

Appx292 78:58-62 (emphasis added). Which “reaction”? Again, the one in the preamble—which occurs in the microfluidic system.

In a long line of cases, this Court has held that the same device—using words like “the” or “said” to refer back to a preamble—communicates the drafter’s intention to treat the preamble as limiting. *See Pacing Techs., LLC v. Garmin Int’l, Inc.*, 778 F.3d 1021, 1024 (Fed. Cir. 2015); *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 952-53 (Fed. Cir. 2006); *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1306 (Fed. Cir. 2005), *abrogated on other grounds by Zoltek Corp. v. United States*, 672 F.3d 1309 (Fed. Cir. 2012) (en banc); *Eaton Corp. v. Rockwell Int’l Corp.*, 323 F.3d 1332, 1339-40 (Fed. Cir. 2003).

This Court did exactly that in the one case the district court discussed, *TomTom, Inc. v. Adolph*, 790 F.3d 1315 (Fed. Cir. 2015). When a claim’s body used the phrase “said mobile unit” and “the mobile unit” to refer back to the “mobile unit” mentioned in the preamble, this Court held that meant the “mobile unit” in question must have the particular attributes recited in the preamble. *Id.* at 1323; *see also Bell*, 55 F.3d at 621 (claim’s use of “said packet” meant that the packet in question must have the particular attributes recited in the preamble);

Proveris Sci. Corp. v. Innovasystems, Inc., 739 F.3d 1367, 1373 (Fed. Cir. 2014) (“The phrase ‘the image data’ clearly derives antecedent basis from the ‘image data’ that is defined in greater detail in the preamble.”). So too here, “*the* reaction” and “*the* microfluidic system” must be the ones the preamble describes, and therefore subject to the preamble’s limitations.

Second, the specification’s focus on the location of the reactions reinforces the same conclusion. Beyond the titles, which are themselves revealing, the abstracts describe the “present invention” as “methods of conducting reactions *within* [microfabricated] substrates”—i.e., in microfluidic chips. Appx188 (emphasis added). The patents also consistently specify that the reaction occurs “in” the microfluidic system. *See, e.g.*, Appx287-288 67:24-25, 67:60-62, 68:42-43.

The specification is also revealing on another dimension: This Court has found it telling when a specification describes an “inventive concept” that is not achieved unless the device operates in the manner described only in the preamble. *Proveris*, 739 F.3d at 1373; *Deere*, 703 F.3d at 1358. That is the case here—twice over. The specification notes two “advantage[s]” over the prior art: The invention enables the

researcher to “obtain information involving complex reactions at several times, simultaneously, *simply by observing the channels* at different distances from the point of origin.” Appx272 38:51-54 (emphasis added). Likewise, “[t]he reaction time can be monitored *at various points along a channel*—each point will correspond to a different reaction or mixing time.” Appx272 38:55-57 (emphasis added). By definition, any reaction that is monitored *in* the channels is happening on the chip, which means the reaction is occurring *in* the microfluidic system. There is no way to achieve those inventive objectives unless the reaction occurs “in a microfluidic system,” as the preamble specifies.

The final guidepost, the prosecution history, supports the same conclusion. In the very office actions allowing these claims, the examiner amended the preambles to specify that the reactions are conducted “in plugs in a microfluidic system.” Appx8625-8629; Appx8631-8635. The examiner also amended the titles of the patents to emphasize that the reactions occur “in plugs in a microfluidic system.” Appx8626; Appx8632. It is telling that she considered the location of the reaction important enough to insert it prominently into the claims and titles of the patents.

Putting all these guideposts together, the preambles limit the claimed reactions to ones that take place when the plugs are “in the microfluidic system.” The preambles are “‘necessary to give life, meaning, and vitality’ to the claim[s].” *Catalina Mktg.*, 289 F.3d at 808 (citation omitted).

The district court’s rationale for reaching the opposite conclusion was neither consistent nor clear. On claim construction, 10x argued that the entire preamble (including “in a microfluidic system”) is limiting; Bio-Rad argued that the preamble was not limiting at all. Appx7011-7016. The district court devised its own construction: “The entire preamble is not limiting,” but it “is limiting only to the extent that it provides an antecedent basis.” Appx8845-8846. The court later acknowledged being “puzzled” by its own construction. Appx29725. The court then issued a summary judgment ruling that was premised on the view that the preamble is limiting. Appx22262-22263. On the first day of trial, however, the court changed direction again. Appx29726.

Ultimately, the court prohibited 10x from arguing that reactions must take place in the microfluidic system. Appx29472-29473. It

explained its reasoning for the first time when it denied 10x's request for post-trial relief. Appx29427-29428. The court correctly concluded "[t]hat 'reaction' and 'microfluidic system' provide antecedent basis for the use of those terms in the body of the claim," but then held that "the portion of the preamble that states '*conducting* a reaction in plugs *in a* microfluidic system' is not limiting." Appx29428. The court's only explanation for the distinction was that "[n]othing in the body of the claims further limits the location of the reaction." Appx29426-29427.

By that logic, no preamble would ever be limiting. The district court failed to address any of the guideposts this Court has prescribed. Thus, for example, the court discussed this Court's opinion in *TomTom* at length. But it overlooked the crucial point, discussed above (at 46), that *TomTom* actually found a portion of a preamble limiting because the body of the claim directed the reader back to the preamble with words like "the" and "such," just as these claims do.

Instead, the only lesson the district court extracted from *TomTom* was that it is possible for one part of a preamble to be limiting even though another portion is not, when the two are "separate[]." 790 F.3d at 1323. There, the preamble contained two phrases that the parties

stipulated should be construed independently: “A method for [1] *generating and updating data* [2] *for use in a destination tracking system of at least one mobile unit* comprising” *Id.* at 1318, 1323 (numbers added). This Court found the second phrase limiting (for the reasons discussed) even though the first phrase was not. *Id.* at 1323-24. But just because it is possible to give different effect to two “separate[]” phrases in a preamble does not mean that it’s the norm. *Id.* at 1323. As important, *TomTom* does not authorize different treatment where, as here, the terms are not “separate.” By its own account, the district court here carved up a single phrase as follows, giving limiting effect to the bolded terms but not to the italicized ones nested around them:

“conducting a **reaction in plugs** *in a microfluidic system.*”

Appx29428. The district court’s dissection of the preamble is not just “puzzl[ing],” Appx29725, but paradoxical.

B. As a matter of law, 10x does not infringe under the correct construction of the claims.

Because the district court’s “incorrect claim construction ... remove[d] from the jury a basis on which the jury could reasonably have reached a different verdict, the verdict should not stand.” *Cardiac Pacemakers, Inc. v. St. Jude Med., Inc.*, 381 F.3d 1371, 1383 (Fed. Cir.

2004). Bio-Rad is not entitled to another trial, because the evidence does not support an infringement verdict under the correct claim construction. *See, e.g., Saffran v. Johnson & Johnson*, 712 F.3d 549, 563-64 (Fed. Cir. 2013) (entering judgment of non-infringement after reversing claim construction). Based on the undisputed evidence presented at trial, the biological/autocatalytic reactions occur in the thermal cycler, which is not part of 10x's microfluidic system. So as a matter of law, the claimed reactions do not occur "in a microfluidic system."

There is no dispute that 10x's "proprietary barcoding reactions," Appx15733—Landlord, PHASE, and GEM-RT——do not occur until after a researcher removes the droplets from the microchannel and places them in the thermal cycler. Appx29860; Appx30169-30171; *see* Appx29579 ("I think every droplet system that I'm aware of ... moved to a thermal cycler to do their reactions.").

Bio-Rad has no evidence that any other relevant reaction occurs before the droplets are placed in the thermal cycler. Bio-Rad pointed to the dissolution of the gel beads as a "biological" (but not "autocatalytic") reaction. Appx29848. But the evidence Bio-Rad relied on to prove that

the reaction occurred in 10x's controller did not reflect "10x Genomics products in any way." Appx30376-30378; *see* Appx29926-29928. And, the dissolution of the polyacrylamide gel beads is *not* a biological reaction under the district court's construction. Appx8871; Appx29848; Appx30593; Appx30596-30597.

The record is also clear that the thermal cycler is not part of the microfluidic system. Bio-Rad's expert Dr. Sia testified that 10x's "microfluidic system" consists of a "microfluidic chip," "reagents that are loaded into the chip," and the controller "that is used to run that microfluidic chip." Appx29812; *see* Appx29814 ("[T]his is their product. It's introducing reagents into the microfluidic chip putting the chip into an instrument and that instrument runs the chip. This is a microfluidic system."); Appx29818; Appx30523.

Moreover, the thermal cycler is indisputably *not* a 10x product; they are "common" to "most labs," which purchase them separately from "a lot of different companies." Appx30170; *see* Appx30171-30172. The reactions therefore do not even occur in a 10x product, let alone within 10x's microfluidic system.

III. The Damages Award Should Be Vacated.

The jury awarded Bio-Rad its full asserted damages of \$23.9 million, representing a 15% royalty on worldwide sales of all instruments, chips, and reagents. Appx29441. The award should be vacated, as based on evidence that was both inadmissible and insufficient.

In the hypothetical negotiation, 10x would have negotiated with RainDance and the University of Chicago. Appx30605-30606. Normally, the analysis would begin with “[a]ctual licenses to the patented technology,” which are generally the most “highly probative as to what constitutes a reasonable royalty for those patent rights.” *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 79 (Fed. Cir. 2012). In keeping with this norm, 10x’s expert, Dr. Ryan Sullivan, relied on the University of Chicago’s license of the asserted patents to RainDance. Appx30665-30666; Appx31864-31881; Appx32713-32729. That was an *exclusive* license for a royalty of 1% on instruments and 3% on consumables (or less, with a royalty-stacking offset). Appx30667; Appx30672; Appx32717. It was one of 15 licenses with rates ranging from 0.25% to 3%. Appx16178-16194; Appx29161; Appx30609-30610.

Bio-Rad's damages expert, James Malackowski, swept away all 15 licenses, including the license to the asserted patents, and focused exclusively on three outliers. Appx30066-30068. In his opinion, RainDance and Chicago would have demanded, and 10x would have paid, a 15% royalty on all of 10x's sales, Appx30062-30064—15 times what Chicago accepted on instruments and 5 times what it accepted on consumables in its negotiation with RainDance.

10x moved to exclude Mr. Malackowski's opinion as relying on non-comparable licenses and for failing to apportion damages. Appx17010-17016 (*Daubert*). At first, the district court rejected Mr. Malackowski's methodology for lack of apportionment. Appx22361-22362. Mr. Malackowski then submitted a new report, relying on the same inputs and reaching the same 15% outcome with little further analysis. Appx22390-22392. Mr. Malackowski still did not apportion, but merely *asserted* that the patents covered by the three cherry-picked licenses represented a similar value to the licensed products as the asserted patents do to 10x's products. Appx22392; *see* Appx22864-22880. Nonetheless, the district court admitted his testimony. Appx25650-25653.

After the jury delivered its verdict, the district court held that one of Mr. Malackowski's three reference licenses was not comparable, yet upheld the verdict anyway. Appx29441-29446. The verdict should be vacated for that reason alone. It should also be vacated, whether on sufficiency or admissibility grounds, because: (A) the other two licenses were not comparable either; and (B) regardless, the award was not properly apportioned.

A. Bio-Rad's expert relied on licenses that were not comparable to the hypothetical negotiation.

Bio-Rad was permitted to rely on "[t]he rates paid by the licensee for the use of other patents comparable to the patent in suit," *Georgia-Pac. Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970), but it "had the burden to prove that the licenses were sufficiently comparable to support the ... damages award," *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1329 (Fed. Cir. 2009).

Instead of meeting that burden, Bio-Rad violated this Court's directions in two ways: First, it excluded the Chicago/RainDance license to the asserted patents in favor of three licenses that are not comparable (let alone more comparable than the license that included the asserted patents). See *ResQNet.com, Inc. v. Lansa, Inc.*, 594 F.3d

860, 870-73 (Fed. Cir. 2010) (rejecting expert’s reliance on insufficiently comparable licenses to the exclusion of the one agreement to the asserted patents). Second, Bio-Rad cited to only the highest-value licenses while excluding the many other licenses, which “served no purpose other than to increase the reasonable royalty rate above rates more clearly linked to the economic demand for the claimed technology.” *LaserDynamics*, 694 F.3d at 80 (internal citations omitted) (error to permit testimony to non-comparable licenses “to the exclusion of the many licenses expressly for the” asserted patent).

Mr. Malackowski’s excuse for cherry-picking the outlier licenses was that patentees impose higher rates on “competitors,” Appx30071-30076; *see* Appx17066, so any license between non-competitors (including the Chicago/RainDance license covering the patents-in-suit) was utterly irrelevant, Appx30064-30067. Never mind that the hypothetical licensors here—Chicago and RainDance—never actually competed with 10x. Appx29618; Appx30102-30103. And never mind that the licenses Mr. Malackowski chose—on different technologies in wildly different circumstances—do not come close to demonstrating a 15% norm for competitors on *this* technology in *this* case.

Applera/Bio-Rad. The first license is simple: The district court held that Bio-Rad failed to show it was comparable. So the jury should never have heard it. Appx29443-29445. Bio-Rad acceded to this license from Applera with a 15% royalty on sales of PCR instruments as Bio-Rad was on the verge of being held in contempt of an injunction. Appx29605-29606; Appx30613-30614; Appx32029-32065. The rate was so high because PCR is a Nobel Prize-winning invention that “launched the human genome project.” Appx30578. As the district court explained, the license is not comparable because 10x’s controller is not a PCR instrument and the asserted patents are not PCR patents. Appx29444-29445.

On this basis alone, this Court should at least order a new trial. The admission of improper testimony is not harmless unless “it is highly probable that the error[] did not affect the outcome of the case.” *Hirst v. Inverness Hotel Corp.*, 544 F.3d 221, 228 (3d Cir. 2008). There can be no such confidence here, since this was one out of only three licenses adduced in support of the verdict, it is the only one that covers the sale of instruments, and it is the only license reflecting the single 15% rate the jury adopted, as distinguished from a range.

AppliedBio/QuantaLife. In the second license, QuantaLife agreed to pay AppliedBio 10-15% for certain *reagents* also for *PCR*. Appx30152-30153; Appx30617-30619; Appx32568-32630. Those are two critical distinctions.

First, the license does not require payments for instruments—or even chips. Appx30152-30153; Appx30616-30617. The reagents sold at around \$2.00, yielding a royalty payment of 24 cents per unit.

Appx30153; Appx30619. That 10-15% rate cannot be uncritically translated into a rate for instruments bearing price tags of \$60,000 to \$125,000, Appx30615, any more than a 15% royalty on a gallon of gas translates into the royalty rate on the price of the entire car.

Mr. Malackowski made no adjustments for the difference—even though the most probative license in the record (the Chicago/RainDance license) applied different rates to instruments and consumables.

Appx32717.

Second, the PCR focus was as disqualifying here as the district court found it to be for Applera/Bio-Rad: This license covered a PCR enzyme that “transformed the field” and “enabled modern molecular biology.” Appx30577-30578; *see* Appx29597; Appx29894-29895; *supra* 7.

The district court reached a different result here based on the testimony of Bio-Rad's technical expert, Dr. Sia, that (1) the AppliedBio/QuantaLife license covered "reagents for doing ... PCR in the droplets," Appx29895; and (2) the Ismagilov patents also "deal with the subject [of] trying to do PCR and trying to do it better using the droplet technologies," Appx29894; *see* Appx29445-29446. That is like saying a license to the recipe for Coca-Cola is comparable to a license to an improved bottling machine, because Coca-Cola is something you can bottle.

10x was not bargaining for a license to PCR (or anything like the prized Coca-Cola recipe), because 10x's accused products do not conduct PCR in droplets. Appx30254. And the asserted patents do not claim "reagents for doing the PCR"; they mention PCR—an already well known reaction—as an example of a reaction that can hypothetically be performed in a droplet, but teach no advancements to PCR technology. Appx276 45:30-33.

As with the Applera license, what one company would pay for PCR reagents that "enabled modern molecular biology," Appx30577, has no bearing on what 10x would pay for the asserted patents. As discussed

(at 20-22), the Ismagilov patents—mainly copied verbatim from another patent—do not improve PCR and were nothing close to transformative in microfluidics.

Mr. Malackowski, for his part, addressed none of this. He found the license comparable merely because it was “between competitors, comparable technology, non-exclusive.” Appx30080-30081. Such “superficial testimony’ and the simple recitation of royalty numbers” simply does “not support the jury’s award when no analysis is offered.” *Whitserve, LLC v. Comput. Packages, Inc.*, 694 F.3d 10, 32 (Fed. Cir. 2012).

Caliper/RainDance. The third license was one Caliper granted to RainDance for a portfolio of 550+ patents. Appx29932-29933. This one, too, did not cover instruments, but only reagents and chips. The license had two rates: RainDance agreed to pay 2% for “non-screening” uses, which did not compete with Caliper, but 15% for “screening” uses that “directly and demonstrably impact sales of Caliper’s products.” Appx30076; Appx30620; Appx32631-32712. RainDance “never paid at a 15% rate” because it never competed with Caliper. Appx30620. The

license was not comparable along several of the same dimensions as the AppliedBio license—and more.

First, a license on consumables cannot be applied with no adjustments to a license on very expensive instruments. *Supra* 59.

Second, the technology was different. Caliper's technology involved some aspects of microfluidics, but "not droplets." Appx29892. The district court accepted Dr. Sia's opinion that the Caliper license was comparable because it "dealt with microfluidics and all sorts of ways to control fluids," which "is similar to ... the subject matter" of the asserted patents. Appx29892; *see* Appx29442-29443. But a license to a portfolio of 550+ microfluidics patents is not "similar to" a license to three patents that largely share a specification and deal with discrete aspects of droplet generation and manipulation. *Supra* 20-22. Dr. Sia and Mr. Malackowski's testimony left the jury without the evidence needed to "adequately evaluat[e] the probative value of" the Caliper/RainDance license. *Lucent*, 580 F.3d at 1328 (rejecting reliance on IBM's portfolio-wide "personal computer" license as applied to a hypothetical negotiation to a specific feature of computer program); *see also LaserDynamics*, 694 F.3d at 80 (rejecting a comparison between

DVD-related licensing programs and the patent-in-suit despite the overlap in DVD focus, because “no evidence shows that [the licensing programs] even involve[d] a disc discrimination method.”).

Third, the 15% rate in that license was pure fiction. *See Wordtech Sys., Inc v. Integrated Networks Sols., Inc.*, 609 F.3d 1308, 1320 (Fed. Cir. 2010). Mr. Malackowski seemed to think that RainDance’s acceptance of a potential 15% competitor rate proved that any competitor would accept that same rate. Appx30079. But RainDance never exceeded the 2% rate, because it never competed with Caliper. Appx30620-30621. Even Bio-Rad recognized that Caliper “hadn’t thought about droplets or what RainDance wanted to do.” Appx29591. Indeed, when conducting due diligence on licenses needed for the ddPCR product, Bio-Rad determined that “what Caliper is doing ... was in no way competing with anything [Bio-Rad] planned to do with the droplets.” Appx29595.

If you run a profitable deli and lease out the adjacent storefront to a drycleaner for “\$500 if used as a drycleaner or \$50,000 if used as a deli,” that may say something about your desire to prevent a competitor from entering the market, but it says nothing about the actual market

rate for delis. So too here, a price that no one expected RainDance ever to pay cannot support an opinion that actual competitors would pay 15% and therefore cannot support the jury's verdict. And, more importantly, it cannot support applying a prohibitively expensive rate—which kicked in only if sales “directly and demonstrably impact” the licensor—to 10x, which never sold a product that competes with RainDance's products. Appx30102-30103; Appx30620.

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Bio-Rad did no more than “alleg[e] a loose or vague comparability between different technologies or licenses,” which “does not suffice” to support the jury's verdict. *LaserDynamics*, 694 F.3d at 79. Telling the jury that three outlier rates—chosen over numerous others in the 0.25-3% range—reflect a universal 15% “competitor” rate does not “account for ‘the technological and economic differences’ between” the licenses and the hypothetical negotiation. *Wordtech*, 609 F.3d at 1320. Bio-Rad's expert opinion therefore cannot support the jury's verdict. *See id.*; *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1227 (Fed. Cir. 2014). It was impermissible to let the jury fill in the gaps based on “speculative and unreliable evidence divorced from proof of economic harm linked to

the claimed invention.” *ResQNet.com*, 594 F.3d at 868. For this reason alone, the damages award should be vacated.

B. Bio-Rad’s expert did not apportion damages to the value of the patented technology.

Even if the reference licenses were comparable, the verdict cannot stand because Mr. Malackowski failed to apportion. Bio-Rad was required to “give evidence tending to separate or apportion the defendant’s profits and the patentee’s damages between the patented feature and the unpatented features, and such evidence must be reliable and tangible, and not conjectural or speculative.” *CSIRO*, 809 F.3d at 1130 (quoting *Garretson*, 111 U.S. at 121).

There is no dispute that 10x’s products have numerous non-infringing features and components—and highly consequential ones at that. Appx30091; Appx30669-30671. That much is evident from the technological challenges 10x overcame, and all the ways in which its single-cell products outperform Bio-Rad’s ddSEQ, even though both systems use droplets. *Supra* 12-15, 17-18.

Nevertheless, Mr. Malackowski opined that it was appropriate to take the 15% royalty in his cherry-picked reference licenses and slap it onto 10x’s products, with no adjustment at all. Appx30074-30075;

Appx30091. He claimed that that this 15% rate was already apportioned because he had “looked at the relative value of the droplets technology that’s at issue in this case versus the non-infringing contributions that 10x asserts it brings,” and then compared that “general relationship” to the licensed technology and unlicensed features of the licensed product. Appx30074-30075. In other words, he purported to compare these two ratios:

$$\frac{\textit{Asserted patents}}{\textit{Noninfringing features of 10x's products}} \quad v. \quad \frac{\textit{Licensed patents}}{\textit{Unlicensed features of licensed products}}$$

He never provided any numerical values to support his analysis. Yet, coincidentally, the ratio on the right turned out to be the same in each of the three licenses he considered. And even more coincidentally, those three ratios all turned out to be the same as the one on the left. Only by supporting that quadruple coincidence could Mr. Malackowski apply the same royalty rate across all these products.

The first problem with Mr. Malackowski’s analysis is that it does not apportion to the value of the patented technology as a matter of law. The starting point for apportionment must be the actual value of the

patented technology, not the value of other technology to other products. For example, in *CSIRO*, the district court relied on negotiations over a license *to the asserted patent* to set a royalty rate. This Court accepted that comparable license's "built in apportionment" as a "starting point" because the rate was "negotiated over the value of the asserted patent." 809 F.3d at 1303.

The second problem is that there is no evidence supporting any of Mr. Malackowski's coincidences. Mr. Malackowski's testimony lacks *any* evidence that he actually performed the analysis he claimed to have performed. He gave no actual numbers. He provided no facts that a jury could have used to confirm that he actually balanced the novel equation that he proposed. Neither he nor any other witness provided useful evidence showing the relative value of the licensed technology and unlicensed features in the reference licenses. So Bio-Rad had no proof supporting the righthand side of the formula. Without that analysis, there is no way to say that the lefthand side has been properly apportioned.

Mr. Malackowski is an accountant. Appx30059-30060. Because he lacks technical expertise, he could not—and did not purport to—

opine on the technical contributions of *any* patent. Appx30067-30068. Instead, he relied on Dr. Sia and Ms. Tumolo to draw conclusions about the technologies covered by the licenses. Appx30067-30068; Appx30082. But they did not fill in the gaps.

Bio-Rad/Aplera. For the Bio-Rad/Aplera license (which the district court found not comparable), Mr. Malackowski “pick[ed] an example number” to illustrate how he would undertake the apportionment analysis, and in the same breath concluded he was “good to go with the 15 percent.” Appx30073-30075.

Caliper/RainDance. For the Caliper/RainDance license, Mr. Malackowski relied on Dr. Sia, who explicitly conceded he did not undertake the purported apportionment analysis:

Q. And you did not ... do any analysis of the licensed products for the RainDance license versus the licensed products in this case, the 10x products, you didn’t do that in your report, did you?

A. No, ... that wasn’t really part of the scope.

Appx29934. Ms. Tumolo, meanwhile, simply asserted that the Caliper patents were “a small part of the value of [RainDance’s] products ... in my mind.” Appx29592. She never explained how a “small part of the value” could ever translate into a 15% royalty. (Perhaps because

RainDance *never paid* a 15% royalty. *Supra* 63-64.) Yet from that testimony and unadmitted “information that [he] reviewed in this case,” Mr. Malackowski told the jury “it was comparable both at a technical economic and rights perspective.” Appx30078-30079. He did not identify the unlicensed features of RainDance’s product (the denominator in his formula). He did not say whether those unnamed features were important. So he had no basis for balancing the equation and concluding no adjustment to the (fictional) 15% rate was necessary.

AppliedBio/QuantaLife. As to the AppliedBio/QuantaLife license, Ms. Tumolo testified only that the licensed patents cover “sort of basic rights if you want to do PCR,” Appx29597, while unspecified “software,” “chemistry,” and “emulsion work” was the “value in [her] mind” of QuantaLife’s product, Appx29604-29605. Based on nothing but these sparse observations and Dr. Sia’s testimony that the AppliedBio patents cover “some reagents that would help you to do PCR,” Appx29894-29895, Mr. Malackowski testified:

[L]ook at the technology [AppliedBio] brought to the table, the ddPCR technology[,] versus [what] QuantaLife was bringing to the table, which is the list of factors or technology that wasn’t included in the license. And, again, I was able to confirm that that relative ratio would not be greater on the green circle than it was on the blue circle.

Appx30081. “[T]he list of factors or technology” and blue and green circles are nowhere in the record. They appeared on a demonstrative slide displayed during Mr. Malackowski’s testimony. The district court instructed the jury that demonstratives are “just ... an aid to whatever testimony you’re listening to,” unless admitted into evidence.

Appx31369. Mr. Malackowski’s slides were not moved into evidence. The jury therefore could not have relied on the slides in reaching its verdict, and they are not in the record on appeal. *See* Fed. R. App. P. 10(a); *Finisar Corp. v. DIRECTV Grp., Inc.*, 217 F. App’x 981 (Fed. Cir. 2007) (“Because the demonstrative exhibits were not filed with the district court, they are not part of the record on appeal.”).

“When parties rely on demonstratives to present evidence or mathematical calculations to the jury, it is their burden to assure that the record captures the substance of the data so presented. [This court] can not guess at what the jury saw.” *Whitserve*, 694 F.3d at 32 n.16. Bio-Rad failed to meet its burden to provide record evidence reflecting the substance of Mr. Malackowski’s analysis. And Mr. Malackowski’s abstract and conclusory testimony about blue and green circles cannot

provide the substantial apportionment evidence necessary to uphold the award.

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When concluding his testimony and reciting the *Georgia-Pacific* factors, Mr. Malackowski simply asserted: “[I]n all of those 15-percent competitive licenses, you remember that pie chart analysis I did, each of those parties were also bringing the types of things that 10x is bringing.” Appx30091. But his “pie chart analysis” is also not in evidence. And a vague reference to other licensees—to other patents, covering other products—bringing “the types of things that 10x is bringing” is not tangible evidence of anything, let alone of a reliable apportionment analysis.

Mr. Malackowski never stated what he determined to be the relative value of the licensed features to the licensed products—not for any one of the three licenses on which he relied. Nor did he ever state what he determined to be the relative value of the asserted patents to the accused 10x products. Instead, he underscored how hollow his testimony was by explaining, “I just pick[ed] an example number. If droplets were, say, a quarter of the value of what’s being brought to the

table in the hypothetical negotiation, I need to be certain that the [licensed technology] is not half the value.... And so that's what I did." Appx30075.

Mr. Malackowski's vague testimony reflects a "complete lack of economic analysis to quantitatively support" the verdict. *LaserDynamics*, 694 F.3d at 69 (rejecting "vague qualitative notions of the relative importance" of the patented technology); see *ResQNet.com*, 594 F.3d at 873. It "amounts to nothing more than speculation," and "[w]ithout a more detailed analysis, the jury is simply left to speculate or adopt the expert's unsupported conclusory opinion." *Exmark Mfg. Co., v. Briggs & Stratton Power Prods. Grp., LLC*, 879 F.3d 1332, 1350 (Fed. Cir. 2018).

The district court, for its part, did not "scrutinize the evidence carefully to ensure that the 'substantial evidence' standard is satisfied," as it was required to do. *Lucent*, 580 F.3d at 1336. When 10x explained the deficiencies in Mr. Malackowski's testimony, Appx30284-30285, the court simply remarked that "the Federal Circuit will ... be available to fix that." Appx30298.

And so it should.

IV. The Permanent Injunction Should Be Vacated.

“An injunction is a drastic and extraordinary remedy, which should not be granted as a matter of course.” *Monsanto Co. v. Geertson Seed Farms*, 561 U.S. 139, 165 (2010). Bio-Rad was required to prove that it meets each of the four traditional equitable factors governing injunctions. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 391 (2006). Bio-Rad wholly failed to justify its request for a permanent injunction, especially as to the four product lines on which Bio-Rad did not even purport to compete.

A. Bio-Rad did not show irreparable harm that cannot be compensated by monetary damages.

1. The district court premised the injunction on the notion that Bio-Rad and 10x are direct competitors and “[d]irect competition strongly suggests the potential for irreparable harm.” Appx61. But one undisputed fact is fundamental to both the court’s premise and any assessment of irreparable harm: Bio-Rad *did not even claim to compete* with four out of five of 10x’s product lines. Appx28498-28500; Appx30196. Thus, despite one Bio-Rad executive’s vague assertion that Bio-Rad “can fill that need” for 10x’s products, Appx28499, Bio-Rad plainly could not replace sales for the four product lines for which it had

no substitute product. It was improper for the court to enjoin sales in the name of competition where there is not—and could not possibly be—any competition.

The only 10x product line with which Bio-Rad's ddSEQ even purported to compete is 10x's Single Cell 3'. Appx29619. But even here, there is no harm, because ddSEQ is so inferior that researchers do not want to use it. Appx28886-28915; Dkt. 9.5-9.8. Moreover, with respect to that one product line, Bio-Rad faces competition from at least 10 other competitors. Appx35327. That is one reason Bio-Rad had to withdraw its lost profits claim when the district court demanded an offer of proof; Bio-Rad could not prove that 10x caused it to lose even a single ddSEQ sale. Appx25238; Appx25242. The district court impermissibly ignored this clear evidence that enjoining 10x is unlikely to help Bio-Rad's competitive position. *See Apple Inc. v. Samsung Elecs. Co.*, 678 F.3d 1314, 1324 (Fed. Cir. 2012).

Instead, the court took Bio-Rad's attorney argument and cursory corporate declaration at face value. Appx28498-28501. But there was no *evidence* to substantiate the conclusory assertions about lost sales or market share, pricing pressures, increased marketing costs, or

reputational harm. Appx28498-28501. *Compare Robert Bosch LLC v. Pylon Mfg. Corp.*, 659 F.3d 1142, 1151 (Fed. Cir. 2011) (detailing “overwhelming evidence” of irreparable harm); *Broadcom Corp. v. Emulex Corp.*, 732 F.3d 1325, 1336-37 (Fed. Cir. 2013) (patentee provided “conclusive[]” evidence of “lost market share”).

2. Without any evidence of meaningful competition between 10x’s and Bio-Rad’s specific products, the district court found 10x and Bio-Rad both participate in a broader market: “the market for products that perform genetic analysis on a droplet platform.” Appx61.

This concept of “competition” is foreign to the law of injunctions. The notion of a “droplet product market” is like saying that microscopes and telescopes compete in an “optical instrument” market for tools that use lenses at opposite ends of movable cylinders. The applications are totally different: A telescope cannot help a microbiologist observe a cell, and a microscope cannot help an astronomer see Mars. Selling a microscope that infringes a patent on lenses cannot cause irreparable harm to a company that sells only telescopes.

So too here. Just because Bio-Rad and 10x both sell products that put a variety of items (chemicals, plus cells or genetic material) in

droplets does not mean they compete in the sense that is relevant to irreparable harm. 10x's sale of a CNV product, for example, could never inflict harm on Bio-Rad's completely separate and concededly non-competing ddPCR products. And Bio-Rad submitted zero evidence that 10x caused Bio-Rad to lose any ddPCR sales.

Relatedly, the court also justified the injunction on the ground that 10x was "captur[ing] and defin[ing] the market" and it was now necessary to help Bio-Rad overcome 10x's "strong market lead over Bio-Rad." Appx63-65. A "market lead" in what? Certainly not in launching a "product[] that perform[s] genetic analysis on a droplet platform," the market the district court considered relevant. Appx62. Thanks to 10x's founders and the QuantaLife technology they brought to Bio-Rad, Bio-Rad sold the ddPCR product—to great success—before 10x even existed. Thus, the court was plainly wrong in asserting that "10x's infringement coincided with the emergence of the droplet market." Appx64.

QuantaLife launched its original droplet PCR product in 2011, four years before 10x's first product and five years before 10x's first single-cell product. If there really were some sort of relevant market for all products that use "droplets," then Bio-Rad should be enjoying all the

“head start” benefits it attributes to 10x. Nor did 10x have a “first to market position” in the single-cell market, as Bio-Rad claimed.

Appx28499. The undisputed evidence was that Fluidigm was on the market with a single cell product *five years* before 10x’s first single-cell product. Appx16135-16136; Appx30191.

Regardless, the court failed to explain how the prospective injunction would remedy any supposed market lead. By allowing scientists to continue buying consumables for existing instruments, the court acceded to allowing the “sticky” customer relationships to continue. The injunction Bio-Rad sought and received simply does not enable it to reclaim its supposedly “lost” market share with 10x’s existing customers.

B. The balance of the hardships and public interest do not support an injunction.

Bio-Rad had an affirmative burden to show that the balance of the hardships and the public interest would not be disserved by an injunction. *eBay*, 547 U.S. at 391; *Amgen Inc. v. Sanofi*, 872 F.3d 1367, 1381 (Fed. Cir. 2017), *cert. denied*, 139 S. Ct. 787 (2019). Failing to sustain that burden means that the district court “may not issue an injunction,” and this Court cannot affirm it. *Amgen*, 872 F.3d at 1381.

The district court acknowledged that 10x is a much smaller company and Bio-Rad is a Goliath, and the sole product the injunction could protect accounts for “only 0.2% of [Bio-Rad’s] \$2 billion in sales.” Appx65-66. But the court found the balance of hardships “weighs in favor of granting injunctive relief, or, at minimum, is neutral,” Appx65-66, based on (1) 10x’s ability to sell a limited set of new, non-infringing products and (2) Bio-Rad’s investments in “droplets” broadly. But the district court ignored that 10x *does not* have a new design for two of its product lines. Appx28862. And the district court carried forward its misunderstanding of the relevant market in finding Bio-Rad’s “droplet” investments (in ddPCR) relevant to the injunction analysis. The balance weighs strongly against an injunction here.

On the public interest, the court accepted Bio-Rad’s argument that “[i]t is generally in the public interest to uphold patent rights.” Appx66. That is insufficient to justify an injunction. *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1341 (Fed. Cir. 2012); *see eBay*, 547 U.S. at 392-93. The undisputed evidence was that scientists need 10x’s products to do their research, and that Bio-Rad’s (and the larger market) do not meet that need. Appx28857-28859, Appx28862-

28868. 10x should not be enjoined from providing the scientific community with the tools necessary to carry out life-saving research into the causes and cures for devastating human diseases. *See Cordis Corp. v. Bos. Sci. Corp.*, 99 F. App'x 928, 935 (Fed. Cir. 2004).

CONCLUSION

For the foregoing reasons, the Court should reverse the judgment of infringement and vacate the damages award and injunction or, at a minimum, remand for a new trial.

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IN THE
United States Court of Appeals for the Federal Circuit

BIO-RAD LABORATORIES, INC., THE UNIVERSITY OF CHICAGO,
Plaintiffs-Appellees,

v.

10X GENOMICS INC.,
Defendant-Appellant.

On Appeal from the United States District Court
for the District of Delaware
No. 1:15-cv-00152-RGA, Hon. Richard G. Andrews

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Statement Regarding Confidential Material Omitted

Pursuant to Federal Circuit Rule 30(h)(1)(A), materials that were filed under seal pursuant to the district court's protective order (Appx1-38) have been omitted from the nonconfidential version of the Joint Appendix. The omitted material includes confidential details regarding the design of 10x's products, details of prior licensing agreements with third-parties, as well as confidential business information related to sales and revenue and appears on the following pages of the Joint Appendix. Appx22441, Appx22445, Appx28989-29072, Appx29316, Appx29361

Statement Regarding Outside Attorneys' Eyes Only Material Omitted:

Pursuant to Federal Circuit Rule 30(h)(1)(A), materials that were filed under seal pursuant to the district court's protective order (Appx1-38) have been omitted from the nonconfidential version of the Appendix. The omitted material includes confidential descriptions of 10x's product development and design and appears on the following pages of the confidential version of the Appendix. Appx15132, Appx15173-15174, Appx15245-15246, Appx16087, Appx16104-16106, Appx16135-16136, Appx16143-16144, Appx16178-16194, Appx16504, Appx16526-16527, Appx17000, Appx17003-17004, Appx17011, Appx17027, Appx17058-17063, Appx17066, Appx22388, Appx22390-22392, Appx22866, Appx22870-22871, Appx22879, Appx24628, 24738-24739, Appx28484-28485, Appx28486, Appx28494, Appx28862-28863, Appx28867, Appx28868, Appx28989-29072

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BIO-RAD LABORATORIES, INC. and THE
UNIVERSITY OF CHICAGO,

Plaintiffs,

v.

10X GENOMICS, INC.,

Defendant.

C.A. No. 15-152-RGA

REDACTED
PUBLIC VERSION

DECLARATION OF RANDY Z. WU IN SUPPORT OF
10X GENOMICS, INC.'S BRIEF IN OPPOSITION
TO PLAINTIFFS' POST-TRIAL MOTIONS

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Appx28877

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Appx28878

I, Randy Z. Wu, declare:

1. I am Senior Director of Intellectual Property and Litigation at 10X Genomics, Inc. ("10X"). Prior to my legal career, I was a researcher in the field of biological sciences and genomics and hold a A.B. in Chemistry from Harvard University and a Ph.D. in Biophysics from the University of California, San Francisco. I performed my doctoral thesis work studying mechanisms of how genes are regulated based on their epigenetic environment, and have a general scientific familiarity with the fields in which 10X's products are used and the major contributors in this field.

2. 10X has received letters from a number of researchers who are 10X's customers regarding the significance of their research using 10X's products and the detrimental impact that an injunction against 10X would have on their research. These researchers include some of the most prominent thought leaders in genomics who are currently using 10X's products to gain unprecedented insight the biology of human diseases, and which is already translating into visible impact on patient treatment.

3. Attached as **Exhibit A** is a true and correct copy of a letter dated January 9, 2019, that 10X received from Dana Pe'er, Chair of the Computational and Systems Biology Program at Memorial Sloan Kettering Cancer Center. Sloan Kettering is the largest and oldest private cancer center in the world that treats more than 600,000 cancer patients annually. *See* https://en.wikipedia.org/wiki/Memorial_Sloan_Kettering_Cancer_Center. Dr. Pe'er's laboratory develops single-cell approaches to study development, immunology and cancer, with a focus on tumor-immune interactions and the spread of cancer (metastasis). Dr. Pe'er collaborates with clinicians and leading biomedical scientists at Memorial Sloan Kettering and globally, bringing single-cell approaches to their research. Ex. A.

4. Attached as **Exhibit B** is a true and correct copy of a letter dated January 4, 2019, that 10X received from Greg Gibson, Professor and Director of the Center for Integrative Genomics and Co-Director of the CHoA Center for Transplantation and Immune Disorders at the Georgia Institute of Technology. Dr. Gibson and his collaborators at Georgia Tech are using 10X products to study the genetic basis of autoimmune disease and of cancer immunotherapy. Ex. B.

5. Attached as **Exhibit C** is a true and correct copy of a letter dated January 4, 2019, that 10X received from Paola A. Guerrero, Scientific Manager at the University of Texas MD Anderson Cancer Center. The MD Anderson Cancer is one of the most original three comprehensive cancers in the U.S. and is one of the top institutions in the world for cancer research and treatment. *See*

https://en.wikipedia.org/wiki/University_of_Texas_MD_Anderson_Cancer_Center. Her lab focuses on understanding and treating pancreatic cancer, and is using 10X's Single Cell 3' Gene Expression and Single Cell CNV products in these efforts. Ex. C.

6. Attached as **Exhibit D** is a true and correct copy of a letter dated January 4, 2019, that 10X received from Leslie S. Kean, Director of the Stem Cell Transplantation Program at Boston Children's Hospital/Dana Farber Cancer Institute. Dr. Kean is using 10X's Single Cell 3' Gene Expression and Single Cell V(D)J products to understand how inflammatory bowel disease arise in children, and how graft-versus host disease (a deadly complication associated with bone marrow transplants) arise in children with transplants. Ex. D.

7. Attached as **Exhibit E** is a true and correct copy of a letter dated January 4, 2019, that 10X received from John D. Carpten, Professor and Chair of the Department of Translation Genomics at the University of Southern California Keck School of Medicine. Dr. Carpten is an internationally recognized expert in genomic sciences, including cancer genomics. *See*

<https://keck.usc.edu/faculty-search/john-d-carpten/>. Dr. Carpten is using 10X's Single Cell 3' Gene Expression, Single Cell CNV, and Single Cell ATAC-seq products to study tumors and select therapeutics for small populations of cells within a tumor or cancer. Ex. E.

8. Attached as Exhibit F is a true and correct copy of a letter dated January 4, 2019, that 10X received from Jonathan Weissman, Professor at the University of California San Francisco Cellular Molecular Pharmacology UCSF School of Medicine. Dr. Weissman is highly recognized for his work on elucidating the function of prions, misfolded proteins that lead to diseases such as Mad Cow Disease and Alzheimer's Disease. *See, e.g.,* <https://www.hhmi.org/scientists/jonathan-s-weissman>. He is using 10X's Single Cell 3' Gene Expression product with CRISPR methods to systematically perturb and study how cells ensure that proteins fold into their correct shape, and the role of protein misfolding in diseases. Ex. F

9. Attached as **Exhibit G** is a true and correct copy of a letter dated December 17, 2018, that 10X received from Jason Bielas, Full Member in the Translational Research Program at the Fred Hutchinson Cancer Research Center and Affiliate Associate Professor in the Department of Pathology at the University of Washington. The Fred Hutchinson Cancer Research Center is a world-renowned biomedical research institution having more than 300 faculty members dedicated to studying cancer at a molecular and cellular level to translate into treatments. *See* www.fredhutch.org. Dr. Bielas is using 10X products to study the how mutations in nuclear and mitochondrial DNA lead to cancer and age-related disease. Ex. G.

10. Attached as **Exhibit H** is a true and correct copy of a letter dated December 17, 2018, that 10X received from Calvin Kuo, Maureen Lyles D'Ambrogio Professor of Medicine and Vice Chair of the Department of Medicine at the Stanford University School of Medicine. Dr. Kuo is using 10X products to develop innovative approaches to generate stem cells and immune

cells that can be used to treat diseases such as inflammatory bowel disease or cystic fibrosis. Ex. H.

11. Attached as **Exhibit I** is a true and correct copy of a letter dated December 18, 2018, that 10X received from Xiaole Shirley Liu, Professor of Biostatistics at the Harvard School of Public Health and Co-Director of the Center for Functional Cancer Epigenetics at the Dana-Farber Cancer Institute. Dr. Liu is a computational biologist studying the genetics and epigenetics of cancer. Dr. Liu was among the first researchers to adopt the ATAC-seq method in cancer studies and is using 10X's Single Cell 3' Gene Expression and Single Cell ATAC-seq products to investigate how tumors change under different chemical environments. Ex. I.

12. Attached as **Exhibit J** is a true and correct copy of a letter dated December 19, 2018, that 10X received from Hanlee Ji, Associate Professor at the Stanford University School of Medicine. Dr. Ji leads a research team that is investigating the cause of cancer and discovering new cancer treatments. He is using 10X products in multiple studies that are leading to new discoveries about cancer and providing candidate treatments. Ex. J.

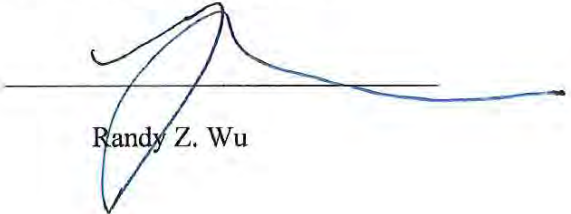
13. Attached as **Exhibit K** is a true and correct copy of a letter dated December 19, 2018, that 10X received from Michael Snyder, Stanford B. Ascherman Professor and Chair of Genetics and Director of Genomics and Personalized Medicine at the Stanford University School of Medicine. Dr. Snyder is using 10X's Single Cell 3' Gene Expression and Single Cell ATAC-seq products in a \$13 million grant sponsored by the National Institutes of Health to investigate cancer at a single cell level. Ex. K.

14. Attached as **Exhibit L** is a true and correct copy of a letter dated January 3, 2019, that 10X received from Robert Sebra, Associate Professor at the Icahn School of Medicine at Mount Sinai and Director of Technology Development and the Genomics Core Facility for the

Icahn Institute for Data Science and Genomic Technology. Dr. Sebra is using 10X's Single Cell 3' Gene Expression and Single Cell V(D)J products to develop a single-cell level understanding of tumor heterogeneity in different types of cancer and how embryos develop. Ex. L.

15. Attached as **Exhibit M** is a true and correct copy of a letter dated December 14, 2018, that 10X received from Aldons Lusis, Professor of Human Genetics and Medicine at the University of California, Los Angeles. Dr. Lusis's laboratory studies the genetic basis of cardiovascular and metabolic diseases, and is using 10X products to further his research. Ex. M.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct and that this Declaration was executed on January 9, 2019.



Randy Z. Wu

CERTIFICATE OF SERVICE

I hereby certify that on January 9, 2019, I caused true and correct copies of the foregoing document to be served on the following counsel in the manner indicated:

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/s/ Alexandra M. Ewing

Alexandra M. Ewing (#6407)
ewing@rlf.com

Exhibit A

Appx28885



Memorial Sloan Kettering
Cancer Center

January 9, 2019

Dana Pe'er, Ph.D.

Chair, Computational Biology Program

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To Whom It May Concern:

I am chair of the Computational and Systems Biology Program at Memorial Sloan Kettering Cancer Center (MSKCC), scientific director of the Alan and Sandra Gerry Center for Tumor Metastasis and Ecosystems at MSKCC, and founding director of MSKCC's Single Cell Research Initiative (SCRI). In these roles, I collaborate with many clinicians and leading biomedical scientists, both at MSKCC and globally, bringing single-cell approaches to bear light on their research questions. For example, I collaborate with Jim Allison, recipient of the 2018 Nobel Prize in Physiology or Medicine; our joint work applying single-cell approaches to immunotherapy prominently appeared in his Nobel Lecture (Stockholm Dec 2018).

My lab develops single-cell approaches to study development, immunology and cancer, with a focus on tumor-immune interactions and the spread of cancer (metastasis).

I have a long history and substantial expertise in single-cell biology. My contributions to the field began with my 2005 paper in *Science*, demonstrating how statistical structure in single-cell data can uncover biological mechanisms—awarded runner-up to *Science's* Breakthrough of the Year in 2005. Since then, I have published dozens of papers on the topic in top journals, including *Science*, *Nature*, *Cell* and *Nature Biotechnology*. My work has been recognized with the Burroughs Wellcome Fund Career Award, NIH Director's New Innovator Award, Packard Fellow in Science and Engineering, Overton Award and NIH Director's Pioneer Award. My expertise is also acknowledged by the community, as I serve in leadership roles on the Human Cell Atlas Project.

I have never received compensation from and have no financial interest in any of the involved parties or related commercial enterprises. I am writing only in the interests of my field, to express my grave concern over the expected consequences of prohibiting sales of 10X Genomics products. I understand that this letter may be submitted to a court, and give you permission to use it in proceedings to oppose an injunction.

Single-cell technologies are enabling a revolution in the biomedical sciences that has the potential to bring great medical benefit to mankind. It would be very damaging to block this momentum. To enable excellence, innovation and scientific discovery, it is critical to foster a diversity of approaches and maintain a climate that incentivizes businesses to advance innovation.

I would like to stress the importance of 10X Genomics technologies in my own sphere of research. Under my leadership, SCRI has engaged with over 35 labs and clinical programs to decipher tumor biology using single-cell approaches, including the characterization of drug-resistant cells and tumor- and metastasis-initiating cells, which could point to innovative new therapies. Our work on tumor-immune interactions attempts to determine when immunotherapy works, why it fails, and to suggest alternative therapeutic approaches. SCRI also engages in impactful projects on auto-immune disease, infectious disease and regeneration. 10X Genomics products have been central in our efforts. It is currently the primary technology at SCRI and has been used to profile over 900 samples and 3.5 million cells from patients, disease models and

Appx28886

healthy controls. It has allowed us to collect data from patient samples of lung, breast, prostate, brain, colon, skin, pancreas and ovarian cancers, providing new insights and leads for new therapies.

Data collected with the 10X Genomics platform served as preliminary data for multiple large grants awarded by the Howard Hughes Medical Institute, US National Institutes of Health, and other funders. This includes the Human Tumor Atlas Network (HTAN) grant, a \$13.4-million award from the National Cancer Institute, as part of the Beau Biden Cancer Moonshot Initiative, to characterize the metastatic transition in lung and pancreatic cancers, two of the deadliest and most metastatic cancers. Losing access to 10X Genomics products would be catastrophic for the efforts of the HTAN, Alan and Sandra Gerry Center and SCRI. It would severely disrupt dozens of ongoing projects.

SCRI constantly evaluates new technologies as these emerge on the market, and we gave BioRad's ddSEQ careful consideration by rigorously testing it on our samples. We identified very serious issues with the ddSEQ and deemed it unsuitable for our needs. In particular, the 10X Genomics platform places a bead in almost every droplet, whereas the BioRad device only includes one bead in every 50 droplets or so, which results in a dramatic loss of cells loaded into the device. Even if the performance of the BioRad product were improved by a factor of 10, the result would still be far inferior to that of 10X. Most of the samples that we profile are precious patient samples, often from a tiny needle biopsy, and do not contain nearly enough cells to be profiled with the BioRad device. Thus, we cannot use the technology to ask important questions such as "how did the patient respond to the drug?" or "what changed that led to drug resistance and relapse?" Moreover, even for large samples with sufficient cell numbers, we found that molecular capture rates are inferior to that of the 10X Genomics platform. Specifically, in our hands-on experience with the BioRad device, we recovered approximately 3-times less transcript molecules than when using the older 10X V2 technology for the same sample. This drop in data quality means that much less information can be derived, leaving many discoveries out of reach. Simply put, I would not be able to execute a large part of my research agenda, nor that of many SCRI collaborating labs, without access to 10X Genomics products. The BioRad ddSEQ system, based on the current technical specifications, is not a viable alternative.

Even if BioRad were in the future to begin selling a product that fills the space for which the field is now reliant on the 10X Genomics products, the disruption to research would be great. Even a new and greatly improved product would involve many months of setup, and switching technologies is completely incompatible with most ongoing projects. New technologies typically require substantial time investments to separate biological signal from technological artefacts, and result in significant data loss at instantiation. Case in point, for all ongoing projects we elected to stick with 10X's V2 product, even though their recently released V3 product is clearly superior. Moreover, the difference between the two 10X products is very small relative to the difference between 10X and any non 10X product.

There is currently no market product that can replace the 10X Genomics platform. The immediate effect of an injunction would be to bring great harm to dozens of ongoing projects at MSKCC involving dozens of rare selected patient samples, millions of federal grant dollars, and many years of work by postdoctoral trainees. It would impede the budding careers of young scientists. Lack of a competitive alternative would also cause a major slowdown for projects nearing launch, including those already funded by federal grants such as the HTAN.

Single-cell genomics is a young and thriving field full of innovators in both scientific labs and startups. There are many vital questions that will only be answerable with improved technologies. An injunction against 10X Genomics would stifle young researchers focused on pushing the boundaries of what is currently possible, would hurt the field and would severely limit our lab's ability to study susceptibilities in metastatic cells, mechanisms of drug resistance and potentially discover new therapeutic avenues in cancer treatment.

Sincerely,

Dana Pe'er, PhD.

A handwritten signature in black ink, appearing to read 'Dana Pe'er', with a stylized, flowing script.

Chair, Computational and Systems Biology Program
Director, Gerry Center for Metastasis and Tumor Ecosystems
Director, Single Cell Research Initiative
Sloan Kettering Institute, Memorial Sloan Kettering Cancer Center

Appx28888

Exhibit B

Appx28889



Greg Gibson, Professor
School of Biological Sciences
Atlanta, Georgia 30332-0230 USA

January 4, 2019

To Whom It May Concern:

It has come to my attention that BioRad is seeking to prevent 10X Genomics from selling their single cell products. In addition, they have used the instrument which I supervise the usage of, as an example that supports their claim for equivalency of the BioRad ddseq with the 10X Genomics system. That is a claim that I explicitly do not agree with: the two systems are complementary in some respects, but there are critical applications for which the 10X system provides the only option. It follows that if we were to lose the ability to use the 10X instrument the research we support would be severely impacted.

The Center for Integrated Genomics in the School of Biology at Georgia Tech acquired the ddseq system from BioRad in the Summer of 2017. Despite several visits from the BioRad support team while getting the instrument up and running, we were unable to achieve acceptable results for the primary application that we are interested in. This is profiling of primary human blood cells, also known as peripheral blood monocyctic cells, or PBMC: the protocol offered by BioRad does not work (and I am not aware of publications showing that it does) and the experiments are too expensive to risk failure. Consequently, in the Fall of 2018 we elected to purchase the 10X Genomics system with feedback and recommendations from colleagues at multiple universities around the world, some of whom had experienced similar frustrations with the ddseq. The 10X system is superior, it is generating superb data from PBMC and is supporting several collaborative efforts studying the genetic basis of autoimmune disease and of cancer immunotherapy. In addition, our colleagues in the Center for Cell Manufacturing at Georgia Tech have switched to the 10X system because it provides much greater throughput, greater consistency and repeatability, and for large projects is far more cost-effective. We retain the BioRad ddseq system for small studies of cell lines, and for pilot research by colleagues with less experience in single cell genomics, but to say it is equivalent is unambiguously false.

To be clear, neither I, nor the institutions with which I am associated, wish to take a position in the legal matter between BioRad and 10X Genomics. However, you should know that I did not give my consent for BioRad to use our name in their filing and would not have given it. I also hope that the extremely detrimental impact of an injunction against 10X Genomics on our research and that of thousands in the genomics community, will be taken into consideration.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Greg Gibson', with a stylized flourish extending to the right.

Greg Gibson
Professor and Director, Center for Integrative Genomics
Co-Director, CHoA Center for Transplantation and Immune Disorders

Appx28890

Exhibit C

Appx28891



UT MD Anderson Cancer Center
Department of Translational Molecular Pathology
2130 W. Holcombe Blvd
Life Science Plaza, Unit 2951
Houston, TX 77030

January 4th, 2019

To Whom It May Concern:

I am a Scientific Manager at The University of Texas MD Anderson. I am writing because I feel that an injunction against 10x Genomics would have a negative impact on my research progress.

The work in my lab focuses on pancreatic cancer. In my laboratory we apply genomics, transcriptomics and systems biology to uncover the underlying dysfunction in cancer. We are performing single cell transcriptomics and copy number variation detection in tissues obtained from fine needle aspirates of pancreatic cancers. The goal of this work is to determine how heterogeneous populations of tumor cells may lead to previously identified molecular subtypes of pancreatic cancer which dictate response to therapy. Additionally, we are performing single cell RNA sequencing of established organoid cultures from human pancreatic cancer, in order to perform in detailed silico pharmacogenomic analysis.

I use 10X's single cell system to perform experiments on large numbers of single cells. Specifically, I used 10X's single cell RNA-seq and single cell DNA products to understand gene dysfunction in cancer. Indeed, we are now in a revolution in which genomes and other "omes" can be readily characterized, and I believe that 10X is leading this revolution for single cell analysis.

While there are other companies such as Bio-Rad provide substitute products for single cell sequencing, none of these other products is a true substitute. The Bio-Rad ddSeq doesn't offer the assortment of assays that 10X offers. But the big difference is in the lack of performance of the Bio-Rad ddSeq. For example, the 10X's system has much higher cell capture rates, higher data quality, and higher sensitivity. This is a difference that makes all the difference for my research. The ddSeq is completely inadequate.

I am informed that BioRad is seeking an injunction that would prevent 10X from selling its products. If I had to switch to a new single cell system, it would do great harm to my research, which I would not be able to effectively carry out on Bio-Rad's or anyone else's products. Finally, in the worst case scenario in which I am forced to use a new product, I would need months to transition my research to a new product.

Sincerely,



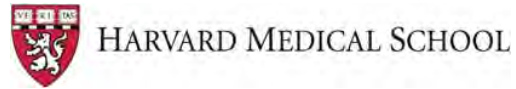
Paola A. Guerrero Ph.D, M.S.
Scientific Manager

CARING

Appx28892 DISCOVERY

Exhibit D

Appx28893



Leslie S. Kean, MD, PhD

Director, Stem Cell Transplantation Program
Dana-Farber/Boston Children's Cancer and Blood Disorders Center
1 Blackfan Circle, Karp Research Building 08215
Boston, Massachusetts 02115
phone 617-919-1370 |
leslie.kean@childrens.harvard.edu

January 4, 2019

To Whom It May Concern:

I am currently the Director of the Stem Cell Transplantation Program at Boston Children's Hospital/Dana Farber Cancer Institute. I am writing regarding the negative impact that an injunction against 10X Genomics would have on important ongoing research in my labs at both Boston Children's Hospital and Seattle Children's Hospital.

The work in these labs focuses on applying genomics, transcriptomics, and other systems-wide analysis to establish new and effective treatment for pediatric patients. Specifically, we started the PREDICT trial (Precision Diagnostics in Inflammatory Bowel Disease, Cellular Therapy and Transplantation) in late 2017 with the goal of gaining a better understanding of how the immune system drives both inflammatory bowel disease (IBD) in pediatric autoimmunity patients and graft-versus host disease (GVHD) in pediatric bone marrow transplant (BMT) patients. Bone Marrow Transplant is used to treat a wide range of pediatric conditions from leukemia to inherited bone marrow failure syndromes, congenital metabolic disorders and other metabolic diseases.

In order to carry out this research, we use 10X's single cell system to perform experiments on large numbers of single cells from clinical patient cohorts. Specifically, I use 10X's single cell RNA-seq and Single Cell Immune Profiling products (5' TCR immune profiling) to understand why inflammatory bowel disease (IBD) and graft-versus host disease GVHD (the deadliest complication associated with BMT) arise in children. By gaining a foundational molecular diagnostic knowledge about a patient's T cells, we hope to ultimately discover better treatment approaches for both IBD and GVHD. To date we have run 51 patients through our program. For each enrolled patient, we sample 7 different tissues and run both of 10X's 3' and 5' assays for Gene expression and TCR sequencing. The unprecedented scale of 10X's solution, combined with the robust protocols and efficient capture rate of cells is what has enabled this work so far. This work is currently being prepared for publication and will be presented this year at (1) The 2019 Crohn's and Colitis Congress, February 7-9, Las Vegas NV and (2) The Keystone Symposium on Single Cell Biology, January 13-17, Breckenridge CO. Our work would not be possible without 10x Genomics products. 10X Genomics are truly leading a revolution in how science is conducted, and permitting studies like PREDICT to gain unprecedented insight into deadly diseases affecting both children and adults.

I am informed that BioRad is seeking an injunction that would prevent 10X from selling its products, including future reagents and microfluidic chips that would be used with my 10X instruments. If I had to switch to a new single cell system, it would do great harm to my research, which I would not be able to effectively carry out on Bio-Rad's or anyone else's products. 10X's platform is enabling our research program due to its inherent scale, speed and performance. We have already invested >\$1,500,000 in generating data on these first 51

Appx28894

patients. If I were forced to transition to another technology for this work, there is a good chance that this initial investment would be wasted. Finally, in the worst-case scenario in which I am forced to use a new product, I would need at least 12 months to transition my research to that new platform (if a suitable product existed), and would likely have to enroll many additional patients on-study, which would be a significant detriment to the goals of this work, which include rapid dissemination of our results to the patient community.

Please let me know if you have any further questions. I would be happy to discuss the profoundly positive impact that the 10X platform has had on my work.

Sincerely,



Leslie Kean, MD, PhD
Professor, Department of Pediatrics, Harvard Medical School
Director, Stem Cell Transplantation Program
Division of Pediatric Hematology/Oncology, Boston Children's Hospital
Department of Pediatric Oncology, Dana-Farber Cancer Institute

Appx28895

Exhibit E

Appx28896

January 4th, 2019

Re: Letter in support of continuation of 10X Genomics

To Whom It May Concern:

I am the Professor and Chair of Translational Genomics at the Keck School of Medicine University of Southern California. I am concerned that an injunction against 10x Genomics would cause profound and considerable damage to my current and future research plans.

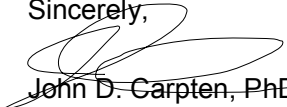
The core theme of our department and research program is genomics and genome sciences. My research interests focus on cancer genomics, and spans molecular profiling of many tumor types including, but not limited to, prostate cancer, breast cancer, colon cancer, brain cancer, and multiple myeloma, in addition to several forms of pediatric cancer. We have made a number of significant discoveries that have led to new and improved ways of diagnosing and treating cancer.

Indeed, we are now in a revolution in which genomes and other “omes” can be readily characterized, and I believe that 10X is leading this revolution for single cell analysis. I have applied the 10X's single cell system to interrogate the genomes, epigenomes and transcriptomes of tumors to identify targetable events for select therapeutics that might be specific to small populations of cells within a tumor or cancer. The 10X Genomics assays for single cell RNA-seq, single cell DNA, and single cell ATAC products are instrumental to my current and future scientific endeavors. We have several grants including studies of ovarian cancer and endometrial cancer that have been recently funded that proposed and require the use of the 10X Genomics single cell system and assays.

While there are other companies such as Bio-Rad provide similar products for single cell sequencing, none of these other products represent a true substitute for the types of assays that are needed for our work, particularly the DNA sequencing and epigenetic (ATAC-seq) assays. The Bio-Rad ddSeq does not offer either single cell DNA or single cell ATAC. The lack of these products would eliminate some of the experiments that I have worked so hard to acquire funding and precious samples for. With regard to single cell RNA Seq, the 10X Genomics system has much higher cell capture rates, higher data quality, and higher sensitivity, providing more robust experimental designs. In essence, the ddSeq single cell RNA seq assay is inferior to the point that it is unusable for my purposes.

I am informed that BioRad is seeking an injunction that would prevent 10X Genomics from selling its products. If I had to switch to a new single cell system, it would do significant harm to my research and to the work of my research trainees who have invested significant time and effort in this work. And I simply cannot afford to carry out on Bio-Rad's or anyone else's products, mainly because none of these other products can provide the type of data that I need for my funded research studies. Finally, in the worst case scenario in which I am forced to use a new product, I would need months to transition my research to a new product. Therefore, I implore you to not grant any injunction that would prohibit me from purchasing and gaining access to the 10X Genomics system as funding and training is highly relying on the availability of this technology.

Sincerely,


John D. Carpten, PhD
Professor and Chair
Department of Translational Genomics
Director, USC Institute for Translational Genomics
Director, USC Molecular Genomics Core

University of Southern California Keck School of Medicine 1441 Eastlake Avenue, Los Angeles, CA 90033

Appx28897

Exhibit F

Appx28898

January 4th, 2019

To Whom It May Concern:

I am a Professor at University of California San Francisco Cellular Molecular Pharmacology UCSF School of Medicine. I am writing to document the fact that an injunction against 10x Genomics would have a dramatic negative impact on my research progress.

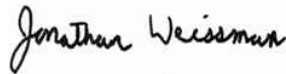
My laboratory explores how cells ensure that proteins fold into their correct shape, as well as the role of protein misfolding in disease and normal physiology. My group is also widely recognized for building innovative tools for broadly interrogating the organizational principals of biological systems. These include ribosome profiling for globally monitoring protein translation and the development of CRISRPi/a to enable fine-tuned modulating human gene expression at genome scale. More recently, we co-developed Perturb-seq, which pairs CRISPRi/a with advances in droplet-based single cell RNA-seq to enable the systematic exploration of gene function with ultra-rich phenotypic readouts. Perturb-seq has become a powerful engine for discovery in my lab, revealing for example how cells use the three branches of the mammalian unfolded protein response (UPR) to monitor and correct distinct types of ER stress. Moving forward, I anticipate that Perturb-seq will be a key tool for elucidating the information encoded within genomes in a principled and unbiased manner. Most recently we have developed a molecular recording technology with single cell read out. This approach was part of a larger set of techniques that were just recognized by Science magazine as being the “breakthrough of the year” for 2018.

Appx28899

The 10x genomic single cell RNA-seq has proven to be an essential and irreplaceable component of the Perturb-seq and molecular recorder approaches. While there are other companies such as Bio-Rad that provide approaches for single cell sequencing, none of these other products would be even close to being an acceptable substitute for our studies. In particular, the Bio-Rad ddSeq simply doesn't offer the scale of assay required for my experimentation.

I am informed that BioRad is seeking an injunction that would prevent 10X from selling its products. If I had to switch to a new single cell system, it would do great harm to my research, which I would not be able to effectively carry out on Bio-Rad's or anyone else's products.

Sincerely,

A handwritten signature in black ink that reads "Jonathan Weissman". The signature is written in a cursive, flowing style.

Jonathan Weissman

Exhibit G

Appx28901

December 17, 2018

Jason H. Bielas, Ph.D.
Full Member
T 206.667.3170 / F 206.667.2537
Mail Stop M5-A864
jbielas@fredhutch.org

To Whom It May Concern,

I am a Full Member in the Translational Research Program (TRP) at Fred Hutchinson Cancer Research Center (Fred Hutch) and hold an Affiliate Associate Professorship in the Department of Pathology at the University of Washington.

The *mission* of my laboratory is to **prevent disease, advance treatment, and increase patient survival**. To this end, we pursue a broad-based methodological approach to elucidate the fundamental and clinical implications of nuclear and mitochondrial DNA mutations in the pathogenesis of cancer and age-related disease.

The majority of our projects set out to address long-standing intractable questions in mutation research, which have remained unanswered, largely due to technical limitations. We are using the 10X Genomics single cell system, in pursuit of these questions and our overarching laboratory *mission*.

It has come to my attention that Bio-Rad is seeking to prevent 10X from selling their single cell products. If this were to occur, my research, and that of my many collaborators, would be severely impacted as there is no other alternative, with an equivalent technical performance that can be substituted in its place.

In no way am I, nor are the institutions for which I am associated with, taking a position in the matter between Bio-Rad and 10x Genomics. I do hope, however, that the impact of a possible injunction on our research, and thus lives of our patients will be taken into consideration.

Thank you,

Jason Bielas

Appx28902

Exhibit H

Appx28903



December 17, 2018

To Whom It May Concern:

I am currently the Maureen Lyles D'Ambrogio Professor of Medicine and Vice Chair of the Department of Medicine at the Stanford University School of Medicine. I am writing regarding the negative impact that an injunction against 10X Genomics would have on important research in my lab at Stanford.

The work in my lab focuses on applying genomics, transcriptomics, and other systems-wide analysis to analyze stem cell biology and cancer therapeutics. We can grow normal and diseased human tissues in petri dishes as 3-dimensional "organoids". These studies have the potential to generate stem cells that can be transplanted for treatment of diseases such as inflammatory bowel disease or cystic fibrosis. Other investigations in my lab study how the immune system can be used to treat cancer, growing organoids that contain both tumor cells and the cancer-fighting immune cells together as a unit.

To carry out this research, I use the 10X Genomics single cell system to perform experiments on large numbers of single cells. Specifically, I used 10X's single cell RNA-seq and Single Cell Immune Profiling products to analyze thousands of individual cells at a single cell resolution. In one study, published in Nature in 2017, we used the 10X single cell RNA-seq platform to analyze 50 times more individual intestinal stem cells than was previously possible, which indicated strategies by which these stem cells could be more effectively produced (Yan, Janda et al. 2017). In another study, published in Cell Stem Cell in 2017, we used the 10X single cell RNA-seq method to detect differences between intestinal stem cells that are specifically induced to repair the intestine after injury (Yan, Gevaert et al. 2017). Lastly, as published in the journal Cell in 2018, we used the 10X Single Cell Immune Profiling product to demonstrate that organoids from tumor biopsies possess a wide diversity of potentially cancer-fighting immune populations (Neal, Li et al. 2018). These were all collaborative projects in which 10X scientists actively participated. There is absolutely no doubt in my mind that 10x Genomics products have transformed how science is conducted. Previously, single cell transcriptomic analysis has been quite cumbersome, and unable to analyze large numbers of cells. The 10X methods have truly revolutionized single cell analysis and brought it to the masses.

I have learned that Bio-Rad is seeking an injunction that would prevent 10X from selling its products, including future reagents and microfluidic chips that would be used with my 10X instrument. If I had to switch to a new single cell system, it would do great harm to my research,

Appx28904

which I would not be able to effectively carry out on Bio-Rad's or anyone else's products. The Bio-Rad solution appears to be tied to particular sequencing machines which would be a constraint on our studies. Finally, in the worst-case scenario in which I am forced to use a new product, I would need months to transition my research, which would severely compromise our research efforts. Please let me know if I can provide any further information in this regard.

Sincerely,

Calvin Kuo, M.D., Ph.D.
D'Ambrogio Professor of Medicine
Vice Chair, Department of Medicine
Co-Lead, Cancer Biology Program,
Stanford Cancer Center
Stanford University
Lokey G2034A
265 Campus Drive
Stanford, CA 94305 USA
ckkuo@stanford.edu
Office: 650 498 9047
Fax: 650 721 4125

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Yan, K. S., O. Gevaert, G. X. Y. Zheng, B. Anchang, C. S. Probert, K. A. Larkin, P. S. Davies, Z. F. Cheng, J. S. Kaddis, A. Han, K. Roelf, R. I. Calderon, E. Cynn, X. Hu, K. Mandleywala, J. Wilhelmy, S. M. Grimes, D. C. Corney, S. C. Boutet, J. M. Terry, P. Belgrader, S. B. Ziraldo, T. S. Mikkelsen, F. Wang, R. J. von Furstenberg, N. R. Smith, P. Chandrakesan, R. May, M. A. S. Chrissy, R. Jain, C. A. Cartwright, J. C. Niland, Y. K. Hong, J. Carrington, D. T. Breault, J. Epstein, C. W. Houchen, J. P. Lynch, M. G. Martin, S. K. Plevritis, C. Curtis, H. P. Ji, L. Li, S. J. Henning, M. H. Wong and C. J. Kuo (2017). "Intestinal Enteroendocrine Lineage Cells Possess Homeostatic and Injury-Inducible Stem Cell Activity." Cell Stem Cell **21**(1): 78-90 e76.

Yan, K. S., C. Y. Janda, J. Chang, G. X. Y. Zheng, K. A. Larkin, V. C. Luca, L. A. Chia, A. T. Mah, A. Han, J. M. Terry, A. Ootani, K. Roelf, M. Lee, J. Yuan, X. Li, C. R. Bolen, J. Wilhelmy, P. S. Davies, H. Ueno, R. J. von Furstenberg, P. Belgrader, S. B. Ziraldo, H. Ordonez, S. J. Henning, M. H. Wong, M. P. Snyder, I. L. Weissman, A. J. Hsueh, T. S. Mikkelsen, K. C. Garcia and C. J. Kuo (2017). "Non-equivalence of Wnt and R-spondin ligands during Lgr5+ intestinal stem-cell self-renewal." Nature **545**(7653): 238-242.

Appx28905

Exhibit I

Appx28906



December 18, 2018



Xiaole Shirley Liu, Ph.D.

Professor of Biostatistics and Computational Biology
Harvard T.H. Chan School of Public Health

Professor of Statistics
Faculty of Art and Sciences, Harvard University

Director of Center for Functional Cancer Epigenetics
Dana-Farber Cancer Institute

Associate Member
Broad Institute of Harvard and MIT

450 Brookline Ave, Mail CLS11007, Boston, Massachusetts 02215
617.632.2472 tel 617.632.2444 fax

xslu@jimmy.harvard.edu, <http://liulab.dfci.harvard.edu>

To Whom It May Concern:

I am a Professor of Biostatistics at the Harvard School of Public Health and Co-Director of the Center for Functional Cancer Epigenetics at the Dana-Farber Cancer Institute. The CFCE has been at the frontier in epigenetic profiling techniques and analyses. We were among the first to adopt ChIP-seq and ATAC-seq, for developing low-input and FFPE ChIP-seq protocols, and for using it in impactful cancer studies. Recently we have a project, where we observed very interesting phenotype of mouse tumor responding differently to immune checkpoint inhibitors depending on the timing of steroid application. 10X's products have brought paradigm shifts to gene regulation studies, especially in understanding cancer biology and immunology. We are currently using scRNA-seq and scATAC-seq on the 10X genomics platform to investigate the tumor microenvironment changes under different steroid application conditions. In addition to this experimental effort, we have also been analyzing many publicly available 10X Genomics scRNA-seq data in cancer and immune cells to generate useful insights. These studies not only take advantage of our epigenetic and immunology expertise, but also might bring immediate clinical insights to cancer immunotherapy.

It has come to my attention that Bio-Rad is seeking to prevent 10X from selling their single cell products. If this were to occur, my research, and that of my many collaborators, would be severely impacted as there is no other alternative. The 10X's single cell system allows me to analyze cells in manner not available from Bio-Rad or any other company.

To be clear, neither I, nor the institutions for which I am associated with are taking a position in the matter between Bio-Rad and 10x Genomics. However, I hope the impact of an injunction on my research will be taken into consideration.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Xiaole Liu'.

Xiaole Shirley Liu, Ph.D.

A Teaching Affiliate
of Harvard Medical School

Appx28907

Exhibit J

Appx28908



STANFORD UNIVERSITY SCHOOL OF MEDICINE

Hanlee P. Ji, M.D.
Associate Professor

*Division of Oncology
Department of Medicine
CCSR 1115
Stanford, California 94305-5151
Phone (650) 721-1503
Fax (650) 725-1420*

December 19, 2018

To whom it may concern:

I am an Associate Professor at Stanford University and lead a biomedical research team that investigates the cause of cancer and discovers new treatments for treating cancer patients. I am writing this letter in regard to a potential halt of sales of the 10X Genomics product for single cell and linked read analysis.

Using the 10X Genomics products, we are conducting multiple studies that are leading to new discoveries about cancer and providing us with candidate for new types of treatments for patients with this disease. The key advantage of these reagents is their high performance when using clinical samples from patients. These reagents are very complex in composition and undergo extensive quality control that insures that our scientific results are of the highest level of quality and accurate. Our attempts to generate these reagents on our own would be extraordinarily costly and slow down if not halt our research in helping cancer patients.

Importantly, many of the 10X Genomic reagents are unique, seeing that there are no practical alternatives, commercial or otherwise, that would enable us to continue our research in discovering and improving new cancer therapies. Furthermore, a halt in sales of these unique reagents would have a major impact on biomedical research – it would practically stop many promising avenues of research leading to improving the treatment of a wide variety of diseases. Many research groups at Stanford and elsewhere rely on these unique reagents to investigate the cause and treatment of various disease. Without them, much of this work will stop and it will be difficult to move forward.

Sincerely,

A handwritten signature in black ink, appearing to be "H. Ji".

Hanlee Ji, M.D.

Appx28909

Exhibit K

Appx28910



STANFORD UNIVERSITY SCHOOL OF MEDICINE
DEPARTMENT OF GENETICS

Michael Snyder, Ph.D.

Stanford B. Ascherman Professor and Chair
Director, Center for Genomics and Personalized Medicine

Phone: (650) 736-8099

Fax: (650) 725-1534

December 19, 2018

To Whom It May Concern:

I am the Stanford B. Ascherman Professor and Chair of Genetics and Director of Genomics and Personalized Medicine at Stanford University School of Medicine. I am writing because I feel that an injunction against 10x Genomics would have a negative impact on my research progress.

In my laboratory we apply genomics, transcriptomics and systems biology to uncover the underlying dysfunction in human disease. For example, we will map open chromatin regions in single cells from both diseased and normal human tissues. These studies will greatly expand the catalog of regulatory regions in the human genome.

I use 10X's single cell system to perform experiments on large numbers of single cells. Specifically, I used 10X's single cell RNA-seq and ATAC-seq products to understand how genes are regulated with single cell resolution. These experiments are used to understand how genetic variations among humans affect health. This platform is essential for our \$13M NIH-sponsored PreCancer Atlas grant as well as other projects. Indeed, we are now in a revolution in which genomes and other "omes" can be readily characterized, and I believe that 10X is leading this revolution for single cell analysis.

While there are other companies such as Bio-Rad that provide commercial products for single cell sequencing, none of these other products can replace 10X. In developing my research plan and experimental protocols, I considered the pros and cons of a number of different single cell products, including 10X's Chromium system and BioRad's ddSEQ system. Each system gives different data and has different capabilities. I ultimately chose to use 10X's system because of its high cell capture rates, high data quality, high sensitivity, and low cost per cell.

I am informed that BioRad is seeking an injunction that would prevent 10X from selling its products. If I had to switch to a new single cell system, it would do great harm to my research, which I would not be able to effectively carry out on Bio-Rad's or anyone else's products. Furthermore, in the worst case scenario in which I am forced to use a new product, I would need months to transition my research to a new product. Thus, it is essential for our research and for efficient use of taxpayers funds to continue to use 10X system.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Snyder".

Michael Snyder, Ph.D.

Stanford B. Ascherman Professor and Chair, Department of Genetics
Director, Stanford Center for Genomics and Personalized Medicine
School of Medicine, Stanford University

Appx28911



Appx28920

Appx28920

Bio-Rad Laboratories, Inc. et al. v. 10x Genomics, Inc.

No. 1:15-cv-00152

Direct Examination of

Dr. Ben Hindson

10X Chief Scientific Officer, President, and Co-Founder

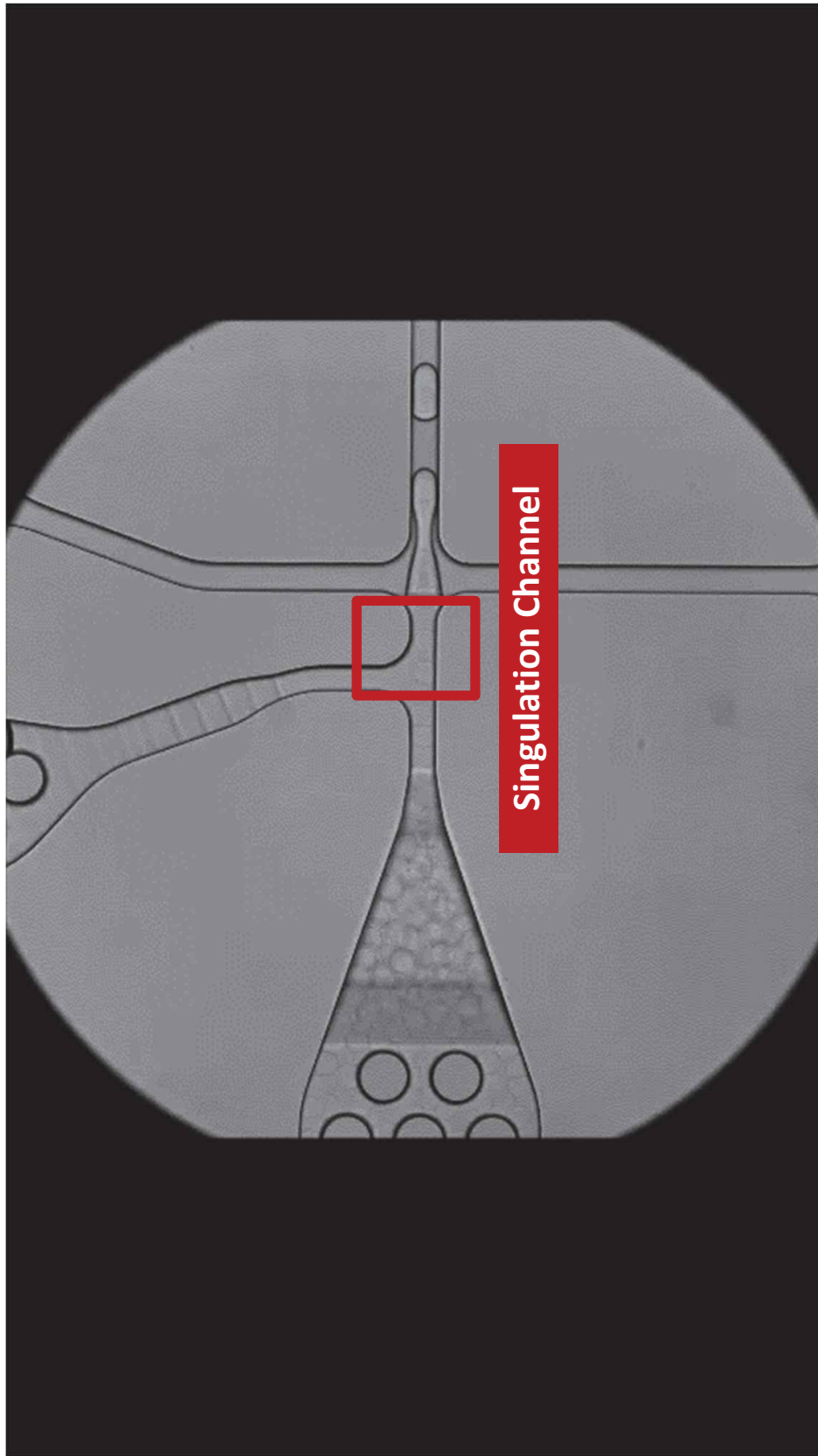
DDX6.1

10X's Product Workflow



Appx28924

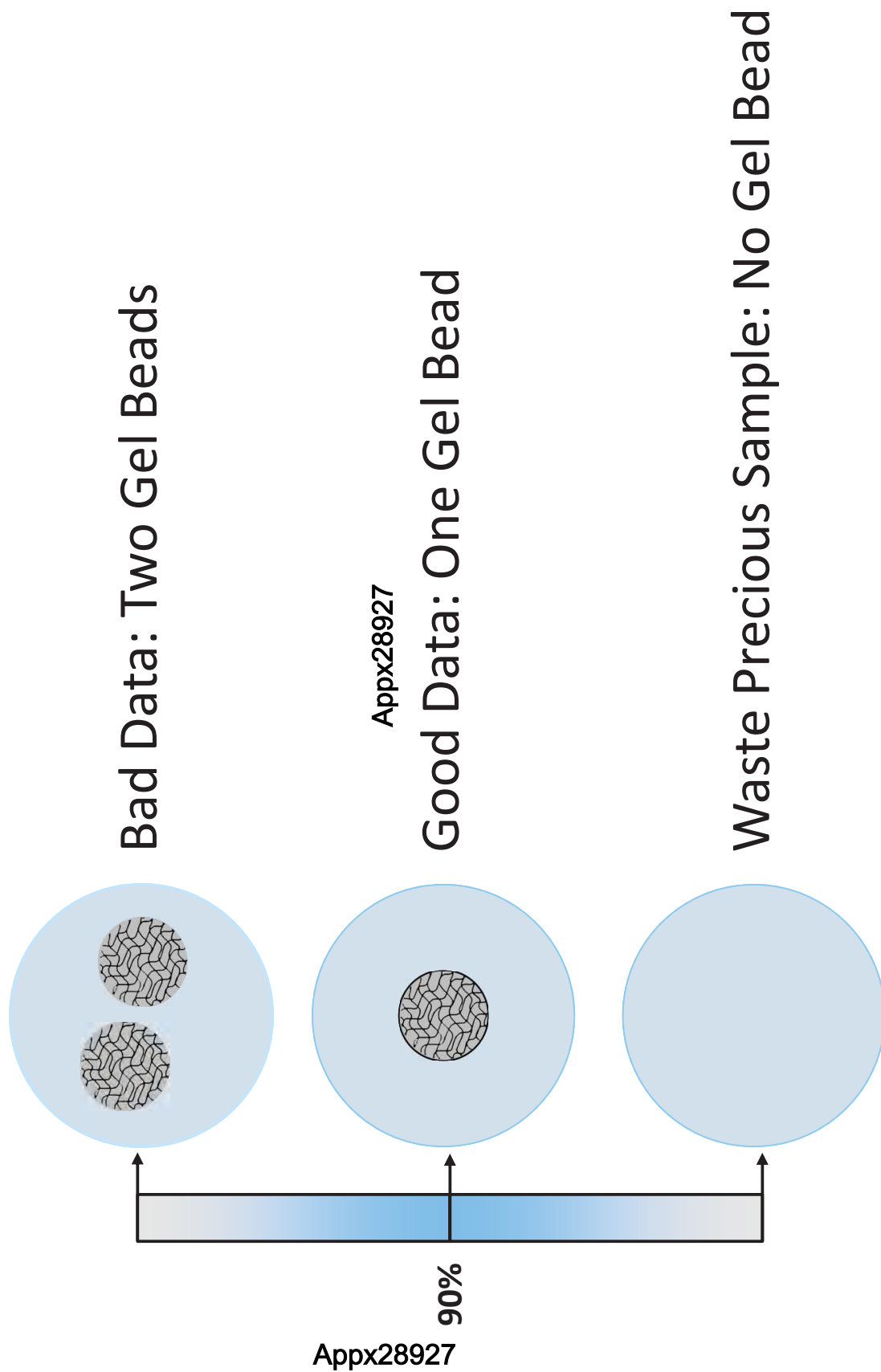
Gel Bead Loading: Singulation Channel



DDX6.7

Appx28926

Gel Bead Loading Is A Balancing Act



Product Comparison

	 Chromium Single Cell	 ddSeq
Cells Per Run	80,000 +	~1,200s
Cell Capture Efficiency	Up to 65%	5-10%
Doublet Rate	Less than 1%	> 5%
Lower Price Per Cell	\$0.28	~\$1.00

Appx28931

Product Comparison

	 Chromium Single Cell	 ddSeq
Cells Per Run	80,000 +	~1,200s
Cell Capture Efficiency	Up to 65%	5-10%
Doublet Rate	Less than 1%	> 5%
Lower Price Per Cell	\$0.28	~\$1.00

Appx28931

DTX-1050.0007, .0030

DDX6.12

03:04:27 1 Thornton away now. You understand that there are several
03:04:37 2 ways that customers of Bio-Rad's single cell products ddSEQ
03:04:44 3 and 10X's single cell products measure the performance of
03:04:48 4 those products, right?

03:04:49 5 A. That's correct.

03:04:50 6 Q. One of those is called cell utilization?

03:04:53 7 A. That's correct.

03:04:54 8 Q. And you're familiar with the fact that 10X's cell
03:05:00 9 utilization is substantially better than Bio-Rad's?

03:05:02 10 A. Yes, I am.

03:05:03 11 Q. And that's something customers care about, isn't it?

03:05:05 12 A. Some customers care about that, yes.

03:05:08 13 Q. And another variable is the amount of bad data that
03:05:14 14 you get, right?

03:05:15 15 A. That's correct.

03:05:16 16 Q. And in that metric, 10X is also substantially better
03:05:21 17 than Bio-Rad's ddSEQ product, isn't it?

03:05:23 18 A. I'm not sure I agree with that.

03:05:25 19 Q. Have you seen measures that Bio-Rad's bad data is
03:05:29 20 more than five percent?

03:05:30 21 A. I have not seen those data.

03:05:32 22 Q. Never seen it?

03:05:33 23 A. Uh-huh, that's correct.

03:05:34 24 Q. Have you seen data that 10X's bad data presented is
03:05:40 25 below 1%?

Appx29643

03:05:41 1 A. At my level, I'm not in that level of analysis, so
03:05:47 2 sorry.
03:05:49 3 Q. Have you seen measures of the numbers of cells that
03:05:56 4 it can process in a single run?
03:05:58 5 A. I think you showed that --
03:05:59 6 Q. I did.
03:06:00 7 A. -- today, yes.
03:06:00 8 Q. Other than what I showed.
03:06:02 9 A. Yeah.
03:06:04 10 Q. Other than what I showed --
03:06:06 11 A. Like I said, most of my focus, if I'm dropping down
03:06:13 12 from my larger life science role, but most of my focus is on
03:06:19 13 the droplet PCR business right now in terms of monitoring
03:06:24 14 sales our plans for the sequencing project, products are
03:06:29 15 really future state since we know we have work to do to
03:06:35 16 develop next generation products.
03:06:41 17 Q. So Bio-Rad's ddSEQ product is Bio-Rad's only single
03:06:47 18 cell product, right?
03:06:48 19 A. It's our first droplet product in sequencing sample
03:06:54 20 prep, that's correct.
03:06:55 21 Q. The ddPCR isn't sequencing sample prep, is it?
03:07:01 22 A. No, it's our droplet PCR product.
03:07:04 23 Q. And Bio-Rad's ddSEQ product is, as I said earlier, is
03:07:10 24 the one that competes with 10X's single cell product, right?
03:07:13 25 A. Today that's true, yes.

Appx29644

03:07:14 1 Q. And Bio-Rad's ddSEQ product is the one that's been on
03:07:19 2 sale for almost two years, right?

03:07:20 3 A. Going on two years.

03:07:22 4 Q. And you're responsible for that ddSEQ single cell
03:07:26 5 product, true?

03:07:27 6 A. I'm responsible for thousands of products at Bio-Rad,
03:07:31 7 so yes.

03:07:31 8 Q. That's the only one you have that's single cell
03:07:34 9 sequencing sample prep, true?

03:07:36 10 A. That is true.

03:07:37 11 Q. Now, through -- as you said, ddSEQ has been on sale
03:07:57 12 for about two years. Total sales for that period, the
03:08:00 13 entire period for the whole two years is about \$2 million,
03:08:04 14 right?

03:08:05 15 A. I actually think it's higher than that, but I don't
03:08:09 16 -- I don't monitor -- I'm fairly certain it's higher than
03:08:12 17 that, but I don't monitor that product line level sales, so
03:08:17 18 I don't get those reports. It's available, I just don't get
03:08:20 19 them.

03:08:21 20 Q. You're responsible for that business, though?

03:08:22 21 A. I'm responsible for an almost billion dollar business
03:08:27 22 for Bio-Rad, yes.

03:08:28 23 Q. I appreciate that, but this is the business that's at
03:08:31 24 issue in this case, right?

03:08:33 25 A. Well, I think what's at issue in this case is our

Appx29645

03:08:37 1 droplet business.

03:08:39 2 Q. Well, the droplet PCR business, that doesn't compete
03:08:42 3 with 10X, does it?

03:08:44 4 A. Well, it uses the same underlying technologies.

03:08:49 5 Q. It does?

03:08:50 6 A. Yeah.

03:08:51 7 Q. Does the droplet PCR business use gel beads?

03:08:55 8 A. Uses droplets.

03:08:57 9 Q. Does it use gel beads?

03:08:59 10 A. It uses droplets.

03:09:01 11 Q. I understand that. Does it use gel beads?

03:09:04 12 A. No.

03:09:05 13 Q. Does it use barcodes?

03:09:08 14 A. No, but the underlying technology is what I'm talking
03:09:12 15 about. The product built technology on top of -- the
03:09:19 16 underlying technology.

03:09:21 17 Q. So in terms of the total amount of sales, you just
03:09:23 18 don't know what it is?

03:09:24 19 A. It's several million. I just -- honestly I just
03:09:27 20 don't track product line by product line.

03:09:29 21 Q. It's well below \$5 million, isn't it?

03:09:32 22 A. Pardon me?

03:09:32 23 Q. It's well below \$5 million for the full two years,
03:09:36 24 isn't it?

03:09:37 25 A. I'm sorry, if I knew -- if I knew that, then I could

Appx29646

03:09:41 1 tell you the number. It's certainly below 10 million, but
03:09:44 2 I'm just not sure what the exact number is.

03:09:42 3 Q. Okay. Just a few questions. A few more questions
03:09:56 4 about the Applera-Bio-Rad business.

03:09:58 5 A. Mm-hmm.

03:09:58 6 Q. You testified about that on direct examination; true?

03:10:01 7 A. I did.

03:10:02 8 Q. Now, that wasn't just a normal negotiation between a
03:10:09 9 licensor who comes and says, Hey, I've got a patent. Maybe
03:10:12 10 you're interested in it. You start doing negotiations.

03:10:15 11 It wasn't like that, was it?

03:10:16 12 A. It was a difficult negotiation, I would agree.

03:10:18 13 Q. And one of the -- and you testified, for example,
03:10:21 14 about the Caliper agreement. You said you had a lot of
03:10:25 15 leverage in that discussion; do you recall that?

03:10:26 16 A. That's right.

03:10:27 17 Q. You had no leverage in the Applied Biosystems-Applera
03:10:32 18 agreement, did you? The Applera agreement?

03:10:33 19 A. We didn't have as much leverage. That's true.

03:10:36 20 Q. And one reason you had no leverage is that there had
03:10:40 21 already been a trial about whether the products that were at
03:10:44 22 issue infringed?

03:10:46 23 A. No, that's not true. This -- the Applera patent was
03:10:51 24 about the Higuchi patent. And there was no U.S. trial about
03:10:58 25 that between Bio-Rad and --

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03:11:01 1 Q. Do you recall that there was a trial regarding some
03:11:05 2 PCR patents against a company called MJ?
03:11:08 3 A. Yes, thermal cyclers. Different patent family.
03:11:11 4 Q. Agreed. And do you recall that MJ was found to
03:11:17 5 infringe those patents?
03:11:18 6 A. I do recall that.
03:11:19 7 Q. And after that finding, Bio-Rad bought MJ; right?
03:11:23 8 A. They begged us and we did. Yes.
03:11:26 9 Q. So now Bio-Rad has bought a company that's been found
03:11:29 10 to infringe; true?
03:11:31 11 A. We had licensed, so they fell under our license.
03:11:34 12 Q. And then there was a dispute, and an injunction was
03:11:40 13 entered preventing future sales of those products; right?
03:11:43 14 A. Yes, on a technicality.
03:11:45 15 Q. And following that technicality, the judge said, I'm
03:11:51 16 going to hold a hearing to see whether Bio-Rad is in
03:11:54 17 contempt of the injunction. Do you recall that?
03:11:56 18 A. I don't actually recall that, but I'll trust you.
03:11:59 19 Q. Do you recall -- if you've heard this name, you'll
03:12:02 20 never forget. Do you recall a letter from someone named
03:12:06 21 Elmer Futterback?
03:12:09 22 A. Just recently, yeah. It was some funny fake name, I
03:12:14 23 think. Maybe that was fake news.
03:12:16 24 Q. Do you recall that in response to that letter, the
03:12:20 25 Court ordered a deposition of Bio-Rad personnel?

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03:12:24 1 A. I was not that close to the proceedings.

03:12:27 2 MR. REINES: Objection, Your Honor. We've
03:12:29 3 established the litigation that all this is talking about
03:12:32 4 for a different patent family than the license is about.
03:12:34 5 The license is about the Higuchi patent.

03:12:36 6 THE WITNESS: Yes.

03:12:37 7 MR. REINES: This is about another thing.

03:12:38 8 MR. POWERS: I'll tie it together, Your Honor.

03:12:40 9 BY MR. POWERS:

03:12:40 10 Q. Do you recall that at the time you signed the license
03:12:42 11 agreement for the Higuchi patent, there were also other
03:12:45 12 agreements that were entered into at about the same time?

03:12:49 13 A. Yes.

03:12:49 14 Q. One of those agreements was a license agreement where
03:12:54 15 Bio-Rad paid on these MJ thermal cycler patents at the same
03:12:58 16 time?

03:12:58 17 A. It was a long time ago, but okay, I think that's
03:13:02 18 right.

03:13:03 19 Q. In fact, there were a number of agreements all signed
03:13:06 20 about the same time between Applera and Bio-Rad; true?

03:13:09 21 A. That's right.

03:13:10 22 Q. And Bio-Rad was, is it fair to say, under the gun to
03:13:17 23 sign those agreements because of the injunction hearing that
03:13:20 24 was coming up?

03:13:21 25 A. Well, it was a difficult -- it was certainly a

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03:13:24 1 difficult negotiation and where we, I think, were hurt or
03:13:32 2 maybe wished we had more leverage was in the areas of the
03:13:38 3 upfront fees that we had to pay 17 million. The fact that
03:13:43 4 we had to take worldwide licenses, even if we were making
03:13:48 5 and selling in areas where there were no patents in force.
03:13:52 6 The 15-percent royalty, that was the standard going royalty,
03:13:56 7 and it was generally known in the industry and validated
03:14:02 8 when I was in the negotiation and doing diligence to buy
03:14:07 9 strategy that that was the rate everybody got.

03:14:10 10 So we got the same royalty rate, but we got a
03:14:13 11 bunch of other penalties that I don't think anybody else had
03:14:17 12 like the upfront fees and having to pay where there weren't
03:14:22 13 patents in force. That's the best to my recollection.

03:14:37 14 Q. I did hear you correctly to say that you hadn't heard
03:14:40 15 of Elmer Futterback until recently?

03:14:43 16 A. I -- yeah.

03:14:44 17 Q. You didn't hear about it at the time?

03:14:45 18 A. No. I wasn't that involved. At that level.

03:14:48 19 Q. So one point that you made that I want to come back
03:14:53 20 to is that you said droplets are needed to do single-cell
03:14:58 21 analysis. Do you recall saying that?

03:14:59 22 A. I do.

03:15:00 23 Q. There are several companies that are in the
03:15:02 24 single-cell market without droplets, aren't there?

03:15:05 25 A. Yes.

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03:15:05 1 Q. Fluidigm is one of them?

03:15:08 2 A. Not so successful.

03:15:09 3 Q. Fluidigm is one of them?

03:15:10 4 A. That's correct.

03:15:11 5 Q. Becton Dickinson Rhapsody product is one?

03:15:14 6 A. That's correct.

03:15:15 7 Q. Wafergen is one?

03:15:17 8 A. Yeah.

03:15:17 9 Q. And there's a lot of homegrown systems being used by

03:15:20 10 customers to do single-cell without droplets as well; true?

03:15:24 11 A. When I spoke to -- to answer your question, when I

03:15:28 12 spoke to a well-known researcher at Harvard about why he

03:15:32 13 wasn't using Fluidigm --

03:15:34 14 Q. I don't want to hear hearsay. I am just asking a

03:15:37 15 simple question.

03:15:37 16 A. Okay. Droplets are enabling and scalable, and that's

03:15:41 17 why they win over all those other technologies you

03:15:44 18 mentioned.

03:15:44 19 Q. My only question was whether, in addition to

03:15:49 20 Fluidigm, Becton Dickinson, and Wafergen, all of which have

03:15:53 21 non-droplet based single-cell systems, there's also a large

03:15:57 22 number of homegrown single-cell systems being used by

03:16:00 23 customers; true?

03:16:01 24 A. Most of which use droplets, yes.

03:16:04 25 Q. But there's many that do not; true?

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03:16:06 1 A. I don't know actually. I don't know about the ones
03:16:08 2 that don't.

03:16:08 3 Q. You would agree, I take it, that 10X single-cell
03:16:16 4 product is much, much more successful than Bio-Rad's ddSEQ
03:16:22 5 single-cell product?

03:16:23 6 A. I -- I think that that is the current state.
03:16:26 7 Absolutely.

03:16:27 8 Q. Probably about a hundred times more successful in
03:16:29 9 terms of sales?

03:16:30 10 A. Oh, I would have no way to judge.

03:16:32 11 Q. You don't know what -- do you know how many total
03:16:35 12 instruments Bio-Rad has sold of ddSEQ?

03:16:38 13 A. I don't.

03:16:39 14 Q. And so if Bio-Rad's ddSEQ system has droplets, and
03:16:50 15 10X's single-cell system has droplets, but also gel beads,
03:16:54 16 bar codes and many other things. It's actually not just
03:16:58 17 droplets that make it work, is it? You need more?

03:17:03 18 A. Yeah. We use bar codes as well. So I think -- I
03:17:07 19 think I've made that point several times today that getting
03:17:12 20 licensed to one set of rights doesn't mean that's the only
03:17:15 21 innovation you have to make. And I think they've done a
03:17:18 22 really good job, and we intend to do a good job as well.

03:17:23 23 MR. POWERS: Nothing further, Your Honor.

03:17:24 24 THE COURT: All right. Any redirect?

03:17:26 25 MR. REINES: Yes, very briefly, Your Honor.

02:49:00 1 performed the experiments using that surfactant.

02:49:06 2 THE COURT: So, Mr. Gindler, why don't you
02:49:10 3 ask -- he may have just said that, but I didn't catch that,
02:49:13 4 so why don't you ask him again.

02:49:15 5 BY MR. GINDLER:

02:49:15 6 Q. Did you work with this surfactant while you were at
02:49:18 7 QuantaLife?

02:49:19 8 A. Yeah. This is a chemical depiction of, in the form
02:49:24 9 of a 3D model, that represents that Zonyl surfactant that I
02:49:29 10 was referring to.

02:49:30 11 Q. And did you help to make this 3D model?

02:49:33 12 A. Yes.

02:49:33 13 Q. Thank you. I'd like to change topics now. I'd like
02:49:38 14 to talk a little bit about Bio-Rad's product. Now, does
02:49:42 15 Bio-Rad have a single cell gene expression product that uses
02:49:47 16 droplets?

02:49:48 17 A. Yes.

02:49:49 18 Q. And what's the product called?

02:49:51 19 A. It's called ddSEQ.

02:49:53 20 Q. Now, do you know when Bio-Rad's ddSEQ product was
02:49:57 21 released?

02:50:00 22 A. Early 2017.

02:50:02 23 Q. And when was 10X's Chromium single cell gene
02:50:06 24 expression product released?

02:50:08 25 A. About a year earlier, February, I think, of 2016.

02:50:13 1 Q. So can you take a look at what's exhibit DTX 1050 in
02:50:21 2 your notebook?

02:50:28 3 A. Okay.

02:50:28 4 Q. And what is exhibit 1050?

02:50:33 5 A. This is a power point presentation that we've
02:50:36 6 prepared to train our sales team.

02:50:39 7 MR. GINDLER: I'd like to offer exhibit DTX 1050
02:50:42 8 into evidence.

02:50:43 9 MR. REINES: No objection, Your Honor.

02:50:44 10 THE COURT: Admitted without objection.

02:50:47 11 BY MR. GINDLER:

02:50:48 12 Q. So let's put page 5 of this document on the screen.
02:50:50 13 And can you explain to the jurors what is depicted on this
02:50:55 14 slide, which is page 5 of exhibit DTX 1050?

02:51:01 15 A. Yes. This is a list of the -- shows the company
02:51:06 16 logos of those companies that 10X thinks are competitive in
02:51:11 17 the single cell gene expression market.

02:51:15 18 Q. Now, what are some of these companies?

02:51:17 19 A. So you can see that's Bio-Rad, Illumina, Fluidigm,
02:51:23 20 TaKaRa, Becton Dickinson, Dolomite. There's a chain of
02:51:27 21 them. There's 10 listed here. There may be more now.

02:51:30 22 Q. Also includes 1CellBio and Berkeley Lights and
02:51:35 23 Mission Bio?

02:51:36 24 A. Correct.

02:51:36 25 Q. And Bio-Rad is listed here as one of the competitors?

02:51:41 1 A. Yes.

02:51:41 2 Q. Can we put page 7 on the screen? And so what's
02:51:46 3 depicted on this slide?

02:51:50 4 A. This is the slide summarizing some key things, both
02:51:54 5 in terms of how much the instrument would cost to Bio-Rad's
02:51:59 6 ddSEQ instrument and then some performance metrics, how the
02:52:03 7 products works and how it performed and then how much it
02:52:06 8 also would cost to run an experiment using their product,
02:52:11 9 not the complete experiment, but at least that part of it.

02:52:14 10 Q. Have you prepared a slide which takes these
02:52:17 11 performance metrics that are listed here and compares them
02:52:20 12 to the performance metrics of 10X's single cell gene
02:52:24 13 expression product?

02:52:25 14 A. Yes.

02:52:26 15 Q. Let's take a look at that. So what I'd like to do is
02:52:32 16 walk through what's depicted on this slide. So I noticed
02:52:35 17 the
02:52:36 18 first --

02:52:36 19 MR. REINES: Your Honor, I'm going to object to
02:52:38 20 lack of foundation for this slide. There's none of this is
02:52:42 21 in the record. He's not in the competitive marketing. I
02:52:45 22 mean, he's a science guy.

02:52:47 23 MR. GINDLER: That's right. He's the science
02:52:49 24 guy, he understands everything about the Chromium single
02:52:52 25 cell product. He just walked through the work flow.

02:52:54 1 MR. REINES: I am not questioning that he knows
02:52:56 2 the Chromium single cell product. I didn't make any
02:52:59 3 objections about that. It's this comparison that doesn't
02:53:01 4 have any basis in the record and there's no foundation.

02:53:04 5 THE COURT: So --

02:53:06 6 MR. REINES: Can we put the slide down?

02:53:07 7 THE COURT: Well, so why don't you see whether
02:53:10 8 you can lay some foundation for the Bio-Rad products?

02:53:16 9 MR. GINDLER: Well, the Bio-Rad product comes
02:53:18 10 from a 10X document on competitors, which was just admitted
02:53:23 11 into evidence.

02:53:24 12 MR. REINES: Your Honor, that exacerbates the
02:53:27 13 concern. He's getting it from a Bio-Rad document.

02:53:30 14 THE COURT: Okay. Well, so, but wait, wait,
02:53:34 15 wait. So it's in evidence. What you're telling me is what
02:53:37 16 he was just showing me --

02:53:39 17 MR. GINDLER: That's correct.

02:53:40 18 THE COURT: You may proceed.

02:53:42 19 MR. GINDLER: Can you put the slide back up,
02:53:44 20 please?

02:53:44 21 BY MR. GINDLER:

02:53:45 22 Q. So can you explain what is shown in the first row and
02:53:50 23 says cells per run and compares the Chromium single cell
02:53:53 24 product to the Bio-Rad ddSEQ product.

02:53:57 25 A. Said. Per run you can get up to 80,000 cells per

02:54:02 1 run. And Bio-Rad, the current version was about 1,200.

02:54:07 2 Q. Now, what does it mean for cells per run? What's a
02:54:12 3 run?

02:54:12 4 A. A run was, basically what I walked you through there
02:54:15 5 where you load the chip and put it in the instrument and run
02:54:19 6 it through that once.

02:54:20 7 Q. And the second row says cell capture efficiency. So
02:54:24 8 that, let's start with that what is cell capture efficiency?

02:54:27 9 A. This is where I was referring to how many cells you
02:54:30 10 load into the input well and then how many cells you
02:54:33 11 actually get data out at the end of the process, all the way
02:54:38 12 through sequencing.

02:54:38 13 Q. So what's depicted for 10X Genomics?

02:54:43 14 A. Initially we have a very high efficiency, so houses
02:54:48 15 about 65% and Bio-Rad, by comparison, is much lower, about
02:54:52 16 5- to 10%.

02:54:53 17 Q. Now, I also see that there's something called doublet
02:54:57 18 rate. So first what's a doublet?

02:54:59 19 A. Doublets are something you want to avoid. And where
02:55:04 20 you get two cells in one barcoding reaction. And so that
02:55:09 21 means that two potentially different cells being labeled
02:55:12 22 with the same barcode. And that's also confusing, because
02:55:15 23 you don't know -- it makes kind of a bad data that's not
02:55:19 24 real. And that's something that confuses the software and
02:55:22 25 can confuse the researcher, so you want to avoid that, you

02:55:26 1 want those numbers to be very low and you can see that 10X,
02:55:30 2 our doublet rate, this is the likelihood of that happening
02:55:34 3 is at 1% and Bio-Rad's is higher at least 5% or maybe more.

02:55:40 4 Q. And the last line says lower price per cell. What
02:55:45 5 does price per cell mean?

02:55:47 6 A. This is how much it costs to run your cells through
02:55:50 7 the system on a per cell basis. Ours is 28 cents a cell and
02:55:59 8 by comparison, Bio-Rad's is at about a dollar.

02:56:03 9 Q. Now, you've compared 10X's single cell gene
02:56:08 10 expression product to Bio-Rad's ddSEQ product. Now, can you
02:56:13 11 do a similar comparison for 10X's other two products, the
02:56:17 12 single cell immune profiling solution and the chromium
02:56:22 13 genome exome solution?

02:56:24 14 A. No.

02:56:25 15 Q. And why is that?

02:56:26 16 A. Because they don't have those products.

02:56:29 17 Q. Now, was this lawsuit initially filed by Bio-Rad or
02:56:35 18 by a different company?

02:56:36 19 A. It was filed by RainDance Technologies.

02:56:39 20 Q. Now, did RainDance have a product that competed with
02:56:44 21 10X's single cell gene expression product?

02:56:47 22 A. No.

02:56:50 23 Q. Was RainDance a competitor to any 10X product?

02:56:56 24 A. Not that I'm aware of, no.

02:57:00 25 Q. To develop all of these products, has 10X invested in

02:12:02 1 about 65 percent of the cells that go into your sample that
02:12:06 2 you're able to retrieve individual information from.

02:12:09 3 Q. And is that referred to as a cell utilization or cell
02:12:13 4 efficiency rate?

02:12:14 5 A. Yes, that's cell utilization.

02:12:17 6 Q. Now, we heard a little bit about Bio-Rad's single
02:12:21 7 cell product. That's the ddSEQ; is that right?

02:12:25 8 A. That's correct.

02:12:26 9 Q. And what is the Bio-Rad ddSEQ cell utilization rate?

02:12:31 10 A. That's much lower. That is in the order of five
02:12:33 11 percent. So --

02:12:34 12 Q. Is that an important distinction between the
02:12:36 13 products?

02:12:37 14 A. It's a huge difference because if you think about it,
02:12:41 15 the cells you're interested in might be very rare cells. So
02:12:44 16 if you only can study a few of them, you will not find the
02:12:47 17 rare ones, or it might, indeed, be cells that are derived
02:12:51 18 from or obtained from a tumor. So you don't have many
02:12:55 19 cells. And then if you just loss your sample or majority of
02:12:58 20 your sample, then that is really not a very good start.

02:13:01 21 Q. Now, outside of your work in this case, just as part
02:13:05 22 of your research, have you read research papers authored by
02:13:11 23 scientists who have used 10X's single-cell products to
02:13:15 24 present data and conduct their work?

02:13:17 25 A. Yes. This field of single cell measurements is

02:13:20 1 really exploding at the moment. There is literally not a
02:13:23 2 day that there's not a paper on this topic. And really a
02:13:26 3 lot of the papers involve the 10X Genomics products.

02:13:30 4 Q. Now, do you recall reading a paper that was authored
02:13:34 5 by scientists using Bio-Rad's ddSEQ?

02:13:37 6 A. No, I don't recall those papers.

02:13:40 7 Q. All right. So let's talk a little bit more about the
02:13:46 8 10X gel beads. Can you explain to us how those gel beads
02:13:51 9 help unlock the gene expression information you've been
02:13:55 10 discussing?

02:13:55 11 A. Yes. The first step -- going in the wrong direction.
02:14:04 12 The first step is compartmentalizing a single cell and a
02:14:08 13 single gel bead in one of these small droplets called a GEM.
02:14:12 14 And so that is what happens first.

02:14:14 15 You put your sample and the gel bead on a chip,
02:14:18 16 and then you put the chip in the controller. And then you
02:14:21 17 have this first step of GEM formation. That's where the
02:14:26 18 unique barcodes are paired with a single cell.

02:14:29 19 Q. Now, we heard the term microfluidics system in this
02:14:35 20 case. What did Dr. Sia say that the microfluidics system is
02:14:39 21 in the 10X system?

02:14:40 22 A. Yeah. So that's the chip and the 10X controller
02:14:44 23 where you make the GEM. That is the microfluidic system.

02:14:47 24 Q. And do you agree with that characterization?

02:14:50 25 A. Yes, I agree with that. Yes.

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03:35:49 1 Q. Do you use microfluidics in your work?

03:35:51 2 A. We do. Microfluidics is an important part of our
03:35:54 3 sequencing work flow. So it's been a key element for a long
03:35:59 4 time in assuring we generate high quality data.

03:36:02 5 Q. Do you know Professor Steven Quake?

03:36:04 6 A. So I've known Professor Quake for a number of years.
03:36:08 7 I first met him in a conference. I've talked to him many
03:36:12 8 times. He and I served on a scientific advisory board
03:36:15 9 together. I've had a chance to review some of his patent
03:36:18 10 applications, some of his papers. I've read many of his
03:36:21 11 papers. Known him for a while.

03:36:22 12 Q. You said you have read some of his papers. You read
03:36:25 13 any papers written by Doctor Steven Quake about reactions?

03:36:29 14 A. Yes. I've read a number of papers where Professor
03:36:33 15 Quake talks about conducting reactions, conducting reactions
03:36:37 16 using microfluidics. And I've heard him speak about it many
03:36:41 17 times.

03:36:41 18 Q. Have you used 10X's products?

03:36:43 19 A. So to date we haven't used their products to generate
03:36:47 20 data, but we've analyzed a lot of data that have come from
03:36:51 21 10X's products to develop the methods that we use to analyze
03:36:53 22 this kind of large scale data I talked about earlier.

03:36:56 23 Q. You said to date. Do you have plans to use 10X's
03:36:59 24 products?

03:37:00 25 A. Sure. This past summer my colleagues and I submitted

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03:37:04 1 a grant to the National Heart Lung & Blood Institute, so
03:37:06 2 this is one of the institutes of the National Institutes of
03:37:10 3 Health, the NIH. And we asked for funding over the next
03:37:13 4 five years to study a disease called chronic obstructive
03:37:17 5 pulmonary disease, COPD. A major subtype of this disease is
03:37:22 6 emphysema. It's a terrible disease, the third leading
03:37:25 7 killer in the US and it arises because of a mixture of
03:37:28 8 genetic and environmental factors that lead to the
03:37:31 9 development and progression of the disease. So what we
03:37:34 10 proposed to do is to analyze samples from the lungs of COPD
03:37:38 11 patients using 10X's -- 10X's technologies.

03:37:42 12 Q. Did you consider other products?

03:37:44 13 A. We looked at all the different products that are
03:37:47 14 available on the market. It's one of the things we sort of
03:37:50 15 have to do, but at the end of the day when we made our
03:37:54 16 decision, there was clearly no choice but to use 10X and it
03:37:58 17 was a combination of the quality of the data we've seen come
03:38:01 18 from their products as well as the cell capture efficiency.

03:38:05 19 Q. Why is the cell capture efficiency important?

03:38:09 20 A. So we're analyzing samples that come from patients
03:38:13 21 suffering from COPD, so we can send them to a process by
03:38:17 22 which we collect a sample of cells from their lungs. I
03:38:20 23 won't tell you about the process, but it's uncomfortable.
03:38:24 24 And those cells are really precious. We have a small number
03:38:28 25 and we feel we owe it not only to the quality of the science

03:38:31 1 but to the patients to use this precious resource as
03:38:34 2 effectively as we can. So the difference between a 65
03:38:38 3 percent cell capture efficiency or a 5 to 10 percent cell
03:38:41 4 capture efficiency is night and day in terms of the research
03:38:44 5 that we do.

03:38:45 6 Q. Thank you, Professor Quackenbush. Can you summarize
03:38:48 7 some of your awards and achievements?

03:38:50 8 A. Certainly. So as an academic scientist there are a
03:38:54 9 number of criteria they use to judge us when we're being
03:38:58 10 evaluated. One is the number of peer reviewed scientific
03:39:01 11 publications, so as of recently I have 291 publications that
03:39:07 12 have been accepted. We also look at how often those papers
03:39:09 13 are cited. My papers have been cited over 66,000 times. So
03:39:15 14 it means my work is well respected by my peers. The third
03:39:19 15 criteria we use is grant funding. I've had funding from
03:39:23 16 lots of different agencies, but doing by medical research,
03:39:27 17 the amount of funding I've had from the NIH is important and
03:39:30 18 I've had more than 25 years of continuous funding from the
03:39:34 19 NIH to support my research. That includes something I'm
03:39:36 20 really proud of, an award I received this summer called an
03:39:41 21 NCI, National Cancer Institute Career Award. And this
03:39:44 22 recognizes a long history of continued contributions to the
03:39:48 23 field. And then among the other awards I've received, one
03:39:54 24 of the ones I'm most proud of was in 2001 I was invited to
03:39:56 25 the White House and recognized as what they called the Open

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03:39:59 1 Science Champion of Change.

03:40:02 2 MS. DRAKE: Thank you. 10X proffers Professor
03:40:03 3 Quackenbush as an expert of molecular biology, DNA
03:40:05 4 amplification techniques including PCR and DNA sequencing.

03:40:11 5 MR. WALTERS: No objection.

03:40:12 6 THE COURT: All right. You may you may proceed.

03:40:15 7 BY MS. DRAKE:

03:40:16 8 Q. What is the scope of your assignment in this case?

03:40:18 9 A. So, I was asked to look at the Ismagilov patents and
03:40:22 10 to look at 10X's products to see whether or not the
03:40:25 11 reactions that are carried out in 10X's products are the
03:40:28 12 same as the reactions that are claimed in the patents.

03:40:31 13 Q. And what materials did you consider as part of that
03:40:34 14 assignment?

03:40:34 15 A. So obviously I looked at the patents themselves and
03:40:39 16 the reactions described therein. I looked at 10X's product
03:40:44 17 literature. I also had the opportunity to review internal
03:40:46 18 documents that had more information about the reactions that
03:40:49 19 were being carried out. I looked at scientific publications
03:40:54 20 that I can get access through a database called PubMed, that
03:40:58 21 we all have access to. I also had the opportunity to look
03:41:01 22 at deposition testimony where scientists were talking about
03:41:04 23 these reactions. And then I looked at a license between
03:41:08 24 Applied Biosystems and QuantaLife.

03:41:10 25 Q. And after reviewing all of those materials, what did

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