

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

BIO-RAD LABORATORIES, )  
INC. and THE )  
UNIVERSITY OF CHICAGO, )  
)  
)  
Plaintiffs, )  
)  
) C.A. No. 15-152-RGA  
v. )  
)  
)  
10X GENOMICS, INC., )  
)  
Defendant. )

J. Caleb Boggs Courthouse  
844 King Street  
Wilmington, Delaware

Monday, November 5, 2018  
8:33 a.m.  
Trial Volume I

BEFORE: THE HONORABLE RICHARD G. ANDREWS, U.S.D.C.J.

APPEARANCES:

FARNAN LLP  
BY: BRIAN E. FARNAN, ESQUIRE

-and-

WEIL GOTSHAL & MANGES, LLP  
BY: EDWARD REINES, ESQUIRE  
BY: DEREK C. WALTER, ESQUIRE

For the Plaintiffs

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For the Defendant

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PROCEEDINGS

08:51:13 14

08:33:28 15

THE CLERK: All rise.

08:33:28 16

THE COURT: All right. Everyone be seated.

08:33:30 17

Good morning. Okay.

08:33:31 18

So what do we want to talk about this morning,

08:33:36 19

Mr. Reines?

08:33:36 20

MR. REINES: Thank you, Your Honor. There's two

08:33:38 21

issues with respect to the opening presentation --

08:33:40 22

THE COURT: Okay.

08:33:41 23

MR. REINES: -- of the defendants, and we can

08:33:47 24

put it up. The first issue is on this copying question.

08:33:50 25

They have nine slides dedicated that say that Ismagilov

03:20:09 1 in witnesses here, I think we'll take our afternoon break of  
03:20:13 2 15 minutes. And so if you could take the jury out.

03:20:16 3 (Jury leaving the courtroom.)

03:20:41 4 THE COURT: All right. So we'll be in recess.

03:20:47 5 MR. REINES: Thank you.

03:20:48 6 THE CLERK: All rise.

03:35:03 7 (A recess was taken.)

03:35:03 8 THE COURT: All right. We're ready to go. So  
03:35:05 9 let's get the jury. You could have your next witness come  
03:35:10 10 forward.

03:35:10 11 MR. REINES: Ah, yes. Professor Ismagilov, can  
03:35:20 12 you -- thank you.

03:36:16 13 (Jury enters.)

03:36:16 14 THE COURT: All right. Members of the jury,  
03:36:18 15 welcome back. Everyone, you may be seated. Mr. Reines, you  
03:36:22 16 may proceed.

03:36:23 17 MR. REINES: Thank you, Your Honor. For the  
03:36:25 18 plaintiff's next witness it will be Professor Ismagilov and  
03:36:30 19 Derek Walter, my colleague, will be doing the questioning.

03:36:32 20 THE COURT: All right.

03:36:32 21 RUSTEM ISMAGILOV,  
03:36:32 22 the deponent herein, having first  
03:36:32 23 been duly sworn on oath, was  
03:37:06 24 examined and testified as follows:

03:37:06 25 BY MR. WALTER:

03:37:07 1 Q. Could you please introduce yourself for the jury,  
03:37:09 2 sir?

03:37:09 3 A. Yes. My name is Rustem Ismagilov and I'm a professor  
03:37:13 4 at California Institute of Technology.

03:37:15 5 Q. Are you married?

03:37:16 6 A. Yes. I've been married for 15 years to a wonderful  
03:37:20 7 woman.

03:37:21 8 Q. And do you have kids?

03:37:21 9 A. Yes, I have two boys, 10 and 12.

03:37:24 10 Q. And I think you mentioned earlier that your  
03:37:28 11 profession was you are a professor at Cal Tech?

03:37:30 12 A. Yes, that's correct. California Institute of  
03:37:33 13 Technology, also known as Cal Tech.

03:37:35 14 Q. Where is that located?

03:37:36 15 A. In Pasadena, California.

03:37:37 16 Q. And what is your department?

03:37:38 17 A. I'm actually in two departments, chemistry/chemical  
03:37:42 18 engineering one and biology/bioengineering another.

03:37:45 19 Q. Can you please describe your educational background  
03:37:47 20 for the jury?

03:37:48 21 A. Yes, I got my undergraduate degree in Russia in  
03:37:51 22 chemistry and then I did my graduate work at the University  
03:37:55 23 of Wisconsin also in chemistry and then I did post doc  
03:37:58 24 fellowship at Harvard in the late '90s.

03:38:02 25 Q. Who was your advisor during your post doc at Harvard?

03:40:20 1 did you move to Cal Tech?

03:40:21 2 A. I moved to Cal Tech in 2011. I was recruited to go  
03:40:24 3 there to become a professor, chair professor in the  
03:40:27 4 department of chemistry/chemical engineering.

03:40:30 5 Q. How is Cal Tech regarded in your field?

03:40:32 6 A. It's an absolutely top rate place. It's one of the  
03:40:36 7 top universities in the world and it's routinely ranked as  
03:40:40 8 number one or two or three in chemistry and chemical  
03:40:44 9 engineering among all schools in the United States.

03:40:46 10 Q. Now, what is -- what were the subjects of your  
03:40:48 11 research at Cal Tech?

03:40:51 12 A. My interest is in improving global health and we work  
03:40:55 13 on a number of projects that some involve microfluidics and  
03:41:01 14 one of them for example is diagnosing antibiotic resistant  
03:41:06 15 infections because that's a really important problem, global  
03:41:10 16 health problem that requires a diagnostic solution.

03:41:13 17 Q. Does your research continue to involve microfluidics?

03:41:15 18 A. Yes, it does.

03:41:16 19 Q. How so?

03:41:17 20 A. So, for example, in the, in this particular case of  
03:41:23 21 diagnosing antibiotic resistant infections, what we really  
03:41:27 22 have to be able to do is identify responses of material to  
03:41:30 23 antibiotics very, very quickly. Today it takes three days  
03:41:34 24 and a lot of people get either the wrong treatment or no  
03:41:37 25 treatment when they're treated with antibiotics, so we're

03:41:40 1 trying to speed that process up from three days, which today  
03:41:43 2 renders it useless, to 30 minutes and we've had some success  
03:41:48 3 in that and a nice paper published last year showing we can  
03:41:52 4 go all the way from sample to answer in 30 minutes.

03:41:56 5 Q. Follow up on that publication. How many publications  
03:41:59 6 do you have?

03:41:59 7 A. I have over 140 publications in various journals.

03:42:04 8 Q. How does your publication record compare to other  
03:42:07 9 scientists in the field?

03:42:08 10 A. It is considered to be excellent. I was named as one  
03:42:11 11 of the top 100 cited chemists in the world from the period  
03:42:15 12 of 2000 to 2010.

03:42:16 13 Q. And did that cover your time in Chicago?

03:42:19 14 A. Yes, it did.

03:42:20 15 Q. Have you ever patented any of your work?

03:42:22 16 A. Well, I want to say yes, but I want to be careful  
03:42:25 17 also, because I personally don't patent inventions, but I  
03:42:29 18 assign all of my rights to my employer, University of  
03:42:33 19 Chicago or Cal Tech, and in this case University of Chicago  
03:42:35 20 and University of Chicago will apply and receive patents on  
03:42:40 21 which I'm listed as an inventor.

03:42:42 22 Q. How many patents are there in your name where you're  
03:42:45 23 listed as an inventor?

03:42:46 24 A. I'm listed as an inventor on over 30 issued patents  
03:42:50 25 and I have over 60 patents, additional 60 patents pending

03:42:54 1 and more than a dozen hundreds worldwide.

03:42:58 2 Q. Have you ever received awards or honors for your  
03:43:01 3 research?

03:43:02 4 A. Yes. So my work was recognized by industry  
03:43:08 5 foundations and US government. I received over 20 awards in  
03:43:12 6 my academic career. I'll just name three. So for example,  
03:43:18 7 case in industry is DuPont Young Investigator Award that I  
03:43:22 8 received in 2003 for the work on fluorine surfactants in  
03:43:32 9 droplets.

03:43:34 10 THE COURT: Excuse me, sir. Can you get the  
03:43:37 11 juror some water?

03:43:45 12 A JUROR: Thank you.

03:43:52 13 THE COURT: Sir, you good, sir?

03:43:54 14 A JUROR: I'm good. Thanks.

03:43:55 15 THE COURT: Go ahead. Sorry. Why don't you ask  
03:43:58 16 the question, Mr. Walter?

03:44:00 17 BY MR. WALTER:

03:44:01 18 Q. All right. So why don't you pick up where you left  
03:44:04 19 off. You were describing the three awards for the jury.

03:44:07 20 A. So I receive awards, one of them was for fluorinated  
03:44:15 21 surfactants and droplets. Had to come to DuPont and really  
03:44:19 22 fun experience and I also received an award from the  
03:44:23 23 National Institutes of Health, Director of National  
03:44:26 24 Institutes of Health who does awards every year. About a  
03:44:28 25 dozen people who are the most innovative people in the

03:44:33 1 country, so I received the NIH Director of Science award.

03:44:37 2 And another example I would use, so that was done for

03:44:42 3 biochemicals reactions and droplets. The last award I would

03:44:45 4 mention was -- I need to take a drink of water as well.

03:45:00 5 Excuse me. And then the last award I wanted to mention was

03:45:03 6 the award from the White House, it's called the PK

03:45:09 7 Presentation Early Career Award for Scientists and Engineers

03:45:13 8 and I received that for the work on autocatalytic reactions

03:45:19 9 in droplets. So I got -- my wife and I got to go to the

03:45:23 10 White House and get an award and have a plaque signed by

03:45:27 11 President Bush with this award. So that was fun as well.

03:45:31 12 Q. Now, I want to ask you some more questions about your

03:45:34 13 time at the University of Chicago. When did you start at

03:45:37 14 the University of Chicago?

03:45:38 15 A. I started in 2001.

03:45:40 16 Q. What specifically were you planning to work on when

03:45:44 17 you started at University of Chicago?

03:45:46 18 A. I had several directions that I was thinking about.

03:45:50 19 I was most excited about this direction of doing

03:45:56 20 microfluidic, working on reactions in microfluidic droplets.

03:46:00 21 Q. Can you please explain that for the jury, what a

03:46:05 22 microfluidic droplet is?

03:46:05 23 A. Yes, as you may have heard today, essentially the

03:46:09 24 idea that I had was to run reactions in these little

03:46:16 25 containers of water surrounded by oil on all sides. And as

03:46:22 1 I worked at Harvard, I was really struck by the promise of  
03:46:29 2 microfluidics, promise of being able to do many, many  
03:46:33 3 reactions on small scale, but also actually being able to do  
03:46:37 4 it. Think about turns out if you just try to use the simple  
03:46:42 5 channel filled with water to run a reaction, you start  
03:46:45 6 reaction, move that reaction sheet around, you get basically  
03:46:50 7 the reaction you put in the channel starts spreading out and  
03:46:54 8 put more than one, the spreads start overlapping and becomes  
03:46:57 9 a mess pretty quickly. And also because the channels become  
03:47:02 10 small volume multiples start seeing the rolls of the channel  
03:47:05 11 vary, and that brings a lot of reactions as well. My vision  
03:47:10 12 for this was to really get away from that and start doing  
03:47:14 13 reactions in droplets because we thought hey, we would put  
03:47:17 14 this as a back of fluid surrounded by oil, don't have any  
03:47:21 15 more of that smearing and if I can control the chemistry at  
03:47:24 16 what we call the interface, what separates water from oil, a  
03:47:27 17 controlled chemistry of that interface, I would also solve a  
03:47:31 18 lot of other problems associated with doing reactions in  
03:47:34 19 small volumes. So these were the reasons for trying to do  
03:47:40 20 -- think of doing reactions on top of this.

03:47:42 21 Q. I want to describe some of that a little bit more for  
03:47:46 22 the jury. Can you look at PTX 003 in your binder?

03:47:50 23 A. Yes.

03:47:50 24 Q. What is that document?

03:47:52 25 A. That's a United States patent, patent from University

03:47:56 1 of Chicago on which I am a co-inventor with my students and  
03:48:02 2 some others.

03:48:03 3 MR. WALTER: I'd like to have PTX-0003 admitted  
03:48:07 4 into evidence.

03:48:08 5 MR. POWERS: No objection, Your Honor.

03:48:09 6 THE COURT: Admitted without objection.

03:48:11 7 BY MR. WALTER:

03:48:12 8 Q. Let me show you figure #3, which is on PTX-003-0007.

03:48:17 9 A. Yes.

03:48:27 10 Q. What is this showing?

03:48:30 11 A. Yes. So this --

03:48:36 12 Q. Maybe blow up the top part.

03:48:37 13 A. Yes. Thank you. So this shows an example of  
03:48:43 14 microfluidic channel in which droplets are formed. So you  
03:48:47 15 will see that there is this horizontal channel labeled 00,  
03:48:51 16 what used to be probably 300. That's the channel for which  
03:48:55 17 oil is flowing. Now, you see three other channels 301, 302  
03:49:03 18 and 303 that can introduce reagents. And then there is this  
03:49:07 19 inlet into the oil channel, that short distance between  
03:49:14 20 where the three channels meet and the horizontal channel and  
03:49:18 21 so through that inlet the reagents is introduced into the  
03:49:22 22 stream of oil and then a droplet is formed. And in this  
03:49:26 23 case droplets would be the -- as I can't see from here,  
03:49:32 24 basically droplets form and they flow through the squiggles  
03:49:38 25 of the channel.

03:59:24 1 Q. Are you familiar with this publication?

03:59:27 2 A. I've read it at some point. Yes.

03:59:28 3 Q. And was this a publication that Mr. Powers showed  
03:59:31 4 earlier today during his opening?

03:59:33 5 A. I believe so.

03:59:34 6 Q. All right. I'd like to have PTX-93 admitted into  
03:59:38 7 evidence.

03:59:38 8 MR. POWERS: No objection.

03:59:40 9 THE COURT: All right. Admitted into evidence.

03:59:42 10 (PTX Exhibit 93 was admitted into evidence.)

03:59:42 11 BY MR. WALTER:

03:59:45 12 Q. All right. Could you please bring up DTX-93.002, and  
03:59:50 13 there is a paragraph, the full paragraph on the right-hand  
03:59:55 14 column. Second full paragraph.

04:00:16 15 All right. There we go. And can you highlight  
04:00:18 16 the last sentence?

04:00:26 17 All right. Do you see where it says, Biological  
04:00:29 18 assays, thus, demands fluoro-surfactants with non-ionic  
04:00:33 19 headgroups; however, there are currently no such surfactants  
04:00:35 20 available.

04:00:36 21 Do you see that?

04:00:36 22 A. I do see that.

04:00:38 23 Q. Well, what teaching do any of your patents have  
04:00:43 24 regarding this particular topic?

04:00:45 25 A. Oh, yes. Our patents describe exactly this. Our

04:00:49 1 patents describe fluoro-surfactants with non-ionic head  
04:00:52 2 groups for doing reaction.

04:00:56 3 Q. And your patents were filed and published before  
04:01:00 4 this; correct?

04:01:00 5 A. That's absolutely correct.

04:01:01 6 Q. Now, I would also like to highlight the sentence that  
04:01:05 7 says, Fluoro-surfactants with longer fluorocarbon tails such  
04:01:12 8 as perfluorinated polyethers -- highlight that whole  
04:01:16 9 sentence.

04:01:16 10 What is this referring to, Professor Ismagilov?

04:01:19 11 A. So this refers to the idea that as you make the tail  
04:01:25 12 of the fluorosurfactant longer, it helps stabilize the  
04:01:29 13 droplets.

04:01:31 14 Q. What teachings, if any, do your patents have  
04:01:33 15 regarding this topic?

04:01:34 16 A. This is what our patents teach. The patents teach  
04:01:38 17 that longer tails stabilize droplets.

04:01:41 18 Q. All right. Could you please bring up PTX-3-84 and  
04:02:01 19 then highlight Column 36, Lines 38 to 59.

04:02:05 20 And then will you please highlight the sentence  
04:02:13 21 that begins with for OEG-terminated surfactants in the  
04:02:18 22 middle of the paragraph.

04:02:24 23 Now, I've highlighted the sentence that says,  
04:02:26 24 For OEG-terminated surfactants high values of N, N greater  
04:02:31 25 than or equal to 16, are preferred for making these

04:02:34 1 surfactants oily soluble and preventing them from entering  
04:02:37 2 the aqueous phase.

04:02:39 3 Can you explain for the jury how this sentence  
04:02:40 4 that I've highlighted in the patent relates to the two  
04:02:43 5 features that we discussed in --

04:02:45 6 A. Yes. So we're emphasizing that the longer  
04:02:51 7 fluorinated tails are preferred in this chemistry, and they  
04:02:54 8 would be useful for creating droplets, biological reactions  
04:03:00 9 with high stability and high performance.

04:03:04 10 Q. And then what about the aspect regarding  
04:03:07 11 OEG-terminated surfactants. What does that relate to?

04:03:09 12 A. So the OEG surfactants are exactly that, non-ionic  
04:03:15 13 surfactants. It's a type of non-ionic surfactant that is  
04:03:19 14 mentioned in the article.

04:03:20 15 Q. Why did you use the OEG-terminated surfactants?

04:03:24 16 A. We used them because it was known that this  
04:03:34 17 particular non-ionic group is good at repelling proteins and  
04:03:39 18 essentially was good for compatibility with reactions when  
04:03:42 19 you do cell reactions with cells or biological molecules.

04:03:45 20 Q. So before we move off this, I want to clarify one  
04:03:48 21 point. It talks about high values of N. Can you explain  
04:03:51 22 briefly why a high value of N equates with length?

04:03:54 23 A. Oh, yes, of course. There is another figure in the  
04:03:58 24 patent essentially that says N is the number of fluorinated  
04:04:02 25 carbons. These are perfluorinated carbons, and you have

04:04:06 1 them or those fluorinated carbons you have in the chamber of  
04:04:10 2 the surfactant. So the surfactant essentially has two  
04:04:13 3 parts. It has the fluorinated tail, and it has the  
04:04:16 4 hydrophilic, what we call, hydrophilic or OEG tail.

04:04:23 5 And we are saying higher number of N means  
04:04:26 6 longer fluorinated tail. So N, number of carbons,  
04:04:31 7 fluorinated carbons. Sorry.

04:04:32 8 Q. I want to ask you about one other feature. Can you  
04:04:35 9 please bring up PTX-3-90, and blow up Column 47, 13 to 18.  
04:04:55 10 And then highlight the word beads. Now, there was a lot of  
04:04:59 11 discussion this morning about beads, and you know whether or  
04:05:04 12 not you did or didn't contemplate beads.

04:05:06 13 What is this paragraph teaching regarding use of  
04:05:11 14 beads?

04:05:11 15 A. Yeah. So at that time, beads were a standard way of  
04:05:15 16 doing a lot of the chemistry. So there was a whole industry  
04:05:19 17 called coming into world chemistry in which beads were used  
04:05:22 18 for synthesis of molecules. Beads were also used for many  
04:05:27 19 other applications.

04:05:28 20 So in this particular phase in this particular  
04:05:32 21 case, as I mentioned, we are very interested in studying  
04:05:37 22 these systems that study blood coagulation. It's a hard  
04:05:41 23 problem to study. And blood coagulation turns out is  
04:05:44 24 initiated on surfaces on surface reagent at least by one of  
04:05:49 25 the mechanisms. And so we wanted to have a way to deliver

04:07:15 1 Q. What are some of the companies who are pursuing  
04:07:18 2 commercialized products using droplets?

04:07:20 3 A. Very large number of companies, and I am in the  
04:07:24 4 university. I don't keep track of all of them, but  
04:07:26 5 certainly the companies that we talked about, RainDance,  
04:07:31 6 Bio-Rad, 10X, use chemistry in droplets.

04:07:35 7 Q. Now, one of the companies you mentioned was 10X. Are  
04:07:45 8 you familiar with 10X?

04:07:45 9 A. Yes. I'm familiar with 10X in, I would say, four  
04:07:52 10 capacities. So one capacity is that 10X's team, as was  
04:08:01 11 mentioned, has approached me to be a consultant in  
04:08:04 12 droplet-based microfluidics in 2008, 2009, and also be a  
04:08:07 13 member of their scientific advisory board.

04:08:09 14 Q. Well, let me stop you there. What company were they  
04:08:12 15 at at that time?

04:08:13 16 A. Oh, that was QuantaLife Company. Yes, thank you.

04:08:16 17 And also, I was approached to be a consultant  
04:08:22 18 for 10X in 2015. And also, there was this situation where  
04:08:33 19 all of the inventors in our patents were approached by, I  
04:08:37 20 guess, attorneys on behalf of 10X to try to help them  
04:08:42 21 invalidate our role in University of Chicago's patent.

04:08:46 22 Q. And I take it you didn't participate in those  
04:08:48 23 efforts?

04:08:49 24 A. That's correct. And so the last -- I mean, to be  
04:08:52 25 fair, the last way in which I'm familiar with 10X is just by

04:08:56 1 knowing the people involved. For example, Mr. Stuelpnagel  
04:09:03 2 is a venture capitalist in Viatch that I know. And Ben  
04:09:11 3 Hindson is a person who published in digital PCR droplet  
04:09:16 4 microfluidics. So I know of those people through those  
04:09:18 5 connections as well.

04:09:19 6 Q. Okay. I want to ask you some questions now about one  
04:09:22 7 of the arguments that 10X is making regarding your patents.  
04:09:25 8 You were here earlier today when they mentioned the Quake  
04:09:27 9 reference.

04:09:28 10 And you understand they're contending the  
04:09:30 11 patents are invalid based on the Quake reference; correct?

04:09:33 12 A. That's what I heard.

04:09:34 13 Q. But not all the patents, just the three patents;  
04:09:37 14 right?

04:09:37 15 A. I'm not a patent attorney, but yes, that's what I  
04:09:40 16 heard.

04:09:40 17 Q. Were you aware of Stephen Quake's work related to  
04:09:46 18 droplets before you filed your patents?

04:09:48 19 A. Yes. I was aware of the work. In fact, that work  
04:09:52 20 was provided to the team preparing the patent application,  
04:09:55 21 and they included -- they cited this work in the patent  
04:09:58 22 application.

04:09:59 23 Q. Let me take a step back first. Can you describe what  
04:10:01 24 kind of work Dr. Quake did related to droplets?

04:10:05 25 A. Yes. So Dr. Quake was very, very interested in

04:10:10 1 pattern formation. That's really the title of his paper.  
04:10:16 2 He was interested in the physics. Turns out there's  
04:10:18 3 interesting physics that has to do with how droplets arrange  
04:10:21 4 down the channel as they flow. And those were the images  
04:10:24 5 that were shown earlier this morning where sometimes they go  
04:10:26 6 single file, sometimes they alternate.

04:10:28 7 So it was -- he was very interested in that kind  
04:10:30 8 of information aspect, and that's what the paper is focused  
04:10:33 9 on.

04:10:33 10 Q. How is your work different from Stephen Quake's work?

04:10:36 11 A. I was interested in the chemistry, not the physics.  
04:10:39 12 I mean, we had to solve a lot of the physics problems to get  
04:10:43 13 -- to get -- to make it useful and useable, but I was really  
04:10:47 14 focused on the chemistry. We wanted to run reactions on  
04:10:51 15 droplets, not just patterns.

04:10:53 16 Q. Who, if any one, did you discuss Stephen Quake's work  
04:10:55 17 with when you were embarking on your work on the droplets?

04:10:58 18 A. I discussed it with a number of people, including my  
04:11:01 19 post-op mentor, Dr. Weitz.

04:11:03 20 Q. Can you take a look at DTX-612 --

04:11:06 21 A. Yes.

04:11:08 22 Q. -- in your binder?

04:11:10 23 A. Yes.

04:11:11 24 Q. What is DTX-612?

04:11:13 25 A. This is an email exchange between Dr. Weitz and

04:11:19 1 myself from 2002.

04:11:21 2 Q. I'd like to have DTX-612 admitted into evidence?

04:11:27 3 MR. POWERS: No objection.

04:11:29 4 THE COURT: Admitted without objection.

04:11:29 5 (DTX Exhibit 612 was admitted into evidence.)

04:11:29 6 BY MR. WALTER:

04:11:31 7 Q. When did you have this correspondence with Professor  
04:11:33 8 Weitz?

04:11:34 9 A. So the email is from March of 2002.

04:11:41 10 Q. All right. I'd like to bring up 612.002, and if you  
04:11:44 11 could blow up the first two paragraphs. This was not long  
04:11:50 12 after you started at Chicago?

04:11:51 13 A. Yes, that's correct.

04:11:52 14 Q. .002. Can you describe your conversations with Dr.  
04:12:07 15 Weitz regarding Dr. Quake's work?

04:12:09 16 A. Yes. So, as I've been certainly discussing my ideas  
04:12:14 17 for using chemistry droplets with Dr. Weitz, Professor Weitz  
04:12:18 18 was -- I was -- I was applying for jobs and getting started.  
04:12:21 19 He's been very helpful in these various aspects throughout  
04:12:25 20 my career, especially getting going. So he thought it was a  
04:12:28 21 brilliant idea and was very supportive. It was highly  
04:12:31 22 original. And he told me you should really publish it  
04:12:35 23 because it's really clever and really original.

04:12:39 24 And then I'm telling him, Well, it turns out  
04:12:42 25 Steve Quake published the physics of this, of the droplet

04:12:46 1 part. And I was a bit disappointed because, you know, in  
04:12:49 2 academia really value -- really value publications and  
04:12:57 3 really value that you publish the whole like in multiple  
04:13:04 4 areas, the whole field. So I was -- I said, it's a bit  
04:13:09 5 disappointing that Professor Quake published the physics  
04:13:12 6 part of it, the forming of droplets, but I'm saying that  
04:13:15 7 should somebody find basically because I'm really interested  
04:13:17 8 in chemistry. And Steve Quake is probably not going to do  
04:13:21 9 any chemistry.

04:13:22 10 And that is what he -- Professor Weitz agrees  
04:13:24 11 that Steve Quake is a physicist. It's not his thing.

04:13:28 12 Q. Now, after he published that paper in 2001, Steve  
04:13:31 13 Quake, did he do any further work on droplets?

04:13:33 14 A. I don't know anything about any internal work that  
04:13:42 15 that he has done in his lab, obviously, but I can say he's  
04:13:48 16 not published anything showing chemistry in droplets, work  
04:13:52 17 in chemistry in droplets.

04:13:54 18 Q. Are you aware of any journal articles where he  
04:13:56 19 presented any result in chemistry in droplets?

04:13:59 20 A. No, absolutely not. I'm not aware of those.

04:14:02 21 Q. When you were applying for your patent, what did your  
04:14:04 22 team do with Stephen Quake's work?

04:14:05 23 A. We definitely provided them to the Patent Office. I  
04:14:08 24 mean, I should say I provided them to the patent attorneys  
04:14:13 25 preparing the patent application and they provided it to the

04:14:15 1 Patent Office, so the patents can be considered in light of  
04:14:17 2 Stephen Quake's work.

04:14:19 3 Q. All right. Can you bring up PTX-003-002? And then  
04:14:27 4 if you can blow up the section under U.S. patent documents.

04:14:31 5 What is this showing here, Professor Ismagilov?  
04:14:37 6 And maybe you want to use the laser pointer.

04:14:39 7 A. Yes. So this shows a list of U.S. patent documents  
04:14:44 8 provided with our patents of the patent application, and it  
04:14:49 9 shows that two applications from Professor Quake were  
04:14:54 10 submitted. So this one and this one.

04:14:59 11 And the Patent Office evaluated the patent  
04:15:02 12 application in light of work by Stephen Quake.

04:15:04 13 Q. And can you take a look now at PTX, the next page,  
04:15:09 14 bring up PTX 008 -- 003-003. And then if you can blow up on  
04:15:15 15 the right-hand column the reference to Thorsen Todd dynamic  
04:15:21 16 pattern formation, right-hand column. And then what is this  
04:15:29 17 referring to, Professor Ismagilov?

04:15:31 18 A. Yes, so this shows again this paper by Todd Thorsen  
04:15:35 19 and Steven Quake that in Physical Review Letters dynamic  
04:15:40 20 pattern formation, vesicle generating microfluidic device.  
04:15:48 21 So it's again physical review paper that we mentioned that  
04:15:54 22 was provided to the patent office with our patent  
04:15:57 23 application.

04:15:57 24 Q. And that was the publication that Mr. Powers showed  
04:16:00 25 this morning?

04:16:00 1 A. Yes, that's correct. That's the combination.

04:16:04 2 Q. And then what ultimately happened?

04:16:06 3 A. The patents were evaluated in light of Steven Quake's  
04:16:11 4 work and issued.

04:16:14 5 Q. Now, I want to follow up with what happened with  
04:16:17 6 those patents. You were awarded the patents while you were  
04:16:20 7 at Chicago; is that correct?

04:16:21 8 A. Yes, that's correct.

04:16:22 9 Q. And what did Chicago do with those patents?

04:16:25 10 A. So Chicago obviously is an educational institution.  
04:16:29 11 It's not -- won't commercialize inventions itself, so it  
04:16:33 12 licenses them out and it licenses out these patents to  
04:16:37 13 commercial entities.

04:16:38 14 Q. And do you know the commercial entities that they  
04:16:40 15 were licensed to?

04:16:41 16 A. Yes. So there were -- there was a license to what is  
04:16:45 17 now Purchasing Solutions and a license to RainDance that  
04:16:53 18 focused on genetic analysis in droplets.

04:16:56 19 Q. We talked a bit about RainDance today. Can you give  
04:16:59 20 a brief summary of what some of the things RainDance did  
04:17:03 21 with your technology?

04:17:05 22 A. Yes, so --

04:17:05 23 MR. POWERS: Objection to foundation.

04:17:08 24 THE COURT: Seems like a good objection.

04:17:10 25 BY MR. WALTER:

04:18:39 1 MR. POWERS: Renew the motion.

04:18:42 2 THE COURT: All right. So I'm going to strike  
04:18:46 3 the answer to the last couple of questions about this other  
04:18:56 4 than -- other than for the purpose of showing that the  
04:19:00 5 witness was pleased by what he thought was going on, but to  
04:19:04 6 provide what was actually going on, I'm striking the answer.  
04:19:09 7 All right. You may continue.

04:19:10 8 BY MR. WALTER:

04:19:11 9 Q. We talked earlier about how droplet technology is  
04:19:14 10 being adopted by many different companies. How do you feel  
04:19:17 11 knowing that droplet technology is being adopted by so many  
04:19:21 12 different companies?

04:19:21 13 A. It's extremely amazing because one, we were starting  
04:19:25 14 out and I had this vision that droplets would be used for  
04:19:28 15 all kinds of applications. There were, you know, lots of  
04:19:32 16 naysayers, of course, as always. But having seen, getting  
04:19:35 17 awards from the National Institutes of Health, from the  
04:19:40 18 President of the United States and seeing these things  
04:19:44 19 happen in real, actually happen, come to fruition to  
04:19:48 20 commercial products, that's extremely rewarding.

04:19:50 21 MR. WALTER: All right. Thank you.

04:19:51 22 THE COURT: All right. Cross-examination.

04:20:19 23 MR. POWERS: Permission to approach, Your Honor.

04:20:21 24 THE COURT: Sure. Yes.

04:20:51 25 MR. POWERS: May I proceed?

04:20:53 1 THE COURT: Yes.

04:20:54 2 BY MR. POWERS:

04:20:56 3 Q. I want to make sure I'm pronouncing your name  
04:20:59 4 correctly. It'll bother me if I'm not. Ismagilov?

04:21:05 5 A. Break it up into the two letter increments,  
04:21:11 6 is-ma-gi-lov.

04:21:11 7 Q. Ismagilov. I'll keep trying. If I get it wrong,  
04:21:15 8 feel free to correct me?

04:21:17 9 A. That's quite all right.

04:21:18 10 Q. Let's begin by talking about Dr. Steven Quake.  
04:21:23 11 You've been following Dr. Quake's work for some time,  
04:21:26 12 haven't you?

04:21:26 13 A. Yeah. That's correct.

04:21:29 14 Q. Even beginning way back when you were at Harvard  
04:21:33 15 before you joined Chicago?

04:21:34 16 A. Yes, I was aware of Steven Quake's work. I don't  
04:21:42 17 remember the exact dates, but that would -- I should have.  
04:21:46 18 That would be fair.

04:21:47 19 Q. In fact, do you recall that you made a notation in  
04:21:52 20 your personal lab notebook at Harvard about Dr. Quake?

04:21:56 21 A. I'm sure I have. You'd have to remind me which  
04:22:00 22 notation we're talking about.

04:22:01 23 Q. Can you look in your binder, please, at exhibit DTX  
04:22:07 24 621?

04:22:09 25 A. DTX 6 -- yes, I have it.

04:22:20 1 Q. Is this a portion of your lab book #7 while you were  
04:22:26 2 at Harvard?

04:22:27 3 A. I want to be careful. It's not a lab book in the  
04:22:31 4 sense that it's a book I use in the lab. It's a personal  
04:22:34 5 notebook.

04:22:35 6 Q. It's a notebook you kept while you were at Harvard to  
04:22:39 7 keep notes about things you were thinking about, true?

04:22:42 8 A. That's fair, yes, correct.

04:22:44 9 Q. Could you turn to the page at the bottom right?

04:22:47 10 MR. POWERS: Your Honor, I'll offer this into  
04:22:49 11 evidence. DTX 621.

04:22:59 12 MR. WALTER: I'm sorry. No objection.

04:23:03 13 THE COURT: Admitted without objection.

04:23:05 14 BY MR. POWERS:

04:23:06 15 Q. Let's put it on the screen. Could you go to the page  
04:23:08 16 that's labeled .0013 at the bottom right, please. Page 125  
04:23:13 17 of your notebook. You see the name Steve Quake there?

04:23:23 18 A. I'm on the wrong page. Yes. I see it, yes.

04:23:28 19 Q. And this is a notation you made somewhere between  
04:23:30 20 August and September of 2001. If you look at the page  
04:23:33 21 before and the page after, those are in between August and  
04:23:37 22 September of 2001; is that fair?

04:23:39 23 A. That's fair.

04:23:40 24 Q. So at least as of that date you were aware of Dr.  
04:23:43 25 Quake, thinking about him in connection with the work you

04:23:47 1 were doing at Harvard on microfluidics, fair?

04:23:50 2 A. I want to be careful answering this. So I think what  
04:23:54 3 this is saying is somebody is probably telling me about  
04:23:58 4 Steven Quake. Says Bob Austin's post doc on the top of that  
04:24:03 5 page. And he's telling me about some available technology  
04:24:08 6 Steven Quake has developed. I wouldn't characterize it as I  
04:24:10 7 was walking about thinking about Steven Quake. I had lots  
04:24:14 8 of other things to think about at that time.

04:24:16 9 Q. I'm sure you did. Fair enough. At that time in the  
04:24:19 10 2001 period you knew that Steven Quake was a professor at  
04:24:24 11 Cal Tech?

04:24:24 12 A. Absolutely.

04:24:24 13 Q. And I believe you said that was one of the most  
04:24:29 14 prestigious schools in the space in the world?

04:24:30 15 A. Yes.

04:24:30 16 Q. And you knew he was working on microfluidics?

04:24:32 17 A. Yes.

04:24:33 18 Q. Which you were?

04:24:33 19 A. Yes.

04:24:34 20 Q. Now, you actually wrote an e-mail correspondence with  
04:24:41 21 Dr. Quake seeking his help with your work, weren't you?

04:24:45 22 A. I may have, I don't remember.

04:24:47 23 Q. Could you look in your binder, DTX 615, please.

04:24:51 24 A. 615.

04:25:07 25 Q. Is DTX 615 an e-mail you sent to Dr. Quake at Cal

04:25:12 1 Tech on February 28th of 2002?

04:25:15 2 A. Yes.

04:25:15 3 Q. At 5:35 p.m.?

04:25:18 4 A. Yes. Absolutely.

04:25:19 5 MR. POWERS: I move exhibit DTX 615 into  
04:25:22 6 evidence, Your Honor.

04:25:23 7 MR. WALTER: No objection.

04:25:24 8 THE COURT: All right. Admitted without  
04:25:25 9 objection.

04:25:26 10 BY MR. POWERS:

04:25:27 11 Q. Put it on the screen. In this e-mail you started  
04:25:34 12 off, Dear Steve. And you say I've started at Chicago in the  
04:25:39 13 chemistry department, I am interested in using microfluidic  
04:25:44 14 systems as tools with which to control complex chemical  
04:25:47 15 systems -- use them to do chemical synthesis, et cetera,  
04:25:51 16 trying to define my niche. Do you see that?

04:25:53 17 A. Absolutely. Yes.

04:25:56 18 Q. And the next sentence you said I would like to try  
04:25:59 19 out your PDMS sealing method.

04:26:01 20 A. Uh-huh.

04:26:02 21 Q. Remember that? And you said that your student tried  
04:26:06 22 to do it, but his layers didn't seal well. Do you recall  
04:26:09 23 that?

04:26:10 24 A. I don't recall writing the e-mail, but it says that.

04:26:13 25 Q. Do you recall working -- you're sending this e-mail

04:26:18 1 while you are in Chicago working on your lab, right?

04:26:20 2 A. That's correct, yes.

04:26:21 3 Q. Do you recall having problems with the sealing  
04:26:25 4 efforts that you and your students were doing in your lab on  
04:26:29 5 microfluidics?

04:26:30 6 A. So I should be really careful here because there were  
04:26:33 7 two sealing methods. There was the sealing method I used at  
04:26:36 8 Harvard that worked well. Steve Quake published another  
04:26:40 9 sealing method that used these different types of PDMS. And  
04:26:44 10 I thought, you know, if it's a better method we should use  
04:26:48 11 it because you know the sealing method doesn't matter, it's  
04:26:51 12 what you do it with it that matters. So I'm saying we tried  
04:26:55 13 your method, it doesn't actually work very well, can you  
04:26:58 14 help out. What are we doing wrong?

04:27:00 15 Q. Just to help the jury, what does PDMS stand for?

04:27:03 16 A. Type of soft silicon rubber which lots of  
04:27:08 17 microfluidic devices were made of at the time. And sealing  
04:27:13 18 is when bringing two pieces together, part of the very  
04:27:17 19 standard --

04:27:19 20 Q. The very end you ask for any help or suggestion. Do  
04:27:22 21 you recall that?

04:27:22 22 A. Yes, essentially I'm saying, I mean, it's a nice way  
04:27:26 23 of saying your stuff doesn't work, can you please tell me  
04:27:29 24 how to get it to work.

04:27:31 25 Q. And he responded back to you and helped you with the

04:27:34 1 sealing method, didn't he?

04:27:36 2 A. I mean, I hope so. That would be nice of him to do  
04:27:40 3 because we really used our -- ended up using mostly our own  
04:27:45 4 method, the Harvard method, not the Quake method.

04:27:48 5 Q. Could you look at DTX 612, please. It's already in  
04:28:00 6 evidence so we can put it up on the screen. This is your  
04:28:05 7 e-mail exchange with Dr. Whitesides, right?

04:28:08 8 A. Yes, that's the one we just discussed, yes, that's  
04:28:11 9 right.

04:28:11 10 Q. And you sent this e-mail to Dr. Whitesides on March  
04:28:15 11 23, 2002, right?

04:28:16 12 A. That's what it says.

04:28:18 13 Q. Almost exactly a month after your e-mail to Dr. Quake  
04:28:22 14 asking for help with his sealing method, right?

04:28:25 15 A. Well, again, I want to be really careful. So we had  
04:28:28 16 a sealing method that I did and published lots of great  
04:28:33 17 papers out of the Harvard lab. We wanted to try one more  
04:28:36 18 method that Steve Quake published and said in these papers  
04:28:41 19 it worked better. His method didn't work wasn't that  
04:28:45 20 helpful to us, so we were really focusing on whatever was  
04:28:50 21 working and what was working is mostly our method at that  
04:28:55 22 time.

04:28:55 23 Q. Dr. Ismagilov?

04:28:57 24 A. Wonderful, thank you.

04:28:58 25 Q. Getting better. The only question I asked was

04:30:41 1 how to make masks, period. We have played with Quake's  
04:30:45 2 method of sealing -- it works, but you have to use GE PDMS  
04:30:51 3 that Quake used and the devices come out much softer,  
04:30:55 4 perhaps could be very useful for valves, et cetera, closed  
04:31:01 5 paren.

04:31:01 6 A. I see that yes.

04:31:02 7 Q. Two or three minutes ago you said that Quake's  
04:31:04 8 sealing method didn't work. Do you recall that testimony?

04:31:07 9 A. Yes.

04:31:09 10 Q. You couldn't make it work before you sought out Dr.  
04:31:14 11 Quake's help, true? Is that a true statement, yes or no?

04:31:20 12 A. It didn't work very well.

04:31:22 13 Q. Okay. Fair enough. But a month later it did work?

04:31:27 14 A. I don't remember -- I wouldn't -- I wouldn't classify  
04:31:31 15 this as that's the method we used or it worked better than  
04:31:34 16 what we had, because we really never ended up using Quake's  
04:31:38 17 method of sealing. It just was inferior to what we had in  
04:31:42 18 the lab.

04:31:44 19 Q. It's not quite what I asked, Dr. Ismagilov. One  
04:31:48 20 month later when you wrote to your mentor, Dr. Whitesides,  
04:31:51 21 you said Quake's method works, right?

04:31:54 22 A. Well, works has many different colors, right? So in  
04:31:59 23 the binary sense it sealed. Is it useful? It's a different  
04:32:02 24 discussion.

04:32:03 25 Q. Well, the very next sentence says, parens, could be

04:32:07 1 very useful for valves, et cetera, right?

04:32:10 2 A. Yes. So what I'm saying that if you want to use  
04:32:13 3 Quake-like approaches, which are valves, that requires some  
04:32:18 4 of the PDMS and that could be very useful for valve. We  
04:32:22 5 were not interested at the end of the day in valves. And so  
04:32:24 6 that's why we did not pursue it. Had we really decided, had  
04:32:30 7 we decided to do valves, we would have, of course, use the  
04:32:34 8 -- because some of the PDMS was indeed important for valves,  
04:32:38 9 but was not the focus we had with reactions to droplets.

04:32:42 10 Q. Could you turn to DTX 502, please?

04:32:45 11 A. Yes, of course.

04:32:57 12 Q. DTX 502 is an April 30, 2001 journal article by Dr.  
04:33:07 13 Quake, true?

04:33:08 14 A. Yes, that's true.

04:33:09 15 Q. And it's in a journal called the Physical Review  
04:33:12 16 Letters. That's a very prestigious journal article, isn't  
04:33:16 17 it?

04:33:16 18 A. It's a very prestigious journal on physics.

04:33:19 19 Q. It's a peer reviewed journal, is it not?

04:33:21 20 A. That's correct.

04:33:22 21 Q. And peer reviewed means that a lot of other  
04:33:25 22 scientists look at it to make sure it's accurate and  
04:33:27 23 interesting, true?

04:33:28 24 A. In this case a lot of other physicists look at it to  
04:33:32 25 make sure it's interesting to them.

04:33:33 1 Q. Now, you were aware of this article at the time,  
04:33:38 2 weren't you?

04:33:39 3 A. Yes.

04:33:42 4 Q. And Dr. Quake's April 2001 article specifically  
04:33:47 5 describes a microfluidic device, doesn't it?

04:33:53 6 A. Yes, it does.

04:33:54 7 Q. And it specifically describes a microfluidic device  
04:33:57 8 that makes droplets, true?

04:34:00 9 A. Yes. He, again, talks about vesicles, which is a  
04:34:05 10 different thing than droplets, but they did make droplets as  
04:34:09 11 well.

04:34:09 12 Q. And he expressly says they make droplets, didn't he?

04:34:11 13 A. That's correct.

04:34:12 14 Q. All right. So you're not denying that?

04:34:15 15 A. No, not at all.

04:34:16 16 Q. Okay. Now, you testified on direct examination you  
04:34:19 17 showed a figure from your patent where you showed oil coming  
04:34:22 18 in on something that you thought was 300 and the 3 was cut  
04:34:28 19 off?

04:34:30 20 A. Yes.

04:34:30 21 Q. You thought that was coming in from the side with  
04:34:34 22 oil. And aqueous or water solutions with reagents were  
04:34:38 23 coming in from the top, right?

04:34:39 24 A. Yes, that's correct.

04:34:40 25 Q. Dr. Quake also described a system where an oil stream

04:34:45 1 intersects with a water stream and creates droplets, true?

04:34:49 2 A. Yes. He describes the system that creates droplets.

04:34:53 3 Q. Specifically using an oil stream and a water base  
04:34:57 4 stream, true?

04:34:57 5 A. Yes, true.

04:34:58 6 Q. And that's exactly how your system made droplets, an  
04:35:01 7 oil stream and a water stream?

04:35:03 8 A. I, again, want to be careful here. Our system does  
04:35:07 9 use oil stream and water stream, but there are a lot of  
04:35:11 10 other things that our system has to do or has done to make  
04:35:15 11 droplets suitable for reactions.

04:35:16 12 Q. I was just asking whether your system, like the Quake  
04:35:19 13 system, uses an oil stream and water stream to make  
04:35:23 14 droplets. And it does?

04:35:26 15 A. Water and oil streams are definitely part of our  
04:35:29 16 system.

04:35:29 17 Q. And your first filing of anything showing that, any  
04:35:37 18 public filing of that, was in a patent application dated May  
04:35:41 19 of 2002, correct?

04:35:43 20 A. I believe so, but although I don't remember the dates  
04:35:49 21 off the top of my head,  
04:35:51 22 but --

04:35:52 23 Q. So Dr. Quake's April 2001 publication is a little  
04:35:57 24 more than a year before your first patent filing, right?

04:36:01 25 A. That's correct.

04:36:03 1 Q. Now, you were -- you read Dr. Quake's April 2001  
04:36:14 2 article, you saw extensive results from extensive testing  
04:36:22 3 about how you could control the formation of droplets and  
04:36:25 4 size, frequency, shape, et cetera, True?

04:36:28 5 A. That's absolutely not true.

04:36:30 6 Q. Not true?

04:36:31 7 A. So what I saw was a study of pattern formation, but  
04:36:35 8 not control. They really couldn't control droplets  
04:36:40 9 formation. They essentially played with conditions and  
04:36:45 10 showed that as you change conditions different patterns  
04:36:50 11 form. They could not control droplets to the extent that we  
04:36:53 12 needed them to be controlled. Maybe we're using control in  
04:37:01 13 a different way, but --

04:37:03 14 Q. The way we were using worked in a different way  
04:37:06 15 earlier?

04:37:07 16 A. Sorry, the word control.

04:37:09 17 Q. Let's bring up the middle of the second column on the  
04:37:12 18 first page of DTX 502, please. Now, in the very first page  
04:37:21 19 of this article, Dr. Quake says the droplet size and  
04:37:25 20 frequency can be precisely controlled by modifying the  
04:37:30 21 relevant pressure of water and oil enabling the production  
04:37:34 22 of a wide range of vesicle shapes and patterns. Do you see  
04:37:37 23 that?

04:37:39 24 A. This talks about vesicles.

04:37:40 25 Q. Do you see what I just read to you?

04:39:24 1 application -- now we've cut off part of that line. Get  
04:39:29 2 there -- not quite. Get the words. There we go. This  
04:39:32 3 system may also find application as a component in a  
04:39:36 4 microfluidic screening chip, since it has been shown that  
04:39:41 5 subnanoliter vesicles have significant potential as tools  
04:39:46 6 for screening of biological and synthetic compounds. Do you  
04:39:50 7 see that?

04:39:50 8 A. Yes.

04:39:52 9 Q. A microfluidic screening chip is what the companies  
04:39:58 10 you've described are producing, right? It's a microfluidic  
04:40:00 11 device on a chip?

04:40:03 12 A. Again, I want to be careful. There's a difference  
04:40:06 13 between a chip and a system. And so I guess I would not --  
04:40:13 14 would not agree with your characterization of what this  
04:40:16 15 says.

04:40:16 16 Q. Well, a microfluidic chip is in fact the product that  
04:40:20 17 people are making using microfluidic droplets technology,  
04:40:24 18 right, they're doing that on chips?

04:40:26 19 A. I'm not a commercial person, so I'm not qualified to  
04:40:29 20 discuss what is a product and what is not a product. A chip  
04:40:33 21 is definitely a part of the microfluidic system, but there  
04:40:37 22 could be many other parts to it.

04:40:40 23 Q. I thought on your direct examination you were telling  
04:40:42 24 us that you were -- you knew about how different companies  
04:40:46 25 were using droplets in microfluidic technology. Do you

04:40:49 1 recall that?

04:40:49 2 A. Yes, of course.

04:40:50 3 Q. And you know they're doing that in chips, right?

04:40:53 4 A. So I would not disagree with you that chips are used  
04:40:58 5 in those products, but they are used as part of larger  
04:41:03 6 systems.

04:41:06 7 Q. Let's bring up DTX 612, please. It's already in  
04:41:10 8 evidence, so we can put it on the screen. You've already  
04:41:15 9 testified about this, so I don't want to repeat that, I just  
04:41:18 10 want to make one point. You testified here, sorry, not  
04:41:24 11 testified. This is the e-mail from you to Dr. Whitesides,  
04:41:28 12 right?

04:41:28 13 A. Right.

04:41:32 14 Q. And this is, in this e-mail you specifically say and  
04:41:36 15 it's on the second page, I believe, that you're upset that  
04:41:41 16 Dr. Quake beat you to the punch by publishing in April 2001.  
04:41:46 17 Do you recall that?

04:41:46 18 A. Yes.

04:41:47 19 Q. And my only question is the April 2001 that you're  
04:41:50 20 referring to is the article we just looked at, which was DTX  
04:41:55 21 502.

04:41:59 22 A. Okay. Again, I want to be really clear in this case,  
04:42:03 23 as I've said before, what I was disappointed with is that  
04:42:07 24 Dr. Quake published this piece of droplet formation, which  
04:42:12 25 I've discussed with Dr. Whitesides, but I was very

04:42:15 1 interested in the chemistry, so I thought I would publish  
04:42:19 2 both the droplet piece and the chemistry, which is a much  
04:42:22 3 larger piece, much more important piece to me and I was  
04:42:25 4 essentially telling Dr. Whitesides well, Dr. Quake published  
04:42:28 5 the droplet formation piece, but he's not going to do any  
04:42:33 6 chemistry, so the chemistry is the interesting part and Dr.  
04:42:37 7 Whitesides agreed with me.

04:42:38 8 Q. Dr. Ismagilov, I did not ask for anything. I asked  
04:42:41 9 merely whether you said when you said that you're upset that  
04:42:44 10 Quake published it in April 2001 that by April 2001 you're  
04:42:48 11 referring to the article, the April 2001 article we just  
04:42:51 12 looked at, which is DTX 502. That's all I asked for.

04:42:55 13 A. Absolutely.

04:42:56 14 Q. Didn't ask for the speech. And it is, isn't it?

04:42:59 15 A. Yes. The answer is yes.

04:43:00 16 MR. POWERS: Your Honor, I will move DTX exhibit  
04:43:04 17 502 in evidence.

04:43:06 18 MR. WALTER: No objection.

04:43:08 19 THE COURT: Admitted without objection.

04:43:22 20 BY MR. POWERS:

04:43:22 21 Q. So in addition to following Dr. Quake's publications,  
04:43:27 22 you also followed his patent filings, didn't you?

04:43:29 23 A. That's correct.

04:43:32 24 Q. Could you look at DTX 636, please? Do you have it?

04:43:50 25 A. Yes, I do.

04:57:24 1 familiar with patents?

04:57:24 2 A. Yes.

04:57:25 3 Q. And you talked about the claims being the inventions.

04:57:32 4 Do you recall that?

04:57:32 5 A. Yes.

04:57:32 6 Q. This is part of the specification of the patent?

04:57:34 7 A. Yes.

04:57:35 8 Q. And you know the specification is supposed to explain  
04:57:38 9 those claims in more detail; right?

04:57:40 10 A. Again, I'm not a patent attorney. My understanding  
04:57:43 11 is that the specifications are -- provides background  
04:57:46 12 context and examples on which the claims are built.

04:57:51 13 Q. Exactly. And so when you say in one preferred  
04:57:55 14 embodiment, that's one of the examples; fair?

04:57:57 15 A. There is a section called examples, so that's what I  
04:57:59 16 mean.

04:57:59 17 Q. So do you have any understanding as to what in one  
04:58:03 18 preferred embodiment means in your patent application?

04:58:05 19 A. So I think to me this means, for example, these  
04:58:12 20 things can happen.

04:58:12 21 Q. The word embodiment is there. Do you know -- and you  
04:58:17 22 know what embodiment means, something that embodies  
04:58:19 23 something else?

04:58:19 24 A. I understand the English language.

04:58:23 25 Q. And it's an embodiment of your inventions; right?

04:58:28 1 A. Again, I would be wrong to say that I know exactly  
04:58:36 2 what -- what that means from a legal point of view.

04:58:40 3 Q. Okay. Fair enough.

04:58:41 4 So in this section of your patent application  
04:58:44 5 that we're looking at, you go on at some length about the  
04:58:49 6 formation of the plugs; right?

04:58:51 7 A. So, yeah, this section describes -- let me read it.  
04:59:01 8 Yes. It talks about formation of plugs.

04:59:05 9 Q. And the plugs are just another word for droplets;  
04:59:09 10 right?

04:59:09 11 A. Yes.

04:59:10 12 Q. And the formation of the droplets or plugs is a very  
04:59:14 13 important part of your invention. It's the claims, right?

04:59:17 14 MR. WALTER: Objection, Your Honor. We'd like a  
04:59:18 15 side-bar.

04:59:19 16 THE COURT: I'm sorry. Can you rephrase the  
04:59:21 17 question?

04:59:22 18 BY MR. POWERS:

04:59:23 19 Q. The question is just that as you understand your  
04:59:25 20 invention, not asking you as a lawyer, the formation of  
04:59:29 21 droplets or plugs is an important part of your invention?

04:59:32 22 MR. WALTER: We'd like a side-bar. We have an  
04:59:34 23 objection.

04:59:34 24 THE COURT: All right. Well, I'd like him to  
04:59:36 25 answer the question first.

04:59:40 1 THE WITNESS: I think that formation of droplets  
04:59:42 2 is one of the many, many parts of this invention that has to  
04:59:46 3 happen. So it's definitely a part of the invention.

04:59:49 4 THE COURT: All right. So I think we're going  
04:59:50 5 to have to finish for the day here.

04:59:52 6 So members --

04:59:54 7 THE WITNESS: Actually, may I correct my --

04:59:56 8 THE COURT: Yes. Go ahead.

04:59:57 9 THE WITNESS: I apologize. So I should  
04:59:59 10 characterize it as formation of droplets is important for  
05:00:02 11 the invention to work, but what I want to say is the  
05:00:06 12 invention is really not formation of droplets. It's the  
05:00:09 13 tool kit for running reactions on droplets.

05:00:12 14 MR. POWERS: May I follow up on that with just  
05:00:14 15 two brief questions?

05:00:15 16 THE COURT: All right. Go ahead.

05:00:15 17 BY MR. POWERS:

05:00:18 18 Q. You understand that a significant part of your patent  
05:00:22 19 claims are directed to the formation of droplets; true?

05:00:25 20 A. So I understand that it's formation of specific  
05:00:33 21 droplets that have reagents in them, and it's basically --  
05:00:36 22 so my understanding, non-legal definition -- so from my --  
05:00:40 23 my non-legal understanding of this, it's the way to make --  
05:00:45 24 to make droplets with reagents. It's not about making  
05:00:48 25 droplets in general.

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

BIO-RAD LABORATORIES, )  
INC. and THE )  
UNIVERSITY OF CHICAGO, )  
 )  
 )  
 ) Plaintiffs, )  
 )  
 ) C.A. No. 15-152-RGA  
v. )  
 )  
 )  
10X GENOMICS, INC., )  
 )  
 )  
Defendant. )

J. Caleb Boggs Courthouse  
844 King Street  
Wilmington, Delaware

Tuesday, November 6, 2018  
8:37 a.m.  
Trial Volume II

BEFORE: THE HONORABLE RICHARD G. ANDREWS, U.S.D.C.J.

APPEARANCES:

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-and-

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13

14

PROCEEDINGS

08:37:25 15

THE COURT: All right. Good morning, everyone.

08:37:26 16

Please be seated. So what do you want to talk about?

08:37:35 17

08:37:40 18

MR. POWERS: Your Honor, we have four items on  
the agenda.

08:37:40 19

THE COURT: Okay.

08:37:41 20

08:37:45 21

MR. POWERS: One is the motion for clarification  
that we filed last night.

08:37:46 22

08:37:49 23

THE COURT: Right. So what is it you want me to  
say exactly?

08:37:50 24

08:37:57 25

MR. POWERS: Well, what I think we need is  
clarity what Your Honor's ruling is.

09:19:24 1 THE COURT: All right. Anything else from you,  
09:19:26 2 Mr. Reines?

09:19:26 3 MR. REINES: No, that's it, Your Honor. Thank  
09:19:28 4 you very much.

09:19:28 5 THE COURT: Well, we'll take a ten-minute  
09:19:30 6 recess. Hopefully, the jury will be on time today.

09:19:33 7 THE CLERK: All rise.

09:26:14 8 (Recess was taken.)

09:26:14 9 THE COURT: Are you all ready to begin, because  
09:26:17 10 we do have the jury here? Okay. And Dr. Ismagilov, if  
09:26:21 11 you're here, we're not going to get far without a witness.  
09:27:09 12 All right. Let's get the jury please. Dr. Ismagilov, come  
09:27:15 13 on up.

09:28:12 14 (Jury enters.)

09:28:12 15 THE COURT: Everyone may be seated. Members of  
09:28:15 16 the jury, welcome back. Thank you for your promptness this  
09:28:20 17 morning, so we get to start a couple minutes early. Mr.  
09:28:25 18 Powers.

09:28:25 19 MR. POWERS: Thank you, Your Honor.

09:28:26 20 BY MR. POWERS:

09:28:27 21 Q. Good morning, Dr. Ismagilov.

09:28:29 22 A. Good morning.

09:28:32 23 Q. When we broke yesterday we were discussing DTX 11.  
09:28:36 24 Can you get that in front of you again, please? Should be  
09:28:49 25 in your first big binder. Thank you. I believe you said

09:41:23 1 A. I wouldn't say that my understanding of the legalese  
09:41:26 2 is such that I would know exactly what -- which section  
09:41:31 3 refers to the invention versus the other aspects of it.

09:41:37 4 Q. Well, the invention wasn't referring to anybody  
09:41:40 5 else's invention, was it? This is your patent application,  
09:41:43 6 true?

09:41:43 7 A. It is my patent application, correct.

09:41:44 8 Q. So when it say there's a summary of the invention,  
09:41:48 9 you understood that to mean summary of the invention you  
09:41:51 10 were claiming, right?

09:41:52 11 A. So, I don't know if provisional applications actually  
09:41:56 12 claim. Okay. Again, I'm not a patent attorney. What I can  
09:42:00 13 tell you is this sounded fine to me and I had no problem  
09:42:10 14 with what was written.

09:42:13 15 Q. You understand the patent -- purpose of this patent  
09:42:16 16 application was to define and explain your invention, right?  
09:42:19 17 You did understand that?

09:42:21 18 A. Yeah. Yes, I did.

09:42:22 19 Q. All right. Let's go to page 10. Bring up the  
09:42:25 20 heading there. This heading, at page 10 is, quote, detailed  
09:42:42 21 description of the invention. Do you see that?

09:42:43 22 A. Yes, I do.

09:42:44 23 Q. So again you'd understand this is your detailed  
09:42:47 24 description of what you're claiming to be your invention,  
09:42:50 25 right?

09:42:51 1 A. Yes, that's correct.

09:42:52 2 Q. And it's in this section that the portion I pointed  
09:42:55 3 you to on page 14 lies, isn't it?

09:42:58 4 A. Let me verify that. Yes, that's correct.

09:43:11 5 Q. And this paragraph was copied almost verbatim from  
09:43:19 6 Quake PCT, wasn't it?

09:43:21 7 A. I wouldn't know just by looking at it, but I assume  
09:43:25 8 you've done the comparison and you know which one is which.

09:43:27 9 Q. I have. Let's -- could you keep your DTX 11 handy  
09:43:33 10 and go to DTX 14? Actually, 636, that's your copy.

09:43:48 11 A. Okay.

09:43:50 12 Q. And go to page 29. You there?

09:44:07 13 A. I'm on page 29 -- 0029 or --

09:44:11 14 Q. Bottom right 29, the bottom right 29. DTX 636.0029.

09:44:18 15 A. Yes, I'm on that page.

09:44:19 16 Q. And there's a paragraph that starts at Line 9.

09:44:23 17 A. Yes.

09:44:24 18 MR. POWERS: And Your Honor, I'll put up as  
09:44:28 19 illustrative Exhibit DDX 7.1 which has a comparison of the  
09:44:31 20 two, so he can verify that that is accurate.

09:44:31 21 BY MR. POWERS:

09:44:38 22 Q. So I've shown on the left side, DDX 14, the Quake  
09:44:43 23 PCT, and on the right side your provisional application.  
09:44:47 24 That's the exact two paragraphs we've just been discussing.

09:44:51 25 And if you wish, you can read them yourself. I

09:44:56 1 can tell you a lot of time and care was spent making sure  
09:44:58 2 this is right.

09:45:00 3 The yellow parts are accurately depicting the  
09:45:03 4 identical language you lifted from Quake. And the green  
09:45:06 5 parts show where there was a word change; right?

09:45:10 6 MR. WALTER: Objection.

09:45:11 7 THE WITNESS: I --

09:45:11 8 THE COURT: So I think I know what the objection  
09:45:15 9 is. You're going to need to rephrase the question.

09:45:19 10 MR. POWERS: I'm happy to rephrase.

09:45:21 11 BY MR. POWERS:

09:45:21 12 Q. The right side shows the language in your provisional  
09:45:25 13 application in yellow that is identical to the same portion  
09:45:29 14 from Quake, and the green portion shows where there's been a  
09:45:33 15 small change; true?

09:45:34 16 A. That is true.

09:45:35 17 Q. And so what you did was change droplets --

09:45:40 18 MR. WALTER: Objection.

09:45:41 19 THE WITNESS: I'm sorry.

09:45:42 20 THE COURT: I'm going to let him finish the  
09:45:45 21 question.

09:45:46 22 BY MR. POWERS:

09:45:46 23 Q. So on the left side, if you look at Quake PCT in the  
09:45:49 24 very first line, it says in one preferred embodiment,  
09:45:52 25 droplets. And in your application, it was changed in one

09:45:57 1 preferred embodiment, plugs. Do you see that?

09:45:59 2 A. I see that change. Yes.

09:46:01 3 Q. And that change is a common change throughout that  
09:46:04 4 the word droplets in Quake was changed to plugs in your  
09:46:07 5 application; true?

09:46:08 6 A. At least in -- in this, in these paragraphs, that is  
09:46:14 7 true.

09:46:14 8 Q. And were you aware that there was a change from  
09:46:19 9 droplets to plugs consistently from the Quake application to  
09:46:22 10 your application?

09:46:24 11 A. As I told you a few minutes ago, I was not aware of  
09:46:28 12 that, that these pieces were appearing in -- in that  
09:46:33 13 application. So I couldn't have possibly known that the  
09:46:35 14 change was made.

09:46:36 15 Q. Let me make sure I understand what your earlier  
09:46:38 16 testimony was. You said you didn't -- you weren't aware of  
09:46:40 17 this particular paragraph before arriving in Wilmington;  
09:46:44 18 right?

09:46:44 19 A. Yes.

09:46:45 20 Q. But you were aware that many, many portions from  
09:46:48 21 Quake were copied into your application?

09:46:50 22 A. No, that's not what I said. What I said was during  
09:46:54 23 my work at the University of Chicago, I've learned that  
09:46:58 24 pieces of applications were copied. And I've asked patent  
09:47:06 25 attorneys why. They told me that's how law firms functioned

09:47:12 1 at the time. They showed me some write-up, and they assured  
09:47:19 2 me that was basically what the law firms did.

09:47:24 3 But -- and I just want to be -- make sure when  
09:47:27 4 you say you, this is -- you're not implying that I'm  
09:47:30 5 personally sitting there copying and changing. I'm sorry.  
09:47:34 6 A little bit -- I apologize. I -- maybe I shouldn't have  
09:47:38 7 said that. Just a little disconcerting.

09:47:40 8 Q. I take it you were -- it was important to you that  
09:47:45 9 your patent application accurately described your invention  
09:47:50 10 as opposed to something that was taken directly from Quake?  
09:47:53 11 That would have been important to you; right?

09:47:55 12 A. It was important to me that the patent application  
09:48:04 13 clearly described what the invention is and provided all the  
09:48:09 14 important information in the application such as dimensions  
09:48:13 15 of channels and all these other things. I was not thinking  
09:48:17 16 about Quake in the context of the narrative.

09:48:23 17 I certainly made sure I -- as you've pointed  
09:48:29 18 out, I've given Quake to the patent attorneys, and I've made  
09:48:32 19 sure -- I've asked them, and that's their job as well --  
09:48:36 20 made sure whatever we're describing, whatever we're claiming  
09:48:39 21 is not Quake because, otherwise, it would be just wasting  
09:48:42 22 money filing an application that's already Quake.

09:48:45 23 Q. When you sent Quake -- the Quake PCT to your patent  
09:48:52 24 attorneys to use and draft in the application, did you have  
09:48:57 25 any subsequent discussions with them at all about how they

09:50:09 1 before or after you sent Quake to your lawyers?

09:50:12 2 A. That I would not be able to tell. I just don't  
09:50:14 3 remember.

09:50:15 4 Q. So at least you knew what portions of the application  
09:50:20 5 you had drafted; right?

09:50:22 6 A. Yes.

09:50:22 7 Q. And then you received a draft that had the portions  
09:50:27 8 you had drafted and extensive citations, extensive language  
09:50:33 9 from Quake; right?

09:50:34 10 A. Again, you are mischaracterizing what I've said. I  
09:50:38 11 just want to be very clear, we hire -- University of Chicago  
09:50:43 12 hires patent attorneys that are familiar with microfluidics.  
09:50:46 13 It's their job to take our disclosure, our examples of our  
09:50:50 14 ideas, talk to us, and then generate a patent application.  
09:50:53 15 So it's their job to generate all these other sections.

09:50:56 16 Q. I didn't ask anything about the role of the patent  
09:50:58 17 attorneys. I asked whether you reviewed a draft that came  
09:51:02 18 back from the patent attorneys that had the section you had  
09:51:05 19 drafted and the sections that came straight from Quake?

09:51:09 20 A. So, again, this -- I want to be very clear that when  
09:51:14 21 I reviewed these, I reviewed a draft that came back, but I  
09:51:21 22 did not know at the time where those sections came from. My  
09:51:24 23 assumption is always that patent attorneys draft whatever  
09:51:28 24 they need to draft.

09:51:29 25 Q. You knew what you had drafted when you reviewed the

09:51:32 1 full draft; right?

09:51:33 2 A. That's correct.

09:51:34 3 Q. And you know what you didn't draft?

09:51:36 4 A. That's correct.

09:51:37 5 Q. And you were familiar with the Quake PCT? You read  
09:51:40 6 it closely?

09:51:41 7 A. I wouldn't say that I read it closely.

09:51:42 8 Q. You were following Quake closely at that time,  
09:51:45 9 weren't you?

09:51:45 10 A. That would be mischaracterizing our -- yesterday's  
09:51:50 11 discussion.

09:51:50 12 Q. I wasn't characterizing yesterday's discussion asking  
09:51:53 13 you -- I'm asking you a question. You were, in fact,  
09:51:55 14 following Quake's work closely, weren't you?

09:51:58 15 A. I wasn't following Quake's work anymore closely than  
09:52:02 16 hundreds of other people that were either in the  
09:52:05 17 microfluidics or working in related areas.

09:52:08 18 Q. You did download his PCT seven days after it was  
09:52:11 19 published. Just seven days?

09:52:13 20 A. That's true.

09:52:14 21 Q. And you were aware of his April 2001 article right  
09:52:18 22 after it was published?

09:52:19 23 A. That's correct.

09:52:20 24 Q. And, in fact, there was another Quake patent  
09:52:22 25 application that you reviewed shortly -- that you downloaded

09:52:26 1 shortly after it was published?

09:52:28 2 A. That I can't speak to, but I -- I mean, I've -- you  
09:52:35 3 have all of my emails, so I assume that's true.

09:52:38 4 Q. It wouldn't surprise you that you were downloading  
09:52:41 5 several Quake applications, would it?

09:52:44 6 A. Every day in my work, I download maybe 30, or 40, or  
09:52:49 7 50 articles and patent applications. That's just part of my  
09:52:52 8 job.

09:52:53 9 Q. And Quake was important to you because it bothered  
09:52:55 10 you that he was before you in the microfluidics aspect;  
09:53:00 11 true? That's what you told Professor Whitesides?

09:53:04 12 A. What I told -- I did not tell Professor Whitesides  
09:53:07 13 that Quake was important to me. Quake is -- I like seeing  
09:53:12 14 Quake. He's one of the many people in the field, and of  
09:53:16 15 course, I read articles of Stephen Quake and many others.

09:53:21 16 Q. But you did tell Professor Whitesides that you were  
09:53:23 17 upset that Quake had beaten you to the punch?

09:53:27 18 A. Was that upset or a little upset?

09:53:29 19 Q. A little upset. Let's take it back.

09:53:30 20 A. Okay. I think that's a big difference. Maybe I was  
09:53:33 21 just getting too emotional.

09:53:35 22 Q. Could you turn to DTX 640 in your binder? Let me  
09:54:01 23 know when you have it.

09:54:03 24 A. I have it. Yes.

09:54:06 25 Q. 640?

09:54:06 1 A. Yes.

09:54:07 2 Q. And DTX 640 is another application by Dr. Quake that  
09:54:14 3 was published in March of 2002, March 14th to be specific;  
09:54:19 4 right?

09:54:19 5 A. Mm-hmm. That's correct. Yes.

09:54:21 6 Q. And you downloaded this application as well shortly  
09:54:24 7 after it was published?

09:54:25 8 A. That I wouldn't know, but I assume you're right.

09:54:29 9 Q. Can you turn to the last page? It shows that this  
09:54:39 10 came from a file of yours, custodian. It was downloaded  
09:54:43 11 March 18th, 2002; right?

09:54:45 12 A. That's correct.

09:54:46 13 Q. Four days after it was published? So you were  
09:54:50 14 following it, at least these applications closely, weren't  
09:54:53 15 you?

09:54:53 16 A. I would not -- again, I would not make that  
09:54:55 17 assumption. I don't know if I can exclude that the Transfer  
09:55:00 18 Office was sending me microfluidic patent applications.

09:55:05 19 MR. POWERS: Your Honor, we offer DTX 640 into  
09:55:08 20 evidence.

09:55:08 21 MR. WALTER: No objection.

09:55:09 22 THE COURT: All right. Admitted without  
09:55:12 23 objection.

09:55:13 24 BY MR. POWERS:

09:55:18 25 Q. Let's turn to a different part of your provisional.

09:55:24 1 Could you turn to DTX 11 at 15, please?

09:55:45 2 A. You said 15, 1-5.

09:55:46 3 Q. Page 1-5.

09:55:47 4 A. Yeah.

09:55:48 5 Q. And specifically, Lines 11 to 15. The sentence  
09:56:00 6 starts, For instance?

09:56:02 7 A. Yes, I see that.

09:56:03 8 Q. That section was also copied by someone virtually  
09:56:11 9 identically from Quake, wasn't it?

09:56:12 10 A. I believe that. I assume you've done analysis. And  
09:56:17 11 if so, that must be the case.

09:56:19 12 Q. Could you turn to Quake PCT DTX 636 at 30, Lines 20  
09:56:27 13 to 23?

09:56:32 14 A. Um, I'm sorry, Quake PCT?

09:56:34 15 Q. So DTX 636?

09:56:36 16 A. 636.

09:56:37 17 Q. The one from your files, at lines 30 to 33 and let's  
09:56:46 18 put up illustrative exhibit DDX 7.2.

09:56:52 19 A. I got to 636. I apologize, which page and line?

09:56:57 20 Q. Page 30.

09:56:58 21 A. I have it.

09:57:01 22 Q. That portion is also identical to Quake, except  
09:57:05 23 droplets were changed to plugs, right?

09:57:07 24 A. That is correct.

09:57:11 25 Q. And you were aware of Dr. Quake's use, consistent use

10:45:21 1 THE COURT: Wait. Yeah.

10:45:24 2 MR. POWERS: He cannot answer that Dr. Quake  
10:45:27 3 has not done something. He has no personal --

10:45:28 4 THE COURT: He's saying to his knowledge, for  
10:45:30 5 whatever it's worth, so I'm going to allow it.

10:45:34 6 THE WITNESS: To my knowledge, Professor Quake  
10:45:36 7 has never done reactions in droplets.

10:45:51 8 MR. WALTER: I don't have any further questions.

10:45:53 9 THE COURT: All right. Thank you. All right.

10:45:56 10 Dr. Ismagilov, you're done. Thank you. You may  
10:45:59 11 step down.

10:46:00 12 THE WITNESS: Thank you very much. I appreciate  
10:46:03 13 it.

10:46:08 14 Thank you.

10:46:11 15 MR. REINES: Your Honor, plaintiff's next  
10:46:20 16 witness is Professor Sam Sia.

10:46:22 17 THE COURT: Okay.

10:46:44 18 THE CLERK: Please state and spell your full  
10:46:51 19 name for the record?

10:46:53 20 THE WITNESS: Samuel Sia. S-A-M-U-E-L S-I-A.

10:46:57 21 THE CLERK: You can raise your hand.

10:46:57 22 SAMUEL SIA, Ph.D.,

10:46:57 23 the witness herein, after having

10:46:57 24 been duly sworn under oath, was examined

10:47:08 25 and testified as follows:

10:47:08 1 THE CLERK: Thank you.

10:47:38 2 DIRECT EXAMINATION

10:47:38 3 BY MR. WALTER:

10:47:40 4 Q. Could you please introduce yourself to the jury, sir?

10:47:42 5 A. Yes. My name is Sam Sia.

10:47:45 6 Q. I understand you prepared a series of slides to help  
10:47:47 7 illustrate your testimony. The first one pertains to your  
10:47:50 8 biography.

10:47:51 9 Could you please briefly summarize your  
10:47:54 10 biography to the jury?

10:47:54 11 A. Sure. I've been a professor at Columbia University  
10:47:58 12 in New York since 2005, and I worked on microfluidics.  
10:48:03 13 Before that, I did my post-doctoral work at Harvard  
10:48:06 14 University in microfluidics. That's where I learned  
10:48:09 15 microfluidics. I did that work under Dr. George Whitesides  
10:48:13 16 who, as you've heard, is a pioneer in the field.

10:48:17 17 And before that, I got my Ph.D. in biophysics  
10:48:21 18 from Harvard as well.

10:48:22 19 Q. I understand you received a number of awards and  
10:48:26 20 honors for your research. Can you please describe some of  
10:48:29 21 those?

10:48:30 22 A. Yeah. Some of those awards are shown on the screen  
10:48:32 23 there. But just a couple of the ones, maybe at the top.  
10:48:35 24 That's related to my work in microfluidics. I won the MIT  
10:48:41 25 Technology Review's Top Innovators. I was listed as one of

10:48:42 1 them. And some of the tech luminaries today have also won  
10:48:47 2 that award in the past. And I won that award for  
10:48:50 3 microfluidics.

10:48:50 4 And the top line, I was also inducted into the  
10:48:55 5 AME Society. That's given to the top two percent of  
10:48:58 6 bioengineers in the country.

10:49:00 7 Q. I also understand you received a number of research  
10:49:03 8 grants where you worked. Can you tell the jury about some  
10:49:06 9 of the organizations that are funding your research?

10:49:08 10 A. So we're lucky to receive some funding from a lot of  
10:49:11 11 organizations, but maybe I'll highlight some of the ones  
10:49:14 12 near the top. Again, some of them are -- they fund  
10:49:18 13 international kind of health research work. And part of  
10:49:21 14 what we do is we try to make portable blood tests that you  
10:49:24 15 can take out in the field. And we've tested these in South  
10:49:24 16 Africa.

10:49:30 17 You can take a little microfluidic chip. I  
10:49:32 18 think I actually have maybe -- yeah, it's right here.  
10:49:35 19 Actually I brought a little chip with me right here.

10:49:38 20 So you can take it to Africa, get a blood test  
10:49:42 21 done in 15 minutes. And we received funding from those  
10:49:47 22 foundations.

10:49:48 23 Q. Now, what am I showing here on this slide?

10:49:50 24 A. This is a version of that that we tested. It got a  
10:49:52 25 lot of press. We called it a smart phone accessory. So you

10:49:56 1 can actually do this blood test as an accessory to a smart  
10:50:00 2 phone.

10:50:00 3 Q. You also have industry experience?

10:50:03 4 A. Yeah. So actually this technology that I co-invented  
10:50:09 5 was commercialized into a company called Claros Diagnostics.  
10:50:15 6 And that technology is a bigger version of a smart phone,  
10:50:18 7 but it sits in a doctor's office. And OPKO is currently  
10:50:22 8 doing an 800-patient trial and it's an FDA trial for early  
10:50:27 9 detection of prostate cancer in a doctor's office.

10:50:29 10 I also founded something called Harlem Biospace.  
10:50:32 11 It's quite well known in New York City. It's a facility to  
10:50:36 12 spur biotech innovation in New York City. We've had over 50  
10:50:40 13 biotech companies in that facility since I started it about  
10:50:43 14 five years ago.

10:50:45 15 MR. WALTER: Your Honor, at this time, I'd like  
10:50:47 16 to offer Professor Sia as an expert in the subject matter of  
10:50:50 17 the patents-in-suit.

10:50:50 18 MR. POWERS: No objection.

10:50:51 19 THE COURT: All right. You may proceed.

10:50:55 20 BY MR. WALTER:

10:50:55 21 Q. I understand you prepared some opinions in this case  
10:50:57 22 as to whether 10X's products infringe?

10:51:00 23 A. Yes, I have.

10:51:01 24 Q. Can you please summarize those opinions?

10:51:03 25 A. Yeah. So in my opinion, 10X's products infringe on

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

BIO-RAD LABORATORIES, )  
INC. and THE )  
UNIVERSITY OF CHICAGO, )  
 )  
 )  
Plaintiffs, )  
 )  
 ) C.A. No. 15-152-RGA  
v. )  
 )  
 )  
10X GENOMICS, INC., )  
 )  
Defendant. )

J. Caleb Boggs Courthouse  
844 King Street  
Wilmington, Delaware

Thursday, November 8, 2018  
8:33 a.m.  
Trial Volume IV

BEFORE: THE HONORABLE RICHARD G. ANDREWS, U.S.D.C.J.

APPEARANCES:

FARNAN LLP  
BY: BRIAN E. FARNAN, ESQUIRE

-and-

WEIL GOTSHAL & MANGES, LLP  
BY: EDWARD REINES, ESQUIRE  
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8 BY: MATTHEW D. POWERS, ESQUIRE  
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10 BY: AZRA HADZIMEHMEDOVIC, ESQUIRE

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12 IRELL & MANELLA LLP  
13 BY: DAVID GINDLER, ESQUIRE  
14 BY: LAUREN DRAKE, ESQUIRE

For the Defendant

15 PROCEEDINGS

08:33:22 15

08:33:22 16 THE COURT: Good morning. Please be seated.

08:33:24 17 Mr. Reines, what can I do for you?

08:33:26 18 MR. REINES: There's, I think -- actually I  
08:33:29 19 should say three issues primarily. There is the  
08:33:31 20 indefiniteness question.

08:33:33 21 THE COURT: All right. I'm prepared to resolve  
08:33:36 22 that.

08:33:36 23 MR. REINES: Okay. And then there is the  
08:33:38 24 damages issue you wanted us to look into and report back to  
08:33:43 25 you on. And there's some slides issues that hopefully are

10:39:00 1 products actually worked and you were able to pull it  
10:39:02 2 together, then you actually run the actual product according  
10:39:05 3 to how it's supposed to be used in the product literature?

10:39:09 4 A. That was done internally, yes.

10:39:11 5 Q. And that was done in California, correct?

10:39:13 6 A. Yes.

10:39:13 7 Q. Now, let me ask you, your new company -- your new  
10:39:28 8 company is right near the 10X facilities, correct?

10:39:31 9 A. Correct.

10:39:32 10 Q. Walking distance?

10:39:33 11 A. It's in Cole Center Parkway.

10:39:40 12 Q. Okay.

10:39:42 13 MR. REINES: I think that's where I'll leave it.  
10:39:44 14 Thank you very much.

10:39:45 15 THE WITNESS: Thank you.

10:39:45 16 THE COURT: Any redirect?

10:39:47 17 MR. GERRITY: No redirect, Your Honor.

10:39:48 18 THE COURT: Dr. Ness, thank you. You may step  
10:39:51 19 do you know. Watch your step.

10:40:10 20 MR. GERRITY: At this time, Your Honor, 10X  
10:40:13 21 would call its next witness, Dr. Chang.

10:40:16 22 THE COURT: All right.

10:40:16 23 HSUEH-CHIA CHANG,

10:40:16 24 the deponent herein, having first

10:40:16 25 been duly sworn on oath, was

10:41:20 1 examined and testified as follows:

10:41:20 2 BY MR. GERRITY:

10:41:20 3 Q. Good morning, Dr. Chang. Would you please introduce  
10:41:22 4 yourself to the jury?

10:41:23 5 A. My name is Hsueh-Chia Chang. I'm a professor the  
10:41:27 6 University of Notre Dame. I'm also the director of the  
10:41:29 7 Center for Microfluidics and Medical Diagnostics.

10:41:33 8 Q. Have you been present for all of the trial so far?

10:41:37 9 A. I have, yes.

10:41:37 10 Q. What are you here to testify about today?

10:41:39 11 A. I'm here to testify about the invalidity of the  
10:41:43 12 Ismagilov patents.

10:41:43 13 Q. And have you prepared some slides to help guide the  
10:41:46 14 jury through your testimony?

10:41:47 15 A. I have, yes.

10:41:48 16 Q. Let's put those up. Professor Chang, what's your  
10:42:03 17 current position at Notre Dame?

10:42:05 18 A. I'm the Bayer Professor of Chemical Engineering and  
10:42:15 19 the Director at the Center for Microfluidics and Medical  
10:42:16 20 Diagnostics.

10:42:16 21 Q. I'd like to start by establishing some information  
10:42:17 22 about your educational background. Where did you go to  
10:42:18 23 school?

10:42:19 24 A. I received my BS from Cal Tech in 1976 and I received  
10:42:24 25 my PhD from Princeton in 1980.

10:42:28 1 Q. And how long have you been a professor?

10:42:30 2 A. So I started teaching right after I finished from  
10:42:33 3 Princeton, so I've been teaching for 40 years.

10:42:36 4 Q. Do you teach courses in microfluidics?

10:42:37 5 A. I do, yes. I teach electrokinetics, which is a field  
10:42:42 6 in microfluidics.

10:42:43 7 Q. Where have you taught other than Notre Dame?

10:42:45 8 A. I've taught at University of California in Santa  
10:42:49 9 Barbara. I've taught at University of Houston. I've also  
10:42:53 10 held a position at University of Cambridge.

10:42:56 11 Q. Have you published academic articles during your time  
10:42:59 12 as a professor?

10:43:00 13 A. Yes, I've published continuously over the 40 years.

10:43:03 14 Q. About how many articles have you published?

10:43:06 15 A. I published over 270 articles.

10:43:08 16 Q. How often have they been cited by others?

10:43:12 17 A. They've been cited for 13,000 times.

10:43:15 18 Q. About how many of your articles relate to  
10:43:18 19 microfluidics?

10:43:19 20 A. More than half of them I would say.

10:43:21 21 Q. Have you written any books about microfluidics?

10:43:24 22 A. I've written two books on microfluidics.

10:43:27 23 Q. Are you involved with any journals in the field of  
10:43:30 24 microfluidics?

10:43:31 25 A. Yes, I'm the founder and chief editor of

10:43:35 1 Biomicrofluidics Journal, which is the first journal  
10:43:37 2 published by the American Institute of Physics on related  
10:43:41 3 topics.

10:43:41 4 Q. Would you describe for the jury some of your research  
10:43:44 5 experience in microfluidics?

10:43:45 6 A. So as soon I finished my PhD I was interested in  
10:43:49 7 physics in very small scales, which is now called  
10:43:52 8 microfluidics. So I started with just looking at flows and  
10:43:56 9 channels and looking at also bubbles and droplet transport  
10:44:00 10 in small channels and then I look at droplet formation on  
10:44:05 11 fibers. It's when optical fibers start to perform and how  
10:44:09 12 you get that. I look at how droplets enhance gas scrubbing  
10:44:16 13 and I also look at droplet generation for mass spectrometry  
10:44:21 14 and also for PCR application.

10:44:25 15 Q. What is the gas scrubbing that you mentioned?

10:44:26 16 A. So, in chemical plants, you quite often have toxic  
10:44:32 17 gasses and you remove them by using what's called gas  
10:44:38 18 scrubbing. You have a thin liquid film that'll actually  
10:44:41 19 absorb toxic gasses. Energy is enhanced, the scrubbing  
10:44:48 20 sufficiency by a factor of a hundred percent.

10:44:50 21 Q. Twice as good at cleaning the air?

10:44:52 22 A. That's correct.

10:44:52 23 Q. Was there any follow up on that research?

10:44:54 24 A. Well, the student that worked on that project, Manny  
10:44:57 25 Roberts, was hired by Texaco and he's working on this

10:45:01 1 project now.

10:45:01 2 Q. What are your current research products?

10:45:05 3 A. So I develop new nucleic acids that I actually can  
10:45:11 4 put into PCR chip. I also work on new way of generating  
10:45:15 5 droplets for droplet PCR.

10:45:17 6 Q. We've heard a lot about droplet generation already  
10:45:20 7 this week. Why is that a field you're still researching  
10:45:23 8 today?

10:45:24 9 A. Okay. So droplet microfluidics has been around for  
10:45:29 10 20 years, so before the year 2000 we all appreciated that it  
10:45:33 11 would be great if we can do reactions in small packages like  
10:45:38 12 droplets, thousand times, million times smaller test tube.  
10:45:41 13 And we could generate droplets then, then but the problem  
10:45:44 14 was the droplets were not uniformly sized. We knew they  
10:45:49 15 could do it. Can make more droplets, and we count DNA  
10:45:54 16 molecules one by one, one molecule at a time which is called  
10:45:58 17 digital PCR now, so small we can put one molecule, single  
10:46:04 18 cell, single cell array or can do sorting, but unfortunately  
10:46:08 19 we could not generate these mono dispersed, the droplets  
10:46:12 20 that are all the same size. So that change in 2001 when  
10:46:16 21 Steven Quake, and you've heard his name numerous times now,  
10:46:20 22 he was able to invent a microfluidic technology to generate  
10:46:23 23 this mono dispersed droplets. But there was a problem and  
10:46:29 24 Dr. Ness refer to that. And that is these droplets are --  
10:46:33 25 we like to have millions of them because we're going to

10:46:37 1 carry out as many reactions as we can, but these droplets  
10:46:40 2 are not stable when they're outside the chip and the chip,  
10:46:43 3 as you saw, is quite small, so it doesn't really house too  
10:46:48 4 many droplets, but once they got to the chip they all  
10:46:51 5 coalesce, so that actually was a major problem until 2008  
10:46:58 6 when Dave Weitz at Harvard invented a surfactant that could  
10:47:01 7 actual stabilize the droplets of the chip, so the whole  
10:47:04 8 field just took off after that. So the only remaining  
10:47:07 9 problem in our view is that because the pump that need to  
10:47:13 10 actually drive this oil and liquid and water in this tiny  
10:47:17 11 channels, those pumps are expensive, they're \$50,000 a  
10:47:22 12 piece. So if you're going to do the reactions off the chip  
10:47:25 13 and you can generate droplets without microfluidics, that  
10:47:29 14 would advance the field even further and that's what we're  
10:47:32 15 working on.

10:47:33 16 Q. Have you received any awards for your research?

10:47:35 17 A. Yes. So I was given the Presidential Young  
10:47:43 18 Investigator Award by President Reagan. I won also the  
10:47:46 19 Frankiel Award from the American Physical Society. I was  
10:47:49 20 also elected as a fellow of the American Physical Society.

10:47:53 21 Q. Have you presented any named lectures in  
10:47:55 22 microfluidics?

10:47:55 23 A. I've presented many named lectures, including the  
10:48:01 24 Colburn Lectureship here at the University of Delaware and  
10:48:03 25 also a lecture at Johns Hopkins.

10:48:06 1 Q. Are there any other achievements from the 40 years as  
10:48:09 2 a professor that you are particularly proud of?

10:48:12 3 A. So I'm most proud of the fact that I've mentored more  
10:48:16 4 than 50 PhD and post doc students, more than half have them  
10:48:20 5 are now professors at major research universities and the  
10:48:23 6 other half are working at big industrial research labs like  
10:48:28 7 Genentech, Merck, Intel, Chevron, Texaco and DuPont also.

10:48:33 8 Q. And Professor Chang, did you rely on your 40 years of  
10:48:36 9 experience in the field of microfluidics in forming the  
10:48:38 10 opinions that you're going to tell the jury about today?

10:48:42 11 A. I did yes.

10:48:43 12 MR. GERRITY: Your honor, we would offer  
10:48:47 13 Professor Chang as an expert in the field of the  
10:48:48 14 microfluidics, droplet microfluidics and claims of the  
10:48:48 15 asserted patents.

10:48:49 16 MR. REINES: No objection, Your Honor.

10:48:51 17 THE COURT: All right. You may proceed.

10:48:55 18 BY MR. GERRITY:

10:48:55 19 Q. In addition to your experience, Professor Chang, what  
10:48:58 20 else did you consider in forming your opinions about the  
10:49:01 21 invalidity of Dr. Ismagilov's patents?

10:49:03 22 A. So I look at the asserted patents and the file  
10:49:06 23 history of all the patents. I look at the prior art cited  
10:49:10 24 in the patents. I also look at literature, papers in the  
10:49:16 25 literature related to the patent. I look at the deposition

10:51:50 1 the time frame 2001, 2002 and I've compiled lists of these  
10:51:54 2 active researchers.

10:51:55 3 Q. Is this the list of the nine individuals on the slide  
10:51:57 4 DDX 4.8?

10:51:59 5 A. That's correct, yes.

10:52:01 6 Q. Did each of these individuals at the time of these  
10:52:04 7 patents in 2002 have at least a PhD in one of the fields  
10:52:08 8 you've identified or a related field at least two years of  
10:52:11 9 experience using, designing or creating microfluidic  
10:52:15 10 devices?

10:52:16 11 A. They do, yes.

10:52:17 12 Q. Did you also consider the level of skill of the  
10:52:20 13 inventors?

10:52:21 14 A. I did.

10:52:21 15 Q. Does Dr. Ismagilov meet this definition?

10:52:24 16 A. He definitely does, yes.

10:52:26 17 Q. Did all of the co-inventors meet this definition?

10:52:28 18 A. No. Some of them did not have PhD's.

10:52:31 19 Q. And why did you decide this was the right level of  
10:52:33 20 skill in spite of some of the inventors not yet having it?

10:52:36 21 A. Because these are the inventors that have worked for  
10:52:40 22 Professor Ismagilov.

10:52:40 23 Q. Is that common in the field to work for a professor  
10:52:44 24 in the lab?

10:52:44 25 A. Yes. So most of us have very large groups. We have

10:52:49 1 research professors, we have post docs, we have PhD  
10:52:53 2 students, even undergraduate researchers in our group.  
10:52:57 3 That's just the way it is in this particular area.

10:53:00 4 Q. And were you at least a person of ordinary skill in  
10:53:05 5 2002?

10:53:05 6 A. Yes.

10:53:06 7 Q. More than, right?

10:53:08 8 A. Yeah. Yes. I was probably yes.

10:53:13 9 Q. You mentioned Steven Quake in your answer a moment  
10:53:16 10 ago. Are you familiar with him?

10:53:17 11 A. Yes. I invited Steven Quake to be on my editorial  
10:53:21 12 board when I founded my journal and one of my students  
10:53:26 13 actually interacted with him quite a bit. Zachary Cannon.  
10:53:32 14 He had a problem with his research and contacted Steven and  
10:53:36 15 Steven helped him out. He was very, very generous with his  
10:53:39 16 time to the extent that he actually sent things to Zach.  
10:53:45 17 Zach was so inspired by the experience that he decided to be  
10:53:48 18 a professor and he joined Johns Hopkins after he finished  
10:53:53 19 with me at Notre Dame.

10:53:55 20 Q. I think we've seen it before, but are you familiar  
10:53:58 21 with Professor Quake's Physical Review Letters article, DDX  
10:54:01 22 0502?

10:54:03 23 A. Yes. I read that paper very soon after it came out,  
10:54:07 24 yes.

10:54:07 25 Q. Unrelated to this case, you had already read it?

10:54:10 1 A. Yes, that's right.

10:54:11 2 Q. Was it well known in the field?

10:54:12 3 A. It was very well known. So Physical Review Letters  
10:54:15 4 are obviously at the top journal in physics. And on top of  
10:54:19 5 that, this ground breaking result, the fact that he can  
10:54:23 6 generate droplets in uniformly size, the same size at a very  
10:54:27 7 high frequency, that was ground breaking, we knew there's  
10:54:30 8 great potential to this technology.

10:54:32 9 Q. Was there a different publication by Dr. Quake that  
10:54:35 10 you focused on in your analysis?

10:54:36 11 A. I did. I look at his 2001 patent application, which  
10:54:40 12 is shown here.

10:54:42 13 Q. That was filed September 14th, 2001?

10:54:45 14 A. Correct, yes.

10:54:45 15 Q. And this is DTX 0013?

10:54:49 16 A. Correct.

10:54:49 17 Q. Is it okay if we call it the Quake reference while we  
10:54:52 18 discuss it today?

10:54:53 19 A. Sure.

10:54:56 20 Q. Did you conclude that Quake was prior art to Dr.  
10:55:00 21 Ismagilov's patents?

10:55:00 22 A. Yes. Because it's a provisional patent application  
10:55:06 23 by Ismagilov was May 2002 and September 2001 is before May  
10:55:10 24 2002.

10:55:11 25 Q. Okay. What is Quake's patent application about?

10:55:15 1 A. It's about generating droplets in microfluidic  
10:55:18 2 system, like what he's showing in the Physical Review  
10:55:21 3 Letters paper. It's also about conducting reactions in the  
10:55:24 4 droplet.

10:55:24 5 Q. Okay. Looking at this slide, paragraph 3 from  
10:55:28 6 Quake's patent application, what does it tell us about that?

10:55:30 7 A. So it tells you that he's using microfluidic systems  
10:55:36 8 to compartmentalize, essentially to form small droplets of  
10:55:40 9 aqueous solution. Aqueous solution is just water-based  
10:55:45 10 solutions within microfluidic channel. And you see the  
10:55:48 11 figure 16A that I've also shown in this slide, so there is a  
10:55:53 12 water channel vertically and there's a water channel  
10:55:58 13 horizontally and I think I've added color. Yes. So the  
10:56:01 14 water is coming through the water channel. It's highlighted  
10:56:05 15 in green. And then right at the junction the droplets are  
10:56:11 16 sheared off by the oil phase and those droplets are also  
10:56:14 17 part of the --

10:56:14 18 Q. Does Quake's patent teach what to do with those  
10:56:18 19 droplets, what to use them for?

10:56:19 20 A. Yes. The only reason to generate these droplets are  
10:56:22 21 actually to conduct reactions so he can do sorting of the  
10:56:26 22 droplets later on.

10:56:26 23 Q. And what does he say at paragraph 95?

10:56:28 24 A. He says that these droplets are used as microreactors  
10:56:33 25 that can use to conduct chemical reactions and also

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

BIO-RAD LABORATORIES, )  
INC. and THE )  
UNIVERSITY OF CHICAGO, )  
 )  
 )  
Plaintiffs, )  
 )  
 ) C.A. No. 15-152-RGA  
v. )  
 )  
 )  
10X GENOMICS, INC., )  
 )  
Defendant. )

J. Caleb Boggs Courthouse  
844 King Street  
Wilmington, Delaware

Friday, November 9, 2018  
8:41 a.m.  
Trial Volume V

BEFORE: THE HONORABLE RICHARD G. ANDREWS, U.S.D.C.J.

APPEARANCES:

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-and-

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BY: DEREK C. WALTER, ESQUIRE  
BY: CHRISTOPHER LAVIN, ESQUIRE

For the Plaintiffs

1 APPEARANCES CONTINUED:

2

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08:41:10 15

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-and-

IRELL & MANELLA LLP  
BY: DAVID GINDLER, ESQUIRE  
BY: LAUREN DRAKE, ESQUIRE

For the Defendant

PROCEEDINGS

THE COURT: All right. Good morning. Hi,

Mr. Powers.

MR. POWERS: Good morning, Your Honor. Couple  
of housekeeping matters before we start anything  
substantive.

First I wanted to read in the record the  
exhibits that were admitted yesterday. These have been  
pre-cleared by both sides. Dr. Chang, the exhibits were DTX  
13, DTX 16, DTX 18, DTX 20, DTX 293. And Dr. Huck was DTX  
29 and DTX 247.

The second item is --

10:33:23 1 MR. VLASIS: Thank you, Your Honor.

10:33:25 2 THE COURT: All right. Any redirect?

10:33:30 3 MS. HADZIMEHMEDOVIC: No, Your Honor.

10:33:31 4 THE COURT: Okay. Dr. Sullivan, thank you very  
10:33:33 5 much. You are free to step down. Watch your step.

10:33:43 6 MR. POWERS: Your Honor, subject to the prior  
10:33:45 7 discussion, defendants have no further witnesses.

10:33:48 8 THE COURT: All right. Thank you. So we'll  
10:33:53 9 switch over to the plaintiff here. Plaintiffs.

10:33:57 10 MR. REINES: Yes, Your Honor. Our first witness  
10:34:00 11 is Professor Sia.

10:34:08 12 THE COURT: Okay.

10:35:04 13 BY MR. WALTER:

10:35:04 14 Q. All right. You were here yesterday?

10:35:07 15 THE COURT: I'm sorry, Mr. Walter. So Dr. Sia,  
10:35:10 16 you remain sworn from when you testified previously, all  
10:35:14 17 right?

10:35:14 18 THE WITNESS: Yes.

10:35:14 19 THE COURT: Okay.

10:35:15 20 BY MR. WALTER:

10:35:16 21 Q. All right. Professor Sia, you were here yesterday  
10:35:19 22 when Dr. Chang testified about the history of droplet  
10:35:23 23 technology. Do you recall that?

10:35:24 24 A. Yes, I do.

10:35:26 25 Q. What did Dr. Chang say about how long people had been

10:46:48 1 of the patent experts you heard, Professor Huck.

10:46:48 2 Q. He was one of the experts that testified here  
10:46:50 3 yesterday?

10:46:50 4 A. Yes.

10:46:51 5 Q. All right. Can you please expand the first 10 lines  
10:46:54 6 of the first paragraph? All right. Do you see the first  
10:46:59 7 paragraph here where it says microdroplets formed within the  
10:47:03 8 microfluidic devices present a unique... and then it goes  
10:47:06 9 on?

10:47:06 10 A. Yes.

10:47:06 11 Q. Can you describe for the jury what this is saying?

10:47:10 12 A. Well, so again starts off by this is an introduction  
10:47:15 13 by presenting the background and saying microdroplets formed  
10:47:19 14 within microfluidic devices would offer a lot of potential.  
10:47:24 15 Offers really a unique platform for miniaturization of  
10:47:28 16 chemical and biochemical reactions.

10:47:30 17 Q. And then there's a sentence, starts this is of great  
10:47:33 18 interest?

10:47:33 19 A. Yes.

10:47:34 20 Q. What's being said there?

10:47:35 21 A. This is of great interest for areas of research where  
10:47:39 22 a multitude of reaction conditions, okay, or a very wide set  
10:47:43 23 of reaction conditions with minimum amounts of reactants  
10:47:46 24 need to be tested in high throughput screening of chemical  
10:47:50 25 reactions, protein crystallization and enzyme kinetics.

10:47:54 1 Three different types of reactions. This would be a great  
10:47:57 2 platform.

10:47:57 3 Q. Now, there's five citations here. Do you see those?

10:48:00 4 A. Yes, I do.

10:48:01 5 Q. Now, I want to go to 533.12 and if you can blowup the  
10:48:06 6 first five citations under notes and references. Okay. Who  
10:48:11 7 is being cited here?

10:48:14 8 A. So the first reference is to a paper from Rustem  
10:48:20 9 Ismagilov, 2006. Second reference from Rustem Ismagilov,  
10:48:24 10 going back to 2003. The third reference, okay, that's from  
10:48:34 11 Doctor deMello and others. Rustem Ismagilov again in #4,  
10:48:41 12 2005. Reference #5, Rustem Ismagilov. And those are the  
10:48:45 13 ones I think that were cited in the passages. There's  
10:48:48 14 another reference to Ismagilov's work later on.

10:48:51 15 Q. Can you bring up PTX 4, page 2? What is this  
10:49:04 16 showing?

10:49:04 17 A. Yeah, so this slide is showing really the most well  
10:49:11 18 curated official data base of how citations work. Okay.  
10:49:15 19 Kind of like Google Scholar, but just more official in terms  
10:49:18 20 of citations, the tops in the lawyers list. So here on the  
10:49:23 21 bottom right they rank the top 100 chemists. I just want to  
10:49:27 22 clarify, chemistry is a pretty broad field. Okay.  
10:49:30 23 Chemistry, we've got organic chemistry, inorganic chemistry,  
10:49:36 24 material chemistry, theoretical chemistry. I could go on,  
10:49:36 25 there's like 10 or 12 of these branches, so a lot of Nobel

10:49:42 1 laureates on this list. Professor Ismagilov, over the time  
10:49:45 2 period from 2000 to 2010, and the bulk of his work during  
10:49:50 3 this time, these are the exact inventions that were  
10:49:52 4 discussed here, he's ranked #82 in the world out of all the  
10:49:57 5 chemists of the world's most well cited. And he was cited  
10:49:59 6 the bulk of it for the work we're talking about here.  
10:50:02 7 There's no such list for microfluidics, but if you can  
10:50:05 8 imagine what a list for microfluidics would be, where Dr.  
10:50:08 9 Ismagilov would actually rank.

10:50:12 10 And the other point I would make and we're going  
10:50:14 11 to come back to citations and how well known this work was,  
10:50:18 12 because this was a sensational work in microfluidics when it  
10:50:21 13 came out. And don't take it from me, there's objective  
10:50:24 14 indicators for that. What this always shows is that not  
10:50:29 15 everybody was just citing this, some people were citing the  
10:50:32 16 work as background, but a lot of people were citing the work  
10:50:36 17 because they were trying Dr. Ismagilov's methods as well as  
10:50:38 18 publishing them. And so I think certainly the Dr.  
10:50:43 19 Ismagilov's inventions here were enabling others, not only  
10:50:47 20 himself, to have a series of embodiments that actually work,  
10:50:52 21 but also enabling other people to perform reactions  
10:50:56 22 successfully in droplets.

10:50:57 23 Q. All right. Now, let's talk about the Quake  
10:51:01 24 reference, which was one of the things Dr. Chang discussed  
10:51:05 25 yesterday. Can you bring up DTX 13.0025. I want to talk a

10:51:16 1 little bit about what this reference is about and what  
10:51:19 2 problems it was trying to solve. Can you blow up the title  
10:51:22 3 at the top of the left-hand column? Okay. What is the  
10:51:26 4 title of this? What does this tell you about what the  
10:51:28 5 content of this patent is?

10:51:30 6 A. We've heard a lot of Quake and Quake and more Quake  
10:51:34 7 and the Quake patent application, so this is what we're  
10:51:36 8 looking at. And I thought it would be helpful to actually  
10:51:38 9 walk through the Quake patent application and so what it's  
10:51:41 10 about. Microfabricated cross-flow devices and methods.

10:51:46 11 Q. What does the title tell you about what is this is  
10:51:49 12 about?

10:51:50 13 A. There's a cross-flow kind of, you know, design, but  
10:51:56 14 as we'll see later on, you know, there's nothing about  
10:51:59 15 reactions or anything like that here.

10:52:02 16 Q. Okay. Let's take a look at the background of the  
10:52:04 17 invention, paragraph 5. And it starts out and it talks  
10:52:09 18 about viruses and biological agents, influenza, mumps. What  
10:52:21 19 is being discussed here in the background of the invention?

10:52:23 20 A. As you'll see in this paragraph and the next, the  
10:52:26 21 purpose of this Quake patent application is to try to sort  
10:52:31 22 different particles, okay, in the channel. That's really a  
10:52:34 23 huge interest in what they want to develop. It's kind of  
10:52:38 24 like these flow cytometers. Okay. You can put in here they  
10:52:42 25 start off actually the first thing they mention is a virus,

11:49:11 1 I considered was, remember some of the embodiments in the  
11:49:16 2 Ismagilov's patents. They sent some of those protein  
11:49:20 3 crystals, as you heard this week, up into the space shuttle.  
11:49:23 4 Okay. So if you can remember a space shuttle, it's very --  
11:49:27 5 there's -- it's pretty -- you know, there's quite a bit of  
11:49:31 6 physical agitation to send droplets up into space. Imagine  
11:49:34 7 the temperature variation is that you would need to send  
11:49:37 8 these droplets into space. And I think you heard testimony  
11:49:40 9 this week that these droplets can come down back to earth  
11:49:45 10 and you actually still, the droplets have not coalesced, you  
11:49:48 11 can see which proteins have formed crystals. The argument  
11:49:51 12 from 10X for enablement is that they need long-term  
11:49:55 13 stabilization. When their GEMs, gel beads and droplets are  
11:50:00 14 formed within five minutes, the long-term stabilization  
11:50:02 15 they're referring to is pipetting stuff, which is the  
11:50:06 16 physical agitation. It has to be completed in less than 40  
11:50:10 17 minutes according to user guides and then the thermal  
11:50:13 18 cycling starts. Some of those reactions is one hour at 30  
11:50:16 19 degrees. So I believe that if you can enable droplets to be  
11:50:20 20 stable, to be sent in the space shuttle back down, what, you  
11:50:24 21 know, the long-term stabilization issue that 10X is talking  
11:50:28 22 about here are, you know, are less than what is achieved.

11:50:33 23 Q. What is the real contribution in your mind that  
11:50:34 24 researchers have recognized related to surfactants in  
11:50:38 25 droplets?

11:50:39 1 A. We've seen there in the Holtze article. We've seen  
11:50:41 2 this multiple places, that really the key insight here is  
11:50:45 3 you need a hydrophilic head group with a fluorophilic tail.  
11:50:49 4 Okay. And that -- that's the insight.

11:50:51 5 Q. What about insights related to biocompatibility?

11:50:55 6 A. Yeah, so that hydrophilic head group will allow the  
11:50:58 7 biological molecules to --

11:51:00 8 Q. Any particular chemical structure for the hydrophilic  
11:51:02 9 head group?

11:51:03 10 A. Oligoethylene glycol, polyethylene glycol.

11:51:06 11 Q. Who has been recognized for that?

11:51:07 12 A. Dr. Ismagilov.

11:51:07 13 Q. Do you have any examples of that?

11:51:09 14 A. Sure.

11:51:09 15 Q. Let's bring up PTX 4-4. What is this showing?

11:51:16 16 A. This is an article just talking about Dr. Ismagilov's  
11:51:20 17 work.

11:51:21 18 Q. And what do they say about his work regarding  
11:51:24 19 surfactants in oils?

11:51:25 20 A. I can just read from that. Dr. Ismagilov, et al.,  
11:51:28 21 did major work concerning droplet microfluidics and  
11:51:31 22 concerning the chemistry of the surfactants and oils used to  
11:51:35 23 perform the above experiments.

11:51:36 24 Q. And there's a referenced cite there?

11:51:38 25 A. Yes.

11:51:39 1 Q. Which reference is that, if you can go to the next  
11:51:41 2 page of this presentation?

11:51:43 3 A. Okay. This is the Roach article with Ismagilov.  
11:51:48 4 Controlling non-specific protein adsorption in a plug base.

11:51:54 5 Q. Next page of this presentation. What is this  
11:51:58 6 showing, this is PTX 536-10?

11:52:01 7 A. It's further recognition that it was an asserted  
11:52:05 8 reference here which is going to be Dr. Ismagilov. The same  
11:52:08 9 group develops methods of droplet interfacial chemistry to  
11:52:12 10 actively prevent these types of issues.

11:52:15 11 Q. Take a look at the next one, page 7, which is PTX  
11:52:21 12 989-006. What's being said here?

11:52:22 13 A. Same thing, you know, more recognition like this,  
11:52:26 14 Roach, et al., demonstrated that with proper choice of  
11:52:28 15 surfactant it's possible to decrease the likelihood of  
11:52:34 16 protein localization at that interface.

11:52:36 17 Q. Now, the next one is one that's not highlighted  
11:52:38 18 actually, it says for biochemical experiments this becomes  
11:52:40 19 crucial, the active enzyme may lose activity due to  
11:52:44 20 constraints imposed by the oil/water interface.

11:52:47 21 Do you see that?

11:52:48 22 A. Yes.

11:52:48 23 Q. What is that referring to?

11:52:49 24 A. Again the hydrophilic head group. You know, the  
11:52:57 25 oligoethylene glycol, polyethylene glycol head group that

11:52:58 1 keep the biological molecules from leaving the oil and being  
11:53:01 2 denatured.

11:53:01 3 Q. We talked earlier on the anticipation issue about the  
11:53:04 4 reaction conditions requirement?

11:53:06 5 A. Yes.

11:53:06 6 Q. How does this pertain to that?

11:53:08 7 A. Well, using this kind of surfactant, fluorinated  
11:53:10 8 surfactant with a hydrophilic head group allows -- gives you  
11:53:13 9 the biocompatibility conditions so that you're not just  
11:53:16 10 putting these molecules, biological molecules in water, oil,  
11:53:20 11 they're going to denature. Your biological molecules are  
11:53:22 12 not in the oil. They're seeing this nice oligoethylene  
11:53:27 13 glycol, polyethylene glycol head group.

11:53:33 14 Q. Let's take a look at -- actually let's do something  
11:53:36 15 else real quick. The first sentence, says careful choice of  
11:53:40 16 surfactant formulation is necessary to provide the droplets  
11:53:43 17 with enough stability to avoid exchange of their components  
11:53:47 18 fusion change of volume and aggregation in the reservoir.  
11:53:50 19 What is that referring to?

11:53:51 20 A. So again, it's very important to find the right  
11:53:54 21 surfactant formulation. And if you don't have that, then  
11:53:57 22 you couldn't have things happen, which I think they actually  
11:54:01 23 talk about coalescence here. And then they go right after  
11:54:04 24 that they said, well, look at Roach et al.

11:54:07 25 Q. All right. Let's look at PTX 4-3. What's being

11:54:20 1 shown here?

11:54:21 2 A. Okay.

11:54:21 3 Q. This is DTX 129.

11:54:24 4 A. That's an example that is demonstrated by Professor  
11:54:28 5 Ismagilov, in which they use solvents to measure reactions  
11:54:31 6 in droplets to a millisecond time, enzymes and things like  
11:54:35 7 that.

11:54:35 8 Q. Now, have you done the analysis to confirm whether  
11:54:38 9 this work is related to patents?

11:54:40 10 A. Yes, I have. It's been in my report. I'm not going  
11:54:44 11 to show that here, but I show in my report which of these  
11:54:47 12 publications that are being cited here relate to which  
11:54:50 13 claims of the patents that we have discussed.

11:54:52 14 Q. Is this an objective indicator of the nonobviousness  
11:54:56 15 of the patents-in-suit?

11:54:57 16 A. Yes.

11:54:58 17 Q. Why?

11:54:58 18 A. Well, it's something that is out there for other  
11:55:03 19 people. It's really looking at what the scientific  
11:55:06 20 community, how they evaluate this work.

11:55:08 21 Q. Now --

11:55:11 22 A. And if it was -- it was so obvious they wouldn't just  
11:55:14 23 cite his work, okay, if he was doing things that are totally  
11:55:18 24 obvious, people wouldn't cite it.

11:55:19 25 Q. How would you characterize the importance of the

11:55:21 1 patents that pertain to Ismagilov's work?

11:55:23 2 A. Well, they were centrally important. There was no  
11:55:27 3 contention that -- it's really crucial to being -- it's  
11:55:32 4 really a long felt need in order to perform reactions in  
11:55:35 5 droplets. No experimental data.

11:55:36 6 MR. POWERS: Let Mr. Sia give his opinions, not  
11:55:40 7 our contentions.

11:55:41 8 THE WITNESS: I'm sorry, my apologies. But when  
11:55:46 9 the -- really the Ismagilov patents that, for the first  
11:55:50 10 time, let's say demonstrated a working system with a very,  
11:55:53 11 very wide variety of reactions.

11:55:56 12 BY MR. WALTER:

11:55:57 13 Q. All right. Let's move on now to the indefiniteness  
11:56:00 14 argument that they make. What do you understand their  
11:56:04 15 argument on indefiniteness to be?

11:56:06 16 A. So this relates to the surface tension. Again,  
11:56:09 17 saying that the patent is invalid because we cannot measure  
11:56:12 18 the surface tension and therefore the claim elements can't  
11:56:15 19 be satisfied. I think that's their argument.

11:56:17 20 Q. Can you bring up PTX 121, 7 to 35. While she's  
11:56:22 21 bringing that up, do you agree with this argument?

11:56:24 22 A. No, I don't agree. You know,  
11:56:27 23 we -- these surface tension, again, you just measure two  
11:56:31 24 surface tensions and compare. These measurements and a  
11:56:34 25 person of skill in the art would be able to figure that out.

11:56:37 1 But really it's just -- it's very routine that it's actually  
11:56:41 2 specifically told in the '083 Patent. The '083 Patent,  
11:56:45 3 which is going to be pulled up, pulls up the two interfaces.  
11:56:48 4 It's not that hard to think about what this is. It's just  
11:56:52 5 the water channel, water, oil, measure the two surface  
11:56:57 6 tensions, compare the numbers. And this, what we're looking  
11:57:00 7 at now is -- okay, it's from, '091, but this also appears in  
11:57:05 8 the specification of '083. I believe. But '083 definitely  
11:57:10 9 has language like this where if you see that preferably the  
11:57:14 10 surface tension of a plug fluid channel interface each in 30  
11:57:19 11 milliliters for water PEMS interface is higher than the  
11:57:24 12 surface tension. How would you measure them. Just two  
11:57:26 13 routine instruments. So this  
11:57:29 14 is -- so this is specifically in the specification of the  
11:57:31 15 document. You don't really have to guess what that claim  
11:57:34 16 element is saying. Just tells you right in the  
11:57:37 17 specification, measure these surface tensions, that's it.

11:57:40 18 Q. Now, during your direct you explained that you had a  
11:57:43 19 report regarding the surface tension measurements?

11:57:45 20 A. Yes.

11:57:45 21 Q. When did you submit that?

11:57:46 22 A. I submitted that report one year ago. Okay. The  
11:57:50 23 measurements we made on surface tension of the 10X chips,  
11:57:53 24 remember that data, we submitted that in November, okay, of  
11:57:57 25 last year, one year ago.

12:09:04 1 to the system.

12:09:04 2 Q. All right. Let's go to one of the things that you  
12:09:14 3 spent a fair amount of time on was to make the point that a  
12:09:17 4 lot of people in the field were citing Ismagilov or giving  
12:09:22 5 him credit for being a good chemist; is that fair?

12:09:25 6 A. Yes.

12:09:25 7 Q. You understand that in the -- and you're doing that  
12:09:28 8 to try to show that, in your mind, that means that the  
12:09:33 9 patents weren't obvious; right?

12:09:34 10 A. That's part of -- yeah. That's part of the reason  
12:09:37 11 for doing it.

12:09:38 12 Q. And you understand that that type of evidence is  
12:09:40 13 called a secondary consideration. You know that, don't you?

12:09:42 14 A. Yes, I do.

12:09:43 15 Q. The primary evidence is what the evidence, what the  
12:09:47 16 prior art actually shows; right?

12:09:48 17 A. Well, secondary --

12:09:49 18 Q. Yes or no?

12:09:50 19 A. -- consideration --

12:09:51 20 Q. Yes or no?

12:09:52 21 MR. WALTER: Objection.

12:09:52 22 THE COURT: So let's not ask any legal questions  
12:09:58 23 here.

12:09:58 24 MR. POWERS: I can't ask any leading questions?

12:10:01 25 THE COURT: Don't ask any legal questions.

12:10:01 1 THE WITNESS: I don't think secondary --

12:10:02 2 THE COURT: So there's not a question pending.

12:10:04 3 THE WITNESS: Sorry.

12:10:06 4 BY MR. POWERS:

12:10:07 5 Q. So let's put up your Slide 2 from today. Do you

12:10:35 6 recall putting up this slide, Professor Sia?

12:10:36 7 A. Yes, I do. Yes.

12:10:37 8 Q. This discussion of Dr. Ismagilov doesn't discuss

12:10:42 9 patents at all, does it? Yes or no?

12:10:46 10 A. This specific discussion --

12:10:47 11 Q. Yes or no?

12:10:48 12 A. -- refers to papers.

12:10:49 13 Q. Okay. Papers only, not patents; right?

12:10:52 14 A. That is correct.

12:10:53 15 Q. All right.

12:10:53 16 A. Yeah, that is correct.

12:10:55 17 Q. Now, let's go to your Slide 4, and this is also one

12:11:07 18 of the slides that you put up?

12:11:08 19 A. Yes.

12:11:09 20 Q. Now, this article is also talking about a paper, not

12:11:21 21 any of the patents; right?

12:11:22 22 A. Yes. Correct.

12:11:23 23 Q. And this article doesn't say that Dr. Ismagilov was

12:11:27 24 first in anything, does it?

12:11:29 25 A. This -- this does not use the word first.

12:11:33 1 Q. In fact, what's cited is Dr. Ismagilov's 2005 paper;  
12:11:39 2 right?

12:11:39 3 A. I mean, I would like to just refer to those numbers  
12:11:46 4 again, but --

12:11:46 5 Q. Well you cited -- that's the 2005 article, isn't it?

12:11:49 6 A. Oh, the Roach, yeah. Mm-hmm.

12:11:51 7 Q. All right. So that's three years after the 2002  
12:11:56 8 patent application was filed; right?

12:11:58 9 A. Yes.

12:12:00 10 Q. Now, in fact, this paper that you've cited also cites  
12:12:04 11 Quake repeatedly, too, doesn't it?

12:12:07 12 A. It could. I didn't look at that part.

12:12:10 13 Q. So you thought it was important only to see whether  
12:12:14 14 they cited Professor Ismagilov, you didn't think it was  
12:12:16 15 important to give the jury a balanced view of that it also  
12:12:19 16 cited Quake?

12:12:20 17 MR. WALTER: Objection; argumentative.

12:12:22 18 THE COURT: Overruled.

12:12:23 19 THE WITNESS: I highlight exactly why I pointed  
12:12:26 20 to this reference, and they can cite Quake. But that  
12:12:29 21 doesn't take anything away from what Ismagilov did, and they  
12:12:32 22 explain specifically why they were reciting Ismagilov. They  
12:12:36 23 were not going to cite Quake for these reasons pointed out  
12:12:39 24 here which are the reasons that are relevant to this case.

12:12:45 25 BY MR. POWERS:

12:12:45 1 Q. Can we go to PTX 535, Page 7, the last paragraph on  
12:12:54 2 the first column. It says, This ambitious strategy is made  
12:13:08 3 possible thanks to the development of a microfluidic  
12:13:10 4 formulator. And it goes on to describe that formulate  
12:13:12 5 formulator.

12:13:13 6 Do you see that?

12:13:13 7 A. Mm-hmm.

12:13:16 8 Q. And for that citation, they cite Quake, don't they?

12:13:18 9 A. Yeah, they could. These were the valve types of  
12:13:20 10 experiment that Quake is very well known for that did work.

12:13:23 11 Q. And in fact, what they cite is Quake's 2001 article;  
12:13:27 12 right? In fact, they cite Quake four times, don't they?

12:13:32 13 A. This would not be -- I don't think this would be  
12:13:35 14 cited in the Quake patent application or the --

12:13:39 15 Q. I said the 2001 article.

12:13:41 16 A. Different article in 2001. This is -- this does not  
12:13:45 17 touch the business review at all.

12:13:48 18 Q. Dr. Sia, let's go to PTX 535, Page 10 and bring up  
12:13:54 19 citations 64, 65 and 66 and 76. So there's a citation to a  
12:14:11 20 2004 Quake article, a 2002 Quake article in Science, a 2016  
12:14:17 21 Quake article in The Journal of the American Chemical  
12:14:22 22 Society and the 2001 article; right?

12:14:26 23 A. I know these articles. They're not droplet articles.

12:14:29 24 Q. The 2001 article is not a droplet article?

12:14:33 25 A. No.

12:14:34 1 Q. Interesting. All right.

12:14:37 2 Let's go to your next slide, Slide 6. Bring  
12:14:42 3 that up. This is another article you relied upon showing  
12:14:49 4 that people are referring to Dr. Ismagilov.

12:14:51 5 Now, in this article, there's no reference to  
12:14:54 6 any of the patents; right?

12:14:55 7 A. No.

12:14:56 8 Q. And in fact, there's no statement that Dr. Ismagilov  
12:15:00 9 was first in anything, is there?

12:15:01 10 A. There's no word first here.

12:15:04 11 Q. And in fact, the article is 2005 again, not 2002 when  
12:15:09 12 the patent application was filed; right?

12:15:11 13 A. That's correct.

12:15:13 14 Q. And in fact, this article cites Quake several times  
12:15:17 15 as well, doesn't it?

12:15:18 16 A. It could.

12:15:19 17 Q. You didn't bother to look?

12:15:21 18 A. Well, again, you know -

12:15:23 19 Q. Did you bother to look?

12:15:24 20 A. It talks about a lot of things.

12:15:25 21 Q. Yes or no?

12:15:25 22 A. I did not bother to look.

12:15:27 23 Q. And can we turn to PTX 536, Page 13. That's Page 13  
12:15:47 24 of the exact article that you've got on the screen. And  
12:15:53 25 bring up the first five or six lines of the first full

12:15:55 1 paragraph on the left column, please.

12:16:00 2 It says Thorsen et al. You understand that's a  
12:16:03 3 reference to a Quake article; right?

12:16:05 4 A. Yes, it is.

12:16:06 5 Q. Have remarkably demonstrated the extraordinary  
12:16:09 6 complexity of which microfluidics is capable; right? Do you  
12:16:13 7 see that?

12:16:13 8 A. That's right. That reference is not a droplet  
12:16:15 9 reference.

12:16:16 10 Q. Do you see the words I've read?

12:16:18 11 A. I do.

12:16:18 12 Q. And those words are in the article that I've  
12:16:21 13 described? That's all I asked.

12:16:22 14 A. Yes.

12:16:23 15 Q. I didn't ask for your experienced commentary.

12:16:26 16 A. Okay.

12:16:27 17 Q. Now, it goes on. Lets highlight starting using the  
12:16:32 18 comparator assay, that's describing an enzyme reaction,  
12:16:34 19 isn't it?

12:16:34 20 A. That's correct. No droplets, though.

12:16:37 21 Q. All right. Now, the citations are to Thorsen's 2002  
12:16:44 22 article and a 1999 article; right?

12:16:44 23 A. Yeah.

12:16:50 24 Q. And a 2005 article?

12:16:52 25 A. Yeah, it could. Yeah.

12:16:53 1 Q. All right. Now, let's go to your Slide 7. This is  
12:17:06 2 another article that you relied upon to show that it's  
12:17:08 3 citing Ismagilov; right?

12:17:10 4 A. Right, for the reasons I highlighted there.

12:17:12 5 Q. It doesn't say anything about Ismagilov being first,  
12:17:15 6 does it?

12:17:15 7 A. No.

12:17:15 8 Q. It doesn't refer explicitly to any patents of  
12:17:19 9 Ismagilov?

12:17:19 10 A. No, it doesn't.

12:17:20 11 Q. In fact, the article is 2005, not 2002; right?

12:17:24 12 A. Right.

12:17:26 13 Q. And in fact, this article also cites Quake  
12:17:30 14 repeatedly, doesn't it?

12:17:30 15 A. For what reason?

12:17:34 16 Q. Does it cite Quake or not?

12:17:36 17 A. I don't know. I didn't check. Quake did a lot of  
12:17:38 18 valves work which had nothing to do with droplets. That's  
12:17:41 19 what the previous two examples were.

12:17:42 20 Q. Your testimony is that Quake's publications and  
12:17:46 21 patents have nothing to do with droplets?

12:17:48 22 A. No.

12:17:49 23 Q. Yes or no?

12:17:50 24 A. My testimony is quite --

12:17:51 25 Q. Yes or no?

12:17:52 1 A. In valves --

12:17:52 2 Q. Is that --

12:17:53 3 A. And valves have nothing to do with droplets.

12:17:55 4 Q. Nothing to do with droplets?

12:17:57 5 A. No. They just work with valves.

12:17:59 6 Q. All right. Now, one of the things in your secondary  
12:18:06 7 consideration article -- in fact, the secondary  
12:18:08 8 considerations section of your report, in fact, the first  
12:18:11 9 thing you relied upon was the idea of using the droplets as  
12:18:16 10 microreactors. Do you recall that?

12:18:18 11 A. You can show me which slide this is or --

12:18:25 12 Q. Do you recall that you referred to the subject of  
12:18:28 13 Dr. Ismagilov's microreactors in droplets as being the first  
12:18:32 14 thing you relied upon in secondary considerations in your  
12:18:35 15 report?

12:18:35 16 A. Objective indicia, yeah, it could be.

12:18:37 17 Q. Now, in fact, let's bring up DDX 7.20. I've got on  
12:19:03 18 the right the '407 patent that talks about -- no, that's not  
12:19:06 19 right. DDX 7.20 is what I've got. There we go.

12:19:25 20 The '407 patent is on the right. That's where  
12:19:27 21 Dr. Ismagilov's patents say, for instance, in these cases  
12:19:30 22 where aqueous plugs are used as microreactors, and it goes  
12:19:33 23 on. That language was copied exactly from Quake just  
12:19:38 24 switching out lines for cases and droplets for plugs, right?  
12:19:45 25 The very microreactors language you relied upon?

12:24:01 1 This is again on the right side the language  
12:24:03 2 from Quake, Paragraph 117; right?

12:24:06 3 A. Yeah. I mean, they're quoting --

12:24:07 4 Q. It's yes or no?

12:24:08 5 A. -- snippets. Yeah, sure. Yeah.

12:24:11 6 Q. And in Quake, it says, "The fluids," fluids plural,  
12:24:16 7 "used in the invention may contain additives such as agents  
12:24:19 8 which reduce surface tension surfactants. Exemplary  
12:24:23 9 surfactants include fluorinated oils."

12:24:25 10 Right?

12:24:25 11 A. Yeah, he was --

12:24:26 12 Q. Yes or no?

12:24:26 13 A. -- to the wall --

12:24:31 14 Q. Yes or no, does he disclose the use of fluorinated  
12:24:31 15 oils as a surfactant?

12:24:34 16 A. Well, he disclosed a bunch of surfactants that were  
12:24:37 17 known at the time, not specifically fluorinated oils. And  
12:24:39 18 everything he was disclosing he was saying --

12:24:43 19 Q. Professor Sia, please just answer the question I  
12:24:44 20 asked.

12:24:44 21 A. Okay.

12:24:44 22 Q. He expressly discloses using fluorinated oils. We  
12:24:47 23 can all read it; right?

12:24:48 24 A. He lists fluorinated oil.

12:24:49 25 Q. Okay. That answers the question.

12:24:51 1 A. Those words appear.

12:24:52 2 Q. And the first sentence says, The fluids used in the

12:24:54 3 invention. Now, there's really two fluids; right? There's

12:24:59 4 the aqueous fluid and the carrier fluid?

12:25:03 5 A. Yeah. Yeah. Correct.

12:25:04 6 Q. So, he's saying the fluids could be fluorinated,

12:25:07 7 carrier or something else; right?

12:25:10 8 A. Well, no, because he's talking about the surfactants

12:25:17 9 that might be in the fluid, not the fluids themselves.

12:25:21 10 Q. Even though he says the fluids plural in the very

12:25:23 11 first line?

12:25:24 12 A. Oh, you're -- no. I don't agree with that.

12:25:28 13 Q. All right.

12:25:28 14 A. It would just be multiple chips.

12:25:30 15 Q. Let's talk about Corbett. Corbett discloses PCR;

12:25:35 16 right?

12:25:35 17 A. Corbett discloses PCR. Okay. It's a publication,

12:25:43 18 but yeah, it uses PCR.

12:25:44 19 Q. As of the time of the Quake invention or the patent

12:25:48 20 application, PCR was very well known; right?

12:25:52 21 A. Yeah, PCR in a thermocycler. Yes.

12:25:56 22 Q. Very well known?

12:25:57 23 A. Yes.

12:25:57 24 Q. In fact, viewed as very important?

12:25:58 25 A. Yeah, it was.

12:26:00 1 Q. Those skilled in the art wouldn't need much  
12:26:03 2 motivation to say, Let's use PCR because it was one of the  
12:26:05 3 most important reactions in the world at that time; right?

12:26:08 4 A. Yeah.

12:26:09 5 Q. All right. Now, Erbacher, you said the question is  
12:26:15 6 whether there's any motivation to use a Y-shaped channel, do  
12:26:19 7 you recall that?

12:26:19 8 A. Right. Yes.

12:26:20 9 Q. And can we bring up the cover of the Quake reference,  
12:26:24 10 DDX 13? It shows -- the figure is what I want, the Y-shaped  
12:26:40 11 channel. There's a Y-shaped channel on the very cover page  
12:26:42 12 on Quake; right?

12:26:43 13 A. Sure.

12:26:44 14 Q. And you said no one would be motivated to use a  
12:26:46 15 Y-shaped channel in the Quake system, but Dr. Thorsen did  
12:26:53 16 so in his thesis, didn't he?

12:26:55 17 A. Well --

12:26:55 18 Q. Did he, yes or no?

12:26:57 19 A. It was the Y-shape --

12:26:57 20 Q. Dr. Sia, yes or no?

12:26:59 21 A. There was a Y-shaped geometry in the Thorsen thesis.  
12:27:03 22 Yes.

12:27:11 23 MR. POWERS: All right. Nothing further, Your  
12:27:13 24 Honor.

12:27:13 25 THE COURT: All right. Any redirect?

12:27:15 1 MR. WALTER: Very quickly.

12:27:20 2 BY MR. WALTER:

12:27:25 3 Q. On cross, you were shown this figure from Thorsen's  
12:27:28 4 thesis. Can you explain whether you believe this  
12:27:32 5 demonstrates reactions of droplets?

12:27:34 6 A. No, I do not.

12:27:35 7 Q. Why not?

12:27:36 8 A. I mean, Thorsen, I showed the conclusion of that  
12:27:39 9 paper. There is one figure, the conclusion he concluded, I  
12:27:42 10 think you can remember the words substrate autohydrolysis  
12:27:46 11 was being challenged to overcome. That just means that  
12:27:49 12 sometimes a substrates just turns itself into a product  
12:27:52 13 without any enzyme around, and so you have some minimum  
12:27:55 14 background of a signal.

12:27:57 15 So minimum background of a signal. And he was  
12:27:59 16 pointing specifically at his data and saying that, Well, my  
12:28:04 17 data is actually showing that there's some background signal  
12:28:07 18 being generated that I have to get rid of when I perform  
12:28:10 19 this reactions in droplets.

12:28:11 20 MR. WALTER: Thank you.

12:28:13 21 THE COURT: All right. Dr. Sia, thank you. You  
12:28:16 22 may step down. Watch your step.

12:29:01 23 MR. VLASIS: Your Honor, the plaintiffs call  
12:29:11 24 Mr. Malackowski back to the stand, our damages expert.

12:29:14 25 THE COURT: All right. Mr. Malackowski, you're