

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4
5 ABBOTT LABORATORIES and
6 ABBOTT DIABETES CARE INC.,
7 Petitioner,

8 v.

9 ALTIVERA, LLC,
Patent Owner.

10
11 Case IPR2024-00425
12 Patent 7,969,307 B2

13
14
15 VIDEOTAPED DEPOSITION OF WILLIAM BANDY, Ph.D.

16 Conducted Virtually

17 Wednesday, December 18, 2024

18 7:04 A.M. PST

19
20
21 Job No.: 563956

22 Pages: 1-95

Reported by: Crystal Hereford, RPR

1 Videotaped deposition of WILLIAM BANDY,
2 Ph.D., conducted virtually.

3
4
5
6 Pursuant to notice, before
7 CRYSTAL HEREFORD, Registered Professional
8 Reporter, Certificate No. 30819, and California
9 Certified Reporter, Certificate No. 14416.

A P P E A R A N C E S

ON BEHALF OF PETITIONER:

STEVEN W. PETERS, ESQ.

LATHAM & WATKINS LLP

555 Eleventh Street, NW, Suite 1000

Washington, D.C. 20004

202.637.2200

ON BEHALF OF PATENT OWNER:

CHRISTOPHER G. HANEWICZ, ESQ.

RODGER CARREYN, ESQ.

PERKINS COIE LLP

33 East Main Street, Suite 201

Madison, Wisconsin 53703

608.663.7460

ALSO PRESENT:

DORU HALIP, A/V Technician, Planet Depos

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

C O N T E N T S

EXAMINATION OF WILLIAM BANDY, Ph.D.	PAGE
By Mr. Peters	6

E X H I B I T S

(Previously marked. Not attached)

	DEPOSITION EXHIBIT	PAGE
Exhibit 1005	United States Patent Number 7,148,803	31
Exhibit 2001	Declaration of William Bandy, Ph.D.	12

1 P R O C E E D I N G S

2 THE REPORTER: We will go on the record.

3 Will counsel please announce your
4 appearance, starting with the taking attorney.

5 MR. PETERS: Steven Peters with
6 Latham & Watkins on behalf of Petitioner.

7 MR. HANEWICZ: Chris Hanewicz and Rodger
8 Carreyn from Perkins Coie on behalf of Gentag.

9 THE REPORTER: Doctor, would you raise
10 your right hand to be sworn, please?

11 Doctor, would you raise your right hand
12 to be sworn, please?

13 THE WITNESS: Oh. I'm having a little
14 trouble understanding you. So you're asking me to
15 do what? Raise my right hand?

16 THE REPORTER: Yeah, to be sworn.

17 Can you hear me better now?

18 THE WITNESS: Okay. Fine. Yeah.

19 I have to tell you in advance. I have
20 hearing difficulties. I normally wear hearing
21 aids, which I can't wear with this headset, so I
22 will have some trouble understanding you unless

1 you speak really kind of clearly, slowly, and
2 distinctly for me. My apologies for that, but
3 that's sort of the situation.

4 Okay. My right hand.

5 WILLIAM BANDY, Ph.D.,
6 a witness herein, having been first duly sworn by
7 the certified reporter to speak the truth and
8 nothing but the truth, was examined and testified
9 as follows:

10 EXAMINATION

11 BY MR. PETERS:

12 Q. Good morning, Bill.

13 A. Yes. Good morning.

14 Q. Is it okay if I call you Bill?

15 A. Absolutely. That's what everyone calls
16 me.

17 Q. Great.

18 Have you ever been deposed before?

19 A. Yes, many years ago for a patent case. I
20 think I was on the plaintiff's side on that one.
21 I'm not -- I think. I don't remember. It was
22 long ago.

1 Q. Do you recall roughly what year that was?

2 A. It may have been about 15 or so years
3 ago.

4 Q. Okay. Well, I will refresh you about the
5 sort of ground rules of the deposition.

6 A. Yeah. Great.

7 Q. So we have a court reporter on the line
8 who will be writing down everything we say while
9 we're on the record.

10 A. Okay.

11 Q. So it's important that we don't talk over
12 each other or interrupt each other. Is that all
13 right?

14 A. Perfect.

15 Q. When answering questions, please respond
16 verbally so that your response can be entered into
17 the written transcript of this deposition.
18 Agreed?

19 A. Yes.

20 Q. I typically take a break about every
21 hour, but if you would like to take a break,
22 please let me know. We can accommodate that. But

1 please answer any pending questions before
2 breaking. Okay?

3 A. Sounds perfect. I appreciate that.

4 Q. Is there any reason why you cannot
5 testify truthfully today?

6 A. Nope.

7 Q. Where are you this morning?

8 A. We're on the road headed home. We've
9 just left --

10 THE WITNESS: Where did we just leave?
11 Morgantown, right.

12 A. Yeah, in Maryland. Morgantown is -- I
13 guess it's West Virginia. Right? Anyway, so
14 we're about two hours from home.

15 Q. Okay. So you're in a moving vehicle
16 right now. Is that correct?

17 A. Absolutely. Yep.

18 Q. Is there anybody in the vehicle with you?

19 A. My wife is driving.

20 Q. Anybody else?

21 A. Nope.

22 Oh. Okay. I need to accept your offer

1 to be able to do a quick restroom break. So I'll
2 be happy to answer any questions you need before
3 we stop. It's one mile ahead of us.

4 Q. Okay. Understood.

5 So nobody else is in the car besides you
6 and your wife. Is that right?

7 A. Correct.

8 Q. And you are not driving, right?

9 A. No.

10 Q. I'll say, this is the first time I've
11 deposed somebody who is in a moving vehicle, so
12 it's a day I'll remember.

13 A. Okay.

14 Q. What is your understanding as to why
15 you're being deposed today?

16 A. I think to answer questions from you
17 about this --

18 Q. Okay.

19 A. -- yeah, about the John Peeters case
20 specifically, the '803 patent.

21 Q. Do you recall that you submitted a
22 declaration in this case?

1 A. Yes. Yes.

2 Q. Do you have any materials with you today
3 related to the case?

4 A. (Technical interruption) declaration
5 here. I also have --

6 Q. I'm sorry --

7 A. I also have files -- yes. I have the
8 printed version of my declaration for reference.
9 Also, I have files on my computer, obviously.

10 Is it okay if I then set the computer
11 aside and take a quick break?

12 Q. Let me just ask you one more question.

13 Do you have -- are there any written
14 notes on your printed version of your declaration?

15 A. Written notes? I just have what I
16 printed out.

17 Q. But there's nothing written on the
18 declaration. There's --

19 A. No.

20 Q. -- no annotations or anything.

21 A. No.

22 MR. PETERS: Okay. All right. Let's

1 take a break for you. And --

2 THE WITNESS: Okay.

3 MR. PETERS: Is ten minutes -- okay.

4 Let's go off the record.

5 (Off the record: 7:11 a.m. to 7:15 a.m.)

6 MR. PETERS: Okay. We're on the record.

7 Q. Okay. Bill, you said you are about two
8 hours from home. Is that right?

9 A. We're scheduled to arrive, I think -- oh.
10 It's not showing on the -- I think about noon
11 Eastern time.

12 Q. You mentioned that you normally wear a
13 hearing aid, but you're not wearing one right now.
14 Is that correct?

15 A. Correct, because of the headset. And I
16 have good hearing through the headset.

17 Let me check my volume here.

18 MR. HANEWICZ: I can hear you fine, Bill.
19 You sound good to me. So you're --

20 THE WITNESS: Yeah.

21 MR. HANEWICZ: -- good. Can you hear
22 pretty well? It seems pretty clear.

1 THE WITNESS: Yeah. I just upped my
2 volume. I can hear you very clearly.

3 Q. Good.

4 Okay. Why don't you take out your
5 declaration, which is Exhibit 2001 in this
6 proceeding.

7 MR. PETERS: I'm also going to drop it in
8 the chat for the court reporter and anybody else
9 who wants to download it. This is Exhibit 2001.
10 It is the declaration of William Bandy, Ph.D.

11 (Exhibit Number 2001 introduced.)

12 Q. Did you write this declaration, Bill?

13 A. Did I do what?

14 Q. Did you write this declaration?

15 A. I basically explained my background and
16 my participation through the counsel, who
17 basically wrote the declaration for my review. I
18 think I made a few edits to it or corrections and
19 then finally approved the final result. So I
20 didn't literally sit down and write it. I
21 dictated it over the phone in terms of my
22 experience with it.

1 Q. When preparing your declaration, did you
2 speak with anybody other than counsel?

3 A. No.

4 MR. HANEWICZ: Did you answer, Bill? I
5 apologize. I didn't hear that.

6 MR. PETERS: He did. It's on the
7 realtime as "no."

8 MR. HANEWICZ: Got it. That's what I
9 thought. Okay.

10 Q. Did you do anything to prepare for
11 today's deposition?

12 A. I just reviewed the materials.

13 Q. Did you speak to anybody besides counsel
14 in preparing for the deposition?

15 A. No.

16 Q. Did you review any documents when
17 preparing your declaration?

18 A. I reviewed the '803 patent. I reviewed
19 my declaration and the declaration from John
20 Peeters. And I reviewed an earlier patent that I
21 was a co-inventor on while back at Matrics.

22 Q. And that was for your preparation for the

1 deposition?

2 A. Yeah.

3 Q. Is that what you're referring to?

4 A. Yes.

5 Q. Okay. When you were preparing your
6 declaration, did you review any documents?

7 A. Oh. I don't think so. I think I was
8 just going from my own memory of my involvement --
9 or I may have -- no. No. I think I probably read
10 the Peeters patent. Yeah. I read the -- not the
11 Peeters patent, but Patent '803. I had to refresh
12 myself what that patent was about, because I --
13 that was 20 years ago. I had no immediate
14 recollection, so I had to review the patent to
15 basically refresh myself in terms of the material.

16 Q. When you say the '803, you're referring
17 to U.S. Patent 7,148,803?

18 A. Uh-huh. Yes.

19 Q. Okay. Did you review -- well, let me
20 step back.

21 The case that we are here today for
22 relates to U.S. Patent 7,969,307. Are you

1 familiar with that?

2 A. Not specifically. I did not review that
3 patent. I know that the material was
4 referenced from it, I guess, as referred to in my
5 declaration that the attorneys brought forward in
6 terms of relevant information that's being
7 reviewed. So...

8 Q. I see. But --

9 A. I'm not -- yeah.

10 Q. Sorry. I didn't mean to interrupt. Go
11 ahead.

12 A. No. Again, specifically, I did not
13 review that particular patent. I did not read it.

14 Q. Are you being compensated for your time
15 today?

16 A. No.

17 Q. And I think in paragraph 2 you said that
18 you were not compensated for your declaration. Is
19 that correct?

20 A. Correct.

21 Q. Are you represented by counsel today?

22 A. Yes, Perkins Coie.

1 Q. Do you know who Altivera is?

2 A. Pardon?

3 Q. Do you know who Altivera is?

4 A. Well, I think that is the company that
5 the Peeters' patent is assigned to, that owns the
6 patent.

7 Q. When you say "the Peeters patent," you're
8 referring to 7,969,307. Is that right?

9 A. Any of the patents that involve his
10 inventorship, I understand, are held in that
11 company. That's my understanding.

12 Q. And do you know who Gentag is?

13 A. Who?

14 Q. Gentag.

15 A. Oh, Gentag. That's his company name.
16 That's John Peeters' company name, I think.
17 That's what I know it as.

18 Q. I just want to establish, maybe, just as
19 an understanding that if I refer to Gentag, I'm
20 also referring to Altivera, the company that, in
21 your words, I think, owns the patent. Is that
22 fair?

1 A. Fine. I understand.

2 MR. HANEWICZ: I'll object to the form of
3 the question.

4 You can answer.

5 Q. When did Gentag's counsel first reach out
6 to you in relation to this case?

7 A. It was at a meeting with a mutual friend,
8 a professor at the University of Maryland, John
9 Melngailis. He knew of our work with RFID -- with
10 RFID tags and readers, and he was aware of the
11 interest that John Peeters had, so he made
12 introductions. And that's back in 2003, I
13 remember.

14 Q. Understood.

15 So my question was a little different
16 than that. My question is: When did Gentag's
17 counsel in this case first contact you about
18 submitting a declaration?

19 A. Oh, Gentag counsel.

20 I'd have to look at my calendar. It was
21 months ago. It's been a while ago, but I don't
22 remember specifically when.

1 Q. Do you recall who contacted you from
2 Gentag?

3 A. I think it might have been Chris, but I'm
4 not sure who was the first. Maybe I've kept my
5 voice mails from back then, but I don't recall.

6 I have to explain to you. I'm deeply
7 involved in my own start-up company, and my time
8 is taken up and focused on that. So I don't --
9 anything else that enters the scene other than my
10 own company, I don't particularly, you know, keep
11 it in my head.

12 Q. I completely understand.

13 Did you sign an engagement letter with
14 Gentag's counsel for this IPR?

15 A. I don't recall. I don't know if I did or
16 not.

17 Q. Did you take any notes from your initial
18 conversation with counsel?

19 A. Most likely I did, because I always take
20 notes from conversations. I'm not taking notes on
21 this one, but I usually do on any Zoom call or
22 phone calls, because I need it for my memory,

1 obviously. So I do take notes, and I can
2 certainly refer back and see if I did for those
3 conversations, but I'd have to get my notebook out
4 and go through it.

5 Q. Now, your declaration in this case
6 relates to work that you performed while you were
7 at a company called Matrics. Is that right?

8 A. Correct.

9 Q. And that's spelled, I think, for the
10 court reporter's sake, M-a-t-r-i-c-s. Is that
11 right?

12 A. Correct.

13 Q. What was your role at Matrics?

14 A. I was a cofounder of Matrics with my
15 other business partner, and I basically served in
16 terms of technology development for the company.

17 Q. Did you have another title besides
18 cofounder?

19 A. Perhaps. Obviously, as we first formed
20 the company -- there was three of us actually,
21 cofounders. Bob Williams was a third cofounder.

22 So we may have had different titles. We

1 were all wearing different hats at the time with
2 various stages of the company, which is dynamic.
3 It kept changing. Because then we brought in our
4 first CEO and were able to raise funding to really
5 get the company established. And after that,
6 another CO came in. We had large funders come in
7 who wanted their own CO, so that person came in.

8 I was a member of the board starting
9 with, but as the funders came in and the new CO, I
10 was basically kicked off the board to make room
11 for that. And where I basically resumed my,
12 you know, role was technology development. I
13 might have held the title of -- something like
14 chief science officer or whatnot, but I don't have
15 any recollection specifically of that.

16 Q. So as -- in your role in relation to
17 technology development, you were working on
18 engineering aspects of RFID products. Is that
19 accurate?

20 A. Specifically what I was doing was working
21 on a concept called a charge pump -- which we have
22 patents on -- or did. Matrics had patents on. I

1 was an inventor on that one, co-inventor -- which
2 was to extend the read range of the RFID tags that
3 are passive tags energized/powered up by the
4 reader field.

5 And the current state of the art at that
6 point was that tags could be read from a few feet
7 away, and that was not useful for wide
8 applications. So we developed the technology that
9 allowed them to be read from 30 feet away, which
10 is a huge improvement, which allowed expansion of
11 the use for tags in larger spaces for inventory
12 control.

13 The other important technology I was
14 involved in developing was our interrogation
15 protocol. When you basically power up tags in the
16 reader field, they'll power up, and the real issue
17 is how do you singulate the tag you want to be
18 interrogated.

19 At the time we entered the field, the
20 state of the art was a few tags per second could
21 be read/interrogated by the reader, and we
22 developed a technology where we increased that to

1 1,000 tags per second could be read and singulated
2 and interrogated by the reader field. So it's a
3 substantial improvement in performance, which is
4 why we started gaining market traction and
5 actually market dominance, which is why Symbol in
6 2004 bought the company.

7 So those were the two areas where I
8 specifically was applying my energy towards,
9 developing those capabilities.

10 Q. And the first one you mentioned was a
11 charge pump, right? Is that what you said?

12 A. Yes. Yes. That's the way to basically
13 take the energy from the reader field and
14 basically -- if you will, literally -- pump it up
15 to voltage levels that are adequate to operate the
16 tag. Because the tag is passive. It doesn't have
17 a battery, so it has to operate with energy it
18 absorbs from the reader field.

19 And to do that -- the reader field is
20 very weak. Even with 4 watts radiated out from
21 the reader, it goes -- diminishes as the square of
22 the distance. And so at 30 feet, in terms of area

1 of the energy, it's very small, and you can't use
2 that directly with an antenna. You have an
3 antenna that's designed specifically with
4 impedance matching to match with the
5 characteristics of the electro- -- emanated from
6 the reader to absorb as much energy as possible
7 from that energy from the RF field to operate the
8 tag.

9 And you can't -- without a charge pump,
10 at that distance, the voltage is not adequate to
11 operate the tag. You basically literally pump it
12 up. It's a stage operation, which is itself
13 powered up by the reader field. Each stage
14 requires, you know, further down, less operating
15 voltage to do it.

16 It's a very clever scheme, and it's
17 widely used in the industry now. We basically
18 developed a lot of firsts, I think.

19 Of course, when Symbol bought Matrics,
20 they were maintaining all the patents. Shortly
21 after Symbol bought Matrics, Motorola bought
22 Symbol, and I think Motorola had its own

1 objectives in terms of the marketplace, and I
2 don't -- I really don't think that a lot of the
3 patents we developed were maintained or sustained
4 by the company. I mean, so I think a lot of those
5 patents now are just public domain knowledge now.
6 So Motorola just took things in a different
7 business direction, and a lot of the material we
8 developed, like charge pumps, et cetera, is now in
9 the public domain. I believe that to be the case.

10 It's been 20 years. A lot of those
11 patents have expired or are due to expire anyway.
12 So...

13 Q. The other technology you mentioned was
14 interrogation protocol. Is that right?

15 A. Yes. Exactly. That's the process
16 whereby the reader is able to singulate out of
17 a -- say a thousand tags -- okay? -- which tag it
18 wants to talk to, wants to interrogate. And we
19 used a very clever scheme for doing that. It was
20 very fast.

21 The state of the art in the industry at
22 the time were using -- a lot of people were using

1 Accu Tags. They had a lot of computational power
2 on the tags to run certain algorithms.

3 And, of course, we were trying to extend
4 the read range, so we couldn't have all of that
5 operational circuitry on a tag, you know, taking
6 all this power. So we went to a very simple tag
7 design that basically had one function, which was
8 basically to -- able to go -- we call it
9 tree-walking, a logic tree-walking algorithm,
10 where all tags respond initially to the
11 interrogation signal. But we would then send out
12 the logic symbol, logic zero or one, for which
13 tags to respond to next. And those who didn't
14 have that next logic symbol just went to sleep,
15 and only those tags that had the next logic symbol
16 would respond and so on.

17 So you're dividing down by half every
18 step the number of tags that are responding until
19 the last step or only one tag was responding, and
20 that gave us what we needed in terms of the
21 information that was the, if you will, the tag ID
22 number that was then used to go to the database to

1 obtain the knowledge of the item the tag was
2 attached to.

3 And so we were able to lower the tag
4 cost, extend the read range, increase the number
5 of tags to be interrogated per second, which then
6 opened up the markets -- wider markets. We had
7 Walmart sign up as a customer. We had -- I think
8 Boeing signed up. We had CarMax sign -- we had a
9 number of customers starting to sign up. And
10 actually, our tag is in use in the McCarran
11 Airport in Las Vegas. It still might be used for
12 luggage tags. That was one application. I think
13 they're still in use in that regard.

14 But in general, the industry has moved
15 well beyond all this, and they're using UHF RFID
16 tags for wide applications for item-level
17 tracking, and we had developed a lot of the
18 baseline technology for that. We are basically
19 credited for starting -- really kick-starting the
20 application of UHF RFID tags.

21 Q. Going back to your education --

22 A. Yeah.

1 Q. -- you received a Ph.D. in physics from
2 the University of Maryland. Is that right?

3 A. Yes, in 1974. And I also have my
4 master's degree in electrical engineering from the
5 University of Oklahoma.

6 Q. What was your Ph.D. dissertation about?

7 A. Green's function methodology for electron
8 tunneling through inflators.

9 Q. Is that Green's function?

10 A. Yeah. It's a mathematical formulation,
11 and it basically captures a probability or motion
12 of a particle through a material. And I used a
13 particular construct for the ladder structure,
14 which is called a beta-lattice, which is an
15 idealized formulation of the material structure
16 that has certain advantages coupled with the
17 Green's functions and determining the role of
18 surface states in an insulator and at the time was
19 trying to basically get a better understanding of
20 electron tunneling through structures as related
21 to microelectronic circuits in terms of
22 characterizing surface states and whatnot.

1 At the time -- in that time period, it
2 was basically an issue that had to be dealt with
3 for semiconductor manufacturing to become more of
4 a science and understand all the physics related
5 to that to allow it to really expand like it has
6 today.

7 Back when I was doing this, I was working
8 at the National Security Agency and designing
9 circuits for -- circuits to be designed with maybe
10 a hundred transistors on them, and today, the
11 state of the art is the Apple M3 chip used in its
12 current line of computers has 25 billion
13 transistors on it. So even -- I've been involved
14 in the industry all of my career, and I never
15 cease to be astounded at this -- at what the
16 technology is accomplishing today.

17 So yes.

18 Q. When did you become a chip designer?

19 A. When I first started with NSA, I
20 basically went into the group that was doing
21 failure analysis for semiconductor parts being
22 developed by sort of the very young

1 microelectronics industry at that time. This is
2 back in 1969, the dark ages, you know, when
3 everything was sort of a magical science with
4 everything. We're trying to really understand the
5 science behind -- for the fabrication of
6 integrated circuits, and part of that was
7 analyzing the failures that were occurring and why
8 parts were a failure.

9 And at that point, we made a strategic
10 decision to install our own in-house
11 microelectronic -- facility at the National
12 Security Agency, which I headed up. I developed a
13 team for that and ran that first operation.

14 MR. HANEWICZ: Steve, I don't mean to
15 interrupt.

16 Bill, just one thing. I'm assuming
17 timing -- from a timing perspective this is not a
18 big deal, but I just want to make sure if we're
19 having any discussions about any prior work you
20 did that is not -- that it's appropriate to be
21 public.

22 That's all, Steve. I apologize for

1 interrupting. I think you can understand the
2 issue.

3 THE WITNESS: Oh, yeah. Absolutely.
4 This is work I can talk about.

5 MR. HANEWICZ: Okay. Great. Sorry to
6 interrupt. Go ahead.

7 A. Yep. Yep, nope.

8 And that's when I first decided I needed
9 to learn about integrated circuit design. So I
10 worked with a design group that was designing the
11 integrated circuits that we were fabricating, and
12 I did my first integrated circuit design. And it
13 was very fundamental and basic back then.

14 And so later on when I -- I was actually
15 detailed to the Defense Advanced Research Projects
16 Agency, DARPA, in the mid-'80s. 1980 to 1990, I
17 was the program manager for now research efforts
18 at universities, Stanford and Caltech and -- elite
19 universities with elite research groups,
20 developing the next generation of computer-aided
21 designs for integrated circuit design for
22 semiconductor manufacturing.

1 Of course, all that work led eventually
2 to the ability of being able to design an
3 integration circuit with 85 billion transistors on
4 it, because you could only do that with
5 computer-aided design technology. So my start
6 was, early on, him -- almost him laying out an
7 integrated circuit, then running the research
8 programs for, you know, computer-aided design.
9 And it's been a fun career seeing it all grow and
10 develop.

11 Q. That's amazing.

12 Now, just stepping back to the
13 '803 patent.

14 A. Yes.

15 Q. Do you have that in front of you? Or I
16 can send it to you.

17 A. I have it on my computer. I can bring it
18 up.

19 Q. I'm going to drop it into the chat. So
20 I'm dropping in Exhibit 1005.

21 (Exhibit Number 1005 introduced.)

22 Q. You can either open up your own version

1 or the one I'm putting in the chat. It's up to
2 you.

3 A. Yeah. I'm looking for it.

4 Yep. Here it is. I've got it open.

5 Q. The version you have doesn't have any
6 notes or annotations or comments on it, does it?

7 A. No. This is a PDF file that came up.
8 I'm not able to edit that in any way to insert
9 notes.

10 Q. Okay. Do you see on the cover page of
11 the '803 patent that it lists as assignees -- do
12 you see "assignees"?

13 A. Scrolling.

14 Yeah.

15 Q. And it lists Symbol Technologies, Inc.,
16 and Altivera, LLC?

17 A. Yes.

18 Q. Now, when you were working at Matrics,
19 you -- did you have an obligation to assign your
20 rights and inventions to the company, Matrics?

21 A. Absolutely.

22 Q. Okay. So you don't retain any rights to

1 the '803 patent currently. Is that right?

2 A. No.

3 Q. Now, you're listed as a co-inventor on
4 the cover of the '803 patent, right?

5 A. Yes.

6 Q. And your name is listed first in the
7 inventors -- the list of inventors.

8 A. Yes.

9 Q. Do you recall why the decision was made
10 to list your name first on this patent?

11 A. I have no idea. I mean, I've been
12 involved in probably a hundred different patents
13 in terms of co-inventors, and I never paid much
14 attention to the order of names on them and the
15 significance of such. I believe that, in terms of
16 reviewing the history of that, Matrics agreed to
17 pay for this patent, and that might be the reason.
18 I don't know.

19 Q. What history are you referring to that
20 you reviewed?

21 A. The notes that were produced in John's
22 declaration for the history. I had no

1 recollection myself. I didn't -- I actually --
2 didn't actually recall that it was -- well, I did
3 know John Melngailis introduced us. I just didn't
4 know when. I know that it's been a long history
5 with John Peeters and -- you know, just specifics.
6 A long time ago.

7 Q. Did you review John Peeters' declaration
8 when preparing your own declaration?

9 A. No.

10 Q. What's your relationship with Dr. Peeters
11 today?

12 A. Well, we don't have a working
13 relationship today. When I left Matrics to start
14 up our next company, we had a -- I think it was a
15 four-year prohibition from working in the field of
16 RFID technology. So that just, you know, dropped
17 off any connection or work in that regard, and we
18 went off and did our next company in a whole
19 different technology area.

20 Q. You haven't worked with Dr. Peeters since
21 then?

22 A. I'm sorry. What was the question?

1 Q. You haven't worked with Dr. Peeters since
2 selling Matrics?

3 A. We've stayed in touch for a while over
4 the years, because we had a pretty close working
5 relationship, obviously. And I'm just trying to
6 recall if we ever had any subsequent conversations
7 or discussions. I don't recall that we did.

8 Q. Now, you've referred to Matrics' products
9 in your previous answers. Did Matrics sell RFID
10 chips?

11 A. It sold tags. It was the assembly of the
12 chips onto the antenna substrate which formed the
13 tags themselves, and we also produced the readers
14 that read them. And so we basically were selling
15 an entire system installation for a customer which
16 would be very specific for the customer
17 application, because all environments were
18 different, and they had different RF
19 characteristics in those environments. You had to
20 go in and contend to reflective signals. They'd
21 be bouncing off of walls. That could confuse the
22 tag reading protocol.

1 And we had developed a whole suite of
2 different products for that. We had developed
3 what we called DOT door readers for tags on items
4 going through a DOT door from a loading dock, for
5 example. We developed also what we called shelf
6 readers, which were typical -- (technical
7 interruption)-- a shelf. We even had developed an
8 idea for range extending.

9 Because the readers were very expensive.
10 They were thousands of dollars a piece. It was
11 real -- (technical interruption) -- where with a
12 30-foot read range, if you had a space that
13 involved, you know, thousand foot distances in big
14 warehouses. So we were also developing a line
15 of -- I think we called it the remote access
16 sensor module, little module readers that actually
17 plugged into wall outlets and basically -- were
18 basically communicating with the control unit for
19 those, you know, remote access modules through the
20 electrical system of the building. And then
21 basically all they were doing was energizing the
22 antenna and then receiving the signal back and

1 then -- you know, connecting back then to the
2 central unit. So we were doing a whole series of
3 products trying to extend the product market space
4 for our tags.

5 Theoretically, we could have sold our
6 chips to people who would want to assemble them
7 onto their own antenna substrates. I don't think
8 we ever pursued that market space. I think we
9 were basically selling the entire unit/tag itself.

10 Q. But the tag included chips that were
11 Matrics' proprietary chips. Is that right?

12 A. Yes. Yes. They are basically, if you
13 will, mounted -- assembled onto the antenna
14 substrate, which was the tag, and the tag
15 comprised the antenna substrate with the chips
16 mounted onto it. Yes.

17 Q. Was it just a chip connected to the
18 antenna?

19 A. Yes.

20 Q. Or was there any other components?

21 A. No.

22 Q. Did the chip have its own controller?

1 A. Have a what?

2 Q. Have a controller?

3 A. Like I said, the chips were bare-bone
4 chips. They had minimum electronics necessary to,
5 basically, fundamental logic circuitry which
6 allowed it to basically shut the chip down if it
7 didn't receive the right signal for interrogation
8 and to continue operation with it. So it had very
9 minimum control. Whether you want to --
10 controller or not, that's probably a definition
11 of, you know, terminology. But it had minimal
12 logic function.

13 Q. Did the RFID chips have memory?

14 A. What it had was a read-only memory. It
15 had what we call fused links. That basically is a
16 specific type of read-only memory that is
17 hard-coded in.

18 With that answer, do you mind if I take
19 another quick restroom break? I apologize. But
20 we've kind of got to take advantage of them as
21 they come along on the road. It'll just take me a
22 few minutes like last time. I'll be in and out.

1 MR. PETERS: Yeah. Why don't we --
2 actually, it's been almost an hour, so why don't
3 we just take a 10-minute break.

4 THE WITNESS: Okay.

5 MR. PETERS: We'll all take a little
6 restroom break, and we'll meet back at about
7 11:02.

8 MR. HANEWICZ: Sounds good.

9 (Off the record: 7:52 a.m. to 8:02 a.m.)

10 THE REPORTER: We're back on the record.

11 Q. Welcome back, Bill.

12 A. All right.

13 Q. Now, I think when we took a break you
14 might have been in the middle of answering a
15 question, and that's fine.

16 But my question was: Do the RFID chips
17 have memory? And I think you started to answer
18 about fused links.

19 A. Yes. It has a specific type of
20 hard-coded memory, which are strictly read only.
21 You can't write into them. And it had the
22 advantage -- the reason we chose that, we were

1 looking for a very low-cost RFID tag, because
2 that's been a barrier to entry -- or was at the
3 time for wide application of these RFID tags was
4 the cost as well as the read range and
5 performance. So we were looking at ways to lower
6 the cost.

7 We even developed our own in-house
8 assembly system, which we called a parallel
9 integrated chip assembly system, to even further
10 reduce the cost of assembly. So we were doing
11 everything we could to lower cost, which is why we
12 took functionality off the circuit to lower the
13 complexity, reduce the chip size, which lowers the
14 cost of the chip and which also decreased power
15 consumption, which increased read range. So it's
16 a whole orchestra of things we were doing to
17 increase performance, decrease cost, and just
18 expand the marketplace.

19 Q. What was written -- sorry. Let me start
20 over.

21 What was hard-coded into the memory, the
22 read-only memory?

1 A. Bits, zeros and ones. What we were
2 doing, we used the -- and it was a random number.
3 It was -- well, I guess you could -- a random
4 number back then, using algorithms to create a
5 random number, computer algorithms. Because we
6 used that -- those bit zeros and ones for our
7 singulation routine for singulating the particular
8 tag that we were at that point then communicating
9 with. That was the purpose of that memory. So it
10 was just zeros and ones, random zeros and ones,
11 programmed into it.

12 Q. Were the zeros and ones different for
13 different tags?

14 A. Yes. Each tag had its own unique random
15 number, which had to be the case if you're going
16 to singulate. Singulating on that random number,
17 that had to be different.

18 Q. And just to be clear, for the record,
19 you're using the words "singulate" and
20 "stimulate." Is that right?

21 A. Singulate, singulate. Another word for
22 it is "contention resolution."

1 When you have a collection of RFID tags,
2 if you power them up with the reader field -- they
3 start absorbing energy from the reader field and
4 start powering up and going into some operational
5 state. Okay? If you try to basically interrogate
6 them, they will all respond at once, and it's just
7 noise. You've got to be able to -- the tags to be
8 able to respond one at a time for you to get the
9 information you need from them, which in this case
10 was the random numbering we used to go to the
11 database to run which item they're attached to.
12 So you have to have a way to do contention
13 resolving or -- and I use the term "singulate" --
14 to one tag that's left responding to the reader.

15 That's a primary issue in the field
16 forever, and people have used all kinds of
17 different algorithms to basically be able to
18 contend with the -- do resolution contention or
19 singulation, if you will, so that you end up
20 talking with just one tag instead of a hundred
21 tags trying to talk all at once, or more. It's a
22 very difficult problem.

1 And I actually think that -- you know,
2 it's ringing a bell. That one deposition I've
3 been involved with, you know, 15 years ago might
4 have been in a subtlety of some singulation
5 routine, you know. That's sounding familiar to
6 me.

7 But anyway, it's a hard problem, and we
8 had a very clever, simple solution to it that
9 worked astoundingly well. As I mentioned, our
10 competition was basically able to singulate tags
11 at the rate of, you know, three or four tags a
12 second, and we come along, and we're doing it at a
13 thousand tags a second. We just were blowing the
14 competition away with our approach.

15 Q. Let's go back to your declaration --

16 A. Sure.

17 Q. -- Exhibit 2001, and if you could look at
18 paragraph 5. And let me know when you're ready.

19 A. Yeah.

20 Oh, yeah. That's the John Melngailis
21 meeting.

22 Q. Do you remember that meeting?

1 A. Vaguely. I knew John pretty well, and
2 when I was at NSA, we interfaced with him quite a
3 bit. And I almost remember where he was -- where
4 his office was in the electronic engineering
5 building. I remember the parking lot I parked in,
6 walking in, and going to his office. Yeah.

7 So I don't particularly remember the
8 specifics of the meeting. I know we met. And I'm
9 reminded that's when and where I met John.

10 Q. Who reminded you about when you met John
11 Peeters?

12 A. Well, I was reading -- oh, it wasn't
13 reading his declaration. I'm trying to remember
14 how we came up with this system.

15 I think John and I talked about it,
16 because John had called me and said that this case
17 was happening and reminded me of the patent and
18 asked me if I would basically testify on his
19 behalf in terms of the details of how we generated
20 the patent. And I think he must have reminded me
21 when we had that meeting and how it all happened,
22 which was good. I think that's how that came

1 about.

2 Q. What else did you talk about with John
3 Peeters in that call?

4 A. Probably how each of us were doing, the
5 state of our different companies, and a lot of --
6 it was a social call, just catching up with each
7 other after quite a few years of not
8 communicating.

9 Q. Anything else about the patent?

10 A. He just explained to me that -- I think
11 it was trying to be -- I'm not sure what the term
12 was -- invalidated. Maybe that was the term --
13 based on certain aspects of -- issues that were
14 being raised about it. And he explained to me
15 what the issues were and asked me to basically
16 clarify my role in the patent. It's very clear.
17 So I do remember working with him on it.

18 Q. And so you think it was that conversation
19 where you were refreshed about the date of when
20 you first met John Peeters?

21 A. You know, I don't recall. I think so,
22 but I can't say for sure.

1 Q. Do you recall Dr. Peeters explaining at
2 that meeting his background on sensors?

3 A. Yes. Yes. I remember very specifically
4 that he was the one who was talking about using
5 cell phones as an RFID reader. And he was well
6 ahead of his time, because of course today, cell
7 phones do incorporate NFC tag reader capability.
8 It's pretty amazing how that evolved, and John, I
9 think, was the first person who basically was
10 saying, you know, the cell phone has the inherent
11 technology that could -- to incorporate additional
12 technology into it to turn it into an NFC reader.
13 He was very visionary in that regard. I give him
14 a lot of credit for that. So...

15 Q. Do you recall Dr. Peeters explaining his
16 background on geolocation in that meeting?

17 A. Not particularly. He may have. But
18 geolocation was -- I don't know what the state of
19 the art was back -- (Technical interruption.)

20 THE REPORTER: I'm sorry. He's cutting
21 out for me.

22 MR. HANEWICZ: Bill, you're cutting out a

1 little bit there. Are you --

2 THE TECHNICIAN: Probably he's passing in
3 an area with no signal. His internet dropped.

4 MR. PETERS: Okay. We go off -- let's go
5 off the record.

6 THE TECHNICIAN: Let's go off the record.

7 (Off the record: 8:13 a.m. to 8:14 a.m.)

8 MR. PETERS: Let's go back on the record.

9 A. Okay.

10 Q. So --

11 A. Yeah --

12 Q. You -- hold on.

13 You dropped off after you mentioned that
14 you didn't know the state of the art in
15 geolocation. So we don't have anything you said
16 after that.

17 A. Oh, okay. Well, 20 years ago, remember,
18 you know, GPS systems, they were just basically
19 evolving back then, I think. And the idea for
20 geolocation and, you know, using GPS were probably
21 state-of-the-art ideas. So the fact that John was
22 jumping on board in evolving technology -- it

1 definitely was of interest to me, but I don't
2 remember anything specific about what he was
3 saying.

4 Q. In paragraph 6, you state "At the
5 meeting, Dr. Peeters came up with the idea of
6 incorporating an NFC reader into cell phones." My
7 question is --

8 A. Yes.

9 Q. -- did he come up with that idea at the
10 meeting?

11 A. I think he brought the idea to the
12 meeting.

13 MR. HANEWICZ: Object -- Bill, sorry.

14 Object to the form.

15 You've got to give me just one second
16 before you answer. Go ahead. You can answer.

17 A. I think he brought the idea to the
18 meeting. I don't know if he came up with the idea
19 at the meeting or not. I think he -- well, that's
20 interesting, "came up with it." I don't know if
21 he came up with the idea or brought the idea --
22 (technical interruption) -- remember the

1 conversation, whether it was an idea he had and
2 was introducing it at the meeting or -- (technical
3 interruption.) That's a good question. I have
4 zero recollection of that.

5 Q. You're cutting out quite a bit still. I
6 got most -- we got most of it. I think we got the
7 gist of it for now, but --

8 A. Yeah. Yeah. I guess the point was did
9 he come to the meeting with the idea and introduce
10 us to the idea at the meeting, or did he come up
11 with the idea at the meeting. And that's where I
12 don't really know. I just know it was discussed.

13 Q. How far are you from home right now?

14 A. Let's see. Arriving home at 12:15. It
15 is -- oh, one hour. We're coming into
16 civilization. We should have no problem with cell
17 signals at this --

18 Q. The signal is getting worse now.

19 A. I mean, I can continue the conversation
20 clearly after we get home. I'll just have a
21 little bit more stable environment. I'll just
22 take the computer into the house and log on to

1 that internet.

2 Q. Let's see what we can get done.

3 A. Okay.

4 Q. Did John Bandy -- or sorry. I got the
5 names mixed up.

6 Did John Peeters email you about this
7 case?

8 A. Did John note -- well, that's how I
9 learned about it. John called me and said what I
10 -- it was going on and asked if his lawyers could
11 talk to me and asked if I would agree to basically
12 explain my involvement with the patent.

13 Q. I understand.

14 A. So he's the one who told me. Yeah.

15 Q. I was just wondering if he specifically
16 emailed you, if there was a written communication.

17 A. I think he called me. I could check my
18 email, but I don't recall an email. But I know we
19 discussed it verbally.

20 Q. Did you take any notes from the
21 conversation?

22 A. I can check my notebook and see, but I

1 don't recall, because I think it was pretty
2 straightforward what he was saying.

3 Q. Now --

4 A. He had to remind me, of course, of the
5 patent, because all of this -- to me, it's ancient
6 history, and all of this is long gone from my
7 memory, and I had to be refreshed pretty
8 thoroughly about all the details. Yeah.

9 Q. And you got that refreshing from
10 Dr. Peeters, right?

11 A. He told me the background and reminded me
12 I -- you know, where it came up with, I think. I
13 can't -- I don't have real specific recollection
14 of the memory other than him telling me that his
15 -- (technical interruption) -- and the reason and
16 would I basically be willing to testify on his
17 behalf in terms of my role in that -- (technical
18 interruption) -- and I said yes.

19 Q. In paragraph -- sorry. Going back to
20 paragraph 6.

21 A. Uh-huh.

22 Q. The last part of the first sentence, you

1 wrote "Creating NFC cell phone sensor networks."

2 What is an NFC cell phone sensor network?

3 A. What it would be is that if a cell phone
4 is operating as a reader, if you will, for
5 basically RFID tags that would incorporate John's
6 sensor technology onto them, then during the
7 interrogation of the tags, the sister information
8 at the point or time of interrogation would then
9 basically be sent to -- through the cellular phone
10 network to a central location, and then those cell
11 phones would form a network for sensors, which is
12 a very clever idea.

13 I mean, I think we talked about even
14 applying it for national security. You could have
15 sensors distributed in infrastructure or whatnot
16 testing an environment for hazardous chemicals or
17 other kinds of threats and basically be able to
18 relay those immediately realtime back to the
19 central location of the network, again, over the
20 cellular network of the cell phones, for immediate
21 action.

22 I mean, it was a great idea. It's a

1 great idea today.

2 Q. In paragraph 7, you wrote that shortly
3 after the meeting in May 2003, Dr. Peeters came up
4 with the idea that a wireless RFID sensor could be
5 incorporated into a disposable diagnostic skin
6 patch. Do you see that?

7 A. Yeah. I actually remember that. I mean,
8 I was particularly -- I remember being kind of
9 taken by that idea, because it was one that
10 seemed to be -- that could be implemented.

11 Q. So you remember that he came up with that
12 idea after the meeting?

13 A. Yeah. I mean, we started -- after the
14 meeting -- I was at the meeting and impressed with
15 what John was working on and thought it was very
16 clever, and so we started communicating. And I
17 think maybe he even had a personal meeting with me
18 with that idea. I don't recall, but it seems he
19 was describing the idea to me and trying to figure
20 out how do we -- basically how would we
21 incorporate that sensor onto an RFID tag and how
22 you would read it, et cetera. And so I thought,

1 wow, you know, that could be our first product.

2 Q. Let's look at the '803 patent now.

3 A. Yeah.

4 Q. -- which is Exhibit 1005.

5 A. Yeah.

6 (Exhibit Number 1005 introduced.)

7 A. Okay. Got it.

8 Q. So I'd like to look at Figure 2, which is
9 on the fourth page of the PDF.

10 A. The fourth page.

11 Q. If I share my screen, will that --

12 A. I --

13 Q. -- will that help you at all? Okay.

14 A. I'm looking at Figure 2A and Figure 2.

15 Right.

16 Q. Yeah, Figure 2. Are you with me?

17 A. Yeah.

18 Q. Did you contribute anything to Figure 2
19 in the '803 patent?

20 A. I'm guessing probably, of course, a tag
21 would have antennas. Nothing -- this is a very
22 generic figure, and anything I would have had to

1 contribute would be the specifics of how to do the
2 power generation with a charge pump idea,
3 you know, the interface with the reader, with the
4 antenna, the RF signal. But that would probably
5 be pretty much it.

6 I mean, a lot of this is now dealing with
7 the sensor implementation on an RFID tag, which is
8 bringing a lot of additional logic and whatnot to
9 the tag that is new.

10 Q. And is it your testimony that you didn't
11 contribute anything that was new?

12 A. Not in terms of what he was doing with
13 the sensors. What we're basically contributing is
14 how -- if you had these kind of tags and you're
15 trying to singulate these tags, how you would do
16 it. Okay? So applying basically the Matrics'
17 technology, if you will, for tag operation and
18 singulation and then basically anything in the --
19 you know, how -- basically supplying the voltage
20 operational conditions for his sensor tag, for his
21 sensor operation.

22 So it was hard to integrate the two

1 together, and we were applying the operational
2 component, the voltage, if you will, to operate
3 the -- you know, everything else he was putting on
4 the tag. I mean, it's kind of basic. For him to
5 operate as a sensor tag, he needed to have power
6 to operate. Okay? And we knew how to provide the
7 power for him to operate with what we're doing
8 with our technology.

9 Q. And I guess at least referring to Figure
10 2, which I know is a high-level block diagram --
11 but you're referring to the power to operate would
12 come from --

13 A. The reader -- the reader signal, the RFID
14 signal.

15 Q. Which comes through the antenna, right?

16 A. Right. Exactly.

17 Q. And then it goes to the RF power and
18 communications interface. Is that right?

19 A. Well, it depends on the application.
20 This is all --

21 Q. Well, specifically with this figure.

22 A. Yeah.

1 Q. I'm just talking about this figure.

2 A. Yeah. John did the figure. I'm just
3 trying to explain to you, I guess, what the
4 components and the figure are, but John did the
5 figure.

6 I mean, it's a basic logic design of a
7 generic application. You could, in a sense,
8 you know, apply any generic power generation from
9 the RF field to this figure. It doesn't
10 specifically have anything about -- here about how
11 we would do the singulation or the charge pump or
12 anything.

13 If we were to do this product with John,
14 what would we bring to the table to do it? We
15 would work with John. This would obviously be
16 transferred basically to a very specific logic
17 diagram. We'd have to learn from him what was his
18 specific logic and power requirements to operate
19 the sensor -- okay? -- to see if we could actually
20 provide the RFID part of it that could generate
21 that power for him.

22 There is -- this is the opening door to

1 all the different kind of further design work that
2 would actually be required to implement a sensor
3 tag on an RFID tag getting its power from an RFI
4 -- radio frequency signal.

5 So I'm not sure how to answer the
6 question. I mean, try maybe asking it in a
7 different way to see if I'm answering the
8 question.

9 Q. Okay. Well, I'll try it a few different
10 ways.

11 But as far as on this figure, is --
12 sorry.

13 Is an RF power and communications
14 interface something that would have been in
15 Matrics' products?

16 A. Not the communications model. We didn't
17 do that. As I explained before, what we were
18 doing is a very basic tag operation configuration.
19 We were basically trying to get from the tag this
20 random number ID that we used to identify the item
21 it was attached to, and that's it.

22 So we didn't -- the only communications

1 module we had was basically the modulation scheme
2 and how it would modulate the signal back,
3 obviously maintain it with the tag. But we did it
4 in a very specific way. We weren't communicating
5 back any status of the tag. We were communicating
6 back ones and zeros that at the end indicated what
7 the random number was. Very different, you know,
8 kind of logic operation.

9 Our power generation was our charge pump,
10 pumping up the signal to operate it. So if you're
11 asking about putting on the RFID tags other logic
12 circuitry that needs to communicate its state --
13 logic state back to the reader, that's a whole new
14 communications module aspect you put on, because
15 now you have to communicate information back to
16 the reader, not just states of ones and zeros. So
17 it's a whole different problem set and a whole
18 different engineering design activity.

19 So that's what I'm saying. Putting
20 something like this in an RFID tag, we -- that's
21 why I say. We provide the power to operate, and
22 we could provide the signaling back to the RFI

1 reader. Because what you're doing for the signal,
2 you're changing the impedance of the antenna
3 that's absorbing the field -- from the RF field.
4 You're actually literally changing the impedance
5 of the antenna.

6 And basically you're doing that because
7 when you have an impedance match, that's when the
8 antenna is absorbing all the power it can absorb
9 from the reader field. If you change the
10 impedance so it's not matched, it doesn't absorb
11 from the field. It starts reflecting power back
12 to the antenna, and that's how you communicate
13 with the tag. It's seeing -- looking for that
14 reflected energy coming back from the tag, and
15 that's telling you, you know, that you're changing
16 that impedance with a string of zeros and ones.
17 That can be our read-only memory status, or it can
18 be information from, John's case, a sister that's
19 on the tag.

20 So the modulation scheme is -- it would
21 be the same. You're either changing the impedance
22 of the antenna or you're not. Okay? So you have

1 the modulation scheme, and that's, you know, one
2 of the operations. So it's -- you really have to
3 kind of dig into the details of what the
4 operational requirements are and what it's doing
5 in terms of the relationship to operation with the
6 reader.

7 And in John's case, the reader would be
8 the cell phone. And that had a different set of
9 operational requirements as well as UHF. Now
10 you're talking about near-field. So in that case,
11 you're reading from a shorter read range. You may
12 have different contention issues. Maybe it's
13 easier to do the tag contention singulation.

14 So when you start with the environment,
15 you start designing the product and what the RFID
16 tag is. In this case, it's a whole different RFID
17 tag for this application than it would be for what
18 we were doing. We're just basically sending the
19 random number back.

20 So anyway, that may be an overly
21 complicated answer, but it's very dependent on the
22 application.

1 Q. Now, in paragraph 11, if you could --
2 sorry. Going back to your declaration.

3 A. Yeah.

4 Q. In paragraph 11, in the first sentence,
5 you said that -- sorry. I'll wait for you to get
6 there.

7 A. Right. Right.

8 Q. You said "My contributions to the
9 '803 patent did not relate to the sensor features
10 recited in Claims 1, 2, 3, 5, 9, and 10 of the
11 '307 patent." Do you see that?

12 A. Correct.

13 Q. What do you mean by "sensor features" in
14 this sentence?

15 A. I knew nothing about the sensors John was
16 working on. Zero.

17 Q. So going back to Figure 2 of the
18 '803 patent, we see sensor elements here and
19 references. Is that sort of encompassed within
20 what you refer to as the sensor features, at least
21 of Figure 2?

22 A. Everything related to the sensor and what

1 it's doing and its requirements were all just
2 basically, in my view, generic. You had a logic
3 block. For me, it was a black box. And to
4 interface with the black box in terms of an RFID
5 tag, you'd basically need to know what the
6 operational power requirement was. That's it.

7 I knew nothing about the specifics of the
8 sensors. It's a black box in terms of, you know,
9 what was needed by the RFID tag providing the
10 energy required to do that and other features of,
11 you know, the operation, how do you -- what was
12 the singulation requirements, what were -- you
13 know, in terms of if you had a readout
14 information, et cetera, when and how, all that was
15 black box.

16 That's a term used in engineering design
17 basically in terms of what's -- what you're
18 designing for. You have a black box. You don't
19 know what's in it, but you know what the interface
20 has to be to it, like, you know, power input. You
21 don't know what's going on in it, but you know
22 it's going to take this amount of power.

1 Q. Was there anything in Figure 2 that would
2 not have been a black box, from your perspective?

3 A. That would have what?

4 Q. That would not have -- sorry. Let me
5 rephrase that.

6 In Figure 2 of the '803 patent, is there
7 anything in this diagram, as far as your
8 contributions, was not a black box?

9 A. Well, I know RFID tag operation. I know
10 what's needed to do -- extract energy from the RF
11 field and what's needed to do to convert that to
12 electrical power. That's my knowledge space for
13 what an RFID tag would have to do to support this
14 operation.

15 But specifically, that depends on the
16 specifics of application. Like I say, it's --
17 that's generic. You can't design that until
18 you know what the black box requires.

19 So, again, I don't know how to answer
20 this. I know what the RFID tag would have --
21 would have to do to extract energy from the RFI
22 field to supply it for the operation, but

1 that's -- you know, that's it. I mean, you could
2 take any RFI -- you could go to any -- John could
3 have done this. He could have gone to any RFID
4 company and said "Can I put my sensor on your RFID
5 tag?" Okay?

6 And based on the state of their RFID
7 technology, the answer could be yes or no. If it
8 was yes, you know, how they would do it could
9 achieve the same result but probably different
10 than we would do it, because we have different
11 ways of obtaining power from the RFID field. So
12 in that state, it's generic. You know, RFID
13 technology is what it is.

14 Our competitive advantage was we
15 singulated faster and read from further read
16 ranges because of our charge pump design. But
17 this is -- we contribute certain features to this
18 which could give it certain performance advantages
19 of reading from further distance with his tags --
20 sensor tags. If he needed to singulate, had
21 multiple tags he needed to interrogate, doing it
22 faster. But that's what we would contribute to

1 his product or the product we developed together.

2 So there's a term for that. Maybe it's
3 synergism. I don't know. But he could have
4 literally gone to Philips or other people doing
5 RFID tags and gone and knocked on their door.

6 So I'm not sure how else to answer the
7 question. We brought certain performance
8 characteristics to the table for the RFID tag
9 portion of what he was trying to do. So I guess
10 you can say, yes, we allowed him to read from
11 further read distances with his sensor tags, and,
12 yes, it would have allowed him to singulate
13 faster. And that's what we brought to the table.

14 Are you...

15 Q. I'm here. Yes.

16 A. Oh, okay. Okay.

17 Q. Did you work at all on the -- or did
18 you -- sorry. Let me withdraw that.

19 Did you contribute to the sensor
20 interface in Figure 2?

21 A. No. I didn't know what the sensor
22 interface was. That depends on the sensor. It

1 depends on a lot of -- tons of details that I was
2 -- it depends on the sensor and -- that would be
3 one specific design if you get down to -- for
4 designing a product, when you actually start doing
5 the design, doing the logic design, characterizing
6 the basic requirements for the tag. But that's
7 when you get the engineering team involved.

8 That's when you get his engineers designing a
9 sensor, interfacing with our engineers, and saying
10 "These are the power requirements. Can you meet
11 those power requirements? What would it take?"

12 So the tag people would have to
13 understand his requirements to basically develop
14 the wholistic product. Maybe my problem is I've
15 been involved in too many design projects. The
16 devil is always in the details.

17 Q. Did you and John Peeters end up making a
18 product reflective of --

19 A. No.

20 Q. Okay.

21 A. No. No, unfortunately. I wish we had.
22 I would love to have pursued this product with

1 John. But as you know, shortly thereafter, Symbol
2 bought Matrics, and then shortly thereafter, I
3 left. Because, I mean, we went from a start-up
4 mentality where, you know, things happen fast. It
5 was a creative environment. Symbol is a big
6 bureaucratic company. It was driving me crazy.
7 So I left to go back into the start-up world again
8 and -- you know, for a whole new product domain
9 area, not RFID.

10 And unfortunately, with different
11 management and different priorities and whatnot,
12 it unfortunately was never pursued. And today,
13 it's still a good idea. I mean, this kind of
14 product could be pursued today, but with a
15 different company.

16 Q. Could you quickly -- oh, sorry. Go
17 ahead.

18 A. Oh, by the way, this could be pursued
19 today with current NFC readers. Now, the NFC --
20 cell phones have NFC readers. So now
21 incorporating sensors on RFID tags has become a
22 lot easier to do, because the technology base is

1 out there to do it. A lot of the reader
2 problems -- basically the reader problem has gone
3 away. You still have a tag design problem,
4 because cell phones only have a finite power to
5 provide to the reader field. So you're talking
6 about closer read ranges and et cetera, et cetera,
7 but it's still a great idea.

8 Q. Could you turn to Column 24 of the
9 '803 patent.

10 A. Sure.

11 Scrolling. Column 24. Oh, wow. We're
12 way back there. Okay.

13 Q. Yeah. It's page 30 of the PDF. Are you
14 with me?

15 A. Yep. I'm on Column 24.

16 Q. Do you see around line 24 -- or actually,
17 around 23, it says "What is claimed is," and then
18 it has a Number 1?

19 A. Yeah.

20 Q. Do you understand what claims of a patent
21 are, generally?

22 A. Generally, yes. I understand the whole

1 process of limitations, the and, the and, the and,
2 and and. Yes.

3 Q. Now, in this claim, is it fair to say
4 that you -- when dealing with extracting energy
5 from the RF field, you would have been working on
6 at least the antenna and the RF power and
7 communications interface coupled to the antenna?

8 A. The way I look at this, it's all about
9 the sensor. And when it talks about a radio
10 frequency, RF, addressable sensor comprising one
11 or more sensors, you have to look at the state of
12 the art at the time. And I've really kind of
13 studied these -- this claim, and this is what was
14 sort of known in the art at the time when he was
15 obviously writing this.

16 What was new in the art was the sensor
17 interface, the sensor -- every word in here is
18 related to addressable sensor, sensor interface,
19 et cetera. And the radio frequency aspect of it
20 was known art. I mean, like I said, it could have
21 been done by anyone. What we contributed was not
22 new art of a radio frequency RF. It was

1 specifically -- what our technology was is longer
2 read range and faster singulation.

3 But I can't say we contributed anything
4 specifically to this claim, because what he
5 claimed was new art implemented with known art.
6 So I'd have to say no. This is all John's stuff.

7 Q. The new stuff that Matrics contributed,
8 you were saying it relates to --

9 A. It would relate to basically anything
10 involved with singulation of -- I think the term
11 that was used in here is "initiation." I think
12 that's the term that was being used, which would
13 be the act of bringing up the operational
14 capability of the tag to function with the
15 supplied operating parameters of voltage and the
16 power required and whatnot and allow the tag to
17 operate to provide for the sensor application.
18 That would be where we would contribute in terms
19 of faster, more rapid initiation or singulation if
20 you are to get to the initiation state and being
21 able to do it from longer read ranges, longer
22 distances away. That would be our specific

1 contribution to this.

2 Q. So is it fair to say that an antenna was
3 just a conventional aspect of an RFID tag at the
4 time?

5 MR. HANEWICZ: Object to the form.

6 A. Well -- yeah. Any --

7 MR. HANEWICZ: You can answer.

8 A. That's generic. I mean, if you have an
9 RFID tag, you're going to have to couple it to at
10 least one antenna. That was known art. I mean,
11 that's just -- like I say, he was using -- to
12 me -- because he used the word "sensor." Every
13 sentence of this involves a sensor. So to me,
14 it's obviously the new art here was the sensor,
15 nothing in terms of the RF at this point, just
16 using known art to implement it.

17 Q. Going back to your declaration. In
18 paragraph 8, it said that -- it crosses pages 2
19 and 3.

20 A. Yeah.

21 Q. And you state that your contributions to
22 the '803 patent related to specific nuanced

1 features of enhancing RFID systems, namely,
2 initialization of an RFID tag, as recited in
3 Claims 65, 81, and 83. Do you see that?

4 A. Yeah.

5 Q. And a method of rapidly reading multiple
6 tags. Do you see that?

7 A. Uh-huh. That's the singulation I've been
8 explaining.

9 Q. Okay. So if you could turn to Claim 81
10 of the '803 patent.

11 A. Sure.

12 Q. It's Column 30.

13 A. Uh-huh. Yep -- yeah. The one or more RF
14 addressable sensors, that's the singulation
15 aspect.

16 Oh, yeah. And then to isolate an
17 individual RF addressable sensor, that's the
18 singulation idea. Yeah.

19 Q. So that's -- okay. So stepping back.
20 Were you just identifying the limitations that you
21 contributed to Claim 81? Is that what you were
22 saying?

1 A. Yeah, what I called the nuanced features
2 for enhancing RFID systems. I've been trying to
3 explicitly explain those in terms of the
4 singulation and the longer read range, you know,
5 because of our ability to do the charge pump. But
6 yes. That's the nuanced features.

7 To be clear, if you look at any of our
8 Matrics patents, we weren't inventing RFID
9 technology. We weren't inventing RFID -- UHF RFID
10 technology. We weren't inventing tag technology.
11 What we were inventing was a way to more rapidly
12 singulate and basically clever ways of increasing
13 read range. Those were our inventions. We're
14 doing what John has done here. We're using known
15 art to basically create new art. Okay? We're
16 building on the known art to create new art. So
17 that's what our patents were.

18 So those are the nuanced features of RFID
19 systems, enhancing -- specifically using the word
20 "enhancing."

21 MR. HANEWICZ: Steve, whenever it's a
22 natural stopping point -- obviously I don't want

1 to interrupt your questioning if you want to go a
2 few -- but I think a lunch break before too long.
3 And I imagine Dr. Bandy may be getting close to
4 home.

5 THE WITNESS: Let's see. 10 minutes?
6 Probably 15, 20 minutes.

7 MR. PETERS: Okay. How about this? How
8 about we take a lunch break right now. We can
9 reconvene in an hour or so. Is that all right?

10 MR. HANEWICZ: That's fine with me.

11 MR. PETERS: I don't expect to go much
12 longer, just so you know. But we'll circle back
13 at -- let's just call it 1 o'clock, if that's
14 okay.

15 THE WITNESS: So I just basically will
16 log back on at 1:00 for this. Okay.

17 MR. HANEWICZ: Right.

18 THE WITNESS: Okay. Great.

19 MR. HANEWICZ: Okay. Thanks, Bill.

20 Thanks, Steve.

21 See you soon.

22 MR. PETERS: Let's go off the record.

1 (Off the record: 8:54 a.m. to
2 10:05 a.m.)

3 MR. PETERS: Let's go back on the record.

4 A. Yeah. I must admit. I can hear a lot
5 better too. This is good.

6 Q. Perfect.

7 So, Bill, where are you right now?

8 A. I'm sitting at my desk at home on my same
9 computer.

10 Q. That's in Maryland. Is that right?

11 A. Yeah. Yeah. Gambrills, Maryland.

12 Q. I'm in Takoma Park right now.

13 A. Are you really?

14 Q. Yep.

15 A. So why are we doing it via Zoom versus
16 face-to-face?

17 Q. Well, I suspect your counsel is not in
18 Maryland.

19 MR. HANEWICZ: Because I'm in Madison.

20 THE WITNESS: Okay. It makes it a little
21 bit tougher. All right.

22 Q. So welcome back. Is there anybody else

1 in the room with you right now?

2 A. No, there isn't.

3 Q. Okay. Could we just -- I'll just wrap a
4 few things up.

5 So let's turn to the '803 patent.

6 A. Uh-huh.

7 Q. And if you could --

8 A. I'll pull it up again.

9 Q. Sure.

10 A. Okay. Got it back up.

11 Q. All right. If you could turn to Column
12 28.

13 A. Okay. Yes.

14 Q. I'm looking at Claim 65 -- and actually,
15 just to give you a reference point. In paragraph
16 8 of your declaration -- and we talked about this
17 before the break -- but you mentioned that your
18 contributions relate to specific nuanced features
19 that are recited in Claims 65, 81, and 83. Do you
20 recall that?

21 A. Uh-huh.

22 Q. Okay. So now we're looking at Claim 65

1 of the '803 patent. And I think, you know --
2 please correct me if I'm wrong. But it sounded
3 like you were saying that your contributions
4 related to the first two steps of the method. I
5 know we were referring to Claim 81, but it seems
6 similar to Claim 65.

7 A. Yeah. Specifically, what relates to --
8 and, again, I use the word "singulation." They're
9 using the word -- "initialization" here implies
10 that -- one step above singulation where once
11 you've got the tag you're looking for found,
12 you know, isolated out of a group of many -- which
13 I call singulation -- then it's in an operational
14 state with the voltage it needs to operate --
15 okay? -- to perform whatever other functions is on
16 that particular tag, you know, the sensors or
17 whatnot. And that's important when you're
18 addressing -- you're trying to read more than one
19 tag.

20 Because like I explained before, all tags
21 will be powered up by an RF signal. Otherwise,
22 you wouldn't be able to communicate with them at

1 all. Okay? They wouldn't, you know, wake up, if
2 you will -- okay? -- with a present RF signal.

3 But you don't want them all trying to
4 send a signal to the reader at once, because it
5 would just be like a room full of people all
6 talking. You couldn't -- it's all noise. You
7 can't tell who is talking to you if you have a
8 hundred people in the room speaking. So you've
9 got to isolate the one tag to talk to it
10 one-on-one. And that's what I call singulation.

11 And all tag technology -- well, I
12 shouldn't say all. All tags are being read in
13 groups where you have to isolate one to talk to it
14 has some form of singulation. There's a whole
15 standards committee around this and standard
16 protocols for RFID tags. Okay? And so you can
17 buy RFID tags that meet these specific standards.
18 So they have protocol on the tag to do this and
19 whatnot.

20 And this is where it gets a little bit
21 confusing, I think, when talking about our
22 specific contribution versus sort of the generic

1 tag technology and market domain and whatnot of
2 tags out there. Okay? So we need to be very
3 careful in terms of specifically nailing down the
4 piece that we bring to the table that's different
5 from all else out there -- okay? -- other tag
6 products you can buy off the shelf or from other
7 companies or whatnot.

8 But even -- we participated with the
9 standards committee, and we actually got a
10 specific class assigned to us, which is called
11 class zero, because it is the minimalistic
12 approach. It contains nothing on the RFID tag
13 except that tree-walking algorithm to isolate and
14 singulate the tag rapidly and at long distance.
15 So that's, you know, specifically the piece.

16 And I think that's why we got tangled up
17 a little bit in Claim 1 in Figure 2 is basically,
18 you know, Figure 2 -- the RF part could be taken
19 from a textbook or from a data sheet, from any
20 number of different texts. It's non-specific.
21 It's generic. Okay?

22 And likewise with Claim Number 1, which

1 is talking about a generic RFID technology that is
2 unique. If you're going to do a sensor tag, I
3 mean, you need these certain features on the RFID
4 tag. Okay? You don't need our specific, I mean,
5 enhancements. Okay? You just need an RFID tag if
6 you're going to do an RFID tag sensor. Okay?

7 So Claim 65 and the others basically
8 reference that specific piece that we bring to the
9 table that is new art compared to any other
10 generic tag technology out there, which is being
11 able to singulate faster. And, again, what's
12 relevant -- and I don't think it's spelled out
13 here, but it's relevant and why John was
14 interested in us and working with us -- is the
15 long read range piece as well, because obviously
16 when you're trying to put sensors on an RFID tag,
17 you'd like to have something that's efficient and
18 be able to get the power you need to operate those
19 from longer read ranges. It's just a market
20 advantage. Okay? So -- but it has nothing to do
21 with his sensor technology. It's what we do
22 for -- with the charge pump.

1 Which, by the way, again, is widely used
2 now. We've lost that IP domain. I mean, it's out
3 there in public domain now. So...

4 Anyway, so that's a little bit of
5 clarification for that piece. These specific
6 claims actually reference the piece that we bring
7 that basically is the -- sort of the new -- or the
8 advantage, if you will, of using our tag
9 technology.

10 Q. Is it fair to say that it was basically
11 already known to interrogate an RF addressable
12 sensor to isolate it, but the specific way that
13 you did it --

14 A. Uh-huh.

15 Q. -- is new to the '803 patent and
16 that's --

17 MR. HANEWICZ: Object to form.

18 A. It's not really the '803 patent. It's
19 related to our patent that actually does it. The
20 '803 patent just references it in these claims
21 that we -- you know, on being able to singulate.

22 This is where I get a little bit

1 confused. Okay? Matrics has patents in all this
2 stuff that we're doing. All right? Our approach
3 is list -- our specific approach of how I actually
4 singulate and do the charge bump is nowhere in --
5 oh, it is referenced. I saw the patent was
6 referenced -- okay? -- which is good, up in the
7 referenced patent, somewhere in the body of the
8 document. Okay. So it's referenced, but it
9 doesn't specifically call out any claim language
10 that, you know, we use a charge pump to provide
11 the voltage or that we use tree-walking for
12 singulation.

13 I mean, it's kind of orthogonal, if you
14 will. I mean, what he's doing for sensors is kind
15 of orthogonal to what -- you know, how we
16 specifically do things in our RFID tag. He
17 doesn't care. But he cares in the fact that we
18 give him better performance and longer read range
19 for his sensor tags, again.

20 But this patent here is not supposed to
21 be a patent about Matrics' technology. Other
22 patents are referenced. This is John's sensor

1 technology, you know, and that's -- you know, it
2 seems like that's what it's about. Every claim
3 here, the word "sensor" is in it.

4 And so it's kind of very clear. I mean,
5 to me it is, but, again, I'm -- I've sort of been
6 there and done that with these patents. I know
7 what we've done with ours, and I know what John is
8 doing with his.

9 Q. If you could turn to Column 16 of the
10 '803 patent.

11 A. 16. Okay.

12 Okay.

13 Q. Starting -- I just want to get, you know,
14 us on the same page as to where I'm referring to.
15 I'm going to have some follow-up questions.

16 A. Okay.

17 Q. But starting at line 41 --

18 A. 41.

19 Q. -- it says "In step 780, the RF
20 addressable sensor 110 communicates the digital
21 sensor data to the wireless sensor reader." Do
22 you see that?

1 A. Uh-huh. I'm reading. Yeah.

2 Q. And then the next sentence says "The
3 details of this communication are dependent upon
4 the protocol used for communication between the
5 wireless sensor reader 140/340 and the RF
6 addressable sensor 110." Do you see that?

7 A. Yep.

8 Q. And then the next sentence, it says "In
9 an embodiment to the present invention, the
10 protocol used is a binary tree traversal
11 protocol."

12 A. Oh, yeah. I'll be darned. He did
13 reference that. Yeah. I didn't remember -- I
14 read through all this, but it didn't pop out.
15 Okay. Great.

16 Q. So that binary tree traversal protocol,
17 which is the protocol used in an embodiment is one
18 of your contributions.

19 A. That is our contribution, binary -- and I
20 think that's referenced -- he references that
21 patent earlier in his patent. See, that's
22 referenced. So that's good. I mean, the patent

1 is referenced which discusses it. I believe
2 that's correct.

3 Let me continue reading. "On this
4 embodiment tag..."

5 Okay. So he's talking about in this
6 embodiment. Okay.

7 Because in our -- you know, for what we
8 do in our technology, all we do is -- because the
9 tag identification number -- I call it sort of the
10 random number, tree-walking number. That
11 basically is a -- identifies the tag, because it's
12 the only tag that's left communicating, and we use
13 that to retrieve the data for the item the tag is
14 attached to. So you could call it an ID number
15 appropriately.

16 And he says he's now -- "includes both
17 the tag and the sensor data okay." Okay. So --
18 oh, okay. All right. Got it.

19 Okay. So what's the question? I'm just
20 refreshing myself as I read.

21 Q. That's all right.

22 My question was whether that binary tree

1 protocol was your contribution regarding --

2 A. Oh, yeah. Definitely.

3 Q. So let's go to Column 5 of the
4 '803 patent. And if you could look at -- well,
5 let's start at line 6.

6 A. Column 5, 6. Okay.

7 6. Got it.

8 Q. Okay. Now, starting at line 6, it says
9 "Wireless sensor reader 140 includes logic to
10 interrogate the population of RF addressable
11 sensors, et cetera." And feel free to read that.
12 I'm just trying to focus on the aspects.

13 A. Uh-huh.

14 Q. The next sentence, "In an embodiment,
15 wireless sensor reader also includes logic to
16 process the receive sensor data."

17 The next sentence, "Wireless sensor
18 reader 140 can be any wireless device capable of
19 communicating via an air interface protocol with
20 the population of RF addressable sensors." Do you
21 see that?

22 A. Yeah.

1 Q. So is the binary tree traversal protocol
2 an example of the air interface protocol that's
3 referred to in that last sentence?

4 A. Uh-huh.

5 Q. Is that a yes?

6 A. Yeah. Yes.

7 Q. If we could go to --

8 A. It's our implementation of the air
9 interface protocol. It's not the -- it can be any
10 appropriate air interface protocol, but we do it
11 with tree-walking to -- yeah. So...

12 Q. And is that interface protocol used to
13 interrogate the population of RF addressable
14 sensors?

15 A. Yeah. When he's talking about the air
16 interface protocol, that's the wireless signal.
17 That's the RF signal he's talking about is what
18 he's talking about. That's -- yeah. Yeah.

19 Q. Let's go to -- back to Column 16 --
20 sorry. Following up on the last -- it's the exact
21 same portion. There was just one more.

22 A. Column 16 again?

1 Q. Yeah, Column 16 starting at line 41.

2 A. 41. Okay.

3 Got it.

4 Q. Actually, so we've already read a bunch
5 of this in 41. I would like to focus on --
6 starting at line 47 on the sentence that starts
7 "In this embodiment."

8 A. Oh. Line 47? Oh, "In this" -- I see it.
9 Okay.

10 Q. And I think you, you know, appropriately
11 read the full context of this paragraph earlier.
12 But it says "In this embodiment, the tag
13 identification number signaled by the RF
14 addressable sensor 110 may include both the tag
15 identification number stored in memory and the
16 sensor data obtained by the sensor elements."

17 A. Uh-huh.

18 Q. My question is: Was it your contribution
19 to signal the tag identification number stored in
20 memory in response to interrogation?

21 MR. HANEWICZ: Object to form.

22 A. Well, this is where -- so after I read

1 these sentences and see -- this is a generic tag
2 being discussed of our specific embodiment with --
3 the tree-walking was the specific representation
4 to our -- what we did. But it says here "In this
5 embodiment, the tag identification number signaled
6 by the RF addressable" -- that's generic.

7 I mean, we do it in a specific way, but
8 it could be implemented by any of the RFID
9 standards out there. That's what -- this is what
10 RFID tags do. They basically have to basically
11 get information that's stored in memory from the
12 tag, one of which is an identification number. It
13 could be other information. Some tags even store
14 item ID information, like this tag is, you know,
15 associated with this, and they program that
16 information into the tag itself.

17 So it's very broad, you know, in terms
18 of -- that's why I call it kind of generic. It
19 encompasses the whole body of tag technology. So
20 that's why it could be a little confusing reading
21 through these things. When it says "In this
22 embodiment, which includes the sensors," okay.

1 Then he's saying the tag identification number is
2 signaled by the RF addressable sensor now can both
3 include the tag ID and the sensor data. Okay?
4 Not a sensor. Fair enough. I mean, but that's
5 not -- that's pretty generic. That doesn't say
6 anything specifically about our specific tag
7 technology. That's saying, in general, this is
8 what a tag would do.

9 I hope that clarifies it. Because I know
10 it can be confusing in terms of -- the body of
11 generic tag technology there and that specific
12 enhancement that we do for singulation and read
13 range.

14 Q. Understood.

15 A. Okay.

16 Q. So what is -- would you say that you're
17 still friends with Dr. Peeters?

18 A. Sure. I'd say so. Yeah. I mean, it
19 would be fun to work with him again. He's very
20 creative. He's one of these, I think, creative
21 geniuses who just, you know -- and so I respect
22 him hugely. But unfortunately, our career paths

1 are just -- you know, they're not crossing right
2 now. I'm involved in an entirely different whole
3 domain now that has nothing to do with this kind
4 of stuff anymore.

5 Q. Understood.

6 MR. PETERS: For now I have no further
7 questions. I'll pass the witness.

8 MR. HANEWICZ: Give me just two minutes
9 here. I don't think I'm going to need anything,
10 but hold on just a couple minutes.

11 MR. PETERS: Sure. Let's go off the
12 record.

13 (Off the record: 10:26 a.m. to
14 10:27 a.m.)

15 MR. HANEWICZ: We have no questions for
16 Dr. Bandy.

17 Bill, thanks so much for your time today.

18 THE WITNESS: Okay. We're done?

19 MR. HANEWICZ: I think we're good.

20 MR. PETERS: Stay on just for a second in
21 case the court reporter has some questions, if
22 possible.

1 But thank you, Dr. Bandy. It was a
2 pleasure meeting you.

3 THE REPORTER: I have no questions for
4 the doctor. I just need to get transcript orders
5 on the record from counsel.

6 So, Mr. Peters, I have you down for a
7 rough draft today and regular delivery of the
8 final. Is that correct?

9 MR. PETERS: Regular delivery is two
10 weeks, right?

11 THE REPORTER: Yes.

12 MR. PETERS: Yeah. That works. Thank
13 you.

14 MR. HANEWICZ: That works for us as well,
15 Crystal.

16 THE REPORTER: Okay. A rough draft for
17 you as well?

18 MR. HANEWICZ: Yes.

19 THE REPORTER: And then did you want the
20 exhibits attached since they're already admitted?
21 Or no?

22 MR. HANEWICZ: No.

1 MR. PETERS: No.

2 (Proceedings concluded at 10:27 a.m.)

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

CERTIFICATE OF SHORTHAND REPORTER

I, CRYSTAL HEREFORD, the officer before whom the foregoing deposition was taken, do hereby certify that the foregoing transcript is a true and correct record of the testimony given; that said testimony was taken by me stenographically and thereafter reduced to typewriting under my direction; that reading and signing was not discussed; and that I am neither counsel for, related to, nor employed by any of the parties to this case and have no interest, financial or otherwise, in its outcome.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my signature this 31st day of December 2024.

Crystal Hereford

A			
abbott	60:10	addressing	30:6, 46:6,
1:6, 1:7	absorbing	78:18	48:16, 68:17
ability	42:3, 60:3,	adequate	aid
31:2, 74:5	60:8	22:15, 23:10	11:13
able	absorbs	admit	aids
9:1, 20:4,	22:18	76:4	5:21
24:16, 25:8,	accept	admitted	air
26:3, 31:2,	8:22	93:20	87:19, 88:2,
32:8, 42:7,	access	advance	88:8, 88:10,
42:8, 42:17,	36:15, 36:19	5:19	88:15
43:10, 52:17,	accommodate	advanced	airport
71:21, 78:22,	7:22	30:15	26:11
81:11, 81:18,	accomplishing	advantage	algorithm
82:21	28:16	38:20, 39:22,	25:9, 80:13
about	accu	65:14, 81:20,	algorithms
7:2, 7:4, 7:20,	25:1	82:8	25:2, 41:4,
8:14, 9:17,	accurate	advantages	41:5, 42:17
9:19, 11:7,	20:19	27:16, 65:18	all
11:10, 14:12,	achieve	affixed	7:12, 10:22,
17:17, 27:6,	65:9	95:15	20:1, 23:20,
29:19, 30:4,	act	after	25:4, 25:6,
30:9, 39:6,	71:13	20:5, 23:21,	25:10, 26:15,
39:18, 44:10,	action	45:7, 47:13,	28:4, 28:14,
44:15, 45:1,	52:21	47:16, 49:20,	29:22, 31:1,
45:2, 45:9,	activity	53:3, 53:12,	31:9, 35:17,
45:14, 45:19,	59:18	53:13, 89:22	36:21, 39:5,
46:4, 48:2,	actually	again	39:12, 42:6,
50:6, 50:9,	19:20, 22:5,	15:12, 52:19,	42:16, 42:21,
51:8, 52:13,	26:10, 30:14,	64:19, 68:7,	44:21, 51:5,
57:1, 57:10,	34:1, 34:2,	77:8, 78:8,	51:6, 51:8,
59:11, 61:10,	36:16, 39:2,	81:11, 82:1,	54:13, 56:20,
62:15, 63:7,	43:1, 53:7,	83:19, 84:5,	58:1, 60:8,
69:6, 70:8,	57:19, 58:2,	88:22, 91:19	63:1, 63:14,
70:9, 75:7,	60:4, 67:4,	agency	66:17, 70:8,
75:8, 77:16,	69:16, 77:14,	28:8, 29:12,	71:6, 75:9,
79:21, 81:1,	80:9, 82:6,	30:16	76:21, 77:11,
83:21, 84:2,	82:19, 83:3,	ages	78:20, 79:1,
86:5, 88:15,	89:4	29:2	79:3, 79:5,
88:17, 88:18,	additional	ago	79:6, 79:11,
91:6	46:11, 55:8	6:19, 6:22,	79:12, 80:5,
above	addressable	7:3, 14:13,	83:1, 83:2,
78:10	70:10, 70:18,	17:21, 34:6,	85:14, 86:8,
absolutely	73:14, 73:17,	43:3, 47:17	86:18, 86:21
6:15, 8:17,	82:11, 84:20,	agree	allow
30:3, 32:21	85:6, 87:10,	50:11	28:5, 71:16
absorb	87:20, 88:13,	agreed	allowed
23:6, 60:8,	89:14, 90:6,	7:18, 33:16	21:9, 21:10,
	91:2	ahead	38:6, 66:10,
		9:3, 15:11,	

66:12 almost 31:6, 39:2, 44:3 along 38:21, 43:12 already 82:11, 89:4, 93:20 also 3:17, 10:5, 10:7, 10:9, 12:7, 16:20, 27:3, 35:13, 36:5, 36:14, 40:14, 87:15 altivera 1:12, 16:1, 16:3, 16:20, 32:16 always 18:19, 67:16 amazing 31:11, 46:8 amount 63:22 analysis 28:21 analyzing 29:7 ancient 51:5 annotations 10:20, 32:6 announce 5:3 another 19:17, 20:6, 38:19, 41:21 answer 8:1, 9:2, 9:16, 13:4, 17:4, 38:18, 39:17, 48:16, 58:5, 61:21, 64:19, 65:7, 66:6, 72:7 answering 7:15, 39:14,	58:7 answers 35:9 antenna 23:2, 23:3, 35:12, 36:22, 37:7, 37:13, 37:15, 37:18, 55:4, 56:15, 60:2, 60:5, 60:8, 60:12, 60:22, 70:6, 70:7, 72:2, 72:10 antennas 54:21 any 8:1, 8:4, 9:2, 10:2, 10:13, 13:16, 14:6, 16:9, 18:17, 18:21, 20:15, 29:19, 32:5, 32:8, 32:22, 34:17, 35:6, 37:20, 50:20, 57:8, 59:5, 65:2, 65:3, 72:6, 74:7, 80:19, 81:9, 83:9, 87:18, 88:9, 90:8, 95:11 anybody 8:18, 8:20, 12:8, 13:2, 13:13, 76:22 anymore 92:4 anyone 70:21 anything 10:20, 13:10, 18:9, 45:9, 47:15, 48:2, 54:18, 54:22, 55:11, 55:18, 57:10, 57:12,	64:1, 64:7, 71:3, 71:9, 91:6, 92:9 anyway 8:13, 24:11, 43:7, 61:20, 82:4 apologies 6:2 apologize 13:5, 29:22, 38:19 appeal 1:3 appearance 5:4 apple 28:11 application 26:12, 26:20, 35:17, 40:3, 56:19, 57:7, 61:17, 61:22, 64:16, 71:17 applications 21:8, 26:16 apply 57:8 applying 22:8, 52:14, 55:16, 56:1 appreciate 8:3 approach 43:14, 80:12, 83:2, 83:3 appropriate 29:20, 88:10 appropriately 86:15, 89:10 approved 12:19 area 22:22, 34:19, 47:3, 68:9 areas 22:7 around 69:16, 69:17,	79:15 arrive 11:9 arriving 49:14 art 21:5, 21:20, 24:21, 28:11, 46:19, 47:14, 70:12, 70:14, 70:16, 70:20, 70:22, 71:5, 72:10, 72:14, 72:16, 74:15, 74:16, 81:9 aside 10:11 asked 44:18, 45:15, 50:10, 50:11 asking 5:14, 58:6, 59:11 aspect 59:14, 70:19, 72:3, 73:15 aspects 20:18, 45:13, 87:12 assemble 37:6 assembled 37:13 assembly 35:11, 40:8, 40:9, 40:10 assign 32:19 assigned 16:5, 80:10 assignees 32:11, 32:12 associated 90:15 assuming 29:16 astounded 28:15
--	---	---	--

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

98

astoundingly 43:9 attached 4:11, 26:2, 42:11, 58:21, 86:14, 93:20 attention 33:14 attorney 5:4 attorneys 15:5 aware 17:10 away 21:7, 21:9, 43:14, 69:3, 71:22 B b2 1:17 back 13:21, 14:20, 17:12, 18:5, 19:2, 26:21, 28:7, 29:2, 30:13, 31:12, 36:22, 37:1, 39:6, 39:10, 39:11, 41:4, 43:15, 46:19, 47:8, 47:19, 51:19, 52:18, 59:2, 59:5, 59:6, 59:13, 59:15, 59:22, 60:11, 60:14, 61:19, 62:2, 62:17, 68:7, 69:12, 72:17, 73:19, 75:12, 75:16, 76:3, 76:22, 77:10, 88:19 background 12:15, 46:2, 46:16, 51:11	bandy 1:20, 2:1, 4:2, 4:17, 6:5, 12:10, 50:4, 75:3, 92:16, 93:1 bare-bone 38:3 barrier 40:2 base 68:22 based 45:13, 65:6 baseline 26:18 basic 30:13, 56:4, 57:6, 58:18, 67:6 basically 12:15, 12:17, 14:15, 19:15, 20:10, 20:11, 21:15, 22:12, 22:14, 23:11, 23:17, 25:7, 25:8, 26:18, 27:11, 27:19, 28:2, 28:20, 35:14, 36:17, 36:18, 36:21, 37:9, 37:12, 38:5, 38:6, 38:15, 42:5, 42:17, 43:10, 44:18, 45:15, 46:9, 47:18, 50:11, 51:16, 52:5, 52:9, 52:17, 53:20, 55:13, 55:16, 55:18, 55:19, 57:16, 58:19, 59:1, 60:6, 61:18, 63:2, 63:5, 63:17, 67:13, 69:2,	71:9, 74:12, 74:15, 75:15, 80:17, 81:7, 82:7, 82:10, 86:11, 90:10 battery 22:17 because 11:15, 14:12, 18:19, 18:22, 20:3, 22:16, 31:4, 35:4, 35:17, 36:9, 40:1, 41:5, 44:16, 46:6, 51:1, 51:5, 53:9, 59:14, 60:1, 60:6, 65:10, 65:16, 68:3, 68:22, 69:4, 71:4, 72:12, 74:5, 76:19, 78:20, 79:4, 80:11, 81:15, 86:7, 86:8, 86:11, 91:9 become 28:3, 28:18, 68:21 been 6:6, 6:18, 7:2, 17:21, 18:3, 24:10, 28:13, 31:9, 33:11, 34:4, 39:2, 39:14, 40:2, 43:3, 43:4, 58:14, 64:2, 67:15, 70:5, 70:21, 73:7, 74:2, 84:5 before 1:3, 2:6, 6:18, 8:1, 9:2, 48:16, 58:17, 75:2, 77:17, 78:20, 95:3	behalf 3:2, 3:9, 5:6, 5:8, 44:19, 51:17 behind 29:5 being 9:15, 15:6, 15:14, 28:21, 31:2, 45:14, 53:8, 71:12, 71:20, 79:12, 81:10, 82:21, 90:2 believe 24:9, 33:15, 86:1 bell 43:2 besides 9:5, 13:13, 19:17 beta-lattice 27:14 better 5:17, 27:19, 76:5, 83:18 between 85:4 beyond 26:15 big 29:18, 36:13, 68:5 bill 6:12, 6:14, 11:7, 11:18, 12:12, 13:4, 29:16, 39:11, 46:22, 48:13, 75:19, 76:7, 92:17 billion 28:12, 31:3 binary 85:10, 85:16, 85:19, 86:22, 88:1
---	---	--	--

bit 41:6, 44:3, 47:1, 49:5, 49:21, 76:21, 79:20, 80:17, 82:4, 82:22 bits 41:1 black 63:3, 63:4, 63:8, 63:15, 63:18, 64:2, 64:8, 64:18 block 56:10, 63:3 blowing 43:13 board 1:3, 20:8, 20:10, 47:22 bob 19:21 body 83:7, 90:19, 91:10 boeing 26:8 both 86:16, 89:14, 91:2 bought 22:6, 23:19, 23:21, 68:2 bouncing 35:21 box 63:3, 63:4, 63:8, 63:15, 63:18, 64:2, 64:8, 64:18 break 7:20, 7:21, 9:1, 10:11, 11:1, 38:19, 39:3, 39:6, 39:13, 75:2, 75:8, 77:17 breaking 8:2	bring 31:17, 57:14, 80:4, 81:8, 82:6 bringing 55:8, 71:13 broad 90:17 brought 15:5, 20:3, 48:11, 48:17, 48:21, 66:7, 66:13 building 36:20, 44:5, 74:16 bump 83:4 bunch 89:4 bureaucratic 68:6 business 19:15, 24:7 buy 79:17, 80:6 C calendar 17:20 california 2:8 call 6:14, 18:21, 25:8, 38:15, 45:3, 45:6, 75:13, 78:13, 79:10, 83:9, 86:9, 86:14, 90:18 called 19:7, 20:21, 27:14, 36:3, 36:5, 36:15, 40:8, 44:16, 50:9, 50:17, 74:1, 80:10 calls 6:15, 18:22	caltech 30:18 came 20:6, 20:7, 20:9, 32:7, 44:14, 44:22, 48:5, 48:18, 48:20, 48:21, 51:12, 53:3, 53:11 can't 5:21, 23:1, 23:9, 39:21, 45:22, 51:13, 64:17, 71:3, 79:7 cannot 8:4 capabilities 22:9 capability 46:7, 71:14 capable 87:18 captures 27:11 car 9:5 care 1:7, 83:17 career 28:14, 31:9, 91:22 careful 80:3 cares 83:17 carmax 26:8 carreyn 3:11, 5:8 case 1:16, 6:19, 9:19, 9:22, 10:3, 14:21, 17:6, 17:17, 19:5, 24:9, 41:15, 42:9, 44:16, 50:7, 60:18, 61:7, 61:10, 61:16, 92:21, 95:12 catching 45:6 cease 28:15 cell 46:5, 46:6, 46:10, 48:6, 49:16, 52:1, 52:2, 52:3, 52:10, 52:20, 61:8, 68:20, 69:4 cellular 52:9, 52:20 central 37:2, 52:10, 52:19 ceo 20:4 certain 25:2, 27:16, 45:13, 65:17, 65:18, 66:7, 81:3 certainly 19:2 certificate 2:8, 2:9, 95:1 certified 2:9, 6:7 certify 95:5 cetera 24:8, 53:22, 63:14, 69:6, 70:19, 87:11 change 60:9 changing 20:3, 60:2, 60:4, 60:15, 60:21 characteristics 23:5, 35:19,
--	---	--

66:8 characterizing 27:22, 67:5 charge 20:21, 22:11, 23:9, 24:8, 55:2, 57:11, 59:9, 65:16, 74:5, 81:22, 83:4, 83:10 chat 12:8, 31:19, 32:1 check 11:17, 50:17, 50:22 chemicals 52:16 chief 20:14 chip 28:11, 28:18, 37:17, 37:22, 38:6, 40:9, 40:13, 40:14 chips 35:10, 35:12, 37:6, 37:10, 37:11, 37:15, 38:3, 38:4, 38:13, 39:16 chose 39:22 chris 5:7, 18:3 christopher 3:10 circle 75:12 circuit 30:9, 30:12, 30:21, 31:3, 31:7, 40:12 circuitry 25:5, 38:5, 59:12 circuits 27:21, 28:9,	29:6, 30:11 civilization 49:16 claim 70:3, 70:13, 71:4, 73:9, 73:21, 77:14, 77:22, 78:5, 78:6, 80:17, 80:22, 81:7, 83:9, 84:2 claimed 69:17, 71:5 claims 62:10, 69:20, 73:3, 77:19, 82:6, 82:20 clarification 82:5 clarifies 91:9 clarify 45:16 class 80:10, 80:11 clear 11:22, 41:18, 45:16, 74:7, 84:4 clearly 6:1, 12:2, 49:20 clever 23:16, 24:19, 43:8, 52:12, 53:16, 74:12 close 35:4, 75:3 closer 69:6 co-inventor 13:21, 21:1, 33:3 co-inventors 33:13 cofounder 19:14, 19:18, 19:21	cofounders 19:21 coie 3:12, 5:8, 15:22 collection 42:1 column 69:8, 69:11, 69:15, 73:12, 77:11, 84:9, 87:3, 87:6, 88:19, 88:22, 89:1 come 20:6, 38:21, 43:12, 48:9, 49:9, 49:10, 56:12 comes 56:15 coming 49:15, 60:14 comments 32:6 committee 79:15, 80:9 communicate 59:12, 59:15, 60:12, 78:22 communicates 84:20 communicating 36:18, 41:8, 45:8, 53:16, 59:4, 59:5, 86:12, 87:19 communication 50:16, 85:3, 85:4 communications 56:18, 58:13, 58:16, 58:22, 59:14, 70:7 companies 45:5, 80:7 company 16:4, 16:11,	16:15, 16:16, 16:20, 18:7, 18:10, 19:7, 19:16, 19:20, 20:2, 20:5, 22:6, 24:4, 32:20, 34:14, 34:18, 65:4, 68:6, 68:15 compared 81:9 compensated 15:14, 15:18 competition 43:10, 43:14 competitive 65:14 completely 18:12 complexity 40:13 complicated 61:21 component 56:2 components 37:20, 57:4 comprised 37:15 comprising 70:10 computational 25:1 computer 10:9, 10:10, 31:17, 41:5, 49:22, 76:9 computer-aided 30:20, 31:5, 31:8 computers 28:12 concept 20:21 concluded 94:2 conditions 55:20
--	---	---	---

conducted 1:21, 2:2 configuration 58:18 confuse 35:21 confused 83:1 confusing 79:21, 90:20, 91:10 connected 37:17 connecting 37:1 connection 34:17 construct 27:13 consumption 40:15 contact 17:17 contacted 18:1 contains 80:12 contend 35:20, 42:18 contention 41:22, 42:12, 42:18, 61:12, 61:13 context 89:11 continue 38:8, 49:19, 86:3 contribute 54:18, 55:1, 55:11, 65:17, 65:22, 66:19, 71:18 contributed 70:21, 71:3, 71:7, 73:21 contributing 55:13	contribution 72:1, 79:22, 85:19, 87:1, 89:18 contributions 62:8, 64:8, 72:21, 77:18, 78:3, 85:18 control 21:12, 36:18, 38:9 controller 37:22, 38:2, 38:10 conventional 72:3 conversation 18:18, 45:18, 49:1, 49:19, 50:21 conversations 18:20, 19:3, 35:6 convert 64:11 correct 8:16, 9:7, 11:14, 11:15, 15:19, 15:20, 19:8, 19:12, 62:12, 78:2, 86:2, 93:8, 95:6 corrections 12:18 cost 26:4, 40:4, 40:6, 40:10, 40:11, 40:14, 40:17 could 21:6, 21:20, 22:1, 31:4, 35:21, 37:5, 40:11, 41:3, 43:17, 46:11, 50:10, 50:17, 52:14, 53:4, 53:10, 54:1,	57:7, 57:19, 57:20, 59:22, 62:1, 65:1, 65:2, 65:3, 65:7, 65:8, 65:18, 66:3, 68:14, 68:16, 68:18, 69:8, 70:20, 73:9, 77:3, 77:7, 77:11, 80:18, 84:9, 86:14, 87:4, 88:7, 90:8, 90:13, 90:20 couldn't 25:4, 79:6 counsel 5:3, 12:16, 13:2, 13:13, 15:21, 17:5, 17:17, 17:19, 18:14, 18:18, 76:17, 93:5, 95:10 couple 72:9, 92:10 coupled 27:16, 70:7 course 23:19, 25:3, 31:1, 46:6, 51:4, 54:20 court 7:7, 12:8, 19:10, 92:21 cover 32:10, 33:4 crazy 68:6 create 41:4, 74:15, 74:16 creating 52:1 creative 68:5, 91:20 credit 46:14	credited 26:19 crosses 72:18 crossing 92:1 crystal 1:28, 2:7, 93:15, 95:3 current 21:5, 28:12, 68:19 currently 33:1 customer 26:7, 35:15, 35:16 customers 26:9 cutting 46:20, 46:22, 49:5 D dark 29:2 darned 85:12 darpa 30:16 data 80:19, 84:21, 86:13, 86:17, 87:16, 89:16, 91:3 database 25:22, 42:11 date 45:19 day 9:12, 95:15 deal 29:18 dealing 55:6, 70:4 dealt 28:2 december 1:22, 95:16
--	---	---	---

decided 30:8 decision 29:10, 33:9 declaration 4:16, 9:22, 10:4, 10:8, 10:14, 10:18, 12:5, 12:10, 12:12, 12:14, 12:17, 13:1, 13:17, 13:19, 14:6, 15:5, 15:18, 17:18, 19:5, 33:22, 34:7, 34:8, 43:15, 44:13, 62:2, 72:17, 77:16 decrease 40:17 decreased 40:14 deeply 18:6 defense 30:15 definitely 48:1, 87:2 definition 38:10 degree 27:4 delivery 93:7, 93:9 dependent 61:21, 85:3 depends 56:19, 64:15, 66:22, 67:1, 67:2 depos 3:18 deposed 6:18, 9:11, 9:15 deposition 1:20, 2:1,	4:12, 7:5, 7:17, 13:11, 13:14, 14:1, 43:2, 95:4 describing 53:19 design 25:7, 30:9, 30:10, 30:12, 30:21, 31:2, 31:5, 31:8, 57:6, 58:1, 59:18, 63:16, 64:17, 65:16, 67:3, 67:5, 67:15, 69:3 designed 23:3, 28:9 designer 28:18 designing 28:8, 30:10, 61:15, 63:18, 67:4, 67:8 designs 30:21 desk 76:8 detailed 30:15 details 44:19, 51:8, 61:3, 67:1, 67:16, 85:3 determining 27:17 develop 31:10, 67:13 developed 21:8, 21:22, 23:18, 24:3, 24:8, 26:17, 28:22, 29:12, 36:1, 36:2, 36:5, 36:7, 40:7, 66:1 developing 21:14, 22:9, 30:20, 36:14	development 19:16, 20:12, 20:17 device 87:18 devil 67:16 diabetes 1:7 diagnostic 53:5 diagram 56:10, 57:17, 64:7 dictated 12:21 different 17:15, 19:22, 20:1, 24:6, 33:12, 34:19, 35:18, 36:2, 41:12, 41:13, 41:17, 42:17, 45:5, 58:1, 58:7, 58:9, 59:7, 59:17, 59:18, 61:8, 61:12, 61:16, 65:9, 65:10, 68:10, 68:11, 68:15, 80:4, 80:20, 92:2 difficult 42:22 difficulties 5:20 dig 61:3 digital 84:20 diminishes 22:21 direction 24:7, 95:9 directly 23:2 discussed 49:12, 50:19,	90:2, 95:10 discusses 86:1 discussions 29:19, 35:7 disposable 53:5 dissertation 27:6 distance 22:22, 23:10, 65:19, 80:14 distances 36:13, 66:11, 71:22 distinctly 6:2 distributed 52:15 dividing 25:17 dock 36:4 doctor 5:9, 5:11, 93:4 document 83:8 documents 13:16, 14:6 doing 20:20, 24:19, 28:7, 28:20, 36:21, 37:2, 40:10, 40:16, 41:2, 43:12, 45:4, 55:12, 56:7, 58:18, 60:1, 60:6, 61:4, 61:18, 63:1, 65:21, 66:4, 67:4, 67:5, 74:14, 76:15, 83:2, 83:14, 84:8 dollars 36:10 domain 24:5, 24:9,
---	--	---	--

68:8, 80:1, 82:2, 82:3, 92:3 dominance 22:5 done 50:2, 65:3, 70:21, 74:14, 84:6, 84:7, 92:18 door 36:3, 36:4, 57:22, 66:5 doru 3:18 dot 36:3, 36:4 down 7:8, 12:20, 23:14, 25:17, 38:6, 67:3, 80:3, 93:6 download 12:9 dr 34:10, 34:20, 35:1, 46:1, 46:15, 48:5, 51:10, 53:3, 75:3, 91:17, 92:16, 93:1 draft 93:7, 93:16 driving 8:19, 9:8, 68:6 drop 12:7, 31:19 dropped 34:16, 47:3, 47:13 dropping 31:20 due 24:11 duly 6:6 during 52:6 dynamic 20:2	E each 7:12, 23:13, 41:14, 45:4, 45:6 earlier 13:20, 85:21, 89:11 early 31:6 easier 61:13, 68:22 east 3:13 eastern 11:11 edit 32:8 edits 12:18 education 26:21 efficient 81:17 efforts 30:17 either 31:22, 60:21 electrical 27:4, 36:20, 64:12 electro 23:5 electron 27:7, 27:20 electronic 44:4 electronics 38:4 elements 62:18, 89:16 eleventh 3:5 elite 30:18, 30:19 else 8:20, 9:5,	12:8, 18:9, 45:2, 45:9, 56:3, 66:6, 76:22, 80:5 email 50:6, 50:18 emailed 50:16 emanated 23:5 embodiment 85:9, 85:17, 86:4, 86:6, 87:14, 89:7, 89:12, 90:2, 90:5, 90:22 employed 95:11 encompassed 62:19 encompasses 90:19 end 42:19, 59:6, 67:17 energized 21:3 energizing 36:21 energy 22:8, 22:13, 22:17, 23:1, 23:6, 23:7, 42:3, 60:14, 63:10, 64:10, 64:21, 70:4 engagement 18:13 engineering 20:18, 27:4, 44:4, 59:18, 63:16, 67:7 engineers 67:8, 67:9 enhancement 91:12 enhancements 81:5	enhancing 73:1, 74:2, 74:19, 74:20 enough 91:4 entered 7:16, 21:19 enters 18:9 entire 35:15, 37:9 entirely 92:2 entry 40:2 environment 49:21, 52:16, 61:14, 68:5 environments 35:17, 35:19 esq 3:3, 3:10, 3:11 establish 16:18 established 20:5 et 24:8, 53:22, 63:14, 69:6, 70:19, 87:11 even 22:20, 28:13, 36:7, 40:7, 40:9, 52:13, 53:17, 80:8, 90:13 eventually 31:1 ever 6:18, 35:6, 37:8 every 7:20, 25:17, 70:17, 72:12, 84:2 everyone 6:15 everything 7:8, 29:3,
--	---	--	---

29:4, 40:11, 56:3, 62:22 evolved 46:8 evolving 47:19, 47:22 exact 88:20 exactly 24:15, 56:16 examination 4:2, 6:10 examined 6:8 example 36:5, 88:2 except 80:13 exhibit 4:12, 4:13, 4:16, 12:5, 12:9, 12:11, 31:20, 31:21, 43:17, 54:4, 54:6 exhibits 93:20 expand 28:5, 40:18 expansion 21:10 expect 75:11 expensive 36:9 experience 12:22 expire 24:11 expired 24:11 explain 18:6, 50:12, 57:3, 74:3 explained 12:15, 45:10, 45:14, 58:17, 78:20	explaining 46:1, 46:15, 73:8 explicitly 74:3 extend 21:2, 25:3, 26:4, 37:3 extending 36:8 extract 64:10, 64:21 extracting 70:4 F fabricating 30:11 fabrication 29:5 face-to-face 76:16 facility 29:11 fact 47:21, 83:17 failure 28:21, 29:8 failures 29:7 fair 16:22, 70:3, 72:2, 82:10, 91:4 familiar 15:1, 43:5 far 49:13, 58:11, 64:7 fast 24:20, 68:4 faster 65:15, 65:22, 66:13, 71:2, 71:19, 81:11 features 62:9, 62:13, 62:20, 63:10,	65:17, 73:1, 74:1, 74:6, 74:18, 77:18, 81:3 feel 87:11 feet 21:6, 21:9, 22:22 few 12:18, 21:6, 21:20, 38:22, 45:7, 58:9, 75:2, 77:4 field 21:4, 21:16, 21:19, 22:2, 22:13, 22:18, 22:19, 23:7, 23:13, 34:15, 42:2, 42:3, 42:15, 57:9, 60:3, 60:9, 60:11, 64:11, 64:22, 65:11, 69:5, 70:5 figure 53:19, 54:8, 54:14, 54:16, 54:18, 54:22, 56:9, 56:21, 57:1, 57:2, 57:4, 57:5, 57:9, 58:11, 62:17, 62:21, 64:1, 64:6, 66:20, 80:17, 80:18 file 32:7 files 10:7, 10:9 final 12:19, 93:8 finally 12:19 financial 95:12	fine 5:18, 11:18, 17:1, 39:15, 75:10 finite 69:4 first 6:6, 9:10, 17:5, 17:17, 18:4, 19:19, 20:4, 22:10, 28:19, 29:13, 30:8, 30:12, 33:6, 33:10, 45:20, 46:9, 51:22, 54:1, 62:4, 78:4 firsts 23:18 focus 87:12, 89:5 focused 18:8 follow-up 84:15 following 88:20 follows 6:9 foot 36:12, 36:13 foregoing 95:4, 95:5 forever 42:16 form 17:2, 48:14, 52:11, 72:5, 79:14, 82:17, 89:21 formed 19:19, 35:12 formulation 27:10, 27:15 forward 15:5 found 78:11
--	---	--	---

four 43:11 four-year 34:15 fourth 54:9, 54:10 free 87:11 frequency 58:4, 70:10, 70:19, 70:22 friend 17:7 friends 91:17 front 31:15 full 79:5, 89:11 fun 31:9, 91:19 function 25:7, 27:7, 27:9, 38:12, 71:14 functionality 40:12 functions 27:17, 78:15 fundamental 30:13, 38:5 funders 20:6, 20:9 funding 20:4 further 23:14, 40:9, 58:1, 65:15, 65:19, 66:11, 92:6 fused 38:15, 39:18 G gaining 22:4 gambrills 76:11	gave 25:20 general 26:14, 91:7 generally 69:21, 69:22 generate 57:20 generated 44:19 generation 30:20, 55:2, 57:8, 59:9 generic 54:22, 57:7, 57:8, 63:2, 64:17, 65:12, 72:8, 79:22, 80:21, 81:1, 81:10, 90:1, 90:6, 90:18, 91:5, 91:11 geniuses 91:21 gentag 5:8, 16:12, 16:14, 16:15, 16:19, 17:19, 18:2 gentag's 17:5, 17:16, 18:14 geolocation 46:16, 46:18, 47:15, 47:20 getting 49:18, 58:3, 75:3 gist 49:7 give 46:13, 48:15, 65:18, 77:15, 83:18, 92:8 given 95:6 go 5:2, 11:4, 15:10, 19:4, 25:8, 25:22, 30:6, 35:20, 42:10, 43:15, 47:4, 47:6, 47:8, 48:16, 65:2, 68:7, 68:16, 75:1, 75:11, 75:22, 76:3, 87:3, 88:7, 88:19, 92:11 goes 22:21, 56:17 going 12:7, 14:8, 26:21, 31:19, 36:4, 41:15, 42:4, 44:6, 50:10, 51:19, 62:2, 62:17, 63:21, 63:22, 72:9, 72:17, 81:2, 81:6, 84:15, 92:9 gone 51:6, 65:3, 66:4, 66:5, 69:2 good 6:12, 6:13, 11:16, 11:19, 11:21, 12:3, 39:8, 44:22, 49:3, 68:13, 76:5, 83:6, 85:22, 92:19 gps 47:18, 47:20 great 6:17, 7:6, 30:5, 52:22, 53:1, 69:7, 75:18, 85:15 green's 27:7, 27:9, 27:17 ground 7:5	group 28:20, 30:10, 78:12 groups 30:19, 79:13 grow 31:9 guess 8:13, 15:4, 41:3, 49:8, 56:9, 57:3, 66:9 guessing 54:20 H half 25:17 halip 3:18 hand 5:10, 5:11, 5:15, 6:4, 95:15 hanewicz 3:10, 5:7, 11:18, 11:21, 13:4, 13:8, 17:2, 29:14, 30:5, 39:8, 46:22, 48:13, 72:5, 72:7, 74:21, 75:10, 75:17, 75:19, 76:19, 82:17, 89:21, 92:8, 92:15, 92:19, 93:14, 93:18, 93:22 happen 68:4 happened 44:21 happening 44:17 happy 9:2 hard 43:7, 55:22 hard-coded 38:17, 39:20,
--	--	---

40:21 hats 20:1 hazardous 52:16 head 18:11 headed 8:8, 29:12 headset 5:21, 11:15, 11:16 hear 5:17, 11:18, 11:21, 12:2, 13:5, 76:4 hearing 5:20, 11:13, 11:16 held 16:10, 20:13 help 54:13 here 10:5, 11:17, 14:21, 32:4, 57:10, 62:18, 66:15, 70:17, 71:11, 72:14, 74:14, 78:9, 81:13, 83:20, 84:3, 90:4, 92:9 hereby 95:4 hereford 1:28, 2:7, 95:3 herein 6:6 hereunto 95:14 high-level 56:10 history 33:16, 33:19, 33:22, 34:4, 51:6 hold 47:12, 92:10	home 8:8, 8:14, 11:8, 49:13, 49:14, 49:20, 75:4, 76:8 hope 91:9 hour 7:21, 39:2, 49:15, 75:9 hours 8:14, 11:8 house 49:22 huge 21:10 hugely 91:22 hundred 28:10, 33:12, 42:20, 79:8 I id 25:21, 58:20, 86:14, 90:14, 91:3 idea 33:11, 36:8, 47:19, 48:5, 48:9, 48:11, 48:17, 48:18, 48:21, 49:1, 49:9, 49:10, 49:11, 52:12, 52:22, 53:1, 53:4, 53:9, 53:12, 53:18, 53:19, 55:2, 68:13, 69:7, 73:18 idealized 27:15 ideas 47:21 identification 86:9, 89:13, 89:15, 89:19,	90:5, 90:12, 91:1 identifies 86:11 identify 58:20 identifying 73:20 imagine 75:3 immediate 14:13, 52:20 immediately 52:18 impedance 23:4, 60:2, 60:4, 60:7, 60:10, 60:16, 60:21 implement 58:2, 72:16 implementation 55:7, 88:8 implemented 53:10, 71:5, 90:8 implies 78:9 important 7:11, 21:13, 78:17 impressed 53:14 improvement 21:10, 22:3 in-house 29:10, 40:7 inc 1:7, 32:15 include 89:14, 91:3 included 37:10 includes 86:16, 87:9, 87:15, 90:22 incorporate 46:7, 46:11,	52:5, 53:21 incorporated 53:5 incorporating 48:6, 68:21 increase 26:4, 40:17 increased 21:22, 40:15 increasing 74:12 indicated 59:6 individual 73:17 industry 23:17, 24:21, 26:14, 28:14, 29:1 inflators 27:8 information 15:6, 25:21, 42:9, 52:7, 59:15, 60:18, 63:14, 90:11, 90:13, 90:14, 90:16 infrastructure 52:15 inherent 46:10 initial 18:17 initialization 73:2, 78:9 initially 25:10 initiation 71:11, 71:19, 71:20 input 63:20 insert 32:8 install 29:10 installation 35:15
--	---	---	--

instead 42:20 insulator 27:18 integrate 55:22 integrated 29:6, 30:9, 30:11, 30:12, 30:21, 31:7, 40:9 integration 31:3 interest 17:11, 48:1, 95:12 interested 81:14 interesting 48:20 interface 55:3, 56:18, 58:14, 63:4, 63:19, 66:20, 66:22, 70:7, 70:17, 70:18, 87:19, 88:2, 88:9, 88:10, 88:12, 88:16 interfaced 44:2 interfacing 67:9 internet 47:3, 50:1 interrogate 24:18, 42:5, 65:21, 82:11, 87:10, 88:13 interrogated 21:18, 21:21, 22:2, 26:5 interrogation 21:14, 24:14, 25:11, 38:7, 52:7, 52:8, 89:20 interrupt 7:12, 15:10,	29:15, 30:6, 75:1 interrupting 30:1 interruption 10:4, 36:11, 46:19, 48:22, 49:3, 51:15, 51:18 interruption)- 36:7 introduce 49:9 introduced 12:11, 31:21, 34:3, 54:6 introducing 49:2 introductions 17:12 invalidated 45:12 inventing 74:8, 74:9, 74:10, 74:11 invention 85:9 inventions 32:20, 74:13 inventor 21:1 inventors 33:7 inventorship 16:10 inventory 21:11 involve 16:9 involved 18:7, 21:14, 28:13, 33:12, 36:13, 43:3, 67:7, 67:15, 71:10, 92:2 involvement 14:8, 50:12 involves 72:13	ip 82:2 ipr 1:16, 18:14 isolate 73:16, 79:9, 79:13, 80:13, 82:12 isolated 78:12 issue 21:16, 28:2, 30:2, 42:15 issues 45:13, 45:15, 61:12 it'll 38:21 item 26:1, 42:11, 58:20, 86:13, 90:14 item-level 26:16 items 36:3 itself 23:12, 37:9, 90:16 J job 1:26 john 9:19, 13:19, 16:16, 17:8, 17:11, 34:3, 34:5, 34:7, 43:20, 44:1, 44:9, 44:10, 44:15, 44:16, 45:2, 45:20, 46:8, 47:21, 50:4, 50:6, 50:8, 50:9, 53:15, 57:2, 57:4, 57:13, 57:15, 62:15,	65:2, 67:17, 68:1, 74:14, 81:13, 84:7 john's 33:21, 52:5, 60:18, 61:7, 71:6, 83:22 jumping 47:22 K keep 18:10 kept 18:4, 20:3 kick-starting 26:19 kicked 20:10 kind 6:1, 38:20, 53:8, 55:14, 56:4, 58:1, 59:8, 61:3, 68:13, 70:12, 83:13, 83:14, 84:4, 90:18, 92:3 kinds 42:16, 52:17 knew 17:9, 44:1, 56:6, 62:15, 63:7 knocked 66:5 know 7:22, 15:3, 16:1, 16:3, 16:12, 16:17, 18:10, 18:15, 20:12, 23:14, 25:5, 29:2, 31:8, 33:18, 34:3, 34:4, 34:5, 34:16, 36:13, 36:19, 37:1, 38:11,
--	--	---	--

43:1, 43:3, 43:5, 43:11, 43:18, 44:8, 45:21, 46:10, 46:18, 47:14, 47:18, 47:20, 48:18, 48:20, 49:12, 50:18, 51:12, 54:1, 55:3, 55:19, 56:3, 56:10, 57:8, 59:7, 60:15, 61:1, 63:5, 63:8, 63:11, 63:13, 63:19, 63:20, 63:21, 64:9, 64:18, 64:19, 64:20, 65:1, 65:8, 65:12, 66:3, 66:21, 68:1, 68:4, 68:8, 74:4, 75:12, 78:1, 78:5, 78:12, 78:16, 79:1, 80:15, 80:18, 82:21, 83:10, 83:15, 84:1, 84:6, 84:7, 84:13, 86:7, 89:10, 90:14, 90:17, 91:9, 91:21, 92:1 knowledge 24:5, 26:1, 64:12 known 70:14, 70:20, 71:5, 72:10, 72:16, 74:14, 74:16, 82:11	language 83:9 large 20:6 larger 21:11 las 26:11 last 25:19, 38:22, 51:22, 88:3, 88:20 later 30:14 latham 3:4, 5:6 lawyers 50:10 laying 31:6 learn 30:9, 57:17 learned 50:9 least 56:9, 62:20, 70:6, 72:10 leave 8:10 led 31:1 left 8:9, 34:13, 42:14, 68:3, 68:7, 86:12 less 23:14 let's 10:22, 11:4, 43:15, 47:4, 47:6, 47:8, 49:14, 50:2, 54:2, 75:5, 75:13, 75:22, 76:3, 77:5, 87:3, 87:5, 88:19, 92:11 letter 18:13	levels 22:15 likely 18:19 likewise 80:22 limitations 70:1, 73:20 line 7:7, 28:12, 36:14, 69:16, 84:17, 87:5, 87:8, 89:1, 89:6, 89:8 links 38:15, 39:18 list 33:7, 33:10, 83:3 listed 33:3, 33:6 lists 32:11, 32:15 literally 12:20, 22:14, 23:11, 60:4, 66:4 little 5:13, 17:15, 36:16, 39:5, 47:1, 49:21, 76:20, 79:20, 80:17, 82:4, 82:22, 90:20 llc 1:12, 32:16 llp 3:4, 3:12 loading 36:4 location 52:10, 52:19 log 49:22, 75:16 logic 25:9, 25:12, 25:14, 25:15, 38:5, 38:12,	55:8, 57:6, 57:16, 57:18, 59:8, 59:11, 59:13, 63:2, 67:5, 87:9, 87:15 long 6:22, 34:4, 34:6, 51:6, 75:2, 80:14, 81:15 longer 71:1, 71:21, 74:4, 75:12, 81:19, 83:18 look 17:20, 43:17, 54:2, 54:8, 70:8, 70:11, 74:7, 87:4 looking 32:3, 40:1, 40:5, 54:14, 60:13, 77:14, 77:22, 78:11 lost 82:2 lot 23:18, 24:2, 24:4, 24:7, 24:10, 24:22, 25:1, 26:17, 44:5, 45:5, 46:14, 55:6, 55:8, 67:1, 68:22, 69:1, 76:4 love 67:22 low-cost 40:1 lower 26:3, 40:5, 40:11, 40:12 lowers 40:13 luggage 26:12
L			
laboratories 1:6 ladder 27:13			

lunch 75:2, 75:8	markets 26:6	56:4, 57:6, 58:6, 62:13, 65:1, 68:3, 68:13, 70:20, 72:8, 72:10, 81:3, 81:4, 82:2, 83:13, 83:14, 84:4, 85:22, 90:7, 91:4, 91:18	method 73:5, 78:4
M	maryland 8:12, 17:8, 27:2, 76:10, 76:11, 76:18	master's 27:4	methodology 27:7
m-a-t-r-i-c-s 19:10	match 23:4, 60:7	meet 39:6, 67:10, 79:17	microelectronic 27:21, 29:11
m3 28:11	matched 60:10	meeting 17:7, 43:21, 43:22, 44:8, 44:21, 46:2, 46:16, 48:5, 48:10, 48:12, 48:18, 48:19, 49:2, 49:9, 49:10, 49:11, 53:3, 53:12, 53:14, 53:17, 93:2	microelectronics 29:1
made 12:18, 17:11, 29:9, 33:9	matching 23:4	melngailis 17:9, 34:3, 43:20	mid-'s 30:16
madison 3:14, 76:19	material 14:15, 15:3, 24:7, 27:12, 27:15	member 20:8	middle 39:14
magical 29:3	materials 10:2, 13:12	memory 14:8, 18:22, 38:13, 38:14, 38:16, 39:17, 39:20, 40:21, 40:22, 41:9, 51:7, 51:14, 60:17, 89:15, 89:20, 90:11	might 18:3, 20:13, 26:11, 33:17, 39:14, 43:3
mails 18:5	mathematical 27:10	mentality 68:4	mile 9:3
main 3:13	matrices 13:21, 19:7, 19:13, 19:14, 20:22, 23:19, 23:21, 32:18, 32:20, 33:16, 34:13, 35:2, 35:8, 35:9, 37:11, 55:16, 58:15, 68:2, 71:7, 74:8, 83:1, 83:21	mentioned 11:12, 22:10, 24:13, 43:9, 47:13, 77:17	mind 38:18
maintain 59:3	maybe 16:18, 18:4, 28:9, 45:12, 53:17, 58:6, 61:12, 66:2, 67:14	met 44:8, 44:9, 44:10, 45:20	minimal 38:11
maintained 24:3	mccarran 26:10		minimalistic 80:11
maintaining 23:20	mean 15:10, 24:4, 29:14, 33:11, 49:19, 52:13, 52:22, 53:7, 53:13, 55:6,		minimum 38:4, 38:9
make 20:10, 29:18			minute 39:3
makes 76:20			minutes 11:3, 38:22, 75:5, 75:6, 92:8, 92:10
making 67:17			mixed 50:5
management 68:11			model 58:16
manager 30:17			modulate 59:2
manufacturing 28:3, 30:22			modulation 59:1, 60:20, 61:1
many 6:19, 67:15, 78:12			module 36:16, 59:1, 59:14
marked 4:11			modules 36:19
market 22:4, 22:5, 37:3, 37:8, 80:1, 81:19			months 17:21
marketplace 24:1, 40:18			

more 10:12, 28:3, 42:21, 49:21, 70:11, 71:19, 73:13, 74:11, 78:18, 88:21 morgantown 8:11, 8:12 morning 6:12, 6:13, 8:7 most 18:19, 49:6 motion 27:11 motorola 23:21, 23:22, 24:6 mounted 37:13, 37:16 moved 26:14 moving 8:15, 9:11 much 23:6, 33:13, 55:5, 75:11, 92:17 multiple 65:21, 73:5 must 44:20, 76:4 mutual 17:7 myself 14:12, 14:15, 34:1, 86:20 N nailing 80:3 name 16:15, 16:16, 33:6, 33:10 namely 73:1 names 33:14, 50:5 national 28:8, 29:11,	52:14 natural 74:22 near-field 61:10 necessary 38:4 need 8:22, 9:2, 18:22, 42:9, 63:5, 80:2, 81:3, 81:4, 81:5, 81:18, 92:9, 93:4 needed 25:20, 30:8, 56:5, 63:9, 64:10, 64:11, 65:20, 65:21 needs 59:12, 78:14 neither 95:10 network 52:2, 52:10, 52:11, 52:19, 52:20 networks 52:1 never 28:14, 33:13, 68:12 new 20:9, 55:9, 55:11, 59:13, 68:8, 70:16, 70:22, 71:5, 71:7, 72:14, 74:15, 74:16, 81:9, 82:7, 82:15 next 25:13, 25:14, 25:15, 30:20, 34:14, 34:18, 85:2, 85:8, 87:14, 87:17 nfc 46:7, 46:12,	48:6, 52:1, 52:2, 68:19, 68:20 nobody 9:5 noise 42:7, 79:6 non-specific 80:20 noon 11:10 nope 8:6, 8:21, 30:7 normally 5:20, 11:12 note 50:8 notebook 19:3, 50:22 notes 10:14, 10:15, 18:17, 18:20, 19:1, 32:6, 32:9, 33:21, 50:20 nothing 6:8, 10:17, 54:21, 62:15, 63:7, 72:15, 80:12, 81:20, 92:3 notice 2:6 nowhere 83:4 nsa 28:19, 44:2 nuanced 72:22, 74:1, 74:6, 74:18, 77:18 number 4:14, 12:11, 25:18, 25:22, 26:4, 26:9, 31:21, 41:2, 41:4, 41:5, 41:15, 41:16,	54:6, 58:20, 59:7, 61:19, 69:18, 80:20, 80:22, 86:9, 86:10, 86:14, 89:13, 89:15, 89:19, 90:5, 90:12, 91:1 numbering 42:10 nw 3:5 O o'clock 75:13 object 17:2, 48:13, 48:14, 72:5, 82:17, 89:21 objectives 24:1 obligation 32:19 obtain 26:1 obtained 89:16 obtaining 65:11 obviously 10:9, 19:1, 19:19, 35:5, 57:15, 59:3, 70:15, 72:14, 74:22, 81:15 occurring 29:7 offer 8:22 office 1:1, 44:4, 44:6 officer 20:14, 95:3 oh 5:13, 8:22, 11:9, 14:7, 16:15, 17:19,
---	--	--	--

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

111

30:3, 43:20, 44:12, 47:17, 49:15, 66:16, 68:16, 68:18, 69:11, 73:16, 83:5, 85:12, 86:18, 87:2, 89:8 okay 5:18, 6:4, 6:14, 7:4, 7:10, 8:2, 8:15, 8:22, 9:4, 9:13, 9:18, 10:10, 10:22, 11:2, 11:3, 11:6, 11:7, 12:4, 13:9, 14:5, 14:19, 24:17, 30:5, 32:10, 32:22, 39:4, 42:5, 47:4, 47:9, 47:17, 50:3, 54:7, 54:13, 55:16, 56:6, 57:19, 58:9, 60:22, 65:5, 66:16, 67:20, 69:12, 73:9, 73:19, 74:15, 75:7, 75:14, 75:16, 75:18, 75:19, 76:20, 77:3, 77:10, 77:13, 77:22, 78:15, 79:1, 79:2, 79:16, 80:2, 80:5, 80:21, 81:4, 81:5, 81:6, 81:20, 83:1, 83:6, 83:8, 84:11, 84:12, 84:16, 85:15, 86:5, 86:6, 86:17, 86:18, 86:19, 87:6, 87:8, 89:2,	89:9, 90:22, 91:3, 91:15, 92:18, 93:16 oklahoma 27:5 once 42:6, 42:21, 78:10, 79:4 one 6:20, 9:3, 10:12, 11:13, 18:21, 21:1, 22:10, 25:7, 25:12, 25:19, 26:12, 29:16, 32:1, 42:8, 42:14, 42:20, 43:2, 46:4, 48:15, 49:15, 50:14, 53:9, 61:1, 67:3, 70:10, 72:10, 73:13, 78:10, 78:18, 79:9, 79:13, 85:17, 88:21, 90:12, 91:20 one-on-one 79:10 ones 41:1, 41:6, 41:10, 41:12, 59:6, 59:16, 60:16 only 25:15, 25:19, 31:4, 39:20, 58:22, 69:4, 86:12 open 31:22, 32:4 opened 26:6 opening 57:22 operate 22:15, 22:17, 23:7, 23:11,	56:2, 56:5, 56:6, 56:7, 56:11, 57:18, 59:10, 59:21, 71:17, 78:14, 81:18 operating 23:14, 52:4, 71:15 operation 23:12, 29:13, 38:8, 55:17, 55:21, 58:18, 59:8, 61:5, 63:11, 64:9, 64:14, 64:22 operational 25:5, 42:4, 55:20, 56:1, 61:4, 61:9, 63:6, 71:13, 78:13 operations 61:2 orchestra 40:16 order 33:14 orders 93:4 orthogonal 83:13, 83:15 other 7:12, 13:2, 18:9, 19:15, 21:13, 24:13, 37:20, 45:7, 51:14, 52:17, 59:11, 63:10, 66:4, 78:15, 80:5, 80:6, 81:9, 83:21, 90:13 others 81:7 otherwise 78:21, 95:13 out 10:16, 12:4,	17:5, 19:3, 22:20, 24:16, 25:11, 31:6, 38:22, 46:21, 46:22, 49:5, 53:20, 69:1, 78:12, 80:2, 80:5, 81:10, 81:12, 82:2, 83:9, 85:14, 90:9 outcome 95:13 outlets 36:17 over 7:11, 12:21, 35:3, 40:20, 52:19 overly 61:20 own 14:8, 18:7, 18:10, 20:7, 23:22, 29:10, 31:22, 34:8, 37:7, 37:22, 40:7, 41:14 owner 1:13, 3:9 owns 16:5, 16:21 P page 4:2, 4:12, 32:10, 54:9, 54:10, 69:13, 84:14 pages 1:27, 72:18 paid 33:13 paragraph 15:17, 43:18, 48:4, 51:19, 51:20, 53:2, 62:1, 62:4,
---	--	--	---

72:18, 77:15, 89:11 parallel 40:8 parameters 71:15 pardon 16:2 park 76:12 parked 44:5 parking 44:5 part 29:6, 51:22, 57:20, 80:18 participated 80:8 participation 12:16 particle 27:12 particular 15:13, 27:13, 41:7, 78:16 particularly 18:10, 44:7, 46:17, 53:8 parties 95:11 partner 19:15 parts 28:21, 29:8 pass 92:7 passing 47:2 passive 21:3, 22:16 patch 53:6 patent 1:1, 1:3, 1:13, 1:17, 3:9, 4:13, 6:19, 9:20, 13:18, 13:20,	14:10, 14:11, 14:12, 14:14, 14:17, 14:22, 15:3, 15:13, 16:5, 16:6, 16:7, 16:21, 31:13, 32:11, 33:1, 33:4, 33:10, 33:17, 44:17, 44:20, 45:9, 45:16, 50:12, 51:5, 54:2, 54:19, 62:9, 62:11, 62:18, 64:6, 69:9, 69:20, 72:22, 73:10, 77:5, 78:1, 82:15, 82:18, 82:19, 82:20, 83:5, 83:7, 83:20, 83:21, 84:10, 85:21, 85:22, 87:4 patents 16:9, 20:22, 23:20, 24:3, 24:5, 24:11, 33:12, 74:8, 74:17, 83:1, 83:22, 84:6 paths 91:22 pay 33:17 pdf 32:7, 54:9, 69:13 peeters 9:19, 13:20, 14:10, 14:11, 16:5, 16:7, 16:16, 17:11, 34:5, 34:7, 34:10, 34:20, 35:1, 44:11, 45:3, 45:20, 46:1, 46:15,	48:5, 50:6, 51:10, 53:3, 67:17, 91:17 pending 8:1 people 24:22, 37:6, 42:16, 66:4, 67:12, 79:5, 79:8 perfect 7:14, 8:3, 76:6 perform 78:15 performance 22:3, 40:5, 40:17, 65:18, 66:7, 83:18 performed 19:6 perhaps 19:19 period 28:1 perkins 3:12, 5:8, 15:22 person 20:7, 46:9 personal 53:17 perspective 29:17, 64:2 peters 3:3, 4:3, 5:5, 6:11, 10:22, 11:3, 11:6, 12:7, 13:6, 39:1, 39:5, 47:4, 47:8, 75:7, 75:11, 75:22, 76:3, 92:6, 92:11, 92:20, 93:6, 93:9, 93:12, 94:1 petitioner 1:8, 3:2, 5:6	ph 1:20, 2:2, 4:2, 4:17, 6:5, 12:10, 27:1, 27:6 philips 66:4 phone 12:21, 18:22, 46:10, 52:1, 52:2, 52:3, 52:9, 61:8 phones 46:5, 46:7, 48:6, 52:11, 52:20, 68:20, 69:4 physics 27:1, 28:4 piece 36:10, 80:4, 80:15, 81:8, 81:15, 82:5, 82:6 plaintiff's 6:20 planet 3:18 please 5:3, 5:10, 5:12, 7:15, 7:22, 8:1, 78:2 pleasure 93:2 plugged 36:17 point 21:6, 29:9, 41:8, 49:8, 52:8, 72:15, 74:22, 77:15 pop 85:14 population 87:10, 87:20, 88:13 portion 66:9, 88:21
--	--	--	--

possible 23:6, 92:22 power 21:15, 21:16, 25:1, 25:6, 40:14, 42:2, 55:2, 56:5, 56:7, 56:11, 56:17, 57:8, 57:18, 57:21, 58:3, 58:13, 59:9, 59:21, 60:8, 60:11, 63:6, 63:20, 63:22, 64:12, 65:11, 67:10, 67:11, 69:4, 70:6, 71:16, 81:18 powered 21:3, 23:13, 78:21 powering 42:4 preparation 13:22 prepare 13:10 preparing 13:1, 13:14, 13:17, 14:5, 34:8 present 3:17, 79:2, 85:9 pretty 11:22, 35:4, 44:1, 46:8, 51:1, 51:7, 55:5, 91:5 previous 35:9 previously 4:11 primary 42:15 printed 10:8, 10:14,	10:16 prior 29:19 priorities 68:11 probability 27:11 probably 14:9, 33:12, 38:10, 45:4, 47:2, 47:20, 54:20, 55:4, 65:9, 75:6 problem 42:22, 43:7, 49:16, 59:17, 67:14, 69:2, 69:3 problems 69:2 proceeding 12:6 proceedings 94:2 process 24:15, 70:1, 87:16 produced 33:21, 35:13 product 37:3, 54:1, 57:13, 61:15, 66:1, 67:4, 67:14, 67:18, 67:22, 68:8, 68:14 products 20:18, 35:8, 36:2, 37:3, 58:15, 80:6 professional 2:7 professor 17:8 program 30:17, 90:15 programmed 41:11	programs 31:8 prohibition 34:15 projects 30:15, 67:15 proprietary 37:11 protocol 21:15, 24:14, 35:22, 79:18, 85:4, 85:10, 85:11, 85:16, 85:17, 87:1, 87:19, 88:1, 88:2, 88:9, 88:10, 88:12, 88:16 protocols 79:16 provide 56:6, 57:20, 59:21, 59:22, 69:5, 71:17, 83:10 providing 63:9 pst 1:23 public 24:5, 24:9, 29:21, 82:3 pull 77:8 pump 20:21, 22:11, 22:14, 23:9, 23:11, 55:2, 57:11, 59:9, 65:16, 74:5, 81:22, 83:10 pumping 59:10 pumps 24:8 purpose 41:9 pursuant 2:6	pursued 37:8, 67:22, 68:12, 68:14, 68:18 put 59:14, 65:4, 81:16 putting 32:1, 56:3, 59:11, 59:19 Q question 10:12, 17:3, 17:15, 17:16, 34:22, 39:15, 39:16, 48:7, 49:3, 58:6, 58:8, 66:7, 86:19, 86:22, 89:18 questioning 75:1 questions 7:15, 8:1, 9:2, 9:16, 84:15, 92:7, 92:15, 92:21, 93:3 quick 9:1, 10:11, 38:19 quickly 68:16 quite 44:2, 45:7, 49:5 R radiated 22:20 radio 58:4, 70:9, 70:19, 70:22 raise 5:9, 5:11, 5:15, 20:4 raised 45:14
--	---	---	--

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

114

ran 29:13 random 41:2, 41:3, 41:5, 41:10, 41:14, 41:16, 42:10, 58:20, 59:7, 61:19, 86:10 range 21:2, 25:4, 26:4, 36:8, 36:12, 40:4, 40:15, 61:11, 71:2, 74:4, 74:13, 81:15, 83:18, 91:13 ranges 65:16, 69:6, 71:21, 81:19 rapid 71:19 rapidly 73:5, 74:11, 80:14 rate 43:11 reach 17:5 read 14:9, 14:10, 15:13, 21:2, 21:6, 21:9, 21:21, 22:1, 25:4, 26:4, 35:14, 36:12, 39:20, 40:4, 40:15, 53:22, 61:11, 65:15, 66:10, 66:11, 69:6, 71:2, 71:21, 74:4, 74:13, 78:18, 79:12, 81:15, 81:19, 83:18, 85:14, 86:20, 87:11, 89:4, 89:11, 89:22,	91:12 read-only 38:14, 38:16, 40:22, 60:17 reader 21:4, 21:16, 21:21, 22:2, 22:13, 22:18, 22:19, 22:21, 23:6, 23:13, 24:16, 42:2, 42:3, 42:14, 46:5, 46:7, 46:12, 48:6, 52:4, 55:3, 56:13, 59:13, 59:16, 60:1, 60:9, 61:6, 61:7, 69:1, 69:2, 69:5, 79:4, 84:21, 85:5, 87:9, 87:15, 87:18 readers 17:10, 35:13, 36:3, 36:6, 36:9, 36:16, 68:19, 68:20 reading 35:22, 44:12, 44:13, 61:11, 65:19, 73:5, 85:1, 86:3, 90:20, 95:9 readout 63:13 ready 43:18 real 21:16, 36:11, 51:13 really 6:1, 20:4, 24:2, 26:19, 28:5, 29:4, 49:12, 61:2, 70:12, 76:13, 82:18	realtime 13:7, 52:18 reason 8:4, 33:17, 39:22, 51:15 recall 7:1, 9:21, 18:1, 18:5, 18:15, 33:9, 34:2, 35:6, 35:7, 45:21, 46:1, 46:15, 50:18, 51:1, 53:18, 77:20 receive 38:7, 87:16 received 27:1 receiving 36:22 recited 62:10, 73:2, 77:19 recollection 14:14, 20:15, 34:1, 49:4, 51:13 reconvene 75:9 record 5:2, 7:9, 11:4, 11:5, 11:6, 39:9, 39:10, 41:18, 47:5, 47:6, 47:7, 47:8, 75:22, 76:1, 76:3, 92:12, 92:13, 93:5, 95:6 reduce 40:10, 40:13 reduced 95:8 refer 16:19, 19:2, 62:20 reference 10:8, 77:15,	81:8, 82:6, 85:13 referenced 15:4, 83:5, 83:6, 83:7, 83:8, 83:22, 85:20, 85:22, 86:1 references 62:19, 82:20, 85:20 referred 15:4, 35:8, 88:3 referring 14:3, 14:16, 16:8, 16:20, 33:19, 56:9, 56:11, 78:5, 84:14 reflected 60:14 reflecting 60:11 reflective 35:20, 67:18 refresh 7:4, 14:11, 14:15 refreshed 45:19, 51:7 refreshing 51:9, 86:20 regard 26:13, 34:17, 46:13 regarding 87:1 registered 2:7 regular 93:7, 93:9 relate 62:9, 71:9, 77:18 related 10:3, 27:20, 28:4, 62:22,
---	---	---	---

70:18, 72:22, 78:4, 82:19, 95:11 relates 14:22, 19:6, 71:8, 78:7 relation 17:6, 20:16 relationship 34:10, 34:13, 35:5, 61:5 relay 52:18 relevant 15:6, 81:12, 81:13 remember 6:21, 9:12, 17:13, 17:22, 43:22, 44:3, 44:5, 44:7, 44:13, 45:17, 46:3, 47:17, 48:2, 48:22, 53:7, 53:8, 53:11, 85:13 remind 51:4 reminded 44:9, 44:10, 44:17, 44:20, 51:11 remote 36:15, 36:19 rephrase 64:5 reported 1:28 reporter 2:8, 2:9, 5:2, 5:9, 5:16, 6:7, 7:7, 12:8, 39:10, 46:20, 92:21, 93:3, 93:11, 93:16, 93:19, 95:1 reporter's 19:10	representation 90:3 represented 15:21 required 58:2, 63:10, 71:16 requirement 63:6 requirements 57:18, 61:4, 61:9, 63:1, 63:12, 67:6, 67:10, 67:11, 67:13 requires 23:14, 64:18 research 30:15, 30:17, 30:19, 31:7 resolution 41:22, 42:18 resolving 42:13 respect 91:21 respond 7:15, 25:10, 25:13, 25:16, 42:6, 42:8 responding 25:18, 25:19, 42:14 response 7:16, 89:20 restroom 9:1, 38:19, 39:6 result 12:19, 65:9 resumed 20:11 retain 32:22 retrieve 86:13 review 12:17, 13:16,	14:6, 14:14, 14:19, 15:2, 15:13, 34:7 reviewed 13:12, 13:18, 13:20, 15:7, 33:20 reviewing 33:16 rf 23:7, 35:18, 55:4, 56:17, 57:9, 58:13, 60:3, 64:10, 70:5, 70:6, 70:10, 70:22, 72:15, 73:13, 73:17, 78:21, 79:2, 80:18, 82:11, 84:19, 85:5, 87:10, 87:20, 88:13, 88:17, 89:13, 90:6, 91:2 rfi 58:3, 59:22, 64:21, 65:2 rfid 17:9, 17:10, 20:18, 21:2, 26:15, 26:20, 34:16, 35:9, 38:13, 39:16, 40:1, 40:3, 42:1, 46:5, 52:5, 53:4, 53:21, 55:7, 56:13, 57:20, 58:3, 59:11, 59:20, 61:15, 61:16, 63:4, 63:9, 64:9, 64:13, 64:20, 65:3, 65:4, 65:6, 65:11, 65:12, 66:5, 66:8, 68:9, 68:21, 72:3,	72:9, 73:1, 73:2, 74:2, 74:8, 74:9, 74:18, 79:16, 79:17, 80:12, 81:1, 81:3, 81:5, 81:6, 81:16, 83:16, 90:8, 90:10 right 5:10, 5:11, 5:15, 6:4, 7:13, 8:11, 8:13, 8:16, 9:6, 9:8, 10:22, 11:8, 11:13, 16:8, 19:7, 19:11, 22:11, 24:14, 27:2, 33:1, 33:4, 37:11, 38:7, 39:12, 41:20, 49:13, 51:10, 54:15, 56:15, 56:16, 56:18, 62:7, 75:8, 75:9, 75:17, 76:7, 76:10, 76:12, 76:21, 77:1, 77:11, 83:2, 86:18, 86:21, 92:1, 93:10 rights 32:20, 32:22 ringing 43:2 road 8:8, 38:21 rodger 3:11, 5:7 role 19:13, 20:12, 20:16, 27:17, 45:16, 51:17 room 20:10, 77:1, 79:5, 79:8 rough 93:7, 93:16
---	--	--	--

roughly 7:1 routine 41:7, 43:5 rpr 1:28 rules 7:5 run 25:2, 42:11 running 31:7 S said 11:7, 15:17, 22:11, 38:3, 44:16, 47:15, 50:9, 51:18, 62:5, 62:8, 65:4, 70:20, 72:18, 95:7 sake 19:10 same 60:21, 65:9, 76:8, 84:14, 88:21 saw 83:5 say 7:8, 9:10, 14:16, 16:7, 24:17, 45:22, 59:21, 64:16, 66:10, 70:3, 71:3, 71:6, 72:2, 72:11, 79:12, 82:10, 91:5, 91:16, 91:18 saying 46:10, 48:3, 51:2, 59:19, 67:9, 71:8, 73:22, 78:3, 91:1, 91:7 says 69:17, 84:19,	85:2, 85:8, 86:16, 87:8, 89:12, 90:4, 90:21 scene 18:9 scheduled 11:9 scheme 23:16, 24:19, 59:1, 60:20, 61:1 science 20:14, 28:4, 29:3, 29:5 screen 54:11 scrolling 32:13, 69:11 second 21:20, 22:1, 26:5, 43:12, 43:13, 48:15, 92:20 security 28:8, 29:12, 52:14 see 15:8, 19:2, 32:10, 32:12, 49:14, 50:2, 50:22, 53:6, 57:19, 58:7, 62:11, 62:18, 69:16, 73:3, 73:6, 75:5, 75:21, 84:22, 85:6, 85:21, 87:21, 89:8, 90:1 seeing 31:9, 60:13 seemed 53:10 seems 11:22, 53:18, 78:5, 84:2 sell 35:9	selling 35:2, 35:14, 37:9 semiconductor 28:3, 28:21, 30:22 send 25:11, 31:16, 79:4 sending 61:18 sense 57:7 sensor 36:16, 52:1, 52:2, 52:6, 53:4, 53:21, 55:7, 55:20, 55:21, 56:5, 57:19, 58:2, 62:9, 62:13, 62:18, 62:20, 62:22, 65:4, 65:20, 66:11, 66:19, 66:21, 66:22, 67:2, 67:9, 70:9, 70:10, 70:16, 70:17, 70:18, 71:17, 72:12, 72:13, 72:14, 73:17, 81:2, 81:6, 81:21, 82:12, 83:19, 83:22, 84:3, 84:20, 84:21, 85:5, 85:6, 86:17, 87:9, 87:15, 87:16, 87:17, 89:14, 89:16, 91:2, 91:3, 91:4 sensors 46:2, 52:11, 52:15, 55:13, 62:15, 63:8, 68:21, 70:11, 73:14, 78:16,	81:16, 83:14, 87:11, 87:20, 88:14, 90:22 sent 52:9 sentence 51:22, 62:4, 62:14, 72:13, 85:2, 85:8, 87:14, 87:17, 88:3, 89:6 sentences 90:1 series 37:2 served 19:15 set 10:10, 59:17, 61:8, 95:14 share 54:11 sheet 80:19 shelf 36:5, 36:7, 80:6 shorter 61:11 shorthand 95:1 shortly 23:20, 53:2, 68:1, 68:2 should 49:16 shouldn't 79:12 showing 11:10 shut 38:6 side 6:20 sign 18:13, 26:7, 26:8, 26:9 signal 25:11, 36:22,
--	---	--	--

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

117

38:7, 47:3, 49:18, 55:4, 56:13, 56:14, 58:4, 59:2, 59:10, 60:1, 78:21, 79:2, 79:4, 88:16, 88:17, 89:19 signaled 89:13, 90:5, 91:2 signaling 59:22 signals 35:20, 49:17 signature 95:15 signature-b7fzp 95:18 signed 26:8 significance 33:15 signing 95:9 similar 78:6 simple 25:6, 43:8 since 34:20, 35:1, 93:20 singulate 21:17, 24:16, 41:16, 41:19, 41:21, 42:13, 43:10, 55:15, 65:20, 66:12, 74:12, 80:14, 81:11, 82:21, 83:4 singulated 22:1, 65:15 singulating 41:7, 41:16 singulation 41:7, 42:19, 43:4, 55:18,	57:11, 61:13, 63:12, 71:2, 71:10, 71:19, 73:7, 73:14, 73:18, 74:4, 78:8, 78:10, 78:13, 79:10, 79:14, 83:12, 91:12 sister 52:7, 60:18 sit 12:20 sitting 76:8 situation 6:3 size 40:13 skin 53:5 sleep 25:14 slowly 6:1 small 23:1 social 45:6 sold 35:11, 37:5 solution 43:8 some 5:22, 42:4, 43:4, 79:14, 84:15, 90:13, 92:21 somebody 9:11 something 20:13, 58:14, 59:20, 81:17 somewhere 83:7 soon 75:21 sorry 10:6, 15:10,	30:5, 34:22, 40:19, 46:20, 48:13, 50:4, 51:19, 58:12, 62:2, 62:5, 64:4, 66:18, 68:16, 88:20 sort 6:3, 7:5, 28:22, 29:3, 62:19, 70:14, 79:22, 82:7, 84:5, 86:9 sound 11:19 sounded 78:2 sounding 43:5 sounds 8:3, 39:8 space 36:12, 37:3, 37:8, 64:12 spaces 21:11 speak 6:1, 6:7, 13:2, 13:13 speaking 79:8 specific 35:16, 38:16, 39:19, 48:2, 51:13, 57:16, 57:18, 59:4, 67:3, 71:22, 72:22, 77:18, 79:17, 79:22, 80:10, 81:4, 81:8, 82:5, 82:12, 83:3, 90:2, 90:3, 90:7, 91:6, 91:11 specifically 9:20, 15:2, 15:12, 17:22,	20:15, 20:20, 22:8, 23:3, 46:3, 50:15, 56:21, 57:10, 64:15, 71:1, 71:4, 74:19, 78:7, 80:3, 80:15, 83:9, 83:16, 91:6 specifics 34:5, 44:8, 55:1, 63:7, 64:16 spelled 19:9, 81:12 square 22:21 st 95:15 stable 49:21 stage 23:12, 23:13 stages 20:2 standard 79:15 standards 79:15, 79:17, 80:9, 90:9 stanford 30:18 start 31:5, 34:13, 40:19, 42:3, 42:4, 61:14, 61:15, 67:4, 87:5 start-up 18:7, 68:3, 68:7 started 22:4, 28:19, 39:17, 53:13, 53:16 starting 5:4, 20:8, 26:9, 26:19,
--	--	--	--

84:13, 84:17, 87:8, 89:1, 89:6 starts 60:11, 89:6 state 21:5, 21:20, 24:21, 28:11, 42:5, 45:5, 46:18, 47:14, 48:4, 59:12, 59:13, 65:6, 65:12, 70:11, 71:20, 72:21, 78:14 state-of-the-art 47:21 states 1:1, 4:13, 27:18, 27:22, 59:16 status 59:5, 60:17 stay 92:20 stayed 35:3 stenographically 95:7 step 14:20, 25:18, 25:19, 78:10, 84:19 stepping 31:12, 73:19 steps 78:4 steve 29:14, 29:22, 74:21, 75:20 steven 3:3, 5:5 still 26:11, 26:13, 49:5, 68:13, 69:3, 69:7, 91:17 stimulate 41:20	stop 9:3 stopping 74:22 store 90:13 stored 89:15, 89:19, 90:11 straightforward 51:2 strategic 29:9 street 3:5, 3:13 strictly 39:20 string 60:16 structure 27:13, 27:15 structures 27:20 studied 70:13 stuff 71:6, 71:7, 83:2, 92:4 submitted 9:21 submitting 17:18 subsequent 35:6 substantial 22:3 substrate 35:12, 37:14, 37:15 substrates 37:7 subtlety 43:4 suite 3:5, 3:13, 36:1 supplied 71:15 supply 64:22	supplying 55:19 support 64:13 supposed 83:20 sure 18:4, 29:18, 43:16, 45:11, 45:22, 58:5, 66:6, 69:10, 73:11, 77:9, 91:18, 92:11 surface 27:18, 27:22 suspect 76:17 sustained 24:3 sworn 5:10, 5:12, 5:16, 6:6 symbol 22:5, 23:19, 23:21, 23:22, 25:12, 25:14, 25:15, 32:15, 68:1, 68:5 synergism 66:3 system 35:15, 36:20, 40:8, 40:9, 44:14 systems 47:18, 73:1, 74:2, 74:19	25:21, 26:1, 26:3, 26:10, 35:22, 37:9, 37:10, 37:14, 40:1, 41:8, 41:14, 42:14, 42:20, 46:7, 53:21, 54:20, 55:7, 55:9, 55:17, 55:20, 56:4, 56:5, 58:3, 58:18, 58:19, 59:3, 59:5, 59:20, 60:13, 60:14, 60:19, 61:13, 61:16, 61:17, 63:5, 63:9, 64:9, 64:13, 64:20, 65:5, 66:8, 67:6, 67:12, 69:3, 71:14, 71:16, 72:3, 72:9, 73:2, 74:10, 78:11, 78:16, 78:19, 79:9, 79:11, 79:18, 80:1, 80:5, 80:12, 80:14, 81:2, 81:4, 81:5, 81:6, 81:10, 81:16, 82:8, 83:16, 86:4, 86:9, 86:11, 86:12, 86:13, 86:17, 89:12, 89:14, 89:19, 90:1, 90:5, 90:12, 90:14, 90:16, 90:19, 91:1, 91:3, 91:6, 91:8, 91:11 tags 17:10, 21:2, 21:3, 21:6, 21:11, 21:15,
T			
table 57:14, 66:8, 66:13, 80:4, 81:9 tag 21:17, 22:16, 23:8, 23:11, 24:17, 25:5, 25:6, 25:19,			

21:20, 22:1, 24:17, 25:1, 25:2, 25:10, 25:13, 25:15, 25:18, 26:5, 26:12, 26:16, 26:20, 35:11, 35:13, 36:3, 37:4, 40:3, 41:13, 42:1, 42:7, 42:21, 43:10, 43:11, 43:13, 52:5, 52:7, 55:14, 55:15, 59:11, 65:19, 65:20, 65:21, 66:5, 66:11, 68:21, 73:6, 78:20, 79:12, 79:16, 79:17, 80:2, 83:19, 90:10, 90:13 take 7:20, 7:21, 10:11, 11:1, 12:4, 18:17, 18:19, 19:1, 22:13, 38:18, 38:20, 38:21, 39:3, 39:5, 49:22, 50:20, 63:22, 65:2, 67:11, 75:8 taken 18:8, 53:9, 80:18, 95:4, 95:7 taking 5:4, 18:20, 25:5 takoma 76:12 talk 7:11, 24:18, 30:4, 42:21, 45:2, 50:11, 79:9, 79:13	talked 44:15, 52:13, 77:16 talking 42:20, 46:4, 57:1, 61:10, 69:5, 79:6, 79:7, 79:21, 81:1, 86:5, 88:15, 88:17, 88:18 talks 70:9 tangled 80:16 team 29:13, 67:7 technical 10:4, 36:6, 36:11, 46:19, 48:22, 49:2, 51:15, 51:17 technician 3:18, 47:2, 47:6 technologies 32:15 technology 19:16, 20:12, 20:17, 21:8, 21:13, 21:22, 24:13, 26:18, 28:16, 31:5, 34:16, 34:19, 46:11, 46:12, 47:22, 52:6, 55:17, 56:8, 65:7, 65:13, 68:22, 71:1, 74:9, 74:10, 79:11, 80:1, 81:1, 81:10, 81:21, 82:9, 83:21, 84:1, 86:8, 90:19, 91:7, 91:11 tell 5:19, 79:7	telling 51:14, 60:15 ten 11:3 term 42:13, 45:11, 45:12, 63:16, 66:2, 71:10, 71:12 terminology 38:11 terms 12:21, 14:15, 15:6, 19:16, 22:22, 24:1, 25:20, 27:21, 33:13, 33:15, 44:19, 51:17, 55:12, 61:5, 63:4, 63:8, 63:13, 63:17, 71:18, 72:15, 74:3, 80:3, 90:17, 91:10 testified 6:8 testify 8:5, 44:18, 51:16 testimony 55:10, 95:6, 95:7 testing 52:16 textbook 80:19 texts 80:20 thank 93:1, 93:12 thanks 75:19, 75:20, 92:17 themselves 35:13 theoretically 37:5 thereafter 68:1, 68:2,	95:8 they'd 35:20 thing 29:16 things 24:6, 40:16, 68:4, 77:4, 83:16, 90:21 think 6:20, 6:21, 9:16, 11:9, 11:10, 12:18, 14:7, 14:9, 15:17, 16:4, 16:16, 16:21, 18:3, 19:9, 23:18, 23:22, 24:2, 24:4, 26:7, 26:12, 30:1, 34:14, 36:15, 37:7, 37:8, 39:13, 39:17, 43:1, 44:15, 44:20, 44:22, 45:10, 45:18, 45:21, 46:9, 47:19, 48:11, 48:17, 48:19, 49:6, 50:17, 51:1, 51:12, 52:13, 53:17, 71:10, 71:11, 75:2, 78:1, 79:21, 80:16, 81:12, 85:20, 89:10, 91:20, 92:9, 92:19 third 19:21 thoroughly 51:8 thought 13:9, 53:15, 53:22 thousand 24:17, 36:13,
---	--	--	---

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

120

43:13 thousands 36:10 threats 52:17 three 19:20, 43:11 through 11:16, 12:16, 19:4, 27:8, 27:12, 27:20, 36:4, 36:19, 52:9, 56:15, 85:14, 90:21 time 9:10, 11:11, 15:14, 18:7, 20:1, 21:19, 24:22, 27:18, 28:1, 29:1, 34:6, 38:22, 40:3, 42:8, 46:6, 52:8, 70:12, 70:14, 72:4, 92:17 timing 29:17 title 19:17, 20:13 titles 19:22 today 8:5, 9:15, 10:2, 14:21, 15:15, 15:21, 28:6, 28:10, 28:16, 34:11, 34:13, 46:6, 53:1, 68:12, 68:14, 68:19, 92:17, 93:7 today's 13:11 together 56:1, 66:1 told 50:14, 51:11 tons 67:1	took 24:6, 39:13, 40:12 touch 35:3 tougher 76:21 towards 22:8 tracking 26:17 traction 22:4 trademark 1:1 transcript 7:17, 93:4, 95:5 transferred 57:16 transistors 28:10, 28:13, 31:3 traversal 85:10, 85:16, 88:1 tree 85:10, 85:16, 86:22, 88:1 tree-walking 25:9, 80:13, 83:11, 86:10, 88:11, 90:3 trial 1:3 trouble 5:14, 5:22 true 95:5 truth 6:7, 6:8 truthfully 8:5 try 42:5, 58:6, 58:9 trying 25:3, 27:19,	29:4, 35:5, 37:3, 42:21, 44:13, 45:11, 53:19, 55:15, 57:3, 58:19, 66:9, 74:2, 78:18, 79:3, 81:16, 87:12 tunneling 27:8, 27:20 turn 46:12, 69:8, 73:9, 77:5, 77:11, 84:9 two 8:14, 11:7, 22:7, 55:22, 78:4, 92:8, 93:9 type 38:16, 39:19 typewriting 95:8 typical 36:6 typically 7:20 U uh-huh 14:18, 51:21, 73:7, 73:13, 77:6, 77:21, 82:14, 85:1, 87:13, 88:4, 89:17 uhf 26:15, 26:20, 61:9, 74:9 under 95:8 understand 16:10, 17:1, 18:12, 28:4, 29:4, 30:1, 50:13, 67:13, 69:20, 69:22 understanding 5:14, 5:22,	9:14, 16:11, 16:19, 27:19 understood 9:4, 17:14, 91:14, 92:5 unfortunately 67:21, 68:10, 68:12, 91:22 unique 41:14, 81:2 unit 36:18, 37:2, 37:9 united 1:1, 4:13 universities 30:18, 30:19 university 17:8, 27:2, 27:5 unless 5:22 until 25:18, 64:17 upped 12:1 use 21:11, 23:1, 26:10, 26:13, 42:13, 78:8, 83:10, 83:11, 86:12 useful 21:7 using 24:22, 26:15, 41:4, 41:19, 46:4, 47:20, 72:11, 72:16, 74:14, 74:19, 78:9, 82:8 usually 18:21 V vaguely 44:1 various 20:2
--	--	---	---

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

121

vegas 26:11 vehicle 8:15, 8:18, 9:11 verbally 7:16, 50:19 version 10:8, 10:14, 31:22, 32:5 versus 76:15, 79:22 via 76:15, 87:19 videotaped 1:20, 2:1 view 63:2 virginia 8:13 virtually 1:21, 2:2 visionary 46:13 voice 18:5 voltage 22:15, 23:10, 23:15, 55:19, 56:2, 71:15, 78:14, 83:11 volume 11:17, 12:2 W wait 62:5 wake 79:1 walking 44:6 wall 36:17 walls 35:21 walmart 26:7 want 16:18, 21:17,	29:18, 37:6, 38:9, 74:22, 75:1, 79:3, 84:13, 93:19 wanted 20:7 wants 12:9, 24:18 warehouses 36:14 washington 3:6 watkins 3:4, 5:6 watts 22:20 way 22:12, 32:8, 42:12, 58:7, 59:4, 68:18, 69:12, 70:8, 74:11, 82:1, 82:12, 90:7 ways 40:5, 58:10, 65:11, 74:12 we'll 39:5, 39:6, 75:12 we're 7:9, 8:8, 8:14, 11:6, 11:9, 29:4, 29:18, 39:10, 43:12, 49:15, 55:13, 56:7, 61:18, 69:11, 74:13, 74:14, 74:15, 77:22, 83:2, 92:18, 92:19 we've 8:8, 35:3, 38:20, 82:2, 84:7, 89:4 weak 22:20 wear 5:20, 5:21,	11:12 wearing 11:13, 20:1 wednesday 1:22 weeks 93:10 welcome 39:11, 76:22 went 25:6, 25:14, 28:20, 34:18, 68:3 weren't 59:4, 74:8, 74:9, 74:10 west 8:13 whatever 78:15 whatnot 20:14, 27:22, 52:15, 55:8, 68:11, 71:16, 78:17, 79:19, 80:1, 80:7 whenever 74:21 whereby 24:16 whereof 95:14 whether 38:9, 49:1, 86:22 whole 34:18, 36:1, 37:2, 40:16, 59:13, 59:17, 61:16, 68:8, 69:22, 79:14, 90:19, 92:2 wholistic 67:14 wide 21:7, 26:16, 40:3 widely 23:17, 82:1	wider 26:6 wife 8:19, 9:6 william 1:20, 2:1, 4:2, 4:16, 6:5, 12:10 williams 19:21 willing 51:16 wireless 53:4, 84:21, 85:5, 87:9, 87:15, 87:17, 87:18, 88:16 wisconsin 3:14 wish 67:21 withdraw 66:18 within 62:19 without 23:9 witness 5:13, 5:18, 6:6, 8:10, 11:2, 11:20, 12:1, 30:3, 39:4, 75:5, 75:15, 75:18, 76:20, 92:7, 92:18, 95:14 wondering 50:15 word 41:21, 70:17, 72:12, 74:19, 78:8, 78:9, 84:3 words 16:21, 41:19 work 17:9, 19:6, 29:19, 30:4, 31:1, 34:17, 57:15, 58:1,
---	--	---	---

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

122

66:17, 91:19 worked 30:10, 34:20, 35:1, 43:9 working 20:17, 20:20, 28:7, 32:18, 34:12, 34:15, 35:4, 45:17, 53:15, 62:16, 70:5, 81:14 works 93:12, 93:14 world 68:7 worse 49:18 wouldn't 78:22, 79:1 wow 54:1, 69:11 wrap 77:3 write 12:12, 12:14, 12:20, 39:21 writing 7:8, 70:15 written 7:17, 10:13, 10:15, 10:17, 40:19, 50:16 wrong 78:2 wrote 12:17, 52:1, 53:2	43:20, 44:6, 47:11, 49:8, 50:14, 51:8, 53:7, 53:13, 54:3, 54:5, 54:16, 54:17, 56:22, 57:2, 62:3, 69:13, 69:19, 72:6, 72:20, 73:4, 73:13, 73:16, 73:18, 74:1, 76:4, 76:11, 78:7, 85:1, 85:12, 85:13, 87:2, 87:22, 88:6, 88:11, 88:15, 88:18, 89:1, 91:18, 93:12 year 7:1 years 6:19, 7:2, 14:13, 24:10, 35:4, 43:3, 45:7, 47:17 yep 8:17, 30:7, 32:4, 69:15, 73:13, 76:14, 85:7 young 28:22	.7460 3:15 0 00 75:16 00425 1:16 02 39:7, 39:9 04 1:23 05 76:2 1 1 1:27, 75:16 1,000 22:1 10 39:3, 62:10, 75:5, 76:2, 92:13, 92:14, 94:2 1000 3:5 1005 4:13, 31:20, 31:21, 54:4, 54:6 11 11:5, 39:7, 62:1, 62:4 110 84:20, 85:6, 89:14 12 4:16, 49:14 13 47:7 14 47:7 140 85:5, 87:9, 87:18 14416 2:9	15 7:2, 11:5, 43:3, 49:14, 75:6 16 84:9, 84:11, 88:19, 88:22, 89:1 18 1:22 19 30:16 1969 29:2 1974 27:3 1980 30:16 1990 30:16 2 20 14:13, 24:10, 47:17, 75:6 20004 3:6 2001 4:16, 12:5, 12:9, 12:11, 43:17 2003 17:12, 53:3 2004 22:6 201 3:13 202.637 3:7 2024 1:16, 1:22, 95:16 23 69:17 24 69:8, 69:11, 69:15, 69:16 25 28:12
Y yeah 5:16, 5:18, 7:6, 8:12, 9:19, 11:20, 12:1, 14:2, 14:10, 15:9, 26:22, 27:10, 30:3, 32:3, 32:14, 39:1, 43:19,	Z zero 25:12, 49:4, 62:16, 80:11 zeros 41:1, 41:6, 41:10, 41:12, 59:6, 59:16, 60:16 zoom 18:21, 76:15 . .2200 3:7		

Transcript of William Bandy, Ph.D.
Conducted on December 18, 2024

123

26 92:13	77:19, 77:22, 78:6, 81:7	
27 92:14, 94:2	7	
28 77:12	7 1:23, 11:5, 39:9	
2a 54:14	7,148,803 4:14, 14:17	
3	7,969,307 1:17, 14:22, 16:8	
30 21:9, 22:22, 36:12, 69:13, 73:12	780 84:19	
307 62:11	8	
30819 2:8	8 39:9, 47:7, 76:1	
31 4:13, 95:15	80 30:16	
33 3:13	803 9:20, 13:18, 14:11, 14:16, 31:13, 32:11, 33:1, 33:4, 54:2, 54:19, 62:9, 62:18, 64:6, 69:9, 72:22, 73:10, 77:5, 78:1, 82:15, 82:18, 82:20, 84:10, 87:4	
340 85:5	81 73:3, 73:9, 73:21, 77:19, 78:5	
4	83 73:3, 77:19	
41 84:17, 84:18, 89:1, 89:2, 89:5	85 31:3	
47 89:6, 89:8	9	
5	95 1:27	
52 39:9		
53703 3:14		
54 76:1		
555 3:5		
563956 1:26		
6		
608.663 3:15		
65 73:3, 77:14,		