UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,

Petitioner

v.

CARBYNE BIOMETRICS, LLC,

Patent Owner.

IPR2024-00329
U.S. Patent No. 9,972,010

IPR2024-00330
U.S. Patent No. 10,713,656

IPR2024-00331
U.S. Patent No. 11,526,886

REMOTE DEPOSITION OF MICHAEL T. GOODRICH, Ph.D.

(Taken by Petitioner)

January 7, 2025

12:02 p.m.

Deposition held via Zoom Videoconference

Reported by: F. Renee Finkley, RPR, RMR, CRR, CLR, CCR-B-2289 (Via Videoconference)

APPEARANCES OF COUNSEL

On behalf of the Petitioner:

HONG SHI, Esq. (Via Videoconference)
DAVID W. O'BRIEN, Esq. (Via Videoconference)
Haynes and Boone, LLP
98 San Jacinto Boulevard
Suite 1500
Austin, Texas 78701
(512) 867-8440
hong.shi@haynesboone.com
david.obrien@haynesboone.com

On behalf of the Patent Owner:

BRADLEY JARRETT, Esq. (Via Videoconference)
McKool Smith, PC
300 Crescent Court, Suite 1500
Dallas, Texas 75201
bjarrett@mckoolsmith.com

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(The witness was sworn.)

MICHAEL T. GOODRICH, Ph.D., having been first duly sworn, was examined and testified as follows:

EXAMINATION

BY MS. SHI:

Q. So good morning, Dr. Goodrich. I'm Hong Shi from Haynes and Boone on behalf of Petitioner Apple. So you have had your deposition taken before; is that right?

A. Yes.

Q. And you're appearing here today as an expert witness on behalf of Carbyne Biometrics; is that right?

A. That's right.

Q. How many times have you had your deposition taken before?

A. I have lost track, actually, but I believe it's more than 50 times.

Q. Okay. And when is the most recent ones?

A. I don't recall. It's been a few months.

Q. Okay. So it's in the last year?

A. I believe I was deposed last year, yes.

Q. So I would just go over some basic ground rules. You probably have been through this many

1 times, but we just go over this for the record. So
2 do you understand that you're under oath today?
3 **A. I do.**
4 Q. And you understand that I will be asking
5 you questions?
6 **A. That's right.**
7 Q. And do you understand that the oath
8 requires you to answer the questions truthfully and
9 completely?
10 **A. Yes.**
11 Q. And you will answer truthfully and
12 completely today; is that right?
13 **A. Yes, that is my plan.**
14 Q. Is there any reason that you cannot
15 provide truthful, complete, and accurate testimony
16 today?
17 **A. No.**
18 Q. Is there any reason why your deposition
19 should not go forward today, for example, any medical
20 reasons or other reasons?
21 **A. Not that I'm aware of.**
22 Q. And do you understand that this deposition
23 is being transcribed and we're developing a record?
24 **A. Yes. And is it also true that this is**
25 **being video recorded?**

MS. SHI: Court reporter I don't think it's being video recorded, but could you please confirm?

(Discussion off the record.)

THE WITNESS: So to clarify, I don't need to be wearing my tie the whole time.

Q. (By Ms. Shi) We're not planning on using the Zoom video.

A. Thank you.

Q. So because of that, I would ask you to wait for me to finish asking my questions before you answer. Is that clear?

A. I will do my best.

Q. Thank you. Also, I would like you to respond -- when you respond to the question, focus on the question that I ask, and answer that question, not another question; is that fair? Because we're developing a record, and it only make sense if your answer corresponds to my question.

A. I will do my best to do that as well, but I have had experiences in the past, where I had been interrupted or I was not able to give a complete answer. And in some cases, and in this one as well, I would like to reserve the right to fully answer every question you ask, even if that means picking up

where I had left off before.

Q. Of course. And do you have any preference on when to take a break?

A. I think we can respond in realtime for when breaks should occur. Maybe every hour, hour and a half or so.

Q. Okay. And if you need a -- to take a break, just let me know.

A. Thank you.

Q. So how many IPRs have you worked on?

A. I've lost track of that, too. I'm sure it's more than 20.

Q. Okay. And in how many of those did you work with patent owners?

A. I think the majority have been patent owners, but not exclusively patent owners.

Q. Okay. And can you just explain your process when you work with the patent owners, when you provide your opinions in those IPRs?

MR. JARRETT: Objection.

THE WITNESS: Sure. My process is to start with the patents that are in suit and being challenged. Read those, make sure I understand them.

Then I review the petition. There's often

an expert declaration from the petitioner that I also review. And then there will be some alleged prior art references that I review.

And then together with counsel, typically, there's discussions about positions and studying the different arguments that are coming from the petitioner. And I formulate opinions, discuss those with counsel, and come up with the opinions that I will be rendering.

Q. (By Ms. Shi) Is that the same process you applied in these three IPRs?

A. Yes.

Q. So to prepare for today's deposition, have you reviewed any documents?

A. Yes.

Q. What are those?

A. I reviewed my declarations. I reviewed prior art references. I reviewed the declaration of another expert that was retained by the Petitioner. Those are activities -- I also met with counsel, Mr. Jarrett, who's on the call today, by Zoom yesterday as well.

Q. Did you review the Patent Owner's preliminary response?

A. I did, yes.

Q. And did you review also the Patent Owner's response, which is after the institution decision by the board?

A. I don't recall having seen that.

Q. And did you review the board's decision to institute?

A. I don't recall having seen that either, or having reviewed it at least.

Q. So you mentioned alleged prior art references, do you recall?

A. I do recall that.

Q. So for these three IPRs we're taking the deposition today, are you alleging any references you reviewed are not prior art?

A. I think one of the alleged prior art references could be potentially challenged as to whether or not it rises to the level of a printed publication. And that is called FFIEC Guidance.

Q. Did you provide your opinion in your declaration?

A. I did have some issues about that, that I believe I raised in my -- at least one of my declarations.

Q. Do you remember where it is?

A. I'm looking now. So, for example, in my

declaration for the IPR 2024-00329, for what we've been -- for U.S. Patent 9,972,010, which I call the '010 patent. If you go to paragraph 98 in my declaration, I opine that the FFIEC Guidance is not something that would be of interest to a person of ordinary skill in the art, or a POSITA, per the Petitioner's definition of a POSITA. Hence, it could rise to this level of not be a printed publication, because it was not something that a POSITA would have found using standard search techniques.

Q. Why a POSITA would not be interested in this document?

A. Because as I opined in paragraph 98, because of the definition of a POSITA in this case offered by the Petitioner, which is somebody with a bachelor's degree in electrical engineering, computer engineering, computer science, or a related field, and at least two years of experience in the research, design, development and/or testing of biometric authentication techniques and related firmware and software, or the equivalent, such a person would not be interested in high level regulatory guidance when seeking to develop and implement improved technical solutions for fraud detection and prevention.

Q. Thank you. So did you meet with anyone to

prepare for your declaration?

MR. JARRETT: I caution the witness that he can say who he met with, but not to divulge any contents of those conversations, as they will contain privileged information, potentially.

THE WITNESS: When you say meet, do you include Zoom meetings as a meeting?

Q. (By Ms. Shi) Correct.

A. Yes, I did meet with some people.

Q. Who did you meet?

A. I met with, on Zoom, Mr. Jarrett, who is on the call today, and Mr. Fishback, George Fishback.

Q. Who is Mr. Fishback?

A. He's another attorney with the Patent Owner.

Q. Did you meet anyone else to prepare for your declaration?

A. Yes, I also met with Richard Kamprath, K-A-M-P-R-A-T-H.

Q. And who is Mr. Kamprath?

A. He's also an attorney with McKool Smith, who I believe is representing the Patent Owner.

Q. Anyone else did you discuss with for preparing your declaration?

A. No one else is coming to mind, as I sit here today.

Q. So you just referred to your declaration in '010, so I will refer that as your declaration for '010 IPR.

A. Okay. And for clarification, I have a similar paragraph in my declaration for the IPR 2024-00331, which is for U.S. Patent 11,526,886, which I referred to as the '886 patent.

Q. Okay. And what about the third -- is that -- do you have a similar paragraph in the third IPR? We can refer that to the '656 IPR.

A. Let me check. Yes, I do. It's also paragraph 98 in my declaration for IPR 2024-00330, which is for U.S. Patent 10,713,656, which I referred to as the '656 patent.

Q. Okay. So let's go to your declaration that's Exhibit 2032 for the '010 IPR.

A. I am there.

Q. Let's go to the last page.

A. Okay. I'm there as well.

Q. Is that your signature on the last page of Exhibit 2032?

A. Yes.

Q. Did you sign after you reviewed the entire

PDF?

A. I -- no, I signed a Word version of this, that then was converted into a PDF.

Q. And did you review the entirety of that Word document before you signed?

A. Yes.

Q. And our discussion -- do you recall we just discussed that you didn't discuss with anyone else, in addition to the three attorneys representing Patent Owner, for preparing your declaration for '010 IPR, do you recall?

A. I do recall that. That's -- that's my recollection, as I sit here today.

Q. Can you confirm that no other conversations -- there are no other conversations for each of these IPRs, and each of the preparation of the declaration for all of these three IPRs?

A. That's my recollection. I don't recall having discussed this with anyone else. I just may be overlooking someone. I hope I'm not. And if they're reading this transcript now, I hope they're not offended that I'm not recalling them, but that's my recollection.

Q. Thank you. Is there any error in your declaration that you would like to, correct?

A. In reviewing my declarations, I noticed a few minor typos, but I think those are so minor that they're not substantive. So there's nothing substantive, as I sit here today, that I would wish to correct.

Q. So let's go to paragraph 30.

MR. JARRETT: Counsel, which paragraph 30, of what document?

MS. SHI: So we're going to Exhibit 2032 of the '010 IPR, paragraph 30.

THE WITNESS: I am there in my declaration.

Q. (By Ms. Shi) So could you read the last statement of paragraph 30?

A. Yes. "As the '010 patent states, there are two primary reasons why an even otherwise honest person would refrain from committing fraud. One, associated feelings of guilt. And two, the risk of being caught." And then I reference the patent at column 4, from lines 17 to 19.

Q. Can you give some examples of the risk of getting caught?

A. Yes, the patent, in fact, has some of those examples. Let me just pull that up. Yeah, so, for example, the patent has this very colorful

example, beginning in column 4, at line 19.

Q. Sorry to interrupt. Just for the record, we are referring to the '010 patent.

A. Correct. And to then continue, again, at column 4 of the '010 patent, beginning at line 19, "a daughter might refrain from taking money from her mother's pursue, because she would feel guilty doing so and/or because there's a high-risk of being caught, particularly if the daughter is an only child."

And then it goes on to elaborate on this example, where a daughter would be feeling guilty, and feeling more guilty because of the physical, tangible aspect of taking cash. And then the patent is trying to address a need in the electronic space, where you would want to elicit similar feelings of guilt.

Q. Is the feeling of guilt the same as the risk of getting caught?

A. I think they're interplayed. And as I mention in paragraph 30, they're both valid issues to contend with, and then are things that the patent is addressing.

Q. Let's focus on the risk of getting caught for now. So in the example you just described in

electronic transactions, what are the examples of the risk of getting caught?

A. So, again, going with this elaborate example of a daughter stealing money from her mother's percent. And that it notes that taking money from the mother's phone, using electronic means to purchase goods or send a message, is that the risk of being caught is less than if she would just take money from the mother's pursue.

And hence, you would want to both increase the likelihood of being caught and the guilt that is associated with that.

Q. So what are well-known or common techniques for increasing the risk of being caught for electronic transactions?

MR. JARRETT: Objection, vague.

THE WITNESS: So the patent also speaks to this. And when we talk about the risk of being caught, the way the patent is talking about it, it's talking about the apparent risk from the person who is doing the transaction.

And so the patent discloses an embodiment in column 8, beginning at line 14, where it talks about a voice instruction that could be added to a system, where the fraudster would

erroneously believe, based on their transactions, that they will not be caught.

But now they will be getting caught, because there would be some -- they would believe that they could get caught, because of voice samples on the device that, for example, could be the voice saying, "this is my money" any time a payment is about to be performed.

And then the patent also talks about how a short movie on the device of the account owner could also be used, or an image, instead of a voice sample.

Q. (By Ms. Shi) So how long have you worked in the field of fraud prevention and reduction in electronic transactions?

A. I believe I started very early -- I think I address this in my declaration -- in my career. Yeah, I've authored and coauthored over 350 peer-reviewed publications, many of which are in computer security.

And my interest in computer security began even when I was a graduate student at Purdue University in 1983. I speak to this in paragraph 8 of my declaration for the '010 patent.

And I've had many Ph.D. students and

research topics on computer security, fraud prevention. I could go into details. And you would be probably wanting to interrupt me at that point, when I'm talking so much about my research on fraud prevention, how to use cryptographic techniques, various things as one-way hash functions, to help prevent fraud.

Q. Did you say script-graphic techniques?

A. No. If that was how it was transcribed, that would be an error in the transcription. I said cryptographic techniques.

Q. Thank you for the clarification. So do we -- is cryptographic techniques also referred to as encryption?

A. That's one type of cryptographic technique.

Q. And cryptographic techniques, including encryption, helps with computer security; is that right?

A. It can, yes, depending on how it's used.

Q. And improved computer security helps with fraud prevention and reduction; is that right?

A. It depends on the context of how it's applied. It may benefit or have those benefits, depending on the context.

Q. So computer security can help or benefit fraud prevention and reduction in electronic transactions. Is that --

MR. JARRETT: Asked and answered.

THE WITNESS: I would say it the same way I did before, that computer security can aid in some contexts. But it depends on how it's used. And there may be other techniques as well, in addition to cryptographic techniques.

Q. (By Ms. Shi) Have you been involved in developing or implementing any systems for fraud reduction and prevention in electronic transactions, in addition to your research work?

MR. JARRETT: Objection, vague.

THE WITNESS: Yes.

Q. (By Ms. Shi) What are those?

A. So in the late '90s, early 2000s, I was involved in a startup -- and cofounded, in fact, a startup company that was directed to improving what we call integrity of data. And trying prevent fraud that would occur when somebody is trying to present data that has been modified from the source who created that data.

And we developed a prototype system. We attracted investors. We built a prototype. It went

1 **to market to try to sell that. Unfortunately, we did**
2 **not have anyone purchase that system, but it worked,**
3 **it was effective. And we gave demonstrations of its**
4 **effectiveness.**
5 Q. And is the prototype system a web-based
6 system or a mobile phone app-based system?
7 **A. The primary application we had in mind at**
8 **that time had applications both with the web and for**
9 **mobile devices, because it had to do with -- the**
10 **primary application we were looking at was for**
11 **digital certificates, which are used to facilitate**
12 **and protect electronic transactions.**
13 **And we had built a system to verify**
14 **whether or not a digital certificate is valid. And**
15 **that has applications both in the web, as well as for**
16 **mobile devices.**
17 Q. Does your application for web application
18 have user interfaces?
19 **A. We did not work directly on user**
20 **interfaces for that project, other than a back-end**
21 **API that developers of user interfaces would then use**
22 **to do these validity checks, as we call them.**
23 Q. Have you, in other projects, worked
24 directly on the user interface?
25 **A. Yes.**

Q. For electronic transactions?

A. For -- I'm sorry, we spoke over each other. Could you rephrase your question?

Q. Have you worked directly on user interfaces for electronic transactions?

A. And what do you mean by electronic transactions in this context?

Q. What is your understanding of electronic transactions?

A. So if by electronic transactions, you mean transactions that would be modifying data, performing updates to a database or updates to a data repository of some kind, then, yes, I have done research on work for user interfaces for electronic transactions.

Q. And have you worked directly on user interfaces for electronic transactions that involve financial transactions?

A. Yes. In fact, I cite this in my declaration, that I have two papers, which in my CV are indexed as C-84 and C-151, where we talk about improving the security of online auctions.

So these are transactions where one party is selling a good or service through an auction. And we talk about how we can increase the security and -- of that system, which, of course, then also

includes its user interface, based on various techniques. And, again, I could go into details about that, but you probably would want to stop me from diving in.

Q. So is it typically an important part of the system -- sorry, scratch that.

Is the user interface typically an important part of the secured financial transaction system?

A. I don't understand your question. I'm sorry.

Q. Let me try again. Is user interface typically an important part of designing a secure financial transaction system?

MR. JARRETT: Objection, vague.

THE WITNESS: Generally, yes, that is -- user interface is always important in any human-facing system.

Q. (By Ms. Shi) So you mentioned cryptographic, including encryption, is one technology that can be used to benefit fraud reduction in electronic transactions, do you recall?

A. I don't recall saying it that way. I think the way I phrased it was, the cryptographic techniques can be used. They're one tool that can be

1 used, depending on the context, to help prevent
2 fraud.
3 And in our system that did that, we indeed
4 did use cryptographic techniques. Not just
5 encryption, though. We also used one-way hash
6 functions.
7 Q. What are some other commonly used
8 technologies that can help prevent fraud?
9 A. So other technologies that can help
10 prevent fraud today include other types of
11 cryptographic techniques. So we talked about
12 encryption. There's also decryption that is useful.
13 And then there's another technique called
14 digital signatures that can also be used to help
15 prevent fraud in some cases, where one party will
16 digitally sign something using information that only
17 they know, such as a private key, that then others
18 can verify that they have digitally signed, say, a
19 document, that then others can verify that that
20 person did digitally sign that document.
21 And indeed, in our prototype system for
22 that company, we also used digital signatures in our
23 solution.
24 Q. So you used the word technology today.
25 Does your description apply to the priority date of

the three patents we are discussing today, the '010 patent, the '886 patent, and the '656 patent?

A. In my answer, I was talking about how to do things today. I thought that's what you were asking about. If now you're asking about things from before the priority date, I can think about that as well.

Q. Sorry for not -- thank you for clarifying. Yes. So what are the other commonly used technologies for fraud reduction in electronic transactions as of the priority date of the three Carbyne patents we're discussing today?

And just for clarification, my questions, generally, if without specification, specify to -- directing to today's technology, my questions are directed to what a POSITA would have known as of the priority date of the '010 patent, '886 patent, and '656 patent?

MR. JARRETT: Counsel, I'm going to object to that. If you have a question specifically about whether something was available as of a priority date, that needs to be specified in the question.

A blanket statement like that applying to all questions in future, that's not proper. So

just specify in your question, if you have a specific question about technology as of a priority date or technology as of today.

THE WITNESS: I'm sorry, I do not understand your question.

Q. (By Ms. Shi) So as of the priority date of the three patents we're talking about today -- maybe we can use a shorthand. If I talk about priority date of the Carbyne patents, we will understand that I'm referring to the priority date of the '010 patent, the '656 patent, and '886 patent; is that fair?

A. I still don't understand that question, because of a potential dispute over what that date is. So could you please specify the specific date that you are using?

Q. So let's use the alleged earliest priority date of May 6, 2010.

A. Okay. So now with that in mind, what is your question?

Q. So, first, is it fair that when I refer to the earliest priority date of the '010 patent, you understand that we're referring to May 6, 2010?

A. If you would like to use the shorthand of earliest priority date, that phrase, to reference May

6, 2010, I can understand that that's what you mean.

Q. So as of the earliest priority date, what are some commonly used technologies to reduce fraud in electronic transactions?

MR. JARRETT: Object as vague and ambiguous.

THE WITNESS: Yes, so I'm not comfortable just trying to speculate with respect to a specific date. I've been told that depositions are not memory tests.

And so if we're talking about a specific date now, May 6, 2010, I would want to spend more time to go back and study technologies that were available at that time, and not just rely on my recollection, as I sit here today.

I know there's been some alleged prior art references that are in this case. I did review those. But to answer a more broad question like that, I would want to spend more time, which I'm happy to do on the record.

Q. (By Ms. Shi) Yeah, I'm not asking you to do a memory test. I -- my question is directed at the knowledge you applied as the POSITA's knowledge for preparing your declaration. You don't need to do a memory test.

A. Thank you. And to answer your question, may I use Google to search back at that time to answer your question, since this is an online deposition?

Q. No, let's just restrain it to the POSITA's knowledge you applied when you prepared this declaration, instead of using new knowledge from Google?

MR. JARRETT: Objection, vague and ambiguous.

THE WITNESS: And when you ask that question, are you asking me to review prior art -- alleged prior art references? I'm not fully understanding the scope of your question.

Q. (By Ms. Shi) The scope of the question is the POSITA's knowledge you applied when you were preparing the declaration for your analysis?

MR. JARRETT: Objection, vague and ambiguous. Is this directed to a specific limitation? Is it directed to a specific claim element?

THE WITNESS: Yeah, so to be clear, I speak to this in paragraph 25 of my declaration, where I first review the definition of a person of ordinary skill in the art offered by the

Petitioner. And then I note that in the board's institution decision, they took exception to the language "at least," that that was not precise enough.

And then for my opinions, I applied the definition of a POSITA, including the board's clarifying instruction. So the knowledge that I bring to bear to understand what is the knowledge of a POSITA, then, is based on that, from that date, such as May 6, 2010.

And then based on my experience in teaching thousands of undergraduate and graduate students in computer science since 1987, including on topics relevant to the research, design, development and/or testing of biometric authentication for hardware, software, and firmware solutions. I would add as well as authentication and fraud prevention techniques. Hence, I have extensive experience with respect to the knowledge of a POSITA.

Q. (By Ms. Shi) So what were commonly used technologies to reduce fraud in electronic transactions that would have been known to a POSITA?

MR. JARRETT: Objection, vague, ambiguous, asked and answered.

THE WITNESS: I'm sorry, I'm not quite following that question again. The issue there is that -- what is -- you mean by commonly used. The date is not very precise. I don't want to say anything that -- just based on my recollection today. It might be technically after that date.

So I'm not comfortable speculating about that unless you do allow me to do a Google Scholar search, limited to references before May 6, 2010, or if we look at any alleged prior art reference offered in any of these IPRs.

Q. (By Ms. Shi) So right now, sitting here today, you couldn't answer what were commonly used technologies for reducing fraud in electronic transactions that would have been known to a POSITA; is that correct?

MR. JARRETT: Objection, mischaracterizes testimony.

THE WITNESS: That's not what I'm saying. I'm saying that I do have recollection of those technologies, generally speaking. I know technologies that -- from that time. I know things that were cited in the alleged prior art references. But now to have an open-ended

1 question like that. I would need more time to
2 study and make sure that each of the examples
3 that I give were indeed from before May 6, 2010.
4 Q. (By Ms. Shi) Without doing any additional
5 research, you couldn't give any example of technology
6 used to reduced fraud in electronic transactions that
7 would have been known to a POSITA; is that right?
8 MR. JARRETT: Objection, mischaracterizes
9 testimony, vague and ambiguous, asked and
10 answered.
11 THE WITNESS: No, that is inaccurate. As
12 I said before, I studied the alleged prior art
13 references. And so if you have any question
14 with respect to any specific prior art
15 reference, such as, for example, a reference
16 called Hoyos, H-O-Y-O-S, which is U.S. Patent
17 Application Publication 2010/0014720. That uses
18 a technique known as biometric authentication to
19 do part of its invention.
20 Q. (By Ms. Shi) So in addition to the
21 technology described in Hoyos, could you provide
22 another example of technology used to reduce fraud in
23 electronic transactions that would have been known to
24 a POSITA?
25 MR. JARRETT: Objection, vague and

ambiguous, asked and answered.

THE WITNESS: I'm sorry, I'm not understanding the question or following what you're asking. Are you asking about yet another alleged prior art reference? If so, then another one that is being offered is a publication due to Varghese. This is U.S. Patent Publication 2006/0282660. And that has other techniques that it offers. And then I discuss that as well in my declaration.

Q. (By Ms. Shi) Would a POSITA have knowledge of fraud reduction techniques for electronic transactions, outside of the exhibits you listed in your declaration?

A. I don't recall that as a question that I was asked to answer. Is there a place in my declaration where you feel I have addressed that?

MS. SHI: Court Reporter, can you repeat that question?

(The record was read by the reporter.)

MR. JARRETT: I'm just going to object to that question as being outside the scope of the declaration on its face.

THE WITNESS: And to answer again, I don't recall that being a question that I was asked to

answer. And then for clarification, is there a place in my declaration where you believe I've addressed that? And if so, could you direct me to that place?

Q. (By Ms. Shi) I just asked that question, what do you mean, that's not a question you were asked?

A. What I meant is that when I was engaged in this matter, the attorneys representing the Patent Owner asked me to address a number of questions with respect to rebutting opinions of another expert in this matter.

And I don't recall the question that you just asked being something that I addressed, but again, for clarification, if there's a place in my declaration where you feel I have addressed that, I'd be happy to go there. And we can discuss any opinions that I offered that you feel would be relevant.

Q. Just to be clear, for today's deposition, your answer is not limited to what Carbyne's counsel has asked you to address.

A. Which I accept. And I'm willing to answer any question you have, then. But in some cases, it may take more time, which I would respectfully

request be on the record, for me to answer to your questions, studying other materials.

That sounds like a question that would get into that realm, 'cause it sounds like you're literally asking me about something that is not in my declaration, unless I am misunderstanding your question.

Q. Would a POSITA have knowledge of fraud reduction techniques for electronic transactions, in addition to the exhibits you listed in your declaration?

MR. JARRETT: Objection, outside the scope, asked and answered.

THE WITNESS: That is also a question that would require more time to analyze. I'd want to go and consider other references that are outside of the exhibits, in order to answer your question.

Q. (By Ms. Shi) So is it your opinion that there are other references outside of those listed exhibits that would fall into a POSITA's knowledge?

A. No other ones are coming to mind, as I sit here today. I did, I think -- oh, that was the other case. Sorry, that's tomorrow.

There were some other references that I

did include -- oh, but I cited everything that's new here, too. Same thing. So any -- the references that I used, I cited in my declaration. So I don't have any other references, as I sit here today, to offer, if that is your question.

Q. You don't have any POSITA's knowledge --

MR. JARRETT: Objection, mischaracterizes --

Q. (By Ms. Shi) -- in addition to the references you cited in the declaration; is that right?

MR. JARRETT: Objection, mischaracterizes testimony.

THE WITNESS: No, that is incorrect. I already answered that. So, again, to go back to my declaration, I have a definition of a POSITA that I'm using for these opinions, which is almost identical to that of the Petitioner, but with a clarification from the board added.

And based on that definition, I have knowledge of what the POSITA had at that time. But if now, in your question, you're asking for specific references, in addition to the references that were offered in this case, that would require more time.

I don't want to just speculate and possibly make an error about something with a very specific date of May 6, 2010. So with that in mind, I'm happy to consider any of the exhibits. We can discuss them.

But if you're asking about other references, I would need to see them. And that I can do, if you'll allow me to do a Google Scholar search, 'cause we're doing this online today. I can do a Google Scholar search for any key word you want in realtime, and limit to a date. And only look at things before May 6, 2010. I can read them. But again, I would respectively ask that we do that on the record.

Q. (By Ms. Shi) To clarify, my question is not directed to any specific reference. It is directed to a POSITA's knowledge. And my question is, would a POSITA have knowledge of fraud reduction techniques of electronic transactions that is outside of the exhibits listed in your declaration?

MR. JARRETT: Objection, vague, asked and answered, outside the scope. Counsel, Dr. Goodrich has given the definition of a POSITA. He's given his work experience, and explained what his knowledge base as a POSITA

would be. I don't understand what you're asking.

If you're asking him to provide specific references outside of the declaration, he's given his answer, if that's your question.

MS. SHI: Counsel, please refrain your objection to simple words. I would characterize what you just said as coaching. If you have any objections, please just state objections, and keep it short.

MR. JARRETT: Objection, asked and answered, vague, ambiguous, outside the scope.

MS. SHI: Thank you. And I would like you to refrain from making further coaching like what you just did.

MR. JARRETT: I'm going to object to that. That was not coaching. That was -- we've objected to this. You've asked the same question about eight times. And Dr. Goodrich has given the same answer.

MS. SHI: Counsel, again, if you have objections, please keep it short.

THE WITNESS: May I answer now?

MS. SHI: Court Reporter, if you could repeat my last question, so we have a clean

record?

(The record was read by the reporter.)

THE WITNESS: And my answer is, I stand by the answer that I gave earlier to that question. However, I am open to clarification if there's something in that question that's different than the way you asked it before.

Q. (By Ms. Shi) Let's go to your -- paragraph 27 of your declaration.

A. I'm there.

Q. Could you please read paragraph 27?

A. "For my opinions in this declaration, I applied the Petitioner's POSITA definition with the board's clarifying instruction. Now and as of the priority date of the '010 patent, I meet the level of skill described above.

"Further, I have taught thousands of undergraduate and graduate computer science students since 1987, including on topics relevant to the research, design, development and/or testing of biometric authentication techniques for hardware, software, and firmware solutions. Hence, I have extensive experience with respect to the knowledge of a POSITA."

Q. Are you disavowing that statement in

paragraph 27?

MR. JARRETT: Objection, mischaracterizes testimony.

THE WITNESS: No.

MS. SHI: Counsel, please keep your objections short, without coaching.

MR. JARRETT: That's not coaching. That's a standard objection to a question.

MS. SHI: The IPR Practice Guide requires the objection to be short. Thank you.

Q. (By Ms. Shi) Dr. Goodrich, you can answer.

A. I've lost track of the question, I'm sorry, because you interrupted me. Could you please repeat the question?

MS. SHI: Court Reporter, could you please read back the question?

(The record was read by the reporter.)

THE WITNESS: No.

Q. (By Ms. Shi) What do you mean by extensive experience with respect to the knowledge of a POSITA?

A. I was referring to there, that I have both research, and teaching, and development of systems that are relevant. Namely, in this subject area of

electrical engineering, computer engineering, computer science, and related fields. And at least two years of experience -- actually, with over, in my case -- two years of experience in the research, design, development and/or testing of biometric authentication techniques and related firmware and software, or the equivalent.

If you will allow me, I can go to my CV. And I can highlight additional references that speak to this. Would you like me to do that?

Q. So of all that extensive experience you just mentioned, what are some example techniques for fraud reduction in electronic transactions?

A. So now are you asking in the context of a POSITA or someone like myself, who I believe is having experience superior to that of a POSITA?

Q. POSITA.

A. Again, to answer that question, I would want to go back and study -- and spend more time to study that question.

Q. Did you study that question when you were preparing this declaration?

A. As I mentioned earlier, that was not a question that I was asked to answer. That seems explicitly out of scope, in fact, with my

declaration, because you asked about references, as I recall, that are not in this case. Instead, I focused on alleged prior art references that are in this case.

MS. SHI: Can we take a ten-minute break, please?

THE WITNESS: Sure.

MS. SHI: Thank you.

(A recess was taken.)

Q. (By Ms. Shi) So was multifactor authentication a technology used for fraud reduction in electronic transactions as known to a POSITA?

A. What do you mean by multifactor authentication?

Q. Have you heard about multifactor authentication?

A. Yes, but it's a very broad term. And so I'm asking for clarification of what you mean by that in this context.

Q. What does it mean to a POSITA?

A. So there are two alleged prior art references that discuss multifactor authentication. One is the FFIEC Guidance and the other is Varghese.

So I was asked to consider the knowledge of a POSITA with respect to multifactor

authentication as disclosed in those two references. And I'd be happy to answer any more specific questions with respect to either one.

Q. How is a POSITA's knowledge about multifactor authentication different from those described in the two references?

MR. JARRETT: Objection, vague and ambiguous.

THE WITNESS: I don't understand your question.

Q. (By Ms. Shi) Which part you don't understand?

A. The whole thing. The whole premise of the question, I don't understand. I answered the question as I understood it to be, what does the POSITA understand about multifactor authentication, Petitioner is offering two references, FFIEC Guidance and Varghese as alleged prior art references.

Both of those references discuss, as I recall, multifactor authentication. Hence, I was asked to consider the disclosures of multifactor authentication in those references with respect to the challenge of validity for, say, the '010 patent.

Q. So a POSITA's knowledge about multifactor authentication is not different from those described

in the two references; is that right?

MR. JARRETT: Objection, mischaracterizes testimony.

THE WITNESS: That's not what I'm saying. I'm saying, I did consider the knowledge of a POSITA with respect to multifactor authentication as disclosed in those two references.

Q. (By Ms. Shi) So a POSITA's knowledge about multifactor authentication is different from those described in those two references; is that right?

MR. JARRETT: Objection, vague and ambiguous.

THE WITNESS: I don't understand your question. So, again, to clarify, I understood the Petitioners are offering two alleged prior art references, one called FFIEC Guidance, and the other is called Varghese, that Petitioner is presenting as evidence of including multifactor authentication.

I've acknowledged that in my declaration. And so, hence, I'm acknowledging that I'm willing to consider, as a part of my opinions, these alleged prior art references and their

disclosures.

Q. (By Ms. Shi) So you didn't consider a POSITA's knowledge about multifactor authentication that is not described in those two references, Varghese and FFIEC; is that right?

MR. JARRETT: Objection, mischaracterizes testimony.

THE WITNESS: No, that's incorrect. That mischaracterizes what I've been saying.

Q. (By Ms. Shi) So what did you consider regarding a POSITA's knowledge about multifactor authentication that is not described in those two references, Varghese and FFIEC?

A. So I also considered the opinions of Dr. Creed Jones, Ph.D., in his declaration, where he also speaks of multifactor authentication.

Q. With regard to your own experience, have you ever applied multifactor authentication for fraud reduction in electronic transactions?

A. I'm not following your question. Is it about my research, my experience, my general day-to-day activities? What are you asking about?

Q. Yes, your experience, including all that.

A. Yes, so, for example, here at the University of California, Irvine, we currently use

multifactor authentication for doing access to university sensitive data. And what that does, in this case, is involve both logging in with a user name and password. And also verifying that I have an app running on my phone that also is the second authentication technique factor.

Q. Have you worked on applying multifactor authentication for fraud reduction in electronic transactions?

A. Are you now asking about my research?

Q. Have you worked on applying the technique for fraud reduction in electronic transactions, which does not include merely as an end user, but as a developer?

A. I have worked on research that also involves multifactor authentication, if that is your question.

Q. Can you describe that research project?

A. Sure. Yeah, so that research project had to do with transactions where somebody has a mobile device, and they wish to use wireless radio communication to do a transaction with some kind of -- another device that is in the same room as them, in close proximity. So such as a transaction to print something on a printer, like at a FedEx or

Kinko's type of situation.

And we developed a multifactor technique to prevent the fraud of man-in-the-middle attacks, where somebody could inject content into their printout that they didn't want, or to capture their printout along the way.

And our technique used both the multifactor authentication of the device the person was using, as well as audio to do audio statements that are coming from the -- let's say, the phone that they are using, as well as the same words being printed on a screen of the device that they are performing the transaction with.

Q. So are you aware of any legal framework or regulatory framework related to user data for transactions?

MR. JARRETT: Objection, vague and ambiguous.

THE WITNESS: If by legal and regulatory frameworks and transactions, you're including transactions involving student records, then, yes, I am familiar with some legal frameworks.

As a professor at the University of California, we have protections that we -- in fact, I was just alluding to that earlier, why

we use two-factor authentication for accessing sensitive university data, 'cause some of that sensitive university data includes data about our students, such as their grades, their records.

I don't have access to medical records, but of course, doctors would who work at the University of California. And so there's -- I understand there's legal frameworks involved in how we access and update that data.

Q. (By Ms. Shi) So is it your understanding that the University of California works to comply with the legal framework?

MR. JARRETT: Objection, outside the scope.

THE WITNESS: That's generally my understanding. Again, to be precise, I'd want to spend more time to review those documents, but that's my recollection of what they ask us to do as university professors, is to protect student data.

And one of the ways that the university asks us to protect student data is that they require two-factor authentication when we access that data in the university system.

Q. (By Ms. Shi) Are you aware of any other legal or regulatory framework related to users and user data in electronic transactions?

A. I'm aware, but I don't know the details of how things work in the medical school. And I understand there's additional regulations and rules involved in accessing medical records. But I'm not intimately aware of that. I'm not a medical doctor.

Q. In addition to that, are you aware of any other legal or regulatory framework, for example, in your research?

A. As I sit here today, nothing else is coming to mind. And this is all, of course, with respect to today, not with respect to May 6, 2010.

Q. Do you have any experience working on complying with any of the legal or regulatory frameworks related to user or user data as a researcher or a developer, not as a mere end user?

MR. JARRETT: Objection, compound.

THE WITNESS: I'm not quite following the question. So if you're asking, do I do research in regulations? No, I don't do research in regulations.

And indeed, I opine in my declarations that a person of ordinary skill in the art would

not be interested in such regulatory issues, say, with respect to the FFIEC Guidance, which is why I questioned whether or not it qualifies as a printed publication. Yeah, that's -- that's how I see it.

Q. (By Ms. Shi) Do you have any experience implementing the display of a virtual likeness for introducing guilt for reducing fraud in electronic transactions?

A. I don't recall any such research. As I mentioned, my earlier research had more to do with audio than a virtual likeness. But of course, I'm aware of that reference from the patent, and from the alleged prior art references that the Petitioner is offering.

MS. SHI: Court Reporter, could you please read back line 41-25 through 42-7?

(Discussion off the record.)

MS. SHI: So could you please read back lines at -- my time might be different, but it's after my question, "yes, your experience, including all that."

(The record was read by the reporter.)

Q. (By Ms. Shi) Dr. Goodrich, do you remember making that statement?

1 **A. Yes.**
2 Q. Would a POSITA's understanding of
3 multifactor authentication be different?
4 MR. JARRETT: Objection, vague and
5 ambiguous.
6 THE WITNESS: I'm not following. I don't
7 understand your question. I gave an example of
8 what exists today. And I also acknowledge that
9 there's two alleged prior art references that
10 discuss multifactor authentication. I'm happy
11 to answer any specific question with respect to
12 any of that alleged prior art.
13 Q. (By Ms. Shi) So based on your experience,
14 how effective is the use of a virtual likeness in
15 introducing guilt and reducing fraud in electronic
16 transactions?
17 MR. JARRETT: Objection, vague, ambiguous,
18 calls for speculation.
19 THE WITNESS: I don't understand your
20 question.
21 Q. (By Ms. Shi) Can you provide an example
22 of a transaction system or platform where the
23 inclusion of a virtual likeness has an impact on
24 introducing guilt and reducing fraud in electronic
25 transactions?

A. Yes. An example comes from, for example, the '010 patent.

Q. Can you provide another example?

A. Just sitting here today, none others are coming to mind. But if there's a place in my declaration where you feel I've addressed that, I'd be happy to address it, and answer any additional questions about it.

Q. What are some examples of technologies for determining that a user is alive?

A. So, for example, if we go to the '010 patent, it specifically addresses that. So, for example, if we go in the '010 patent to column 8, and beginning in line 55 -- actually, 54, it says, "in some embodiments, an analysis of the photograph is performed as a part of the transaction. Techniques for confirming that the object being photographed is alive, e.g., by taking multiple photographs in rapid succession, can be employed to help make sure that the fraudster isn't using a camera 112 to photograph a printed picture of the legitimate user."

Q. Are there any other examples that you're aware of?

A. That is an example from the patent. There are also some additional examples from an alleged

1 **prior art reference known as Hoyos.**
2 Q. Are there any other examples, in addition
3 to those?
4 **A. Just sitting here today, I'm not recalling**
5 **any additional examples.**
6 Q. So can we go to your declaration in '010?
7 **A. I'm there.**
8 Q. Let's go to paragraph 42.
9 **A. I am there.**
10 Q. So the last -- can you state the last
11 sentence, please?
12 **A. Sure. "Hoyos also does not discloses**
13 **employing its methods or systems in a client server**
14 **environment, but rather is focused on providing local**
15 **authentication on a client device." And then I cite**
16 **to Hoyos at claim 4.**
17 Q. What is -- what does claim 4 -- how does
18 claim 4 of Hoyos support that conclusion?
19 **A. So it's -- claim 4 is a dependent claim**
20 **that is derived from claim 1 of Hoyos. And claim 4**
21 **reads, "the method of claim 1, wherein the biometric**
22 **data is stored and is used for manual verification."**
23 **And then we go back to claim 1, and it**
24 **reads, "a method of authenticating financial**
25 **transactions, comprising acquiring biometric data**

from a person, calculating probability of liveness, PP, of the person, and a probability of a match, PM, between the person or token and known biometric or token information, and providing an authentication decision, D, based on the combination of PP and PM."

So with that combination of the -- capturing the biometric information, computing the match, and storing, it's all being done on one device. Hence, this is evidence of this being a local or device-oriented invention. And this is just exemplary from Hoyos.

Q. So your understanding is, this is limiting all the steps being done on the one device; is that right?

A. That is what is being disclosed in Hoyos, yes.

Q. In addition to claim 1 and 4 -- scratch that.

So your conclusion is -- how does [sic] manual verification related to providing local authentication on a client device?

A. That's what a person of ordinary skill would understand, that that's what it's referring to. So Hoyos discloses many local sensors that capture biometric information, such as fingerprints, iris

1 **scans, these kinds of things.**
2 **It only ever talks about servers in its**
3 **background section, when it's referring to a**
4 **different invention by Yu, Y-U, et al., that it is**
5 **teaching against.**
6 **So a person of ordinary skill in the art**
7 **reading Hoyos would understand that it is teaching**
8 **against a client server architecture for doing the**
9 **biometric authentication, and instead disclosing a**
10 **system to do it on the local device.**
11 Q. So can we go to paragraph 44?
12 **A. I am there.**
13 Q. Can you read the last two sentences?
14 **A. Sure. "Of these techniques, the FFIEC**
15 **states that fingerprint and face recognition are**
16 **gaining acceptance, see id., but the FFIEC Guidance**
17 **does not state that these techniques or any other**
18 **techniques mentioned in the guidance as well was**
19 **well-known or in general user." And this is one of**
20 **those typos. It should have said "general use."**
21 **"The guidance also does not discuss**
22 **improvements or upgrades to digital displays in**
23 **electronic transactions." And then I cite the**
24 **Guidance at 9211.**
25 Q. Was these techniques, including

fingerprint and the face recognition, well-known to a POSITA?

A. Depending on what you mean by those statements, these are techniques that would be understood to be biometric techniques.

Q. Are these biometric techniques known to a POSITA?

A. So, for example, the Hoyos reference that we have been talking about, it references both facial features and fingerprints as techniques for doing biometrics.

So I'm willing to accept the disclosures from Hoyos with respect to those techniques as being -- I considered whether or not the '010 patent would be invalid in light of that. And my conclusion was, no, it is not invalid, that none of the prior art references disclose or suggest all of the limitations of the '010 patent, the '886 patent, or the '656 patent.

Q. Are you familiar with face recognition techniques for authentication?

A. Yes, depending on the timeline, I am familiar with that.

Q. Can you explain what "depending on the timeline" means?

A. Well, we had talked earlier with respect to a specific date of May 6, 2010. And without revealing anything confidential, I was recently involved in a very big case of the State of Texas versus Meta that involved face recognition, and across various dates going back to roughly 2010, but I think it may have been after May 6 of 2010.

I've also taught face recognition techniques in my class. The one that just concluded in December, for example, I included a lecture on that topic.

Q. Have you heard the term "gallery image" for face recognition?

A. I didn't hear you. What did you say?

Q. Do you know the term "gallery image" --

A. I'm not sure --

Q. -- for face recognition?

A. I'm not sure what you're referring to in that context -- in this context.

Q. Have you heard the term "gallery image" for face recognition?

A. I do not believe that is a term of art. So if that is your question, I'm not recalling that as a term of art. But if you have any reference that uses that term, I'll be happy to look at it.

Q. Have you -- are you familiar with using a reference image in face recognition?

A. There's multiple techniques for how to do face recognition. So that -- it's still not focused enough of a question that I can answer.

Q. Can we go to Exhibit 1037 in the '010 IPR?

A. 1037?

Q. Yes.

A. Yes, this, I believe, is the FFIEC Guidance document.

Q. Can you go to page 11? And do you see the section says, "face recognition"?

A. Yes.

Q. Can you read the sentence starting with "the systems capture"?

A. "The systems capture facial images from video cameras and generate templates that are used for comparisons."

Q. How does the comparisons work?

A. This is just one example of how you can do facial recognition. So what typically happens is that you capture some kind of image, either from a still camera or a video camera in this example. And then through a variety of transforms, you transform that into a template, which is a binary vector that

is then stored and used for comparisons.

Q. What is this template compared to?

A. It depends on the application. So, yeah, that's a very broad question. I can't -- I need more specifics. If you want to narrow it down, I can do that.

So, for example, I built a face recognition system recently as a hobby project for my family photos, where I took images of family photos, captured faces in those images, generated binary templates for each family member.

And then tested against new family photos, where I captured faces, generated a template for each of those faces, and then did a binary comparison of distance between the captured template -- the template generated from the captured face with templates that were produced from previous images. And then I would label the family member with the name of the file -- the template that was closest to them.

Q. Did you use your project for authentication?

A. No, this was a hobby project to label family photos, so that I could easily -- you know, for example, go back and search for family photos of

my wife or just my son -- one of my sons. This kind of thing. I'm giving that answer just as an example of how you can use templates today to do -- in the context of face recognition.

Q. So let's go to paragraph 59 of your '010 declaration.

A. I am there.

Q. Can you read the first sentence of paragraph 59?

A. Sure. "Limitation 1.9 recites a memory coupled to the one or more processors, and configured to provide the one or more processors with instructions."

Q. What does "instructions" mean?

A. In this context, a person of ordinary skill in the art would understand the instructions being recited here are the instructions to perform the steps of claim 1.

Q. Does the '010 patent describe instructions?

A. Yes. So in the context of claim 1, a person of ordinary skill in the art would understand the word instructions at the end, in limitation 1.9, to be a term of art, referring to computer instructions that instruct a processor to perform

1 **operations, 'cause it says "provide the one or more**
2 **processors with instructions."**
3 **And in this context of this one or more**
4 **processors configured to perform a number of steps**
5 **recited in claim 1, a person of ordinary skill in the**
6 **art would understand the instructions to be the**
7 **instructions to perform the steps of claim 1 that**
8 **came above as an antecedent basis.**
9 Q. Any does the '010 patent describe
10 instructions, in addition to those you identified in
11 claim 1?
12 **A. Yes. It also uses the word "instructions"**
13 **in a more general setting of talking about**
14 **instructions you would give to a user. And then**
15 **these would be instructions that appear on the user**
16 **interface.**
17 **And I can give you cited examples, if**
18 **you're interested. But it also uses the word**
19 **"instructions" in this way of a term of art, for**
20 **example, in column 1, starting at line 63 and going**
21 **to column 2, line 13.**
22 Q. So can we go to figure 1 of the '010
23 patent?
24 **A. Yes, I'm there.**
25 Q. What does figure 1 of the '010 patent

illustrate?

A. Figure 1 illustrates an example of an environment in which fraudulent transactions can occur.

Q. Can the techniques described in the '010 patent be implemented in figure 1?

A. Yes.

Q. How?

A. By, say, one or more processors that are configured to perform all of the steps of claim 1.

Q. Where on figure 1 are the one or more processors?

A. There are many embodiments that could be done with figure 1. For example, you could use the mobile device 102, the set top box 104, the mobile device 112, the gaming console 108, or the mobile device 106.

Q. Can we use one example of the device 106? Could you walk through how to implement that -- the invention of the '010 patent using device 106?

A. Sure. So device 106 is a tablet device. Hence, a person of ordinary skill in the art would understand that it has a display that it can use as a part of its interface. And that it can be used to connect to a network, as shown in figure 1. And

hence, it can be used to perform various transactions.

And then, for example, if we go to figure 4, we see an example interface of a checkout operation, with shipping cart instructions, a virtual image of an account holder, a pay now button.

And then we go, for example, to claim 1, we can see how -- and a person of ordinary skill in the art would understand how all that is disclosed in the patent, to do all those steps. We can read them, if you'd like into the record, but for shorthand, I'll just refer to them.

Q. And what you described applies to the device 110; is that right?

A. I described an example just now with device 106. That would also apply to the device 110 as well, yes, because device 110 is a smartphone.

Q. So in figure 1, for example, does the device 106 perform a fraud detection analysis as recited in claim 1?

A. Yes.

Q. So in your example, the 106 device is performing a transaction; is that correct?

A. Yes, the device 106 can also practice all the steps of claim 1, one of which is "render a

transaction icon," "receive an indication of an action taken by a user," and then "complete an electronic transaction." These are all elements of claim 1.

Q. Does it complete the electronic transaction with a server, for example, an online retailer?

A. That is one example you can use, yes.

Q. So can the fraud detection analysis be performed by a device other than device 106?

A. Yeah, we talked about how it can also be device 110.

Q. Let's clarify the question. For one transaction -- for one electronic transaction, can the fraud detection analysis happen on a device other than device 106, regarding the electronic transaction that is completed using device 106?

A. I'm not -- I'm not quite following your question. If by your question, can -- if you're asking whether or not there's a server involved, in some embodiments, there may be a server involved to complete the transaction. The final step of which, however, still could be done on the local device completing the transaction.

Q. Could you give me an example?

A. Yes, the example from the -- from the patent talks about how a user can complete the transaction by pushing the play now button for ten in the -- and then the instructions inside the processor would perform all those steps that are recited in claim 1.

MR. JARRETT: Counsel --

THE WITNESS: That's just one embodiment.

MR. JARRETT: Sorry, Dr. Goodrich. Counsel, we've been on the record for over an hour. Is now a good time for a break?

MS. SHI: Would it work with you, Dr. Goodrich, for a ten-minute break?

THE WITNESS: Sure, but is it possible for me to go to lunch at noon my time?

MS. SHI: Sure. What's --

THE WITNESS: So I'm in the Pacific time zone. So currently, it is 11:18 a.m. for me.

MS. SHI: So we can take a ten-minute break now. And how long would you like for the lunch break?

THE WITNESS: I typically take at least 45 minutes, so I could try to be back by 12:45. Hopefully, it shouldn't take longer than that.

MS. SHI: That works with me.

THE WITNESS: Okay. So we'll do a ten-minute break now, and then break again at noon my time. Thank you.

(A recess was taken.)

Q. (By Ms. Shi) So can we go to Exhibit 1023 in '010 IPR?

A. Yes, I have Exhibit 1023 in the IPR for the '010 patent.

Q. So is it right that the 1023 reference, Draper, describes biometric authentication?

A. Its title is Biometric-Based User Authentication and Data Encryption.

Q. So earlier in your deposition, you mentioned hash function. What is a hash function?

A. A hash function is a term of art in computer science that refers to a function that takes objects of various types, and then maps them to a specific range of values.

In cryptographic contexts, typically, what happens is that this is a so-called one-way hash function, which is easy to compute, but hard to reverse. Given the hash value, it is difficult, computationally, to reverse that, and produce a value as an input that, when run through the hash function, would have that output value.

Q. So can we go to column 22, line 30 -- starting from line 30, claim 1?

A. I'm there.

Q. Can you read from line 32 through 37?

A. "Encoding enrollment biometric parameters of a user using a syndrome encoder to produce an enrollment syndrome vector, wherein the enrollment syndrome vector is quantized, applying a hash function to the enrollment biometric parameters to produce an enrollment hash."

Q. So is this hash function the same hash function you just described?

A. I would need more time to review this document to answer that question. I'm happy to do that, but I would respectfully ask that we do it on the record. For example, this document was not something that Dr. Jones based any of his opinions on. He simply cites to it once.

Q. Yes, please take your time to read through the Draper patent.

A. Okay.

MR. JARRETT: Counsel --

THE WITNESS: Just --

MR. JARRETT: -- you want Dr. Goodrich to read this entire patent?

THE WITNESS: Just for clarification, this is likely to take us past the lunch hour. It's 35 pages long. Is that -- is that what you're asking me to do?

Again, I would respectfully ask that we do this on the record. I try to do all my advance work, and then come to a deposition prepared to answer questions. This document was not relied on for any of the opinions of Dr. Jones. Hence, I would like to spend time now on the record reading it, if that is what you're requesting.

Q. (By Ms. Shi) As you said, it was cited by Dr. Jones, and it is listed as --

A. He simply cites it. He doesn't rely on it for any of his opinions. I mean, he just listed it as a list of things he's considered. And then I did the same thing, listed as -- a number of things that I considered.

But he did not rely on it for any of his opinions. So to answer your question today would require me to read the document in its entirety. And I, again, respectfully ask that we do that on the record.

Q. So can we go to Exhibit 1003 of the '886 patent?

A. I am there.

Q. Can you -- can we go to the end of paragraph 104?

A. I am there.

Q. Can you read the cite starting with "Draper"?

A. Yes. Now, this is for the IPR for the '886 patent. I thought your question was in the context of the '010 patent before.

So now shifting gears a little bit, this cites to Draper Apple Exhibit 1023, from column 8, line 3, to column 9, line 39, as support that he is providing for the understanding of a POSITA that biometric ID means biometric identification information, which I'm not disputing that biometric ID could mean biometric identification information.

Q. So in the cited portion, column -- starting from column 8, you see that at line -- column 8, at line 60, it talks about an authentication phase. Do you see that? Let me know when you're there.

A. Yes, I see that.

Q. Can you read from line column 8 of Draper, starting from 6 -- line 61 through 65?

A. "In an authentication phase 320, biometric data are again acquired from the user. Features are extracted to obtain authentication biometric parameters E prime 360. The database 350 is searched to locate the matching enrollment syndrome vector S331 and enrollment hash H341 for this user."

Q. Is enrollment hash H341 the result of applying the hash function?

A. To answer your question would require me to re-read -- or to read this document. Again, we talked about earlier how a deposition is not a memory test. Hence, to answer your question I would need to review this document, which I would respectfully ask to be on the record.

Q. So now refreshing -- refreshed with the declaration in Dr. Jones, how it's used, this cited portion, what's your estimate of the time you would take?

A. I believe it would take three to five hours. This is a 35-page document. And his citation was just for supporting the conclusion that a POSITA would have understood that biometric ID means biometric identification information.

Q. Can we go to Exhibit 1033?

A. In which IPR?

Q. In the '886 IPR?

A. 1033, you said?

Q. Correct.

A. Yes, I have that in front of me.

Q. Can we go to figure 3?

A. I am there.

Q. What is figure 3 of Exhibit 1033, a Campbell reference?

A. Its subcaption is Generic Speaker Verification System.

Q. Is this consistent with a POSITA's knowledge?

MR. JARRETT: Objection, vague, ambiguous.

THE WITNESS: I don't understand your question.

Q. (By Ms. Shi) Is figure 3 a typical voice verification system?

MR. JARRETT: Objection, vague, ambiguous.

THE WITNESS: To answer that question would require more time to review the document, and then to review other alleged prior art references to make a determination of whether or not this is typical.

Q. (By Ms. Shi) So as we're sitting here right now, you're not able to opine on whether

figure 3 of Campbell is a typical speaker verification system known by a POSITA; is that right?

MR. JARRETT: Objection, mischaracterizes testimony.

THE WITNESS: No, that's not what I'm saying. I'm saying that I'm happy to answer your question, but it would take more time. It is cited by Dr. Jones as supporting certain conclusions with respect to -- his conclusions with respect to the '886 patent. So to answer whether or not it's a typical thing would require more time.

Q. (By Ms. Shi) Did you review Exhibit 1033, Campbell, when you were preparing your declaration?

A. It was one of the -- let me just double-check. I believe it was one of the references that I cite in my declaration as being considered.

Yes, I considered it, but I'm not offering any specific opinions with respect to it for the '886 patent.

Q. Let's go to Exhibit 1024 of the '886 IPR.

A. Could you repeat that, please?

Q. Can we go to Exhibit 1024 of the '886 IPR?

A. Yes, I'm there.

Q. Do you recognize this document?

A. This is the Yu reference that I cite in my declaration.

Q. Did you review the Yu reference for your declaration?

A. My recollection is that I considered it. I'm not offering any specific opinions with respect to it.

Q. So how long does it -- would it take for you to provide any opinion related to Yu?

A. That depends on your question.

Q. Please read the first sentence of the abstract of Yu?

A. "A web-based authentication system and method, the system comprising at least one web client station, at least one web server station, and an authentication center."

Q. So is this a client server architecture known to a POSITA?

A. To answer that question would require more time.

Q. And how much time --

A. I don't recall any specific -- I don't recall any specific opinions that Dr. Jones had with respect to this reference.

Q. How much time would you need?

A. This is 50 pages, so I'd need somewhere between an hour and a half and two hours, which I'd respectfully ask to be on the record. He cites to this in his declaration only to support the conclusion that a POSITA would have understood that biometric ID means biometric identification information.

Q. Okay. So let's come back to your experience in Internet-based financial transaction applications. Could you please describe your experience with Internet-based financial transaction applications?

A. We talked about that earlier. So I have some research papers on Internet auctions, which I can go into more details about, if you'd like.

Q. In addition to the Internet-based auction system, are there any other experience?

A. Let me double-check. So, again, the context is Internet financial transactions; is that right.

Q. Correct.

A. Yes, so I also have some papers on -- some publications that have to do with secure biometric authentication for mobile devices as a part of financial transactions. And we give protocols for

1 how to do certain types of biometric authentication
2 in those contexts.
3 And I had a paper, for example, that
4 appeared at an international conference on financial
5 cryptography and data security. And I can go into
6 more details, if you'd like.
7 Q. In the examples you provided, do they all
8 utilize a web -- a web user interface?
9 A. I'm not recalling the details of the
10 interface aspects of this. I believe we did have
11 web, 'cause it was a client server architecture. We
12 had some kind of an interface. The main technical
13 issue there was that the user device was weak. And
14 so some of the computations had to be performed at
15 the server in our research.
16 Q. So the technical issue was because the
17 user interface was weak. What do you mean by "weak"?
18 A. No, what I meant is that the device was
19 weak. So what I meant by that is that,
20 computationally, certain cryptographic operations,
21 such as encryption, decryption, doing very
22 complicated transforms to convert biometric raw data
23 into a template. These kinds of things can sometimes
24 be computationally intensive.
25 And, hence, if you have a very weak local

device, like a handheld PDA, it could take a very long time for it to do those computations. And so we came up with a secure protocol where some of the computations would be performed by the server, but done in a privacy-preserving way, so that the biometric data is not leaked.

Q. So your improvement is to move some of the computations that was performed on a client previously to now be performed by the server; is that right?

A. It's not that we moved them. It's that we didn't consider doing some of those computations on the client device, because the client device was too weak.

Q. What do you mean by some of those computations? Do you mean part of the computations are done on the server, but there's still some on the client?

A. That is correct.

Q. And is it also a possible design option to do all the computation on the client --

A. Not in --

Q. -- if the client -- right --

A. Not in our system. We had a different architecture.

Q. Because you have a weak client?

A. In our research problem that we studied, yes.

Q. And when was that project?

A. That was published in 2005.

Q. Do you have any experience working with financial institutes, like a bank, to improve their transaction systems?

A. I have done research on data structures that are, to my understanding, now being used in blockchain and cryptocurrency transactions. So I can go into more details about that, if you'd like, as well.

Q. Do you have any experience working with financial institutes on the authentication aspect of their transaction systems?

A. That publication that we were just talking about, which is C-101, the application we were looking at was for financial transactions, such as with a bank. That was the research we did.

MS. SHI: Okay. Let's take the lunch break. Would it work if we come back at -- in 45 minutes?

THE WITNESS: I will do my best to come back by then.

MS. SHI: Appreciate it. Thank you.
THE WITNESS: All right. Bye-bye.
MS. SHI: We can go off record.
(A luncheon recess was taken.)
MS. SHI: So we're back on record.
Q. (By Ms. Shi) So, Dr. Goodrich, we have taken multiple breaks, do you agree?
A. Yes.
Q. During any breaks, did you discuss the subject matter of this deposition with anyone?
A. No.
Q. Did you communicate with anyone regarding the deposition?
A. No.
Q. Did you review any documents or notes during a break that related to this case?
A. No.
Q. Did you discuss any documents related to this case with anyone during the break?
A. No.
Q. So what is your experience with projects dealing with social media platforms?
A. So I have a number of papers that have to do with social media and social networks. I'm happy to discuss any of them, if you'd like.

Q. Sure. Could you give us some examples?

A. Yes. Yeah, so I have a journal paper called J-84. It's about how you send messages in social networks, where you can only communicate via friendship connections. This is very similar to a very famous experiment by the social scientist, Stanley Milgram, that he did in the early 1960s. And then we showed how you could do that more generally, using something called category-based routing.

Then I have another paper, C-146, which is about how you can discover somebody's friends in a social network simply by asking certain questions about whether or not certain pairs of people are friends. And you can end up learning things that maybe people think should be private, such as all their other friends. So we talked about this attack you can do on social networks.

Then in paper C-171, we have a way of visualizing social networks in the user interface, where you want to draw the connections inside of the -- that social network has, but you want to highlight nodes that are highly connected to other nodes. And so we use something called social gravity as a part of that visualization, to visualize social networks better.

1 And then I have a number of papers in how
2 you can discover and map networks of all kinds,
3 including social networks, by asking simple questions
4 of how far apart certain nodes are, and then to be
5 able to, then, learn the social network.
6 Q. So what's your experience of integrating
7 social media platforms with financial transaction
8 systems?
9 A. So this actually is something else that I
10 studied in this paper, C-101. Oh, no, sorry, this is
11 one of my auction papers. Right, so this is paper
12 publication C-151.
13 The answer there is that you have a
14 transaction website like eBay, or there's some other
15 online auction systems that integrate with a social
16 network to sell items, so do financial transactions
17 to sell. And there was an attack that was occurring
18 back then called reputation extortion, where somebody
19 would only give you a positive rating after you'd
20 already given them a positive rating.
21 This is something that happens in a lot of
22 social network financial transactions, that there's
23 this notion of rating. We see this also in things
24 like Yelp, these kinds of things. Amazon has a
25 similar idea, that you can only do -- that you do

1 these reputation scores.
2 But then people can extort you and force
3 you to give them a positive rating, even though they
4 did a bad transaction, by threatening retaliations of
5 various kinds. And so what we did is we actually
6 implemented a privacy preserving way to give somebody
7 a reputation score, so that you give them an honest
8 score, but they can't retaliate against you, 'cause
9 they don't know whether or not you gave them the bad
10 score or somebody else.
11 Q. Do you have any experience related to
12 integrating a social media platform with financial
13 transactions, including payments?
14 A. I just talked about that. Online auctions
15 involves payments. So that work I did with online
16 auctions is inclusive of that.
17 And then I have another paper, C-84, that
18 involves auctions as well and payments. And there
19 the issue was how to be more seller-focused, and come
20 up with algorithms so that the seller of things can
21 have a better return, based on the transactions that
22 they do for their auction.
23 Q. Are those projects related to
24 authentication?
25 A. Those were not specifically

1 authentication, but they did involve authentication.
2 So, for example, C-101, the idea is that people had
3 user IDs. So they would authenticate to a system,
4 based on their user ID. But you want to have privacy
5 for your user ID, so that somebody who you're giving
6 hopefully an honest reputation score to cannot
7 retaliate.
8 And so the way that we achieved a level of
9 privacy preservation was that the actual score that
10 you assign to that transaction, or that commodity, or
11 that person was based on a random sample of all the
12 scores that everybody submitted.
13 And so there would be a degree of
14 anonymity that after you give your score, there would
15 be new random sample. And even if the score went
16 down, the person couldn't blame you for that, because
17 it could have just been a different random sample.
18 And so that person, even when they
19 authenticate to the system, still has a degree of
20 privacy preservation. And of course, I have a lot of
21 other papers on authentication, generally, including
22 biometric authentication and authentication using
23 audio.
24 Q. Have you worked or been involved with
25 developing any commercial products for Internet-based

1 financial transactions?
2 A. Yes. We talked about this earlier, but
3 this was the startup company that I helped co-found
4 that was called Algomagic Technologies. The idea
5 there was that we were providing what would have been
6 a service on the Internet to authenticate digital
7 certificates, which are used to encrypt and protect
8 financial transactions on the Internet.
9 And to avoid you connecting to a
10 fraudulent bank or website, you want to make sure
11 that that digital certificate that you're using to
12 encrypt that session is valid, that they haven't
13 stolen it from some legitimate user. And there have
14 been cases of stolen certificates in the past.
15 And so we developed a system that very
16 efficiently and very quickly can verify a digital
17 certificate as still being valid, un-stolen, and,
18 hence, you can trust the connection that you make for
19 your financial transactions over the Internet.
20 Q. So is this commercial product system you
21 developed at the startup used by an end user?
22 A. As I mentioned before, we did not have
23 financial success with our company. We had end users
24 use it as prototype testing, but ultimately, we were
25 not financially successful with the company.

MS. SHI: So I would like to take a ten-minute break to check my notes, and hopefully wrap it up shortly after. Would that work with you?

THE WITNESS: Sure, that's fine.

(A recess was taken.)

MS. SHI: I have no further questions at this moment. I pass the witness.

MR. JARRETT: I have no questions.

MS. SHI: Okay. Thank you very much. We can go off record.

THE WITNESS: Thank you.

(Whereupon, at 4:15 p.m., the deposition concluded.)

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Georgia CCR-B-2289

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