into that time frame and be very clear about what
17 folks were aware and what they were not aware of. I try
18 and do that to the best of my ability. So I'll uncover
19 some papers.
20 On the legal team's side, where -- where they 09:35:25
21 can make a really good contribution is they do things
22 like searching. In this particular case, what's
23 relevant, springs to my mind, is they'll search the
24 proceedings when a patent is getting reviewed and
25 awarded. And so it's the correspondence that comes out 09:35:41

1 of that can be quite useful, and in this particular case,
2 that's a part of my declaration.
3 Now what happens there obviously is they do that
4 kind of search. They find stuff that they -- that they
5 think may be relevant. And then, of course, then I 09:35:59
6 review it and say, "Oh, well, yeah, it's" -- "I think
7 that's a fair point so it's worth putting in a
8 declaration."
9 And of course, you know, I'm always a wee bit
10 leery about that because, you know, if I didn't do the 09:36:14
11 original search -- and sometimes what I have seen is that
12 those kinds of searches are almost very old-school, kind
13 of VAX, computer-type searches, which is somewhat
14 intimidating to me.
15 But as I said, they do their best and come up 09:36:29
16 with material they think may be relevant, and I look at
17 it and say, "Yeah, you know, I think that's fair."
18 And also to be fair, the legal team, most of
19 their suggestions or contributions tend to be more
20 legalistic based. More like so-and-so used this word. 09:36:46
21 What does that mean?
22 And it's my job to say, well, you know, X, Y,
23 and Z. And sometimes it might be a fair point and
24 sometimes it might not be.
25 Q. Is it fair to say that to the extent that you 09:37:03

1 identified materials, they were sort of scientific
2 literature, like journal articles and the like --
3 A. Yeah.
4 Q. -- and that patent materials was --
5 A. Yeah. In a broad way, I would say the division 09:37:12
6 of labor there is that the legal team -- sorry, should I
7 slow down?
8 A broad division of labor is that the legal team
9 will be primarily occupied with more obviously legalistic
10 things in their comment. My domain is more, as you would 09:37:33
11 expect, the pure science aspects.
12 And of course, I'm always open to suggestions.
13 For example, Steve is somebody in the team who might make
14 a suggestion because they have some -- some knowledge of
15 a particular paper that I might not think of primarily 09:37:55
16 and bring to my attention. And again, I'll read that and
17 see if it's got relevance or not.
18 MR. LUMAN: And I just want to remind the
19 witness to be careful in answering these questions with
20 not revealing communications that took place between you 09:38:11
21 and the attorney that are privileged communications.
22 THE WITNESS: I hear, Nate. And what I'm trying
23 to do is give the flavor of what I'm doing without really
24 providing any identifying details, and I hope I'm being
25 successful in that endeavor. 09:38:31

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1 Yeah, one of the lessons I've learned from these
2 depositions is that my teaching Socratic style, where I
3 perpetually ask questions to make sure everyone
4 understands is not going to get a response. So I
5 apologize for that. 09:38:50
6 Q. BY MR. KRAUSE: All right. So in preparing your
7 declaration, you did not independently search for patent
8 materials; is that correct?
9 A. That would depend by what you mean by "patent
10 materials." I mean, the one example that's springing to 09:39:03
11 my mind is the -- you know, the correspondence, the
12 to-and-fro-ing between the patent examiner and the
13 hopeful inventor, the what I'd call the typical back and
14 forth, where they say, "Oh, we need to do this or maybe
15 this doesn't fit or whatever." That kind of 09:39:20
16 backwards-and-forwards correspondence is what I'm
17 primarily referring to.
18 Q. So, for example, in forming your opinions for
19 this declaration, you didn't review any Personalis
20 patents other than the '033 and '394 patent; is that 09:39:34
21 correct?
22 A. I reviewed those. Now I'm not sure if you know
23 or not, but I got engaged in the, I guess what you'd say
24 in this context, the next two cases.
25 Q. Setting aside those two patents, did you review 09:39:53

1 A. Well, I haven't read them so I'm not able to
2 formulate any opinion on that.
3 Q. Well, based on the process that you previously
4 described, Personalis' counsel likely would have
5 identified them to you; isn't that correct? 09:41:15
6 A. No. I mean, most -- again, Nate, is counseling
7 me not to identify or disclose our privileged
8 information.
9 No. In general -- there's always exceptions --
10 most of those discussions were about papers, you know, 09:41:36
11 from the old days in that time period. Sort of reminding
12 me how things were, which -- which it's a bit of a task
13 to put yourself back into 2011.
14 Q. And other than counsel, did you speak to anyone
15 at Personalis in preparing your declaration? 09:41:56
16 A. Nope.
17 Q. And did you review any of the other declarations
18 Personalis submitted in October in this case?
19 A. No.
20 Q. And since you submitted your declaration in 09:42:14
21 preparing for your deposition, have you reviewed any
22 additional documents besides what's cited in your
23 declaration?
24 A. Yeah, I mean, I'm not sure. Maybe Nate can
25 comment on this because, you know, I don't tend to have a 09:42:29

1 any other Personalis patents in preparation of this
2 declaration?
3 A. That would be four Personalis patents, just so
4 we're on the same page, that I've looked at.
5 Q. Right. 09:40:04
6 A. The first two, I would have to say a little bit
7 more detailed because, obviously, I came back to them in
8 the last week. They're more uppermost in my mind, I
9 think is the way I would say it.
10 Q. And if I can just get a clear answer to my 09:40:17
11 question.
12 So setting aside the '033, the '394, the '611,
13 and the '783 patents, in these IPR proceedings, you have
14 not reviewed any other Personalis patents; is that
15 correct? 09:40:30
16 A. I think that's correct, yeah. At this point, I
17 would have no -- no reason to. Actually, I would have to
18 say it came a bit of a surprise to me that there were so
19 many. It came a bit of a surprise to me that there is so
20 much litigation going on. 09:40:51
21 Q. And given that there's so many, if there were
22 other patents from Personalis out there that supported
23 your positions, you probably would have cited them in
24 your declaration.
25 Is that fair? 09:41:03

1 firm grip on what's in and out. I think I -- I think
2 that's correct.
3 THE WITNESS: Do I stand corrected, Nate? Are
4 you aware of something that is the exception to that
5 rule? 09:42:45
6 Q. BY MR. KRAUSE: I just need the best answer that
7 you can give right now without Mr. Luman's assistance.
8 A. Well, I have to say, again, that I tend to rely
9 on folks' assistance in matters like this. That's too --
10 too much of a general question. 09:43:05
11 I think all of us here would agree there's an
12 enormous amount of material in this particular two cases,
13 and it's a little difficult for me to keep track exactly
14 what is within the boundaries that you're indicating.
15 Q. Very good. 09:43:25
16 And so I think we spoke briefly about this
17 before, but you've been an expert in a number of patent
18 cases.
19 Is that fair?
20 A. Yeah. 09:43:39
21 Q. And in those cases -- and so this proceeding
22 obviously involves the validity of patents. Have you
23 ever opined on the issue of infringement?
24 A. Yeah. I think I need to repeat how lacking in
25 legal knowledge I am. I don't think so. I've -- and 09:44:01

1 again, to be very clear, the opinions I remember about
2 scientific concepts, if you ask me -- and I hope I would
3 be able to respond -- about what my opinion was on a
4 scientific controversy, I'll probably be able to tell
5 you. 09:44:26
6 Again, I'm only speculating. But I think one of
7 the reasons I get on very well with legal teams is that
8 they sort of delight in the fact that I'm almost blindly
9 unaware of the legalistic underpinnings.
10 Q. Well, so in your declaration, one of the 09:44:46
11 scientific opinions that you provide is that the NeXT
12 Personalis -- I'm sorry -- the Personalis NeXT Personal
13 assay embodies the claims of the '394 and '033 patents.
14 Do you understand that?
15 A. Oh, I do understand that, but again, that has to 09:45:04
16 be converted into scientific questions that I can
17 recognize that I can opine on.
18 Q. All right. Let's turn to that. And we can take
19 a look at paragraph 178 of your declaration.
20 A. Sure. 178. 09:45:21
21 Q. And that starts on page 119.
22 A. Yeah. I'm reading in that direction. I
23 apologize for my slowness. Actually, I was given to
24 believe that you would be sharing, you know, the document
25 as a share on Zoom and would be leading me, but... 09:46:00

1 Q. I can try to do that. Give me a second.
2 A. All right, but I'm getting there. 175, -6, 178.
3 Okay. Yep, I'm there.
4 Q. Okay. Let me just see if I can help out. And
5 maybe I'll do it at the break, but it's making me update 09:46:28
6 myself.
7 You've got 178. Very good.
8 A. Yeah, I sympathize.
9 Q. And if you scroll down, there's a lengthy chart
10 with the claim language and some -- some text. 09:46:38
11 Do you see that?
12 A. Yeah, I see that.
13 Q. We're in the same place.
14 A. Yeah.
15 Q. And so I want to understand, what did you do to 09:46:48
16 determine that the NeXT Personal assay bodies the claims
17 of the '394 and '033 patents?
18 A. Well, again, the process is quite familiar. The
19 legal team offered this to me as materials that I should
20 review, and my job is to check that what's in the 09:47:08
21 left-hand-side column there is, in fact, recapitulated in
22 the right-hand-side column.
23 And as I'm looking at this now, this first
24 column, I would concur.
25 Q. And in this analysis, did you apply the same 09:47:26

1 rigor to your nexus analysis as you did to your other
2 analyses in this declaration?
3 A. Well, I think I would say in general in this --
4 I took Latin in school so that's a bit of an advantage.
5 So the objective indicia is something actually I can -- I 09:47:48
6 can recall.
7 And this is an area where it's materials that
8 may not require a high level of analysis. They tend not
9 to be papers; they tend to be statements. And the
10 question for me and my job is to make sure that the 09:48:10
11 scientific language in the left-hand side, for example,
12 indeed corresponds to the language on the right-hand
13 side.
14 Q. And so in matching up the documentation about
15 the Personalis assay and the claims, you didn't review 09:48:36
16 any internal Personalis documents; is that correct?
17 A. No, no.
18 Q. "No"? No confidential documents from
19 Personalis; is that correct?
20 A. This is what I was given as, you know, will you 09:48:46
21 evaluate this and check that what's being said on the
22 left is -- I guess a good word is "mirrored" by these
23 various statements and brochures, that kind of material
24 on the right.
25 Q. All right. Let's turn -- let's look at an 09:49:12

1 example of this. If we turn to page 122.
2 A. Okay.
3 Q. This is claim element 1B of the '394 patent.
4 A. Yeah. Okay.
5 Q. And so what was the basis for your conclusion 09:49:38
6 that the NeXT Personal assay involves whole genome
7 sequencing?
8 A. What was the basis of my conclusion? The
9 statement that they conduct a whole genome sequencing
10 assay. 09:49:56
11 Q. And so you didn't ask to see any documents that
12 show data from a single read -- a single run of that
13 assay; correct?
14 A. No. Again, my role in this exercise is to check
15 that the language in the brochure matches the language on 09:50:06
16 the left-hand side.
17 Now in terms of whole genome sequencing, by the
18 time I came to looking at this section of the
19 declaration, I was already aware of all the controversies
20 and the ideas and notions about what constitutes whole 09:50:25
21 genome sequencing.
22 And so this would not be the place to -- to look
23 at that evidence. This is simply the place to say, yes,
24 we are talking about the same thing here.
25 The evidence as to whether something is or is 09:50:42

1 not whole genome sequencing, at least in my mind, this is
2 not the relevant place for that discussion to occur.
3 Q. It's your testimony that this was not the
4 relevant place to determine whether the whole genome
5 sequencing referenced on page 17 of the NeXT brochure 09:50:59
6 constituted whole genome sequencing in the same way the
7 term is defined in the proceeding; is that correct?
8 A. What I'm saying is: This provides the task, the
9 exercise used for me to establish that what's being said
10 in the claim is mirrored simply in the statement or 09:51:19
11 writings from the Personal brochure.
12 What I'm saying is a major area of discussion in
13 this declaration, I am sure -- we which will have
14 presently -- is the discussion that's elsewhere in my
15 declaration that addresses the nature of that beast and 09:51:40
16 what it may or may not be. What I'm simply saying is:
17 This is not the place to address that. At least that was
18 my understanding.
19 Q. And so it's your understanding that in this
20 section in your declaration on objective indicia, that it 09:51:56
21 was sufficient that the word "whole genome sequencing"
22 appear in the right-hand column; is that correct?
23 A. I prefer my perspective. From what I was
24 challenged to do, that seemed to be sufficient.
25 Q. Very good. 09:52:15

1 Let's turn to page 157 of your declaration.
2 A. I'm sorry for being so slow here. It's going a
3 wee bit slower than I thought.
4 Yeah, okay.
5 Q. And this is the chart for the '033 patent on 09:52:40
6 objective indicia.
7 A. Uh-huh.
8 Q. And this is the -- this is the evidence that you
9 cite for element 1A; is that a fair characterization?
10 A. Sorry. Can you say that again? I was lost a 09:52:57
11 bit there.
12 Q. Yeah. And so this is the entry on element 1A of
13 claim element 1A of the '033 patent?
14 A. We're discussing 1A in the left-hand side, and
15 it's from '033 -- that's quite correct -- and whether 09:53:13
16 that is then illuminated on the materials.
17 Q. Okay.
18 A. And there's -- if I'm recalling, there's
19 something different about this, where there's yet an
20 additional piece of information, which would be this 09:53:28
21 Exhibit 2008.
22 Q. Well, I can -- I can put that into the exhibit
23 share so that you have it.
24 A. Oh, okay. Because I'm just recalling there's
25 something -- something additional is required here, I 09:53:43

1 think, that needs examination.
2 MR. KRAUSE: So I will give you an Exhibit 2008
3 from the '033 IPR.
4 THE WITNESS: Let me go back to Safari, see
5 what's happening back at the -- I clicked on view. Well, 09:54:02
6 I'll refresh.
7 MR. KRAUSE: All right.
8 MR. LUMAN: If you can give us the verbal cue
9 when you put it in, then we'll hit the refresh button.
10 MR. KRAUSE: Yeah, I was waiting for the 09:54:23
11 finished uploading. It is now saying that it is
12 introduced so you guys should refresh.
13 THE WITNESS: It's all good.
14 Exhibit 2008. I suspect we'll just -- just need
15 this transiently; am I correct? There's no sense in 09:54:38
16 loading it?
17 MR. KRAUSE: That's fair.
18 THE WITNESS: Okay. Thank you.
19 Q. BY MR. KRAUSE: Take a look at whatever --
20 whatever you would like in Exhibit 2008. 09:54:48
21 A. Yeah, I may be in error. This is not what I'm
22 thinking of, I suspect. But what I'm seeing in
23 Exhibit 2008 is it says "Exemplary Chart."
24 Q. Yeah, and so I think if you go to page 24,
25 that's what you cite in -- on page 157 of your 09:55:18

1 declaration, which is what I believe --
2 A. Yeah, I apologize. It's very difficult for me
3 to keep exhibit numbers squared away. I'm used to last
4 author publications as being -- as being my memory jog.
5 Yeah, so I apologize. I'm just clearly thinking 09:55:38
6 of something else when -- this is not the thing I need to
7 see or the other thing I was thinking about.
8 Are we all good?
9 Q. If you've reviewed what you needed to --
10 A. Sorry, I was not clear enough. This is not what 09:56:26
11 I thought it was -- this is not what I thought I was
12 looking for.
13 Q. Very good.
14 So let's go back to the chart at page 157.
15 A. Yeah, okay. 09:56:41
16 Q. And so the evidence that you cite for the NeXT
17 Personal assay practicing claim element 1A of the '033
18 patent is this paragraph 6 from Exhibit 2008, page 24;
19 correct?
20 A. Yeah. Correct, yes. 09:56:56
21 Q. And this -- this is a declaration from a
22 Dr. Mouradian; is that correct? In Exhibit 2008?
23 A. Oh. Well, wait a minute. So this is -- we're
24 going around in circles here. Yeah, you've jogged my
25 memory. 09:57:15

There is a statement that Dr. Mouradian make
that is -- would -- would help this particular mirroring
exercise.
Q. And you did not speak to him or her?
A. Yeah. I have no idea who Dr. Mouradian is. 09:57:28
Q. And in this paragraph 6 that you've quoted
here --
A. Yeah.
Q. -- there's no explanation of how the capture
probes are designed in the NeXT Personal assay, is there? 09:57:39
A. Oh. Let's take a quick look here. Blah, blah,
blah, blah, blah, blah.
Yeah. So I would agree with you the -- the
claim language there clearly talks about capture probes.
It's certainly the case that a person of ordinary skill 09:58:21
in the art would be well aware of what such things are,
but that is not specified in this little short blurb.
And I guess my original thought was correct.
Yeah, there's a -- there's a missing piece here where I'm
presuming from that exhibit that I dismissed -- and I 09:58:41
apologize. Somewhere in there is a statement from this
Dr. Mouradian, in fact, indicating what -- in other
words, the pieces that may not be exactly mirrored.
Am I correct?
Q. I -- I don't believe there is. But if that 09:59:03

of what capture probes are and how they might be designed
and how they might work.
Q. And there's no mention of a computer processor
in paragraph 6 cited here; correct?
A. Well, I -- I would have to agree with you. Yes, 10:01:27
there is no mention of a -- using the aid of a computer
processor. That is perhaps something that one might
assume would be the case, but it is not outlined here
directly.
Q. And there's no discussion of the design of any 10:01:44
specific capture probe for a particular polymorphism;
correct?
A. Again, a person of ordinary skill in the art
would be well aware of how such a -- how such a probe
would be designed, and it would seem to me in this 10:02:04
particular announcement or statement that there would not
be any need to specify a particular -- one particular
capture probe for one particular process.
Q. And it's your testimony that the reason for that
is because a person of skill would just know how to do 10:02:27
that.
Is that fair?
A. A person of ordinary skill in the art would be
well aware of what a capture probe is. The missing link,
as ever, would be whether there is knowledge of what the 10:02:39

statement did exist, you would have cited it, wouldn't
you have?
A. Well, what I'm getting at is that statement in
Exhibit 2008. Let me go back to Safari. I had thought
it was in here somewhere. 09:59:24
Oh, yeah. Stephane Mouradian. Okay, it's a
long statement.
Yeah, this appears to be a declaration, which
I -- my goodness, it's quite a long declaration, isn't
it? 10:00:08
So can I ask you what -- what is the scientific
question you'd like me to answer here?
Q. So the question that I'd like to ask is: In --
on page 157 of your declaration, you cite only
paragraph 6 of this declaration; correct? 10:00:22
A. Of his declaration?
Q. And that's the information being cited, the only
thing you've cited on page 157.
Is that fair?
A. Yeah. 10:00:32
Q. So this paragraph pasted here doesn't explain
how capture probes are designed in the NeXT Personal
assay; correct?
A. I think I should repeat what I said before. A
person of ordinary skill in the art would be well aware 10:00:48

useful sequence of that capture probe might be.
I wouldn't expect that to be disclosed in a
company's brochure.
Q. It is not disclosed in this brochure.
A. Huh? 10:02:59
Q. I said the particular sequence is not disclosed
in this brochure; is that correct?
A. Well, as I said, I would be shocked if you were
running a competitive genome analysis company, and in
your brochure you told your competitors the exact 10:03:16
sequence to use, the magic sauce. I would be shocked if
someone did that.
Q. But it would likely be in confidential documents
like Standard Operating Procedures.
Is that fair? 10:03:28
A. Oh, I'm sure the folks at Personalis would know
the sequences and magic sauce. That's what they're
protecting with their patent.
Q. And they didn't provide that to you for this
analysis; correct? 10:03:40
A. No.
Q. And you didn't ask for it?
A. No. Why?
Q. And so one -- one last bit on paragraph 6 here.
This also does not say that the polymorphisms are in 10:03:46

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1 "sequences encoding genes with known biomedically
2 interpretable variance." Correct?
3 A. Let me just read that again. Which sentence is
4 this?
5 Q. Anywhere in paragraph 6 -- 10:04:01
6 A. Uh-huh.
7 Q. -- there's no discussion of polymorphisms in
8 sequences encoding genes with known biomedically
9 interpretable variance; correct?
10 A. There is no discussion, and in my mind, there 10:04:18
11 would be no necessary discussion. And again, I would be
12 shocked if a company would reveal that they have
13 uncovered a brand-new variant with a huge implication to
14 their competitors at this point. I would be astonished.
15 MR. KRAUSE: Very well. 10:04:39
16 I'm going to introduce a new exhibit, and it
17 will be Exhibit 1208.
18 (Exhibit 1208, Exemplary Chart of Personalis'
19 NeXT Personal Test Practicing Claim 1 of U.S.
20 Patent No. 11,384,394, Personalis EX2012-001 -
21 005, was marked for identification by counsel
22 electronically.)
23 MR. KRAUSE: Just give me a moment, and I will
24 let you know.
25 THE WITNESS: Oh, yeah. Good idea. 10:04:57

1 Q. BY MR. KRAUSE: All right. It's been
2 introduced.
3 A. What have we got? I have Exhibit 1208. Is that
4 correct.
5 Q. That's correct. 10:05:55
6 MR. LUMAN: I haven't had a chance to get it
7 yet. My wheel's still turning here.
8 MR. KRAUSE: Apologies. Just let us know.
9 THE WITNESS: Is this a good time for me to take
10 a butterscotch sweet? I, unfortunately, suffer from a 10:06:13
11 dry mouth.
12 MR. KRAUSE: Any time is good.
13 THE WITNESS: Thank you. I appreciate that.
14 MR. LUMAN: I've got it, Andrew.
15 THE WITNESS: Okay. This would just be a 10:06:25
16 transient usage; right? There's no need to download it?
17 Q. BY MR. KRAUSE: Yes, that's correct. And so you
18 have -- you have available to you, you have your
19 declaration, you have Exhibit 2008 from the '033, and
20 just because it's included in this mockup, I will 10:06:39
21 include -- I will also introduce to you Exhibit 2008 from
22 the '394 proceeding.
23 A. Okay. So I have 1208, I have my declaration.
24 Is there something else I need?
25 Q. You have the -- I'm just giving them to you. 10:06:59

1 Everything is there, but I want to just make sure you
2 have the source documents if you would like them.
3 A. Well, let's see where the discussion goes.
4 Q. Well, okay. So the exhibit that was introduced
5 was Exhibit 1208. 10:07:18
6 A. Correct.
7 Q. And in that on the left is -- so on the
8 left-hand side are the claim charts from your
9 declaration, starting with the '394 patent, and then on
10 the right -- 10:07:37
11 A. Uh-huh.
12 Q. -- are claim charts from Exhibit 2012 for the
13 '394 patent, and then when this switches over to the '033
14 patent, there are the analogous claim charts from
15 Exhibit 2008 in that proceeding. 10:07:51
16 And my question for you -- and feel free to take
17 a close look -- but it's other than the citation formats
18 changing, because your declaration cites to Exhibits 2012
19 and 2008, are there any substantive differences between
20 what's in the claim charts in your declaration and these 10:08:12
21 exhibits?
22 And I've tried to box in green where I think
23 there is differences just to speed things along, but feel
24 free to confirm for yourself.
25 A. Okay. So the challenge you're giving me is to 10:08:28

1 check that what's on the left-hand side is indeed
2 corresponding to what's on the right-hand side.
3 Q. Correct.
4 A. And you're giving me a clue by putting in green
5 things that you think are maybe not the same. 10:08:42
6 Q. Correct.
7 A. All right. And I am correct in noting that the
8 claim language is identical between these two?
9 Q. Correct.
10 A. Okay. All right. I'm going to have to zoom 10:09:09
11 this thing up a bit.
12 MR. LUMAN: Yeah, and I'll object to this
13 document that a lot of the text is so blurry, I can't
14 make it out.
15 THE WITNESS: Yeah, I'm glad you said that, 10:09:22
16 Nate, because I'm thinking it's my eyes.
17 Yeah. So in this checking process, you want me
18 to check to see whether it's the same science we're
19 talking about or exactly the same words?
20 Q. BY MR. KRAUSE: Both. And to the extent that 10:09:49
21 you find it blurry, you have the source documents
22 available to you, which are your declaration,
23 Exhibit 2031, Personalis Exhibit 2012, and Personalis
24 Exhibit 2008 should all be available to you if you'd like
25 to check. 10:10:10

A. Okay. Can you -- can you direct me to where in my declaration this is relevant?
Q. Yeah. So this is in -- start is in paragraph 228 of your declaration for the '033 patent, and it's in paragraph 178 of your declaration for the '394 patent. 10:10:26
A. All right. Perhaps a page number would be really good.
Q. 156 for the '033.
A. Okay. All right.
So just to make sure I'm understanding this, 10:10:53 we're back in the '033 patent and we're looking at claim 1?
Q. Correct.
A. Okay. And I'm simply checking that the claim language on the left-hand side is mirrored by the 10:11:05 statements in Personalis' Personal brochure?
Q. I'm asking you if there's any difference in the substance of these charts, including the claim language and the evidence cited.
A. Okay. Let me go to the blurry one. 10:11:23
I am not seeing any obvious differences between these two. If you could maybe point out what you think is the difference.
Q. Well, is it fair to say that the only differences are the green box areas that state that: 10:12:28

"Personalis reserves the right to rely on expert testimony and/or to amend this chart as necessary"?
MR. LUMAN: Objection. Mischaracterizes the document.
THE WITNESS: Seems to me you need to rephrase 10:12:44 the question.
MR. KRAUSE: You can answer it if you understand it.
THE WITNESS: No, I'm still a little mystified as to what the question means. Can you -- can you direct 10:12:54 me to this portion that you just said?
Q. BY MR. KRAUSE: So on page 1 of 1208, there's a green box.
A. Uh-huh, yeah.
Q. That's something that appears in Exhibit -- 10:13:07
A. Oh.
Q. -- 1208, but not in your declaration.
Is that fair?
A. Yeah, I understand now. Sorry, I thought what was written in the green box was some kind of note you 10:13:17 were making or something.
All right. So this is an official statement of some kind?
Q. It's the exhibit that on the right-hand side is the exhibit that you cite in your declaration. 10:13:29

A. Uh-huh.
Q. And on the left-hand side is the page from your declaration where you cite it.
A. Yeah.
Q. And the only difference between the chart at 10:13:37 page 120 of your declaration and this snippet from Exhibit 2012 is the statement that Personalis reserves the right and so on; correct?
MR. LUMAN: Mischaracterizes the document.
THE WITNESS: Yeah, so these seems to be alarm 10:13:59 bells coming from Nate and as to potentially --
MR. KRAUSE: He can make objections for evidentiary record. They're not there to coach you or alarm you.
THE WITNESS: No, I -- 10:14:13
MR. LUMAN: That's correct. My objections are not meant to impact your testimony in any way.
THE WITNESS: So if I can just be clear here, what you're saying is: The only difference between what one sees in the left and the right is the statement that 10:14:27 Personalis reserves the right to rely on expert testimony and analysis and to amend this chart as necessary.
Q. BY MR. KRAUSE: Correct.
A. It seems like a very reasonable statement to me.
Q. And you've identified no other differences 10:14:40

between these charts.
Fair?
A. Well, I'll -- you know -- you know, you're a stand-up guy. I'll take your word for the fact that there are no other differences. 10:14:52
Q. Other than citation formats?
A. Aye.
Q. And you finalize your declaration on October 6, 2023; is that correct?
A. That would be correct, yeah. 10:15:04
Q. And do you know when Exhibits 2002 in the '033 and 2012 in the '394 were created?
A. Nope.
Q. So if we go back to paragraph 180 in your declaration, which is Exhibit 2031. 10:15:21
A. Paragraph 180; is that correct?
Q. Get you a page number. It's page 128?
A. All right. 129. 128. I'm on 128.
Q. And so in paragraph 180, you note that: "Personalis' assay can detect tumor in DNA in blood 10:15:52 plasma at levels of about 1 part per million or 0.0001 percent."
Did I read that correctly?
A. You've read that correctly, yeah. That's my understanding, yeah. 10:16:07

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Q. How did you determine that?
A. I think I saw that in some of the literature.
Q. And when the literature for the Personalis assay refers to the 1 to 3 parts per million sensitivity, does that refer to -- does that refer to the sensitivity for 10:16:28 detecting one specific variant or does it refer to the sensitivity for detecting any one of a number of variants, such as 1800 variants?
A. Well, I don't think I opined on that. This is a general statement, a comparative statement between two 10:16:45 methods which are so enormously divergent, that it doesn't really bear further examination.
Q. And so you cite here Exhibit 2012. And do you still have that in front of you?
A. Yeah, somewhere. Oh, wait a minute. 2012? 10:17:05
Q. I can introduce it again.
All right. It should be available if you refresh.
A. 2012, got it. What is this? Okay.
Yeah, it says in the range of 1 to 3 parts per 10:18:08 million.
Q. And you're looking on page 15 of Exhibit 2012?
A. Looking at page 1.
Q. Page 1 of -- one second.
Let's take a look at page 15 of Exhibit 2012, 10:18:33

which is what you cite in paragraph 180 of your declaration.
A. Oh, okay.
15 is a graph; is that correct?
Q. Yeah. 15 has a graph. That's correct. 10:19:03
A. All right, yeah. Okay.
Q. And so the one-part-per-million number you pulled was from the graph.
Is that fair?
A. No, I suspect that may be a misleading citation. 10:19:15 The number that I have in mind one finds in the very first page.
Q. Okay. Well, we're looking at the source document now. So you cited page 15, and you think that might be a misleading citation; is that your testimony? 10:19:32
MR. LUMAN: Well, mischaracterizes testimony.
THE WITNESS: Not misleading, not at all, but obviously, the information you are seeking is present on page 1.
Q. BY MR. KRAUSE: And you understand page 1 is a 10:19:44 snippet of the document that we were looking at, which is the Personal NeXT brochure.
A. Correct.
Q. Okay. So let's look at the brochure. And if we look on page 16. 10:20:00

A. What are we supposed to be looking at now?
Q. Well, take a look. I want you to review it carefully just so we're on the same page.
A. What page are we on?
Q. Exhibit 2012, page 16. 10:20:15
A. Okay. All right. Yeah.
Q. And so there's -- I guess you would call it a flow chart at the bottom.
A. Uh-huh.
Q. And there's something -- you know, there's a 10:20:32 number 1 for MRD detection on the left-hand side.
Do you see that?
A. Uh-huh.
Q. And it tracks 1800 variants; correct?
A. That's what it says, yeah, approximately. 10:20:41
Q. And they say that the target sensitivity there is 1 to 3 parts per million, or around 1 times 10 to the negative six; correct?
A. That would be correct.
Q. And do you have an understanding of if that 10:20:55 sensitivity is for detecting any one specific variant as opposed to any one of the 1800 variants?
A. I hadn't thought about that at all, I would have to say. My perception here is simply what the overall sensitivity is across the board, which I think is 10:21:15

sufficient. The impetus of this in the declaration was to indicate how different this level of sensitivity was from Leary, which I'm happy to discuss.
Q. And to be clear, this sensitivity is the sensitivity for detecting any one of 1800 variants; 10:21:37 correct?
A. There's nothing in this description that would lead me necessarily to that conclusion. That may be the case; it may not be the case.
If I was to give an opinion on this particular 10:21:52 question, which I haven't opined on before, I would need to actually look at the data.
Q. Okay. Well, let's turn to page 17.
A. Yeah.
Q. And let's look at the third paragraph, which is 10:22:05 one sentence.
A. Third paragraph. "The majority," is that what you're saying or?
Q. No. It starts with -- you're on 2012, page 17.
A. I'm on 17. 10:22:20
Q. And it says in the third paragraph, it says: "Target sensitivity for individual variant detection is 0.1 percent variant allele fraction."
Did I read that correctly?
A. "Target sensitivity for individual variant 10:22:39

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1 detection is 0.1 VAF." Yeah.
2 Q. And .1 VAF is about a thousand parts per
3 million; is that correct?
4 A. Yeah.
5 Q. And so Personalis' marketing literature reports 10:22:49
6 the sensitivity for detecting an individual variant at a
7 thousand parts per million; correct?
8 A. I would need to look at the raw data to make any
9 opinion on this.
10 Q. And you didn't request the raw data from 10:23:09
11 Personalis to form your opinions; correct?
12 A. No, no.
13 Q. And you hadn't --
14 A. It was not central to my -- to the questions
15 that I was answering. 10:23:20
16 Q. One of your opinions is about the sensitivity of
17 the Personalis assay; correct?
18 A. Uh-huh. And I was quite happy to accept the
19 number that was on page 1.
20 Q. And we're looking at the number on page 17 here 10:23:32
21 for individual variant detection, and you agree that
22 that's a thousand parts per million; correct?
23 MR. LUMAN: Mischaracterizes the document.
24 THE WITNESS: As I said, this is just one small
25 statement, one small sentence in a brochure that clearly 10:23:44

1 I had not paid attention to, sufficient attention to
2 answer your question. There's no necessity for me to pay
3 that much attention to this in terms of the questions
4 that I was challenged to answer.
5 Q. BY MR. KRAUSE: There was no necessity for you 10:24:03
6 to pay attention to the sensitivity for detecting an
7 individual variant; is that your testimony?
8 A. What I'm saying is: Most of my -- most of my
9 time was spent in evaluating and providing opinions on
10 other issues other than this. I was quite happy to 10:24:20
11 accept the notion that that was the statement on page 1
12 and went with that.
13 Q. Let's turn to page 21 of Exhibit 2012.
14 A. Yeah. It says "Personal Specifications."
15 Q. All right. And this is the specifications that 10:24:52
16 Personalis reports to customers on the NeXT Personal
17 assay; correct?
18 A. I would -- yes, I would assume that is, yeah.
19 Q. And if we go to "Tumor Variant Tracking" --
20 A. Yeah, I mean, can I just ask a question in 10:25:06
21 advance of all of this?
22 We started with checking that what's in the
23 claim language as represented in the brochure. I don't
24 remember anything --
25 Q. We've moved on to a different topic, and that's 10:25:18

1 your testimony in paragraph 180, that Personalis' assay
2 has a sensitivity of one part per million. So that's
3 what we're discussing now.
4 A. Okay. Within this indicia of objective
5 objection? 10:25:39
6 Q. That's the section of your declaration in which
7 it appears.
8 A. Uh-huh. Okay.
9 Q. I'm just trying to focus on the technical issue.
10 A. Thank you for helping me figure out where it is. 10:25:45
11 Q. And so if we go back to 2012, page 21, the
12 analytical sensitivity for tumor variant tracking is
13 0.1 percent VAF; correct?
14 A. Variant allele frequency.
15 Q. Correct. And that's about a thousand parts per 10:26:10
16 million; correct?
17 A. Well, it's 1 over 1,000.
18 Q. Very good.
19 And so what that means is that the sensitivity
20 for tracking any particular variant using the Personalis 10:26:25
21 NeXT assay is 0.1 percent VAF; correct?
22 MR. LUMAN: Mischaracterizes the document.
23 THE WITNESS: So you probably best ask that
24 question again.
25 Q. BY MR. KRAUSE: Table 1 of the NeXT Personal 10:26:44

1 brochure, Exhibit 2012 at page 21, reports that the
2 sensitivity for the NeXT Personal assay for variant
3 tracking is 0.1 percent VAF; correct?
4 MR. LUMAN: Same objection.
5 THE WITNESS: There is a table that indicates 10:27:03
6 the information you are recording.
7 Q. BY MR. KRAUSE: And similarly on page 17,
8 there's a sentence that says: "Target sensitivity for
9 individual variant detection is 0.1 percent VAF."
10 Correct? 10:27:24
11 A. Sorry, page 17?
12 Q. Correct.
13 A. Yeah, there's a sentence there that says just
14 what you said.
15 Q. And what I said was target sensitivity for 10:27:50
16 individual variant detection is 0.1 percent VAF; correct?
17 A. Correct.
18 Q. And if we go back to paragraph 180 of your
19 declaration, you point out that Leary's target
20 sensitivity for an individual variant was 0.3 percent; 10:28:08
21 correct?
22 A. Yeah, and I'd be delighted to look at the data
23 for that.
24 Q. Let's just talk about the data that you put in
25 your paragraph 180 of your declaration was .0.3 percent; 10:28:20

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1 correct?
2 A. Yeah, but I think I actually provide the
3 evidence for that.
4 Q. If we compare the 0.1 percent VAF for the NeXT
5 Personal assay and the 0.3 percent for the Leary assay -- 10:28:37
6 A. Uh-huh.
7 Q. -- the Personalis NeXT assay is about, at best,
8 three times more sensitive.
9 Fair?
10 A. No, I think that's a misleading statement. I 10:28:47
11 have severe reservations about Leary's 0.3 percent
12 number.
13 Q. That's the number you put in your declaration,
14 though; correct?
15 A. What I'm providing that information to you now. 10:28:57
16 Q. Yeah, but if we compare the 0.3 percent that you
17 put in your declaration and the 0.1 percent for the NeXT
18 Personal assay, if we compare those two numbers, it's
19 about a 3X difference; correct?
20 A. You are correct that the difference between 0.3 10:29:12
21 and 0.1 is threefold, but that's not the point.
22 What I'm saying to you is in the different
23 section of the declaration, I actually presented the data
24 for this with a view to identifying a problem with the
25 Leary data. I would like to discuss that. 10:29:31

1 MR. KRAUSE: So objection, non-responsive after
2 "threefold" and move to strike the rest of the answer,
3 and your counsel can ask you whatever you he wants on
4 redirect.
5 And now would be a good time to take a break. 10:29:51
6 MR. LUMAN: I disagree that with that objection.
7 All right. We're going to go off the record at
8 10:29.
9 (Discussion off the record.)
10 THE REPORTER: Back on the record. 10:41 a.m. 10:40:57
11 Q. BY MR. KRAUSE: Welcome back, Dr. Furneaux.
12 A. Thank you.
13 MR. KRAUSE: I'd like to talk some about the
14 '394 patent now, and so I'm going to introduce it so you
15 have a copy. Give me one moment. 10:41:17
16 THE WITNESS: Sure.
17 MR. KRAUSE: All right. It should be available
18 to you guys.
19 THE WITNESS: So that's Exhibit EX201 --
20 Q. BY MR. KRAUSE: Should be -- 10:42:16
21 A. Oh, 1041. Sorry. You put it up at 1041?
22 Q. Yeah.
23 A. All right. I've got it.
24 Is this going to be transient or is it worth
25 downloading? 10:42:31

1 Q. I think the patent is probably worth
2 downloading.
3 A. Okay. All righty. I'll do that.
4 It's not downloading. Just so you know, so I
5 think we're best to just go with this transient form. 10:43:04
6 Q. Okay, that's fine.
7 So Exhibit 1001 in front of you is the '394
8 patent; correct?
9 A. That's correct, yeah.
10 Q. And you reviewed that carefully in forming your 10:43:17
11 opinions in this case; correct?
12 A. As best as I could.
13 Q. And after that careful review, what is the
14 invention of the '394 patent?
15 MR. LUMAN: Objection. Calls for a legal 10:43:29
16 conclusion.
17 THE WITNESS: I think, as we discussed before,
18 that's a legal question. That's not a science question.
19 Q. BY MR. KRAUSE: Well, can you answer it? What's
20 the best answer you can give about what the invention of 10:43:43
21 the '394 patent is?
22 MR. LUMAN: Same objection.
23 THE WITNESS: I would repeat to you, I sense --
24 and I think I'm correct -- that that's a legal question.
25 Since I'm unable to formulate in my mind an experiment 10:43:57

1 that would answer that question.
2 Q. BY MR. KRAUSE: All right. Well, let's -- let
3 me try and use the screen share.
4 Are you able to see the screen?
5 A. Uh-huh. 10:44:23
6 Q. I put up paragraph 9 of your declaration. Do
7 you see that?
8 A. Yeah.
9 Q. And one of the things that you write is that the
10 '394 patent provided "novel and nonobvious methods that 10:44:32
11 significantly decreased fragment bias and enabled
12 sequence accuracy."
13 A. Yes.
14 Q. Is that in your declaration?
15 A. That's absolutely correct. 10:44:43
16 Q. And so my question is: In the claims of the
17 '394 patent, where is that reflected?
18 A. Can we look at the claims?
19 Q. Sure. Are you able to see now the '394 patent?
20 A. Yes, absolutely. 10:45:10
21 Q. Scroll to the claims.
22 A. Yeah, we're good.
23 Q. Not quite. Claim 1 starts --
24 A. Yeah, I see it. Thank you.
25 Yes. I mean, I would agree with you that 10:45:46

1 that -- the statement I made is not -- not directly
2 embodied in a claim language, but I would suggest that
3 it's implicit. It's a very, very general description of
4 a innovation -- innovation.
5 Your earlier question was what was the big 10:46:12
6 innovation, which I think is subject to different
7 opinions. But what I'm providing is a innovation.
8 Q. Just to make sure I understood your testimony
9 correctly, the statement that the '394 patent
10 significantly decreased fragment bias and enabled 10:46:39
11 sequence accuracy is not directly reflected in the
12 claims; is that correct?
13 A. Can we go back to that statement just so I'm
14 clear.
15 I would agree that the inventors did not -- 10:46:57
16 decided, for whatever reasons they have, not to
17 incorporate that aspect directly into claim language.
18 I would suggest, however, that a person of skill
19 in the art would recognize that when a claim indicates
20 that they're going to comprise whole genome sequencing, 10:47:15
21 they are figuring that there is likely to be some
22 innovative methodology.
23 Q. So let me see if I understand that correctly.
24 Is it your testimony that the claim term "whole
25 genome sequencing" reflects some improvement by 10:47:39

1 Personalis as, opposed to the understanding that a person
2 of skill in the art would have had, absent any of the
3 Personalis alleged inventions?
4 A. Yeah, I would -- let's put ourselves in this
5 position. If you're a person of skill in the art and 10:47:56
6 you're interested in a project that would require whole
7 genome sequencing, my suggestion is you would be
8 motivated by that claim language to further investigate
9 exactly what these folks are talking about.
10 And the thing that you would expect to find 10:48:16
11 would be some kind of innovation in terms of the methods
12 that -- that are being proposed to address the known
13 problems in establishing a whole genome sequence.
14 Q. So in your opinion, the term "whole genome
15 sequencing" used in the claims of the '394 patent mean 10:48:38
16 something different than it did to a person of skill in
17 the art the day the patent was filed; correct?
18 A. I don't understand that question.
19 Q. All right. So in the absence of the Personalis
20 patent when it was filed, those skilled in the art had an 10:48:53
21 understanding of the term "whole genome sequencing."
22 Correct?
23 A. So in a world prior to the Personalis patent --
24 Q. Correct.
25 A. -- you're asking me what the state of mind of a 10:49:08

1 person of skill in the art would be as regards problems
2 in DNA sequencing?
3 Q. Not -- so the question is specifically: If you
4 said the word "whole genome sequencing" to a person of
5 skill in the art before the Personalis patents, they 10:49:23
6 would have a general understanding of what that means;
7 correct?
8 A. I don't think it's fair to say a general
9 understanding. I think they would have an understanding
10 of the acknowledged problems in determining or obtaining 10:49:35
11 a whole genome sequence.
12 Q. So the term "whole genome sequencing" would have
13 merely given a person a view that there are problems with
14 whole genome sequencing, but they wouldn't understand
15 techniques that could be classified as whole genome 10:49:54
16 sequencing.
17 Is that your testimony?
18 A. A person of skill in the art, prior to the
19 arrival of the Personalis patent, would be aware that
20 there are obstacles, well understood obstacles in terms 10:50:06
21 of the nature of the obstacle, but not well appreciated
22 as to the solutions to these problems.
23 And upon reading this claim, a person of skill
24 in the art would say to themselves, "Ah-ha, perhaps
25 there's something in here that's going to solve the 10:50:26

1 problems that I know exist."
2 Q. And to be clear, I think your testimony before
3 was that the solutions to those problems were not
4 immediately apparent in the claim language; is that
5 correct? 10:50:42
6 A. The way I would express it is they're not
7 formally outlined as perhaps they, you know,
8 theoretically, speculatively, you know, could have. You
9 would have to ask the inventors why they decided not to
10 formulate claim language around that. 10:50:57
11 Now, again, I'm not a legal expert. It's often
12 the case that things I think should be don't turn out
13 that way for reasons that I'm totally oblivious to.
14 Q. I just want to understand. When you were
15 reviewing the claim language of the '394 patent and 10:51:15
16 looked at the term "whole genome sequencing" --
17 A. Uh-huh.
18 Q. -- you were not applying the understanding that
19 a person of skill in the art would have had about various
20 known gaps and limitations with it; is that correct? 10:51:27
21 A. No, in this exercise, I adopt. I try and look
22 at this through the eyes of a person of ordinary skill in
23 the art. This is -- this is the exercise I indulge in.
24 I try to avoid looking at it with -- with eyes
25 either in hindsight, with knowledge that's now been 10:51:46

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1 obtained. I earnestly try to put myself in a position of
2 a person of ordinary skill in the art, which would
3 typically, in my mind and how I do this, is I think, "Oh,
4 yeah, I remember that post doc who was in the lab at that
5 particular time. What kind of things would they be 10:52:06
6 thinking, and let me try and put that" -- "that
7 perspective on my review."
8 Q. But in preparing your declaration, did you
9 understand that the term "whole genome sequencing" in
10 claim 1B refers to the understanding that a person of 10:52:41
11 skill in the art would have had in light of the prior
12 art, or did it have some different meaning given by the
13 inventors?
14 A. I'm not sure that's entirely a scientific
15 question. Can you try that again? 10:53:00
16 MR. KRAUSE: Can you just read it back, Madam
17 Court Reporter.
18 THE REPORTER: Yes.
19 (The record was read by the reporter
20 as follows: 12:29:40
21 "QUESTION: But in preparing your declaration,
22 did you understand that the term 'whole genome
23 sequencing' in claim 1B refers to the
24 understanding that a person of skill in the art
25 would have had in light of the prior art, or did 10:52:46

1 it have some different meaning given by the
2 inventors?")
3 THE WITNESS: Okay. I'm going to repeat what I
4 said. What I said was: I -- in this exercise, I imagine
5 that I am a person of ordinary skill in the art looking 10:53:35
6 at this particular patent. My attention would have been
7 drawn to the phrase "whole genome sequencing," and I
8 would have therefore been motivated, stimulated to study
9 this document further to see, indeed, whether there were
10 suggestions and possibilities and methods outlined that 10:54:00
11 may well solv problems that had been, in short, holding
12 the field back.
13 Q. BY MR. KRAUSE: Okay. Well, you have the patent
14 in front of you. So can you point to me anywhere in the
15 patent that you identified where the '394 patent solved 10:54:20
16 these purported problems?
17 A. Yeah, it's somewhere in here. What -- and
18 again, through the eyes of a person of skill in the art,
19 my speculation and guess is they would have been
20 intrigued by a method that purported to solve the problem 10:54:41
21 of GC-rich ends.
22 Q. And so in the '394 patent, did you identify the
23 solution for the problem of GC-rich ends?
24 A. I think I did. Now, I mean, you know, I stand
25 corrected. There are two patents and, you know, I'm 10:55:01

1 confident that it's in one or the other. I couldn't tell
2 you, as I sit here, that's in -- which one are we in now,
3 the '033?
4 Q. We're in the '394. I'll represent to you that
5 the specifications are essentially the same. But we're 10:55:15
6 talking about the '394 patent.
7 A. Oh, it is. Sorry.
8 Q. Can you point me to where that solution is
9 located?
10 A. Well, it's way back. It will be perhaps in some 10:55:24
11 of the examples.
12 Q. Well, I'll let you review it and point me to a
13 section.
14 A. Can I move this around?
15 Q. I think you should be able to download it on 10:55:34
16 your own.
17 A. Oh, okay. I'm looking at the transitory thing.
18 I'm going to go backwards. Okay, well, I'm not getting
19 anywhere here.
20 I'm looking at your screen; correct, currently? 10:56:01
21 Q. Yes.
22 A. Oh, okay. Well, if I'm looking at your screen,
23 can we go back to the beginning of the patent?
24 Q. Certainly.
25 A. Let me see if I can find some clues to this. 10:56:15

1 Perhaps the best way, if we just walk through and I'll
2 see what we're talking about.
3 Oh, unfortunately, it's all cockamamie here.
4 Are we -- if you could just go up to the next page, I
5 think we just skipped through it. Up a wee bit more. 10:56:37
6 This is difficult. Perhaps, if you do find GC-rich that
7 might help us.
8 That can't be. That's got to be GC-rich
9 somewhere, surely. Is it sensitive to capitals?
10 Q. It might not be OCR'd and... 10:57:33
11 A. It might be GC dash rich. Did you do
12 "enrichment"?
13 Q. I searched for "rich," and it was searching for
14 things with the spacings.
15 A. I understand. 10:58:12
16 The section I'm referring to, which I'm very
17 confident is in here somewhere, is a novel, in my mind,
18 innovative method to deal with GC-rich ends.
19 Yeah, we're getting close now. Yeah, sorry.
20 Can you go -- what page is -- the top of 49? 10:58:36
21 Okay. We're definitely in the right place now.
22 Okay. Let me try and think of some language that would
23 narrow this down.
24 In essence, the method was contrary to what a
25 person of ordinary skill in the art might expect. The 10:59:15

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1 method was to actually perform a heat step at a high
2 temperature, which is, in fact, not what one would think
3 of in terms of dealing with a GC-rich end.
4 So this was a very, to my mind, innovative
5 technique that -- seriously, I studied this at some 10:59:37
6 depth. Other investigators a couple years later claimed
7 that they had discovered this self same method.
8 Unfortunately, as I'm looking at this page, I'm
9 having difficulty seeing exactly where this is. There's
10 so much... 11:00:01
11 Okay. So it's "high GC content" would be the
12 key here. One of the unfortunate things about these
13 exercises is I probably have this penciled or highlighted
14 in my original copy, which I obviously don't have before
15 me. 11:00:23
16 Three independent work flows. Where are we?
17 Ligated, validated, mixed thoroughly (inaudible) --
18 THE REPORTER: Excuse me. Counsel, I need to
19 get everything that's said down.
20 THE WITNESS: I'm sorry. I apologize. This is 11:00:44
21 just me rambling when I'm trying to find something in a
22 document.
23 Ah, here we go. Top of page 50. The sample
24 plate was heated at 65 degrees -- or were not heated.
25 Okay? That's where we're getting at it. That's -- 11:01:17

1 ligation of adaptors or whatever.
2 The GC-rich material, instead of being the
3 minority, will now become the majority of the molecules
4 that participate in the reaction.
5 I'm happy to identify that for you under a 11:03:51
6 different situation when I go back to my original
7 document and find the highlighted area.
8 Q. That's fine. Just to be clear, so that's
9 your -- that's your recollection of --
10 A. Uh-huh. 11:04:07
11 Q. -- the synergy we're seeing in the patent;
12 correct?
13 A. Yeah.
14 Q. Okay. So if we turn back the to claim --
15 A. Yeah. 11:04:14
16 Q. -- is that solution required by any element of
17 claim 1 of the '394 patent?
18 A. That innovative method would certainly
19 contribute to the success of a whole-genome-sequence
20 exercise. 11:04:31
21 Q. Is that method required by the
22 whole-genome-sequencing exercise in claim 1B of the '394
23 patent?
24 A. Well, you know, that's -- I'm sensing that's a
25 legal and science question. Okay? 11:04:46

1 that's the trick.
2 Q. I'm sorry, where are you referring to?
3 A. I'm at the top of page 50 on the right-hand
4 column. And what I'm presuming is -- yeah, okay. Wait a
5 minute. 11:01:27
6 I'm afraid you'll have to take my word for it,
7 but there is in here we may -- perhaps it's over the page
8 yet again. (Reading).
9 I would be happy to review this at my leisure
10 and provide you with the -- the place in this patent of 11:02:25
11 which I speak. Currently, I'm very confident that in
12 here somewhere -- ah, wait a minute. We'll have some
13 discussion here.
14 IGC content, sequence and reactions perform
15 poorly. Blah, blah, blah, blah, blah, blah. Standard 11:02:45
16 enrichment.
17 Okay. In short, the trick was that contrary to
18 what one would anticipate, one would think if you ran a
19 high-temperature reaction that this would favor GC
20 content; right? Because the ends would stick together. 11:03:17
21 It turns out that the novel thought here was if
22 you run at a high-reaction temperature, the AT ends will
23 be melted away, and that's the only ends that you will
24 have that are available for whatever enzymatic reactions
25 you're anticipating, which typically might well be 11:03:36

1 Would the whole genome sequencing proceed
2 without that? Perhaps to a limited degree. Would in
3 using this particular assay enhance your ability to
4 perform whole genome sequencing, i.e., perhaps
5 requiring -- in other words, getting you -- sorry, let me 11:05:06
6 re -- let me strike that.
7 It will enhance your ability to perform whole
8 genome sequencing. It may not be absolutely necessary.
9 In other words, whole genome sequencing will proceed
10 without that, as is obvious, since aspirations towards 11:05:22
11 whole genome sequencing were occurring before this
12 innovative method, but it would certainly enhance.
13 It would ensure that a GC-rich end is a higher
14 proportion of the molecules that one was looking at,
15 which was a traditional call. 11:05:44
16 Q. But you don't know one way or another whether
17 solving that GC-rich end problem was required by the term
18 "whole genome sequencing" in the '394 patent; is that
19 correct?
20 A. My testimony is that a person of skill in the 11:05:56
21 art intrigued by this claim that mentions whole genome
22 sequencing would, in displaying much more skill than I
23 have in finding things, go to this patent and ask
24 themselves, "Gee, what's different here? What are they
25 doing that hasn't been done before?" And then would 11:06:17

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1 find, much better than I did, this innovative method
2 which is counterintuitive to what people had thought
3 before, which is, of course, the hallmark of a discovery.
4 Q. But you can't tell me one way or the other
5 whether the reference to whole genome sequencing in 11:06:40
6 claim 1 refers to those aspirational methods you
7 identified before or the purportedly approved method of
8 Personalis; correct?
9 A. What I can tell you with great confidence is
10 that one might have expected the inventors to formulate a 11:06:53
11 claim around that particular method. But as I said, I
12 don't know anything about legal peregrinations, and they,
13 for whatever reason they decided not to make that a
14 formal part of the claim, I could only speculate.
15 Q. Right. This claim doesn't specifically require 11:07:14
16 that GC-rich end improvement that you just referenced;
17 correct?
18 A. Again, to repeat: It would be my understanding
19 that a person of skill in the art would look at this
20 claim, and they would ask themselves, as anyone would, 11:07:30
21 "What's different here?" And they would go to the
22 methods that have been performed and say, "Ooh, that's
23 different. That's new." That will make a significant
24 contribution to the whole genome sequencing exercise
25 since it has been known since the very beginning that 11:07:52

1 GC-rich ends are a problem.
2 The fragment with a GC-rich end does not arrive
3 into the library as efficiently as a molecule that has an
4 AT-rich end.
5 Q. And just so I understand correctly, it's your 11:08:11
6 testimony that a person of skill in the art would see the
7 term "whole genome sequencing" in the claim and then look
8 to the specification to see if there were any innovations
9 surrounding it; is that correct?
10 A. Correct. 11:08:24
11 Q. And other than this concept of GC enrichment, do
12 you see any other innovations reflected in claim 1?
13 A. Well, you know, I think from my perspective --
14 you know, I'm a biochemist, and so my perspective is
15 going to be shaped by problems that I'm very well aware 11:08:43
16 of and also when I see a solution that is innovative.
17 I am sure set forth in the methods and
18 approaches and angles, these are all very sensible and
19 admirable things to do.
20 I guess to put it a different way, what I see 11:09:10
21 here that's different, that's clearly different, without
22 going into details, is that in the previous world,
23 everyone had used the same approach, pretty much the same
24 machine, maybe difference between two machines, and all
25 doing the same thing. 11:09:29

1 And a person of skill in the art would watch
2 this and say, "Everyone's doing the same thing in the
3 same way with the same machines, and they're all
4 wondering why things aren't moving forward."
5 A person of skill in the art would look at this 11:09:42
6 patent and say, "Oh, these guys, yeah, I like this."
7 They are saying let's not do everything the same way
8 every single time. Let's have bespoke methods that
9 address particular problems, and let's do a variety of
10 those and combine them, and we'll need some computer 11:10:00
11 analysis to facilitate all of this, but, gee, this is an
12 interesting way to go.
13 Q. When people were performing those same methods
14 with the same machine in the same way before the
15 Personalis methods, they referred to those methods as 11:10:15
16 whole genome sequencing; correct?
17 A. Well, you know, I think you're well aware that's
18 a central question in our discussion today, and I would
19 refer you to the Board very helpfully provided a
20 construct, which from my scientific perspective, allows 11:10:33
21 us to test that notion.
22 They actually say: "Here is what we think it
23 is. Can you apply this to anything you're interested in
24 as to whether this is indeed whole genome sequencing?"
25 And I would point out at this juncture, there's 11:10:48

1 a difference between the verb of doing whole genome
2 sequencing and obtaining a whole genome sequence.
3 There's a subtle difference there.
4 Q. And so does the claim, claim 1 of the '394
5 patent, does that use the verb of conducting whole genome 11:11:06
6 sequencing or does it require obtaining a whole genome
7 sequence?
8 A. It says -- let me see now -- "yield comprising a
9 sequence." So in other words, what it's saying is:
10 You're acting on this process, but you should eventually 11:11:22
11 wind up with a sequence.
12 Q. It's important to be precise here.
13 And so claim limitation 1B says: "Conducting a
14 first sequencing assay on said first subset of nucleic
15 acid molecules to yield a first result comprising a first 11:11:40
16 nucleic acid sequence."
17 A. Uh-huh.
18 Q. "Wherein said first sequencing assay
19 comprising" -- "comprises a whole genome sequencing."
20 A. Yeah. My interpretation of that is it's 11:11:52
21 instructing you to go forth and indulge in whole genome
22 sequencing with the result that that nucleic acid
23 sequence will, indeed, comprise the whole genome.
24 Q. The result has to be the sequence of the whole
25 genome; correct? 11:12:12

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1 A. Well, yeah. And again, this is the area of
2 major controversy, and we're best to discuss this in
3 light of the construction that the Board has suggested
4 that we use.
5 Q. I just want to get an understanding of your 11:12:24
6 testimony.
7 A. My testimony is that when we discuss whole
8 genome, we should have the Board's construction in mind.
9 Q. I'm trying -- I'm trying to understand how you
10 approached this. I'm just going to ask you again about 11:12:40
11 your understanding of claim 1B.
12 It's your testimony that whole genome sequencing
13 in claim 1B refers to a result that is the whole genome
14 sequence; correct?
15 A. It -- yeah. I would say it's an exercise in 11:12:56
16 which the aspiration is to obtain a whole genome
17 sequence. But everything I'm saying currently depends on
18 how we view the whole genome sequence and how we are
19 going to define that.
20 And again, the Board has provided I think a 11:13:18
21 remarkably useful construct, which in my mind is simply a
22 test of whether one can apply that term to whatever
23 material we're looking at.
24 Q. Let's try again.
25 In your opinion, whole genome sequencing in 11:13:34

1 claim 1B is not a verb; correct?
2 A. Why don't you ask that again.
3 Q. The term "whole genome sequencing," when used in
4 claim 1B of the '394 patent, is not a verb; correct? Is
5 that your testimony? 11:13:55
6 A. My testimony is that the claim indicates that if
7 one indulges or intends to perform whole genome
8 sequencing, performing that act, the expectation from the
9 claim is that one should wind up with a sequence that, in
10 fact, comprises the whole genome. That's the 11:14:21
11 expectation.
12 Q. Right. Can you answer fairly "yes" or "no" --
13 and the answers are "yes, no," or "I can't answer fairly
14 'yes' or 'no,'" the term "whole genome sequencing," when
15 used in claim B -- claim 1B of the '394 patent, is not a 11:14:36
16 verb. "Yes" or "no"?
17 MR. LUMAN: Asked and answered.
18 THE WITNESS: I would concur that I've already
19 discussed this. And you're asking me whether "whole" is
20 a verb, "genome" is a verb, or "sequencing" is a verb? 11:14:54
21 Q. BY MR. KRAUSE: Your previous testimony was that
22 the term "whole genome sequencing" can refer to a
23 sequence or it can be used as a verb.
24 And my question for you is whether "whole genome
25 sequencing" in claim element 1B is used as a verb or not? 11:15:06

1 A. You're distorting my testimony. I'm referring
2 to the fact that "sequencing" is a verb. It is an
3 action. It's an action that one performs in this claim
4 with the expectation and result that what one does at the
5 end of the day will comprise a whole genome. 11:15:30
6 And again, I put in the caveat that we have not
7 yet agreed upon even the construct that the Board has
8 suggested would be a very useful test for us to find out
9 where "indeed," this is what we think it is.
10 Q. All right. Well, let's try it with your 11:15:48
11 clarification, then.
12 In claim element 1B of the '394 patent, is
13 "sequencing" used as a verb?
14 A. The word "sequencing" is a verb.
15 Q. All right. So you wanted to talk about the 11:16:28
16 Board's construction. So let's go there.
17 Is the screen share working for you, Doctor?
18 A. Yes, it is. Thank you. It's really -- it's
19 very helpful. It's much more helpful than me wandering
20 through. 11:16:46
21 Q. Let me just pull up -- I'm going to pull up the
22 Board's institution decision.
23 On page 22 of the '394 institution decision, and
24 you will see the Board's preliminary construction is that
25 whole genome sequencing, as used in claim step 1B means 11:17:43

1 "a non-targeted approach to sequencing all or almost all
2 of a genome." Correct?
3 A. Yeah. I would prefer if we could go back to my
4 declaration since that is saying, I think, exactly the
5 same thing. 11:18:04
6 Q. This is the Board's institution. Isn't correct?
7 A. I'm just a skeptic. I always like to
8 double-check.
9 Q. Well, would it be more accurate in the Board's
10 decision or would it be more accurate in your 11:18:15
11 declaration?
12 A. Well, I'm hoping they're going to be the same.
13 That's my hope and expectation.
14 Q. If we look at paragraph 50.
15 A. Yeah, there we go. I think that is the same, 11:18:28
16 yes.
17 Q. And you agree with the Board's construction?
18 A. I agree that this is a very useful test that the
19 Board has devised, particularly in view of the scientific
20 questions that I'm being asked to opine on. 11:18:47
21 It really is very, very useful for me to be able
22 to opine whether any particular prior art is whole genome
23 sequencing.
24 Q. So there was some hesitancy there. So do you
25 not agree with certain aspect of the Board's -- 11:19:06

1 MR. LUMAN: Mischaracterizes testimony.
2 THE WITNESS: Yeah, I would hesitate to describe
3 my speech as hesitant. That's just an idiosyncratic
4 aspect of my character.
5 I believe very firmly that this is a useful 11:19:21
6 construct to enable us, and me specifically here, to test
7 whether any particular material that I look at
8 corresponds to whole genome sequencing as the Board has
9 constructed it in their wisdom.
10 And I think this is a very, very useful 11:19:41
11 construct or in scientific language, a very, very useful
12 test.
13 Q. BY MR. KRAUSE: Do you agree with the Board's
14 construction or not?
15 A. I think I've already answered that question. 11:19:55
16 Q. I don't think you have and try again.
17 MR. LUMAN: Mischaracterizes testimony. Asked
18 and answered.
19 THE WITNESS: I didn't hear that.
20 Q. BY MR. KRAUSE: Well, let's look at paragraph 52 11:20:07
21 of your declaration, you wrote: "I agree with the
22 Board's construction of whole genome sequencing as used
23 in claim limitation 1B."
24 Did I read that correctly?
25 A. Yeah. 11:20:18

1 Q. Do you stand behind that testimony?
2 A. I agree with their construction, and I added
3 something to it in terms of converting this from legal
4 language to scientific language. I added a scientific
5 language piece which in my world means they have 11:20:34
6 constructed a very useful test, so that we can look at
7 materials and say, "Yeah, this is it," or "no, this is
8 not."
9 Q. And so if we look specifically at the part of
10 the Board's construction that talks about sequencing 11:21:06
11 almost all of the genome, did you consider what
12 percentage of the genome is sufficient to be almost all
13 of a genome?
14 A. Yes. I mean, that question certainly came to my
15 mind perhaps during the formulation of the declaration, 11:21:24
16 but it wasn't really clear to me it would become a
17 pressing issue. But I certainly have reflected on one
18 knows what "all" is. The key question -- and you're
19 absolutely correct -- is: "What does one regard as
20 almost all?" So I have reflected on that. 11:21:46
21 Q. All right. And did you provide a guide point or
22 endpoint for what "almost all" is?
23 A. I'm happy to provide that now. Sorry, I was
24 being a bit obtuse there. That magic number is not
25 presently in the declaration. 11:22:06

1 Q. It's not presently in the declaration?
2 A. Correct.
3 Q. And you've subsequently -- and it's your
4 testimony that you've subsequently come up with an
5 endpoint for that? 11:22:14
6 A. I have subsequently done what I think is
7 appropriate background research with the aim of at least
8 providing a guidepost. Nothing is absolutely definitive,
9 but I think it's a useful guidepost.
10 Q. Well, instead of -- instead of thinking about it 11:23:59
11 as a percentage, maybe -- maybe I can ask a question
12 about how many base reads must align back to a referenced
13 genome to satisfy the requirements that, quote, almost
14 all of the genome is sequenced?
15 A. Well, why don't you do this? Why don't I 11:24:18
16 provide to you what I'm thinking, and we can see whether
17 that fulfills your expectations.
18 Q. So sitting here right now, the -- the guide
19 point for almost all of the genome that you created, what
20 is that? 11:24:41
21 A. I don't understand that question.
22 Q. Let me -- it wasn't a good question so let me
23 try again.
24 So you've stated that you have -- since filing
25 your declaration, you've done further analysis and 11:24:55

1 determined an endpoint for what constitutes "almost all
2 of a genome."
3 Is that your testimony?
4 A. My testimony is that I've thought earnestly
5 about this question and looked at various sources of 11:25:14
6 information so that I can form a consensus in my mind.
7 But importantly, I think it should also reflect a
8 consensus of academic findings in the field and also what
9 other experts would regard as "almost all."
10 Q. What is the consensus that you've formed in your 11:25:41
11 mind for what constitutes "almost all" of the genome?
12 A. And if you'd indulge me for a moment, I think it
13 is very important, and I think this is what you were
14 trying to get at. It is very important that we're both
15 on the same page. But when we're talking about "all" and 11:25:56
16 "almost all," we are, in fact, talking about coverage.
17 Okay?
18 And it's unfortunate -- and I am guilty of this,
19 too -- that sometimes we use "coverage" in different
20 context. And the coverage I am talking about and about 11:26:11
21 to talk about is the coverage not that has been -- well,
22 let me strike that so it's not confusing.
23 The coverage I am talking about is the real
24 coverage. In other words, one performs a sequencing
25 analysis and then one checks, and one can check as one 11:26:31

1 goes along. One checks, for example, each segment of the
2 genome, even indeed each base pair of the genome, and
3 ascertains, "Yes, I have a read that corresponds to this
4 location."
5 That exercise is what one does if one wants to 11:26:49
6 find out the actual real coverage that occurred during
7 your manipulations.
8 Now I want to make it very clear, because we
9 discussed this in the declaration really in a different
10 context, but we did discuss it in the declaration. 11:27:07
11 And I apologize. I know it's my declaration.
12 It's an old habit. When I'm talking about what the lab
13 did, it's always "we." It is my declaration.
14 But in any event, there's a lot of discussion in
15 my declaration about something that I much would prefer 11:27:24
16 we refer to as depth, okay? So that we are not confused.
17 Again, there are occasions where I'm referring
18 to coverage, but this is coverage that one determines
19 prior to commencing sequencing. It is the depth that one
20 wishes to go to. 11:27:45
21 Does one want to use a one-times depth or, for
22 example, the history standard at this time, a 30-times
23 depth.
24 So I'm going to endeavor -- and I may well make
25 mistakes -- but I'm going to endeavor to keep using the 11:28:01

1 phrase "depth" when I'm referring to what one does when
2 one sets up a sequencing experiment.
3 One says, "Ooh, this genome is 3.1 billion
4 bases. So, gee, I'd better make sure that I sequence at
5 least 3.1 billion, but, you know, that would be sailing 11:28:23
6 very, very, way, way, way too close to the wind. I'd
7 better make sure I have enough resources, equipment,
8 whatever, time, machines, to make sure that perhaps I
9 sequence 30 times that would be a good idea."
10 Now I'm saying all of that just so we're very 11:28:42
11 clear that I'm referring to the Lander theoretical depth
12 equation, which is simply a way that an individual says
13 "how much stuff do I need." It doesn't in any way
14 predict what will actually happen. It rests upon an
15 assumption that every segment in the genome can be 11:29:01
16 equally sequenced and has an equal opportunity.
17 That is mostly clearly not the case. But that's
18 what that equation rests upon.
19 And again, let me repeat. I will try and
20 endeavor to refer to that as depth. 11:29:21
21 Now what we're currently discussing and assuming
22 and hoping is coverage, which is an empirical thing.
23 It's not a theoretical thing. It's not an anticipated
24 thing. It's where you actually go and look and say,
25 "Hey, wow, we covered X percentage of all the bases in 11:29:37

1 the genome." Right?
2 So from reviewing articles and results, and I
3 found the most informative aspect to this, as it turns
4 out, the experience of Mr. West, who I became not
5 familiar -- we've never met. I became familiar with 11:30:04
6 his -- I would tacitly say "struggles" in the sense of
7 wanting to use a whole genome sequence, he elicited and
8 outsourced to Illumina. In this time frame, probably the
9 best place to go.
10 And so my consensus understanding -- and this is 11:30:29
11 something I will use as a guidepost -- is simply what
12 Illumina itself was saying at the time.
13 And what they were saying is if you conduct --
14 and I guess you could put it this way: If we conduct a
15 sequencing analysis for you to the best of our ability 11:30:47
16 using perhaps 30 times depth, and we sequence less
17 than -- sorry, I've got to be very clear -- and we cover
18 less than 90 percent of the genome, then we do not view
19 this as a whole genome exercise.
20 So in my mind, the "almost all" part of that 11:31:12
21 statement would be that if you are less than 90 percent,
22 it ain't a whole genome. And I'm relying very heavily
23 upon Illumina. And of course, they would know. They are
24 routinely carrying out this exercise every day in many
25 different circumstances with many different individuals 11:31:33

1 and are aware of all of the caveats that one needs to be
2 aware of.
3 And that integrated wisdom, which I accept, and
4 I would suggest a person of ordinary skill in the art
5 would accept, because it turns out that that 90 percent 11:31:50
6 in fact is a value that you see in the academic research
7 literature and some -- in fact, indeed in one of the -- I
8 think it's in one of the prior arts that your side has
9 suggested we should look at. That coincides.
10 And so as I sit here today, given the year 2011, 11:32:10
11 which I think is what we're talking about, in the 2011,
12 2012 era, to me, that seems like a very useful guideline.
13 Q. Are you finished?
14 A. I think so.
15 Q. Okay. So the answer to the question of what is 11:32:31
16 the consensus that you formed in your mind for what
17 constitutes almost all of the genome, the answer to that
18 question is 90 percent; correct?
19 A. 90 percent coverage. And again, I'm
20 stressing -- although I do suspect you understand what 11:32:55
21 I'm saying -- I'm stressing again coverage as it is
22 empirically determined, not as it's theoretically
23 determined or anticipated or -- yeah, let me just leave
24 it at that.
25 Q. So almost all of the genome means 90 percent 11:33:12

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1 empirical coverage; correct?
2 A. You are putting together these two things.
3 Illumina is saying: If you perform a DNA sequencing
4 exercise and it covers greater than 90 percent, we as
5 experts in the field -- and I concur with them -- would 11:33:33
6 regard this as whole genome sequencing.
7 It would appear to me that the Board, indeed, is
8 deliberately inviting, in this very useful construct,
9 someone to come up with a number, and indeed, that is
10 what you asked. And this is a number I have come up 11:33:53
11 with.
12 Now the second point I'd like to make and
13 emphasize in our likely future discussions is this is a
14 two-part test. The Board says, "Okay, it's got to be a
15 non-targeted approach, and it has to sequence all or 11:34:08
16 almost all of the genome."
17 I just want to put on record right now that if
18 it is a targeted approach, then according to the Board's
19 construct, whatever material you are looking at will not
20 fulfill this criteria. 11:34:25
21 Q. Did the 90-percent number change over time?
22 A. I'm talking about -- yeah. I mean, I completely
23 appreciate -- and I think the Board is extremely
24 insightful here -- is that they are well aware that all
25 of this is a moving target. They are well aware, and 11:34:43

1 it's part of the -- one might almost say guilt complex of
2 genomic scientists, that when the human genome was first
3 revealed was a huge step forward with lots of buzz words
4 and lots of publicity and flashing lights.
5 I would say the vast majority of people skilled 11:35:08
6 in the art understood that this was nothing like the
7 complete version. And there have been subsequent
8 versions over the years, and to be fair, in my
9 appraisals, I have confined my opinions to opinions to
10 deliberations on the genome, as far as I can tell, the 11:35:31
11 referenced genome that the various investigators and the
12 various bits of prior art that we're certainly likely to
13 discuss very soon were using.
14 It is the case in some cases that the
15 individuals doing the prior art were using an out-of-date 11:35:48
16 reference. But I totally understand. Work often happens
17 two or three years before publication, and so perhaps,
18 you know.
19 I'm very -- I would like to indulge everyone
20 with the best optimistic picture that I can. So I'm not 11:36:09
21 going to be quibbling about, well, this was here and this
22 was there. People did experiments to the best of their
23 ability.
24 Q. And to understand your 90-percent number, if one
25 achieved 100 percent, that would constitute sequencing 11:36:28

1 every base of the known referenced genome in 2011; is
2 that correct?
3 A. If -- again, you're using both the Board's
4 definition and the -- and the scientific assay, if one
5 conducted a sequencing exercise, and if one then looked 11:36:50
6 to see whether each base, colloquially speaking, had a
7 read hanging over the top of it, okay? And that was
8 certainly the case in every single base, one would
9 describe that as 100 percent.
10 Now those of us in science know that zero and a 11:37:11
11 hundred percent are often quite difficult to completely
12 define. I suspect there's a whole Armageddon of legal
13 arguments about what zero may be and what 100 percent may
14 be. Okay?
15 So obviously, it may well about that there are 11:37:29
16 discontinuities and general discontinuities. Let me give
17 you an example.
18 There may be an individual, okay, who in one in
19 intron of a gene has a remarkable addition of four to
20 five nucleotides, which may even have occurred 11:38:15
21 somatically; right? And that may not register in the
22 referenced genome. And so there's a bit of a conflict
23 there. What's the right reference; right?
24 Now if one was to be scientifically accurate, if
25 one was doing this exercise in testing the extent of 11:38:15

1 coverage, in other words, how successful the sequencing
2 was, the referenced genome that one was using would have
3 to be the same as the individual that you were testing.
4 That's the only way you could eliminate discontinuities
5 between the reference and the individual. Human sequence 11:38:31
6 varies between individuals.
7 So I would put it to you that that rather
8 unusual situation, of course, which is someone unlikely
9 in the real world, would be the only environment where
10 you could be very rigorous about the assignations between 11:38:45
11 reads and bases.
12 Q. Okay. But you determined the number 90 percent
13 based on, among other things, Illumina data. And so if
14 you wanted to derive that number in the formula, .9
15 equals X over Y -- 11:39:12
16 A. Whoa, whoa, whoa, whoa, whoa, whoa. I just took
17 careful pains to point out to you we're talking about two
18 different things there, apples and oranges.
19 If you're referring to the formula, and I'm
20 suspecting you're referring to the Lander formula? 11:39:28
21 Q. I'm not referring to the Lander formula. If
22 you'd just let me ask the question.
23 Your testimony was since your declaration,
24 you've pondered the question further, including in light
25 of Mr. West's experience and Luna's experience, and 11:39:42

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1 determined that the threshold for almost all of the
2 genome was 90 percent; correct?
3 A. Coverage.
4 Q. 90-percent coverage?
5 A. Uh-huh. 11:39:53
6 Q. And to determine whether or not something is
7 90-percent coverage --
8 A. Uh-huh.
9 Q. -- you defined the number of the bases that were
10 read by some number Y. And my question for you is: What 11:40:03
11 is the number Y in that equation?
12 A. Oh, no. No, no, you don't need to know Y.
13 The exercise of coverage is inspecting. Let's
14 imagine for a second you start off with nucleotide one in
15 the human genome. You're looking at that. 11:40:24
16 You have an alignment. Hopefully, you have read
17 that aligns to that, okay? If there's at least one read
18 aligning to that nucleotide number one, great. We've
19 covered nucleotide number one.
20 Move to nucleotide number two. Is there a read 11:40:43
21 above that? From what I've just said, I think it's kind
22 of likely, unless the sequencing read was extremely
23 short. And you would say, "Ah-ha, covered."
24 Move on to the next one. Covered. Move on to
25 the next one. And in that way you determine the 11:41:00

1 percentage.
2 So you will come across a nucleotide, you look
3 above, "Ooh, there is no read, uh, negative."
4 Q. And the alignment is to a referenced genome;
5 correct? 11:41:12
6 A. Correct. That is -- that's a technical problem,
7 as I just elucidated. There can be some ambiguities
8 there. And in fact, this was apparent in some of the
9 prior art that I reviewed.
10 Q. And so in the alignment of the referenced 11:41:28
11 genome, you referred to aligning to, for example,
12 nucleotide one, nucleotide two, nucleotide three,
13 et cetera. How many nucleotides are you trying to align
14 the obtained reads to?
15 A. Well, the -- we have to now talk about specifics 11:41:41
16 and specific investigations and specific papers. I'm
17 quite happy to move to that phase, but obviously, it
18 depends which referenced genome particular individuals
19 were using at the time.
20 Q. Well, how many nucleotides were in the 11:41:59
21 referenced genomes that were being used in the 2011 to
22 2012 time period when the patent was filed?
23 A. Well, as I mentioned, strictly speaking, the
24 reference to human genome is HG19. Now as it turns out,
25 I think we're likely to be discussing the Leary paper, 11:42:17

1 and as I already indicated, the Leary paper, the
2 referenced genome was HG18, which --
3 (Reporter clarification.)
4 THE WITNESS: Now they used HG18. In fact, HG19
5 had been released certainly by the time that they 11:42:47
6 published their paper.
7 But I -- you know, I'm not going to be difficult
8 about this. Okay? I think it's entirely reasonable that
9 perhaps they were working off HG18 and they probably
10 started there and didn't want to change. All of this is 11:43:03
11 understandable.
12 What you're actually asking me is: What do
13 people think the size of the HG18 genome is. Would that
14 be correct?
15 Q. Yeah, let's start there. 11:43:16
16 A. Okay. The size, according to folks who
17 distribute this referenced genome, is 3.1 billion bases.
18 Ooh, base pairs.
19 Q. Your testimony is that the size of the HG18
20 referenced genome is 3.1 billion base pairs? 11:43:36
21 A. Correct.
22 That's not my testimony; that's what the NIH
23 genome folks said.
24 MR. KRAUSE: Pull up an exhibit.
25 THE WITNESS: Do we have to enter this as a new 11:44:45

1 exhibit?
2 MR. KRAUSE: Yes. I'm working with the
3 technology, if I can.
4 MR. LUMAN: Sure. I appreciate it.
5 THE WITNESS: I didn't want to spring that on 11:44:54
6 you. Should I have perhaps provided that?
7 MR. KRAUSE: No, no, no.
8 (Exhibit 1209, Genome Assembly NCBI36, was
9 marked for identification by counsel
10 electronically.) 12:29:40
11 Q. BY MR. KRAUSE: All right. So Exhibit 1210
12 should be uploaded to the Exhibit Share. I have it up on
13 the screen, if you can see it.
14 A. Uh-huh.
15 Q. And this is the NIH entry for the HG18 genome; 11:46:35
16 correct?
17 A. Well, yeah, you Googled it, yeah.
18 Q. All right. And so you refer to the genome size
19 of 3.1 gigabases; correct?
20 A. Correct. 11:46:49
21 Q. And then it refers to something called the
22 "total ungapped length" below that.
23 Do you see that?
24 A. Uh-huh.
25 Q. And that's 2.9 gigabases? 11:46:55

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A. Uh-huh.
Q. Do you have an understanding of what the ungapped length refers to?
A. Yeah. The essential problem in assembling the human genome is that there's gaps. What this is, is this 11:47:05
is the greatest distance, which is kind of impressive -- we can go now without actually coming across a gap.
Q. And is it your testimony that when determining the empirical sequence coverage, that the appropriate denominator is the 3.1 gigabase number as opposed to the 11:47:24
2.9 gigabase number?
A. Yeah. We're talking generically here, and we're much better talking about specific instances which I've made a pronouncement, which in other words, would be the prior art. 11:47:40
But yeah, I would regard the referenced genome as being 3.1 billion base pairs.
Q. And you testified earlier that you reviewed the '394 patent carefully in preparing your declaration; correct? 11:47:59
A. As carefully as I could, yeah.
Q. And do you have an understanding of what referenced genome length the '394 patent uses in its examples?
A. No, I didn't check that. 11:48:08

MR. KRAUSE: All right. We've been going on for a while so I think it would probably be a good time for a break.
THE WITNESS: Sure. Is this a lunch break?
MR. KRAUSE: You're -- let's go off the record. 11:48:21
THE WITNESS: Oh, sorry.
MR. LUMAN: The time is 11:48. We're going off the record.
(Discussion off the record.)
(Recess.) 12:42:35
THE REPORTER: Back on the record at 12:42 p.m.
Q. BY MR. KRAUSE: All right. Welcome back from lunch, Dr. Furneaux.
A. Thank you.
Can I -- can I just take this opportunity? When 12:42:47
I was at lunch, I took a more careful look at the '394, the thing I couldn't find.
So just to let you know, if you look at the top of page 64 in '394, the paragraph starts: The micro tubes were spun down -- sorry. I apologize I'm so used 12:43:04
to doing it in the lab way.
The micro tubes were spun down. I think that's all we need to specify that paragraph. And you can see there that this was where they discuss the trick. Heated it at 65 degrees for five minutes, which was the HG, 12:43:29

which this is the IGCP sample.
So that's -- that's the trick. And what disconcerted me is we must have blown right through the figures. This is outlined in Figure 8. And Figure 8 is telling you about the problems of GCNs and the end repair 12:43:47
by DNA polymerase.
And I actually -- I think I identified this. What confused me was that the -- there was no mention of adding a polymerase. But, of course, companies like to call their mixes various things, and that ERP mix or 12:44:04
solution and repair polymerase includes the polymerase, which I regret to say, which is not the way we did things in the old days, but that's why it fooled me a little bit. But that's what I was referring to.
Q. That's what you were referring to as the GC -- 12:44:26
A. Yeah. Yeah.
Q. And that's the one that's not reflected in the claims of the '394 patent; correct?
A. Absolutely not. And yeah, why is it isn't, I -- you know, I couldn't say. 12:44:40
MR. KRAUSE: All right. I'm going to introduce Exhibit 1210.
(Exhibit 1210, Sequence Coverage, was marked for identification by counsel electronically.)
MR. LUMAN: We've already got a 1210. We just 12:44:53

did 1210. 1210 was the --
THE WITNESS: Yeah, NCBI.
MR. KRAUSE: I think that was 1209.
MR. LUMAN: I see that it's got a label. The file name says 1209 in the ShareFile, but the transcript 12:45:13
said 1210.
MR. KRAUSE: So I think we can let the transcript reflect that the exhibit marked 1209 is the homo sapiens genome assembly. I might have misspoken on the record, but could we make that clarification if 12:45:30
everybody understands that?
THE WITNESS: No problem.
MR. KRAUSE: And then 1210 was just introduced.
THE WITNESS: Yeah, yeah. Let me find it.
MR. KRAUSE: I can share the screen to help. 12:45:45
THE WITNESS: Well, if you want to do that, it's probably easier.
MR. KRAUSE: All right. Can you see the screen?
THE WITNESS: Yeah.
Q. BY MR. KRAUSE: Okay. And so I just wanted to 12:45:56
revisit our discussion about --
A. Uh-huh.
Q. -- the 90 percent number for almost all of the genome.
A. Uh-huh. 12:46:05

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1 Q. And I just wanted to see again, are you able to
2 tell me what numbers you would plug in for X and Y in
3 this equation to get to the genome?
4 A. Yeah. So let's make sure that we're talking
5 about the same thing. We're talking about an inspection 12:46:19
6 assay that determines whether a residue is covered by a
7 read.
8 Are we agreed on that?
9 Q. I believe so.
10 A. Okay. And so here you're referring to Y being 12:46:45
11 the size of the genome in base pairs.
12 Q. And what is Y?
13 A. What is Y? Well, I'm sure there's going to be
14 discussions about what Y may or may not be, and what's
15 more important is what the investigators who were 12:47:08
16 carrying out the experiment might have thought it might
17 be.
18 Q. So it's your testimony that Y varies depending
19 on the thinking and expectations of the investigators
20 performing the experiment; is that correct? 12:47:21
21 MR. LUMAN: Mischaracterizes testimony.
22 THE WITNESS: Yeah, I think that's
23 mischaracterizing. Perhaps I was not clear enough.
24 There is certainly an instance I can think of in
25 which the investigators chose a value for Y rather than 12:47:34

1 reflecting upon what might -- Y might be. Let's put it
2 that way.
3 Q. BY MR. KRAUSE: Within the meaning of the
4 preliminary construction for whole genome sequencing in
5 the '394 patent, is there a fixed meaning for Y in this 12:47:52
6 equation when 90 percent constitutes almost all of the
7 genome?
8 A. Okay. So the construct that the Board provided
9 merely indicated nearly all, and what we're saying here
10 is 90 percent corresponds to nearly all. There isn't 12:48:11
11 anything in the Board's construct that indicates how one
12 arrives at that number which, for our purposes, is to
13 clarify what "nearly all" means.
14 Q. And you haven't identified a specific number for
15 what "all" is in order to determine when 90 percent is 12:48:30
16 almost all; correct?
17 A. Well, "all" when we're talking about percentages
18 is, in plain and ordinary language, taken to be
19 100 percent.
20 Q. And so if we saw this equation, if 100 percent 12:48:43
21 is the answer, what are X and Y?
22 A. You're asking me what is the value of X and Y
23 have to be to yield 100 percent?
24 Q. Correct.
25 A. One over one. 12:49:00

1 Q. Well, how many base pairs would Y be to reduce
2 to one over one?
3 MR. LUMAN: Incomplete hypothetical.
4 THE WITNESS: Yeah, I think you might want to
5 reframe that question. You just asked me what 12:49:12
6 100 percent is, and if X equals 1 and Y equals 1, we have
7 100 percent.
8 Q. BY MR. KRAUSE: In the context of a whole genome
9 sequencing experiment with the '394 patent, how many base
10 pairs? 12:49:26
11 A. No, no. No, no. I think I need to --
12 Q. If you can't answer the question, that's fine.
13 MR. LUMAN: Let's get his answer.
14 MR. KRAUSE: He interrupted my question so I'm
15 going to reask it. 12:49:37
16 THE WITNESS: Okay. So reask your question.
17 Q. BY MR. KRAUSE: So you testified earlier today
18 that sequencing 90 percent of the genome constitutes
19 sequencing almost all of the genome within the meaning of
20 the '394 patent. 12:49:51
21 And my question is: What is Y in this formula
22 when you're calculating it?
23 MR. LUMAN: Incomplete hypothetical.
24 THE WITNESS: And a lot of things have been
25 conflated there, okay? I'm working from the Board's very 12:50:06

1 useful test construction and -- which is composed of two
2 parts, okay? Targeting, non-targeting, and then nearly
3 or -- sorry, nearly all or all.
4 And what we're discussing now is what my
5 conception of "nearly all" means in this context. And 12:50:27
6 what we're talking about is sequence coverage, not
7 sequencing. Sequence coverage.
8 And so what I have given to you is my thought
9 and opinion on what "nearly all" may mean. And this is
10 substantiated by Illumina's experience, extensive 12:50:47
11 experience. It's also substantiated by the work in the
12 field, in which it is felt that if one manages to do
13 90 percent. In other words, if one manages to show that
14 one has covered 90 percent of a particular genome, then
15 one has executed full genome coverage. 12:51:09
16 Q. BY MR. KRAUSE: And when you're determining the
17 particular genome, that varies from experiment to
18 experiment.
19 Is that your testimony?
20 A. There -- I'm absolutely sure that there's going 12:51:23
21 to be some controversy about what the exact size of the
22 genome may be. And the appropriate thing to do is to
23 look at the experiments which are supporting the case
24 that you folks are making.
25 And while I'm saying that, I have not thought it 12:51:42

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1 was job or challenge to examine Personalis' data. My job
2 is to examine the data that you are using via the prior
3 art to assert your arguments.
4 I was not aware of the fact that I am supposed
5 to be critiquing the data in the Personalis patent. 12:52:02
6 MR. KRAUSE: Move to strike as non-responsive.
7 Q. During the break, did you have any conversations
8 with counsel?
9 A. No. I busied myself finding that little GC-rich
10 section. It took a while, I've got to think. 12:52:24
11 Q. Taking a look back at this Exhibit 1210, it's
12 your testimony that in this equation, the value for Y
13 will vary from experiment to experiment; correct?
14 MR. LUMAN: Incomplete hypothetical.
15 Mischaracterizes testimony. 12:52:59
16 THE WITNESS: I don't think I've said anything
17 about -- oh, sorry. Did you say Y or X?
18 Q. BY MR. KRAUSE: I said Y.
19 A. Y --
20 MR. LUMAN: Objection to form. 12:53:11
21 THE WITNESS: -- may well -- well, let me put it
22 this way: The real Y does not change. The size of the
23 human genome is a constant, perhaps varying very slightly
24 between individuals and perhaps in disease conditions.
25 An extra chromosome, for example, yes. But in general, 12:53:30

1 reviewed the data in the patent. I have not been asked
2 to review the data in the patent.
3 Q. BY MR. KRAUSE: All right. Let's turn back to
4 your declaration, and we'll go to paragraph 82. I'll let
5 you review it briefly. 12:56:03
6 A. The whole paragraph?
7 Q. It's short, so yeah, just have you read it all.
8 A. Yeah. I think I've reviewed it sufficiently at
9 this point.
10 Q. And so one of your opinions here is that 12:56:31
11 standard whole genome sequencing "failed to target
12 biomedically interesting non-exomic and exomic regions
13 and would perform poorly in certain regions of the
14 genome."
15 Is that accurate? 12:56:47
16 A. Well, these are -- these are the words from the
17 patent. I'm simply saying what it states.
18 Q. Fair enough. I was just confirming that I was
19 accurately reading your declaration into the record.
20 A. Yeah. 12:57:03
21 Q. And it goes on, and you cite some passages that
22 explain that: "The problem was that if a POSA used the
23 conventional methods many DNA fragments would either be
24 missed from the analysis or would be hard to sequence."
25 Is that correct? 12:57:19

1 when people are working with human DNA, that is a
2 constant.
3 Now, of course, since the human genome has, in
4 fact, only recently been completely completed -- and one
5 might even argue whether that is the case -- there have 12:53:49
6 been iterations and ideas throughout the years. And my
7 approach has been not to come up with some generic
8 guidepost, but actually look at directly what the folks,
9 investigators in the prior art think, and thereby that
10 giving me a way to evaluate this particular equation. 12:54:10
11 Q. BY MR. KRAUSE: And so as of 2012, when the
12 patents were filed, or 2013 when the patent was filed,
13 the complete human genome was not known; correct?
14 A. That's absolutely correct. I mean, the --
15 that -- that saga has been going on until, perhaps some 12:54:48
16 may argue the most complete version was earlier this
17 year. Was it in January? The T-to-T version,
18 Telomere-to-Telomere? I suspect there may well be
19 surprises yet in store.
20 Q. And as of 2013, when the patent was filed, 12:55:11
21 you're not prepared to offer what the accepted value for
22 Y was at that time?
23 MR. LUMAN: Mischaracterizes testimony.
24 THE WITNESS: Yeah. I -- I will say again, I
25 have not studied the implications of -- I have not 12:55:28

1 A. I think that's a fair appraisal. I would
2 probably add a little bit to that. If a POSA used the
3 one-size-fits-all, standard road, standard prep, standard
4 machine, standard approach.
5 Q. The standard approach for whole genome 12:57:35
6 sequencing that was in place before the patent; is that
7 pretty --
8 A. Yeah. Not necessarily whole genome sequencing.
9 The standard approach is for sequencing.
10 Q. But this paragraph, you're specifically 12:57:51
11 referring to the sequencing of fragments from whole
12 genomes; correct?
13 A. That's what's relevant to the aspiration of the
14 patent, but the last sentence is really more a general
15 statement. It was well-known to people in the field from 12:58:05
16 the very early days of sequencing, when I used to do
17 sequencing myself, and that is, yeah, there's problems
18 with fragments because of their structure.
19 And I guess the best example would be when they
20 have a GC-rich end, they might not even arrive in the 12:58:24
21 library, and they would perhaps be a very small
22 proportion of the total fragments, in other words,
23 nonuniform, and therefore, would be hard to sequence.
24 They would not be well represented.
25 Q. But in this paragraph, you're specifically 12:58:43

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1 referring to the way that the '394 patent taught to
2 improve whole genome sequencing; is that correct?
3 A. Yeah, I am -- I am tacitly agreeing that they've
4 identified significant problems. It was well-known to
5 all persons skilled in the art that there were problems 12:59:01
6 that needed to be solved.
7 Q. And I want to now go to the portion of the
8 patent that you cite at column 69, line 49, to column 70,
9 line 20. And I just want to understand the citation.
10 I'm going to pull that up on the screen. 12:59:19
11 And I think 49 is somewhere in this table. So I
12 think the citation probably was referring to example 10
13 starting at line 29.
14 A. Well, you can maybe help us out by actually
15 highlighting the actual text that was quoted. 12:59:37
16 Q. So I believe it was column 69, line 49, which
17 would be somewhere down here in Table 10. So I'm
18 proposing that perhaps it meant -- it was intended to be
19 29. I'll try -- it's highlighting across the column so
20 it's going to go a little bit beyond. 12:59:56
21 Starting there at 29 to column 70, line 20,
22 which is here.
23 A. Yeah, this section is about targeted sequencing.
24 That would appear to be an entirely different topic.
25 Q. And that's my question. This section is about 13:00:11

1 targeted sequencing and not whole genome sequencing;
2 correct?
3 A. Well, yeah, again, let me emphasize. There are
4 general problems in DNA sequencing by any method, whether
5 it's exomic or non-exomic. For example, I give again the 13:00:27
6 example of the GC-rich ends. That's a problem that will
7 be in fragments that are coming from exomic regions,
8 intronic regions, non-coating regions. It's a generic
9 problem.
10 Q. It's a generic problem, and this is the passage 13:00:45
11 that you cited in support of Personalis' improvements of
12 whole genomic sequencing; correct?
13 MR. LUMAN: Mischaracterizes the document.
14 THE WITNESS: Yeah. I -- that is not accurate.
15 Q. BY MR. KRAUSE: Well, is it fair to say that 13:00:56
16 column 69, line 29, to column 70, line 20, contain no
17 information about whole genome sequencing?
18 A. Okay, so let me repeat.
19 What I'm saying here is that there are problems
20 in performing DNA sequencing, problems that need to be 13:01:11
21 solved. And this patent was offering at least one
22 innovative method, in my opinion, that may solve an
23 existing problem.
24 Q. And the innovative method that you're referring
25 to is the repair of the GC ends that we talked about? 13:01:28

1 A. Yeah, absolutely.
2 Q. Take a look at paragraph 106 of your
3 declaration. Go to the two-page view. It didn't help
4 because there's a page break.
5 So paragraph 106 begins in the top -- at the 13:02:17
6 bottom of page 70, it says: "As another example,
7 Meyerson has a table that summarizes 'whole genome
8 studies of cancer,'" and then that table is reproduced in
9 the paragraph.
10 Is that fair? 13:02:31
11 A. Can I see paragraph 105? Okay.
12 So the general theme here is we're now talking
13 about Leary's pair approach, and there seems to be some
14 debate and discussion as to whether their approach could
15 be regarded as whole genome sequencing. 13:02:58
16 And what I'm pointing out here is that you may
17 well find a phrase "whole genome sequencing" used by
18 folks at different times, different places, whatever, but
19 that doesn't necessarily mean that it is whole genome
20 sequencing. 13:03:17
21 Q. And so if I can understand that testimony
22 correctly in the context of paragraph 106, are you now
23 disputing that the studies listed in Meyerson's Table 1
24 are whole genome sequencing studies?
25 A. Some may be; some may not be. 13:03:30

1 Q. That's not a question that you investigated in
2 putting together your declaration?
3 A. In part, it can be. If I can see that table.
4 It's very difficult for me to see the table clearly.
5 And then what's been a challenge is to remind 13:03:47
6 myself which lab this is coming from. Okay.
7 For example, Ley, et al., 2008, I'm pretty sure
8 that's the Ley paper that you're cite -- cited as prior
9 art.
10 Am I correct there? 13:04:05
11 Q. That is.
12 A. It's coming from Mardis; right?
13 I think it's appropriate that that was regarded
14 as whole genome sequencing. Let me see if I can find one
15 that I can be sure just by looking at the title that I 13:04:21
16 think is not.
17 Yeah, I would -- I would -- of course, I stand
18 to be corrected, but I rather think the Campbell paper
19 there, et al., which -- is this one the Stratton group?
20 Q. So in your declaration, that's not an opinion 13:04:42
21 that you offered; correct?
22 A. I'm using this as an example that sometimes
23 things are called whole genome sequencing and they're
24 not. And here we have Campbell being thought of as whole
25 genome sequencing by whoever wrote this table. Was it 13:05:03

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1 Meyerson? Yeah. And I would disagree that describing
2 Campbell as whole genome sequencing is correct. I would
3 say that's in error.
4 I can understand how it got mistaken to be whole
5 genome sequencing. I can understand how it got 13:05:23
6 mischaracterized. Well, when I say "understand," I can
7 hazard a guess. But in my view, that is not whole genome
8 sequencing.
9 Q. All right. The Meyerson study was published in
10 about the 2010 time frame? 13:05:37
11 A. This is not a study. This is a review.
12 Q. The Meyerson review was published in the 2010 to
13 2011 time frame.
14 Is that fair?
15 A. Yeah. This is not supposed to be a memory test. 13:05:46
16 Can you show me the Meyerson reference?
17 Q. Sure. And this is Matt Meyerson. This is
18 during his time with Dana Farber or Boston?
19 You would know better than I do.
20 A. Sorry, I didn't mean to imply that you should 13:06:11
21 know. I just you may recognize that --
22 Q. Matthew Meyerson?
23 A. Sorry. Yeah, yeah. Dana Farber. Yeah, so now
24 I know what we're talking about.
25 Q. I said it was published in October 2010; 13:06:32

1 correct?
2 A. Correct, yes. That's when it's published.
3 Q. And it was a review of the knowledge in the
4 field as of October 2010; is that what a review article
5 is? 13:06:47
6 A. Yeah. I'm trying this is Nature Reviews
7 Genetics. Yeah, it's a -- it's like where things are at
8 2010, at least in Dr. Meyerson's view.
9 One does wonder how much of these statements
10 became true, but that's a separate issue. 13:07:14
11 Q. Pull up Exhibit 1030, which is the Forshew
12 reference.
13 A. Okay.
14 Q. Are you able to see it okay?
15 A. Your screen sharing is blocking out my picture. 13:08:02
16 I'm trying to figure out how I can track your image.
17 Q. Do you want me to zoom it out a little bit?
18 A. Yeah. It's -- the problem at my end. Your
19 screen sharing is taking up my whole picture, and I'm not
20 looking around for where I can -- yeah, if I shrink -- 13:08:20
21 I'm clicking on your computer.
22 If I come out of Zoom for a minute. Hesitate to
23 do that. All right. I'm going to have to come out of
24 Zoom, unfortunately. It's the only thing I can see here.
25 MR. KRAUSE: Let's go off the record for a 13:08:53

1 second.
2 MR. LUMAN: Off the record at 1:08.
3 (Discussion off the record.)
4 MR. LUMAN: We'll go back on the record at 1:10.
5 MR. KRAUSE: All right. Thank you. 13:12:11
6 Q. And you're able to see the screen share now
7 showing Exhibit 1030, the Forshew reference?
8 A. Yeah, I'm seeing you primarily, but I'm guessing
9 -- yeah, yeah. It's just very small.
10 Q. Did that help you -- 13:12:25
11 A. I mean, on my screen, your picture is huge and
12 the picture on the paper is small. Maybe if I go to full
13 screen.
14 Q. I think that's probably an option on your end.
15 A. Yeah, no, it is. It says exit full screen. I'm 13:12:41
16 in full screen. Let me see if I can pinch it in and
17 draw. No, of course I can't do anything with it.
18 It's -- oh, all right. All right. We're good. I'm just
19 about in.
20 All right. I apologize to you. You're now 13:12:59
21 about one centimeter square.
22 MR. KRAUSE: Probably better.
23 THE WITNESS: All right. Sorry.
24 Forshew, yeah.
25 Q. BY MR. KRAUSE: You have Forshew up now; 13:13:09

1 correct?
2 A. Yep.
3 Q. And this was a peer-reviewed article in the
4 journal Science Translational Medicine; is that correct?
5 A. Well, you know, I'm old school. So, yeah, peer 13:13:23
6 reviewed would be strictly correct, yeah.
7 Q. And before this case, were you familiar with the
8 journal Science Translational Medicine?
9 A. Sadly, yes.
10 Q. Why do you see "sadly, yes"? 13:13:41
11 A. Well, I don't think this is the appropriate
12 forum to discuss this kind of thing, but I would say in
13 general, the papers that I find in Science Translation
14 Medicine and -- well, you know.
15 I independently fund my research so I can be 13:13:58
16 quite candid. Most of the things I find in science
17 journals are not exactly inspiring, and the rigor is
18 not -- is not apparent in their data. But that's just a
19 personal opinion. I'm sure it's a wonderful
20 organization. 13:14:15
21 Q. And the authors of the Forshew paper were at the
22 Cambridge UK Cancer Institute?
23 A. Yeah, yeah. I mean, I recognize Carlos Caldas.
24 I had conversations with him years ago. Bentley, I
25 recognize. 13:14:31

1 Yeah, that is a -- I mean, let me say first and
2 foremost, this is a quality group from whom I expect
3 great things.
4 Q. In fact, in your declaration you said that the
5 Cambridge UK Cancer Institute was "one of the most 13:14:44
6 sophisticated sequencing laboratories in the world at the
7 time."
8 Is that fair?
9 A. Yeah, one of. I mean, I think that's a general
10 point. I think on that road of discussion, when we talk 13:14:56
11 about a person of ordinary skill in the art, I think we
12 do have to consider the environment, too. And I would
13 certainly place this group and environment as one of the
14 places where one could actually do significantly big
15 things as opposed to a person of ordinary skill in the 13:15:14
16 art who may be in the lab next door, perhaps would be
17 much more difficult. I don't think even perhaps. It
18 would be much more difficult.
19 Q. But when this outstanding group was
20 communicating with the field, generally they would 13:15:34
21 communicate a consistent and accurate understanding to
22 the community.
23 Is that fair?
24 A. Well, I think, you know, when I say "an
25 outstanding group," I think we have to be careful. I'm 13:15:41

1 talking about the data they produce, in general. I mean,
2 there's always exceptions.
3 And the data is really the only thing that one
4 really needs to concern oneself with when one is
5 evaluating a group. It's sad, but true in science, 13:15:56
6 especially these days, there's an awful lot of buzz and
7 woo, including social media and all sorts of thoughts and
8 ideas that are spread around that perhaps are not
9 intentionally accurate.
10 Q. In general, you think that the Forshew group 13:16:35
11 produced quality data.
12 Is that fair?
13 A. I don't know Forshew, but I certainly know
14 Caldas. Carlos impressed me when I met him many years
15 ago. 13:16:50
16 Yeah, I would expect good stuff in terms of data
17 from this group, yeah I'd expect them to make a
18 contribution. But, you know, the proof of the pudding's
19 in the eating.
20 Q. (Inaudible) -- in this case; correct? 13:17:03
21 A. Sorry, what was that?
22 THE REPORTER: Counsel, I think you cut out.
23 All right. It looks like Mr. Krause is frozen.
24 Shall we go off the record, Counsel?
25 MR. LUMAN: Yes, we can go off the record at 13:17:28

1 1:17.
2 (Discussion off the record.)
3 MR. LUMAN: Back on the record at 1:17.
4 MR. KRAUSE: Can we go off.
5 (Discussion off the record.) 13:18:47
6 MR. LUMAN: Back on the record at 1:18.
7 Q. BY MR. KRAUSE: Dr. Furneaux, in your review and
8 study of materials in this case, you didn't identify or
9 cite in your declaration any retraction of any part of
10 the Forshew article in Science Translational Medicine; 13:19:05
11 correct?
12 A. Oh, no. No, no, no. There's none as far as I
13 know. I don't know to what extent I'd be aware of that
14 necessarily. What was our retraction?
15 Q. I don't believe there was, but you didn't search 13:19:25
16 for one and you didn't identify one; correct?
17 A. That's not my normal practice. I review a
18 paper, and it wouldn't be an efficient use of my time, I
19 would assert, to do that.
20 Q. Fair enough. 13:19:43
21 And you mentioned earlier you were familiar with
22 Matthew Meyerson. Are you familiar --
23 A. I'm familiar with his work. I'm -- I don't
24 think he'd recognize me if I met him in the street.
25 Q. Familiar in the professional sense of being 13:19:56

1 knowledgeable about his work. That's fair?
2 A. Yeah. And of course, you know, at this stage in
3 my career, sometimes things get a little distant, but my
4 recollection is that he is the guy who came up with the
5 EGFR mutations and then the therapeutic drugs. Am I 13:20:14
6 correct in thinking that? Then he went to Yale; is that
7 right? Yeah, he was head of the NCIA at Yale, the cancer
8 institute at Yale, cancer center at Yale. I think that's
9 what I'm thinking.
10 Q. And so it sounds like he's a fairly prominent 13:20:31
11 researcher, pretty well-known?
12 A. Oh, yeah, yeah, absolutely. I mean, you know,
13 when one measures those kinds of things, you know, I'm
14 not sure how rigorous that often is. But the work I have
15 seen him do has been noteworthy, yeah. 13:20:46
16 Q. And are you familiar with a researcher named
17 Kevin Bly?
18 A. No. I mean, you know, maybe if you'd show me a
19 paper. He's probably in this paper.
20 Q. That's what I wanted to look at. So if you take 13:21:02
21 a look at paragraph 119 of your declaration. You quote
22 fairly extensively --
23 A. Oh, now I know who this kid is. This is the kid
24 who wrote a thesis; is that right?
25 Q. Yeah, he's the kid who wrote a thesis. 13:21:23

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A. From Holland?
Q. That I don't know. It looks like the Republic of Ireland, but you cited his thesis fairly extensively; is that correct?
A. Yeah. I mean, it happened -- it's one of those 13:21:37
happy circumstances where he seemed to crystal -- I think the utility of that was he would be a person of skill, ordinary skill in the art in that time frame, and it so happened he was writing that thesis. So he was actually writing down his thoughts. So I thought that was a 13:21:53
useful vision to have.
Q. And so your testimony is that he would have been a person of ordinary skill in the art in that time frame; correct?
A. Yeah. I know there's been a debate about what 13:22:07
the level of skill of an ordinary person in the art is. I'm happy to discuss that.
From my perspective, you know, I didn't check to see that he had each credential as identified in that Board statement. I meant in general terms, looking 13:22:28
through his eyes would be a good place to start for me to think about and crystalize my thoughts and what somebody would be thinking at that time.
Q. And so at the time he submitted -- and I don't have a Ph.D. so correct me if I'm wrong about the 13:22:43

process.
At the time the thesis was submitted, he would not have had a Ph.D.; correct?
A. That's why I'm trying to remember. I think he was in Holland, and I had a student who actually worked 13:22:54
in my lab and had a thesis in Holland, and I -- I think -- well, there's two possibilities.
In some systems, people actually publish first, put those together into a thesis. Okay? My recollection is hazy here. 13:23:14
I would guess that it's the other possibility, that he presents the thesis first and then it is published. But, of course, the presentation of a thesis is a formal publication.
In most systems that I'm thinking of, your 13:23:26
thesis is bound and it is a book, in essence, has been published. Not by a publisher, but by yourself or by the university.
Q. All right. So let's go back in your declaration to paragraph 40 -- actually, let me -- I'll just see. 13:23:42
We'll pull up Exhibit 2155. And this is the Bly thesis; correct?
A. I'm not seeing anything.
Q. Let me because my screen share probably stopped. My apologies. 13:23:59

A. Yeah, yeah. No worries.
Q. Do you see that?
A. Oh, Leicester. Well, okay. Holland, Ireland, and then Leicester. Oh, wait a minute. No, it says Republic -- oh, he's from Ireland. All right. 13:24:13
Q. So when he submitted this thesis, he had a BSE degree; correct?
A. Yeah, he had a BSE Honors from somewhere in the Republic of Ireland?
Q. And he submitted this degree or he submitted 13:24:29
this thesis, and this was the --
(Interruption in proceedings.)
(Reporter clarification.)
Q. BY MR. KRAUSE: I'll start over.
So when this thesis was submitted for review, 13:25:00
Mr. Bly did not yet have his Ph.D. degree; correct?
A. That would certainly be the case. I'm racking my brain for the -- the English system is a little different than the Scottish system, which I'm more accustomed to. 13:25:19
But I think -- obviously, I'm speculating here, but I suspect that's the route.
Q. And if we look back to paragraph 48 of your declaration, this is where you recite the Board's construction of a person of ordinary skill; correct? 13:25:45

A. Oh, yeah. Okay. Yeah.
Q. And so you see that the formulation of the person of ordinary skill requires an advanced degree such as an M.D. or Ph.D. at number one?
A. Yeah. Yeah. 13:26:01
Q. So we agree that Mr. Bly hadn't risen to that level at the time he submitted his thesis?
A. I think we're being a little harsh there and judgmental. He was clearly on his way to get the Ph.D., and He had certainly undergone all the training required 13:26:16
for a Ph.D. He just did not yet have the stamp on his forehead that said "doctor."
Q. And you understand that the Board's formulation also included the additional training listed in numbers 2 through 4? 13:26:29
A. Yeah, I see that. I would have to say I wouldn't have -- well, I certainly aren't in complete agreement with these criteria for a person of ordinary skill in the art. However, I understand this is what we have to work with because this is what's been agreed by 13:26:44
the Board.
It would seem to me that this would be quite an extraordinary individual that has these particular combinations, and I'm not sure I can really testify to whether Bly has an understanding of the clinical 13:27:05

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1 applications. That's -- that's -- that's something that
2 you could only discern if you were in conversation with
3 an individual, in my view.
4 Q. But you didn't challenge the Board's formulation
5 in your declaration; correct? You said you, quote, have 13:27:25
6 applied the definition?
7 A. Yeah, I, mean, that's not my habit. I was
8 certainly asked at one point whether I thought this was a
9 suitable criteria, and my opinion was that this was a
10 very unusual combination of skills, in my mind. 13:27:41
11 And I typically one finds persons of ordinary
12 skill in the art, they might have two and they might have
13 four, for example, but they wouldn't have two, three, and
14 four. They might have three and they might have four,
15 but they might not have two. 13:27:58
16 That's been my experience, including folks I've
17 trained in my own lab. So that -- I think that was my
18 concern and opinion about this particular construction.
19 Q. But you nevertheless adopted it for purposes of
20 your opinions in this case; correct? 13:28:16
21 A. Oh, yes. No, absolutely. Yeah. My vision of a
22 person of skill in the art conforms to this. And Bly is
23 just providing perhaps not all of these criteria. It's
24 more about the fact that there he was in the right place
25 at the right time, was the compelling aspect. 13:28:35

1 Q. And did you review his thesis carefully?
2 A. Well, I didn't review it as carefully -- for
3 example, if I was a thesis examiner, I would have
4 reviewed it much more in higher level of intensity,
5 including the data, which I don't think there was a lot 13:28:57
6 of data. Am I correct on that?
7 But anyway, leaving that to one side. No, I had
8 a shallow read of this, and I was just entranced by the
9 fact that he appeared to be, you know, around at the
10 right time. And he, in essence, he's sort of like a time 13:29:15
11 snapshot, was my thought on this.
12 Q. Do you consider yourself to be a POSA within the
13 meaning of the term set forth by the Board?
14 A. Well, you know, I'm modest by nature, but I
15 would say I'm way beyond this. Not to toot my own horn, 13:29:43
16 but I've made several seminal contributions to cancer
17 biology, nuclear, biology, what else do we need?
18 I actually also devised novel assays that are
19 clinical applications of early cancer detection. So --
20 and I have a Ph.D., and I used to do sequencing back in 13:30:10
21 the old days when it was quite a skill.
22 Q. So let's move on to the Ley reference, which is
23 Exhibit 1012 in these proceedings.
24 A. Yeah.
25 Q. And I've shared it. Can you see it okay? 13:30:28

1 A. Uh-huh, perfect. This is good.
2 Q. All right. I'll keep it on the one-page view.
3 A. Yeah.
4 Q. And I think you mentioned this earlier, but just
5 to confirm, you agree that Ley is a study that uses whole 13:30:39
6 genome sequencing?
7 A. Yeah. In the light of the -- using the
8 construct that the Board has suggested, and that now
9 we've applied a number to that "nearly all" aspect, which
10 is the key part of our deliberation here. 13:31:00
11 So in sum, if I look at the Board's construct, I
12 would say targeted, no. Perhaps there's a little
13 discussion could be had there, but in the first place,
14 no. I can have some reservations, I think. Not enough
15 to negate its status. 13:31:24
16 And I think they were successful in covering
17 90 -- is it 90 or 91? I can't recall. Of the tumor
18 sample. We'll need to look over the page for that.
19 Q. So that's the high level -- so there was that
20 initial non-targeted sequencing step in Ley, and then 13:31:46
21 subsequently, they performed a PCR-based assay and did
22 targeted followup sequencing.
23 Is that a fair characterization of the paper?
24 A. No, that's not how I would describe it. If we
25 are talking about targeting and non-targeting. I think 13:32:02

1 the best thing -- the best thing to -- there was backdrop
2 to that conversation is the flow diagram.
3 Q. Okay.
4 A. You need to go -- yeah. No, that's perfect.
5 Sorry, I know. 13:32:22
6 Q. Toggling, do you want me to go up or down?
7 A. I just need to see Figure 2 as best as you can.
8 And so I think this is a perfect example of
9 something I would describe as you could do whole genome
10 sequencing, but would you? I think that's the issue 13:32:47
11 here.
12 You can see they start off with great fanfare;
13 right? And I'm blanking, but how many runs on the
14 machine did they do? Was it 38 or something?
15 I -- I don't mean to keep directing you. If we 13:33:05
16 can look at the -- the first couple of paragraphs and the
17 methods. You need to go back a page.
18 No, sorry, in the results. Sorry. It must be
19 in the results somewhere. It's probably in the first
20 page of the results. 13:33:31
21 Oh, here we go. We performed -- it's not 38.
22 We performed 98 full runs. Oh, my God. That's a hell of
23 an endeavor.
24 And of course, it's very important to point out
25 this is the Wash U Center, which is one of the funded 13:33:59

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1 centers by The Human Genome Project.
2 And so, yeah, it might well be these are the
3 only folks in this time scale who could have done that.
4 Sow I'm sort of diverting a little bit from your
5 question, but it seems like the right time to discuss 13:34:23
6 this.
7 If you look at this flow diagram here, which is
8 Figure 2, a person of ordinary skill in the art would be
9 saying to himself, "Hey, you know, you could do whole
10 genome sequencing," and I think they've done a decent 13:34:37
11 job. They've actually got 90 percent coverage, which
12 fits into our now numerical guideline that we've
13 discussed.
14 But oh, my God, it goes downhill after that.
15 You could do it, but would you? Would you have yourself 13:34:51
16 then actually -- it looks like you've skimmed a little
17 bit on the sequencing of the normal skin.
18 If we go back up, somewhere the normal skin was
19 coming in at maybe 80 percent average? Am I right?
20 Go back to where it said 90, and it's probably 13:35:12
21 going to say the normal skin was 80. I think it's in the
22 previous page. Aye, okay. It's in the next paragraph.
23 We sequenced the genome normal skin cells -- la, la, la,
24 la, la -- 80 percent. That's not so good.
25 A person of ordinary skill in the art is 13:35:31

1 thinking to himself, "Uh, somebody pulled the plug on
2 this." Is that beginning to suggest that, well, you
3 could do it, but would you?
4 And if we go back to that flow diagram, you
5 begin to see a true nightmare emerging. All right. 13:35:50
6 We've got -- what is that? Three ga-million single
7 nucleotide variants?
8 (Reporter clarification.)
9 THE WITNESS: Single -- sorry -- single
10 nucleotides variants. 13:36:00
11 THE REPORTER: Thank you.
12 THE WITNESS: SNVs.
13 We start with a ton of those. Of course, many
14 of those are not somatic so we have to subtract out the
15 skin because that's the normal tissue. That's our 13:36:25
16 expectation.
17 We whittle it down further, and you can see that
18 they're beginning to -- they're beginning to get a little
19 cagey. We've got 31,000 now new SNVs. But they've said,
20 oh, you know what? We're going to forgot about the -- 13:36:44
21 how did they describe it? Non-genic regions.
22 So in -- where are we? 2012 -- no, 2008 this
23 is. In 2008 speak, that means we don't want to go into
24 the non-protein encoding regions.
25 And while I'm discussing this, this is one of 13:37:07

1 the innovative aspects of the patents that we were
2 discussing, that they says, let's go into the non-coding
3 regions. Let's move forth and concur. Very inspiring.
4 Anyway, you can see what I'm getting at here.
5 They jettison that, and then they're saying, you know 13:37:25
6 what? Why don't we just look at coding region. We've
7 got 216 in the untranslated region, but we don't know
8 what to do with that. So we'll just leave that.
9 And pretty much at the end of the day a person
10 of skill in the art says, "Okay, we've got eight new 13:37:43
11 inverted columns somatic mutations." That's not
12 inspiring. That's not going to motivate a person of
13 skill in the art to -- to be taught by this, to attempt a
14 project like this.
15 In fact, not only is it not inspiring, it's -- 13:38:07
16 it's quite intimidating.
17 Q. Are you done?
18 A. I think so.
19 Q. Okay. Thank you for those prepared remarks.
20 A. Oh, whoa, whoa, whoa, whoa. That's 13:38:24
21 inappropriate.
22 Q. If we could just focus on the questions a little
23 bit more.
24 A. Let's -- let's not focus on spurious ad
25 homonyms. Prepared comments. I am reading this paper. 13:38:40

1 As you can see, I don't even know where things are in the
2 paper, and I'm giving you my impression as I read the
3 paper live.
4 I would like an apology for that statement.
5 Q. I would just like to get some answers to the 13:38:59
6 questions.
7 A. No, you characterized my response as some kind
8 of in-the-can drama presentation. However, let's move
9 on.
10 Q. So if you can just take a look at page 69 of 13:39:17
11 Ley, and it begins: "To better define the percentage of
12 tumor cells that contain each of the discovered somatic
13 mutations."
14 Do you see that?
15 A. I see that. 13:39:35
16 Q. And then they continue, and as part of that
17 experiment, they create PCR amplicons of those discovered
18 somatic mutations; correct?
19 A. Yes, that's true.
20 Q. And it goes on to state that the resulting 13:39:49
21 amplicons were sequenced using the Roche/454 FLX
22 platform; correct?
23 A. Oh, yes. Yes, that's my recollection, yeah.
24 Q. I'll highlight it there.
25 And then they go on to note that: "The 13:40:06

1 frequency of reads containing the reference and variant
2 alleles were defined," and it refers to Figure 3 and
3 Table 3; correct?
4 A. Uh-huh.
5 Q. And so when it refers here to the frequency of 13:40:17
6 reads, I want to just understand what that refers to.
7 And is it correct that that refers to the number
8 of times the sequence in the reference allele was
9 detected and the number of times a mutant allele was
10 detected? 13:40:35
11 A. Yeah. Let me take a minute or two to -- to --
12 Q. Certainly.
13 A. -- analyze this a little bit better. Okay?
14 Okay. So it's important to point out they've
15 already confirmed the nature of the SNV by PCR and 13:40:55
16 presumably Sanger, if I recall, Sanger sequencing. I
17 think that's correct. Working by memory.
18 So this whole paragraph concerns not the
19 identity, not the sequence data, not the identity, but
20 merely what they're trying to figure out here is the 13:41:20
21 proportion of tumor cells versus normal cells.
22 Q. Correct. And maybe if we look at Table 3 for
23 that. I have Table 3 up on the screen. You see that;
24 correct?
25 A. Uh-huh, uh-huh. 13:41:40

1 Q. And so the first row is for a gene CVH24. Do
2 you see that?
3 A. Right, uh-huh.
4 Q. And they're looking at a mutation --
5 A. Right. 13:41:51
6 Q. -- for a point mutation that changes a tyrosine
7 to a stop code on called Y590X; is that correct?
8 A. They're reporting an amino acid change. They're
9 not reporting the sequence.
10 Q. They're not reporting the sequence in the 13:42:05
11 consequence, but they're looking for that mutation when
12 they run the 454 sequencer.
13 Is that fair?
14 A. Yeah, but we don't know what that mutation is.
15 Q. Understood. 13:42:19
16 And in the fifth column, it indicates the
17 variant percent for the primary tumor was 53.70 percent.
18 Do you see that?
19 A. Hold on. Let me just see. Which column are we
20 looking at? 13:42:34
21 Q. Actually, since I'm sharing the screen, I'll
22 highlight it. It's the fifth --
23 A. Okay. All right.
24 So we're looking at the preliminary tumor, which
25 is essentially pure, and we're asking what percentage we 13:42:43

1 can find of tumor cells that have -- that carry the
2 variant, okay?
3 Q. Sure.
4 A. So in other words, one would expect here, since
5 this is a heterozygous mutation, one would expect 13:43:00
6 50 percent.
7 Q. And so the raw read count numbers in the variant
8 and reference numbers mean that they read the variant
9 5,672 times and the reference 4,890 times; is that a
10 correct reading of the table? 13:43:21
11 A. Yeah, I think that's a fair point. Yeah.
12 Q. And so the sequencer read that position about
13 10,000 times?
14 A. Yep.
15 MR. KRAUSE: All right. We've been going on a 13:43:36
16 little over an hour so I think it would be a good time to
17 take our next break.
18 MR. LUMAN: Okay. We're off the record at
19 1:43 p.m.
20 (Recess.) 13:57:09
21 MR. LUMAN: All right. We'll go back on the
22 record. The time is 1:58.
23 MR. KRAUSE: Thank you.
24 Q. Welcome back, Dr. Furneaux.
25 A. Yeah. Thanks. 13:58:27

1 Q. I'd like to take a look at paragraph 66 of your
2 declaration, and I'll share the screen with it now. Let
3 me know when --
4 A. Oh, yeah.
5 Q. It's legible and visible? 13:58:40
6 A. Yeah. It's fantastic. Perfect.
7 Q. Excellent.
8 And so I want to talk about the cartoon that's
9 on the screen here in paragraph 66.
10 A. Yeah. 13:58:53
11 Q. This is a cartoon that's being used to depict
12 the process of using a pull-down probe.
13 Is that fair?
14 A. Yes, I think that's -- I mean, it's fairish. I
15 think this was provided by Dr. Quackenbush; right? 13:59:03
16 Q. Right. But you cite this cartoon as well?
17 A. Oh, yeah. I cite it because I think it's a good
18 idea that we're all on the same page. I mean, I might
19 suggest one or two -- well, perhaps one alteration to the
20 cartoon that might help the elucidation. Maybe we can 13:59:20
21 keep that in mind.
22 Q. Why don't you let me know what the alteration is
23 and we can --
24 A. Sure. Oh, this cartoon is absolutely correct in
25 most respects, but, of course, it would appear that 13:59:36

1 you're seeking to capture something you already have;
2 right?
3 So in other words, what would be probably a
4 slightly better diagram is you see that target DNA
5 molecule in the light brown? 13:59:50
6 A. Yeah.
7 Q. Where it's surrounded by other molecules. Like
8 red and green ones or something like that. Thereby we're
9 seeing that we are actually physically removing that from
10 that group. 14:00:05
11 It's a small suggestion, but you know, I think
12 when we look at this, most of us who, you know, have done
13 such experiments immediately realize that that would be
14 the real scenario.
15 Q. I think I understand what you're saying. And I 14:00:16
16 apologize if I'm seeing the color wrong.
17 So in this diagram, there's either a yellow or
18 an orange squiggle labeled "Target."
19 A. Oh, okay.
20 Q. The correction, you would add additional 14:00:30
21 non-targeted and --
22 A. Right.
23 Q. -- all sorts of other things?
24 A. Obviously, the whole object of this is to
25 isolate what's called the target in this diagram, that 14:00:38

1 target DNA molecule from other DNA molecules that you
2 don't want. That's the principle here.
3 Q. Understood.
4 And I think -- I think we can walk with that
5 understanding that the target is within a larger 14:00:52
6 population of molecules floating around. I think we
7 can --
8 A. Yeah.
9 Q. -- certainly understand that.
10 A. Yeah. 14:01:00
11 Q. And so -- so I think, you know, we talked so on
12 the top in the cartoon in the most left-hand panel,
13 there's the target, which is the top squiggle, and then
14 there's a purple line labeled "Probes in Solution."
15 Correct? 14:01:17
16 A. Uh-huh, yeah. Totally.
17 Q. And attached to the purple part of the probe is
18 a little squiggly line and a ball.
19 Is that fair?
20 A. Yeah. That's fair to say, and let me say that I 14:01:27
21 think that's probably biotin.
22 Q. That was -- my next question was going to be --
23 right.
24 So the purple part is some sort of nucleic acid
25 that hybridizes to the target, and the filled-in circle 14:01:38

1 is most commonly biotin, B-I-O-T-I-N.
2 A. I am glad that you said commonly because, of
3 course, a probe in the classical sense was inexorably
4 linked to physical isolation. One did need to qualify
5 that. 14:02:14
6 Because the methods that were devised in those
7 days, the early '60s, early '70s, you had to employ
8 physical isolation since that was the only way you could
9 identify that duplex that we see there.
10 So I appreciate your point, yeah. Biotin is one 14:02:27
11 solution to physically isolating this. There could be
12 many.
13 Q. Right. And so in the left-hand panel, just so
14 we're clear, we have the probes in solution have the
15 purple represent some forms of nucleic acid, and the 14:02:42
16 filled-in circle represents probably biotin; correct?
17 A. In this case. I think the principle is a
18 molecule which you can then stick to some other molecule
19 or some surface, thereby removing it physically from
20 the -- in this case, it's a solution. 14:03:00
21 Q. Right. Counsel, I think --
22 MR. LUMAN: Yeah, Andrew, you're frozen. Let's
23 go off the record at 2:03.
24 (Discussion off the record.)
25 MR. LUMAN: Back on the record at 2:03. 14:03:35

1 Q. BY MR. KRAUSE: All right. I'm going to reshare
2 the screen. Okay?
3 So I believe before the technical glitch, we
4 were talking about the far right-hand part of the panel,
5 and there is a caption that says "Capture on Magnetic 14:03:54
6 Beads."
7 A. Uh-huh.
8 Q. And then there's the gray circle, and that
9 represents a magnetic bead; correct?
10 A. Yeah. Well, in this case, it does specify. It 14:04:06
11 could be a number of things. But yep, magnetic beads is
12 a commonly used protocol.
13 Q. And in -- in the situation where the black
14 circle is biotin, then those beads would typically be
15 coated with streptavidin molecules; correct? 14:04:25
16 A. Yeah. Avidin, streptavidin. There's all sort
17 of debates among folks who do this as to what may be
18 superior in different circumstances, but that's the
19 principle.
20 Q. And so the middle of this figure shows 14:04:40
21 hybridization between the probes in solution and the
22 target; correct?
23 A. That is correct, yeah.
24 Q. And at that point, it's your opinion that the
25 target DNA has not yet been captured; correct? 14:04:53

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1 MR. LUMAN: Incomplete hypothetical.
2 THE WITNESS: I think what might be useful in
3 this context is if we take a look -- if we have on the
4 screen our -- I'm always using the royal "we" -- our -- I
5 don't know what the legal term is -- definition from -- 14:05:12
6 MR. KRAUSE: Yeah, I'm happy to show that to
7 you. I'm not technologically adept to get both, but I'm
8 happy to look at it. And I believe --
9 THE WITNESS: Actually, yeah, yeah. That's what
10 I want. If we had that on the left and the diagram on 14:05:27
11 the right, that would be perfect. I don't know if you
12 can do that.
13 Q. BY MR. KRAUSE: Let me see. I'm not sure that
14 I'm getting the left and right that you wanted, but I
15 think this is getting close, if you can see two documents 14:06:26
16 now?
17 A. I can see two documents, yeah. If you find the
18 cartoon on the left.
19 Q. I think I found it, but does that work for you?
20 A. Yeah, absolutely. I mean, I'm right-handed, but 14:06:39
21 still.
22 Q. Right. Do you see it now?
23 A. I think what would help the discussion, if I
24 simply just walk through our definition here. Is it the
25 definition? It's our -- well, whatever it is, the 14:06:59

1 statement here.
2 Okay. So as you can see in the cartoon, we have
3 a nucleic acid sequence, which would be -- you're quite
4 right -- the purple thing, and that hybridizes to a
5 target DNA, which we have in that diagram, either in 14:07:14
6 solution or a solid support. Sure. So that one can
7 physically capture and isolate the target DNA.
8 Now there's a couple of points I'd like to make
9 and emphasize.
10 First of all, we're dealing with a nucleic acid 14:07:29
11 sequence in the singular. You'll also note, as you can
12 see very well in the cartoon, that the target DNA is, in
13 fact, the same molecule in the beginning as it is in the
14 end. Primarily it exists, and one isolates that same
15 molecule. 14:07:55
16 Importantly, in one context that we'll like
17 discuss, you are capturing the original molecule. And
18 should that molecule be unique in some way, perhaps there
19 are methylated bases, for example, one will capture that
20 information. And that, I think, are the unique aspects 14:08:11
21 of the process that I think are worth illuminating
22 presently.
23 Q. Thank you for that explanation.
24 And just back to understanding the cartoon. So
25 in the middle column, there's the hybridization step; 14:08:32

1 correct?
2 A. Uh-huh. I mean, sometimes we call that a
3 duplex.
4 Q. Right. Or base pair. There are various terms
5 that are used for hybridization; correct? 14:08:46
6 A. Yeah, we have a regional base pairing and
7 creating a duplex structure.
8 Q. And at that point, you would not consider the
9 capture to have occurred; correct?
10 A. Well, again, the problem here is we have not -- 14:09:00
11 we don't have the surrounding relevant sequences that we
12 are seeking to remove this from, and were they present,
13 they would still be present in there, and I would argue
14 it has yet to be captured.
15 Q. And so the capture part of this schematic occurs 14:09:18
16 when the, for example, streptavidin on the magnetic
17 beads --
18 A. Uh-huh.
19 Q. -- binds to the biotin on the captured probe;
20 correct? 14:09:30
21 A. Yeah. And adding an additional part to that,
22 one has washed away all of the molecules that do not have
23 the probe and yield hybridized to them.
24 Q. And so that process requires at least the
25 streptavidin molecule and at least the biotin molecule; 14:09:47

1 correct?
2 A. Right. One -- in this particular formulation.
3 There are many other ways that you could capture that
4 duplex, but in this particular iteration -- and this gets
5 back to my important point about it is informative to 14:10:01
6 have the collection of DNAs that one does not want to
7 capture. And that would, in fact, crystallize my last
8 statement.
9 Q. Go back up to paragraph 63, and it's fair that
10 one of your opinions in this case that the term "capture 14:11:04
11 probe" is synonymous with the term "pull-down probe"?
12 A. Yeah, I think there's evidence that people have
13 regarded them as synonymous, and I'm giving the example
14 of the examiner.
15 Q. I just want to understand. By "synonymous," do 14:11:21
16 you mean that the universe of capture probes is
17 100 percent co-extensive with the universe of pull-down
18 probes?
19 A. You know, we're sort of a little bit in a
20 semantic area and also different generational semantics. 14:11:36
21 Pull-down -- they are both utilizing the same concept. I
22 would suggest to you that pull-down became a buzzword
23 with the evolution of the magnetic bead approach.
24 Because in an actual fact, when one does this, one
25 actually takes a magnet and pulls stuff down. That, I 14:12:02

1 think, is a derivation of this.
2 But what I would stress is the underlying
3 concept here is identical between these two things.
4 Q. But the magnetic bead approach is the approach
5 that would typically be referred to as the pull-down 14:12:28
6 approach; correct?
7 A. Well, as I'm implying, if one did a casual
8 examination of the use of pull-down, one might find --
9 and I can only -- I can't say with any veracity -- one
10 might find that that tends to be applied more to the 14:12:46
11 magnetic bead situation than the other scenario.
12 But what remains to be true is the underlying
13 concept of how one isolates the molecule is identical,
14 irrespective of what you might call it, in the sense of
15 the qualifying word to probe. 14:13:06
16 Q. But so there are capture probes that are not
17 pull-down probes; correct?
18 A. Are there capture probes that are not pull-down
19 probes? I think you would have to be a little bit more
20 specific and help me whether the capture probe has what 14:13:31
21 on it that initiates the capturing?
22 Q. As you've used the terms in your declaration;
23 right? We've agreed that one of your opinions was that
24 pull-down probes and capture probes are synonymous, and
25 I'm just trying to understand if there's any 14:13:50

1 nonoverlapping areas of those definitions or if they mean
2 absolutely 100 percent the same thing no matter what.
3 A. I would regard them as meaning the same thing.
4 I -- I would suggest that there are folks in this
5 universe who perhaps have only ever done this technique 14:14:08
6 one way and may be under the impression there's something
7 different about a pull-down probe versus a capture probe.
8 You know, I can't legislate for that. Folks
9 have their own opinions. This is just speculation. In
10 my mind, these are two synonymous concepts primarily 14:14:26
11 because, in my mind, "probe" itself the original meaning
12 of probe, as it was used -- in fact, probe is first
13 coined by Karl Marx, I guess in '73, '74.
14 This technique had been used since the '60s in
15 terms of forming a duplex and being able to identify 14:14:52
16 nucleic acids. He even suggested we should -- we should
17 all use the word "probe."
18 Laterally, people felt the need to add yet an
19 additional modifying word, "capture probe, pull-down
20 probe." Primarily probably because there are probes that 14:15:07
21 are used for other things that can be labeled probes.
22 They're still capable of capturing a duplex, but they're
23 seen in a slightly different context and could be
24 confusing the layperson.
25 Q. But so a labeled probe might be an example of a 14:15:25

1 captured probe. That's not a pull-down probe? Is that
2 your testimony?
3 A. Well, no, I would say the concept is identical.
4 Well, let me just be a little facetious for a
5 second. You could perhaps isolate a nucleic acid by 14:15:43
6 pulling down a scalpel through a nitrous cellulose sheet.
7 Then you would say, "Ooh, that's a pull-down probe."
8 Q. But the act of -- the act of cutting a nucleic
9 acid out of a nitrous cellulose sheet is not pull-down;
10 correct? 14:16:06
11 A. You're pulling down a scalpel.
12 Q. And that's the way the "pull-down" is used when
13 you use the term "pull-down probe" in the context of the
14 '394?
15 A. Well, what I'm simply saying to you is that one 14:16:12
16 can be endlessly pedantic, if one chooses.
17 Q. I'm trying to understand in the sense that
18 you're using "pull-down" in this declaration, you don't
19 mean that in the sense of pulling down a scalpel on a
20 piece of paper; correct? 14:16:30
21 A. You could if that's what you use the probe in
22 the context for.
23 Q. The pull-down probes includes pulling down a
24 scalpel on a piece of paper. That's your testimony?
25 A. That -- that is a slightly facetious comment, 14:16:38

1 but it's simply meant to indicate that the origin of
2 "pull-down" in some minds may -- some minds may think
3 it's inexorably associated with magnetic beads. That's
4 not necessarily so.
5 Let me give you another example. Instead of a 14:16:57
6 magnetic bead, it could be just a big heavy bead. One
7 would spin this material down, and many people regard a
8 centrifuge as a pull-down apparatus. There we go. But
9 the concept is identical.
10 Q. And so in support of this argument that capture 14:17:19
11 probes and pull-down probes are synonymous, one of the
12 documents you cite is this excerpt from the '394 patent's
13 file history. That's what's shown here in paragraph 63.
14 A. This is what's shown here. And let me just
15 indicate straightaway that this is material the legal 14:17:36
16 team sallied forth with, and they understand the search
17 terms that the examiners use. I have very little
18 facility in that regard.
19 Q. So I have that correctly, you don't understand
20 the search terms the examiners used here? 14:17:52
21 A. Well, to be precise, I learned for the first
22 time what CAPTUR dollar five meant. And what I now
23 understand is that means you want to, in fact, catch all
24 the terms that could be somewhat related to capture,
25 including capturement, I guess, or all the variants. 14:18:14

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1 That's not really a big deal. I was mystified
2 by it initially, but it was explained to me.
3 Q. Fair to say you're -- you're an expert on the
4 science, but not on an expert on the patent examination
5 process. 14:18:29
6 Is that fair?
7 A. No, I think that's reasonably fair. I've had
8 patents myself. I'm familiar with the to's and fro'ings
9 of examination battles. I'm not intimately familiar with
10 searching in this sort of primitive form, shall I say? 14:18:50
11 But it appears to work.
12 Q. And so your understanding of the search list is
13 that sort of everything that's within a single
14 parenthesis, the examiner considered to be a synonym of
15 itself? 14:19:05
16 A. No, my -- my -- my understanding of this process
17 is you look to see whether those things are linked, and
18 you go through a reduction process which -- is this on
19 the next page?
20 Q. I'm happy to scroll. 14:19:21
21 A. No, it isn't. So this must be a short excerpt
22 of the -- of the proceedings.
23 Okay. So L10 is one search, L1, and these are
24 combined with other searches. And so the conclusion is
25 that where you find "capture," you find "pull-down." 14:19:40

1 Q. And are "capture" and pull-down synonymous
2 100 percent with enrichment?
3 A. Enrichment is a whole other discussion that we
4 should and probably will have.
5 Q. And so in L10, when the search terms use "enrich 14:20:00
6 dollar sign five, capture dollar sign five, pull down,
7 and pull down, is it your understanding that that means
8 that the examiner considered "enrichment" and "capture"
9 and "pull-down" to be the exact same thing?
10 A. No, I think that he's looking here for prior art 14:20:17
11 that may have "enrich" and prior art that may have
12 "capture" and seeing what the story is.
13 Q. And so it doesn't -- so it doesn't show that he
14 thought "enrich" and "capture" were the same thing;
15 correct? 14:20:34
16 A. That may be the case; it may not necessarily be
17 the case. This is just merely a search term.
18 Q. And do you see down the farthest right-hand
19 column, there's a bunch of date and time stamps on this?
20 A. Yeah. 14:20:47
21 Q. So you see search L10 was performed on May 21st,
22 2022, at 2037 p.m.
23 Do you see that?
24 A. I see that, yeah.
25 Q. And search L11 was performed on May 21st, 2022, 14:20:56

1 at 2037.
2 Do you see that?
3 A. Appears to be the same time, as far as I can
4 tell.
5 Q. And search L12 also performed the same time and 14:21:07
6 date?
7 A. Yeah.
8 Q. So these three searches show here all within the
9 same minute; correct?
10 A. Sounds likely, yeah. 14:21:17
11 Q. So does that indicate whether or not this search
12 was a thorough search?
13 A. Well, I couldn't comment on that.
14 Q. You referenced a little bit ago the concept of
15 labeled probes. So I'd like to go to your declaration at 14:21:34
16 paragraph 65?
17 A. Okay.
18 MR. LUMAN: Did you say 65?
19 MR. KRAUSE: Correct. Is the screen working for
20 you, Nate? 14:21:47
21 THE WITNESS: Yeah. Sorry.
22 MR. KRAUSE: I'll go double so you can see
23 everything. Sorry.
24 Q. So have you had a chance to review, Doctor?
25 A. Oh, sorry, I didn't realize. Yeah, I quickly 14:23:14

1 took a glance over it. I'm quite familiar with this
2 question because it was a question that I saw I think in
3 the -- the Board decision.
4 Q. Right. You understand -- sorry, sorry.
5 Did you -- I want to allow you to finish. I'm 14:23:31
6 sorry for talking over you.
7 A. No, no, no, no, no. You're quite right. I had
8 finished. I was just thinking about something
9 additional.
10 But, yes, no, I saw this question in the 14:23:41
11 original Board pronouncement.
12 Q. Right. And so one of the points the Board
13 raised in its institution decision was that under its
14 preliminary construction of capture probes --
15 A. Uh-huh. 14:23:55
16 Q. -- labeled probes used in a southern blot
17 constitute capture probes. That's what the Board said;
18 correct?
19 A. Well, my interpretation of this was that they
20 were suggesting that this is an instance where you might 14:24:09
21 call something a capture probe, and then it would not
22 fulfill that definition because you're not physically
23 collecting the target DNA.
24 That was my interpretation; is that correct?
25 Q. Yeah, I believe that's a fair summary of your 14:24:26

1 declaration, and I want to just explore the later part of
2 it.
3 And so you explain here in your declaration that
4 after that hybridization event, a way to physically
5 collect that nucleic acid would be to localize it on a 14:24:41
6 nitrous cellulose paper, cut it out --
7 A. Yeah.
8 Q. -- and then DNA --
9 A. Sorry. I apologize for interrupting.
10 Just the transfer to nitrous cellulose is part 14:24:52
11 of this process routinely. That's what a southern blot
12 is.
13 Q. Right. So nucleic acids exists on the nitrous
14 cellulose paper; correct?
15 A. Correct. And be aware that before the nucleic 14:25:08
16 acids are transferred, they've already been spread out on
17 a gel according to size; right?
18 Q. And so when nucleic acids are spread out on a
19 gel according to size, were there techniques known in the
20 2012 time frame to remove nucleic acids from those gels? 14:25:27
21 A. Oh, sure. It's a Standard Operating Procedure.
22 One can isolate nucleic acids from a gel, which is what
23 you're presently talking about. One can also isolate
24 nucleic acids from a gel whose nucleic acids have been
25 transferred to nitrous cellulose, which is the point I'm 14:25:49

1 making here.
2 I would have to say that this is a bit of
3 old-school knowledge in terms of things we used to do,
4 and it's quite possible the younger generation of folks
5 may be understandably unaware of how one could do this. 14:26:02
6 Q. And just so I can some understand some of the
7 terminology and techniques -- it's been a while since I
8 took molecular biology.
9 A. Likewise.
10 Q. But -- so right. One of the techniques known 14:26:20
11 for separating DNA based on size is gel electrophoresis;
12 correct?
13 A. Absolutely correct, yeah. It goes gel
14 electrophoresis or acrylamide electrophoresis if they're
15 smaller DNAs. 14:26:36
16 Q. And so when you -- when you run those gels, then
17 the DNA separates according to its size, and you can
18 identify bands within that DNA; correct?
19 A. If indeed -- if indeed it is a species that
20 contains fragments of a particular size and they are 14:26:49
21 unique enough to be visualized.
22 Q. And if you can find and visualize the fragment
23 of a particular size on a gel, then you can physically
24 remove it from the gel?
25 A. Uh-huh. Absolutely. 14:27:05

1 Q. And then you can subsequently extract the
2 nucleic acids from the gel; correct?
3 A. I'm not quite sure what era we're in, but
4 originally you could isolate DNA from a gel of a
5 particular size, and thence you could perhaps -- you 14:27:19
6 could perhaps clone it, you could perhaps sequence it.
7 Which era are we in currently?
8 Q. Well, so this would have been -- this is
9 something that was done in the old-school techniques, the
10 technique of isolating a particular DNA from a gel. That 14:27:36
11 was an old-school technique; correct?
12 A. Yeah, well, when we say "old school," probably
13 it came into vogue I would imagine in the early '80s
14 because that's when people started -- well, let's think
15 now. When did cloning first happen of any DNA fragment? 14:27:55
16 Late '70s? And then it sort of went mainstream.
17 So, yeah, my reasonable guess is the early '80s,
18 people were well facile with identifying DNAs,
19 particularly if they were the major constituent of a
20 preparation; right? Otherwise, you're looking at a big 14:28:16
21 sphere, which would be the typical scenario.
22 Q. And so by the '80s, if you had an
23 electrophoresis gel with a clean DNA band, it would be
24 relatively facile to extract that DNA; correct?
25 A. The extract process is facile. The real 14:28:33

1 question is: How do you know which DNA you want?
2 Q. Assuming that you knew which DNA you wanted --
3 A. But you wouldn't necessarily -- you wouldn't
4 necessarily know. That's where a labeled probe would
5 come in very handy. 14:28:51
6 Q. Fair enough.
7 But if you knew which DNA that you wanted on the
8 gel, it would be relatively facile to extract it and
9 collect it; correct?
10 A. Yeah, if you knew. The question is how would 14:29:04
11 you know.
12 Q. I'm going to pull up Exhibit 2027, which is the
13 Gellert reference that you cite.
14 A. Oh, Marty. All right.
15 Q. Do you need time to review it? It sounds like 14:29:30
16 you're familiar with this.
17 A. Well. It's -- it is a classic, but I think I
18 reread it back in -- geez, I don't know -- maybe August.
19 I haven't reread it before today's proceedings, but I'm
20 happy to let you go forth, and if you are accommodating, 14:29:52
21 I can check.
22 Q. I'll start asking some more questions, and if
23 you need time to review, then feel free.
24 A. Yeah.
25 Q. So I just want to understand, in your 14:30:02

1 declaration you cite this Gellert reference,
2 Exhibit 2027 -- I'm sorry -- as an example where a single
3 nucleotide can function as a capture probe; is that
4 correct?
5 A. Uh-huh. 14:30:13
6 Q. And so throughout this reference -- and I'm
7 happy to search -- the Gellert reference doesn't use the
8 term "capture probe."
9 Is that fair?
10 A. Oh, that would be very fair. This is 1962. 14:30:26
11 Q. But just so I understand your opinion correctly,
12 even so, Gellert's guanylic acids still constitute
13 capture probes as the term would have been understood --
14 (Reporter clarification.)
15 MR. KRAUSE: Guanylic, G-U-A-N-Y-L-I-C, acids. 14:30:47
16 THE REPORTER: Thank you.
17 Q. BY MR. KRAUSE: Try and start the question over.
18 A. Uh-huh.
19 Q. In your opinion --
20 A. Yeah. 14:31:01
21 Q. -- Gellert's guanylic acids constitute capture
22 probes as the term would have been understood by a person
23 of skill in the art in light of the specification of
24 these patents; correct?
25 MR. LUMAN: Incomplete hypothetical. 14:31:13

1 THE WITNESS: Yeah, I think it's more
2 constructive to think about the framework and the context
3 in which I presented this paper.
4 Another anomaly that I noted from the Board's
5 presentation, Board's decision document, and was not 14:31:31
6 surprising to me, having taught for 40-odd years, there's
7 a sort of a street myth that bases don't -- that a single
8 base can't base pair to another base. That's a sort
9 of -- that's a myth. Of course they can. They're
10 forming hydrogen bonds, and if you provide the 14:32:00
11 appropriate environment, you'll get an interaction
12 between two base pairs.
13 And so in terms of then providing an evidence
14 towards how that would be relating to capture, I thought
15 of Gellert's article because what happens here is each 14:32:22
16 guanine base is actually capturing another base to the
17 extent that they form a gel, and therefore, they may be
18 captured merely by spinning down the material.
19 Now in common parlance now, a young kid in my
20 lab, a person of skill in the art, would actually be 14:32:47
21 surprised. They're going to be, whoa, I didn't know a
22 single base could anneal to a single base. Yeah, if you
23 find the right conditions.
24 Now why this is amenable to our discussion is
25 because there's something even more subtle going on here, 14:33:04

1 and that is we're forming an interaction, hydrogen bond
2 interaction between two guanine bases. Not G and C, for
3 example, as one might suspect, okay? It's actually G
4 basing to G. This is called a Hoogsteen interaction.
5 Fascinating interaction, gets rediscovered every 14:33:24
6 couple of years or so, and it actually turns out to be
7 quite relevant to our discussion on sequencing.
8 Because, of course, some of the DNA is not in a
9 classic structure. It's actually Hoogsteen basis, which
10 makes a little single stranded region loop out and base 14:33:45
11 pair on itself.
12 And that's a -- that's a formidable structure to
13 deal with both in terms of making a library of fragments
14 and sequencing. They're called quadruplex structures.
15 So I diverged a little bit. But what I'm saying 14:34:03
16 here is so what we have here is a G annealing to another
17 G and capturing it by forming a gel.
18 Q. BY MR. KRAUSE: So let's take a look at
19 Figure 4, and I think this is the structure you're
20 referring to. 14:34:18
21 A. Yeah, that is the Hoogsteen interaction right
22 there. Yeah, and I stand corrected. You're actually
23 looking at four bases are actually what the Hoogsteen
24 structure is.
25 Q. And so these are four identical guanylic acid 14:34:29

1 molecules; is that correct?
2 A. And guanylic is kind of like the old term.
3 Let's call them guanine bases. I think that's fine for
4 our purposes.
5 Q. This shows four guanine bases interacting with 14:34:43
6 each other; correct?
7 A. Four G bases in terms of modern.
8 Q. And in this structure, can you identify which
9 ones are the capture probes and which ones are the target
10 DNA? 14:34:55
11 MR. LUMAN: Incomplete hypothetical.
12 THE WITNESS: Well, this -- the purpose of this
13 paper was to allay the concerns that a probe could not be
14 a single base. And so in this particular circumstance,
15 any one of these bases is the target and any one of these 14:35:14
16 bases is the probe.
17 Q. BY MR. KRAUSE: So just so I understand
18 correctly, each of the G bases here is simultaneously a
19 target and a probe; correct?
20 A. Because each of them are a single base. 14:35:32
21 MR. KRAUSE: If we could just go off the record?
22 MR. LUMAN: Off the record at 11 -- I'm sorry,
23 at 2:36.
24 (Recess.)
25 MR. LUMAN: Okay. We are back on the record at 14:47:01

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2:47.
MR. KRAUSE: All right. Thank you.
Q. Dr. Furneaux, do you have an understanding of what an aliquot is?
A. Huh, yeah. It's something that is a bit of a 14:47:11
controversy, aliquot. Some people regard it as an equal -- an equal amount, and some people simply regard it as a sample. It's best to consider that in a context.
Q. So it can be -- it can be considered sort of like an equal parts of a sample. Like if somebody has 14:47:35
multiple aliquots of a sample that they've divided into multiple parts, is that part of the definition?
MR. LUMAN: Outside the scope.
THE WITNESS: Yeah. I mean, I'm offering a gratuitous opinion here. There has been controversy in 14:47:48
terms of that term. As I'm repeating, it's best to see that in context to understand it. And also, I think it is outside the scope of this report.
MR. KRAUSE: Move to strike after "yeah."
Q. And so we've discussed the institution decisions 14:48:21
at fair length today. And fair to say that you've reviewed those decisions?
A. Oh, yeah. My -- my role in that was to look at the -- in the first instance, was to look at the Board's decisions and to check to see that there was actually 14:48:39

some scientific veracity in those decisions.
I'm not impugning that the -- expertise of the Board, but there are some times, as we've already discussed, treatments about nucleic acids that seem to get perpetuated in these circumstances. 14:48:58
Q. But generally, you understand that the judges of the Board have a lot of experience in reading and analyzing patents?
A. I would imagine so, yes.
Q. And you understand from your review of the 14:49:10
institution decision that the three judges on the Panel in this case preliminarily determined that a POSA reviewing these patents would have understood that the claimed capture probes encompass PCR primers? That was their opinion? 14:49:24
A. Oh, yeah. That -- I think that was their opinion. I would reject that notion.
Q. And in fact, in paragraph 14 of your declaration, you called that notion quite simply ridiculous; is that correct? 14:49:38
A. I probably did, yeah.
Q. And do you stand behind that testimony?
A. Yeah, I would actually say it's incredibly ridiculous.
Q. And so when the PTAB judges deliberate about the 14:49:49

credibility of the evidence and arguments in this case, one of the things that they can consider is your testimony that the recent analysis of a Harvard professor and three expert patent judges was "quite simply ridiculous." Correct? 14:50:07
MR. LUMAN: Hold on. That's argumentative and that mischaracterizes the testimony and his declaration.
THE WITNESS: I would also add that I even sense a little bit of intimidation in that statement.
Q. BY MR. KRAUSE: I'm just asking if they can 14:50:23
consider the statements in context.
A. I'm not quite sure what you're asking me. I made a mistake -- I made a statement. In my opinion, this assertion is ridiculous.
MR. KRAUSE: All right. Pass the witness. No 14:50:40
further questions.
MR. LUMAN: We are off the record at 2:50.
(Recess.)
MR. LUMAN: The time is 3 o'clock. We're back on the record, and I have no questions for the witness. 15:00:11
So this will end the deposition. And I would like to take an opportunity to review the transcript for confidentiality. I don't recall anything being confidential here, but I would like to take a look through it just to confirm. 15:00:27

MR. KRAUSE: All right. That's fine. Thank you very much, Dr. Furneaux and Leslie.
THE WITNESS: Thanks to you, Andy. You know, fair game. All the best.
THE REPORTER: Off the record at 3:00 p.m. 15:00:40
(Time noted: 3:00 p.m. Eastern Standard Time.)
--oOo--

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I declare under the penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on _____, 2023, at _____, _____.

_____

HENRY MORRICE FURNEAUX, PH.D.

STATE OF CALIFORNIA) ss:
COUNTY OF MARIN)

I, LESLIE ROCKWOOD ROSAS, RPR, CSR NO. 3452, do hereby certify:

That the foregoing deposition testimony was taken before me at the time and place therein set forth and at which time the witness was administered the oath;

That testimony of the witness and all objections made by counsel at the time of the examination were recorded stenographically by me, and were thereafter transcribed under my direction and supervision, and that the foregoing pages contain a full, true and accurate record of all proceedings and testimony to the best of my skill and ability.

I further certify that I am neither counsel for any party to said action, nor am I related to any party to said action, nor am I in any way interested in the outcome thereof.

IN WITNESS WHEREOF, I have subscribed my name this 14th day of December, 2023.

LESLIE ROCKWOOD ROSAS, RPR, CSR NO. 3462

HENRY MORRICE FURNEAUX, PH.D.
furneaux@ribogenix.com
December 14, 2023
RE: FORESIGHT DIAGNOSTICS, INC. vs. PERSONALIS, INC.
December 12, 2023-HENRY MORRICE FURNEAUX, PH.D.-JOB NO.6346424
The above-referenced transcript has been completed by Veritext Legal Solutions and review of the transcript is being handled as follows:

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__ Waiving the CA Code of Civil Procedure per Stipulation of Counsel - Original transcript to be released for signature as determined at the deposition.

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__ Federal R&S Not Requested - Reading & Signature was not requested before the completion of the deposition.

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California Code of Civil Procedure

Article 5. Transcript or Recording

Section 2025.520

(a) If the deposition testimony is stenographically recorded, the deposition officer shall send written notice to the deponent and to all parties attending the deposition when the Original transcript of the testimony for each session of the deposition is available for reading, correcting, and signing, unless the deponent and the attending parties agree on the record that the reading, correcting, and signing of the transcript of the testimony will be waived or that the reading, correcting, and signing of a transcript of the testimony will take place after the entire deposition has been concluded or at some other specific time.

(b) For 30 days following each notice under subdivision (a), unless the attending parties and the deponent agree on the record or otherwise in writing to a longer or shorter time period, the deponent may change the form or the substance of the answer to a question, and may either approve the transcript of the deposition by signing it, or

refuse to approve the transcript by not signing it.

(c) Alternatively, within this same period, the deponent may change the form or the substance of the answer to any question and may approve or refuse to approve the transcript by means of a letter to the deposition officer signed by the deponent which is mailed by certified or registered mail with return receipt requested. A copy of that letter shall be sent by first-class mail to all parties attending the deposition.

(d) For good cause shown, the court may shorten the 30-day period for making changes, approving, or refusing to approve the transcript.

(e) The deposition officer shall indicate on the original of the transcript, if the deponent has not already done so at the office of the deposition officer, any action taken by the deponent and indicate on the original of the transcript, the deponent's approval of, or failure or refusal to approve, the transcript. The deposition officer shall also notify in writing the parties attending the deposition of any changes which the deponent timely made in person.

(f) If the deponent fails or refuses to approve the transcript within the allotted period, the

deposition shall be given the same effect as though it had been approved, subject to any changes timely made by the deponent.

(g) Notwithstanding subdivision (f), on a seasonable motion to suppress the deposition, accompanied by a meet and confer declaration under Section 2016.040, the court may determine that the reasons given for the failure or refusal to approve the transcript require rejection of the deposition in whole or in part.

(h) The court shall impose a monetary sanction under Chapter 7 (commencing with Section 2023.010) against any party, person, or attorney who unsuccessfully makes or opposes a motion to suppress a deposition under this section, unless the court finds that the one subject to the sanction acted with substantial justification or that other circumstances make the imposition of the sanction unjust.

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ERRATA SHEET

Case Name: *Foresight Diagnostics Inc. v. Personalis, Inc.*
Date: December 12, 2023
Deponent: Henry Furneaux, Ph.D.

Page(s)	Line(s)	Change	Reason
16	2	“funs” to “fun”	Transcription error
18	16	“look at in” to “look at it in”	Transcription error
38	13-14	“we which will have presently” to “which we will have presently,”	Transcription error
62	15	“What I’m providing” to “Well, I’m providing”	Transcription error
69	12-13	“I think should be don’t turn out that way” to “I think should be, don’t turn out that way,”	Transcription error
69	21	“I adopt.” to “I adopt…”	Transcription error
71	11	“solv” to “solve”	Transcription error
75	23-24	“and that’s the only ends that you will have that” to “and that the only ends that you will have,”	Transcription error
84	9	“where ‘indeed,’ this is” to “where, indeed, this is”	Transcription error
88	15	“don’t you do this?” to “don’t we do this.”	Transcription error
89	20-21	“I am talking about and about to talk about” to “I am talking about, and about to talk about,”	Transcription error
90	22	“history” to “industry”	Transcription error
91	17	“mostly” to “most”	Transcription error
95	3	“revealed was a” to “revealed it was a”	Transcription error
95	9-10	“my opinions to opinions to deliberations on the genome,” to “my opinions to deliberations on the genomes,”	Transcription error

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Page(s)	Line(s)	Change	Reason
95	11	“referenced genome” to “referenced genomes”	Transcription error
95	12-13	“bits of prior art that we’re certainly likely to discuss very soon” to “bits of prior art, that we’re certainly likely to discuss very soon,”	Transcription error
95	18-19	“you know. I’m very --” to “you know… I’m very…”	Transcription error
96	15	“well about that” to “well be that”	Transcription error
97	8	“someone unlikely” to “somewhat unlikely”	Transcription error
97	25	“Luna’s” to “Illumina’s”	Transcription error
117	8	“you’re cite” to “you’re side”	Transcription error
123	6-7	“buzz and woo” to “buzzwords”	Transcription error
124	14	“our retraction” to “the retraction”	Transcription error
125	7	“NCIA” to “NCI”	Transcription error
126	6	“crystal” to “crystalize”	Transcription error
134	16	“then actually -- it looks like” to “then actually… It looks like”	Transcription error
135	10	“nucleotides” to “nucleotide”	Transcription error
136	3	“concur” to “discover”	Transcription error
136	24-25	“ad homonyms. Prepared comments.” to “ad hominems. Prepared comments!”	Transcription error
146	3-4	“take a look -- if we have on the screen our -- I’m always using the royal ‘we’ -- our -- I” to “take a look… (if we have on the screen our)… I’m always using the royal ‘we’… our… I”	Transcription error
147	23	“the probe and yield hybridized” to “the biotin probe annealed, hybridized,”	Transcription error
151	13	“Karl Marx” to “Paul Marks”	Transcription error

Page(s)	Line(s)	Change	Reason
151	18	“Laterally” to “Recently”	Transcription error
152	6	“nitrous” to “nitro”	Transcription error
160	21	“sphere” to “schmear”	Transcription error
167	4	“treatments about” to “street myths about”	Transcription error
168	12-13	“I made a mistake --” to “I made a mistake?”	Transcription error

Dated: December 20, 2023

Henry Furneaux, Ph.D.