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Transcript of Peter Kazanzides, Ph.D (271) and Peter Kazanzides, Ph.D (807)

Date: June 22, 2023

Case: Medivis, Inc. -v- Novarad Corp. (PTAB)

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

Transcript of Peter Kazanzides, Ph.D (271) and Peter Kazanzides, Ph.D (807)¹ (1 to 4)
Conducted on June 22, 2023

<p style="text-align: right;">1</p> <p>1 UNITED STATES PATENT AND TRADEMARK OFFICE</p> <p>2 -----</p> <p>3 BEFORE THE PATENT TRIAL AND APPEAL BOARD</p> <p>4 -----</p> <p>5 MEDIVIS, INC.,</p> <p>6 Petitioner,</p> <p>7 v.</p> <p>8 NOVARAD CORP.,</p> <p>9 Patent Owner.</p> <p>10 -----</p> <p>11 U.S. PATENT 11,004,271</p> <p>12 -----</p> <p>13 IPR2023-00042</p> <p>14 -----</p> <p>15 U.S. PATENT 10,945,807 B2</p> <p>16 -----</p> <p>17 IPR2023-00045</p> <p>18 Deposition of PETER KAZANZIDES</p> <p>19 CONDUCTED VIRTUALLY</p> <p>20 Thursday, June 22, 2023</p> <p>21 9:59 a.m. EST</p> <p>22 Job No.: 496331</p> <p>23 Pages: 1 - 134</p>	<p style="text-align: right;">3</p> <p>1 A P P E A R A N C E S</p> <p>2 ON BEHALF OF THE PETITIONER:</p> <p>3 KIA L. FREEMAN, ESQUIRE</p> <p>4 McCARTER & ENGLISH, LLP</p> <p>5 265 Franklin Street</p> <p>6 Boston, Massachusetts 02110</p> <p>7 617-449-6549</p> <p>8</p> <p>9 ON BEHALF OF THE PATENT OWNER:</p> <p>10 JOSEPH HARMER, ESQUIRE</p> <p>11 JED HANSEN, ESQUIRE</p> <p>12 THORPE NORTH & WESTERN LLP</p> <p>13 175 South Main, Suite 900</p> <p>14 Salt Lake City, Utah 84111</p> <p>15 801-566-6633</p> <p>16</p> <p>17</p> <p>18 Also Present: William Pantoja, Technician</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p>																																										
<p style="text-align: right;">2</p> <p>1 Reported By: Brooklyn E. Schweitzer, RPR, CRR</p> <p>2 Deposition of PETER KAZANZIDES, conducted</p> <p>3 virtually.</p> <p>4</p> <p>5</p> <p>6 ** ALL PARTIES ATTENDED REMOTELY. **</p> <p>7</p> <p>8</p> <p>9 Pursuant to Notice, before Brooklyn E.</p> <p>10 Schweitzer, Registered Professional Reporter,</p> <p>11 Certified Realtime Reporter, and Notary Public in</p> <p>12 and for the Commonwealth of Pennsylvania.</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p>	<p style="text-align: right;">4</p> <p>1 C O N T E N T S</p> <table><tr><td>2 EXAMINATION</td><td>PAGE</td></tr><tr><td>3 By Mr. Harmer</td><td>5,69</td></tr><tr><td>4</td><td></td></tr><tr><td>5</td><td></td></tr><tr><td>6 E X H I B I T S</td><td></td></tr><tr><td>7 EXHIBIT</td><td>PAGE</td></tr><tr><td>8 Exhibit '807 1010</td><td>16,80</td></tr><tr><td>9 Exhibit '807 1009</td><td>41,105</td></tr><tr><td>10 Exhibit '271 1012</td><td>53,117</td></tr><tr><td>11</td><td></td></tr><tr><td>12</td><td></td></tr><tr><td>13</td><td></td></tr><tr><td>14</td><td></td></tr><tr><td>15</td><td></td></tr><tr><td>16</td><td></td></tr><tr><td>17</td><td></td></tr><tr><td>18</td><td></td></tr><tr><td>19</td><td></td></tr><tr><td>20</td><td></td></tr><tr><td>21</td><td></td></tr><tr><td>22</td><td></td></tr></table>	2 EXAMINATION	PAGE	3 By Mr. Harmer	5,69	4		5		6 E X H I B I T S		7 EXHIBIT	PAGE	8 Exhibit '807 1010	16,80	9 Exhibit '807 1009	41,105	10 Exhibit '271 1012	53,117	11		12		13		14		15		16		17		18		19		20		21		22	
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<p>5</p> <p>1 PROCEEDINGS</p> <p>2 PETER KAZANZIDES,</p> <p>3 was called, and having been duly sworn,</p> <p>4 testified as follows:</p> <p>5 EXAMINATION</p> <p>6 BY MR. HARMER:</p> <p>7 Q Good morning, Dr. Kazanzides.</p> <p>8 A Good morning.</p> <p>9 Q Can you please state your full name and</p> <p>10 address for the record?</p> <p>11 A Peter Kazanzides, 10 Forest Ridge Ct,</p> <p>12 Lutherville, Maryland 21093.</p> <p>13 Q Thank you. My name is Joseph Harmer. I'm</p> <p>14 an attorney for Novarad Corporation, and I want to</p> <p>15 thank you for your time this morning.</p> <p>16 Have you ever had your deposition taken</p> <p>17 before?</p> <p>18 A No, I have not.</p> <p>19 Q One of the objectives of a deposition is</p> <p>20 to create a clean record. If we all talk at the</p> <p>21 same time, we make it difficult for our court</p> <p>22 reporter. It may seem like a small thing, but if</p>	<p>7</p> <p>1 courtroom?</p> <p>2 A Yes.</p> <p>3 Q Are there any reasons why you can't give</p> <p>4 truthful testimony today?</p> <p>5 A No.</p> <p>6 Q And you're not aware of any illness or</p> <p>7 medication that can affect your ability to provide</p> <p>8 truthful testimony?</p> <p>9 A That's correct.</p> <p>10 Q Is there anybody in the room with you</p> <p>11 today?</p> <p>12 A No.</p> <p>13 Q Do you understand that no one can assist</p> <p>14 you in answering questions?</p> <p>15 A Yes.</p> <p>16 Q Are you using any device or software to</p> <p>17 receive assistance answering questions?</p> <p>18 A No.</p> <p>19 Q And you agree not to accept any</p> <p>20 assistance --</p> <p>21 A Excuse me. I want to exit my email.</p> <p>22 Sorry for interrupting. I forgot to do that.</p>
<p>6</p> <p>1 we can all try not to talk at the same time, it</p> <p>2 will really help.</p> <p>3 Will you try to wait and respond until</p> <p>4 after I'm done asking a question?</p> <p>5 A Yes.</p> <p>6 Q Thank you. And I will try not to ask</p> <p>7 another question until you've finished answering.</p> <p>8 It's also important to provide verbal</p> <p>9 responses. Other responses including a head nod</p> <p>10 or other gestures are more difficult to record, as</p> <p>11 you can imagine. Does that make sense?</p> <p>12 A Yes.</p> <p>13 Q And there may be times when Ms. Freeman,</p> <p>14 Medivis' counsel, might make an objection. If</p> <p>15 that happens, please wait until the objection is</p> <p>16 made, and then go ahead and answer to the best of</p> <p>17 your ability unless you are specifically</p> <p>18 instructed not to answer. Can you do that?</p> <p>19 A Yes.</p> <p>20 Q Thank you. And you understand that you</p> <p>21 are under oath today to tell the truth the same as</p> <p>22 if you were in front of a judge and a jury in a</p>	<p>8</p> <p>1 In fact, I'll close everything on this</p> <p>2 computer except for Zoom. Sorry. I meant to do</p> <p>3 that beforehand.</p> <p>4 Okay. There we go.</p> <p>5 Q Thank you.</p> <p>6 A Nothing running.</p> <p>7 Q And you agree not to accept any assistance</p> <p>8 answering questions today?</p> <p>9 A Yes.</p> <p>10 Q If you don't understand a question, please</p> <p>11 let me know. Otherwise I will assume that you</p> <p>12 understood the question. Is that fair?</p> <p>13 A Yes.</p> <p>14 Q Have you ever given testimony at trial</p> <p>15 before?</p> <p>16 A No.</p> <p>17 Q Have you ever provided a declaration in an</p> <p>18 inter partes proceeding other than the two IPR</p> <p>19 proceedings we're currently involved in?</p> <p>20 A No.</p> <p>21 Q Rather than say inter partes review, I may</p> <p>22 use IPR. Do you understand that IPR stands for</p>

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<p style="text-align: right;">9</p> <p>1 inter partes review?</p> <p>2 A Yes.</p> <p>3 Q You've been retained by Medivis, Inc., to</p> <p>4 provide expert testimony in connection with two</p> <p>5 IPR proceedings; correct?</p> <p>6 A Yes.</p> <p>7 Q One is related to U.S. Patent No.</p> <p>8 10,945,807; is that right?</p> <p>9 A Yes.</p> <p>10 Q For clarification, is it okay if we refer</p> <p>11 to that patent as the '807 patent?</p> <p>12 A Yes.</p> <p>13 Q And is it okay if we refer to that IPR</p> <p>14 proceeding as the '807 IPR?</p> <p>15 A Yes.</p> <p>16 Q The other IPR proceeding is U.S. -- pardon</p> <p>17 me. Yes, the other IPR proceeding is related to</p> <p>18 U.S. Patent No. 11,004,271; is that right?</p> <p>19 A That's right.</p> <p>20 Q And may we refer to that patent as the</p> <p>21 '271 patent and that IPR proceeding as the '271</p> <p>22 IPR?</p>	<p style="text-align: right;">11</p> <p>1 Q Do you remember who at Medivis reached out</p> <p>2 to you?</p> <p>3 A I'm not certain of who it was, but I</p> <p>4 believe it would have been -- I don't recall his</p> <p>5 full name, but one of -- one of the founders of</p> <p>6 the company.</p> <p>7 Q Have you provided any other expert</p> <p>8 services to Medivis?</p> <p>9 A No.</p> <p>10 Q Do you have any prior relationship with</p> <p>11 the founders of Medivis?</p> <p>12 A I've spoken to them, but I don't have any</p> <p>13 prior relationship with them.</p> <p>14 Q Have you spoken to them about either of</p> <p>15 the '807 and '271 IPRs?</p> <p>16 A Prior to when they contacted me about it,</p> <p>17 no.</p> <p>18 Q Have you had any business dealings at all</p> <p>19 with Medivis?</p> <p>20 A I am not clear what you mean by business</p> <p>21 dealings.</p> <p>22 Q Have you conducted business with Medivis</p>
<p style="text-align: right;">10</p> <p>1 A Yes.</p> <p>2 Q You've provided a declaration in each of</p> <p>3 the '807 and '271 IPR proceedings. Can we refer</p> <p>4 to those as the '807 and '271 declarations</p> <p>5 respectively?</p> <p>6 A Yes.</p> <p>7 Q Do you understand that you're here today</p> <p>8 to provide testimony with respect to each of the</p> <p>9 '807 and '271 declarations?</p> <p>10 A Yes.</p> <p>11 Q Thank you. When were you first engaged to</p> <p>12 provide services in connection with the '807 and</p> <p>13 '271 IPR proceedings?</p> <p>14 A I don't recall the exact date, but it was</p> <p>15 sometime in late 2022. I'm guessing somewhere</p> <p>16 August -- between August and October.</p> <p>17 Q And who engaged you to perform those</p> <p>18 services?</p> <p>19 A Who engaged me? The company Medivis in</p> <p>20 conjunction with McCarter & English.</p> <p>21 Q Did Medivis reach out to you directly?</p> <p>22 A Yes, that's my recollection.</p>	<p style="text-align: right;">12</p> <p>1 in any way?</p> <p>2 A I would say no. Clarify: I did once</p> <p>3 contact them about possibly partnering with a</p> <p>4 grant proposal, but they declined, so I would not</p> <p>5 consider that a business dealing.</p> <p>6 Q And what was the subject of the grant?</p> <p>7 A It was -- it was a DOD solicitation on,</p> <p>8 like, 5D for telemedicine, along those lines.</p> <p>9 Q Thank you. Did it have anything to do</p> <p>10 with augmented reality?</p> <p>11 A The grant?</p> <p>12 Q Yes.</p> <p>13 A So the -- the DOD grant would have</p> <p>14 involved augmented reality.</p> <p>15 Q In what way?</p> <p>16 A My best recollection is that it involved</p> <p>17 telementoring of having a -- basically remote</p> <p>18 assistance.</p> <p>19 Q Can you explain to me what that is? I'm</p> <p>20 sorry. I didn't understand.</p> <p>21 A It's hard for me to say because I did go</p> <p>22 ahead with another entity and we did refine the</p>

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<p style="text-align: right;">13</p> <p>1 grant further. So really at the time I approached 2 Medivis, it was rather vague. The DOD was just 3 looking for ways to use 5G to enable long-distance 4 sort of telemedicine. 5 So there weren't really any specific plans 6 at the time at which I contacted Medivis, and as I 7 said, they have declined to participate. 8 Q When was the first time you reached out to 9 Medivis about the grant proposal? 10 A It was a couple years ago. I don't 11 recall. 12 Q Can you approximate? A couple years, you 13 said? 14 A Yeah. Right. I can't really pin it down. 15 Within the last five years, anyway. 16 Q And when was the last time you spoke to 17 them about the proposal? 18 A About the same time. It really was a very 19 brief "are you interested or no," that kind of 20 thing. 21 Q Why did you reach out to them in the first 22 place? How did you know about them? Sorry.</p>	<p style="text-align: right;">15</p> <p>1 with anyone at Medivis? 2 A Not since beginning this process, no. 3 Q When was the last time you spoke with them 4 before this process began? 5 MS. FREEMAN: Objection. 6 THE WITNESS: Okay. Could you -- 7 Q Yes, I'll rephrase the question. 8 A Yeah. 9 Q When was the last time you spoke to anyone 10 at Medivis prior to being retained as an expert in 11 these IPR proceedings, the '271 and '807 IPRs? 12 A It was probably in May of 2021. 13 Q And what was the purpose of that contact 14 with Medivis in May of 2021? 15 A Yeah. My student attended the graduation 16 ceremony to receive his PhD, the one who's 17 employed at Medivis. 18 Q This is Long Qian? 19 A Yes. 20 MR. HARMER: William, can you please put 21 up Exhibit '807 1010? 22 TECHNICIAN: Sure. One moment.</p>
<p style="text-align: right;">14</p> <p>1 Those are two questions. Let me ask it -- 2 A Thank you -- thank you for clarifying. 3 Q How did you know about Medivis before you 4 reached out to them? 5 A One of my students who graduated is 6 employed there. 7 Q Is he still your student? 8 A No, no. He had graduated. 9 Q At the time. I see. 10 A He graduated, and then he -- yeah, he took 11 a position there at some point after he graduated. 12 It was not his first position after graduation. 13 Q Does that student still work for Medivis? 14 A To the best of my knowledge, yes. 15 Q What is that student's name? 16 A Long Qian. Long -- 17 Q Spell that. Thank you. 18 A L-O-N-G Q-I-A-N. 19 Q Have you spoken with anyone at Medivis 20 specifically about your deposition today? 21 A No. 22 Q And have you had any other conversations</p>	<p style="text-align: right;">16</p> <p>1 (Exhibit '807 1010 was marked for 2 identification and is attached to the transcript.) 3 BY MR. HARMER: 4 Q Dr. Kazanzides, is this a copy of the 5 curriculum vitae or CV that you attached to your 6 '807 declaration? 7 A Yes. At least the first one or two pages 8 that you've shown, yes. 9 MR. HARMER: William, can you give 10 Dr. Kazanzides control so he can scroll through 11 it real quick? 12 TECHNICIAN: No problem. 13 THE WITNESS: All right. 14 TECHNICIAN: You now have control. 15 THE WITNESS: Okay. Okay, this works. 16 Yes, this is my entire CV. 17 BY MR. HARMER: 18 Q Did you attach the same document to your 19 '271 declaration as Exhibit 1013? 20 A Let me check the exhibit number. Which -- 21 which -- I'm sorry, which did you ask about? Was 22 it attached to which one?</p>

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<p>17</p> <p>1 Q This one that we're looking at now is your</p> <p>2 '807 declaration.</p> <p>3 A Okay.</p> <p>4 Q I just want to make sure it's the same CV</p> <p>5 you attached to the '271 declaration, and it was</p> <p>6 Exhibit 1013.</p> <p>7 A Okay. In my notes, it's the same as</p> <p>8 Exhibit 1010.</p> <p>9 Q '807 is Exhibit 1010?</p> <p>10 A That is my -- that is what my notes say.</p> <p>11 Q And for the '271 declaration, what exhibit</p> <p>12 is it?</p> <p>13 A '271 -- 1013.</p> <p>14 Q Is this CV current?</p> <p>15 A I have the date on the bottom. It is</p> <p>16 current as of that date.</p> <p>17 Q July 24th, 2022?</p> <p>18 A Yes.</p> <p>19 Q Is there anything that you would like to</p> <p>20 add to it?</p> <p>21 A There's not any significant change. I</p> <p>22 probably have a few more publications and some</p>	<p>19</p> <p>1 All right. So it looks like you've been</p> <p>2 an employee at Johns Hopkins since 2002; is that</p> <p>3 right?</p> <p>4 A Yes.</p> <p>5 Q Did you speak permission from Johns</p> <p>6 Hopkins before you were retained as an expert</p> <p>7 witness in these IPR proceedings?</p> <p>8 A The process at Johns Hopkins is that we</p> <p>9 don't seek permission in advance, but we submit</p> <p>10 a -- what's it called, a conflict of interest</p> <p>11 disclosure, and that gets reviewed and approved.</p> <p>12 Q Who reviews it?</p> <p>13 A The process. I don't have a name as to</p> <p>14 who reviews it, but someone at the -- at Johns</p> <p>15 Hopkins reviews it.</p> <p>16 Q And what's the purpose of the conflict of</p> <p>17 interest check?</p> <p>18 A Well, there's several goals. One is</p> <p>19 that -- you know, they want to make sure that what</p> <p>20 you're doing is not -- well, some of the concerns</p> <p>21 they have when they review conflict of interest</p> <p>22 disclosures is whether you could abuse your</p>
<p>18</p> <p>1 changes in sponsored research, but I don't think</p> <p>2 that's extremely important to add.</p> <p>3 Q You're currently a research professor at</p> <p>4 Johns Hopkins University?</p> <p>5 A Yes.</p> <p>6 Q Do you have full confidence in a college</p> <p>7 that doesn't know how to spell John? I'm just</p> <p>8 joking.</p> <p>9 Who said that?</p> <p>10 A I'm sorry. Who said what?</p> <p>11 Q Do you remember who said "I don't have</p> <p>12 full confidence in a college that doesn't know how</p> <p>13 to spell John"?</p> <p>14 A I mean, you said it; right?</p> <p>15 Q It's a famous quote from Mark Twain. It's</p> <p>16 on Johns Hopkins' website. I just thought it was</p> <p>17 funny.</p> <p>18 A It's on the website?</p> <p>19 Q It is. It's not funny. I apologize. Bad</p> <p>20 joke.</p> <p>21 A Okay. It's good to break the ice, though.</p> <p>22 Q Yeah, yeah.</p>	<p>20</p> <p>1 position of authority over a student. For</p> <p>2 example, if you do consulting work and you have</p> <p>3 your students do the work and get paid for it,</p> <p>4 that would be a bad case.</p> <p>5 They also look for conflict of interest,</p> <p>6 conflict of commitment, factors such as that.</p> <p>7 Q On Page 2 of your CV, you state that</p> <p>8 you've done research in augmented reality</p> <p>9 head-mounted displays. What does that research</p> <p>10 entail?</p> <p>11 A So --</p> <p>12 MS. FREEMAN: Objection; foundation.</p> <p>13 THE WITNESS: I'm sorry. Was there --</p> <p>14 MS. FREEMAN: I just said objection;</p> <p>15 foundation. Feel free to answer.</p> <p>16 THE WITNESS: Okay.</p> <p>17 So I've done research both in sort of</p> <p>18 fundamental technology involving augmented reality</p> <p>19 displays. For example, calibration of optical</p> <p>20 see-through head-mounted displays.</p> <p>21 I have done applications in the use of</p> <p>22 augmented reality -- not necessarily with</p>

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<p style="text-align: right;">21</p> <p>1 head-mounted displays, but with different kinds of</p> <p>2 display technology for applications in the medical</p> <p>3 domain as well as in space -- space robotics</p> <p>4 applications.</p> <p>5 I can get into more detail if you wish. I</p> <p>6 could also point out some of the publications that</p> <p>7 I have as examples. Let's see.</p> <p>8 Okay. So here's one where -- again, I can</p> <p>9 get into as much detail as you'd like in these,</p> <p>10 but this is an augmented reality including</p> <p>11 magnification. Going kind of quickly here, so --</p> <p>12 let's see.</p> <p>13 This one refers to some work in the use of</p> <p>14 mixed reality for space and space application.</p> <p>15 This one technically could qualify as well as far</p> <p>16 as telerobotics and sort of remote control.</p> <p>17 I think there's a lot more in the</p> <p>18 conferences. Okay, here's another one, a review</p> <p>19 paper that we did on the use of augmented reality</p> <p>20 in robot-assisted surgery.</p> <p>21 Here's another journal paper on restoring</p> <p>22 awareness of the visual field. Here's one on the</p>	<p style="text-align: right;">23</p> <p>1 software.</p> <p>2 Q And what are the purposes of those</p> <p>3 algorithms?</p> <p>4 A So one example is the calibration of</p> <p>5 the -- when you have an optical see-through</p> <p>6 head-mounted display as an example of a HoloLens,</p> <p>7 the -- you're overlaying virtual objects on</p> <p>8 essentially a little transparent or</p> <p>9 semitransparent lens.</p> <p>10 And so the alignment of that virtual</p> <p>11 object with the real world really depends on how</p> <p>12 the user perceives it. So you essentially have to</p> <p>13 calibrate the display system to the retina of the</p> <p>14 user.</p> <p>15 And so in that calibration step, you're</p> <p>16 collecting data. You're trying to identify</p> <p>17 parameters, and there's different techniques that</p> <p>18 you can use for doing that.</p> <p>19 Q What are the challenges with doing that?</p> <p>20 A So challenges are essentially getting it</p> <p>21 to be accurate enough, depending on what your</p> <p>22 application requirements are, without making it</p>
<p style="text-align: right;">22</p> <p>1 use of augmented reality on a head-mounted display</p> <p>2 for an assistant for robotic surgery.</p> <p>3 This is one using augmented virtuality,</p> <p>4 which is on the sort of a mixed-reality continuum</p> <p>5 for telerobotic satellite servicing.</p> <p>6 I think I go now to the -- okay. This is</p> <p>7 one -- this was just a comparison of different</p> <p>8 display technologies.</p> <p>9 So those are just the journals. I have</p> <p>10 even more in conference publications. Do you wish</p> <p>11 me to continue?</p> <p>12 Q No, that's okay.</p> <p>13 A Okay.</p> <p>14 Q Does your research, does it involve the</p> <p>15 software side of these AR applications or hardware</p> <p>16 or both?</p> <p>17 A It's been primarily software and</p> <p>18 algorithms.</p> <p>19 Q And when you say algorithms, what do you</p> <p>20 mean?</p> <p>21 A I mean, let's say some mathematical</p> <p>22 constructions which can be implemented in</p>	<p style="text-align: right;">24</p> <p>1 too much of a burden for the user. People don't</p> <p>2 want to do -- every time they put on a headset, do</p> <p>3 a calibration for, you know, ten minutes, for</p> <p>4 example. So...</p> <p>5 Q Does any of your research have application</p> <p>6 in the medical field with regard to AR headsets,</p> <p>7 AR technology?</p> <p>8 A Yes.</p> <p>9 Q Does it involve the use of augmented</p> <p>10 reality head-mounted displays by medical</p> <p>11 professionals during surgery?</p> <p>12 A Could you clarify whether -- are you</p> <p>13 asking if it's being used in actual surgeries or</p> <p>14 if it's -- or if that's the application area.</p> <p>15 Q If that's the application area.</p> <p>16 A Yes.</p> <p>17 Q As part of your research, do you ever work</p> <p>18 with physicians at Johns Hopkins?</p> <p>19 A Yes.</p> <p>20 Q Which ones?</p> <p>21 A You know, they're listed as co-authors on</p> <p>22 some of these papers.</p>

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<p>25</p> <p>1 Q Can you identify some of those for us?</p> <p>2 A Sure. Robin Yang and Cecil Qiu, maybe.</p> <p>3 Camilo Molina and Judy Huang. Also here Camilo</p> <p>4 and Judy Huang are in this one. Greg Osgood, I</p> <p>5 think, was in one of the journal papers that was</p> <p>6 listed above, and -- augmented reality -- let's</p> <p>7 see.</p> <p>8 There may be others, but those are the</p> <p>9 ones that came to mind.</p> <p>10 Q Thank you. Do you know who Dr. Timothy</p> <p>11 Witham is?</p> <p>12 A I don't think so. Could you spell the</p> <p>13 last name.</p> <p>14 Q W-I-T-H-A-M?</p> <p>15 A W-I-T-H-A-M? I do not.</p> <p>16 Q Do you know who -- let's see -- the</p> <p>17 director of Johns Hopkins neurosurgery spinal</p> <p>18 fusion laboratory is?</p> <p>19 A I do not. I may know the person, but I</p> <p>20 don't know who holds that position.</p> <p>21 Q Thank you. Are these all physicians that</p> <p>22 work at Johns Hopkins medical -- or it's Johns</p>	<p>27</p> <p>1 A Okay. Okay. So Paper No. 19 on the</p> <p>2 screen here is about using augmented reality --</p> <p>3 where's the cursor -- for minimally invasive</p> <p>4 surgery using a head-mounted display, and what</p> <p>5 that did is -- the goal there was to provide</p> <p>6 essentially see-through vision for the surgeon,</p> <p>7 for example, in a laparoscopic procedure.</p> <p>8 And the way that was done, as disclosed in</p> <p>9 the publication, was to in reality build a model</p> <p>10 or a 3D point cloud of the internal anatomy of the</p> <p>11 patient, project the endoscope video onto that</p> <p>12 point cloud, and then render that on a</p> <p>13 head-mounted display.</p> <p>14 Q When you say 3D point cloud, what do you</p> <p>15 mean?</p> <p>16 A Yes. What I mean is a collection of</p> <p>17 points that have three dimensional coordinates;</p> <p>18 that is, X, Y, and Z locations.</p> <p>19 Q How is that 3D point cloud generated?</p> <p>20 A In the paper, No. 19, we generated it from</p> <p>21 basically looking at the disparity between images</p> <p>22 from a left and right camera in a stereo</p>
<p>26</p> <p>1 Hopkins Hospital, I think?</p> <p>2 A Yeah, that's fine.</p> <p>3 MS. FREEMAN: Objection to form.</p> <p>4 THE WITNESS: I -- are you -- could you</p> <p>5 please clarify the question?</p> <p>6 Q Yes. Are the physicians that you</p> <p>7 identified in these papers, do they all work at</p> <p>8 the Johns Hopkins Hospital?</p> <p>9 A No, not currently.</p> <p>10 Q Do any of them have a business</p> <p>11 relationship with Medivis?</p> <p>12 A Not that I'm aware of.</p> <p>13 Q Besides calibration, which you mentioned</p> <p>14 in your research, is there any other functions of</p> <p>15 the use of AR during your surgery that you've</p> <p>16 investigated in your research?</p> <p>17 A Yes.</p> <p>18 Q Can you identify some of those that have</p> <p>19 use in surgical applications by a medical</p> <p>20 professional?</p> <p>21 A Do you want me to identify papers?</p> <p>22 Q If that's easiest.</p>	<p>28</p> <p>1 endoscope. But there are other techniques in the</p> <p>2 literature.</p> <p>3 Q In this particular application, what was</p> <p>4 the purpose of generating the 3D point cloud?</p> <p>5 A So to be able to render the internal view</p> <p>6 of the patient from a different perspective; that</p> <p>7 is, from the perspective of the person wearing the</p> <p>8 head-mounted display rather than from the</p> <p>9 perspective of the endoscope that's actually</p> <p>10 taking the image.</p> <p>11 Q And the endoscope has two cameras?</p> <p>12 A Yes. In this -- in our implementation, we</p> <p>13 used a stereo endoscope.</p> <p>14 Q Can you please identify the next paper</p> <p>15 that has surgical applications for AR?</p> <p>16 A All right. I will go to Paper 21, which</p> <p>17 is called augmented reality-assisted instrument</p> <p>18 insertion and tool manipulation for the first</p> <p>19 assistant in robotic surgery.</p> <p>20 Q And what is this app -- what is this paper</p> <p>21 about?</p> <p>22 A So first -- some knowledge. First</p>

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<p style="text-align: right;">29</p> <p>1 assistant is a term used in da Vinci robotic 2 surgery. If you're familiar with the da Vinci 3 surgical robot, there's a robot pulling 4 instruments inside the patient controlled by a 5 surgeon sitting at a console. 6 First assistant is another surgeon who's 7 actually at the patient's bedside and is 8 assisting, doing things like exchanging 9 instruments, feeding materials, say, such as 10 suture through another port, retracting -- 11 applying retractions, suction, irrigation, those 12 kinds of tasks. 13 And that person doesn't have the 14 visualization that's provided to the surgeon 15 sitting at the console there operating similar to 16 a laparoscopic surgeon looking currently at a 2D 17 display of, you know, the endoscope view, and that 18 can be difficult due to some, you know, hand-eye 19 coordination challenges. 20 And so the -- what we proposed and 21 implemented was give that assistant a head-mounted 22 display, and by registering that head-mounted</p>	<p style="text-align: right;">31</p> <p>1 they were also able to see the anatomy. 2 Q How are they able to see the anatomy? 3 A In the case in this paper, it was as a -- 4 basically a 2D image that was correctly oriented 5 inside -- you know, what would appear to be at the 6 correct location inside the patient. 7 Q It's a 2D image, you said? 8 A In that case, it was 2D. I'm going 9 through two things, I guess, in reverse 10 chronological order. That was one of the 11 motivations for the Paper No. 19 that I discussed. 12 It was basically being able to do that at 3D. But 13 in No. 21, it was a 2D image of the anatomy. 14 Q In Paper No. 19, was that the first time 15 you had done 3D patient anatomy? 16 MS. FREEMAN: Objection; form. 17 A So I need to think about that a moment. 18 Q No problem. 19 A No. 20 Q Okay. When did you use a 3D point cloud 21 before Paper 19? 22 A A 3D point cloud is not the only 3D</p>
<p style="text-align: right;">30</p> <p>1 display to the da Vinci robot, we could project, 2 you know, augmented images on the head-mounted 3 display where the robotic instruments are inside 4 the patient, where the endoscope is, also the 5 endoscope field of view, which we rendered as a -- 6 as a three-dimensional outline, like a ThruSTEM, 7 as well as they could also view the endoscope 8 image in its correct location physically, you 9 know, inside the patient. 10 So it gave them -- to summarize, it gives 11 the assistant sort of see-through capability to 12 look inside the patient, which helps them do their 13 task because now they can more easily, when 14 they're inserting devices or instructs to assist, 15 they can -- they have better awareness of where 16 they need to go. 17 Q So the assistant can see through the 18 augmented reality display the anatomy of the 19 patient as well as the instrument? 20 A The -- yeah. The anatomy of the -- that 21 is correct. Yes. We focused more on the 22 instruments and the endoscope field of view, but</p>	<p style="text-align: right;">32</p> <p>1 entity. So -- okay. So 3D entities could also 2 include, like, a wire mesh, which is a point cloud 3 but also with edges to produce a more closed 4 object. 5 Q What do you mean by closed object? 6 A Well, a point cloud has both -- 7 essentially just a cloud of points. So there's 8 gaps between the points. If you define shapes 9 through the points; for example, taking three 10 points, forming a triangle, that now defines -- 11 and you do that for all of the points. That 12 defines a shape. Could be a -- well, some sort of 13 3D shape. 14 Often it's called a 3D mesh. 15 Q How is a 3D mesh generated? 16 A Well, there are a number of ways. 17 Probably the most famous was a technique called 18 marching cubes, which was patented by GE I think 19 in about 1990 or '91. But it was just a technique 20 of creating a 3D mesh from voxelized data such as 21 you would find in a CT or an MRI. 22 Q Okay. We'll come back to that. Can you</p>

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<p style="text-align: right;">33</p> <p>1 point out the next paper that has surgical --</p> <p>2 excuse me. Strike that.</p> <p>3 Can you point out the next paper that has</p> <p>4 AR applications or AR use in surgical</p> <p>5 applications?</p> <p>6 A Okay. I think what I'll do is I'm going</p> <p>7 to go kind of in chronological order, so I'll go</p> <p>8 down towards the bottom in -- let's see. So are</p> <p>9 you asking, as a point of clarification, augmented</p> <p>10 reality only on head-mounted displays or on other</p> <p>11 displays as well?</p> <p>12 Q Just head-mounted, and we can just do one</p> <p>13 more. We don't have to do every one.</p> <p>14 A Okay. Let's see. There's one, I know --</p> <p>15 one or two in 2012, head-mounted displays. Almost</p> <p>16 there.</p> <p>17 Okay. I believe this one is one of the</p> <p>18 exhibits, No. 80 -- Paper 82, which is augmented</p> <p>19 reality goggles with an integrated tracking system</p> <p>20 for navigation in neurosurgery.</p> <p>21 Q Great. Thank you.</p> <p>22 Does Johns Hopkins own the research that</p>	<p style="text-align: right;">35</p> <p>1 THE WITNESS: Sorry. What was the</p> <p>2 objection?</p> <p>3 MS. FREEMAN: Objection; relevance.</p> <p>4 THE WITNESS: Okay.</p> <p>5 MS. FREEMAN: I apologize. I think I</p> <p>6 might have thrown off Dr. Kazanzides with that</p> <p>7 objection. Would you mind having -- repeating the</p> <p>8 question?</p> <p>9 MR. HARMER: Sure.</p> <p>10 BY MR. HARMER:</p> <p>11 Q Which of these patents is Johns Hopkins</p> <p>12 University the applicant or the assignee?</p> <p>13 A Mm-hmm. Okay. So for Patents 6 -- let's</p> <p>14 see -- so from 6 through 14, I was a Johns Hopkins</p> <p>15 employee, and so therefore they -- at least my</p> <p>16 rights -- some of these are joined patents with</p> <p>17 other entities.</p> <p>18 I believe Patent No. 5 might have Hopkins</p> <p>19 involved through one of my co-inventors. At the</p> <p>20 time, I was -- I was not at Johns Hopkins, so my</p> <p>21 assignment would not be to Johns Hopkins or No. 5</p> <p>22 or any of the ones -- you know, 1 through 4</p>
<p style="text-align: right;">34</p> <p>1 you conduct since you've been employed there?</p> <p>2 A You mean -- yes. They have -- any IP that</p> <p>3 I develop is assigned to Johns Hopkins.</p> <p>4 Q Including IP related to augmented reality</p> <p>5 head-mounted displays?</p> <p>6 A If it's developed during the course of my</p> <p>7 employment, yes.</p> <p>8 Q Dr. Kazanzides, can you turn to page --</p> <p>9 let's see -- 26? Kazanzides, I apologize.</p> <p>10 A That's okay. You can just call me</p> <p>11 whatever, Peter or Mr. K or whatever.</p> <p>12 Q I was calling you Mr. K initially,</p> <p>13 actually. It was easier.</p> <p>14 A Yes, 26.</p> <p>15 Q So here you list 14 patents.</p> <p>16 A Yes.</p> <p>17 Q Are you a named inventor on each of these</p> <p>18 patents?</p> <p>19 A Yes.</p> <p>20 Q Is Johns Hopkins the applicant or assignee</p> <p>21 in any of these?</p> <p>22 MS. FREEMAN: Objection; relevance.</p>	<p style="text-align: right;">36</p> <p>1 either.</p> <p>2 Q Thank you. I believe that on a few of</p> <p>3 these patents Intuitive Surgical Operations is a</p> <p>4 joint applicant with Johns Hopkins.</p> <p>5 A That's correct.</p> <p>6 Q What is Intuitive Surgical Operations?</p> <p>7 A That is the company that makes the da</p> <p>8 Vinci surgical robot.</p> <p>9 Q And what's its relationship with Johns</p> <p>10 Hopkins?</p> <p>11 A They -- well, they've done some -- I think</p> <p>12 these particular patents were a result of a joint</p> <p>13 research grant from NSF, but they've -- they've --</p> <p>14 they're a large company. They've sponsored</p> <p>15 research. They've been partners on funded</p> <p>16 research.</p> <p>17 So they, I believe, have -- they haven't</p> <p>18 licensed any of my IP from Johns Hopkins, but they</p> <p>19 may have licensed other IP.</p> <p>20 Q Does Intuitive Surgical Operations provide</p> <p>21 tools for augmented reality-assisted surgery?</p> <p>22 MS. FREEMAN: Objection; form.</p>

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<p>37</p> <p>1 A So I can tell you what they provide. The</p> <p>2 company provides a surgical robot that's used for</p> <p>3 minimally invasive procedures. That's the da</p> <p>4 Vinci. And it has kind of the endoscope camera</p> <p>5 inside of the patient. Those images are captured</p> <p>6 and streamed to a display nearby. Usually it's in</p> <p>7 the same operating room, but it's away from the</p> <p>8 patient, and the surgeon is viewing in 3D those</p> <p>9 images from a stereo console.</p> <p>10 They also provide another robotic system</p> <p>11 that's sort of for smaller kind of vascular</p> <p>12 procedures that I don't know very much about.</p> <p>13 Those are their products that they provide.</p> <p>14 Q Does one use an AR headset with the da</p> <p>15 Vinci?</p> <p>16 MS. FREEMAN: Objection; form.</p> <p>17 A Neither of the products I mentioned -- or</p> <p>18 at least the company does not provide a product</p> <p>19 based on an AR headset with their existing</p> <p>20 products.</p> <p>21 Q Do any of the patents that you list in</p> <p>22 your CV involve the use of augmented reality in</p>	<p>39</p> <p>1 Q Yeah. Have you been involved in the</p> <p>2 development of augmented reality or use of</p> <p>3 augmented reality in surgery at Johns Hopkins</p> <p>4 Hospital or other Johns Hopkins medical</p> <p>5 facilities?</p> <p>6 MS. FREEMAN: Objection; form.</p> <p>7 A As I stated before, I've done research</p> <p>8 with people at Johns Hopkins medical institutions</p> <p>9 on applications that could be used in surgery.</p> <p>10 Q So medical professionals at Johns Hopkins</p> <p>11 have used or tested your applications for use of</p> <p>12 AR in surgery?</p> <p>13 A They've --</p> <p>14 MS. FREEMAN: Objection; form.</p> <p>15 A Yes. They've tested, yes.</p> <p>16 Q Do you know whether Johns Hopkins is using</p> <p>17 AR-assisted surgery in their hospital?</p> <p>18 A Yes.</p> <p>19 Q And are they?</p> <p>20 A They have, yes.</p> <p>21 Q Do you know when they started doing that?</p> <p>22 A I would not know all of the -- it's a very</p>
<p>38</p> <p>1 surgery?</p> <p>2 A Yes.</p> <p>3 Q Which ones?</p> <p>4 A No. 12 and -- let's see -- No. 13, No.</p> <p>5 Nine.</p> <p>6 I'm sorry. Did you -- I want to clarify.</p> <p>7 Did you say augmented reality or augmented reality</p> <p>8 on a head-mounted display?</p> <p>9 Q Augmented reality.</p> <p>10 A Okay. So, then, Nos. Seven -- so 7, 9,</p> <p>11 12, 13. Those I'm certain of. I'd have to review</p> <p>12 some of the other ones to see if there's a</p> <p>13 possibility that was mentioned.</p> <p>14 No. 14 is a more general methods-type --</p> <p>15 or calibration method, and probably mentioned</p> <p>16 medicine is a motivating example, but it's really</p> <p>17 not tied to a medical application.</p> <p>18 Q Have you been involved in the development</p> <p>19 of AR for use in surgery at Johns Hopkins medical</p> <p>20 facilities?</p> <p>21 A Could you please rephrase that? I didn't</p> <p>22 understand.</p>	<p>40</p> <p>1 large hospital. I know of certain cases, but I</p> <p>2 don't know -- I'm not sure of the first case that</p> <p>3 was done.</p> <p>4 Q Do you know whether Johns Hopkins is</p> <p>5 currently using an AR head-mounted display to</p> <p>6 project a patient's medical imaging data onto</p> <p>7 non-image actual views of a patient during</p> <p>8 surgery?</p> <p>9 MS. FREEMAN: Objection; relevance.</p> <p>10 A There was a lot of detail in that</p> <p>11 question. Could you just say it again or rephrase</p> <p>12 it?</p> <p>13 Q Sure. Do you know whether Johns Hopkins</p> <p>14 is using AR to project medical imaging of a</p> <p>15 patient onto an actual patient for purposes of</p> <p>16 performing surgery?</p> <p>17 MS. FREEMAN: Objection; relevance.</p> <p>18 A Okay. I know that they have done that. I</p> <p>19 don't know if they're currently doing it.</p> <p>20 Q Do you know if they've projected 3D</p> <p>21 medical imaging data onto a patient?</p> <p>22 MS. FREEMAN: Objection; form, relevance.</p>

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<p>41</p> <p>1 A I'm not sure of that. I believe so.</p> <p>2 Q All right. Looks like we've been going</p> <p>3 for almost an hour. We're about to move to</p> <p>4 another section. Is it okay if we take a quick</p> <p>5 break?</p> <p>6 A Yes.</p> <p>7 (A recess was taken.)</p> <p>8 MR. HARMER: William, can you put up</p> <p>9 Exhibit '807 1009?</p> <p>10 TECHNICIAN: One moment.</p> <p>11 (Exhibit '807 1009 was marked for</p> <p>12 identification and is attached to the transcript.)</p> <p>13 MR. HARMER: And can you give</p> <p>14 Dr. Kazanzides control?</p> <p>15 BY MR. HARMER:</p> <p>16 Q Dr. Kazanzides, what is this document?</p> <p>17 A It looks like my declaration. Let me take</p> <p>18 a quick scroll.</p> <p>19 This is the one I signed, yes.</p> <p>20 Q And this is for the '807 IPR?</p> <p>21 A Yes.</p> <p>22 Q Can you scroll down to the last page</p>	<p>43</p> <p>1 information.</p> <p>2 Q What do you think this paragraph means?</p> <p>3 A That I have, you know, accurately applied</p> <p>4 my knowledge to -- you know, to the information</p> <p>5 given, and --</p> <p>6 Q What do you mean by information given?</p> <p>7 MS. FREEMAN: Objection. I don't think</p> <p>8 Professor Kazanzides had completed his answer.</p> <p>9 THE WITNESS: Right. So the information</p> <p>10 that I have provided as exhibits to the</p> <p>11 declaration, and then I have -- in cases where</p> <p>12 I've been informed about the sort of legal basis</p> <p>13 or legal principals, I have noted that those</p> <p>14 are -- that that's information that I've been</p> <p>15 provided.</p> <p>16 Q Thank you. Who drafted the '271/'807</p> <p>17 declarations?</p> <p>18 MS. FREEMAN: Objection; form.</p> <p>19 A So the declarations are based on my</p> <p>20 analysis of the -- of the prior art and the</p> <p>21 exhibits, and I created them based on my own</p> <p>22 opinions, and I did have -- I did work with</p>
<p>42</p> <p>1 again, Page 78?</p> <p>2 Do you see the statement that reads I</p> <p>3 hereby declare that all statements made herein of</p> <p>4 my own knowledge are true and that all statements</p> <p>5 made on information and belief are believed to be</p> <p>6 true?</p> <p>7 A Yes.</p> <p>8 Q And you made a similar statement on the</p> <p>9 last page of your '271 declaration; is that right?</p> <p>10 A Yes.</p> <p>11 Q What portion of the '807 declaration did</p> <p>12 you make on information and belief?</p> <p>13 MS. FREEMAN: Objection; foundation.</p> <p>14 A Yeah, I -- I don't quite understand the</p> <p>15 question.</p> <p>16 Q I'm just curious if any of it was based on</p> <p>17 information and belief or if all of it is based on</p> <p>18 your own knowledge?</p> <p>19 MS. FREEMAN: Objection; form, foundation.</p> <p>20 A I'm struggling to see the difference</p> <p>21 between knowledge and information that you -- as</p> <p>22 far as your knowledge to, you know, analyze the</p>	<p>44</p> <p>1 counsel in format.</p> <p>2 Q How much time did you spend drafting the</p> <p>3 '271 declaration?</p> <p>4 A I don't recall the amount of time that I</p> <p>5 required.</p> <p>6 Q Can you approximate?</p> <p>7 A I don't want to just make a guess on that.</p> <p>8 Q Is it closer to two hours or 10 hours?</p> <p>9 A That's -- again, I don't know how -- what</p> <p>10 you're planning to do here, but I think that's</p> <p>11 part of a -- sort of a guessing game.</p> <p>12 Q Did you spend more than one hour?</p> <p>13 A I can certainly answer that. Yes, I spent</p> <p>14 more than one hour.</p> <p>15 Q More than one hour drafting the</p> <p>16 declaration?</p> <p>17 A Yes.</p> <p>18 Q More than two hours?</p> <p>19 A This is where I was thinking you may be</p> <p>20 going. I'm not going to get into a guessing game</p> <p>21 on this.</p> <p>22 Q So you have no idea; is that right?</p>

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<p style="text-align: right;">45</p> <p>1 A That's --</p> <p>2 MS. FREEMAN: Objection; form.</p> <p>3 A That's not what I said. I just said I</p> <p>4 don't want to make a -- I'm under oath to provide,</p> <p>5 you know, truthful answers, and so I don't want to</p> <p>6 make an incorrect answer on this.</p> <p>7 Q Can you make a truthful guess?</p> <p>8 MS. FREEMAN: Objection. Are you calling</p> <p>9 for the witness to guess under oath?</p> <p>10 MR. HARMER: I'm asking the witness to</p> <p>11 provide an honest, truthful estimate of the time</p> <p>12 he spent drafting the declarations that he signed.</p> <p>13 THE WITNESS: I really don't want to make</p> <p>14 a guess on that.</p> <p>15 BY MR. HARMER:</p> <p>16 Q Are you incapable of making an estimate?</p> <p>17 A I -- I don't -- I think that I -- I would</p> <p>18 say yes. I don't feel comfortable making an</p> <p>19 estimate.</p> <p>20 Q What assistance did you receive drafting</p> <p>21 the '271 and '807 declarations?</p> <p>22 A I would like to have a discussion with my</p>	<p style="text-align: right;">47</p> <p>1 Q And what are those? Well, strike that.</p> <p>2 How long did you -- how much time did you</p> <p>3 spend reviewing these documents?</p> <p>4 A It was a lot of time, but I -- again, I</p> <p>5 don't know the -- I can't really guess a specific</p> <p>6 number.</p> <p>7 Q Are you able to provide an estimate?</p> <p>8 A Are you asking about the exhibits on the</p> <p>9 '807 or the '271?</p> <p>10 Q '807. Can you scroll to Page 13 in your</p> <p>11 declaration?</p> <p>12 A I may not have control.</p> <p>13 MR. HARMER: William, can you give</p> <p>14 Dr. Kanzanzides control, please?</p> <p>15 THE WITNESS: Okay. Page -- this one.</p> <p>16 Okay.</p> <p>17 Q I thought it was 13. It's the page that</p> <p>18 has the exhibits listed. Can you find that?</p> <p>19 A I think it's 7, if I recall. Let's see.</p> <p>20 Q Thank you, yes. Page 7 of the</p> <p>21 declaration, Page 13 of the document, Adobe</p> <p>22 document, it looks like.</p>
<p style="text-align: right;">46</p> <p>1 legal representative regarding privilege on that.</p> <p>2 MS. FREEMAN: Okay. We're going off the</p> <p>3 record.</p> <p>4 MR. HARMER: Wait, he can't go off the</p> <p>5 record right now.</p> <p>6 MS. FREEMAN: Absolutely we can. He wants</p> <p>7 to confer on privilege. That's absolutely</p> <p>8 appropriate.</p> <p>9 MR. HARMER: I'm not asking him to</p> <p>10 disclose any privileged information.</p> <p>11 MS. FREEMAN: It doesn't matter. He has a</p> <p>12 privilege question, and we will confer on that.</p> <p>13 We're going off the record.</p> <p>14 THE WITNESS: So I guess, hold on. I need</p> <p>15 to find my mute here.</p> <p>16 (A recess was taken.)</p> <p>17 BY MR. HARMER:</p> <p>18 Q All right. Dr. Kanzanzides, what</p> <p>19 documents did you read before you prepared the</p> <p>20 '807 declaration?</p> <p>21 A Okay. I read the documents that are in</p> <p>22 the exhibits.</p>	<p style="text-align: right;">48</p> <p>1 A Okay. I get it. Mm-hmm.</p> <p>2 Q So how much time did you spend</p> <p>3 reviewing -- or an estimate -- strike that.</p> <p>4 MS. FREEMAN: Counsel, you think asking</p> <p>5 the same question again and again -- clearly these</p> <p>6 questions are annoying the witness. He's answered</p> <p>7 them in multiple -- multiple times, and you're</p> <p>8 just repeating and repeating them. So I would ask</p> <p>9 you to move on.</p> <p>10 MR. HARMER: His last response was whether</p> <p>11 I was referring to the exhibits in his</p> <p>12 declaration, whether it was the '807 or the '271.</p> <p>13 We've directed him to Page 13 or Page 7 of the</p> <p>14 declaration that has the list of exhibits, and now</p> <p>15 I would like him to provide an estimate if he is</p> <p>16 able of the amount of time he's spent reviewing</p> <p>17 these exhibits.</p> <p>18 THE WITNESS: Okay. That is a somewhat</p> <p>19 different question than previous where you asked</p> <p>20 about time spent drafting.</p> <p>21 BY MR. HARMER:</p> <p>22 Q Correct.</p>

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<p style="text-align: right;">49</p> <p>1 A Mm-hmm. So I can give very -- yeah, I can 2 give an estimate, sort of crude estimate of some 3 of these. The actual -- for a patent or patent 4 application, those are quite lengthy. So each one 5 of those, at least a couple of hours. Some of the 6 other -- well, the paper, Exhibit 1003, is one of 7 my papers. So that really didn't take much time. 8 Yeah. So these look like mostly -- yes, 9 they're mostly patent applications, so they were 10 quite -- took quite a bit of time to read those. 11 Q And how did you come by these documents? 12 A The documents -- you're talking about the 13 exhibits shown on this page? 14 Q I am. 15 A Yes. So other than the ones that I 16 generated, including, of course, my CV, they were 17 provided -- they were identified by counsel. 18 Q Which exhibits did you provide? 19 A Let's see. I provided -- well, 1010. 20 Let's see. I believe the best of my recollection 21 they have already located or provided 1003, and I 22 didn't have to provide that.</p>	<p style="text-align: right;">51</p> <p>1 A Yes. 2 Q It says in my opinion, a person of 3 ordinary skill in the art at the relevant time 4 would have understood the Claims 1 through 7. 5 Do you see that? 6 A Yes. 7 Q What did you mean by the 8 term "anticipates"? 9 A That somebody of ordinary skill in the art 10 would -- after reading the publication by Jones, 11 would be capable of implementing the -- what is 12 laid out in Claims 1 through 7 of the '807 patent. 13 Q Is that based on your own understanding of 14 anticipation or based on understanding that was 15 communicated to you? 16 A I believe both. 17 Q Are you an attorney? 18 A No. 19 Q Are you providing a legal opinion about 20 anticipation? 21 MS. FREEMAN: Objection; form. 22 A Yeah. I'm -- did you -- could you restate</p>
<p style="text-align: right;">50</p> <p>1 Q And who do you mean by "they"? 2 A Counsel. Sorry. 3 Q Thank you. What is Exhibit 1002? 4 A That's the file history. 5 Q Is it the complete file history? 6 A I'm sorry, no. It's excerpts of the file 7 history. 8 Q And this is the file history of the '807 9 patent? 10 A Yes, yes. It had -- so prior application 11 numbers. 12 Q Did you select those excerpts? 13 A No. 14 Q And who did? 15 A Counsel. 16 Q Can you please scroll to the document 17 number, not the number on the bottom of each page, 18 Page 27? You can type it in where it says 13. 19 Wow, that's still not it. I apologize. 20 Paragraph 58. 21 Thank you. 22 Paragraph 58. Do you see that?</p>	<p style="text-align: right;">52</p> <p>1 the question? 2 Q Yeah. Are you providing a legal opinion? 3 MS. FREEMAN: Objection; form. 4 A I'm providing my opinion in a legal 5 proceeding. 6 Q I'm going to ask one more question about 7 the documents we reviewed, and I apologize. How 8 long did you review those documents? 9 MS. FREEMAN: Objection; form. 10 A Could you please clarify? 11 Q Yeah. The exhibits that we're looking at 12 in the '807 declaration, when did you review 13 those? 14 MS. FREEMAN: Objection; form. 15 A So I reviewed them prior to writing the 16 declaration, and I've reviewed them subsequently 17 as well. 18 Q When did you draft the declaration? 19 A It was around the time when I signed it, 20 which was in October of 2022. 21 Q Thank you. 22 MR. HARMER: William, can you put up '271</p>

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<p>53</p> <p>1 Exhibit 1012?</p> <p>2 (Exhibit '271 1012 was marked for</p> <p>3 identification and is attached to the transcript.)</p> <p>4 MR. HARMER: And can you give me control,</p> <p>5 please?</p> <p>6 BY MR. HARMER:</p> <p>7 Q I'm just going to quickly ask some other</p> <p>8 questions about the '271 declaration, if that's</p> <p>9 okay.</p> <p>10 A Yes.</p> <p>11 Q On Page 7 of your declaration, a table</p> <p>12 starts and finishes on the next page and shows</p> <p>13 exhibits that you reference in the '271</p> <p>14 declaration. Do you see that?</p> <p>15 A Yes.</p> <p>16 Q Can you give an estimate about how much</p> <p>17 time you spent reviewing these documents?</p> <p>18 MS. FREEMAN: Objection; form.</p> <p>19 A So as with the other declaration, the -- a</p> <p>20 rather crude estimate on the patent applications</p> <p>21 or publications is a couple hours per, for each</p> <p>22 one, that is.</p>	<p>55</p> <p>1 to?</p> <p>2 A I mentioned in my declaration that I --</p> <p>3 what I had done, so I believe it was at least</p> <p>4 Exhibit 1007.</p> <p>5 Q Thank you. Can you look at Exhibit 1003?</p> <p>6 A Are you --</p> <p>7 MS. FREEMAN: Objection to form.</p> <p>8 Q Just in the table.</p> <p>9 A Okay.</p> <p>10 Q Why did you include Exhibit 1003 in this</p> <p>11 table?</p> <p>12 A These were excerpts of the file history,</p> <p>13 and they are referred to in the declaration.</p> <p>14 Q Can you show me where Exhibit 1003 is</p> <p>15 referred to in the '271 declaration?</p> <p>16 A I mean, I could probably get there faster</p> <p>17 by searching. Do I have --</p> <p>18 Q Please do.</p> <p>19 A All right. So -- all right. That's</p> <p>20 there.</p> <p>21 All right. I guess it's not searchable.</p> <p>22 I apologize for not including the exhibit number</p>
<p>54</p> <p>1 The technical papers such as 1009 is --</p> <p>2 would, I'm guessing, be closer to the order of an</p> <p>3 hour.</p> <p>4 Q Thank you.</p> <p>5 MR. HARMER: William, can you give</p> <p>6 Dr. Kazanzides control so he can look at Page 8,</p> <p>7 too?</p> <p>8 TECHNICIAN: You now have control.</p> <p>9 THE WITNESS: Thank you.</p> <p>10 BY MR. HARMER:</p> <p>11 Q And which of these exhibits did you</p> <p>12 provide?</p> <p>13 A I provided 1013. Yes, that's what I</p> <p>14 provided.</p> <p>15 Q And the remaining exhibits were provided</p> <p>16 to you by counsel?</p> <p>17 A Yes.</p> <p>18 Q Can you look at exhibit --</p> <p>19 A I'd like to clarify that in cases of</p> <p>20 online documents, I also verified, you know, that</p> <p>21 I could access them and download them myself.</p> <p>22 Q What online documents are you referring</p>	<p>56</p> <p>1 here, but this is where it's referring to claims</p> <p>2 from the prior applications. So Paragraph 31,</p> <p>3 Paragraph 32.</p> <p>4 Q Paragraph 31 is referring to which</p> <p>5 application number?</p> <p>6 A 15 or 74702.</p> <p>7 Q And what application number is referenced</p> <p>8 in Paragraph 32?</p> <p>9 A I see the same one.</p> <p>10 Q Can you scroll back up to the table?</p> <p>11 A You said it was on Page 13 of the PDF.</p> <p>12 Q And which exhibit refers to the '702</p> <p>13 application?</p> <p>14 A I'm sorry. Was that number previously</p> <p>15 '702?</p> <p>16 Q You just said --</p> <p>17 A I see what you're saying. It's 104.</p> <p>18 Okay.</p> <p>19 Q So 1004. So Exhibit 1003 is not mentioned</p> <p>20 in your declaration except to say that you had</p> <p>21 read it; is that correct?</p> <p>22 A Okay.</p>

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<p>57</p> <p>1 MS. FREEMAN: Objection; form, foundation.</p> <p>2 A I would -- I would need to review the</p> <p>3 declaration to confirm if that's the case, but</p> <p>4 based on what we have seen so far, that appears to</p> <p>5 be possible.</p> <p>6 Q You did a search for Exhibit 100 --</p> <p>7 A I did, yeah.</p> <p>8 Q And you were unable to find a reference?</p> <p>9 MS. FREEMAN: Professor Kanzanzides and</p> <p>10 Mr. Harmer, you -- as we said at the beginning,</p> <p>11 it's important to get a clear record, so we need</p> <p>12 to have questions separate from answers. So I'm</p> <p>13 just going to caution --</p> <p>14 THE WITNESS: Okay.</p> <p>15 MS. FREEMAN: -- that we're getting to be</p> <p>16 a mess right now.</p> <p>17 MR. HARMER: All right. Let's move on.</p> <p>18 William, you can take that down. Thank you.</p> <p>19 BY MR. HARMER:</p> <p>20 Q Dr. Kanzanzides, what does the term three</p> <p>21 dimensional mean to you?</p> <p>22 MS. FREEMAN: Objection; form.</p>	<p>59</p> <p>1 MR. HARMER: Exhibit, can you pull up '271</p> <p>2 Exhibit 1012? And give Dr. Kanzanzides control.</p> <p>3 Q And can you scroll to Paragraph 30?</p> <p>4 Actually -- well. So from Paragraph 30, quote,</p> <p>5 from the '271 patent, the '271 patent states 3D</p> <p>6 data may include but is not limited to MRI images,</p> <p>7 computerized tomography, CT scan images, x-ray</p> <p>8 images --</p> <p>9 A Mm-hmm.</p> <p>10 Q And can you scroll to Paragraph 31? And</p> <p>11 scroll further down, please.</p> <p>12 In Paragraph 32, you conclude with in the</p> <p>13 foregoing, in my opinion, the person of ordinary</p> <p>14 skill in the art could understand that 73 data may</p> <p>15 be one or more of any of the foregoing types of</p> <p>16 images.</p> <p>17 Did I read that right?</p> <p>18 A Yes.</p> <p>19 Q So in your opinion, is an x-ray an example</p> <p>20 of 3D data?</p> <p>21 A I would --</p> <p>22 MS. FREEMAN: Objection; form.</p>
<p>58</p> <p>1 A Okay. That actually, depending on</p> <p>2 context, has different meanings. One meaning is</p> <p>3 that it has -- if you're thinking of a point, it</p> <p>4 has three coordinates, X, Y, and Z.</p> <p>5 If you're thinking of an object, it could</p> <p>6 be also considered sort of the sixth dimensional</p> <p>7 or the position and orientation of the object.</p> <p>8 That's still a 3D object, but its orientation --</p> <p>9 basically a combination of position and</p> <p>10 orientation has 6 degrees of freedom.</p> <p>11 Q Is it true that something is three</p> <p>12 dimensional if it has the dimension of depth as</p> <p>13 well as width and height?</p> <p>14 MS. FREEMAN: Objection; form.</p> <p>15 A Generally, yes.</p> <p>16 Q Do you remember in your '271 declaration</p> <p>17 you say that x-rays, MRI images, CT images, among</p> <p>18 others, are examples of 3D data?</p> <p>19 MR. HARMER: Objection; foundation, form.</p> <p>20 A I want to -- check exactly what was</p> <p>21 written there if that's the wording that I used.</p> <p>22 Q Sure.</p>	<p>60</p> <p>1 A Yeah. I would clarify that it states</p> <p>2 x-ray images. So multiple x-ray images would be</p> <p>3 considered 3D data.</p> <p>4 Q Can you explain that more?</p> <p>5 MS. FREEMAN: Objection; form.</p> <p>6 Q How can multiple x-ray images be</p> <p>7 considered 3D data?</p> <p>8 A Well, you can -- as one example, you can</p> <p>9 have a biplane x-ray where you take x-ray images</p> <p>10 from orthogonal directions, and based on that you</p> <p>11 can get 3D -- well, 3D visualization or 3D</p> <p>12 point -- identify 3D points in the anatomy, as one</p> <p>13 example.</p> <p>14 Q What is a computerized tomography or CT</p> <p>15 scan?</p> <p>16 A It's a 3D image that is reconstructed from</p> <p>17 multiple, essentially, x-ray images.</p> <p>18 Q Can you explain how a CT scan is</p> <p>19 generated?</p> <p>20 A Sure. There's a source providing the</p> <p>21 x-rays in a detector, and they both rotate around</p> <p>22 the patient and translate getting multiple sort of</p>

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<p>61</p> <p>1 raw x-ray images from a lot of different 2 orientations over some, you know, volume. Could 3 be whole body CT; could be just a limited section 4 of the body, and then they use different 5 algorithms to reconstruct the 3D position or the 6 3D coordinates -- or create 3D voxels of the 7 internal anatomy of the patient. 8 Q How do they create the 3D voxels of the 9 patient? 10 A So this is not my area of expertise, but 11 there's different reconstruction techniques. 12 Essentially what you're getting is the lines 13 through the patient, and based on the number of 14 the -- having lots of different lines that 15 intersect, you can then through mathematical -- 16 usually iterative technique. There's one 17 technique called, ART algebraic reconstruction 18 technique, I think might be what it stands for. 19 It basically then calculates the density of the 20 material that that ray -- that that -- at that 21 position, the X/Y/Z position. 22 So it's often stored -- a CT scan, if you</p>	<p>63</p> <p>1 Q Are each of those individual slices, are 2 those 2D slices or 3D slices? 3 MS. FREEMAN: Objection; form and 4 foundation. 5 A Okay. They are typically considered 2D in 6 that they provide 2D information. In -- in 7 reality, they do have an associated depth or 8 thickness to them, but there's no information 9 provided along that direction. 10 Q In the slice itself? 11 A Yeah. You -- essentially you could think 12 of it like a picture where you have -- you know, 13 you can see things in sort of the horizontal and 14 vertical directions, X and Y, but there's -- the 15 picture has -- you know, pictures are -- you can 16 think of a picture. You print out a picture as a 17 3D object because the paper has a thickness to it, 18 but in reality, there's no information provided in 19 that depth direction. It's still really a 2D 20 image. 21 Q So you would agree that each slice 22 provides X and Y information but no Z information?</p>
<p>62</p> <p>1 look at the -- sort of the final reconstructed 2 image, it looks like an x-ray image of these axial 3 images, but none of those -- those are all 4 reconstructed. They're not raw x-ray images. 5 Q So they're reconstructed stack of 2D 6 slices? 7 A Yeah. It's like a stack of pancakes 8 through the patient, a stack of 2D slices. 9 Q And they look like x-rays at each -- 10 A They look -- yeah, they look like x-rays 11 in terms of, you know, how they -- how they 12 appear. But they're not -- it's not exactly the 13 same thing as an x-ray. 14 Q Are the slices 2D or 3D? 15 MS. FREEMAN: Objection; form. 16 A Yes. Could you please specify? 17 Q Yeah. You said that the output of a CT 18 scan is like a stack of pancakes? 19 A Yeah. 20 Q A stack of 2D x-ray images. They're not 21 x-ray images, but they look like x-ray images. 22 A Right.</p>	<p>64</p> <p>1 MS. FREEMAN: Objection; form, foundation. 2 A So it provides X and Y information about, 3 yes, the anatomy. There's -- Z information is 4 common to the slice. There's a -- you know, 5 all -- because this is a stack, you know, you know 6 where each slice is in Z, but within that slice, 7 there's no variation along that dimension. 8 Q So what's the best way to identify Z 9 information from a CT scan? 10 A You -- it's based -- so, again, I'd like 11 to clarify that the common -- one common 12 convention is to consider Z being the axis along 13 which the slices are arranged, but that's not the 14 only one. In some cases, I've seen that's the X 15 axis. 16 But assuming a convention where each slice 17 could be considered in an X/Y plane, it -- each 18 slice has a single Z coordinate saying that within 19 the -- you know, within -- relative to the other 20 slices, this is where it was. Let's say this 21 slice is a millimeter away from the other slice 22 along that core -- along Z.</p>

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<p>65</p> <p>1 Q And how would -- how would a person of</p> <p>2 ordinary still in the art extract that missing Z</p> <p>3 data, right, the data that you don't see in one</p> <p>4 slice, how would you identify Z information using</p> <p>5 CT scan data if it's primarily a stack of 2D</p> <p>6 slices?</p> <p>7 MS. FREEMAN: Objection; foundation, form.</p> <p>8 A Okay. So the -- sort of the</p> <p>9 traditional -- or let's say the first approach</p> <p>10 people did was the scroll thing on a computer</p> <p>11 screen, or even on a light board, look at, you</p> <p>12 know, each slice one by one in sequence and try to</p> <p>13 identify things that way. That's -- that's kind</p> <p>14 of the oldest method.</p> <p>15 Then you can also create 3D volumes as we</p> <p>16 talked about. You know, these meshes. You're</p> <p>17 saying algorithms such as marching cubes to create</p> <p>18 a 3D model of surfaces identified or features</p> <p>19 identified in the CT, and then you can visualize</p> <p>20 them however you would visualize a 3D object,</p> <p>21 whether it's on a computer screen, by sort of</p> <p>22 rotating it around, holographic display, 3D</p>	<p>67</p> <p>1 Q Just a couple more questions,</p> <p>2 Dr. Kanzanzides. How many of your current or post</p> <p>3 students work at Medivis?</p> <p>4 A How many of -- I'm sorry, I didn't hear</p> <p>5 the full question.</p> <p>6 Q How many of your students work at Medivis</p> <p>7 or have worked at Medivis?</p> <p>8 A Okay.</p> <p>9 MS. FREEMAN: Form.</p> <p>10 A None of my current students are working or</p> <p>11 have worked at Medivis. To the best of my</p> <p>12 knowledge, two of my students after graduation</p> <p>13 have worked there and may still work there.</p> <p>14 Q Are you aware of any other Johns Hopkins</p> <p>15 students that work at Medivis?</p> <p>16 A No, I'm not. There may be, but I'm not</p> <p>17 aware.</p> <p>18 Q And do you know whether Johns Hopkins has</p> <p>19 a business relationship at all with Medivis?</p> <p>20 A I'm not aware of any business</p> <p>21 relationship.</p> <p>22 Q Okay. I don't think I have any further</p>
<p>66</p> <p>1 display with shutter glasses, whatever.</p> <p>2 Q And can you explain what a magnetic</p> <p>3 resonance imaging or MRI scan is?</p> <p>4 MS. FREEMAN: Objection; form.</p> <p>5 A Yes. It is an imaging device that creates</p> <p>6 three dimensional images of patient anatomy.</p> <p>7 Q Is it true that it produces slices similar</p> <p>8 to those of a CT scan in form? It produces a</p> <p>9 series of 2D slices?</p> <p>10 MS. FREEMAN: Objection; form.</p> <p>11 A The -- yes. When you get information or</p> <p>12 images from an MRI scanner, they're typically</p> <p>13 arranged as essentially a stack of 2D slices.</p> <p>14 Q Give me, like, five minutes, and then I'll</p> <p>15 have just a few more questions, and we'll be close</p> <p>16 to done, I think. Does that work?</p> <p>17 Is that okay?</p> <p>18 A So break?</p> <p>19 Q Five minutes?</p> <p>20 A Okay.</p> <p>21 (A recess was taken.)</p> <p>22 BY MR. HARMER:</p>	<p>68</p> <p>1 questions.</p> <p>2 MS. FREEMAN: Medivis has no redirect, so</p> <p>3 I believe this -- the deposition of Professor</p> <p>4 Kanzanzides is completed.</p> <p>5 COURT REPORTER: Thank you. Attorney</p> <p>6 Harmer, would you like a copy of this transcript?</p> <p>7 MR. HARMER: I would, and can we get</p> <p>8 expedited delivery, please?</p> <p>9 COURT REPORTER: Sure. I can have a final</p> <p>10 delivery for you tomorrow or later today,</p> <p>11 whichever is better for you?</p> <p>12 MR. HARMER: Tomorrow's fine.</p> <p>13 COURT REPORTER: Sure. And, Attorney</p> <p>14 Freeman, would you like a copy of this transcript?</p> <p>15 MS. FREEMAN: Yes.</p> <p>16 (Off the record at 11:56 a.m.)</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22 PROCEEDINGS</p>

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<p>69</p> <p>1 PETER KAZANZIDES, 2 was called, and having been duly sworn, 3 testified as follows: 4 EXAMINATION 5 BY MR. HARMER: 6 Q Good morning, Dr. Kazanzides. 7 A Good morning. 8 Q Can you please state your full name and 9 address for the record? 10 A Peter Kazanzides, 10 Forest Ridge Ct, 11 Lutherville, Maryland 21093. 12 Q Thank you. My name is Joseph Harmer. I'm 13 an attorney for Novarad Corporation, and I want to 14 thank you for your time this morning. 15 Have you ever had your deposition taken 16 before? 17 A No, I have not. 18 Q One of the objectives of a deposition is 19 to create a clean record. If we all talk at the 20 same time, we make it difficult for our court 21 reporter. It may seem like a small thing, but if 22 we can all try not to talk at the same time, it</p>	<p>71</p> <p>1 A Yes. 2 Q Are there any reasons why you can't give 3 truthful testimony today? 4 A No. 5 Q And you're not aware of any illness or 6 medication that can affect your ability to provide 7 truthful testimony? 8 A That's correct. 9 Q Is there anybody in the room with you 10 today? 11 A No. 12 Q Do you understand that no one can assist 13 you in answering questions? 14 A Yes. 15 Q Are you using any device or software to 16 receive assistance answering questions? 17 A No. 18 Q And you agree not to accept any 19 assistance -- 20 A Excuse me. I want to exit my email. 21 Sorry for interrupting. I forgot to do that. 22 In fact, I'll close everything on this</p>
<p>70</p> <p>1 will really help. 2 Will you try to wait and respond until 3 after I'm done asking a question? 4 A Yes. 5 Q Thank you. And I will try not to ask 6 another question until you've finished answering. 7 It's also important to provide verbal 8 responses. Other responses including a head nod 9 or other gestures are more difficult to record, as 10 you can imagine. Does that make sense? 11 A Yes. 12 Q And there may be times when Ms. Freeman, 13 Medivis' counsel, might make an objection. If 14 that happens, please wait until the objection is 15 made, and then go ahead and answer to the best of 16 your ability unless you are specifically 17 instructed not to answer. Can you do that? 18 A Yes. 19 Q Thank you. And you understand that you 20 are under oath today to tell the truth the same as 21 if you were in front of a judge and a jury in a 22 courtroom?</p>	<p>72</p> <p>1 computer except for Zoom. Sorry. I meant to do 2 that beforehand. 3 Okay. There we go. 4 Q Thank you. 5 A Nothing running. 6 Q And you agree not to accept any assistance 7 answering questions today? 8 A Yes. 9 Q If you don't understand a question, please 10 let me know. Otherwise I will assume that you 11 understood the question. Is that fair? 12 A Yes. 13 Q Have you ever given testimony at trial 14 before? 15 A No. 16 Q Have you ever provided a declaration in an 17 inter partes proceeding other than the two IPR 18 proceedings we're currently involved in? 19 A No. 20 Q Rather than say inter partes review, I may 21 use IPR. Do you understand that IPR stands for 22 inter partes review?</p>

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<p>73</p> <p>1 A Yes.</p> <p>2 Q You've been retained by Medivis, Inc., to</p> <p>3 provide expert testimony in connection with two</p> <p>4 IPR proceedings; correct?</p> <p>5 A Yes.</p> <p>6 Q One is related to U.S. Patent No.</p> <p>7 10,945,807; is that right?</p> <p>8 A Yes.</p> <p>9 Q For clarification, is it okay if we refer</p> <p>10 to that patent as the '807 patent?</p> <p>11 A Yes.</p> <p>12 Q And is it okay if we refer to that IPR</p> <p>13 proceeding as the '807 IPR?</p> <p>14 A Yes.</p> <p>15 Q The other IPR proceeding is U.S. -- pardon</p> <p>16 me. Yes, the other IPR proceeding is related to</p> <p>17 U.S. Patent No. 11,004,271; is that right?</p> <p>18 A That's right.</p> <p>19 Q And may we refer to that patent as the</p> <p>20 '271 patent and that IPR proceeding as the '271</p> <p>21 IPR?</p> <p>22 A Yes.</p>	<p>75</p> <p>1 to you?</p> <p>2 A I'm not certain of who it was, but I</p> <p>3 believe it would have been -- I don't recall his</p> <p>4 full name, but one of -- one of the founders of</p> <p>5 the company.</p> <p>6 Q Have you provided any other expert</p> <p>7 services to Medivis?</p> <p>8 A No.</p> <p>9 Q Do you have any prior relationship with</p> <p>10 the founders of Medivis?</p> <p>11 A I've spoken to them, but I don't have any</p> <p>12 prior relationship with them.</p> <p>13 Q Have you spoken to them about either of</p> <p>14 the '807 and '271 IPRs?</p> <p>15 A Prior to when they contacted me about it,</p> <p>16 no.</p> <p>17 Q Have you had any business dealings at all</p> <p>18 with Medivis?</p> <p>19 A I am not clear what you mean by business</p> <p>20 dealings.</p> <p>21 Q Have you conducted business with Medivis</p> <p>22 in any way?</p>
<p>74</p> <p>1 Q You've provided a declaration in each of</p> <p>2 the '807 and '271 IPR proceedings. Can we refer</p> <p>3 to those as the '807 and '271 declarations</p> <p>4 respectively?</p> <p>5 A Yes.</p> <p>6 Q Do you understand that you're here today</p> <p>7 to provide testimony with respect to each of the</p> <p>8 '807 and '271 declarations?</p> <p>9 A Yes.</p> <p>10 Q Thank you. When were you first engaged to</p> <p>11 provide services in connection with the '807 and</p> <p>12 '271 IPR proceedings?</p> <p>13 A I don't recall the exact date, but it was</p> <p>14 sometime in late 2022. I'm guessing somewhere</p> <p>15 August -- between August and October.</p> <p>16 Q And who engaged you to perform those</p> <p>17 services?</p> <p>18 A Who engaged me? The company Medivis in</p> <p>19 conjunction with McCarter & English.</p> <p>20 Q Did Medivis reach out to you directly?</p> <p>21 A Yes, that's my recollection.</p> <p>22 Q Do you remember who at Medivis reached out</p>	<p>76</p> <p>1 A I would say no. Clarify: I did once</p> <p>2 contact them about possibly partnering with a</p> <p>3 grant proposal, but they declined, so I would not</p> <p>4 consider that a business dealing.</p> <p>5 Q And what was the subject of the grant?</p> <p>6 A It was -- it was a DOD solicitation on,</p> <p>7 like, 5D for telemedicine, along those lines.</p> <p>8 Q Thank you. Did it have anything to do</p> <p>9 with augmented reality?</p> <p>10 A The grant?</p> <p>11 Q Yes.</p> <p>12 A So the -- the DOD grant would have</p> <p>13 involved augmented reality.</p> <p>14 Q In what way?</p> <p>15 A My best recollection is that it involved</p> <p>16 telementoring of having a -- basically remote</p> <p>17 assistance.</p> <p>18 Q Can you explain to me what that is? I'm</p> <p>19 sorry. I didn't understand.</p> <p>20 A It's hard for me to say because I did go</p> <p>21 ahead with another entity and we did refine the</p> <p>22 grant further. So really at the time I approached</p>

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<p style="text-align: right;">77</p> <p>1 Medivis, it was rather vague. The DOD was just 2 looking for ways to use 5G to enable long-distance 3 sort of telemedicine. 4 So there weren't really any specific plans 5 at the time at which I contacted Medivis, and as I 6 said, they have declined to participate. 7 Q When was the first time you reached out to 8 Medivis about the grant proposal? 9 A It was a couple years ago. I don't 10 recall. 11 Q Can you approximate? A couple years, you 12 said? 13 A Yeah. Right. I can't really pin it down. 14 Within the last five years, anyway. 15 Q And when was the last time you spoke to 16 them about the proposal? 17 A About the same time. It really was a very 18 brief "are you interested or no," that kind of 19 thing. 20 Q Why did you reach out to them in the first 21 place? How did you know about them? Sorry. 22 Those are two questions. Let me ask it --</p>	<p style="text-align: right;">79</p> <p>1 A Not since beginning this process, no. 2 Q When was the last time you spoke with them 3 before this process began? 4 MS. FREEMAN: Objection. 5 THE WITNESS: Okay. Could you -- 6 Q Yes, I'll rephrase the question. 7 A Yeah. 8 Q When was the last time you spoke to anyone 9 at Medivis prior to being retained as an expert in 10 these IPR proceedings, the '271 and '807 IPRs? 11 A It was probably in May of 2021. 12 Q And what was the purpose of that contact 13 with Medivis in May of 2021? 14 A Yeah. My student attended the graduation 15 ceremony to receive his PhD, the one who's 16 employed at Medivis. 17 Q This is Long Qian? 18 A Yes. 19 MR. HARMER: William, can you please put 20 up Exhibit '807 1010? 21 TECHNICIAN: Sure. One moment. 22 (Exhibit '807 1010 was marked for</p>
<p style="text-align: right;">78</p> <p>1 A Thank you -- thank you for clarifying. 2 Q How did you know about Medivis before you 3 reached out to them? 4 A One of my students who graduated is 5 employed there. 6 Q Is he still your student? 7 A No, no. He had graduated. 8 Q At the time. I see. 9 A He graduated, and then he -- yeah, he took 10 a position there at some point after he graduated. 11 It was not his first position after graduation. 12 Q Does that student still work for Medivis? 13 A To the best of my knowledge, yes. 14 Q What is that student's name? 15 A Long Qian. Long -- 16 Q Spell that. Thank you. 17 A L-O-N-G Q-I-A-N. 18 Q Have you spoken with anyone at Medivis 19 specifically about your deposition today? 20 A No. 21 Q And have you had any other conversations 22 with anyone at Medivis?</p>	<p style="text-align: right;">80</p> <p>1 identification and is attached to the transcript.) 2 BY MR. HARMER: 3 Q Dr. Kazanzides, is this a copy of the 4 curriculum vitae or CV that you attached to your 5 '807 declaration? 6 A Yes. At least the first one or two pages 7 that you've shown, yes. 8 MR. HARMER: William, can you give 9 Dr. Kazanzides control so he can scroll through 10 it real quick? 11 TECHNICIAN: No problem. 12 THE WITNESS: All right. 13 TECHNICIAN: You now have control. 14 THE WITNESS: Okay. Okay, this works. 15 Yes, this is my entire CV. 16 BY MR. HARMER: 17 Q Did you attach the same document to your 18 '271 declaration as Exhibit 1013? 19 A Let me check the exhibit number. Which -- 20 which -- I'm sorry, which did you ask about? Was 21 it attached to which one? 22 Q This one that we're looking at now is your</p>

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<p>81</p> <p>1 '807 declaration.</p> <p>2 A Okay.</p> <p>3 Q I just want to make sure it's the same CV</p> <p>4 you attached to the '271 declaration, and it was</p> <p>5 Exhibit 1013.</p> <p>6 A Okay. In my notes, it's the same as</p> <p>7 Exhibit 1010.</p> <p>8 Q '807 is Exhibit 1010?</p> <p>9 A That is my -- that is what my notes say.</p> <p>10 Q And for the '271 declaration, what exhibit</p> <p>11 is it?</p> <p>12 A '271 -- 1013.</p> <p>13 Q Is this CV current?</p> <p>14 A I have the date on the bottom. It is</p> <p>15 current as of that date.</p> <p>16 Q July 24th, 2022?</p> <p>17 A Yes.</p> <p>18 Q Is there anything that you would like to</p> <p>19 add to it?</p> <p>20 A There's not any significant change. I</p> <p>21 probably have a few more publications and some</p> <p>22 changes in sponsored research, but I don't think</p>	<p>83</p> <p>1 an employee at Johns Hopkins since 2002; is that</p> <p>2 right?</p> <p>3 A Yes.</p> <p>4 Q Did you speak permission from Johns</p> <p>5 Hopkins before you were retained as an expert</p> <p>6 witness in these IPR proceedings?</p> <p>7 A The process at Johns Hopkins is that we</p> <p>8 don't seek permission in advance, but we submit</p> <p>9 a -- what's it called, a conflict of interest</p> <p>10 disclosure, and that gets reviewed and approved.</p> <p>11 Q Who reviews it?</p> <p>12 A The process. I don't have a name as to</p> <p>13 who reviews it, but someone at the -- at Johns</p> <p>14 Hopkins reviews it.</p> <p>15 Q And what's the purpose of the conflict of</p> <p>16 interest check?</p> <p>17 A Well, there's several goals. One is</p> <p>18 that -- you know, they want to make sure that what</p> <p>19 you're doing is not -- well, some of the concerns</p> <p>20 they have when they review conflict of interest</p> <p>21 disclosures is whether you could abuse your</p> <p>22 position of authority over a student. For</p>
<p>82</p> <p>1 that's extremely important to add.</p> <p>2 Q You're currently a research professor at</p> <p>3 Johns Hopkins University?</p> <p>4 A Yes.</p> <p>5 Q Do you have full confidence in a college</p> <p>6 that doesn't know how to spell John? I'm just</p> <p>7 joking.</p> <p>8 Who said that?</p> <p>9 A I'm sorry. Who said what?</p> <p>10 Q Do you remember who said "I don't have</p> <p>11 full confidence in a college that doesn't know how</p> <p>12 to spell John"?</p> <p>13 A I mean, you said it; right?</p> <p>14 Q It's a famous quote from Mark Twain. It's</p> <p>15 on Johns Hopkins' website. I just thought it was</p> <p>16 funny.</p> <p>17 A It's on the website?</p> <p>18 Q It is. It's not funny. I apologize. Bad</p> <p>19 joke.</p> <p>20 A Okay. It's good to break the ice, though.</p> <p>21 Q Yeah, yeah.</p> <p>22 All right. So it looks like you've been</p>	<p>84</p> <p>1 example, if you do consulting work and you have</p> <p>2 your students do the work and get paid for it,</p> <p>3 that would be a bad case.</p> <p>4 They also look for conflict of interest,</p> <p>5 conflict of commitment, factors such as that.</p> <p>6 Q On Page 2 of your CV, you state that</p> <p>7 you've done research in augmented reality</p> <p>8 head-mounted displays. What does that research</p> <p>9 entail?</p> <p>10 A So --</p> <p>11 MS. FREEMAN: Objection; foundation.</p> <p>12 THE WITNESS: I'm sorry. Was there --</p> <p>13 MS. FREEMAN: I just said objection;</p> <p>14 foundation. Feel free to answer.</p> <p>15 THE WITNESS: Okay.</p> <p>16 So I've done research both in sort of</p> <p>17 fundamental technology involving augmented reality</p> <p>18 displays. For example, calibration of optical</p> <p>19 see-through head-mounted displays.</p> <p>20 I have done applications in the use of</p> <p>21 augmented reality -- not necessarily with</p> <p>22 head-mounted displays, but with different kinds of</p>

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<p style="text-align: right;">85</p> <p>1 display technology for applications in the medical</p> <p>2 domain as well as in space -- space robotics</p> <p>3 applications.</p> <p>4 I can get into more detail if you wish. I</p> <p>5 could also point out some of the publications that</p> <p>6 I have as examples. Let's see.</p> <p>7 Okay. So here's one where -- again, I can</p> <p>8 get into as much detail as you'd like in these,</p> <p>9 but this is an augmented reality including</p> <p>10 magnification. Going kind of quickly here, so --</p> <p>11 let's see.</p> <p>12 This one refers to some work in the use of</p> <p>13 mixed reality for space and space application.</p> <p>14 This one technically could qualify as well as far</p> <p>15 as telerobotics and sort of remote control.</p> <p>16 I think there's a lot more in the</p> <p>17 conferences. Okay, here's another one, a review</p> <p>18 paper that we did on the use of augmented reality</p> <p>19 in robot-assisted surgery.</p> <p>20 Here's another journal paper on restoring</p> <p>21 awareness of the visual field. Here's one on the</p> <p>22 use of augmented reality on a head-mounted display</p>	<p style="text-align: right;">87</p> <p>1 Q And what are the purposes of those</p> <p>2 algorithms?</p> <p>3 A So one example is the calibration of</p> <p>4 the -- when you have an optical see-through</p> <p>5 head-mounted display as an example of a HoloLens,</p> <p>6 the -- you're overlaying virtual objects on</p> <p>7 essentially a little transparent or</p> <p>8 semitransparent lens.</p> <p>9 And so the alignment of that virtual</p> <p>10 object with the real world really depends on how</p> <p>11 the user perceives it. So you essentially have to</p> <p>12 calibrate the display system to the retina of the</p> <p>13 user.</p> <p>14 And so in that calibration step, you're</p> <p>15 collecting data. You're trying to identify</p> <p>16 parameters, and there's different techniques that</p> <p>17 you can use for doing that.</p> <p>18 Q What are the challenges with doing that?</p> <p>19 A So challenges are essentially getting it</p> <p>20 to be accurate enough, depending on what your</p> <p>21 application requirements are, without making it</p> <p>22 too much of a burden for the user. People don't</p>
<p style="text-align: right;">86</p> <p>1 for an assistant for robotic surgery.</p> <p>2 This is one using augmented virtuality,</p> <p>3 which is on the sort of a mixed-reality continuum</p> <p>4 for telerobotic satellite servicing.</p> <p>5 I think I go now to the -- okay. This is</p> <p>6 one -- this was just a comparison of different</p> <p>7 display technologies.</p> <p>8 So those are just the journals. I have</p> <p>9 even more in conference publications. Do you wish</p> <p>10 me to continue?</p> <p>11 Q No, that's okay.</p> <p>12 A Okay.</p> <p>13 Q Does your research, does it involve the</p> <p>14 software side of these AR applications or hardware</p> <p>15 or both?</p> <p>16 A It's been primarily software and</p> <p>17 algorithms.</p> <p>18 Q And when you say algorithms, what do you</p> <p>19 mean?</p> <p>20 A I mean, let's say some mathematical</p> <p>21 constructions which can be implemented in</p> <p>22 software.</p>	<p style="text-align: right;">88</p> <p>1 want to do -- every time they put on a headset, do</p> <p>2 a calibration for, you know, ten minutes, for</p> <p>3 example. So...</p> <p>4 Q Does any of your research have application</p> <p>5 in the medical field with regard to AR headsets,</p> <p>6 AR technology?</p> <p>7 A Yes.</p> <p>8 Q Does it involve the use of augmented</p> <p>9 reality head-mounted displays by medical</p> <p>10 professionals during surgery?</p> <p>11 A Could you clarify whether -- are you</p> <p>12 asking if it's being used in actual surgeries or</p> <p>13 if it's -- or if that's the application area.</p> <p>14 Q If that's the application area.</p> <p>15 A Yes.</p> <p>16 Q As part of your research, do you ever work</p> <p>17 with physicians at Johns Hopkins?</p> <p>18 A Yes.</p> <p>19 Q Which ones?</p> <p>20 A You know, they're listed as co-authors on</p> <p>21 some of these papers.</p> <p>22 Q Can you identify some of those for us?</p>

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<p style="text-align: right;">89</p> <p>1 A Sure. Robin Yang and Cecil Qiu, maybe. 2 Camilo Molina and Judy Huang. Also here Camilo 3 and Judy Huang are in this one. Greg Osgood, I 4 think, was in one of the journal papers that was 5 listed above, and -- augmented reality -- let's 6 see. 7 There may be others, but those are the 8 ones that came to mind. 9 Q Thank you. Do you know who Dr. Timothy 10 Witham is? 11 A I don't think so. Could you spell the 12 last name. 13 Q W-I-T-H-A-M? 14 A W-I-T-H-A-M? I do not. 15 Q Do you know who -- let's see -- the 16 director of Johns Hopkins neurosurgery spinal 17 fusion laboratory is? 18 A I do not. I may know the person, but I 19 don't know who holds that position. 20 Q Thank you. Are these all physicians that 21 work at Johns Hopkins medical -- or it's Johns 22 Hopkins Hospital, I think?</p>	<p style="text-align: right;">91</p> <p>1 screen here is about using augmented reality -- 2 where's the cursor -- for minimally invasive 3 surgery using a head-mounted display, and what 4 that did is -- the goal there was to provide 5 essentially see-through vision for the surgeon, 6 for example, in a laparoscopic procedure. 7 And the way that was done, as disclosed in 8 the publication, was to in reality build a model 9 or a 3D point cloud of the internal anatomy of the 10 patient, project the endoscope video onto that 11 point cloud, and then render that on a 12 head-mounted display. 13 Q When you say 3D point cloud, what do you 14 mean? 15 A Yes. What I mean is a collection of 16 points that have three dimensional coordinates; 17 that is, X, Y, and Z locations. 18 Q How is that 3D point cloud generated? 19 A In the paper, No. 19, we generated it from 20 basically looking at the disparity between images 21 from a left and right camera in a stereo 22 endoscope. But there are other techniques in the</p>
<p style="text-align: right;">90</p> <p>1 A Yeah, that's fine. 2 MS. FREEMAN: Objection to form. 3 THE WITNESS: I -- are you -- could you 4 please clarify the question? 5 Q Yes. Are the physicians that you 6 identified in these papers, do they all work at 7 the Johns Hopkins Hospital? 8 A No, not currently. 9 Q Do any of them have a business 10 relationship with Medivis? 11 A Not that I'm aware of. 12 Q Besides calibration, which you mentioned 13 in your research, is there any other functions of 14 the use of AR during your surgery that you've 15 investigated in your research? 16 A Yes. 17 Q Can you identify some of those that have 18 use in surgical applications by a medical 19 professional? 20 A Do you want me to identify papers? 21 Q If that's easiest. 22 A Okay. Okay. So Paper No. 19 on the</p>	<p style="text-align: right;">92</p> <p>1 literature. 2 Q In this particular application, what was 3 the purpose of generating the 3D point cloud? 4 A So to be able to render the internal view 5 of the patient from a different perspective; that 6 is, from the perspective of the person wearing the 7 head-mounted display rather than from the 8 perspective of the endoscope that's actually 9 taking the image. 10 Q And the endoscope has two cameras? 11 A Yes. In this -- in our implementation, we 12 used a stereo endoscope. 13 Q Can you please identify the next paper 14 that has surgical applications for AR? 15 A All right. I will go to Paper 21, which 16 is called augmented reality-assisted instrument 17 insertion and tool manipulation for the first 18 assistant in robotic surgery. 19 Q And what is this app -- what is this paper 20 about? 21 A So first -- some knowledge. First 22 assistant is a term used in da Vinci robotic</p>

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<p style="text-align: right;">93</p> <p>1 surgery. If you're familiar with the da Vinci 2 surgical robot, there's a robot pulling 3 instruments inside the patient controlled by a 4 surgeon sitting at a console. 5 First assistant is another surgeon who's 6 actually at the patient's bedside and is 7 assisting, doing things like exchanging 8 instruments, feeding materials, say, such as 9 suture through another port, retracting -- 10 applying retractions, suction, irrigation, those 11 kinds of tasks. 12 And that person doesn't have the 13 visualization that's provided to the surgeon 14 sitting at the console there operating similar to 15 a laparoscopic surgeon looking currently at a 2D 16 display of, you know, the endoscope view, and that 17 can be difficult due to some, you know, hand-eye 18 coordination challenges. 19 And so the -- what we proposed and 20 implemented was give that assistant a head-mounted 21 display, and by registering that head-mounted 22 display to the da Vinci robot, we could project,</p>	<p style="text-align: right;">95</p> <p>1 Q How are they able to see the anatomy? 2 A In the case in this paper, it was as a -- 3 basically a 2D image that was correctly oriented 4 inside -- you know, what would appear to be at the 5 correct location inside the patient. 6 Q It's a 2D image, you said? 7 A In that case, it was 2D. I'm going 8 through two things, I guess, in reverse 9 chronological order. That was one of the 10 motivations for the Paper No. 19 that I discussed. 11 It was basically being able to do that at 3D. But 12 in No. 21, it was a 2D image of the anatomy. 13 Q In Paper No. 19, was that the first time 14 you had done 3D patient anatomy? 15 MS. FREEMAN: Objection; form. 16 A So I need to think about that a moment. 17 Q No problem. 18 A No. 19 Q Okay. When did you use a 3D point cloud 20 before Paper 19? 21 A A 3D point cloud is not the only 3D 22 entity. So -- okay. So 3D entities could also</p>
<p style="text-align: right;">94</p> <p>1 you know, augmented images on the head-mounted 2 display where the robotic instruments are inside 3 the patient, where the endoscope is, also the 4 endoscope field of view, which we rendered as a -- 5 as a three-dimensional outline, like a ThruSTEM, 6 as well as they could also view the endoscope 7 image in its correct location physically, you 8 know, inside the patient. 9 So it gave them -- to summarize, it gives 10 the assistant sort of see-through capability to 11 look inside the patient, which helps them do their 12 task because now they can more easily, when 13 they're inserting devices or instructs to assist, 14 they can -- they have better awareness of where 15 they need to go. 16 Q So the assistant can see through the 17 augmented reality display the anatomy of the 18 patient as well as the instrument? 19 A The -- yeah. The anatomy of the -- that 20 is correct. Yes. We focused more on the 21 instruments and the endoscope field of view, but 22 they were also able to see the anatomy.</p>	<p style="text-align: right;">96</p> <p>1 include, like, a wire mesh, which is a point cloud 2 but also with edges to produce a more closed 3 object. 4 Q What do you mean by closed object? 5 A Well, a point cloud has both -- 6 essentially just a cloud of points. So there's 7 gaps between the points. If you define shapes 8 through the points; for example, taking three 9 points, forming a triangle, that now defines -- 10 and you do that for all of the points. That 11 defines a shape. Could be a -- well, some sort of 12 3D shape. 13 Often it's called a 3D mesh. 14 Q How is a 3D mesh generated? 15 A Well, there are a number of ways. 16 Probably the most famous was a technique called 17 marching cubes, which was patented by GE I think 18 in about 1990 or '91. But it was just a technique 19 of creating a 3D mesh from voxelized data such as 20 you would find in a CT or an MRI. 21 Q Okay. We'll come back to that. Can you 22 point out the next paper that has surgical --</p>

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<p style="text-align: right;">97</p> <p>1 excuse me. Strike that.</p> <p>2 Can you point out the next paper that has</p> <p>3 AR applications or AR use in surgical</p> <p>4 applications?</p> <p>5 A Okay. I think what I'll do is I'm going</p> <p>6 to go kind of in chronological order, so I'll go</p> <p>7 down towards the bottom in -- let's see. So are</p> <p>8 you asking, as a point of clarification, augmented</p> <p>9 reality only on head-mounted displays or on other</p> <p>10 displays as well?</p> <p>11 Q Just head-mounted, and we can just do one</p> <p>12 more. We don't have to do every one.</p> <p>13 A Okay. Let's see. There's one, I know --</p> <p>14 one or two in 2012, head-mounted displays. Almost</p> <p>15 there.</p> <p>16 Okay. I believe this one is one of the</p> <p>17 exhibits, No. 80 -- Paper 82, which is augmented</p> <p>18 reality goggles with an integrated tracking system</p> <p>19 for navigation in neurosurgery.</p> <p>20 Q Great. Thank you.</p> <p>21 Does Johns Hopkins own the research that</p> <p>22 you conduct since you've been employed there?</p>	<p style="text-align: right;">99</p> <p>1 objection?</p> <p>2 MS. FREEMAN: Objection; relevance.</p> <p>3 THE WITNESS: Okay.</p> <p>4 MS. FREEMAN: I apologize. I think I</p> <p>5 might have thrown off Dr. Kazanzides with that</p> <p>6 objection. Would you mind having -- repeating the</p> <p>7 question?</p> <p>8 MR. HARMER: Sure.</p> <p>9 BY MR. HARMER:</p> <p>10 Q Which of these patents is Johns Hopkins</p> <p>11 University the applicant or the assignee?</p> <p>12 A Mm-hmm. Okay. So for Patents 6 -- let's</p> <p>13 see -- so from 6 through 14, I was a Johns Hopkins</p> <p>14 employee, and so therefore they -- at least my</p> <p>15 rights -- some of these are joined patents with</p> <p>16 other entities.</p> <p>17 I believe Patent No. 5 might have Hopkins</p> <p>18 involved through one of my co-inventors. At the</p> <p>19 time, I was -- I was not at Johns Hopkins, so my</p> <p>20 assignment would not be to Johns Hopkins or No. 5</p> <p>21 or any of the ones -- you know, 1 through 4</p> <p>22 either.</p>
<p style="text-align: right;">98</p> <p>1 A You mean -- yes. They have -- any IP that</p> <p>2 I develop is assigned to Johns Hopkins.</p> <p>3 Q Including IP related to augmented reality</p> <p>4 head-mounted displays?</p> <p>5 A If it's developed during the course of my</p> <p>6 employment, yes.</p> <p>7 Q Dr. Kazanzides, can you turn to page --</p> <p>8 let's see -- 26? Kazanzides, I apologize.</p> <p>9 A That's okay. You can just call me</p> <p>10 whatever, Peter or Mr. K or whatever.</p> <p>11 Q I was calling you Mr. K initially,</p> <p>12 actually. It was easier.</p> <p>13 A Yes, 26.</p> <p>14 Q So here you list 14 patents.</p> <p>15 A Yes.</p> <p>16 Q Are you a named inventor on each of these</p> <p>17 patents?</p> <p>18 A Yes.</p> <p>19 Q Is Johns Hopkins the applicant or assignee</p> <p>20 in any of these?</p> <p>21 MS. FREEMAN: Objection; relevance.</p> <p>22 THE WITNESS: Sorry. What was the</p>	<p style="text-align: right;">100</p> <p>1 Q Thank you. I believe that on a few of</p> <p>2 these patents Intuitive Surgical Operations is a</p> <p>3 joint applicant with Johns Hopkins.</p> <p>4 A That's correct.</p> <p>5 Q What is Intuitive Surgical Operations?</p> <p>6 A That is the company that makes the da</p> <p>7 Vinci surgical robot.</p> <p>8 Q And what's its relationship with Johns</p> <p>9 Hopkins?</p> <p>10 A They -- well, they've done some -- I think</p> <p>11 these particular patents were a result of a joint</p> <p>12 research grant from NSF, but they've -- they've --</p> <p>13 they're a large company. They've sponsored</p> <p>14 research. They've been partners on funded</p> <p>15 research.</p> <p>16 So they, I believe, have -- they haven't</p> <p>17 licensed any of my IP from Johns Hopkins, but they</p> <p>18 may have licensed other IP.</p> <p>19 Q Does Intuitive Surgical Operations provide</p> <p>20 tools for augmented reality-assisted surgery?</p> <p>21 MS. FREEMAN: Objection; form.</p> <p>22 A So I can tell you what they provide. The</p>

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<p style="text-align: right;">101</p> <p>1 company provides a surgical robot that's used for</p> <p>2 minimally invasive procedures. That's the da</p> <p>3 Vinci. And it has kind of the endoscope camera</p> <p>4 inside of the patient. Those images are captured</p> <p>5 and streamed to a display nearby. Usually it's in</p> <p>6 the same operating room, but it's away from the</p> <p>7 patient, and the surgeon is viewing in 3D those</p> <p>8 images from a stereo console.</p> <p>9 They also provide another robotic system</p> <p>10 that's sort of for smaller kind of vascular</p> <p>11 procedures that I don't know very much about.</p> <p>12 Those are their products that they provide.</p> <p>13 Q Does one use an AR headset with the da</p> <p>14 Vinci?</p> <p>15 MS. FREEMAN: Objection; form.</p> <p>16 A Neither of the products I mentioned -- or</p> <p>17 at least the company does not provide a product</p> <p>18 based on an AR headset with their existing</p> <p>19 products.</p> <p>20 Q Do any of the patents that you list in</p> <p>21 your CV involve the use of augmented reality in</p> <p>22 surgery?</p>	<p style="text-align: right;">103</p> <p>1 development of augmented reality or use of</p> <p>2 augmented reality in surgery at Johns Hopkins</p> <p>3 Hospital or other Johns Hopkins medical</p> <p>4 facilities?</p> <p>5 MS. FREEMAN: Objection; form.</p> <p>6 A As I stated before, I've done research</p> <p>7 with people at Johns Hopkins medical institutions</p> <p>8 on applications that could be used in surgery.</p> <p>9 Q So medical professionals at Johns Hopkins</p> <p>10 have used or tested your applications for use of</p> <p>11 AR in surgery?</p> <p>12 A They've --</p> <p>13 MS. FREEMAN: Objection; form.</p> <p>14 A Yes. They've tested, yes.</p> <p>15 Q Do you know whether Johns Hopkins is using</p> <p>16 AR-assisted surgery in their hospital?</p> <p>17 A Yes.</p> <p>18 Q And are they?</p> <p>19 A They have, yes.</p> <p>20 Q Do you know when they started doing that?</p> <p>21 A I would not know all of the -- it's a very</p> <p>22 large hospital. I know of certain cases, but I</p>
<p style="text-align: right;">102</p> <p>1 A Yes.</p> <p>2 Q Which ones?</p> <p>3 A No. 12 and -- let's see -- No. 13, No.</p> <p>4 Nine.</p> <p>5 I'm sorry. Did you -- I want to clarify.</p> <p>6 Did you say augmented reality or augmented reality</p> <p>7 on a head-mounted display?</p> <p>8 Q Augmented reality.</p> <p>9 A Okay. So, then, Nos. Seven -- so 7, 9,</p> <p>10 12, 13. Those I'm certain of. I'd have to review</p> <p>11 some of the other ones to see if there's a</p> <p>12 possibility that was mentioned.</p> <p>13 No. 14 is a more general methods-type --</p> <p>14 or calibration method, and probably mentioned</p> <p>15 medicine is a motivating example, but it's really</p> <p>16 not tied to a medical application.</p> <p>17 Q Have you been involved in the development</p> <p>18 of AR for use in surgery at Johns Hopkins medical</p> <p>19 facilities?</p> <p>20 A Could you please rephrase that? I didn't</p> <p>21 understand.</p> <p>22 Q Yeah. Have you been involved in the</p>	<p style="text-align: right;">104</p> <p>1 don't know -- I'm not sure of the first case that</p> <p>2 was done.</p> <p>3 Q Do you know whether Johns Hopkins is</p> <p>4 currently using an AR head-mounted display to</p> <p>5 project a patient's medical imaging data onto</p> <p>6 non-image actual views of a patient during</p> <p>7 surgery?</p> <p>8 MS. FREEMAN: Objection; relevance.</p> <p>9 A There was a lot of detail in that</p> <p>10 question. Could you just say it again or rephrase</p> <p>11 it?</p> <p>12 Q Sure. Do you know whether Johns Hopkins</p> <p>13 is using AR to project medical imaging of a</p> <p>14 patient onto an actual patient for purposes of</p> <p>15 performing surgery?</p> <p>16 MS. FREEMAN: Objection; relevance.</p> <p>17 A Okay. I know that they have done that. I</p> <p>18 don't know if they're currently doing it.</p> <p>19 Q Do you know if they've projected 3D</p> <p>20 medical imaging data onto a patient?</p> <p>21 MS. FREEMAN: Objection; form, relevance.</p> <p>22 A I'm not sure of that. I believe so.</p>

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<p style="text-align: right;">105</p> <p>1 Q All right. Looks like we've been going 2 for almost an hour. We're about to move to 3 another section. Is it okay if we take a quick 4 break? 5 A Yes. 6 (A recess was taken.) 7 MR. HARMER: William, can you put up 8 Exhibit '807 1009? 9 TECHNICIAN: One moment. 10 (Exhibit '807 1009 was marked for 11 identification and is attached to the transcript.) 12 MR. HARMER: And can you give 13 Dr. Kazanzides control? 14 BY MR. HARMER: 15 Q Dr. Kazanzides, what is this document? 16 A It looks like my declaration. Let me take 17 a quick scroll. 18 This is the one I signed, yes. 19 Q And this is for the '807 IPR? 20 A Yes. 21 Q Can you scroll down to the last page 22 again, Page 78?</p>	<p style="text-align: right;">107</p> <p>1 Q What do you think this paragraph means? 2 A That I have, you know, accurately applied 3 my knowledge to -- you know, to the information 4 given, and -- 5 Q What do you mean by information given? 6 MS. FREEMAN: Objection. I don't think 7 Professor Kazanzides had completed his answer. 8 THE WITNESS: Right. So the information 9 that I have provided as exhibits to the 10 declaration, and then I have -- in cases where 11 I've been informed about the sort of legal basis 12 or legal principals, I have noted that those 13 are -- that that's information that I've been 14 provided. 15 Q Thank you. Who drafted the '271/'807 16 declarations? 17 MS. FREEMAN: Objection; form. 18 A So the declarations are based on my 19 analysis of the -- of the prior art and the 20 exhibits, and I created them based on my own 21 opinions, and I did have -- I did work with 22 counsel in format.</p>
<p style="text-align: right;">106</p> <p>1 Do you see the statement that reads I 2 hereby declare that all statements made herein of 3 my own knowledge are true and that all statements 4 made on information and belief are believed to be 5 true? 6 A Yes. 7 Q And you made a similar statement on the 8 last page of your '271 declaration; is that right? 9 A Yes. 10 Q What portion of the '807 declaration did 11 you make on information and belief? 12 MS. FREEMAN: Objection; foundation. 13 A Yeah, I -- I don't quite understand the 14 question. 15 Q I'm just curious if any of it was based on 16 information and belief or if all of it is based on 17 your own knowledge? 18 MS. FREEMAN: Objection; form, foundation. 19 A I'm struggling to see the difference 20 between knowledge and information that you -- as 21 far as your knowledge to, you know, analyze the 22 information.</p>	<p style="text-align: right;">108</p> <p>1 Q How much time did you spend drafting the 2 271 declaration? 3 A I don't recall the amount of time that I 4 required. 5 Q Can you approximate? 6 A I don't want to just make a guess on that. 7 Q Is it closer to two hours or 10 hours? 8 A That's -- again, I don't know how -- what 9 you're planning to do here, but I think that's 10 part of a -- sort of a guessing game. 11 Q Did you spend more than one hour? 12 A I can certainly answer that. Yes, I spent 13 more than one hour. 14 Q More than one hour drafting the 15 declaration? 16 A Yes. 17 Q More than two hours? 18 A This is where I was thinking you may be 19 going. I'm not going to get into a guessing game 20 on this. 21 Q So you have no idea; is that right? 22 A That's --</p>

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<p>109</p> <p>1 MS. FREEMAN: Objection; form.</p> <p>2 A That's not what I said. I just said I</p> <p>3 don't want to make a -- I'm under oath to provide,</p> <p>4 you know, truthful answers, and so I don't want to</p> <p>5 make an incorrect answer on this.</p> <p>6 Q Can you make a truthful guess?</p> <p>7 MS. FREEMAN: Objection. Are you calling</p> <p>8 for the witness to guess under oath?</p> <p>9 MR. HARMER: I'm asking the witness to</p> <p>10 provide an honest, truthful estimate of the time</p> <p>11 he spent drafting the declarations that he signed.</p> <p>12 THE WITNESS: I really don't want to make</p> <p>13 a guess on that.</p> <p>14 BY MR. HARMER:</p> <p>15 Q Are you incapable of making an estimate?</p> <p>16 A I -- I don't -- I think that I -- I would</p> <p>17 say yes. I don't feel comfortable making an</p> <p>18 estimate.</p> <p>19 Q What assistance did you receive drafting</p> <p>20 the '271 and '807 declarations?</p> <p>21 A I would like to have a discussion with my</p> <p>22 legal representative regarding privilege on that.</p>	<p>111</p> <p>1 How long did you -- how much time did you</p> <p>2 spend reviewing these documents?</p> <p>3 A It was a lot of time, but I -- again, I</p> <p>4 don't know the -- I can't really guess a specific</p> <p>5 number.</p> <p>6 Q Are you able to provide an estimate?</p> <p>7 A Are you asking about the exhibits on the</p> <p>8 '807 or the '271?</p> <p>9 Q '807. Can you scroll to Page 13 in your</p> <p>10 declaration?</p> <p>11 A I may not have control.</p> <p>12 MR. HARMER: William, can you give</p> <p>13 Dr. Kazanzides control, please?</p> <p>14 THE WITNESS: Okay. Page -- this one.</p> <p>15 Okay.</p> <p>16 Q I thought it was 13. It's the page that</p> <p>17 has the exhibits listed. Can you find that?</p> <p>18 A I think it's 7, if I recall. Let's see.</p> <p>19 Q Thank you, yes. Page 7 of the</p> <p>20 declaration, Page 13 of the document, Adobe</p> <p>21 document, it looks like.</p> <p>22 A Okay. I get it. Mm-hmm.</p>
<p>110</p> <p>1 MS. FREEMAN: Okay. We're going off the</p> <p>2 record.</p> <p>3 MR. HARMER: Wait, he can't go off the</p> <p>4 record right now.</p> <p>5 MS. FREEMAN: Absolutely we can. He wants</p> <p>6 to confer on privilege. That's absolutely</p> <p>7 appropriate.</p> <p>8 MR. HARMER: I'm not asking him to</p> <p>9 disclose any privileged information.</p> <p>10 MS. FREEMAN: It doesn't matter. He has a</p> <p>11 privilege question, and we will confer on that.</p> <p>12 We're going off the record.</p> <p>13 THE WITNESS: So I guess, hold on. I need</p> <p>14 to find my mute here.</p> <p>15 (A recess was taken.)</p> <p>16 BY MR. HARMER:</p> <p>17 Q All right. Dr. Kazanzides, what</p> <p>18 documents did you read before you prepared the</p> <p>19 '807 declaration?</p> <p>20 A Okay. I read the documents that are in</p> <p>21 the exhibits.</p> <p>22 Q And what are those? Well, strike that.</p>	<p>112</p> <p>1 Q So how much time did you spend</p> <p>2 reviewing -- or an estimate -- strike that.</p> <p>3 MS. FREEMAN: Counsel, you think asking</p> <p>4 the same question again and again -- clearly these</p> <p>5 questions are annoying the witness. He's answered</p> <p>6 them in multiple -- multiple times, and you're</p> <p>7 just repeating and repeating them. So I would ask</p> <p>8 you to move on.</p> <p>9 MR. HARMER: His last response was whether</p> <p>10 I was referring to the exhibits in his</p> <p>11 declaration, whether it was the '807 or the '271.</p> <p>12 We've directed him to Page 13 or Page 7 of the</p> <p>13 declaration that has the list of exhibits, and now</p> <p>14 I would like him to provide an estimate if he is</p> <p>15 able of the amount of time he's spent reviewing</p> <p>16 these exhibits.</p> <p>17 THE WITNESS: Okay. That is a somewhat</p> <p>18 different question than previous where you asked</p> <p>19 about time spent drafting.</p> <p>20 BY MR. HARMER:</p> <p>21 Q Correct.</p> <p>22 A Mm-hmm. So I can give very -- yeah, I can</p>

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<p style="text-align: right;">113</p> <p>1 give an estimate, sort of crude estimate of some 2 of these. The actual -- for a patent or patent 3 application, those are quite lengthy. So each one 4 of those, at least a couple of hours. Some of the 5 other -- well, the paper, Exhibit 1003, is one of 6 my papers. So that really didn't take much time. 7 Yeah. So these look like mostly -- yes, 8 they're mostly patent applications, so they were 9 quite -- took quite a bit of time to read those. 10 Q And how did you come by these documents? 11 A The documents -- you're talking about the 12 exhibits shown on this page? 13 Q I am. 14 A Yes. So other than the ones that I 15 generated, including, of course, my CV, they were 16 provided -- they were identified by counsel. 17 Q Which exhibits did you provide? 18 A Let's see. I provided -- well, 1010. 19 Let's see. I believe the best of my recollection 20 they have already located or provided 1003, and I 21 didn't have to provide that. 22 Q And who do you mean by "they"?</p>	<p style="text-align: right;">115</p> <p>1 Q It says in my opinion, a person of 2 ordinary skill in the art at the relevant time 3 would have understood the Claims 1 through 7. 4 Do you see that? 5 A Yes. 6 Q What did you mean by the 7 term "anticipates"? 8 A That somebody of ordinary skill in the art 9 would -- after reading the publication by Jones, 10 would be capable of implementing the -- what is 11 laid out in Claims 1 through 7 of the '807 patent. 12 Q Is that based on your own understanding of 13 anticipation or based on understanding that was 14 communicated to you? 15 A I believe both. 16 Q Are you an attorney? 17 A No. 18 Q Are you providing a legal opinion about 19 anticipation? 20 MS. FREEMAN: Objection; form. 21 A Yeah. I'm -- did you -- could you restate 22 the question?</p>
<p style="text-align: right;">114</p> <p>1 A Counsel. Sorry. 2 Q Thank you. What is Exhibit 1002? 3 A That's the file history. 4 Q Is it the complete file history? 5 A I'm sorry, no. It's excerpts of the file 6 history. 7 Q And this is the file history of the '807 8 patent? 9 A Yes, yes. It had -- so prior application 10 numbers. 11 Q Did you select those excerpts? 12 A No. 13 Q And who did? 14 A Counsel. 15 Q Can you please scroll to the document 16 number, not the number on the bottom of each page, 17 Page 27? You can type it in where it says 13. 18 Wow, that's still not it. I apologize. 19 Paragraph 58. 20 Thank you. 21 Paragraph 58. Do you see that? 22 A Yes.</p>	<p style="text-align: right;">116</p> <p>1 Q Yeah. Are you providing a legal opinion? 2 MS. FREEMAN: Objection; form. 3 A I'm providing my opinion in a legal 4 proceeding. 5 Q I'm going to ask one more question about 6 the documents we reviewed, and I apologize. How 7 long did you review those documents? 8 MS. FREEMAN: Objection; form. 9 A Could you please clarify? 10 Q Yeah. The exhibits that we're looking at 11 in the '807 declaration, when did you review 12 those? 13 MS. FREEMAN: Objection; form. 14 A So I reviewed them prior to writing the 15 declaration, and I've reviewed them subsequently 16 as well. 17 Q When did you draft the declaration? 18 A It was around the time when I signed it, 19 which was in October of 2022. 20 Q Thank you. 21 MR. HARMER: William, can you put up '271 22 Exhibit 1012?</p>

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<p>117</p> <p>1 (Exhibit '271 1012 was marked for 2 identification and is attached to the transcript.) 3 MR. HARMER: And can you give me control, 4 please? 5 BY MR. HARMER: 6 Q I'm just going to quickly ask some other 7 questions about the '271 declaration, if that's 8 okay. 9 A Yes. 10 Q On Page 7 of your declaration, a table 11 starts and finishes on the next page and shows 12 exhibits that you reference in the '271 13 declaration. Do you see that? 14 A Yes. 15 Q Can you give an estimate about how much 16 time you spent reviewing these documents? 17 MS. FREEMAN: Objection; form. 18 A So as with the other declaration, the -- a 19 rather crude estimate on the patent applications 20 or publications is a couple hours per, for each 21 one, that is. 22 The technical papers such as 1009 is --</p>	<p>119</p> <p>1 A I mentioned in my declaration that I -- 2 what I had done, so I believe it was at least 3 Exhibit 1007. 4 Q Thank you. Can you look at Exhibit 1003? 5 A Are you -- 6 MS. FREEMAN: Objection to form. 7 Q Just in the table. 8 A Okay. 9 Q Why did you include Exhibit 1003 in this 10 table? 11 A These were excerpts of the file history, 12 and they are referred to in the declaration. 13 Q Can you show me where Exhibit 1003 is 14 referred to in the '271 declaration? 15 A I mean, I could probably get there faster 16 by searching. Do I have -- 17 Q Please do. 18 A All right. So -- all right. That's 19 there. 20 All right. I guess it's not searchable. 21 I apologize for not including the exhibit number 22 here, but this is where it's referring to claims</p>
<p>118</p> <p>1 would, I'm guessing, be closer to the order of an 2 hour. 3 Q Thank you. 4 MR. HARMER: William, can you give 5 Dr. Kazanzides control so he can look at Page 8, 6 too? 7 TECHNICIAN: You now have control. 8 THE WITNESS: Thank you. 9 BY MR. HARMER: 10 Q And which of these exhibits did you 11 provide? 12 A I provided 1013. Yes, that's what I 13 provided. 14 Q And the remaining exhibits were provided 15 to you by counsel? 16 A Yes. 17 Q Can you look at exhibit -- 18 A I'd like to clarify that in cases of 19 online documents, I also verified, you know, that 20 I could access them and download them myself. 21 Q What online documents are you referring 22 to?</p>	<p>120</p> <p>1 from the prior applications. So Paragraph 31, 2 Paragraph 32. 3 Q Paragraph 31 is referring to which 4 application number? 5 A 15 or 74702. 6 Q And what application number is referenced 7 in Paragraph 32? 8 A I see the same one. 9 Q Can you scroll back up to the table? 10 A You said it was on Page 13 of the PDF. 11 Q And which exhibit refers to the '702 12 application? 13 A I'm sorry. Was that number previously 14 '702? 15 Q You just said -- 16 A I see what you're saying. It's 104. 17 Okay. 18 Q So 1004. So Exhibit 1003 is not mentioned 19 in your declaration except to say that you had 20 read it; is that correct? 21 A Okay. 22 MS. FREEMAN: Objection; form, foundation.</p>

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<p>121</p> <p>1 A I would -- I would need to review the 2 declaration to confirm if that's the case, but 3 based on what we have seen so far, that appears to 4 be possible. 5 Q You did a search for Exhibit 100 -- 6 A I did, yeah. 7 Q And you were unable to find a reference? 8 MS. FREEMAN: Professor Kazanzides and 9 Mr. Harmer, you -- as we said at the beginning, 10 it's important to get a clear record, so we need 11 to have questions separate from answers. So I'm 12 just going to caution -- 13 THE WITNESS: Okay. 14 MS. FREEMAN: -- that we're getting to be 15 a mess right now. 16 MR. HARMER: All right. Let's move on. 17 William, you can take that down. Thank you. 18 BY MR. HARMER: 19 Q Dr. Kazanzides, what does the term three 20 dimensional mean to you? 21 MS. FREEMAN: Objection; form. 22 A Okay. That actually, depending on</p>	<p>123</p> <p>1 Exhibit 1012? And give Dr. Kazanzides control. 2 Q And can you scroll to Paragraph 30? 3 Actually -- well. So from Paragraph 30, quote, 4 from the '271 patent, the '271 patent states 3D 5 data may include but is not limited to MRI images, 6 computerized tomography, CT scan images, x-ray 7 images -- 8 A Mm-hmm. 9 Q And can you scroll to Paragraph 31? And 10 scroll further down, please. 11 In Paragraph 32, you conclude with in the 12 foregoing, in my opinion, the person of ordinary 13 skill in the art could understand that 73 data may 14 be one or more of any of the foregoing types of 15 images. 16 Did I read that right? 17 A Yes. 18 Q So in your opinion, is an x-ray an example 19 of 3D data? 20 A I would -- 21 MS. FREEMAN: Objection; form. 22 A Yeah. I would clarify that it states</p>
<p>122</p> <p>1 context, has different meanings. One meaning is 2 that it has -- if you're thinking of a point, it 3 has three coordinates, X, Y, and Z. 4 If you're thinking of an object, it could 5 be also considered sort of the sixth dimensional 6 or the position and orientation of the object. 7 That's still a 3D object, but its orientation -- 8 basically a combination of position and 9 orientation has 6 degrees of freedom. 10 Q Is it true that something is three 11 dimensional if it has the dimension of depth as 12 well as width and height? 13 MS. FREEMAN: Objection; form. 14 A Generally, yes. 15 Q Do you remember in your '271 declaration 16 you say that x-rays, MRI images, CT images, among 17 others, are examples of 3D data? 18 MR. HARMER: Objection; foundation, form. 19 A I want to -- check exactly what was 20 written there if that's the wording that I used. 21 Q Sure. 22 MR. HARMER: Exhibit, can you pull up '271</p>	<p>124</p> <p>1 x-ray images. So multiple x-ray images would be 2 considered 3D data. 3 Q Can you explain that more? 4 MS. FREEMAN: Objection; form. 5 Q How can multiple x-ray images be 6 considered 3D data? 7 A Well, you can -- as one example, you can 8 have a biplane x-ray where you take x-ray images 9 from orthogonal directions, and based on that you 10 can get 3D -- well, 3D visualization or 3D 11 point -- identify 3D points in the anatomy, as one 12 example. 13 Q What is a computerized tomography or CT 14 scan? 15 A It's a 3D image that is reconstructed from 16 multiple, essentially, x-ray images. 17 Q Can you explain how a CT scan is 18 generated? 19 A Sure. There's a source providing the 20 x-rays in a detector, and they both rotate around 21 the patient and translate getting multiple sort of 22 raw x-ray images from a lot of different</p>

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<p style="text-align: right;">125</p> <p>1 orientations over some, you know, volume. Could 2 be whole body CT; could be just a limited section 3 of the body, and then they use different 4 algorithms to reconstruct the 3D position or the 5 3D coordinates -- or create 3D voxels of the 6 internal anatomy of the patient. 7 Q How do they create the 3D voxels of the 8 patient? 9 A So this is not my area of expertise, but 10 there's different reconstruction techniques. 11 Essentially what you're getting is the lines 12 through the patient, and based on the number of 13 the -- having lots of different lines that 14 intersect, you can then through mathematical -- 15 usually iterative technique. There's one 16 technique called, ART algebraic reconstruction 17 technique, I think might be what it stands for. 18 It basically then calculates the density of the 19 material that that ray -- that that -- at that 20 position, the X/Y/Z position. 21 So it's often stored -- a CT scan, if you 22 look at the -- sort of the final reconstructed</p>	<p style="text-align: right;">127</p> <p>1 those 2D slices or 3D slices? 2 MS. FREEMAN: Objection; form and 3 foundation. 4 A Okay. They are typically considered 2D in 5 that they provide 2D information. In -- in 6 reality, they do have an associated depth or 7 thickness to them, but there's no information 8 provided along that direction. 9 Q In the slice itself? 10 A Yeah. You -- essentially you could think 11 of it like a picture where you have -- you know, 12 you can see things in sort of the horizontal and 13 vertical directions, X and Y, but there's -- the 14 picture has -- you know, pictures are -- you can 15 think of a picture. You print out a picture as a 16 3D object because the paper has a thickness to it, 17 but in reality, there's no information provided in 18 that depth direction. It's still really a 2D 19 image. 20 Q So you would agree that each slice 21 provides X and Y information but no Z information? 22 MS. FREEMAN: Objection; form, foundation.</p>
<p style="text-align: right;">126</p> <p>1 image, it looks like an x-ray image of these axial 2 images, but none of those -- those are all 3 reconstructed. They're not raw x-ray images. 4 Q So they're reconstructed stack of 2D 5 slices? 6 A Yeah. It's like a stack of pancakes 7 through the patient, a stack of 2D slices. 8 Q And they look like x-rays at each -- 9 A They look -- yeah, they look like x-rays 10 in terms of, you know, how they -- how they 11 appear. But they're not -- it's not exactly the 12 same thing as an x-ray. 13 Q Are the slices 2D or 3D? 14 MS. FREEMAN: Objection; form. 15 A Yes. Could you please specify? 16 Q Yeah. You said that the output of a CT 17 scan is like a stack of pancakes? 18 A Yeah. 19 Q A stack of 2D x-ray images. They're not 20 x-ray images, but they look like x-ray images. 21 A Right. 22 Q Are each of those individual slices, are</p>	<p style="text-align: right;">128</p> <p>1 A So it provides X and Y information about, 2 yes, the anatomy. There's -- Z information is 3 common to the slice. There's a -- you know, 4 all -- because this is a stack, you know, you know 5 where each slice is in Z, but within that slice, 6 there's no variation along that dimension. 7 Q So what's the best way to identify Z 8 information from a CT scan? 9 A You -- it's based -- so, again, I'd like 10 to clarify that the common -- one common 11 convention is to consider Z being the axis along 12 which the slices are arranged, but that's not the 13 only one. In some cases, I've seen that's the X 14 axis. 15 But assuming a convention where each slice 16 could be considered in an X/Y plane, it -- each 17 slice has a single Z coordinate saying that within 18 the -- you know, within -- relative to the other 19 slices, this is where it was. Let's say this 20 slice is a millimeter away from the other slice 21 along that core -- along Z. 22 Q And how would -- how would a person of</p>

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<p style="text-align: right;">129</p> <p>1 ordinary still in the art extract that missing Z</p> <p>2 data, right, the data that you don't see in one</p> <p>3 slice, how would you identify Z information using</p> <p>4 CT scan data if it's primarily a stack of 2D</p> <p>5 slices?</p> <p>6 MS. FREEMAN: Objection; foundation, form.</p> <p>7 A Okay. So the -- sort of the</p> <p>8 traditional -- or let's say the first approach</p> <p>9 people did was the scroll thing on a computer</p> <p>10 screen, or even on a light board, look at, you</p> <p>11 know, each slice one by one in sequence and try to</p> <p>12 identify things that way. That's -- that's kind</p> <p>13 of the oldest method.</p> <p>14 Then you can also create 3D volumes as we</p> <p>15 talked about. You know, these meshes. You're</p> <p>16 saying algorithms such as marching cubes to create</p> <p>17 a 3D model of surfaces identified or features</p> <p>18 identified in the CT, and then you can visualize</p> <p>19 them however you would visualize a 3D object,</p> <p>20 whether it's on a computer screen, by sort of</p> <p>21 rotating it around, holographic display, 3D</p> <p>22 display with shutter glasses, whatever.</p>	<p style="text-align: right;">131</p> <p>1 Dr. Kanzanzides. How many of your current or post</p> <p>2 students work at Medivis?</p> <p>3 A How many of -- I'm sorry, I didn't hear</p> <p>4 the full question.</p> <p>5 Q How many of your students work at Medivis</p> <p>6 or have worked at Medivis?</p> <p>7 A Okay.</p> <p>8 MS. FREEMAN: Form.</p> <p>9 A None of my current students are working or</p> <p>10 have worked at Medivis. To the best of my</p> <p>11 knowledge, two of my students after graduation</p> <p>12 have worked there and may still work there.</p> <p>13 Q Are you aware of any other Johns Hopkins</p> <p>14 students that work at Medivis?</p> <p>15 A No, I'm not. There may be, but I'm not</p> <p>16 aware.</p> <p>17 Q And do you know whether Johns Hopkins has</p> <p>18 a business relationship at all with Medivis?</p> <p>19 A I'm not aware of any business</p> <p>20 relationship.</p> <p>21 Q Okay. I don't think I have any further</p> <p>22 questions.</p>
<p style="text-align: right;">130</p> <p>1 Q And can you explain what a magnetic</p> <p>2 resonance imaging or MRI scan is?</p> <p>3 MS. FREEMAN: Objection; form.</p> <p>4 A Yes. It is an imaging device that creates</p> <p>5 three dimensional images of patient anatomy.</p> <p>6 Q Is it true that it produces slices similar</p> <p>7 to those of a CT scan in form? It produces a</p> <p>8 series of 2D slices?</p> <p>9 MS. FREEMAN: Objection; form.</p> <p>10 A The -- yes. When you get information or</p> <p>11 images from an MRI scanner, they're typically</p> <p>12 arranged as essentially a stack of 2D slices.</p> <p>13 Q Give me, like, five minutes, and then I'll</p> <p>14 have just a few more questions, and we'll be close</p> <p>15 to done, I think. Does that work?</p> <p>16 Is that okay?</p> <p>17 A So break?</p> <p>18 Q Five minutes?</p> <p>19 A Okay.</p> <p>20 (A recess was taken.)</p> <p>21 BY MR. HARMER:</p> <p>22 Q Just a couple more questions,</p>	<p style="text-align: right;">132</p> <p>1 MS. FREEMAN: Medivis has no redirect, so</p> <p>2 I believe this -- the deposition of Professor</p> <p>3 Kanzanzides is completed.</p> <p>4 COURT REPORTER: Thank you. Attorney</p> <p>5 Harmer, would you like a copy of this transcript?</p> <p>6 MR. HARMER: I would, and can we get</p> <p>7 expedited delivery, please?</p> <p>8 COURT REPORTER: Sure. I can have a final</p> <p>9 delivery for you tomorrow or later today,</p> <p>10 whichever is better for you?</p> <p>11 MR. HARMER: Tomorrow's fine.</p> <p>12 COURT REPORTER: Sure. And, Attorney</p> <p>13 Freeman, would you like a copy of this transcript?</p> <p>14 MS. FREEMAN: Yes.</p> <p>15 (Off the record at 11:56 a.m.)</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p>

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<p>133</p> <p>1 ACKNOWLEDGMENT OF DEPONENT</p> <p>2</p> <p>3 I, PETER KAZANZIDES, do hereby</p> <p>4 acknowledge that I have read and examined the</p> <p>5 foregoing testimony, and the same is a true,</p> <p>6 correct and complete transcription of the</p> <p>7 testimony given by me and any corrections appear</p> <p>8 on the attached errata sheet signed by me.</p> <p>9</p> <p>10</p> <p>11</p> <p>12 _____</p> <p>13 (DATE) (SIGNATURE)</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p>	<p>134</p> <p>1 CERTIFICATE OF SHORTHAND REPORTER-NOTARY PUBLIC</p> <p>2</p> <p>3 I, Brooklyn E. Schweitzer, the officer</p> <p>4 before whom the foregoing deposition was taken, do</p> <p>5 hereby certify that the foregoing transcript is a</p> <p>6 true and correct record of the testimony given;</p> <p>7 that said testimony was taken by me</p> <p>8 stenographically and thereafter reduced to</p> <p>9 typewriting under my direction; that reading and</p> <p>10 signing was not requested; and that I am neither</p> <p>11 counsel for, related to, nor employed by any of</p> <p>12 the parties to this case and have no interest,</p> <p>13 financial or otherwise, in its outcome.</p> <p>14 IN WITNESS WHEREOF, I have hereunto set my</p> <p>15 hand and affixed my notarial seal this 22nd day of</p> <p>16 June, 2023. My commission expires: May 20th,</p> <p>17 2026.</p> <p>18</p> <p>19 </p> <p>20 _____</p> <p>21</p> <p>22 Brooklyn E. Schweitzer, RPR, CRR</p>
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