

1 UNITED STATES PATENT AND TRADEMARK OFFICE

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4

BEFORE THE PATENT TRIAL AND APPEAL BOARD

5

6

10X GENOMICS, INC.

7

Petitioner,

8

v.

9

BIO-RAD LABORATORIES, INC.

10

Patent Owner

11

12

Case IPR2020-00086

13

U.S. Patent No. 9,562,837

14

15

[Captions for related cases

16

on following pages.]

17

18

REMOTE VIDEOCONFERENCED AND

19

VIDEOTAPED DEPOSITION OF

20

RICHARD B. FAIR, PhD

21

VOLUME II, PP. 173-243

22

DATE TAKEN: DECEMBER 3, 2020

23

24

REPORTED BY: PAUL J. FREDERICKSON, CSR

25

JOB NO. 4357304

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13 Case IPR2020-00088

14 U.S. Patent No. 9,896,722  
15 -----

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18 VIDEOTAPED DEPOSITION OF

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25 JOB NO. 4357304

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13 Case IPR2020-00089

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15 -----

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7 Petitioner,

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9 BIO-RAD LABORATORIES, INC.

10 Patent Owner  
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15 Remote Videoconferenced and  
16 Videotaped Deposition of RICHARD B. FAIR,  
17 PhD, the witness herein, at 6:58 a.m.  
18 Pacific Time, 9:58 a.m. Eastern Time,  
19 pursuant to notice, reported by certified  
20 court reporter Paul J. Frederickson, CSR.  
21 All parties appeared remotely and the  
22 witness was sworn remotely.  
23  
24  
25

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A P P E A R A N C E S

FOR 10X GENOMICS, INC. AND THE WITNESS:

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ALSO PRESENT:

KIMBERLEE DECKER

Videographer

I N D E X

RICHARD B. FAIR, PhD

By Mr. Baker: 182

Request for information: None

Request for documents: None

I N D E X

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re IRP2020-00088

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Notice of Deposition

re IRP2020-00089

1	EXHIBIT 5	210
2	Diagram "Monolithic cured product,"	
3	one page	
4		
5	EXHIBIT 6	223
6	Diagram "Monolithic cured product,"	
7	modified, one page	
8		
9	EXHIBIT 7	233
10	Diagram "Ismagilov's Collection Well	
11	(Illustrative)," one page	
12		
13	EXHIBIT 1003	186
14	Previously marked exhibit	
15		
16		
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18		
19		
20		
21		
22		
23		
24		
25		



RICHARD B. FAIR, PhD., VOLUME 2

1	DECEMBER 3, 2020	06:58:37
2	[9:58 a.m. Eastern Time, 6:58	06:58:40
3	a.m. Pacific Time.]	06:58:43
4	[Deposition Exhibits 1 through 4	06:58:43
5	marked for identification.]	06:58:46
6	THE VIDEOGRAPHER: Good morning.	06:58:46
7	We are going on the record at 9:58	06:58:55
8	a.m. on December 3 of 2020.	06:58:58
9	All participants are attending	06:59:02
10	remotely.	06:59:04
11	Audio and video recording will	06:59:06
12	continue to take place unless all	06:59:07
13	party agree to go off the record.	06:59:09
14	This is media unit 1, volume 2	06:59:11
15	of the recorded deposition of Richard	06:59:14
16	Fair PhD taken by counsel for the	06:59:18
17	patent owner in the matter of	06:59:20
18	10x Genomics Inc. versus Bio-Rad	06:59:24
19	Laboratories Inc. filed with the	06:59:27
20	United States Patent and Trademark	06:59:31
21	Offices, case number IPR2020-00088.	06:59:33
22	My name is Kimberlee Decker from	06:59:43
23	Veritext Legal Solutions and I'm the	06:59:46
24	videographer. The reporter is Paul	06:59:47
25	Frederickson. I'm not related to any	06:59:50

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1 party in this action, nor am I 06:59:51  
2 financially interested in the outcome. 06:59:53  
3 Counsel and all present will now 06:59:56  
4 state their appearances and 06:59:57  
5 affiliations for the record. If there 06:59:59  
6 are any objections to proceeding, 07:00:01  
7 please state them at the time of your 07:00:02  
8 appearance, beginning with the 07:00:03  
9 noticing attorney. 07:00:04  
10 MR. BAKER: James Baker from 07:00:05  
11 Quinn Emanuel representing patent 07:00:09  
12 owner. 07:00:12  
13 MR. GERRITY: Robert Gerrity of 07:00:15  
14 Tensegrity Law Group on behalf of 07:00:17  
15 10x Genomics and the witness. 07:00:20  
16 THE VIDEOGRAPHER: Thank you. 07:00:23  
17 Will the court reporter please 07:00:23  
18 swear in the witness? 07:00:35  
19 RICHARD FAIR, PhD 07:00:35  
20 being duly sworn on oath, was 07:00:35  
21 examined and testified 07:00:35  
22 as follows: 07:00:35  
23 EXAMINATION 07:00:35  
24 BY MR. BAKER: 07:00:37  
25 Q. Good morning, Dr. Fair. 07:00:37

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1	A.	Good morning.	07:00:39
2	Q.	Nice to see you again.	07:00:40
3	A.	Nice to see you, Mr. Baker.	07:00:42
4	Q.	Thanks for taking the time	07:00:45
5		today. I appreciate it.	07:00:46
6		So I have -- well, first of all,	07:00:47
7		is there any reason you can't testify	07:00:51
8		truthfully and accurately today?	07:00:53
9	A.	No.	07:00:53
10	Q.	Okay.	07:00:53
11		I've loaded up into the Exhibit	07:00:59
12		Share -- do you have your Exhibit Share up?	07:01:02
13	A.	I do.	07:01:04
14	Q.	I've loaded up four exhibits	07:01:08
15		there, which are your deposition notices for	07:01:09
16		the IPRs at issue here which are IPR 2020	07:01:13
17		'86, '87, '88, and '89.	07:01:18
18		Do you see those deposition	07:01:22
19		notices?	07:01:23
20	A.	Yes, I do.	07:01:24
21	Q.	Have you seen those before?	07:01:26
22	A.	No, not specifically these	07:01:27
23		documents but, you know, I know --	07:01:34
24	Q.	You understand that you're here	07:01:37
25		testifying in all four IPRs today; right?	07:01:38

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1	A.	Correct.	07:01:42
2	Q.	All right.	07:01:42
3		Now, in those four IPRs you	07:01:44
4		submitted some -- a second declaration in	07:01:49
5		support of petitioner's replies; is that	07:01:54
6		right?	07:01:54
7	A.	Correct.	07:02:00
8	Q.	Okay.	07:02:00
9		Can you just describe for me	07:02:02
10		generally what your new opinions are?	07:02:04
11	A.	I'm sorry, what?	07:02:10
12	Q.	Your new opinions in your new	07:02:11
13		declaration, can you describe them for me	07:02:14
14		generally?	07:02:16
15		MR. GERRITY: Objection to form.	07:02:17
16	A.	Well, my responsive declarations	07:02:23
17		are a restatement of opinions that appeared	07:02:29
18		in my initial declarations. So I don't	07:02:33
19		have -- I have not formed new opinions.	07:02:37
20		I've just been responsive in replying to	07:02:40
21		points raised by Bio-Rad counsel.	07:02:45
22	Q.	Okay.	07:02:49
23		And in your responsive	07:02:50
24		declarations, you have some opinions about	07:02:53
25		the outlet wells, the alleged outlet wells	07:02:58

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1 in Thorsen and Ismagilov; correct? 07:03:01

2 A. Yes. 07:03:07

3 Q. How big are the outlet wells in 07:03:08

4 Thorsen? 07:03:12

5 A. In Thorsen? 07:03:13

6 Q. Yes. 07:03:13

7 A. Well, I think that to answer 07:03:20

8 that you would have to look at the 07:03:23

9 application. The outlet wells in chapter 4 07:03:28

10 we don't really know how big they are 07:03:32

11 except, in my opinion, they would have to be 07:03:34

12 big enough to pipette whatever is collected 07:03:37

13 because the application is high throughput 07:03:46

14 chemical screening and you need to get the 07:03:49

15 collected volumes out of those wells. 07:03:53

16 In the chapter 3 of Thorsen 07:03:58

17 system, that is an incubation chamber, and 07:04:01

18 so that collection system, the dimensions of 07:04:08

19 which I believe are given in -- as something 07:04:13

20 on the order of a microliter. So -- and the 07:04:18

21 dimensions are described in chapter 3 of 07:04:23

22 Thorsen. 07:04:26

23 Q. And where -- can you point me -- 07:04:26

24 show me where those dimensions are in 07:04:28

25 chapter 3 of Thorsen? 07:04:31

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1           A.     All right. Well, I'll need to           07:04:32  
2     find Thorsen.   07:04:34  
3           Q.     I can put it on the Exhibit           07:04:35  
4     Share if you want, or if you have it in           07:04:36  
5     front of you, that's fine too.                   07:04:39  
6           A.     I do. Let me find it.                07:04:42  
7                   THE COURT REPORTER: Mr. Baker,       07:04:53  
8     can you also put it on Exhibit Share?           07:05:01  
9                   MR. BAKER: Sure.                    07:05:03  
10                  THE COURT REPORTER: Thank you.       07:05:04  
11     BY MR. BAKER:                                       07:05:09  
12           Q.     Okay. So for the record I've        07:05:24  
13     moved over into the Marked Exhibits the        07:05:25  
14     Thorsen reference which has been previously     07:05:28  
15     marked as Exhibit 1003.                         07:05:30  
16                   [Previously marked Exhibit 1003       07:05:30  
17     shown to the witness.]                         07:05:30  
18     BY MR. BAKER:                                       07:05:30  
19           Q.     So you have Thorsen in front of       07:05:38  
20     you, Dr. Fair?                                    07:05:40  
21           A.     I do.                                 07:05:41  
22           Q.     And my question was if you could     07:05:42  
23     show me where when you said that the            07:05:44  
24     dimensions of the outlet well for chapter 3     07:05:47  
25     were given, and I asked you to please show     07:05:50

1 me where that was. 07:05:52

2 A. Well, what I'm calling the 07:05:54

3 outlet well is in fact the -- what is 07:05:56

4 referred to by Thorsen as an incubation 07:06:00

5 chamber, and this is a 500-micron high 07:06:03

6 cavity. And the photograph in figure 3.29 07:06:11

7 has a scale on it, and so you would be able 07:06:27

8 to get the dimension, the width dimension of 07:06:32

9 this circular incubation chamber, from that. 07:06:37

10 Q. Are there any other outlet wells 07:06:40

11 or collection wells in chapter 3 that you're 07:06:43

12 relying on? 07:06:46

13 MR. GERRITY: Objection to form. 07:06:48

14 A. In chapter 3 we know that there 07:06:55

15 is an outlet but we don't have information 07:07:01

16 about what that outlet was. 07:07:04

17 Q. What about -- go ahead, doctor. 07:07:13

18 A. It is similar to what is 07:07:13

19 described earlier in chapter 3 for the 07:07:16

20 serpentine channel system, and all they've 07:07:23

21 done is replaced the serpentine channel with 07:07:28

22 this incubation cavity. 07:07:31

23 Q. And do you know what the 07:07:38

24 dimensions are for the outlet well in the 07:07:39

25 serpentine system? 07:07:41

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1	A.	In chapter 3, and let me find	07:07:47
2		the figure --	07:07:49
3		[Pause.]	07:07:56
4	A.	So I'm looking at figure 3.13.	07:08:27
5		And that structure shows a droplet inlet, a	07:08:33
6		cross-flow droplet generator, a serpentine	07:08:41
7		channel, and then the collection and the	07:08:46
8		discrimination and detection and collection	07:08:50
9		wells.	07:08:53
10		So we're not given much detail	07:08:54
11		about these, but the same similar figure	07:08:58
12		appears in chapter 4 for a different	07:09:03
13		application, and in that high-throughput	07:09:09
14		screening application the wells would have	07:09:12
15		to be sized for collection by a miropipette.	07:09:13
16	Q.	And what is the minimum diameter	07:09:22
17		that those collection wells would be to	07:09:26
18		enable collection from a micropipette?	07:09:30
19	MR. GERRITY:	Objection to form,	07:09:34
20		beyond the scope of reply.	07:09:36
21	A.	Yeah, I have not -- well, if	07:09:47
22		you're micropipetting what I can say is	07:09:53
23		something that I've mentioned in my reply,	07:09:55
24		is that the -- the well diameter would have	07:09:58
25		to be large enough to accommodate the tip of	07:10:02

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1	the smallest micropipette available, and	07:10:07
2	that diameter would be greater than a	07:10:11
3	millimeter, probably 2 millimeters.	07:10:14
4	Q. So just to summarize, and	07:10:20
5	looking at figure 3.13, your opinion is that	07:10:23
6	the collection wells are the circles that	07:10:27
7	have a plus and a minus in them; right?	07:10:31
8	A. Correct.	07:10:35
9	Q. And you believe that those	07:10:36
10	collection wells exist in the system of both	07:10:38
11	chapter 3 and chapter 4; right?	07:10:41
12	A. Well, the system in chapter 3	07:10:45
13	shows the existence of collection wells.	07:10:47
14	The system with the serpentine channel in	07:10:51
15	chapter 4 also shows collection wells.	07:10:54
16	Q. Right.	07:10:57
17	So --	07:10:59
18	A. But I can't tell you -- I mean,	07:11:00
19	certainly the chapter 4 system was intended	07:11:02
20	for an application that required collection.	07:11:07
21	I don't think there's a specific application	07:11:10
22	associated with figure 3.13.	07:11:13
23	Q. Okay.	07:11:16
24	So there is no teaching in	07:11:17
25	chapter 3 that the droplets would be	07:11:21

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1 collected; is that right? 07:11:27

2 MR. GERRITY: Objection to form, 07:11:28

3 beyond the scope of reply. 07:11:30

4 A. Well, I just told you that in 07:11:41

5 chapter 3 there is a incubation chamber that 07:11:43

6 collects that is a collection chamber. And 07:11:48

7 so -- 07:11:54

8 Q. I'm sorry -- go ahead. 07:11:54

9 A. -- that would be the -- that 07:11:56

10 would be my answer. 07:11:57

11 Q. I'm referring to your opinions 07:11:58

12 about the collection with the pipette? 07:12:00

13 MR. GERRITY: Same objection. 07:12:06

14 BY MR. BAKER: 07:12:07

15 Q. It's your opinion that even 07:12:07

16 though chapter 4 doesn't refer to collection 07:12:12

17 with a pipette, that this would happen 07:12:15

18 because of the application of chapter 4; is 07:12:20

19 that right? 07:12:20

20 MR. GERRITY: Objection to form, 07:12:25

21 beyond the scope of reply. 07:12:26

22 A. Yeah, I really haven't said 07:12:30

23 anything in my reply declarations about 07:12:32

24 this -- what -- so let me have your question 07:12:35

25 again, please. 07:12:42

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1 Q. In your reply, your responsive 07:12:44  
 2 declarations, are you opining about 07:12:46  
 3 collection of droplets from the chapter 4 07:12:49  
 4 system? 07:12:52

5 [Pause.] 07:14:45

6 A. What I said in my responsive 07:14:46  
 7 declaration is -- about the size of the 07:14:49  
 8 outlet wells is that since Thorsen discloses 07:14:52  
 9 the outlet wells collect thousands of 07:14:56  
 10 droplets coming -- confirming the outlet 07:15:00  
 11 wells would have to have a volume sufficient 07:15:03  
 12 to accommodate multiple droplets in a 07:15:05  
 13 miscible fluid. And then on top of that, 07:15:10  
 14 you wanted to get to a specific dimension, 07:15:14  
 15 the chapter 4 outlet wells would have to be 07:15:18  
 16 sized to accommodate a micropipette. 07:15:22

17 Q. Okay. 07:15:25  
 18 Which in your opinion would be 07:15:27  
 19 greater than 1 millimeter, probably greater 07:15:29  
 20 than 2 millimeters? 07:15:32

21 MR. GERRITY: Objection to form. 07:15:34

22 A. Well, in my -- in my opinion, 07:15:39  
 23 for the minimum-size pipette the collection 07:15:42  
 24 well would have to be greater than 07:15:45  
 25 1 millimeter, probably 2 millimeters or 07:15:49

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1	greater.	07:15:52
2	Q. Okay.	07:15:52
3	And the collection wells that	07:15:53
4	you're referring to with respect to	07:15:55
5	chapter 4 are the same plus and minus	07:15:57
6	collection wells that we see in figure 3.13;	07:16:01
7	correct?	07:16:05
8	MR. GERRITY: Objection to form.	07:16:07
9	A. Well, I can't tell you that	07:16:13
10	they're the same. The diagrams are quite	07:16:15
11	similar, but they're highly schematic. It's	07:16:18
12	just that the chapter 4 application with the	07:16:24
13	serpentine channel has statements about	07:16:28
14	collecting thousands of droplets, and the	07:16:35
15	application would require micropipetting the	07:16:38
16	contents of the well, collection well, out	07:16:44
17	of -- out of the chip. And so they would	07:16:47
18	have to be at least 1 to 2 millimeters in	07:16:51
19	size.	07:16:54
20	Q. Okay.	07:16:54
21	And you believe that that same	07:16:55
22	collection well would also exist in the	07:16:57
23	systems of chapter 3?	07:17:00
24	A. Well, there's nothing expressly	07:17:09
25	stated about figure 3.13 in terms of -- it's	07:17:13

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1 more of a demonstration of the crossflow 07:17:18  
 2 droplet generation. The separation chamber 07:17:21  
 3 that's used in chapter 3 that I'm relying 07:17:27  
 4 upon is the incubation chamber. 07:17:36  
 5 So we're not giving any details 07:17:38  
 6 about an application for figure 3.13 or, 07:17:40  
 7 therefore, how many droplets would be 07:17:51  
 8 collected. Just -- you know, you can 07:17:53  
 9 generate thousands of droplets a second. So 07:17:57  
 10 if you looked at the use of such a system, 07:17:59  
 11 you would say, "Well, you better have 07:18:04  
 12 reasonably sized wells to collect the 07:18:06  
 13 droplets you're sorting at that junction on 07:18:09  
 14 the outlet." But that's all you can say. 07:18:12  
 15 Q. Okay. 07:18:12  
 16 So you can't say anything about 07:18:19  
 17 the dimensions of the outlet wells in 07:18:21  
 18 chapter 3? 07:18:24  
 19 MR. GERRITY: Objection to form, 07:18:26  
 20 beyond the scope of reply. 07:18:27  
 21 A. I am unable to comment on the 07:18:37  
 22 size of the outlet wells in figure 3.13 07:18:39  
 23 except one of ordinary skill in the art 07:18:45  
 24 would understand that they would have to be 07:18:47  
 25 sized to accommodate numerous droplets, 07:18:50

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1       which that system is capable of producing.       07:18:54

2               Q.       Would they need to be sized to       07:18:57

3       accommodate a micropipette?       07:18:59

4               MR. GERRITY:  Objection to form,       07:19:02

5       beyond the scope of reply.       07:19:06

6               A.       So there is nothing expressly       07:19:18

7       stated in chapter 3 about how big the outlet       07:19:22

8       wells would be in figure 3.13.  So I really       07:19:25

9       can't answer your question based upon what       07:19:34

10      Thorsen discloses.       07:19:38

11              Q.       So you don't have any opinions       07:19:40

12      about whether it would be possible to       07:19:42

13      collect droplets from the chapter 3 outlet       07:19:44

14      wells?       07:19:47

15              MR. GERRITY:  Objection to form,       07:19:48

16      beyond the scope of reply.       07:19:50

17              A.       Yeah, if you could point -- help       07:19:56

18      me find my opinion -- that opinion that       07:20:00

19      you're looking for in my reply declaration,       07:20:03

20      I would appreciate some help, because I       07:20:06

21      don't -- don't know where I would find it.       07:20:08

22              Q.       Well, that's my question.  I'm       07:20:10

23      just making sure that you don't -- if you       07:20:12

24      don't have any opinions about that, that's       07:20:14

25      fine.  You can tell me that.       07:20:17

1                   That's my only question.                   07:20:20

2                   MR. GERRITY: Objection to form,               07:20:23

3                   beyond the scope of reply.                   07:20:24

4                   A.       What I'm telling you is in my           07:20:28

5                   reply declaration I have not expressed any       07:20:31

6                   opinion of -- that I'm aware of regarding           07:20:34

7                   the use of a micropipette to remove content           07:20:39

8                   of the outlet wells in figure 3.13.               07:20:44

9                   Q.       Okay.                               07:20:48

10                  And have you expressed any               07:20:49

11                  opinions about that in this case at all,     07:20:51

12                  whether in your responsive declaration or     07:20:56

13                  your original declaration?               07:20:58

14                  MR. GERRITY: Objection to form,           07:21:01

15                  beyond the scope of reply.               07:21:02

16                  A.       Well, with regard to 3.13,           07:21:06

17                  figure 3.13, I would have to go back and     07:21:09

18                  look at my initial declaration.           07:21:12

19                  Q.       So I'm just -- my question is     07:21:14

20                  more basic than that. I'm just saying, in     07:21:16

21                  this case do you have any opinions about     07:21:19

22                  whether it would be possible to collect       07:21:22

23                  droplets from the chapter 3 outlet wells?     07:21:24

24                  MR. GERRITY: Objection to form,           07:21:28

25                  beyond the scope of reply.               07:21:29

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1	A.	Well, I have to go back to my	07:21:40
2		initial declaration to -- to answer that	07:21:42
3		question.	07:21:43
4	Q.	Okay.	07:21:44
5		Let's talk about collection of	07:21:51
6		droplets from the incubation chamber. Is	07:21:52
7		that possible?	07:21:58
8	MR. GERRITY:	Objection to form,	07:22:00
9		beyond the scope of reply.	07:22:06
10	A.	So in figure 3.28 is a picture	07:22:34
11		of an incubation chamber. And what you see	07:22:39
12		is that there is an inlet to that chamber	07:22:43
13		and there is an outlet. And so collection	07:22:47
14		of droplets from that incubation chamber are	07:22:54
15		made through the outlet to the system at the	07:22:58
16		bottom with an arrow pointed as the letter C	07:23:05
17		where sorting of the droplets occurs.	07:23:13
18	Q.	All right.	07:23:13
19	A.	So the physical outlet.	07:23:18
20	Q.	So there is no way to collect	07:23:21
21		the droplets directly from the incubation	07:23:23
22		chamber?	07:23:26
23	MR. GERRITY:	Objection to form,	07:23:27
24		mischaracterizes, beyond the scope of	07:23:28
25		reply.	07:23:31



1           A.     Well, there -- I just told you           07:23:38  
2     there is an outlet. And you can see it.           07:23:39  
3     You can see the devices that were collected.       07:23:45  
4     I mean, the -- whatever was collected is           07:23:52  
5     shown in -- well, the outlet is shown in           07:23:57  
6     figure 3.28C.                                       07:24:05  
7           Q.     Are you referring -- what are           07:24:07  
8     you referring to specifically?                   07:24:09  
9           A.     Well, I'm referring to --           07:24:12  
10               MR. GERRITY: Just one moment so       07:24:13  
11               I get the objection on the record,       07:24:14  
12               Dr. Fair.                               07:24:18  
13               THE WITNESS: Okay. Sorry.           07:24:19  
14               MR. GERRITY: Objection to form       07:24:19  
15               beyond the scope much reply.           07:24:20  
16               Go ahead.                               07:24:22  
17           A.     If you could help me find in my       07:24:33  
18     reply -- in responsive declaration where I'm       07:24:36  
19     talking about the outlets of the incubation       07:24:38  
20     chamber in chapter 3, I would appreciate it.      07:24:43  
21           Q.     Well, I -- I don't think you --       07:24:45  
22     I don't think you do. I don't think it's           07:24:47  
23     possible to collect from the incubation           07:24:49  
24     chamber. So that's why I'm asking you. But       07:24:51  
25     now you're referring to figure 3.28 and           07:24:57

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1       telling me that there is an outlet from                   07:25:00  
 2       which you can collect droplets in the                   07:25:01  
 3       incubation chamber. My question is where --           07:25:04  
 4       can you point me to that in figure 3.28?               07:25:06  
 5               MR. GERRITY: Objection to form,               07:25:10  
 6               beyond the scope of reply.                   07:25:11  
 7               A. Well, at a basic level you have             07:25:19  
 8       an incubation chamber that's shown in                 07:25:20  
 9       figure 3.28A. You may have an inlet and a             07:25:24  
 10      backflow channel going in, you have an               07:25:31  
 11      outlet, a backflow channel going out of the            07:25:33  
 12      circle and an exploded view, higher mag view         07:25:35  
 13      of that, is in 3.28C, which shows election            07:25:41  
 14      outlet, carrying -- that would carry the             07:25:47  
 15      contents to the sorting valves below.                 07:25:51  
 16               Q. Okay.                                       07:25:56  
 17               Where are the sorting valves?                 07:25:59  
 18               A. In figure --                                 07:26:03  
 19               MR. GERRITY: Objection to form,               07:26:04  
 20               beyond the scope of reply.                   07:26:05  
 21      BY MR. BAKER:   07:26:05  
 22               Q. In the top figure, the                    07:26:07  
 23      schematic?   07:26:10  
 24               A. There are pictures -- well,                07:26:11  
 25      there's a schematic of the valves that                07:26:12

1 control flow, and in figure 3.28C there is a 07:26:15  
 2 magnified view of an actual system that was 07:26:24  
 3 manufactured with the -- the valves present 07:26:27  
 4 running vertically to the flow channels. 07:26:33  
 5 Q. And are those shown in the top 07:26:36  
 6 figure, the top schematic? 07:26:37  
 7 MR. GERRITY: Same objection. 07:26:41  
 8 A. Well, yes. You see the 07:26:47  
 9 pneumatic control channels that control the 07:26:50  
 10 valves in both 3.28C and 3.28A. 07:26:54  
 11 Q. Okay. 07:27:00  
 12 And the control valves in the 07:27:04  
 13 top figure, of the schematic, are you 07:27:05  
 14 referring to the things that are shaded in 07:27:08  
 15 gray? 07:27:11  
 16 A. Yes, those are the pressure 07:27:15  
 17 lines that activate the valves. 07:27:17  
 18 Q. Okay. 07:27:20  
 19 If I wanted to go in and collect 07:27:21  
 20 droplets, can you show me in the top 07:27:24  
 21 schematic in figure 3.28, can you point to 07:27:29  
 22 me in that schematic where I would be able 07:27:32  
 23 to collect droplets? 07:27:35  
 24 MR. GERRITY: Objection to form, 07:27:38  
 25 beyond the scope of reply. 07:27:39

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1                   We talked at your deposition,                   07:30:20  
2       first deposition, about the idea that a                   07:30:22  
3       collection well could have the same height               07:30:24  
4       as the microchannel. Do you recall that?               07:30:28  
5                   MR. GERRITY: Objection to form,               07:30:31  
6                   mischaracterizes, beyond the scope of           07:30:33  
7                   reply.   07:30:35  
8                   A.       Could you point that testimony           07:30:38  
9       out to me, please?                                       07:30:40  
10                  Q.       I'm just asking if you remember.       07:30:41  
11       Do you remember that?                                   07:30:42  
12                  MR. GERRITY: Same objections.               07:30:44  
13                  A.       I don't remember that, no.             07:30:47  
14                  Q.       Do you remember talking about           07:30:51  
15       waste reservoirs?                                       07:30:52  
16                  MR. GERRITY: Same objections.               07:30:55  
17                  A.       In what context?                     07:31:00  
18                  Q.       In the context of microfluidic           07:31:02  
19       devices.   07:31:06  
20                  MR. GERRITY: Same objections.               07:31:07  
21                  A.       Well, I'd really like to see            07:31:11  
22       what I said before I respond to that.                   07:31:12  
23                  Q.       Dr. Fair, do you remember             07:31:14  
24       testifying about waste reservoirs?                     07:31:16  
25                  MR. GERRITY: Objection to form,               07:31:18

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1	Q.	You didn't -- okay.	07:32:28
2		Did you talk about punching	07:32:33
3		through any -- any layers?	07:32:34
4	A.	I did talk about punching	07:32:40
5		through PDMS or silicon rubber layers, yes.	07:32:44
6	Q.	Okay.	07:32:47
7		And what is your opinion in that	07:32:53
8		regard?	07:32:55
9		MR. GERRITY: Objection to form.	07:32:56
10	A.	Well, my opinions are stated in	07:33:00
11		my responsive declaration. So if you're	07:33:01
12		looking for any particular one, I would like	07:33:03
13		you to point me to the area in my report.	07:33:06
14	Q.	I'd like for you to tell me in	07:33:10
15		your own words what your opinions are about	07:33:11
16		punching through the PDMS layer.	07:33:14
17		MR. GERRITY: Objection to form.	07:33:19
18	A.	I'm sorry, I don't understand.	07:33:23
19		That's so vague, I can't get my head around	07:33:24
20		it.	07:33:26
21	Q.	Punching through the PDMS layer	07:33:30
22		is too big of an issue for you to testify	07:33:32
23		about?	07:33:34
24		MR. GERRITY: Objection to form.	07:33:37
25	A.	Well, is there some aspect of	07:33:45

1	punching through that you would like me to	07:33:48
2	respond to that's within the four corners of	07:33:51
3	my declarations, responsive declaration?	07:33:56
4	Q. It's your belief that the outlet	07:34:01
5	wells of Thorsen were made by punching	07:34:02
6	through the PDMS layer; right?	07:34:06
7	A. Well, it would be my opinion	07:34:13
8	that since Thorsen did use PDMS-type	07:34:18
9	materials and that if he wanted to, in the	07:34:27
10	chapter 4 device, collect the contents for	07:34:31
11	his high-throughput screening application,	07:34:35
12	he would need to punch through his layers to	07:34:38
13	create a large enough well. In fact,	07:34:45
14	Thorsen actually talks about punching	07:34:47
15	through the elastomer layers. So that --	07:34:51
16	that -- he actually has used that kind of a	07:34:58
17	method.	07:35:00
18	Q. Okay.	07:35:00
19	It's possible though, isn't it,	07:35:03
20	that he could have punched through using --	07:35:05
21	to create a -- a tunnel, if you will, down	07:35:12
22	to the collection well that is smaller than	07:35:17
23	the 1 millimeters that you say is necessary?	07:35:21
24	MR. GERRITY: Objection to form,	07:35:26
25	foundation.	07:35:29



1           A.     Well, Thorsen does talk about           07:35:34  
2     punching with a syringe needle that's less       07:35:38  
3     than 1 millimeter. But if he wanted to           07:35:42  
4     collect from those output wells in               07:35:45  
5     chapter 4, he would need to have something       07:35:48  
6     substantially larger than what he used, and       07:35:51  
7     so he -- I think he used a 20-gauge syringe       07:35:55  
8     needle. He would have to use a different          07:36:01  
9     gauge needle to get a well that was adequate     07:36:04  
10    for pipetting.                                       07:36:07  
11           Q.     All right.                             07:36:09  
12                   I'll just show you -- I'm going     07:36:19  
13    to mark as an exhibit here -- well, let me        07:36:24  
14    take you in your -- in your responsive            07:36:36  
15    declaration, in the '87 petition.                  07:36:41  
16                   [Previously marked Exhibit 1072       07:36:41  
17    shown to the witness.]                             07:36:41  
18    BY MR. BAKER:                                       07:36:41  
19           Q.     If you go to page 23.                07:37:19  
20                   Are you there?                      07:37:41  
21           A.     Yes.                                   07:37:41  
22           Q.     On that page you refer to            07:37:43  
23    figure 3.27 from Thorsen; right?                  07:37:45  
24           A.     Correct.                              07:37:47  
25           Q.     Okay.                                07:38:05

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1	MR. GERRITY: And, counsel,	07:38:05
2	you're at pdf page 23 or text page 23?	07:38:06
3	Just so I'm literally on the same	07:38:09
4	page.	07:38:11
5	MR. BAKER: I don't know. It's	07:38:11
6	the page that's number 23 in his	07:38:15
7	responsive declaration.	07:38:18
8	MR. GERRITY: It's got an	07:38:20
9	internal pagination and then it's got	07:38:21
10	the exhibit stamped page.	07:38:22
11	MR. BAKER: Yeah, I'm on the	07:38:24
12	internal one. It's the one with the	07:38:25
13	figure 3.27.	07:38:27
14	MR. GERRITY: Okay.	07:38:28
15	BY MR. BAKER:	07:38:28
16	Q. I want to ask you about that	07:38:34
17	figure.	07:38:43
18	So in the very bottom of that	07:38:44
19	figure you see it says:	07:38:45
20	"Monolithic cured product"?	07:38:46
21	A. Yes.	07:38:52
22	Q. And then there is -- there is	07:38:56
23	the red microchannel which is on the bottom.	07:39:02
24	Right?	07:39:08
25	A. Yes.	07:39:08

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1	Q.	And then there is a blue	07:39:10
2		microchannel on top of that that I think is	07:39:11
3		the -- the valve; right?	07:39:14
4	A.	Well, the blue channel is the	07:39:20
5		pressure, pneumatic pressure channel, that	07:39:23
6		actuates the valve.	07:39:28
7	Q.	Right.	07:39:29
8	A.	Which the valve is right on top	07:39:30
9		the channel.	07:39:32
10	Q.	Right.	07:39:33
11		And in the earlier schematic	07:39:33
12		that we saw, it was a -- the plus and the	07:39:39
13		minus circles at the end of the	07:39:42
14		microchannels; right?	07:39:45
15		MR. GERRITY: Objection to form.	07:39:49
16		BY MR. BAKER:	07:39:49
17	Q.	Do you need to go back and look	07:39:53
18		at that?	07:39:54
19	A.	We were looking at figure 3.13	07:39:57
20		in Thorsen, and that had outlet wells marked	07:40:00
21		plus or minus.	07:40:04
22	Q.	Right.	07:40:04
23	A.	Then there's a figure in	07:40:06
24		chapter 4 as well.	07:40:11
25	Q.	Correct.	07:40:13

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1	And those outlet wells, the	07:40:14
2	plus- and the minus-type outlet wells, would	07:40:17
3	be at the ends -- the beginning and the ends	07:40:20
4	of the red microchannel here right? Is that	07:40:23
5	your understanding?	07:40:26
6	A. No.	07:40:32
7	Q. It's not your understanding?	07:40:33
8	A. There is no microfluidic	07:40:35
9	structure that's associated with	07:40:38
10	figure 3.27.	07:40:42
11	Q. Yeah, but in your responsive	07:40:42
12	declaration you say that the way that the	07:40:44
13	outlet well is created is by punching at the	07:40:46
14	end of the red microchannel, punching all	07:40:50
15	the way down to the end.	07:40:53
16	Are you not saying that?	07:41:00
17	A. Let me just find out what I	07:41:02
18	said.	07:41:04
19	[Pause.]	07:41:05
20	Q. If you look at paragraph 36 and	07:41:18
21	then it goes on to -- starts on page 22,	07:41:21
22	goes on to page 23. Right underneath the	07:41:25
23	figure on page 23 you say:	07:41:35
24	"The inlet and outlet wells for	07:41:37
25	the droplet flow layer microchannels (at the	07:41:39

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1 bottom of the thin layer) are then 'punched' 07:41:44  
 2 or bored through the entire 'thick' top 07:41:47  
 3 layer as well as the thin layer to connect 07:41:50  
 4 to the (red) bottom microchannels...." 07:41:53  
 5 Do you see that? 07:41:58  
 6 A. I do. 07:41:59  
 7 Q. Okay. 07:41:59  
 8 So -- and that is your opinion; 07:42:02  
 9 right? 07:42:07  
 10 A. Well, that's my opinion, 07:42:07  
 11 although figure 3.27 is kind of a process 07:42:09  
 12 flow for how to create a generic red channel 07:42:16  
 13 with a blue valve, pressurized valve, 07:42:20  
 14 channel on top. So you would have to take 07:42:25  
 15 that and say, okay, now if I have outlet 07:42:28  
 16 wells, as I do in figure 3.13 or in the 07:42:33  
 17 chapter 4, then I would have to go through 07:42:40  
 18 the entire thickness of the PDMS layer, 07:42:43  
 19 punch through that in order to get down to 07:42:47  
 20 the liquid flow layer, which is indicated as 07:42:51  
 21 maybe a red channel. But not necessarily 07:42:55  
 22 the channel in figure 3.27. 07:42:58  
 23 Q. Right. 07:43:00  
 24 And it's this process of 07:43:01  
 25 punching through, in your opinion, that 07:43:03

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1 would create the plus and minus wells that 07:43:06  
2 we saw in figure 3.13; right? 07:43:10  
3 A. That's -- that would be my 07:43:21  
4 opinion, yes. 07:43:23  
5 Q. Okay. 07:43:23  
6 I want to explore the 07:43:24  
7 possibility that there is another way that 07:43:25  
8 it could have been done. Okay? So that was 07:43:27  
9 all a setup to talk with you about whether 07:43:30  
10 there's another way where -- whether -- how 07:43:33  
11 it could have been done. 07:43:37  
12 So I've marked as Exhibit 5 an 07:43:39  
13 annotated version of that monolithic cured 07:43:46  
14 product. So if you can pull up Exhibit 5 in 07:43:52  
15 your Marked Exhibit folder. 07:43:55  
16 [Deposition Exhibit 5 marked for 07:43:55  
17 identification.] 07:43:55  
18 A. So -- 07:44:07  
19 MR. GERRITY: And just while 07:44:13  
20 he's pulling that up, I'll note that 07:44:14  
21 we object to the introduction of any 07:44:16  
22 exhibit at this stage in the 07:44:17  
23 proceedings as beyond the scope of the 07:44:19  
24 surreply. 07:44:21  
25 MR. BAKER: It's your exhibit. 07:44:22

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1           It's what he used in his responsive           07:44:24  
2           declaration. So --           07:44:26  
3           MR. GERRITY: Exhibit 5 is not           07:44:27  
4           his exhibit. You're not representing           07:44:28  
5           that it's his exhibit. You said it's           07:44:29  
6           your annotation, your drawing; right?           07:44:32  
7           MR. BAKER: Well, that's right.           07:44:34  
8           I made an annotation on his exhibit           07:44:34  
9           and I'm going to ask him questions           07:44:36  
10          about that.           07:44:37  
11          MR. GERRITY: I understand. I'm           07:44:37  
12          just noting my objection for the           07:44:39  
13          record that it's beyond the scope of           07:44:40  
14          his reply and not proper for           07:44:42  
15          surrebuttal.           07:44:44  
16          BY MR. BAKER:           07:44:44  
17          Q. Are you there, Dr. Fair?           07:44:51  
18          Do you see Exhibit 5?           07:44:58  
19          [Pause.]           07:44:58  
20          A. Are they -- is this sequential?           07:45:18  
21          Because I don't have a number. I have the           07:45:20  
22          fifth -- the fifth item down is my '86           07:45:23  
23          declaration. The sixth item down is the '87           07:45:29  
24          declaration. So --           07:45:31  
25          Q. You should have in your Marked           07:45:33

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1 Exhibit folder -- there should be a pdf that 07:45:36  
 2 is labeled Exhibit - 0005 - Image. 07:45:38  
 3 Do you see that? 07:45:44  
 4 A. I don't. 07:45:45  
 5 MR. GERRITY: And I had to click 07:45:47  
 6 "reply" to get it to show up, 07:45:49  
 7 Dr. Fair -- or rather "refresh" to get 07:45:52  
 8 it to show up. 07:45:54  
 9 A. Okay. Let me -- 07:45:56  
 10 [Pause.] 07:46:06  
 11 A. Let me relaunch Exhibit Share. 07:46:38  
 12 I see it now. Thank you. 07:46:41  
 13 Q. Do you have Exhibit 5 in front 07:46:45  
 14 of you now? 07:46:47  
 15 A. I do. 07:46:47  
 16 Q. Okay. 07:46:47  
 17 So the annotations that I've 07:46:51  
 18 made is I've drawn a red circle at the end 07:46:53  
 19 of the red microchannel and then a dashed 07:46:58  
 20 line coming up from that red circle. 07:47:03  
 21 Do you see that? 07:47:05  
 22 A. I do. 07:47:06  
 23 Q. And so my question is, the red 07:47:06  
 24 circle I'm representing here would be the 07:47:10  
 25 plus and minus wells, and the dashed line 07:47:13

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1	would be a very small hole punch with a	07:47:19
2	syringe needle, let's say, down to that	07:47:25
3	well.	07:47:27
4	Is it possible that Thorsen	07:47:33
5	could have fabricated his devices this way?	07:47:34
6	MR. GERRITY: Objection to form,	07:47:36
7	beyond the scope of reply.	07:47:39
8	A. Well, actually, it is beyond the	07:47:57
9	scope of my responsive declaration.	07:48:00
10	But what you see is, in your	07:48:02
11	structure, I think you're saying if you form	07:48:07
12	the PDMS layer that would form the liquid	07:48:09
13	flow, the red line, and then you punched	07:48:15
14	into that PDMS layer.	07:48:18
15	But on the other hand the blue	07:48:22
16	layer is the control layer. So you still	07:48:24
17	have to put on top the thick layer that is	07:48:26
18	the control layer PDMS, and that would cover	07:48:31
19	up your -- well, it would fill it in with	07:48:35
20	PDMS.	07:48:39
21	Q. But then you could punch through	07:48:40
22	to the well with a small syringe needle;	07:48:42
23	right?	07:48:46
24	MR. GERRITY: Same objection.	07:48:47
25	A. Well, the difficulty is you	07:48:52

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1 would have to align. So if this is, say, a 07:48:53  
2 half-millimeter circle and you wanted to 07:49:00  
3 align through a 1-centimeter-thick PDMS 07:49:03  
4 layer, you might, after numerous tries, 07:49:10  
5 after you've punched holes all over your -- 07:49:16  
6 through your PDMS layer, you may get an 07:49:19  
7 alignment through the extension through the 07:49:22  
8 thick layer. But it would -- I don't -- I 07:49:24  
9 don't -- this would -- this is not anything 07:49:29  
10 you do because this large circle would be 07:49:31  
11 filled in with PDMS that you just deposited 07:49:34  
12 on top. 07:49:38

13 Q. Well, I don't think that's true, 07:49:41  
14 is it? Because if that's true, then the red 07:49:42  
15 microchannel would be filled in with PDMS as 07:49:45  
16 well; right? 07:49:48

17 MR. GERRITY: Objection to form. 07:49:49

18 A. See, that's -- that's incorrect 07:49:52  
19 because you already have a buried channel 07:49:54  
20 below the thickness of a layer. 07:49:57

21 The PDMS on the bottom is 07:50:00  
22 thicker than the molded channel that is 07:50:02  
23 shown in red. However, the circle that 07:50:05  
24 you've exposed by punching through the thin 07:50:09  
25 layer is open and there is nothing covering 07:50:12

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1 it. So now it's vulnerable to the thick 07:50:16  
 2 deposition of PDMS, which would just fill up 07:50:20  
 3 that circle. 07:50:23  
 4 Q. Oh, I -- what I'm suggesting is 07:50:25  
 5 that the red circle is fabricated, molded, 07:50:26  
 6 at the same time as the microchannel so that 07:50:33  
 7 you just have a reservoir there. 07:50:35  
 8 MR. GERRITY: Objection to form. 07:50:38  
 9 BY MR. BAKER: 07:50:39  
 10 Q. A cavity. 07:50:40  
 11 MR. GERRITY: Same objection. 07:50:41  
 12 A. I'm sorry, I think you used 07:50:44  
 13 incorrect words. Could you re-ask that? 07:50:46  
 14 Q. Well, I would need you to tell 07:50:49  
 15 me why you think it's incorrect. 07:50:51  
 16 MR. GERRITY: Objection to form. 07:50:53  
 17 A. Why don't you repeat it? 07:50:54  
 18 Because I -- 07:50:55  
 19 Q. Well, I'm saying you're saying 07:50:57  
 20 that -- that we couldn't do it this way 07:51:00  
 21 because the PDMS would fill the red circle. 07:51:03  
 22 Right? 07:51:09  
 23 A. Well, you're indicating that you 07:51:11  
 24 had punched that, that outlet, that circle. 07:51:12  
 25 Q. Let me -- let's do it this way. 07:51:18

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1 MR. BAKER: I'm sorry, who was 07:52:09  
2 that? 07:52:19  
3 COURT REPORTER: That was Paul, 07:52:19  
4 the reporter. We were speaking over 07:52:20  
5 each other. 07:52:21  
6 BY MR. BAKER: 07:52:21  
7 Q. My question, Dr. Fair, is -- did 07:52:26  
8 you understand my question, Dr. Fair? I'll 07:52:30  
9 repeat it for the court reporter. I just 07:52:33  
10 want to make sure you -- 07:52:34  
11 A. I -- 07:52:36  
12 Q. Did you understand it? 07:52:37  
13 MR. GERRITY: Objection to form. 07:52:44  
14 A. No, I don't recall what it was. 07:52:45  
15 Q. There's a red microchannel in 07:52:46  
16 this image. You see that; right? 07:52:54  
17 A. Yes. 07:52:54  
18 Q. And the red circle, I want that 07:52:59  
19 to be an open reservoir. Okay? That the 07:53:03  
20 microchannel empties into. Okay? Do you 07:53:07  
21 understand? 07:53:12  
22 MR. GERRITY: Objection -- 07:53:13  
23 A. Yeah, I do. 07:53:14  
24 MR. GERRITY: Objection to form. 07:53:15  
25 BY MR. BAKER: 07:53:15

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1 Q. And on the top of -- 07:53:16

2 MR. GERRITY: You've got to let 07:53:17

3 me get my objection in without me 07:53:18

4 talking over you so that the reporter 07:53:20

5 can get us one at a time. 07:53:23

6 Objection to form, incomplete 07:53:25

7 hypothetical, beyond the scope of 07:53:26

8 reply. 07:53:28

9 BY MR. BAKER: 07:53:28

10 Q. At the top of the reservoir I 07:53:29

11 want there to be a small opening like a 07:53:30

12 chimney that goes all the way up to the top 07:53:32

13 of the PDMS. Do you understand that? 07:53:35

14 MR. GERRITY: Same objection. 07:53:38

15 A. Well, I understand what you're 07:53:39

16 asking, but your structure still would not 07:53:46

17 allow you to build what you're trying to 07:53:48

18 build. 07:53:51

19 Q. Okay. 07:53:52

20 I'm -- my question for you is if 07:53:53

21 that's the structure that I want, can you -- 07:53:55

22 could you build it for me? 07:54:00

23 MR. GERRITY: Objection to form, 07:54:02

24 beyond the scope of reply, incomplete 07:54:05

25 hypothetical. 07:54:08

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1           A.       So the only way to create the           07:54:12  
2       red structure on the bottom is use a           07:54:13  
3       directly fabricated channel in the           07:54:20  
4       horizontal -- the left-to-right running line   07:54:24  
5       which is indicating that you have a solid       07:54:29  
6       red line that is molded and covered with a     07:54:32  
7       thin layer. Now you have this open area on     07:54:37  
8       the right, but it's not opened because         07:54:41  
9       you've -- the interior is white. If you had     07:54:44  
10      that as an open, it would all be red.           07:54:48  
11               And so when you do your second         07:54:54  
12      layer of PDMS, it would just fill that open     07:54:56  
13      layer in. You see the inside of that circle     07:54:58  
14      is the background white color, and that        07:55:00  
15      means it's -- it may have been open after       07:55:05  
16      the first layer and then the hole punch, but     07:55:08  
17      afterwards it would get filled in.             07:55:11  
18           Q.       Okay. If I didn't want it to be   07:55:17  
19      filled in, could you do that?                   07:55:19  
20               MR. GERRITY: Objection to form,        07:55:20  
21               incomplete hypothetical, beyond the     07:55:23  
22               scope of reply.                         07:55:24  
23           A.       So you would need -- yeah, you     07:55:28  
24      would need a mold that when you poured your     07:55:35  
25      initial layer of PDMS on it would give           07:55:38

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1	you -- when you do the molding it would	07:55:42
2	imprint the feature where you have a channel	07:55:50
3	and an open volume.	07:55:55
4	Q. Exactly.	07:55:58
5	A. Okay. So this, this exhibit, is	07:56:00
6	incorrect because it shows that you have	07:56:02
7	opened that outlet circle down to the base	07:56:07
8	of the Petri dish that you have.	07:56:13
9	Q. Oh, you're objecting to it	07:56:18
10	because it's -- because it's white on the	07:56:19
11	inside and not red?	07:56:22
12	A. Yeah. You've -- it's not --	07:56:24
13	it's not a chamber unless you punch it.	07:56:27
14	Q. Okay.	07:56:29
15	We -- but you acknowledge that	07:56:37
16	we could mold a chamber and create a	07:56:38
17	chamber, and if you want to fill it in as	07:56:48
18	red that's fine. As a matter of fact, you	07:56:51
19	know what? I can do that. If that makes it	07:56:53
20	easier for you, I can -- I can do that and	07:56:56
21	we can talk about it after a break.	07:56:58
22	But you understand the point	07:57:00
23	that I'm making; right?	07:57:02
24	MR. GERRITY: Objection to form,	07:57:04
25	beyond the scope of reply, incomplete	07:57:07

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1	go -- let's go on a break. I'm going to	07:58:22
2	color in that circle just to clarify. Okay?	07:58:25
3	And then when we get back we'll talk a	07:58:28
4	little bit more about this.	07:58:31
5	But this is a pretty critical	07:58:33
6	point, so I just want to reiterate please	07:58:35
7	don't discuss during the break with your	07:58:37
8	counsel anything of substance. Okay?	07:58:41
9	A. That's fine.	07:58:47
10	MR. BAKER: Okay. All right.	07:58:49
11	Why don't we take a ten-minute break	07:58:49
12	and we'll come back?	07:58:51
13	THE VIDEOGRAPHER: We are off	07:58:52
14	the record at 10:58 a.m.	07:58:53
15	[Recess at 10:58 a.m. Eastern	07:58:59
16	Time, 7:58 a.m. Pacific Time.]	07:59:05
17	[Resuming at 11:13 a.m. Eastern	07:59:08
18	Time, 8:13 a.m. Pacific Time.]	07:59:15
19	THE VIDEOGRAPHER: Stand by.	08:13:44
20	We are on the record at 11:13	08:13:44
21	a.m.	08:13:51
22	EXAMINATION CONTINUING	08:13:51
23	BY MR. BAKER:	08:13:51
24	Q. All right, Dr. Fair. I made a	08:13:53
25	further annotation to the image during the	08:13:55

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1	break. I've loaded into your Marked	08:13:58
2	Exhibits another image that's Exhibit 6. If	08:14:01
3	you can pull that up?	08:14:06
4	[Deposition Exhibit 6 marked for	08:14:06
5	identification.]	08:14:07
6	A. I have it.	08:14:07
7	Q. Okay.	08:14:08
8	So this is the same as Exhibit 5	08:14:08
9	except as we discussed I filled in the --	08:14:10
10	the red circle with a white interior, I've	08:14:13
11	now filled it in with red.	08:14:18
12	Do you see that?	08:14:22
13	A. I can.	08:14:22
14	MR. GERRITY: And I note the	08:14:22
15	same objections.	08:14:23
16	MR. BAKER: Go ahead.	08:14:23
17	MR. GERRITY: I'll note the same	08:14:24
18	objection for the record to adding any	08:14:26
19	material or exhibits at this point,	08:14:28
20	improper surreply.	08:14:30
21	MR. BAKER: Okay.	08:14:30
22	BY MR. BAKER:	08:14:30
23	Q. And, Dr. Fair, do you understand	08:14:37
24	what this image depicts?	08:14:38
25	MR. GERRITY: Objection to form,	08:14:41

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1 incomplete hypothetical, beyond the 08:14:43  
2 scope of reply. 08:14:45  
3 A. Why don't you tell me what you 08:14:50  
4 think it depicts since it's your exhibit? 08:14:52  
5 Q. I'm just referring -- I just 08:14:55  
6 wanted to refer back to our previous 08:14:56  
7 discussion. I think you understand what it 08:14:58  
8 depicts based on our previous discussion, 08:15:00  
9 but I'll -- we'll go through it again if you 08:15:01  
10 need me to. 08:15:04  
11 The red line from left to right 08:15:04  
12 is the microchannel. The red filled-in 08:15:07  
13 circle at the end is the reservoir that has 08:15:10  
14 the same height as the microchannel. And 08:15:13  
15 then the red dash line is the chimney, if 08:15:15  
16 you will, that we punched through with a 08:15:18  
17 syringe down to the reservoir. 08:15:20  
18 Do you see that? 08:15:22  
19 MR. GERRITY: Objection to form, 08:15:24  
20 incomplete hypothetical, beyond the 08:15:25  
21 scope of reply. 08:15:27  
22 A. I do see it. Just the -- with 08:15:32  
23 the caveat that we have -- it's my 08:15:35  
24 understanding that this system is formed by 08:15:42  
25 molding, molding a PDMS layer, and that the 08:15:45

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1 thickness of the PDMS layer is greater than 08:15:53  
 2 the height of the channel or the circular 08:16:00  
 3 area so that it is enclosed. The red -- the 08:16:04  
 4 red structure is covered over with a 08:16:07  
 5 thickness of PDMS. 08:16:12  
 6 Q. Correct. 08:16:12  
 7 A. Okay. 08:16:17  
 8 Q. With that understanding in mind, 08:16:19  
 9 it's possible to make a system like that 08:16:21  
 10 depicted here on Exhibit 6; right? 08:16:23  
 11 MR. GERRITY: Objection to form, 08:16:26  
 12 beyond the scope of reply, incomplete 08:16:27  
 13 hypothetical. 08:16:30  
 14 A. One could make this channel and 08:16:36  
 15 circular area system, yes. 08:16:42  
 16 Q. Okay. 08:16:48  
 17 Let me turn to another topic. 08:16:52  
 18 You have some opinions in your 08:17:05  
 19 responsive declaration about a cork borer; 08:17:07  
 20 correct? 08:17:19  
 21 A. Correct. 08:17:22  
 22 Q. What is a cork borer? 08:17:22  
 23 A. A cork borer is a hollow tube 08:17:28  
 24 with a handle on it that can be used to 08:17:32  
 25 punch a hole in a cork or elastomer material 08:17:38

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1	thereby extracting the volume of material	08:17:51
2	that comports with the interior dimension of	08:17:55
3	the bore.	08:17:59
4	Q. Have you ever used a cork borer?	08:18:02
5	A. Yes, I have.	08:18:06
6	Q. In the fabrication of	08:18:07
7	microfluidic devices?	08:18:10
8	A. Yes.	08:18:10
9	Q. And when is the last time you	08:18:12
10	did that?	08:18:14
11	A. That would have been in 2004. I	08:18:17
12	remember it well because I was just starting	08:18:20
13	a new course on microfluidic devices. It	08:18:22
14	was called biochip engineering. And at that	08:18:27
15	time soft lithography was a hot topic and I	08:18:36
16	used soft lithography to build a simple	08:18:41
17	microchannel in a PDMS layer, which channel	08:18:46
18	was molded. And to access the channel I	08:18:51
19	used cork borer to create inlet well and an	08:18:58
20	outlet well.	08:19:03
21	Q. Okay.	08:19:03
22	I want to talk a little bit	08:19:48
23	about the field of microfluidic droplet	08:19:50
24	generation generally. Okay?	08:19:53
25	MR. GERRITY: Objection to form,	08:19:56

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1       answer the question if you can, Dr. Fair.                   08:21:08

2                   MR. GERRITY:  Objection to form               08:21:10

3                   and beyond the scope of reply.                   08:21:12

4                   A.       Well, you're asking beyond the       08:21:19

5       scope of what I have opined about in my                   08:21:20

6       responsive declarations.                                   08:21:23

7                   Q.       Are you going to refuse to           08:21:24

8       answer my question?                                       08:21:26

9                   MR. GERRITY:  Same objections.               08:21:28

10                  A.       Well, I have not offered an           08:21:34

11       opinion on how big the field of                           08:21:36

12       microfluidics is.   08:21:38

13                  Q.       Dr. Fair, are you going to           08:21:39

14       answer my question or not?  If you're not               08:21:40

15       going to answer the question, that's -- you             08:21:42

16       can just say that and I'll move on.  If you             08:21:44

17       are going to answer the question, I would               08:21:46

18       appreciate it if you would just give me an               08:21:48

19       answer.   08:21:50

20                   MR. GERRITY:  Objection to --               08:21:50

21                  A.       I'm not going to answer that --       08:21:52

22                   MR. GERRITY:  Objection to form               08:21:54

23                   and beyond the scope of reply.               08:21:55

24       BY MR. BAKER:   08:21:58

25                  Q.       All right.                             08:21:58

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1                   So let's get a clean record then           08:21:59  
2           and then we'll move on.                               08:22:00  
3                   Dr. Fair, how big is the field           08:22:03  
4           of microfluidic droplet generation?           08:22:05  
5                   MR. GERRITY: Objection to form           08:22:08  
6                   and beyond the scope of reply.           08:22:09  
7                   A.       Well, I'm not going to answer       08:22:14  
8           that question because it's beyond the scope       08:22:16  
9           of what I have opined about in my responsive       08:22:17  
10          declaration.                                       08:22:21  
11                  Q.       Okay.                               08:22:21  
12                  Now, you have some opinions           08:22:23  
13          though about someone in the field of           08:22:26  
14          microfluidic droplet generation who had the       08:22:31  
15          Ismagilov reference, that they would look to       08:22:37  
16          Quake for certain things; right?           08:22:40  
17                  A.       Yes, I have opined about -- I've       08:22:44  
18          given an obvious opinion based upon the           08:22:54  
19          combination of Ismagilov and Quake.           08:22:56  
20                  Q.       And why would someone with       08:23:02  
21          Ismagilov be motivated to turn to Quake?       08:23:05  
22                  MR. GERRITY: Objection to form.       08:23:10  
23                  A.       Well, Quake and Ismagilov use       08:23:21  
24          the same fabrication techniques using PDMS       08:23:26  
25          layers. They use -- they teach the use of       08:23:31

1 cork borers, or borers, to create 08:23:38  
 2 inlet/outlet wells. They teach the use of 08:23:44  
 3 micropipetting. They're both in the field 08:23:46  
 4 of water and oil droplet generation. And 08:23:51  
 5 large sections of Ismagilov's specification 08:24:03  
 6 come right out of Quake's specification. 08:24:08  
 7 And so it would be obvious because one of 08:24:12  
 8 ordinary skill in the art would have an 08:24:16  
 9 expectation of success in that combination. 08:24:20  
 10 Q. Now, with respect to PDMS, there 08:24:24  
 11 are lots of references that talk about PDMS; 08:24:28  
 12 right? 08:24:30  
 13 MR. GERRITY: Objection to form. 08:24:32  
 14 A. Yes, there are. 08:24:37  
 15 Q. So someone who had the Ismagilov 08:24:38  
 16 reference in front of them, why would they 08:24:41  
 17 look to Quake as opposed to some other 08:24:43  
 18 reference that talk about PDMS? 08:24:49  
 19 MR. GERRITY: Objection to form, 08:24:53  
 20 beyond the scope of reply. 08:24:55  
 21 A. Well, Quake and Ismagilov were 08:25:03  
 22 both high-visibility workers in the field of 08:25:08  
 23 microfluidics. I know that there was 08:25:11  
 24 collaboration, and so there are very -- 08:25:19  
 25 there's similarities in what is taught in 08:25:21

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1 the specifications of both patents. 08:25:23

2 The methods of fabrication using 08:25:30

3 PDMS and cork borers and PDMS molding are 08:25:32

4 such that Quake gives some details that one 08:25:45

5 of ordinary skill in the art would -- might 08:25:50

6 be looking for in terms of what's taught in 08:25:52

7 Ismagilov. 08:25:56

8 Q. Like what? 08:25:57

9 MR. GERRITY: Objection to form. 08:26:00

10 A. Well, for example, Quake gives a 08:26:04

11 specific dimension of the outlet well that 08:26:07

12 is created in PDMS by a cork borer. 08:26:11

13 Q. And why would someone reading 08:26:15

14 Ismagilov care about the dimensions of the 08:26:17

15 outlet well? 08:26:20

16 A. Because Ismagilov teaches that 08:26:22

17 one can use a micropipette to remove 08:26:27

18 material from wells, outlet wells, and 08:26:35

19 therefore Quake gives some specific details 08:26:40

20 about how big those wells would have to be 08:26:43

21 because Quake too discusses the use of the 08:26:48

22 micropipette. 08:26:53

23 Q. Okay. 08:26:53

24 Now, I'm looking now at your 08:27:05

25 declaration in the '86 petition. And you've 08:27:12

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1	got --	08:27:26
2	MR. GERRITY: And, counsel is	08:27:27
3	this the responsive declaration or the	08:27:27
4	initial?	08:27:27
5	MR. BAKER: Sorry?	08:27:28
6	MR. GERRITY: The responsive	08:27:28
7	declaration or the initial?	08:27:32
8	MR. BAKER: The responsive	08:27:33
9	declaration, yep.	08:27:33
10	BY MR. BAKER:	08:27:33
11	Q. And you've got a couple of	08:27:35
12	images that you've created in this	08:27:37
13	responsive declaration. I want you to take	08:27:39
14	a look at the one you created on page 24.	08:27:41
15	And let me know when you're	08:28:08
16	there.	08:28:09
17	A. Okay.	08:28:09
18	Q. So just referring to --	08:28:13
19	referring to this, to the image on page 24,	08:28:17
20	I want to go back to the similar discussion	08:28:25
21	that we had with Thorsen.	08:28:27
22	You kind of have a -- the	08:28:32
23	cylinder in this image going from the	08:28:36
24	microchannel up to the top of the PDMS	08:28:38
25	layer.	08:28:44

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1	Do you see that?	08:28:44
2	A. I do.	08:28:45
3	Q. And it's your representation	08:28:47
4	that that could be made by punching a hole	08:28:49
5	all the way down through the PDMS to the	08:28:54
6	microchannel; right?	08:28:58
7	A. Correct.	08:28:59
8	Q. And then that makes a well at	08:29:00
9	the end of the microchannel; correct?	08:29:02
10	A. Correct.	08:29:05
11	Q. Similar to what we talked about	08:29:07
12	in Thorsen, though, you could have a design	08:29:08
13	where there is a well at the end of the	08:29:15
14	microchannel that has the same height as the	08:29:19
15	microchannel and then just a very thin	08:29:22
16	chimney going up to the top of the PDMS;	08:29:25
17	right?	08:29:29
18	MR. GERRITY: Objection to form,	08:29:30
19	incomplete hypothetical.	08:29:31
20	A. So what do you mean by a thin	08:29:35
21	chimney?	08:29:37
22	Q. So if you look in Marked	08:29:39
23	Exhibits, I've loaded up Exhibit 7.	08:29:42
24	[Deposition Exhibit 7 marked for	08:29:42
25	identification.]	08:29:52

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1	A.	Okay. Hold on. I just lost	08:29:52
2		the -- the link.	08:29:55
3		[Pause.]	08:30:09
4	MR. GERRITY:	And, again, while	08:30:26
5		he pulls that up I'll note the same	08:30:27
6		objection to the introduction of any	08:30:31
7		new exhibits at this stage as improper	08:30:32
8		surreply.	08:30:35
9	A.	So that is Exhibit 7. Okay.	08:30:41
10	Q.	Yes.	08:30:44
11	A.	Okay.	08:30:44
12	Q.	Do you have that open?	08:30:47
13	A.	I do.	08:30:48
14	Q.	So I've drawn a red dashed line	08:30:49
15		to represent what I mean by the thin	08:30:51
16		chimney. Do you understand the	08:30:56
17		representation?	08:31:03
18	A.	So according to your Exhibit 7,	08:31:07
19		the chimney is aligned to the center of the	08:31:09
20		well that was punched, and it has no	08:31:15
21		dimension associated with it.	08:31:19
22	Q.	Yeah. I mean, the -- the point	08:31:20
23		is simply that rather than punching a large	08:31:22
24		cylinder like you have in your image, it's	08:31:27
25		possible that you could have a very thin	08:31:30

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1 punch down to a bigger reservoir at the end 08:31:35  
 2 of a channel. Right? 08:31:38  
 3 MR. GERRITY: Objection to form, 08:31:40  
 4 incomplete hypothetical. 08:31:41  
 5 A. Well, there are all kinds of 08:31:53  
 6 practical issues here. What you're trying 08:31:54  
 7 to do is align something that -- I mean, I 08:31:57  
 8 really need to know how big that dashed red 08:32:02  
 9 line is. It makes all the difference in the 08:32:05  
 10 world in whether you can make it work or 08:32:07  
 11 not. 08:32:09  
 12 Q. Well, how big is the reservoir 08:32:19  
 13 at the end of the microchannel? 08:32:21  
 14 MR. GERRITY: Objection to form. 08:32:25  
 15 BY MR. BAKER: 08:32:26  
 16 Q. Tell you what, I can do it 08:32:45  
 17 another way. 08:32:47  
 18 Would it be possible to make 08:32:48  
 19 this work? 08:32:49  
 20 MR. GERRITY: Objection to form, 08:32:53  
 21 incomplete hypothetical. 08:32:54  
 22 A. Well, you're going to be limited 08:33:12  
 23 by a couple of things. So the answer is it 08:33:13  
 24 might work if -- if the -- the chimney 08:33:18  
 25 you've drawn is large enough. Because even 08:33:20

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1 if you use a syringe -- and, you know, 08:33:28  
 2 syringes -- I just have a little chart here 08:33:39  
 3 on gauges of syringes. A gauge which is the 08:33:43  
 4 outer diameter. You're looking at syringes 08:33:48  
 5 down to a few 10ths of a millimeter. 08:33:55  
 6 And so you have a couple of 08:34:05  
 7 issues. 08:34:07  
 8 So it's what is the size? Would 08:34:08  
 9 the syringe hold up by pressing it through a 08:34:12  
 10 centimeter-thick PDMS layer? How would you 08:34:15  
 11 align it? I mean, the issue with using 08:34:19  
 12 syringes in cork borers is you have to make 08:34:23  
 13 sure that the chimney is pretty vertical and 08:34:26  
 14 you would have to align it to what is maybe 08:34:29  
 15 a 1-millimeter-sized collection area at the 08:34:33  
 16 end of this channel. 08:34:39  
 17 Q. This is -- this is an image that 08:34:41  
 18 you drew; right, Dr. Fair? Not the red 08:34:42  
 19 dashed line but the rest of it is an image 08:34:46  
 20 that you drew; correct? 08:34:48  
 21 A. Well, that's right. It's in my 08:34:50  
 22 report. 08:34:51  
 23 Q. Okay. 08:34:51  
 24 If I wanted you to make a thin 08:34:52  
 25 punch like the red dashed line instead of a 08:34:57



1 thick punch like the cylinder, how would you 08:34:59  
 2 do it? 08:35:04  
 3 MR. GERRITY: Objection to form, 08:35:05  
 4 incomplete hypothetical. 08:35:06  
 5 A. Yeah, the -- you've got to tell 08:35:12  
 6 me how -- what's the diameter of that red 08:35:13  
 7 dashed line? I know what the -- the 08:35:18  
 8 diameter of the cork borer is. I mean, the 08:35:21  
 9 smallest cork borers I've ever seen were 08:35:24  
 10 2 millimeters. But, you know, they're -- 08:35:28  
 11 you have a practical limitation that even 08:35:31  
 12 using a syringe needle you'd have to have a 08:35:33  
 13 few tenths of a millimeter at least and 08:35:39  
 14 you'd have an issue of how you align so that 08:35:42  
 15 you can hit your target down at the bottom 08:35:45  
 16 where the channel is. 08:35:49  
 17 Q. So are you saying that you could 08:35:50  
 18 not do it? 08:35:52  
 19 MR. GERRITY: Objection to form. 08:35:54  
 20 A. I would say that you would have 08:35:58  
 21 to know more than you're telling me. And -- 08:36:00  
 22 Q. Well, what's the thinnest red 08:36:06  
 23 line that you could make? 08:36:09  
 24 MR. GERRITY: Objection to form, 08:36:13  
 25 incomplete hypothetical. 08:36:18

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1	A.	Well, since you haven't given me	08:37:39
2		much, and I have bounded what I think would	08:37:41
3		be reasonable parameters that you could use,	08:37:44
4		I think with a lot -- a lot of	08:37:48
5		experimentation you could -- maybe you would	08:37:51
6		be lucky and you could get that chimney in	08:37:53
7		place.	08:37:55
8	Q.	Okay.	08:38:00
9		MR. BAKER: All right. I don't	08:38:06
10		think I have any other questions.	08:38:07
11		MR. GERRITY: So, Dr. Fair, I've	08:38:08
12		got just a short redirect on this	08:38:11
13		chimney discussion.	08:38:12
14		EXAMINATION	08:38:12
15		BY MR. GERRITY:	08:38:12
16	Q.	Could you collect droplets by	08:38:17
17		micropipette from a chimney that was punched	08:38:19
18		using a .1 millimeter needle?	08:38:21
19	A.	No way.	08:38:26
20		MR. GERRITY: Nothing more from	08:38:28
21		me.	08:38:30
22		MR. BAKER: No further	08:38:30
23		questions.	08:38:31
24		THE WITNESS: Have a good day.	08:38:32
25		MR. BAKER: All right. You too.	08:38:34

1 Thanks a lot. 08:38:35

2 MR. GERRITY: Thank you. 08:38:36

3 We can go off. 08:38:36

4 MR. BAKER: All right. 08:38:37

5 THE VIDEOGRAPHER: We are off 08:38:39

6 the record at 11:38 a.m. 08:38:41

7 [Deposition concluded at 11:38

8 a.m. Eastern Time, 8:38 a.m. Pacific

9 Time.]

10 [Deposition Exhibits 1 through 7

11 marked for identification.]

12 [Signature reserved.]

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C E R T I F I C A T E

\*\*\*\*\*

I, PAUL J. FREDERICKSON,  
California Certified Shorthand  
Reporter No. 13164, do hereby certify:

That prior to being examined,  
the witness named in the foregoing  
deposition was by me remotely sworn or  
affirmed to testify to the truth, the  
whole truth and nothing but the truth;

That said deposition was taken  
down by me remotely in shorthand at,  
and thereafter reduced to print by  
means of computer-aided transcription;  
and the same is a true, correct and  
complete transcript of said  
proceedings.

I further certify that I am not  
interested in the outcome of the  
action.

Witness my hand this 4th day of  
December 2020.



PAUL J. FREDERICKSON, CSR

CA CSR 13164

Expiration date January 31, 2021

\*\*\*\*\*

WITNESS SIGNATURE

\*\*\*\*\*

I, RICHARD B. FAIR, PhD, do  
hereby declare under penalty of perjury  
that I have read the foregoing transcript  
of my deposition; that I have made such  
corrections as noted herein, in ink,  
initialed by me, or attached hereto; that  
my testimony as contained herein, as  
corrected, is true and correct.

EXECUTED this\_\_\_\_day  
of\_\_\_\_\_, 2020,  
at\_\_\_\_\_(City),  
\_\_\_\_\_(State).

\_\_\_\_\_

RICHARD B. FAIR, PhD

[& - ahead]

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[aided - case]

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[case - cylinder]

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[d - examination]

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