

**UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE PATENT TRIAL AND APPEAL BOARD**

---

**LG ENERGY SOLUTION, LTD.,**

**Petitioner,**

**v.**

**MOLECULAR REBAR DESIGN, LLC,**

**Patent Owner.**

---

**Case IPR2024-01012 (US Patent No. 10,608,282)  
Ref. 18768-0210IP8**

---

**VIDEOCONFERENCE DEPOSITION OF**

**DEBORAH D.L. CHUNG, Ph.D.**

**INDIVIDUALLY AND ON BEHALF OF**

**PATENT OWNER**

**JUNE 27, 2025**

**Page 1 - 89**

**9:01 a.m. to 12:39 p.m. EST**

**REPORTED BY:**

**Tamara L. Houston**

**CA CSR No. 7244, RPR, CCRR No. 140**

**Job Number J12853870**

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

REMOTE VIDEOCONFERENCE DEPOSITION OF DEBORAH D.L.  
CHUNG, Ph.D., taken on behalf of the Petitioner,  
commencing from 9:01 a.m. to 12:39 p.m., Friday, June  
27, 2025, before Tamara L. Houston, CSR No. 7244, CCRR,  
RPR.

THE SULLIVAN GROUP OF COURT REPORTERS

1 APPEARANCE OF COUNSEL:

2

3 On behalf of the Petitioner:

4 FISH & RICHARDSON P.C.  
5 BY: HYUN JIN IN, ESQ.  
JENNIFER HAN, ESQ.  
6 1000 Maine Avenue SW  
Suite 1000  
7 Washington, DC 20024  
(202) 783-5070  
8 in@fr.com

9 On behalf of the Patent Owner and Witness:

10 CABELLO HALL ZINDA, PLLC  
11 BY: JAMES GLENN, ESQ.  
801 Travis Street  
12 Suite 1610  
Houston, Texas 77030  
13 (832) 631-9994

14

15

16

17

18

19

20

21

22

23

24

25

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

**INDEX TO EXAMINATION**

**WITNESS: DEBORAH D.L. CHUNG, Ph.D.**

| <b>EXAMINATIONS</b> | <b>PAGE</b> |
|---------------------|-------------|
| Mr. In.....         | 6           |
| Mr. Glenn.....      | 82          |

**QUESTIONS INSTRUCTED NOT TO ANSWER**

**Page      Line**  
**NONE**

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

**INDEX TO EXHIBITS**

**DEBORAH D.L. CHUNG, Ph.D.**

**LG ENERGY SOLUTION, LTD. vs. MOLECULAR REBAR DESIGN, LLC**

**JUNE 27, 2025**

**Tamara L. Houston, CSR No. 7244, CRR No. 140, RPR**

| <b>EXHIBIT</b> | <b>DESCRIPTION</b> | <b>PAGE</b> |
|----------------|--------------------|-------------|
|----------------|--------------------|-------------|

**NONE MARKED.**

**--000--**

1 FRIDAY, JUNE 27, 2025, 9:01 A.M.

2 --o0o--

3 COURT REPORTER: My name is Tamara Houston,  
4 California Certified Shorthand Reporter Number 7244.

5 --o0o--

6 Whereupon, DEBORAH D.L. CHUNG, PH.D., having  
7 been called as a witness was duly sworn  
8 to tell the truth, the whole truth,  
9 and nothing but the truth testified  
10 as follows:

11 MR. GLENN: Counsel, before we start, as we  
12 did in the previous deposition, I'll restrict my form  
13 objections to just "objection to form" to keep the  
14 deposition clean, as long as you are okay with that.  
15 Doesn't mean that I've waived any form objection I  
16 haven't made.

17 MR. IN: Absolutely. Appreciate that.

18 MR. GLENN: No worries.

19 EXAMINATION BY MR. IN:

20 Q. All right. Good morning, Ms. Chung.

21 A. Morning.

22 Q. My name is Hyun Jin In. I'm joined here by  
23 Jennifer Han. We are from Fish & Richardson,  
24 representing Petitioner here.

25 Could you please state your full name for the

1 record?

2 A. Deborah D.L. Chung.

3 Q. Great. Thank you.

4 I know you just went through this with my  
5 colleague, Mr. Tim Riffe, just two days ago, this past  
6 Wednesday. So I think we can skip past a lot of these  
7 background, and let's just stick to my questions, but  
8 please bear with me if I re-ask some of them again this  
9 morning.

10 So during today's deposition, Dr. Chung, you  
11 understand that I am going to be asking you questions  
12 and you're going to be answering those questions under  
13 oath; is that right?

14 A. Yes.

15 Q. And that means you have to tell the truth just  
16 as if you were testifying in court; is that right?

17 A. Yes.

18 Q. The court reporter, Ms. Houston, here will be  
19 transcribing everything we say today, so please answer  
20 verbally in a clear manner so that she can make an  
21 accurate record.

22 It's also important that we wait for each  
23 other to finish asking or answering a question before  
24 the other one starts talking.

25 Is that fair?

1           A.    Yes.

2           Q.    All right.  I'll try to call for a break every  
3 hour or so, but if you need a break at any time for  
4 whatever reason, please just let me know.  The only  
5 thing I ask is that if there's a pending question,  
6 please do answer it before we take a break.

7                   Does that make sense?

8           A.    Yes.

9           Q.    Great.

10                  Do you have any documents or applications open  
11 on your computer at this time, Dr. Chung?

12           A.    No, I have just hard copies.

13           Q.    Great.

14                  Do you have any notes or annotations in those  
15 hard copies?

16           A.    I don't have any, but the LG document has a  
17 little bit.  The LGES1001 has its pink marking at the  
18 back page.  That's the document that I'm supposed to  
19 live with.  It's not my marking --

20           Q.    Understood.  Thank you, Dr. Chung.

21                  So since your deposition two days ago, did you  
22 do anything between then and now to prepare for today's  
23 deposition?

24                  MR. GLENN:  Objection to the extent the  
25 question calls for attorney work product.

1           THE WITNESS: I had some communication with  
2 counsel, and also I just reviewed some of the documents.

3 BY MR. IN:

4           Q. Who did you speak with?

5           A. Mr. Glenn mainly, but also Mr. Zinda.

6           Q. Okay. And how many hours would you say you  
7 spent preparing for this deposition speaking with  
8 Mr. Glenn and Mr. Zinda?

9           A. Could be four hours.

10          Q. Did you communicate with anyone else in  
11 preparation for today's deposition?

12          A. No.

13          Q. And which documents did you review in your  
14 preparation for today?

15          A. My declaration more than anything else.

16          Q. Great. Thank you.

17                 Okay. So today, as you know, I'll be asking  
18 you questions concerning IPR proceeding IPR2024-01012  
19 related to U.S. Patent Number 10,608,282.

20                 You understand that, right?

21          A. Yes.

22          Q. And when I say "the '282 patent," you --  
23 you'll know which patent I'm referring to, correct?

24          A. Yes.

25          Q. Great.

1           And as we did two days ago, for any exhibits  
2   that I may be referring to in my questioning, I will  
3   upload those as they occur into the chat window. So if  
4   you could download that, that would be great, but please  
5   feel free to use the clean hard copies that you have  
6   with you if that makes it easier for you.

7           Does that make sense?

8           A.    (No verbal response).

9           Q.    Okay. So before we get into the substance of  
10   your opinions this morning, Dr. Chung, I wanted to start  
11   by asking just a few questions about your background?

12           And I should mention that I, as well as my  
13   colleague Gretchen, who was here the other day -- we  
14   both got our Ph.D.s from MIT doing nanotech research,  
15   and we actually ran into Professor Dresselhaus quite a  
16   few times. This was over 20 years ago now.

17           So I'm very happy and honored to be sitting  
18   here with you today and speaking with you about carbon  
19   nanotubes, among other things. So thank you for your  
20   time here today.

21           Let me now go ahead and upload your  
22   declaration, Dr. Chung. And this is Exhibit 2004.

23           Let me know when you have it, Dr. Chung.

24           THE WITNESS: I have it, hard copy.

25

1 BY MR. IN:

2 Q. Great. Okay.

3 So if you look at your declaration, starting  
4 at paragraph 14, which is on page 8 -- let me know when  
5 you're there.

6 A. Yes, I'm there.

7 Q. It says here that you are an expert in, among  
8 other things, "materials for electrical functions."

9 Can you help explain what that means there,  
10 Dr. Chung?

11 MR. GLENN: Objection. Mischaracterizes the  
12 document. I think it says "electrochemical functions."  
13 So I'm not meaning to object unnecessarily, but as I  
14 read it, they're electro --

15 MR. IN: Oh, no. So starting with the second  
16 sentence, it does say "including materials for  
17 electrical functions."

18 MR. GLENN: My apologies. Objection  
19 withdrawn.

20 MR. IN: No problem.

21 THE WITNESS: Okay. Materials for electrical  
22 functions are those for various electrical applications.  
23 Examples include electrical conduction, resistance-based  
24 feeding, lightening protection, electromagnetic  
25 interference fielding, electrical grounding, and so on

1 and so forth.

2 BY MR. IN:

3 Q. Okay. And does that include the use of carbon  
4 nanotubes or nanofibers as materials for those  
5 applications?

6 A. Yes.

7 I should add sensing too. That's an  
8 electrical function.

9 Q. Okay. What about the next part where it says  
10 "materials for electrochemical functions"? Can you help  
11 explain what you're referring to there?

12 A. Yes.

13 Electrochemical function pertain to various --  
14 the functions of various components in an  
15 electrochemical device. And these include electrodes,  
16 electrically conductive additive, as well as binder.

17 Q. Okay. And that would include, let's say,  
18 lithium-ion battery applications?

19 A. Yes.

20 Q. Would you consider yourself to be an expert in  
21 lithium-ion batteries, Dr. Chung?

22 A. I'm an expert in the materials aspect of this  
23 battery, as well as other batteries.

24 Q. Okay. And what about electrochemistry?

25 Would you consider yourself to be an expert in

1 electrochemistry?

2 A. I don't know what you mean by "expert," but  
3 I've been very much accustomed to electrochemistry  
4 throughout in order to undertake the research on  
5 electrochemical functions. They are kind of  
6 intertwined.

7 Q. I know you've had a very long career,  
8 Dr. Chung. But, you know, during that span, has any of  
9 your research involved the use of carbon nanotubes or  
10 carbon nanofibers in battery components?

11 A. In -- for instance, I've investigated the use  
12 of carbon nanofiber as an electrically conductive  
13 additive in batteries. That's one example.

14 Q. And which component of the battery would that  
15 have been in?

16 A. It's the electrical conductive additive, which  
17 is needed for the electrode in case the electrode is not  
18 sufficiently conducted.

19 Q. And so was this for the anode or cathode or  
20 both?

21 A. Can be either.

22 Q. And what kind of carbon materials were you  
23 working with for that?

24 A. Well, the carbon nanofiber. Also carbon  
25 black.

1 Q. Do you have any publications related to  
2 lithium-ion batteries?

3 A. Yes.

4 Q. Are those included in your -- in your CV?

5 A. Yes, and also cited here.

6 Q. Okay. If we go to page 11 of your  
7 declaration, sort of at the middle of that page, there  
8 is a paper by you and a Weiming Lu.

9 A. There are two by -- with him.

10 Q. Oh, yeah, the one titled "Anodic Performance  
11 of Vapor-Deprived Carbon Filaments."

12 Do you see that, Dr. Chung?

13 A. Yes. That's a typo. It's "derived," not  
14 "deprived."

15 Q. Yeah. Thank you. I thought that was a little  
16 weird.

17 Do you recall what that paper was about,  
18 generally? I know it's been a while.

19 A. Okay. It's the use of the vapor-derived  
20 carbon filaments, which really are the carbon  
21 nanofibers, as a component in the anode in lithium-ion  
22 battery.

23 Q. Okay. And what was the reason that you added  
24 carbon filaments into the anode in that instance?

25 A. My recollection is not very good. It's like

1 20-some years ago. Yeah.

2 So based on my limited recollection, it's --  
3 it's the use of the carbon filaments or carbon nanofiber  
4 and the anode in these batteries.

5 Q. Okay. And when you say "performance," let's  
6 say improving performance in the context of an anode,  
7 what does that mean?

8 A. The performance includes numerous aspects,  
9 including the voltage and current and cycling  
10 components.

11 Q. And what chemical or mechanical or electrical  
12 change that comes about due to the presence of nanotubes  
13 helps contribute to those improvements that you just  
14 mentioned, Dr. Chung?

15 MR. GLENN: Objection. Form.

16 THE WITNESS: Yeah, please clarify your  
17 question.

18 BY MR. IN:

19 Q. Sure.

20 You just mentioned that things like voltage  
21 and current and cycling performance could be improved by  
22 the addition of nanotubes, and I'm just trying to get a  
23 better sense for how the nanotubes contribute to that  
24 more specifically.

25 MR. GLENN: Same objection.

1           THE WITNESS: Yeah. You are asking me  
2 something that I did 20-some years ago, and as I said,  
3 my recollection of the details is not good at all.

4           For -- the carbon filaments or nanofiber are  
5 attractive in their high surface area or high specific  
6 surface area. That might be one of the reasons why I  
7 was interested in that.

8 BY MR. IN:

9           Q. Do they lead to improvements in mechanical  
10 stability?

11          A. It might, but I don't think I address the  
12 mechanical properties in that case.

13          Q. Can they also help improve electrical  
14 conductivity?

15          A. My recollection is not so good. I cannot even  
16 remember whether the carbon filaments or fiber or  
17 nanofiber is alone or with some -- something else in --  
18 in the anode.

19          Q. Okay. But, you know, also more generally and  
20 not just with respect to that paper, are carbon  
21 nanotubes known to help improve electrical conductivity  
22 when added to battery electrodes?

23          A. Yes, it's one of the electrically conductive  
24 additives, and I've worked on that also, and I have  
25 publications on that also. Yeah. Carbon black is more

1 commonly used because it's a lot cheaper, but the common  
2 carbon filament has the advantage because it's long and  
3 thin.

4 Q. Okay. And how does being long and thin  
5 provide advantages over carbon black?

6 A. Long and thin means that there's a higher  
7 chance of forming a network through the -- through the  
8 contact or touching between one nanotube and another  
9 nanotube in that collection of nanotube.

10 So you have a continuous electrically  
11 conductive network formed more easily with these long  
12 and thin nanofiber.

13 In contrast with the carbon black, it's really  
14 particulate. So it's very different situation.

15 Q. Understood. Thank you.

16 If we could go back to page 4 of your  
17 declaration now, Dr. Chung. There is what is labeled as  
18 an "Exhibit List."

19 Do you see that?

20 A. Yes.

21 Q. So are these all the documents that you  
22 considered in preparing your declaration?

23 MR. GLENN: Objection to form.

24 THE WITNESS: Well, I obviously have to look  
25 at the patent itself, which is the LGES-1001. So this

1 list is not all the documents that I've reviewed.

2 BY MR. IN:

3 Q. And what other documents did you review,  
4 Dr. Chung?

5 A. Okay. I reviewed the declaration of Dr. Gido.

6 Q. Okay.

7 A. Which is not in this list.

8 My recollection is not perfect, but I might  
9 have reviewed the LGES-1005 and -1006, but my  
10 recollection is not perfect.

11 Q. Okay. So would it be fair to say you  
12 reviewed, you know, some or all of LG's exhibits along  
13 with the exhibits submitted by MRD? Is that fair?

14 A. Yes.

15 Q. Did you review any other documents that were  
16 not listed as an exhibit?

17 A. Not really I review, but, you know, in coming  
18 up with some of these references, such as the MRD-2006  
19 or MRD-2007, I had to search the literature, you know.  
20 A literature search, electronic literature search.

21 And in that regard, I had to kind of look  
22 through at least like the abstract, you know, briefly.  
23 Those were quite a few before I selected these  
24 particular two.

25 Q. Sure.

1                   So MRD-2006; the Streit, S-T-R-E-I-T,  
2                   reference; and MRD-2007, the Cabana, C-A-B-A-N-A,  
3                   reference, you found those through your own search; is  
4                   that right, Dr. Chung?

5                   A.     Yes.

6                   Q.     What about MRD-2008, the "Webster's New World  
7                   College Dictionary (4th Ed. 1999)"? Did you find that  
8                   on your own as well, Dr. Chung?

9                   A.     No.

10                  Q.     Why did you list that particular exhibit,  
11                  Dr. Chung?

12                  A.     This is after talking with the counsel that  
13                  this is a reasonable thing to include.

14                  Q.     Okay. Did you choose that particular  
15                  dictionary, or was that done by counsel?

16                         MR. GLENN: Objection. Calls for attorney  
17                  work product.

18                         THE WITNESS: I did not choose that  
19                  dictionary, but I know that is a very well-recognized  
20                  dictionary, the Webster.

21                  BY MR. IN:

22                  Q.     Sure.

23                         And did you look at any other dictionaries or  
24                  just that one?

25                  A.     Maybe not. But as I said, I did some

1 electronic searches on the web, and I might have looked  
2 at other electronic dictionaries very briefly. My  
3 recollection is not total.

4 Q. Okay. But fair to say you don't recall those  
5 specific dictionaries, other than this one, that you may  
6 have come across in your search, right?

7 A. Yeah. I've always recognized Webster as a  
8 trustworthy one. Yeah.

9 Q. Okay. Fair enough.

10 Let me go ahead and upload the '282 patent  
11 now, Dr. Chung. That's Exhibit 1001.

12 And, again, please feel free to refer to your  
13 hard copy if that's more helpful to you.

14 MR. GLENN: And when you say "upload,"  
15 Counsel, you mean to put it into the chat.

16 MR. IN: That's right.

17 MR. GLENN: Thank you.

18 The first document you said you were uploading  
19 never showed up in the chat, at least not in mine. And  
20 I have my own copy, so that's perfectly okay, but in  
21 case Tamara may need --

22 MR. IN: Can we quickly go off the record? I  
23 just want to make sure.

24 (Discussion held off the record.)  
25

1 BY MR. IN:

2 Q. So, Dr. Chung, referring to Exhibit 1001, this  
3 is the '282 patent, correct?

4 A. Yes.

5 Q. And you reviewed this patent, right?

6 A. Yes.

7 Q. When is the last time you reviewed this  
8 patent?

9 A. Yesterday.

10 Q. So safe to say you understand this patent,  
11 right?

12 MR. GLENN: Objection. Form.

13 THE WITNESS: I don't know what you mean by  
14 understanding. Because I -- I -- you know, the -- the  
15 author or the inventor might not describe all the --

16 (Reporter requests clarification.)

17 THE WITNESS: In the patent, the patent  
18 document, the science behind all the different concepts  
19 might not be sufficiently revealed for one to come up  
20 with a true scientific understanding.

21 If that's what you mean by "understanding,"  
22 then that -- that's -- that's kind of a deep  
23 understanding that I'm talking about.

24 But I do understand what the patent is talking  
25 about.

1 BY MR. IN:

2 Q. But fair to say you reviewed this patent  
3 pretty carefully, right, Dr. Chung?

4 A. Yes.

5 Q. And when you say that some of the science  
6 behind the different concepts "might not be sufficiently  
7 revealed" in this one document, was there anything in  
8 particular that came to your mind in terms of not being  
9 sufficiently described in this patent?

10 MR. GLENN: Objection. Form. Objection.  
11 Mischaracterizes the witness's testimony.

12 THE WITNESS: Could you rephrase, please?

13 BY MR. IN:

14 Q. Yeah.

15 Just earlier, you noted that some of the  
16 science behind the concepts of this patent might not be  
17 sufficiently revealed.

18 Was there a particular scientific concept that  
19 you thought was not sufficiently described in this  
20 patent?

21 MR. GLENN: Same objections.

22 THE WITNESS: In general, patents don't  
23 describe the science very well. And it could be they  
24 just want to leave it, you know, very practical. And  
25 that's what I mean, in general. That's the situation.

1           If you want to really study the science, you  
2 go to the journal publications which have been peer  
3 reviewed. That's where you really hit the science hard  
4 and expect the science to be clear.

5           But I've never expected any patent to -- to  
6 give enough weight on the science part. That's what I  
7 mean by -- by what I said. It's -- it's, in general,  
8 the case for patents.

9 BY MR. IN:

10          Q.    Okay. Understood.

11                If you could go to the last page of the  
12 patent, Dr. Chung, on the right side, column 14.

13          A.    Yes.

14          Q.    Do you see the claims of the patent there?

15          A.    Yes.

16          Q.    Did you review those claims as well as part of  
17 your review?

18          A.    Yes.

19          Q.    Do you have an understanding of what each term  
20 used in that claim means to a POSITA?

21          A.    Yes. Particularly on the claims that are most  
22 relevant.

23          Q.    So in Claim 1, the fourth line of Claim 1, it  
24 says "carbon nanotube fibers."

25                Do you see that?

1           A.    Yes.

2           Q.    And in the second-to-the-last line of that  
3 same claim, it says "carbon nanotubes."

4                   Do you see that?

5           MR. GLENN: Counsel, if you could refer to the  
6 line number as it's in the patent, that might be easier  
7 to follow.

8           MR. IN: Yeah, I think that's around line 11  
9 or 12 of column 14.

10           THE WITNESS: Yes, I see that.

11 BY MR. IN:

12           Q.    Do you know why they use those two different  
13 terms there, "nanotube fibers" and "nanotubes"?

14           MR. GLENN: Objection. Form.

15           THE WITNESS: Yeah, I did consider this.  
16 Okay. And after going through the overall patent, I  
17 realized that they use those two terms interchangeably.

18                   You know, personally, I would like to use the  
19 term "carbon nanotubes," but then these are fibers in a  
20 way. So it's not wrong to call them carbon nanotube  
21 fibers, but it appears that the author uses those two  
22 terms interchangeably.

23 BY MR. IN:

24           Q.    Is that not the case in perhaps industry or  
25 academia where the term "nanotube fibers" and

1 "nanotubes" are used interchangeably?

2 MR. GLENN: Objection. Form.

3 THE WITNESS: The term "carbon nanotube" is  
4 very common in the world of science or industry or  
5 academia. But the term "carbon nanotube fibers" is not  
6 so common. But you cannot say that it's the wrong term  
7 because they are fibers.

8 BY MR. IN:

9 Q. And what is a fiber in this context,  
10 Dr. Chung?

11 A. A fiber is long and thin. That is, it's an  
12 entity having a unit, and each unit is a fiber, and  
13 that -- each unit, it has a -- long and thin.

14 Q. Could the fiber be made up of smaller fibers?

15 MR. GLENN: Objection. Form.

16 THE WITNESS: Please clarify your question.

17 BY MR. IN:

18 Q. Yeah.

19 Can a carbon nanotube fiber be made by using  
20 smaller strands that are combined together?

21 MR. GLENN: Objection. Form.

22 THE WITNESS: After reading the overall  
23 patent, I've come to the conclusion that that's not what  
24 this term "carbon nanotube fiber" is referring to.  
25 That, you know, as I said, it's referring to carbon

1 nanotube.

2 BY MR. IN:

3 Q. Okay. Fair enough.

4 When -- when did you first hear about the '282  
5 patent, Dr. Chung?

6 A. Maybe half a year ago. I can't remember when  
7 I started working on this, plus four other patents in  
8 this whole pack, I believe, of patent. I guess half a  
9 year. Could be more.

10 Q. Okay. So the first time you heard about the  
11 '282 patent was when you started working on this case;  
12 is that fair?

13 A. Yes.

14 Q. If you go to the cover page of the patent, the  
15 first page -- and I won't go into what the face of the  
16 patent means today -- there on the left side, there are  
17 three listed inventors there.

18 Do you see that, Dr. Chung?

19 A. Yes.

20 Q. So Clive Bosnyak, Kurt Swogger, and Milos  
21 Marinkovic.

22 Did you hear about any of those individuals  
23 before working on this case?

24 A. No.

25 Q. Have you spoken or otherwise communicated with

1 any of them before or during your involvement in this  
2 case?

3 A. No.

4 Q. The next line on that page of the patent says  
5 "Molecular Rebar Design" or "MRD."

6 Did you know about MRD before your involvement  
7 in this case?

8 A. No.

9 Q. Did you ever work for or receive research  
10 funding from them?

11 A. No.

12 Q. Did you ever work for or receive research  
13 funding from LG?

14 A. No.

15 Q. From any of LG's subsidiaries?

16 A. Not that I know of. I don't know even what  
17 are its subsidiaries.

18 Q. Okay. Fair enough.

19 Okay. Let's go back to your declaration,  
20 Dr. Chung, and I'm going to take you to paragraph 62  
21 where it says "Overview of Technology."

22 Do you see that, Dr. Chung?

23 Let me know when you're there.

24 A. Yes. I'm there.

25 Q. So here, you are discussing the general

1 technology associated with the '282 patent; is that  
2 fair?

3 A. Yes.

4 Q. And does that include dispersing nanotubes  
5 into battery materials for improved properties?

6 MR. GLENN: Objection to form.

7 THE WITNESS: It's quite a few pages. You're  
8 telling me -- asking me if a particular thing is  
9 included in these pages. It would take me some time to  
10 go through.

11 BY MR. IN:

12 Q. Yeah. Well, not just those pages, Dr. Chung.  
13 But based on your careful review of the '282 patent,  
14 which we talked about earlier, is the '282 patent  
15 generally associated with dispersing nanotubes into  
16 battery materials for improved performance?

17 MR. GLENN: Objection to form.

18 THE WITNESS: Well, it relates to that.

19 BY MR. IN:

20 Q. Perfect.

21 And what parts of a battery, according to the  
22 '282 patent, can these nanotubes be added to?

23 MR. GLENN: Objection to form.

24 THE WITNESS: Okay. For the '282 patent, the  
25 nanotubes are included in, you know, certain matrices

1     like polymers for various applications such as binders,  
2     electrolytes, and separators.

3     BY MR. IN:

4             Q.     Okay. In any of those battery components that  
5     the '282 patent contemplates, would any of them benefit  
6     from having higher electrical conductivity?

7             MR. GLENN: Objection. Form.

8             THE WITNESS: You really need to clarify  
9     whether you're talking about electronic conductivity or  
10    ionic conductivity.

11    BY MR. IN:

12            Q.     Thank you.

13            I am talking about electronic conductivity.

14            A.     Okay.

15            MR. GLENN: Same objection.

16            THE WITNESS: Yeah, the binder would be helped  
17    by having better electronic conductivity.

18    BY MR. IN:

19            Q.     How about the electrolyte?

20            A.     The electrolyte would be helped by having  
21    better ionic conductivity.

22            Q.     If you could go with me, Dr. Chung, to  
23    columns 12 and 13 in the '282 patent.

24            A.     Okay.

25            Q.     Here, it is talking about solid electrolyte

1 films; is that right?

2 MR. GLENN: Objection. Form.

3 THE WITNESS: It talks about solid electrolyte  
4 composition. I'm not sure what is films. You mentioned  
5 films.

6 BY MR. IN:

7 Q. Okay. Yeah. So let me point to column 12,  
8 line 64, starting there. It talks about significant  
9 improvements in the conductivity of solid electrolyte  
10 films.

11 Do you see that?

12 Sorry, I missed your response there,  
13 Dr. Chung. Did you say "yes"?

14 A. I'm sorry. Could you repeat your question?

15 Q. Yeah.

16 I was just trying to get you -- get your  
17 confirmation that you see, in column 12, line 64, that  
18 it talks about improvements in the conductivity of the  
19 solid electrolyte film.

20 A. Yes, I read that.

21 Q. So in that context, what type of conductivity  
22 are they talking about; electronic or ionic?

23 A. It has to be ionic.

24 Q. What characteristics of carbon nanotubes help  
25 contribute to improved ionic conductivity?

1 MR. GLENN: Objection. Form.

2 THE WITNESS: The carbon nanotubes has a  
3 hollow channel in the middle, and there is constituents  
4 that may be inserted into that open channel.  
5 Particularly if the channel is not closed, obviously.  
6 If it's open.

7 And it might be possible to put some other  
8 stuff into the channel, and that other stuff might be  
9 such that it causes the ionic conductivity to be  
10 improved.

11 BY MR. IN:

12 Q. Okay. Does the '282 patent -- sorry.  
13 Strike that.

14 Let's go to paragraph 70 of your declaration  
15 now, Dr. Chung. If you could just take a minute to read  
16 paragraph 70 and let me know when you're done.

17 A. Yes.

18 Yes, I'm done.

19 Q. So starting at the third line of that  
20 paragraph, when you talk about CNTs with a higher aspect  
21 ratio tending to provide higher electrical conductivity,  
22 what do you mean by that, Dr. Chung?

23 A. Okay. It has to do with the higher aspect  
24 ratio promoting the chance of touching between one  
25 nanotube and another nanotube. And that touching

1 promotes the establishing of a continuous electrically  
2 conducting path. And that's what I mean by tending to  
3 provide higher conductivity.

4 Q. Okay. So if a POSITA wanted to achieve higher  
5 electrical conductivity in their CNT-containing  
6 material, you're saying here that they could force  
7 this -- increase the aspect ratios of those CNTs; is  
8 that right?

9 A. Yes.

10 MR. GLENN: Objection. Form.

11 THE WITNESS: A POSITA would tend to think  
12 like that because of the concept that I just said.

13 BY MR. IN:

14 Q. And how would that POSITA go about achieving  
15 such adjustments of aspect ratios?

16 A. Well, a POSITA typically would buy the carbon  
17 nanotubes rather than making its own nanotube. So one  
18 would go to, you know, the market to see what nanotubes  
19 are available commercially.

20 Q. Is there something that they could do on their  
21 own to adjust the aspect ratios of nanotubes?

22 A. What do you mean, "on their own"?

23 Q. Let's say they bought a batch of nanotubes  
24 from a commercial supplier and they wanted to compare  
25 the performance of higher aspect ratio nanotubes with

1 lower aspect ratio nanotubes. Could they perform some  
2 process to that single batch of nanotubes to achieve two  
3 different aspect ratios?

4 MR. GLENN: Objection. Form.

5 THE WITNESS: It is possible to -- to examine  
6 the -- the various nanotubes in that collection of  
7 nanotubes and distinguish them in terms of the aspect  
8 ratio. But it is tedious.

9 BY MR. IN:

10 Q. So I think my question was slightly different.  
11 If they had a batch of nanotubes that they  
12 purchased with a certain given aspect ratio, could  
13 they -- could they then change that in their laboratory  
14 to achieve a different aspect ratio?

15 MR. GLENN: Objection to form.

16 THE WITNESS: Well, to decrease it is  
17 feasible. But to -- yeah. Decreasing it means you cut  
18 it up, you know. And it applies to whatever mechanical  
19 means to chop it up. Then -- then the aspect ratio  
20 would go down.

21 But to get the aspect ratio to go up, it's  
22 more difficult.

23 BY MR. IN:

24 Q. And why would chopping up the nanotubes lead  
25 to a smaller aspect ratio?

1           A.     Because the aspect ratio is the length divided  
2     by the diameter. So by chopping up, you decrease the  
3     length, while the diameter is not -- essentially not  
4     affected and, therefore, the aspect ratio would be  
5     decreased by the chopping.

6           Q.     And how would the POSITA chop up the  
7     nanotubes, Dr. Chung?

8                     What are some methods he could use?

9           A.     For instance, one -- one can use various  
10    mixing techniques. Also mechanical processing. You  
11    know, the processing that involves mechanical  
12    deformation such as injection molding or extrusion, you  
13    know.

14                    So, yeah, just -- just agitation. Agitation  
15    can result in a degree of chopping.

16          Q.     Okay. So those processes, such as various  
17    types of agitation would decrease the length of the  
18    nanotubes and thus decrease the aspect ratios; is that  
19    right?

20          A.     I would say that such agitation would tend to  
21    decrease. You know, it's not guaranteed. It depends on  
22    the particular situation. But it would tend to decrease  
23    the aspect ratio.

24          Q.     Yeah. Sure.

25                    Would those same processes affect the

1 nanotube's diameters?

2 A. The effect on the diameter by this -- this  
3 agitation method would be much less than the effect on  
4 the length.

5 Q. So if we could look at the last sentence in  
6 that paragraph 70, Dr. Chung, you say, in that quote,  
7 "For a particular CNT diameter, the volume fraction and  
8 aspect ratios of the CNTs within each subrange can thus  
9 be adjusted accordingly..."

10 Do you see that, Dr. Chung?

11 A. Yes.

12 Q. So would this agitation method that we just  
13 talked about be an example of adjusting the aspect  
14 ratios accordingly?

15 A. Not necessarily --

16 MR. GLENN: Objection. Form.

17 THE WITNESS: -- because you can buy nanotubes  
18 that have different aspect ratios.

19 BY MR. IN:

20 Q. Okay. But the agitation method still would be  
21 an example of something you could do if you, let's say,  
22 were not able to purchase additional nanotubes?

23 A. Chop -- yes.

24 Q. You also talk about volume fraction there,  
25 Dr. Chung.

1           A.    Yes.

2           Q.    What do you mean by that?

3           A.    Volume fraction means the fraction by volume  
4 as opposed to fractions by weight. And so the volume  
5 fraction of CNTs would be the fraction of the volume of  
6 this overall material, the fraction of the volume of  
7 this overall material that is CNTs.

8           Q.    Is there a difference between adjusting the  
9 volume fraction and adjusting the weight fraction in  
10 this context?

11                   MR. GLENN:  Objection.  Form.

12                   THE WITNESS:  The volume fraction and weight  
13 fraction are two ways to -- to quantify the content.  In  
14 this case, the CNT content in a certain material.

15                   And so -- but the volume fraction is not the  
16 same as the weight fraction, though.  Just it's two  
17 different beasts.  But in the laboratory, a POSITA can  
18 use either the volume fraction or the weight fraction.

19 BY MR. IN:

20           Q.    Are there any different ways to quantify the  
21 CNT fraction in a particular composition?

22           A.    Well, the volume fraction and weight fraction  
23 are the two most important ways.  You know, other  
24 quantification would tend to be more directed to, say,  
25 delineating between the single wall and multiwall, you

1 know. But that -- I think that's not what you mean.

2 So if you just look -- considered all the  
3 nanotubes under consideration, regardless of the type of  
4 nanotube, then -- then you would consider the volume  
5 fraction to be the -- to relate to the volume of all the  
6 CNTs and the weight fraction to relate to the weight of  
7 all of the CNTs.

8 Q. Okay. If we could go back to Claim 1,  
9 Dr. Chung, of the '282 patent that we were looking at.  
10 There, it talks about percentage by number of nanotubes.

11 Do you see that, Dr. Chung?

12 A. Yes.

13 Q. So is that the same thing as volume fraction,  
14 or is that something else?

15 MR. GLENN: Objection --

16 THE WITNESS: Oh, no. This is percentage by  
17 number of the nanotubes. So this is a number fraction.  
18 Yes. So there is a third fraction that I neglected to  
19 say is the number fraction. It is not only volume  
20 fraction, weight fraction, but also number fraction.

21 But there's a number fraction. It's not --  
22 here, it refers to the number of nanotubes within a  
23 collection of nanotubes.

24 BY MR. IN:

25 Q. Do you know why Claim 1 uses number fraction

1 as opposed to volume fraction or weight fraction?

2 MR. GLENN: Objection. Form.

3 THE WITNESS: When you -- the volume fraction  
4 and weight fraction are most commonly used when you  
5 consider combining A and B and how much A to put in, you  
6 know, to make the A/B hybrid. Okay.

7 The volume fraction and weight fraction are  
8 most common used for that purpose, but here is not  
9 that -- that -- that purpose. Here is just to consider  
10 how -- how much of the nanotubes are of this particular  
11 characteristic among all the available nanotubes. Okay.

12 So in that context, it makes very good  
13 sense -- I think even better sense -- to just count the  
14 number of nanotubes.

15 BY MR. IN:

16 Q. But instead of count -- just counting the  
17 nanotubes, could a POSITA also potentially measure the  
18 volume or the weight of nanotubes?

19 MR. GLENN: Objection. Form.

20 THE WITNESS: Yes. One can measure the volume  
21 of a subset of nanotubes or the weight of a subset of  
22 nanotubes. Yeah, that's possible.

23 BY MR. IN:

24 Q. Sorry to be jumping back and forth. Jumping  
25 back to your declaration now, if we could go up one

1 paragraph to paragraph 69. That's on page 33.

2 A. Yes.

3 Q. Here, you say that the '282 patent "teaches...  
4 a bimodal distribution."

5 Do you see that?

6 A. Okay. The fourth line of that paragraph.

7 Yeah, I think I see that.

8 Q. What is bimodal distribution in this context,  
9 Dr. Chung?

10 A. Bimodal distribution is that, in that  
11 distribution, there are two humps, two peaks, as opposed  
12 to only one peak. Having one peak is kind of more  
13 common. But having two peaks in that distribution,  
14 that's bimodal.

15 Q. And is bimodal distribution a requirement of  
16 Claim 1 that we were just looking at earlier?

17 MR. GLENN: Objection to form.

18 THE WITNESS: Yes, Claim 1 involves bimodal  
19 distribution.

20 BY MR. IN:

21 Q. And where does it say in Claim 1 that bimodal  
22 distribution is required?

23 A. The last four lines of this Claim 1, "wherein  
24 40 percent to 90 percent by number of the discrete  
25 carbon nanotubes have an aspect ratio of 30 to 70 and

1 wherein from 1 percent to 30 percent by number of  
2 discrete carbon nanotubes have an average aspect ratio  
3 80 to 140."

4 Q. And why is that a bimodal distribution,  
5 Dr. Chung?

6 A. It -- it talks about the distribution of  
7 aspect ratio among the collection of nanotubes, and it  
8 talks about two subranges of the aspect ratio. One is  
9 30 to 70; the other is 80 to 140.

10 And so these corresponding to the two peaks  
11 of -- of the bimodal distribution. And the  
12 concentration of nanotubes in the two piece are  
13 different. One is 40 percent to 90 percent; the other  
14 is 1 percent to 30 percent.

15 Q. Okay. So in your view, Dr. Chung, if one  
16 bucket of nanotubes, there were 90 percent by number of  
17 that and, in the other bucket of nanotubes, there was  
18 1 percent of that, would that be a bimodal distribution,  
19 in your view?

20 MR. GLENN: Objection. Form.

21 THE WITNESS: Yeah, maybe you can rephrase  
22 because I don't understand your question completely.

23 BY MR. IN:

24 Q. Sure. Let me try again.

25 Let's say, based on Claim 1's language, that

1 we had 90 percent by number of nanotubes having an  
2 aspect ratio of 30 to 70 and then 1 percent by number of  
3 nanotubes having an aspect ratio of 80 to 140.

4 So 90 percent of one type and 1 percent of the  
5 other type, would that be a bimodal distribution, in  
6 your view?

7 MR. GLENN: Objection to form.

8 THE WITNESS: You -- you can -- if you're --  
9 what you said, you're singling out the 1 percent out of  
10 the subrange of 1 percent to 30 percent. That is --

11 BY MR. IN:

12 Q. That's right.

13 A. That is different from what it says here.  
14 What it says here is the subrange is 1 percent to  
15 30 percent. It's not talking about just 1 percent.

16 So your question is not consistent with what  
17 is described in Claim 1.

18 Q. So your view, Dr. Chung, is that, to be  
19 consistent with Claim 1, that entire range of nanotube  
20 percentages, mainly 1 to 30 percent and 40 to  
21 90 percent, has to be present?

22 MR. GLENN: Objection. Form.  
23 Mischaracterizes the witness's testimony.

24 THE WITNESS: What I mean is that the entire  
25 subrange has to be recognized rather than picking up

1 just a little bit of a particular subrange.

2 BY MR. IN:

3 Q. Okay. So let's say that I have a sample of  
4 nanotubes with me and it turns out I hire a graduate  
5 student to count every single nanotube in that sample  
6 and that graduate student comes back to me and says,  
7 "Based on my analysis, 90 percent of the nanotubes here  
8 have an aspect ratio of 30 to 70, and 1 percent of the  
9 nanotubes here have an aspect ratio of 80 to 140."

10 In that instance, would that sample not read  
11 on this requirement of Claim 1? Is that your comfort  
12 zone?

13 MR. GLENN: Object to form.

14 THE WITNESS: One has to consider the  
15 experimental error. Okay? And how much is the error,  
16 it depends on the size of your sample, you know. Are  
17 you just playing with 100 CNTs, or are you playing with  
18 1 million CNTs, you know?

19 And the smaller is your sample size, the  
20 bigger would be the error of -- with the 1 percent, you  
21 know. 1 percent of 100 CNTs is just 1 CNT, you know.  
22 1 percent of 10,000 is 1,000, you know.

23 So the accuracy of the claimed 1 percent is  
24 questionable because it could be within the experimental  
25 error.

1 BY MR. IN:

2 Q. But just hypothetically, Dr. Chung, let's  
3 assume that this is a brilliant graduate student and the  
4 measurements that was taken is correct. Let's assume  
5 it's correct for now.

6 So the sample of nanotubes that was measured,  
7 there is actually 1 percent of one aspect ratio and  
8 90 percent of the other aspect ratio.

9 In that case, does this claim language of  
10 Claim 1 apply to that sample?

11 MR. GLENN: Objection. Form.

12 THE WITNESS: Even a brilliant graduate  
13 student can report results to the professor without  
14 adequate consideration of the error. Okay.

15 BY MR. IN:

16 Q. Well, let's say he was only looking at ten  
17 nanotubes. And so he counted nine that had one aspect  
18 ratio, and he counted one that had the other aspect  
19 ratio.

20 Does that then satisfy this claim?

21 MR. GLENN: Objection to form.

22 THE WITNESS: Okay. Let me explain.

23 You have ten, but then you select the ten out  
24 of maybe a million, you know. And so this group of ten  
25 and another group of ten may be -- may come up with very

1 different results. And so, again, that points to the  
2 error.

3 BY MR. IN:

4 Q. Yeah. I understand that completely,  
5 Dr. Chung.

6 But let's say my question to you is not  
7 talking about the entire population of nanotubes. My  
8 question is directed just to those ten nanotubes that  
9 were observed by the graduate student.

10 If I ask you, "Are those ten nanotubes, just  
11 in that universe" -- "has the claim language been  
12 satisfied?" what would your response be to that?

13 MR. GLENN: Objection to form.

14 THE WITNESS: One should not just consider the  
15 ten nanotubes to be representative of the millions of  
16 nanotubes that are available in that sample and just  
17 assume that these ten are represented.

18 BY MR. IN:

19 Q. Yeah.

20 A. That's why I -- I think just looking at ten  
21 and saying that that's representative of the universe is  
22 misleading.

23 Q. I understand that completely, Dr. Chung.

24 But my question here -- I'm not saying  
25 anything about those ten nanotubes being representative.

1 Those ten nanotubes are all the nanotubes I have in this  
2 particular experiment that I'm doing. There are no  
3 other nanotubes, just those ten. It could be for a  
4 transistor application. I don't know. But just ten  
5 nanotubes.

6 So just in that universe, would that satisfy  
7 that claim language?

8 MR. GLENN: Objection to form.

9 THE WITNESS: I -- I don't think the -- the  
10 gist of this claim is for looking at ten nanotubes.  
11 Okay? Rather, it is looking at a sufficiently large  
12 universe and wanting to look at the distribution of  
13 aspect ratios in this large collection of nanotubes.  
14 That's the context.

15 And if you just say ten, you know, that's  
16 really not the context of this particular patent.

17 BY MR. IN:

18 Q. Okay. So you're unable to tell me at this  
19 time, Dr. Chung, if you had ten nanotubes, whether those  
20 nanotubes would satisfy this claim?

21 You're unable to tell me with that  
22 information; is that your position?

23 MR. GLENN: Objection to form.

24 Mischaracterizes the witness's testimony.

25 THE WITNESS: Could you rephrase, please?

1 BY MR. IN:

2 Q. So it is your position right now, Dr. Chung,  
3 that based on my example where there are only ten  
4 nanotubes present, you are unable to tell me whether or  
5 not the claim language is satisfied by those ten  
6 nanotubes?

7 MR. GLENN: Same objections.

8 THE WITNESS: See, if you deal with only ten  
9 nanotubes, it is not in the spirit of this particular  
10 invention, and that's why I -- I am reluctant to equate  
11 your -- your situation of ten nanotubes with the  
12 situation of Claim 1.

13 BY MR. IN:

14 Q. If I were to, let's say, revise the scenario  
15 slightly. So let's say there are approximately a  
16 million nanotubes and my very smart and diligent  
17 graduate student made statistically accurate  
18 measurements such that he comes back to you and says,  
19 "Dr. Chung, I've measured statistically relevant samples  
20 among these million nanotubes, and I have concluded that  
21 that 1 percent has this one aspect ratio and 90 percent  
22 has this other aspect ratio," would your answer change  
23 in that example?

24 MR. GLENN: Objection to form.

25 THE WITNESS: As a professor, I am still not

1 satisfied with this graduate student's answer because  
2 you have to show me the histogram of the distribution of  
3 the aspect ratios among these 1 million CNTs. You  
4 cannot just say 1 percent is this and 99 percent is  
5 that.

6 You know, you have to show me the entire  
7 histogram, not just one bit here, one bit there.

8 BY MR. IN:

9 Q. Okay. And your review is that to satisfy this  
10 claim, you need a histogram where it shows 1 to  
11 30 percent of one type and 40 to 90 percent of the other  
12 type; is that right?

13 MR. GLENN: Objection to form and  
14 mischaracterizes the witness's testimony.

15 THE WITNESS: Well, in general, you want a  
16 histogram showing the distribution of the aspect ratio  
17 such that the aspect ratio range is sufficient in line  
18 with what you're working with.

19 MR. GLENN: Counsel, we've been going about  
20 maybe an hour and ten minutes.

21 MR. IN: Yeah, let's go off the record.

22 (Recess: 10:13 a.m. to 10:27 a.m.)

23 BY MR. IN:

24 Q. Dr. Chung, did you have any discussions with  
25 anyone during the break?

1           A.     No.

2           Q.     Okay.  We were talking about bimodal  
3 distribution before the break.

4                     If you would go with me to Figure 1 of the  
5 '282 patent.  It's on page 3.

6           A.     Yes.

7           Q.     Is that showing an example of bimodal  
8 distribution according to Claim 1 of the '282 patent?

9                     MR. GLENN:  Objection to form.  Objection.  
10 Calls for a legal conclusion.

11                    THE WITNESS:  Okay.  This -- this figure  
12 doesn't correspond exactly to Claim 1 because Claim 1  
13 deals with aspect ratio, not the length of the carbon  
14 nanotubes.

15 BY MR. IN:

16           Q.     So are you not able to make any conclusions  
17 regarding aspect ratio based on this figure?

18                    MR. GLENN:  Objection to form.  
19 Mischaracterizes the witness's testimony.

20                    THE WITNESS:  No, this histogram just  
21 doesn't -- is not in terms of the aspect ratio.  And one  
22 cannot say that the histogram involving the length is  
23 the same as the histogram involving the aspect ratio.

24 BY MR. IN:

25           Q.     Do you know how the inventors of the '282

1 patent came up with that Figure 1, Dr. Chung?

2 MR. GLENN: Objection to form.

3 THE WITNESS: I'm looking.

4 I don't think that the patent describes how  
5 Figure 1 was obtained.

6 BY MR. IN:

7 Q. If you could go with me, Dr. Chung, to  
8 column 6 of the '282 patent, starting at around line 18.

9 A. Okay.

10 Q. Does that provide some description of how that  
11 Figure 1 was generated?

12 A. I can't hear your sentence.

13 Q. Starting at line 18 in column 6 of the '282  
14 patent, does that paragraph describe how Figure 1 was  
15 generated?

16 MR. GLENN: Objection to form.

17 THE WITNESS: It doesn't describe how it was  
18 generated. It just presents this figure.

19 Oh, excuse me. It does say one thing, though.  
20 "The lengths were determined by deposition of the  
21 discrete carbon nanotubes on a silicon wafer and by  
22 using scanning electron microscopy."

23 That's the extent of the description of how  
24 Figure 1 was obtained.

25

1 BY MR. IN:

2 Q. Okay. Can you try to explain that a little  
3 bit more in laymen's terms about what they did with the  
4 scanning electron microscope?

5 MR. GLENN: Objection to form.

6 THE WITNESS: Apparently they used the SEM to  
7 examine the collection of CNTs to measure the length of  
8 each and then make the histogram.

9 BY MR. IN:

10 Q. Does it say how many nanotubes they observed?

11 A. No, it doesn't say.

12 Q. Can you make any educated guesses about the  
13 number of nanotubes that they measured to generate  
14 Figure 1?

15 MR. GLENN: Objection to form.

16 THE WITNESS: I can't guess.

17 BY MR. IN:

18 Q. Could it be millions of nanotubes?

19 MR. GLENN: Objection to form.

20 THE WITNESS: I don't want to guess.

21 BY MR. IN:

22 Q. If you were to provide a similar type of  
23 histogram in one of your papers using this method of  
24 using scanning electron microscopy, how many  
25 measurements would it take to satisfy you?

1 MR. GLENN: Objection to form.

2 THE WITNESS: See, if you look at this  
3 Figure 1, there are so many columns. And you need to  
4 have a decent number of nanotubes within each column.  
5 You can't have just one and two, you know, especially  
6 the tallest column. You need to have an adequate  
7 number. Otherwise, it's -- it's statistically not  
8 meaningful.

9 And so how many nanotubes it takes me to allow  
10 these columns to statistic -- be statistically  
11 meaningful in the height of the column.

12 BY MR. IN:

13 Q. So what would you say, for your paper, the  
14 minimum number of nanotubes required for each column to  
15 give it statistical meaning?

16 MR. GLENN: Objection to form.

17 THE WITNESS: It really boils down to the  
18 error, and I want to make sure that I have multiple CNT  
19 sets and do the same measurement on each CNT set to see  
20 if I get, more or less, the same histogram for each set.

21 So it's not just looking at one set. I don't  
22 think that would be a good way to do it.

23 BY MR. IN:

24 Q. How many sets would you look at for your  
25 paper?

1 MR. GLENN: Objection to form.

2 THE WITNESS: The number of sets required  
3 depends on how reproducible the histograms from the  
4 different sets are, you know. Right? If they are all  
5 the same, then you're happy. But if they are not, then  
6 you might need to do more sets.

7 BY MR. IN:

8 Q. Okay. And within each set, how many distinct  
9 nanotube measurements would you want to have in your  
10 paper?

11 MR. GLENN: Objection to form.

12 THE WITNESS: Within each set, you need to  
13 have a sufficiently large number because when you have a  
14 very small number, the chance of having reproducibility  
15 between one set and the other set would be very small,  
16 and you would have to do many, many sets.

17 BY MR. IN:

18 Q. So would this be in the hundreds of  
19 measurements, would you say?

20 MR. GLENN: Objection to form.

21 THE WITNESS: I wouldn't want to guess like  
22 that.

23 BY MR. IN:

24 Q. What would be a reasonable number for a  
25 graduate student to make these SEM-based measurements to

1     come up with this histogram?

2                 MR. GLENN:  Objection to form.

3                 THE WITNESS:  See, one needs to realize that  
4     it's not just the length that is a variable.  The  
5     diameter is also a variable.  Like single wall, double  
6     wall, triple wall.  The diameter is different.

7                 And the collection of CNT in a set might have  
8     a variety of diameters, not only a variety of lengths.  
9     That's one of the reasons why I said doing a histogram  
10    for the aspect ratio is not the same as doing a  
11    histogram for the length.

12                And to do a histogram of the aspect ratio, you  
13    have to measure both the length and the diameter.  And  
14    that's a lot more work than just measuring the length.

15    BY MR. IN:

16                Q.    If you were able to -- if you were able to  
17    obtain nanotubes with varying lengths but same  
18    diameters, then would measurement of length be  
19    sufficient to show bimodal distribution of aspect  
20    ratios?

21                A.    Yes.  Yes.  You can have this hypothetical  
22    thing of all the nanotubes having exactly the same  
23    diameter.  If that hypothetical wish is indeed arrived  
24    at, then that would be nice.  But in reality, it's not  
25    like that.

1           You know, even if you buy a sample of carbon  
2 nanotubes, it's not all the same diameter. You know,  
3 they -- the vendor often gives you the average diameter  
4 or a range of diameter. It's not all the same diameter,  
5 even within one sample that you buy.

6           So assuming that all of the nanotubes in that  
7 set have the same diameter is really a too idealistic  
8 kind of assumption.

9           Q. Well, maybe not the same, but if they had very  
10 similar diameters, would that be sufficient?

11           MR. GLENN: Objection to form.

12           THE WITNESS: Yeah, the word "similar" is very  
13 vague, you know, like single wall, double wall. It's a  
14 big difference. The fractional difference is a big one.

15           And among the multiwall nanotubes, you have a  
16 big range of diameters, and just assuming that they are  
17 similar I think is a bit wishful.

18 BY MR. IN:

19           Q. So is it your view, going back to Figure 1 of  
20 the '282 patent, that you cannot correlate this  
21 histogram to the bimodal distribution that is required  
22 in Claim 1?

23           MR. GLENN: Objection to form. Objection to  
24 the extent it mischaracterizes the witness's testimony.

25           THE WITNESS: It relates. It relates, but

1 it's not identical. That's what I mean because length  
2 and aspect ratio are not the same thing. But it  
3 relates.

4 BY MR. IN:

5 Q. What do you mean by "relates," Dr. Chung?

6 A. That is, that the length distribution may have  
7 some relationship with the aspect ratio but they are not  
8 the same.

9 Q. Again, referring to Figure 1, then in your  
10 view, what other information would you need to be able  
11 to actually correlate this type of histogram to Claim 1?

12 MR. GLENN: Objection to form.

13 THE WITNESS: As I said, the aspect ratio  
14 depends on both the length and the diameter. Not just  
15 the length.

16 So to really determine the aspect ratio for  
17 each nanotube in the set, you need to measure both the  
18 length and diameter of each nanotube in the set.

19 BY MR. IN:

20 Q. Earlier today, Dr. Chung, we talked about, you  
21 know, purchasing a commercial nanotube, having a  
22 particular diameter, and chopping them up or, other way,  
23 agitating them such that they have different lengths.

24 In that case, if you took a histogram like  
25 this of those samples, can you measure just the length

1     there to give you a correlation to aspect ratios, or  
2     would you still need to measure diameters in that case  
3     as well?

4                 MR. GLENN:  Objection to form.

5                 THE WITNESS:  Earlier, our discussion was one  
6     particular nanotube, one particular piece.  So we have  
7     the diameter very well defined for that one particular  
8     piece.

9                 Then if you chop that one particular piece,  
10    then you would have different lengths corresponding to  
11    different aspect ratios all having the same diameter,  
12    assuming, obviously, that the diameter is uniform  
13    throughout the entire length of that one piece of  
14    nanotube there.

15                But if you are dealing with a set of many  
16    nanotubes, it's a different situation because the  
17    diameter varies among the different nanotubes.

18    BY MR. IN:

19                Q.    So earlier when you were talking about the  
20    different agitation processes that a POSITA could  
21    perform to reduce the length of nanotubes, you were  
22    referring to performing that on a single nanotube?

23                MR. GLENN:  Objection.  Mischaracterizes the  
24    witness's testimony.  And objection to form.

25                THE WITNESS:  I was talking about chopping and

1 the effect of the chopping. And for any diameter of  
2 nanotube, the chopping would tend to decrease the  
3 length. But if you want to specify the aspect ratio  
4 resulting from the chopping, you need to know both the  
5 length and the diameter.

6 BY MR. IN:

7 Q. Let's go back to paragraph 70 of your  
8 declaration, Dr. Chung. And let's revisit that last  
9 sentence that we talked about earlier, starting with  
10 "for a particular CNT diameter."

11 A. Yes.

12 Q. So here, you say that, for a particular CNT  
13 diameter, "aspect ratios of the CNTs within each  
14 subrange can thus be adjusted accordingly."

15 What does that mean?

16 A. Yes, this sentence pertains to the idealistic  
17 case of all the nanotubes having the same diameter.  
18 Just for the sake of argument, for the sake of  
19 explanation, because if you have the same diameter, then  
20 the logic is -- is easy -- easier to understand.

21 So even if it's of the same diameter, you can  
22 adjust the volume fraction and aspect ratios in order to  
23 arrive at a composition that meets the requirement of  
24 the particular application.

25 Q. But you're saying that is only in theory and

1 not in real life?

2 MR. GLENN: Objection to form.

3 Mischaracterizes the witness's testimony.

4 THE WITNESS: No, I'm not saying that it's not  
5 in real life. It is in real life. As I said, if you  
6 take one CNT and you chop it, you know, it's real life.  
7 Real-life chopping. It's not theoretical chopping.

8 BY MR. IN:

9 Q. I mean, there's nothing here, Dr. Chung, about  
10 chopping up a single CNT. It says here, like I said  
11 earlier, for a particular diameter, and then you go on  
12 to talk about the ratio -- aspect ratios, plural, of the  
13 CNTs, plural.

14 Isn't that saying, Dr. Chung, that you can  
15 have multiple CNTs who have a particular diameter and  
16 whose aspect ratios can be adjusted?

17 MR. GLENN: Objection. Form.

18 THE WITNESS: Could you clarify? I didn't  
19 hear it very well.

20 BY MR. IN:

21 Q. Yeah.

22 I was just reading, again, that last sentence  
23 where you are talking about a single CNT diameter and  
24 then you talk about aspect ratios of multiple CNTs,  
25 plural.

1           And my understanding of that sentence was that  
2   you can have a plurality of CNTs with a particular  
3   diameter.

4           Do you agree with that?

5           A.   Yes. So this sentence is for that -- for a  
6   particular diameter. Yes. That is, if you consider a  
7   particular diameter, that then this follows.

8           Q.   So you can have a group of CNTs with a  
9   particular diameter, and you can adjust their aspect  
10   ratios while maintaining that diameter; is that right?

11           MR. GLENN: Objection to form.

12           THE WITNESS: Yeah. Basically, the diameter  
13   is in this sentence, which is illustrating the concept  
14   for a simplistic case of a particular CNT diameter. For  
15   this particular simplistic case, yes. Then you are  
16   dealing with a collection of CNT having a particular CNT  
17   diameter.

18   BY MR. IN:

19           Q.   Just give me a minute, Dr. Chung.

20           A.   Okay.

21           Q.   If I could direct your attention, Dr. Chung,  
22   to again the '282 patent, column 5 now. Column 5,  
23   starting at line 55.

24                   Let me know when you're there.

25           A.   I'm there.

1           Q.    It says, "The discrete carbon nanotubes can  
2   have a unimodal, bimodal, or multimodal distribution of  
3   diameters and/or lengths."

4                   Do you see that?

5           A.    Yes.

6           Q.    What is meant by the "and/or" there,  
7   Dr. Chung?

8                   MR. GLENN:  Objection to form.

9                   THE WITNESS:  It means that it could be a  
10   distribution in terms of the diameter.  It can also be a  
11   distribution in terms of the length.

12   BY MR. IN:

13           Q.    So if we were referring to the case where it  
14   is a distribution of lengths, then what would a POSITA  
15   understand about the diameters of those nanotubes?

16                   MR. GLENN:  Objection to form.

17                   THE WITNESS:  Well, if one wants to have a  
18   distribution of the length, ideally all the nanotubes  
19   have the same diameter.  And similarly, if one wants to  
20   have distribution of the diameter, ideally all the  
21   nanotubes have the same length.

22   BY MR. IN:

23           Q.    I'm going to upload now one more document.  
24   This is Exhibit 1008.  It's the Son reference.

25                   And then just to make things easier, let me

1 also go ahead and upload Exhibit 1003, which is the  
2 declaration of Dr. Gido.

3 Let me know when you have those, Dr. Chung.

4 A. I have them.

5 Q. So looking at Exhibit 1008, this is the  
6 translated English version of the Son reference; is that  
7 right?

8 A. Yes.

9 Q. Okay. Did you review this reference in  
10 preparing for today's deposition?

11 A. Yes.

12 Q. And then at the same time, if we go back to  
13 your declaration, at paragraph 76, you say that  
14 figures 1, 2, 3 -- "1 through 3 of Son are reproduced  
15 below and directed to the same embodiment."

16 And then you show those three figures from  
17 Son; is that right?

18 A. Yes.

19 Q. So when you say, Dr. Chung, that these three  
20 figures are "directed to the same embodiment," what does  
21 that mean?

22 A. Figure 1 shows the longer nanotube called --  
23 called carbon nanotube A, and the shorter one is called  
24 carbon nanotube B. And then they are distributed.

25 And then Figure 2 is the other -- this

1 composite after injection or -- or mechanical  
2 deformation during the processing. So that is stretched  
3 horizontally.

4 And then Figure 3 is the same thing but  
5 looking from the top. You know, rather than, in  
6 Figure 2, it's kind of -- Figure 2 is not purely looking  
7 at the top, but Figure 3 is looking straight from the  
8 top.

9 So there is really one story there.

10 Q. Is it fair to say that Figure 2 is three  
11 dimensional and Figure 3 is two dimensional?

12 MR. GLENN: Objection to form.

13 THE WITNESS: Well, Figure 3 is definitely two  
14 dimensional. Figures 1 and 2 are meant to be three  
15 dimensional.

16 But these are just -- just cartoons. They  
17 really don't convey the three-dimensional structure very  
18 well in Figures 1 and 2. But we know, more or less,  
19 what it means. You know, it conveys the concept, but  
20 they are just cartoons.

21 BY MR. IN:

22 Q. Okay. So these are cartoons, but, as you  
23 said, Figures 1 and 2 are 3-D cartoons and Figure 3 is a  
24 2-D cartoon; is that fair?

25 MR. GLENN: Objection to form.

1           THE WITNESS: Yes. Although, as I said, the  
2 3-D cartoons are not doing -- not conveying the nanotube  
3 distribution in a very 3-D fashion. The box looks 3-D.  
4 The box looks 3-D.

5           Anyway, that's cartoon. Perhaps I can't  
6 expect too much.

7 BY MR. IN:

8           Q. Okay. And is it your view, Dr. Chung, that  
9 all three of those figures are showing the exact same  
10 position in the sample? That is, they are all showing  
11 the exact same volume? Or are they just depicting  
12 different parts but just of the same embodiment?

13           MR. GLENN: Objection to form.

14           THE WITNESS: I think that Figures 1 to 3  
15 convey the representative structures. And most  
16 importantly is Figure 3, which -- which is very clear in  
17 terms of how the carbon nanotube is -- Figure 3 is -- we  
18 understand there's a mislabeling. We have Figure 3A and  
19 B reversed. But I'll -- I'll refer to "big" and  
20 "small," maybe. Those are easier.

21           And the Figure 3, I think that that cartoon is  
22 very clear in conveying the notion that the big  
23 nanotubes touch one another and thereby forming a  
24 continuous electrical network. And that is the main  
25 point that I want to emphasize.

1 BY MR. IN:

2 Q. Okay. But you're not saying that Figure 3 is  
3 a top-bound view of the exact volume shown in Figures 1  
4 or 2, right?

5 MR. GLENN: Objection to form. Objection.  
6 Mischaracterizes the witness's testimony.

7 THE WITNESS: Yeah. As I said, these are  
8 cartoons. They are not microscope photos, so they are  
9 just drawn there. And whether they are exactly the same  
10 chunk, you know, is just a matter of the drawing.

11 BY MR. IN:

12 Q. Yeah. Well, let's take Figure 2. If we look  
13 at the thick nanotubes, there are -- I see five of them.  
14 And in Figure 3, I think there's maybe seven of them.

15 Would you agree with that?

16 A. Let me count.

17 Maybe. Maybe about seven for Figure 3. Yeah.  
18 For Figure 2, it's easier to count. Figure 2 is  
19 three -- I mean five -- Figure 2 is five. Five big  
20 ones.

21 Q. Okay. So fair to say Figures 2 and 3 are  
22 probably trying to depict the same volume in this  
23 sample?

24 MR. GLENN: Objection to form.  
25

1 BY MR. IN:

2 Q. Right?

3 A. I -- I wouldn't say that so exactly because  
4 these are just depictions. And Son wants to convey  
5 the -- this -- the structure. Okay? And these are  
6 cartoons and not microscope photos. And so I wouldn't  
7 say that the number of --

8 (Reporter requests clarification.)

9 THE WITNESS: I said "wiggly lines."

10 Those are thin wiggly lines and thick wiggly  
11 lines and have the same number of thin wiggly lines and  
12 thick wiggly lines in each of the Figures 1, 2, 3.

13 I don't think that is what's important when  
14 these cartoons were drawn by Son.

15 BY MR. IN:

16 Q. So referring to your annotated Figure 3 there,  
17 Dr. Chung, is it your view that wherever you put those  
18 red circles, that is where those thicker nanotubes or  
19 wiggly lines are making physical contact with another  
20 thick nanotube? Is that right?

21 A. Not really --

22 MR. GLENN: Objection to form.

23 THE WITNESS: Yeah. Those pink circles are  
24 positions where one thick wiggly line makes contact with  
25 another thick wiggly line. But also some of these pink

1 circles depict places where the thick wiggly line  
2 touches a small -- a small or thin wiggly line.

3 BY MR. IN:

4 Q. And how do you know, Dr. Chung, that in those  
5 red-circled areas, the nanotubes are making physical  
6 contact with each other?

7 A. Well, that's what this cartoon is meant to  
8 convey. So we just believe what Son is trying to  
9 convey. I don't think he's trying to trick us. And if  
10 we just look at the cartoon, it's clear that that's what  
11 he's trying to convey.

12 Q. And that understanding, Dr. Chung, is based  
13 solely on that one Figure 3?

14 MR. GLENN: Objection. Form. Objection.  
15 Mischaracterizes the witness's testimony.

16 THE WITNESS: What is based -- could you  
17 rephrase, please?

18 BY MR. IN:

19 Q. What disclosure in Son are you relying on to  
20 draw your conclusion that at those red circles, the  
21 nanotubes are making physical contact with each other?

22 A. Yeah, the -- pretty much the entirety of the  
23 Son patent is geared towards forming an electrically  
24 continuous conductive path. And he is exploiting those  
25 thick nanotubes for providing that continuity. And in

1 order for that continuity to be feasible, there has to  
2 be physical contact between these thick carbon  
3 nanotubes.

4 And throughout this patent of Son, it's very  
5 clear that that's the -- that's the intention. And that  
6 intention is consistent with the -- with Figure 3  
7 indicating the physical contact made between the thick  
8 nanotubes.

9 Q. Besides Figure 3, is there any portion of Son  
10 that you can point to to support that position?

11 MR. GLENN: Objection to form.

12 THE WITNESS: Okay. You can look at, say,  
13 paragraph 21. "As a result, the excellent  
14 dispersibility of the carbon nanotube B with a small  
15 aspect ratio and the electrical properties of the carbon  
16 nanotube A with a large aspect ratio are simultaneously  
17 expressed."

18 So the big ones are more electrical  
19 properties. And by "electrical properties," Son means  
20 the electrical conductivity.

21 BY MR. IN:

22 Q. Where does that talk about physical contact  
23 between nanotubes?

24 MR. GLENN: Objection to form.

25 THE WITNESS: I'm looking.

1                   Okay. Paragraph 22 of Son. "Therefore, as  
2 shown in Figure 2, it is possible to prevent the rupture  
3 of the carbon nanotubes even through the injection  
4 process so that the electrical network before injection  
5 can be maintained. As shown in Figure 3, the electrical  
6 network is mainly composed of carbon nanotubes having a  
7 large aspect ratio. The portion marked with dots in  
8 Figure 3 is a position where an electrical contact is  
9 made."

10                   So Son is very clear that there is electrical  
11 contact. That means that there's physical contact  
12 between these big ones, the big carbon nanotubes.

13 BY MR. IN:

14                   Q. So is it your view, Dr. Chung, that electrical  
15 contact between two nanotubes requires physical contact  
16 between those two nanotubes?

17                   A. Yes. If they don't touch with a gap in  
18 between, cannot be a decent -- cannot be --

19                   (Reporter requests clarification.)

20                   THE WITNESS: Yeah, with a -- when you have a  
21 gap between A and B, then you don't have an electrical  
22 contact between A and B.

23 BY MR. IN:

24                   Q. What if there were a conductive particle  
25 between A and B? Would that allow electrical contact

1 between A and B without direct physical contact?

2 MR. GLENN: Objection to form.

3 THE WITNESS: If you have a conductive  
4 particle in the gap between A and B, that particle would  
5 allow electric current to flow from A to B. But you  
6 need to have that third party.

7 But if you don't have that third party, that A  
8 and B cannot have a gap in between and still be  
9 electrically in contact.

10 BY MR. IN:

11 Q. Okay. But you would agree with me that, in  
12 some cases, such as when there is an intervening  
13 conductive particle, it is possible to have electrical  
14 contact between two nanotubes without having them  
15 directly contact each other, right?

16 MR. GLENN: Objection to form.  
17 Mischaracterizes the witness's testimony.

18 THE WITNESS: It really depends on the nature  
19 of the interface between the particle and each of the  
20 two nanotubes. You know, it's not just the presence of  
21 that conductive particle.

22 It needs to be an intimate contact with both  
23 nanotube A and nanotube B in order to electrically  
24 connect nanotube A and nanotube B. Just being present  
25 in the gap does not imply that it has that intimate

1 interface with A or B.

2 BY MR. IN:

3 Q. So if a conductive particle were in intimate  
4 contact between nanotube A and nanotube B to allow the  
5 electrical conduction there through, then in that case,  
6 nanotube A and nanotube B would be in electrical contact  
7 with each other but not necessarily in physical contact;  
8 is that right?

9 MR. GLENN: Objection. Form.

10 THE WITNESS: Yeah. In that situation, A and  
11 B would be electrically connected. I would use that  
12 word. Electrically connected near this third party.

13 Rather than saying that they are electrically  
14 in contact, I would rather say they are electrically  
15 connected.

16 BY MR. IN:

17 Q. Okay. Let's move on to a different topic  
18 here.

19 If I could direct you, Dr. Chung, to  
20 paragraph 95 and 96 of your declaration.

21 A. Yes.

22 Q. And you may recall, in Claim 1, as we  
23 discussed earlier, it talks about percentage by number  
24 of nanotubes as opposed to percentage of weight or  
25 percentage of volume.

1           And Dr. Gido, as you note here, has provided  
2 several methodologies for converting Son's weight ratios  
3 into number percentages; is that right?

4           A.    Yes.

5           Q.    I think you said earlier, Dr. Chung, that it  
6 was more common to use volume or weight percentage as  
7 opposed to number percentage.

8                   Did I get that right?

9           MR. GLENN:  Objection to form.  Objection.  
10 Mischaracterizes the witness's testimony.

11           THE WITNESS:  Not quite exactly.  I said that  
12 when you have A and B, you know, two parties in your --  
13 in your material -- and people often talk about the  
14 volume fraction of A or the weight fraction of A.  You  
15 know, you have the two parties making up the -- your --  
16 your entire material.

17                   So until the composite materials -- which is  
18 what I mean here, A and B making a composite material --  
19 in that situation, people commonly talk about the volume  
20 fraction of A in this composite, the volume fraction of  
21 B in this composite, and similarly the weight fraction  
22 of A and weight fraction of B.  Okay.

23                   But, here, we are not really talk about a  
24 composite.  It's just a collection of nanotubes.  Okay.  
25 And when that is the case, it makes a lot of sense to

1 count the fraction of the number of nanotubes that's  
2 within a certain aspect ratio range, for instance.

3 BY MR. IN:

4 Q. Is it possible to convert from one realm to  
5 the other? Namely from number percentage to weight  
6 percentage and vice versa? Is that theoretically  
7 possible?

8 MR. GLENN: Objection. Form.

9 THE WITNESS: It -- it is not possible unless  
10 you have a lot of information about the mass or  
11 dimensions. But the number fraction and the weight  
12 fraction are equal only if all other nanotubes are the  
13 same.

14 BY MR. IN:

15 Q. I didn't ask you, Dr. Chung, whether they were  
16 equal. I just asked if it's possible to go from one to  
17 the other.

18 A. Well, it's possible only if you have a lot of  
19 information. And I have described the required  
20 information in my declaration.

21 Q. Have you done this type of conversion before  
22 in your academia -- in your academic career?

23 MR. GLENN: Objection to form.

24 THE WITNESS: I haven't done exactly this --  
25 this conversion in the context of a collection of

1 nanotubes, you know. But the -- say I told you about  
2 the mass fraction versus volume fraction. A -- in the  
3 A/B composite, you know.

4 In that context, I've done a lot converting  
5 between the volume fraction of A and weight fraction of  
6 A in that composite. But that, again, requires  
7 information on -- on the -- the mass. Say it's the  
8 atomic weight, for instance.

9 So anyway, that kind of conversion, that's  
10 very common. I even do it for homework, my students'  
11 homework. Okay.

12 But, here, we are not talk about a composite  
13 with A and B. We are talking about a set of nanotubes  
14 and converting from mass fraction to number fraction for  
15 the collection of nanotubes. That's something I have  
16 not done before.

17 And it's -- it's something that is not  
18 trivial, and I've explained in detail why is because of  
19 you have so many nanotubes and you need the information  
20 of each. It's just very, very tedious.

21 BY MR. IN:

22 Q. So in paragraph 95, Dr. Chung, you say that  
23 Dr. Gido's three different methodologies are  
24 fundamentally flawed.

25 And then in paragraph 96, you say that

1 "Petitioner assumes that the diameter of all of the CNTs  
2 in Son are the same."

3 Do you see that?

4 A. Yes.

5 Q. So would you say that assumption about the  
6 same diameters is one of the main flaws of Dr. Gido's  
7 approach?

8 MR. GLENN: Objection to form.

9 THE WITNESS: Yeah, in one -- at least one of  
10 the approach, he made this assumption. The assumption  
11 is that all the nanotubes in that collection are the  
12 same in diameter. And this is not a realistic  
13 assumption.

14 BY MR. IN:

15 Q. Then instead of assuming that all the  
16 diameters were the same, as you say, Dr. Chung, what  
17 should have Dr. Gido done instead?

18 MR. GLENN: Objection. Form.

19 THE WITNESS: Well, it's up to him. He  
20 provides three ways of doing it, and all three ways  
21 involve assumptions that are not realistic.

22 BY MR. IN:

23 Q. Those real -- unrealistic assumptions,  
24 including assuming that the diameters are all the same;  
25 is that right?

1           A.    Yeah.

2                   MR. GLENN:  Objection.  Form.

3                   THE WITNESS:  I mean, one of the three  
4 specifically mentions this assumption that the diameter  
5 of all the nanotubes in the collection are the same.

6 BY MR. IN:

7           Q.    Did you try to replicate the math that  
8 Dr. Gido provides in his declaration?

9           A.    I have looked at the math.  I think the math  
10 itself is okay.  The problem is the assumption.  If the  
11 assumption behind the math is flawed, then whatever you  
12 do afterward is flawed.

13          Q.    Did you review the Appendix A of Dr. Gido's  
14 declaration?

15          A.    I'm looking.

16                   Do you have a page number for that?

17          Q.    Yeah, it starts at page 100.

18          A.    Okay.

19          Q.    It's a lot of pages.

20                   Do you recall going through that in your  
21 review for this case?

22          A.    I did not study these pages.

23          Q.    Do you know what those are referring to?

24          A.    Yeah.  He was doing calculation -- a detailed  
25 calculation, in fact.  And I have no problem with the

1 math. My problem is with the assumptions.

2 Q. Besides the equal diameter assumption that you  
3 say was a flaw, what other assumptions by Dr. Guido do  
4 you think was flawed?

5 MR. GLENN: Objection to form.

6 THE WITNESS: Okay. He has three  
7 methodologies of turning ratio to number of ratio. And  
8 all three involved assumptions.

9 The first methodology involves assuming that  
10 the mass ratio and the number ratio are the same. And  
11 that is the most -- most unreasonable assumption.

12 The two ratios cannot be the same unless all  
13 of the nanotubes have the same mass. And they obviously  
14 don't because they can have different diameter,  
15 different length, and even the density is not identical  
16 depending on -- because the density also can vary  
17 depending on the number of walls.

18 And so assuming that all those nanotubes are  
19 identical in weight is very, very unreasonable.

20 BY MR. IN:

21 Q. Is it theoretically possible, though?

22 MR. GLENN: Objection to form.

23 THE WITNESS: Well, theoretical is -- is -- is  
24 not the same as being realistic. Okay. You can have  
25 theory, but it's not realistic.

1 BY MR. IN:

2 Q. Okay. But it is theoretically possible,  
3 right?

4 MR. GLENN: Objection. Form.

5 THE WITNESS: I -- it's an assumption. It's a  
6 possible assumption.

7 BY MR. IN:

8 Q. Is it an impossible assumption?

9 A. It's a bad --

10 MR. GLENN: Objection to form.

11 MR. IN: Sorry. Could you say that again,  
12 Dr. Chung?

13 THE WITNESS: It's a bad assumption.

14 BY MR. IN:

15 Q. Okay. Please continue with -- I think you  
16 were talking about the other flaws as well here.

17 A. Okay. So that was the first methodology of  
18 Gido.

19 The second is the assumption that the diameter  
20 of all the CNTs are the same. As I mentioned before,  
21 that's also an unrealistic assumption because you cannot  
22 get a collection of CNTs that have the same diameter  
23 unless you go through the various tedious tasks of  
24 measuring the diameter of all the CNTs in your  
25 collection of CNTs and singling out those that have the

1 same value of your chosen diameter.

2 So it's just not realistic, again. And to  
3 extract from a sample of CNT so as to arrive at a subset  
4 that have -- all the CNTs have the same diameter, that  
5 is very, very tedious. So it's, again, not a realistic  
6 assumption.

7 Q. Okay. Anything else?

8 A. And he has a third methodology, too. I'm  
9 trying to find it here.

10 (Pause on the record.)

11 THE WITNESS: Excuse me. I'm sorry for the  
12 wait.

13 BY MR. IN:

14 Q. Oh, no problem.

15 A. Dr. Gido's third approach.

16 Okay. I find it now. Okay.

17 So the third method of Dr. Gido relies on  
18 assuming that the distribution of carbon nanotube  
19 diameters is similar across the range of aspect ratios.  
20 And it further states that one way to characterize this  
21 carbon nanotube --

22 (Reporter requests clarification.)

23 THE WITNESS: To characterize the carbon  
24 nanotube diameter distribution is by its average.

25 But it is practically infeasible to obtain a

1 CNT set in which the CNTs in all the classes of aspect  
2 ratio ranges have similar values of the average  
3 diameter.

4 It is also practically infeasible to obtain a  
5 CNT set in which the CNTs in all the classes have  
6 similar diameter distributions.

7 Thus, it is my opinion that the petitioned  
8 third method also fails.

9 MR. IN: Okay. Thank you for that, Dr. Chung.  
10 Can we go off the record real quick, James?

11 MR. GLENN: Sure.

12 (Recess: 11:33 a.m. to 11:44 a.m.)

13 BY MR. IN:

14 Q. Welcome back, Dr. Chung. I have just a few  
15 more questions for you here today.

16 I'm going to upload two more exhibits, 1005  
17 and 1006.

18 1005 is what we've been referring to as  
19 Bosnyak '392, and 1006 is Bosnyak '129.

20 Let me know when you have that ready,  
21 Dr. Chung.

22 A. I have them ready.

23 Q. Okay. Great.

24 So starting with Bosnyak '392, did you review  
25 this reference as well, Dr. Chung?

1           A.    I believe so.

2           Q.    And you realize it's by -- or it includes two  
3 of the same inventors as the '282 patent; is that right?

4           A.    Yes.

5           Q.    What -- strike that.

6                   Does the Bosnyak '392 reference disclose the  
7 use of discrete CNTs?

8           MR. GLENN:  Objection to form.

9           THE WITNESS:  Okay.  The '392 patent discloses  
10 exfoliated carbon nanotubes.

11 BY MR. IN:

12           Q.    Is that different from discrete carbon  
13 nanotubes?

14           MR. GLENN:  Objection.  Form.

15           THE WITNESS:  In order to have discreteness,  
16 it must be exfoliated.  The exfoliation involves  
17 disentanglement so that it's possible for the nanotubes  
18 to be separated from one another.

19                   However, full exfoliation would involve  
20 complete separation among the nanotubes, and when it's  
21 fully exfoliated, it becomes discrete because no -- no  
22 touching between one nanotube and the other.

23 BY MR. IN:

24           Q.    Okay.  Would you agree with me, Dr. Chung,  
25 that one of the things that Bosnyak '392 is trying to

1 achieve with its nanotubes is improved mechanical  
2 properties of battery components?

3 MR. GLENN: Objection. Form.

4 THE WITNESS: I'm looking.

5 This patent, '392, does mention of the  
6 reinforcing function of the nanotubes in composites.

7 However, it says, (as read) "Utilization of  
8 the nanotubes in this application has been hampered due  
9 to the general inability to reliably produce  
10 individualized carbon nanotubes. For example, load  
11 transfer to carbon nanotubes in polymer composites is  
12 typically less than would be expected than if the carbon  
13 nanotubes were fully exfoliated as individual  
14 nanotubes."

15 BY MR. IN:

16 Q. Okay. If we now move on to Exhibit 1006,  
17 Bosnyak '129, I'll ask the same question here.

18 Did you review this reference as well,  
19 Dr. Chung?

20 A. I think so.

21 Q. Does Bosnyak '129 disclose the use of discrete  
22 carbon nanotubes?

23 MR. GLENN: Objection to form.

24 THE WITNESS: Yes, it does. In Claim 4, it  
25 says, "The fibers of Claim 1 wherein the fibers are

1 discrete individual fibers, not entangled as a mass."

2 MR. IN: Okay. So that concludes my line of  
3 questioning for now, so I'll pass the witness.

4 Thank you, Dr. Chung.

5 MR. GLENN: If we can take a -- take a break  
6 before I start my questioning. We can go off the  
7 record.

8 THE WITNESS: So I'm done?

9 MR. GLENN: Just a second, Dr. Chung.

10 COURT REPORTER: Mr. In, that's fine?

11 MR. GLENN: Are you okay to go off the record?

12 MR. IN: Oh, yes. Yes, please. Off the  
13 record, yeah.

14 (Recess: 11:52 a.m. to 12:30 p.m.)

15 EXAMINATION BY MR. GLENN:

16 Q. Okay. We're back on the record.

17 Dr. Chung, all the instruction -- you remember  
18 all of the instructions today that Counsel gave you  
19 before that, if -- ask me to clarify the question if you  
20 don't understand it, correct?

21 A. Yes.

22 Q. And if you've answered my question, I am  
23 assuming that you understood it; is that fair?

24 A. Yes.

25 Q. Okay. In this morning's testimony, you talked

1 about the documents that were reviewed for your  
2 declaration.

3 What about the documents that you rely on for  
4 your opinions in your declaration? Where can we find  
5 those documents?

6 A. Those documents that I relied on in my  
7 declaration are cited in the declaration.

8 Q. Okay. Are all the documents you cite in the  
9 exhibit list attached to your declaration?

10 A. Those plus those of the Petitioner. Their  
11 exhibits.

12 Q. In the --

13 A. Yeah. From LG.

14 Q. I see.

15 So would it be then fair to say that all the  
16 documents that you rely on for your opinion are listed  
17 either in the exhibit list of your declaration or the  
18 exhibit list on the petition in this proceeding?

19 A. Yes.

20 Q. Thank you.

21 You also testified earlier about  
22 information -- the sufficiency of information within the  
23 patent itself.

24 Do you remember that?

25 A. Yes.

1 Q. Does the patent's specification and its  
2 accompanying figures provide sufficient information for  
3 a POSITA to understand the claims of the patent?

4 A. Yes.

5 Q. Does the patent's specification and the  
6 figures contain information sufficient for a POSITA to  
7 make or use the inventions claimed in the patent?

8 A. Yes.

9 Q. There was also significant discussion in your  
10 earlier testimony about whether or not a universal -- a  
11 universe of hypothetical nanotubes would or would not be  
12 covered by the claims.

13 Do you remember that?

14 A. Yes.

15 Q. And counsel was proposing a universe of  
16 nanotubes that -- it was of ten carbon nanotubes,  
17 correct?

18 A. Yes.

19 Q. And if those nanotubes had been measured by a  
20 particularly diligent graduate student and that graduate  
21 student --

22 (Reporter requests clarification.)

23 MR. GLENN: I'll strike the question and  
24 restart.

25 BY MR. GLENN:

1           Q.    So if we take this hypothetical universe of  
2   ten carbon nanotubes and our very diligent graduate  
3   student measures all ten and finds nine of them are  
4   within the aspect ratio 40 percent to 90, one of them is  
5   in the aspect range -- aspect ratio range of --  
6   strike it.

7                   Let me rephrase the question.  I'm already --  
8   I'm already wrong.

9                   If we take this hypothetical universe of  
10   carbon -- ten carbon nanotubes and our very diligent  
11   graduate student measures all ten and finds that nine  
12   fall within the aspect ratio range of 30 to 70 and one  
13   falls in the aspect range of 80 to 140, would that  
14   hypothetical universe of carbon nanotubes be covered by  
15   the claim if all the other limitations were thus  
16   satisfied?

17           A.    Yes.

18           Q.    Okay.  So if those carbon nanotubes were, for  
19   example, in a -- in a composition, they were all  
20   discrete, and they otherwise met all the limitations of  
21   the claim, they would be covered by the claim?

22           A.    Yes.

23           Q.    Okay.  There was also discussion earlier about  
24   electrically connected -- I mean, electrical contact and  
25   whether or not two nanotubes were in contact or

1 electrically connected.

2 Do you remember that?

3 A. Yes.

4 Q. Let's take the hypothetical where we have an  
5 intervening material that sits between carbon nanotube A  
6 and carbon nanotube B and both carbon nanotubes are in  
7 contact with the intervening material but otherwise do  
8 not touch each other.

9 Is carbon nanotube A in physical contact with  
10 carbon nanotube B?

11 A. No.

12 MR. GLENN: I believe that's all the questions  
13 I have, Counsel.

14 MR. IN: I have nothing else from Petitioner  
15 either. Thank you.

16 COURT REPORTER: Counsel, may I get transcript  
17 requests on the record, please?

18 MR. GLENN: Yes, ma'am. We would like a full  
19 transcript and a dirty as soon as possible.

20 MR. IN: Same for Petitioner, please. Thank  
21 you.

22 (Whereupon the proceedings concluded at  
23 12:39 p.m.)

24

25

THE SULLIVAN GROUP OF COURT REPORTERS

|    |                                                            |                                 |        |
|----|------------------------------------------------------------|---------------------------------|--------|
| 1  | <b>ERRATA SHEET</b>                                        |                                 |        |
| 2  | <b>NAME OF CASE: LG ENERGY SOLUTION, LTD. V. MOLECULAR</b> |                                 |        |
| 3  | <b>REBAR DESIGN, LLC</b>                                   |                                 |        |
| 4  | <b>DATE OF DEPOSITION: JUNE 27, 2025</b>                   |                                 |        |
| 5  | <b>NAME OF WITNESS: DEBORAH D.L. CHUNG, Ph.D.</b>          |                                 |        |
| 6  | <b>Reason Codes:</b>                                       |                                 |        |
| 7  | 1:                                                         | To clarify the record.          |        |
| 8  | 2:                                                         | To conform to the facts.        |        |
| 9  | 3:                                                         | To correct transcription error. |        |
| 10 | Page                                                       | Line                            | Reason |
| 11 | From                                                       | to                              |        |
| 12 | Page                                                       | Line                            | Reason |
| 13 | From                                                       | to                              |        |
| 14 | Page                                                       | Line                            | Reason |
| 15 | From                                                       | to                              |        |
| 16 | Page                                                       | Line                            | Reason |
| 17 | From                                                       | to                              |        |
| 18 | Page                                                       | Line                            | Reason |
| 19 | From                                                       | to                              |        |
| 20 | Page                                                       | Line                            | Reason |
| 21 | From                                                       | to                              |        |
| 22 | Page                                                       | Line                            | Reason |
| 23 | From                                                       | to                              |        |
| 24 | Deponent's Signature                                       |                                 |        |
| 25 | Date                                                       |                                 |        |

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

**DECLARATION UNDER PENALTY OF PERJURY**

I, DEBORAH D.L. CHUNG, Ph.D., do hereby  
certify under penalty of perjury that I have read the  
foregoing transcript of my deposition taken on  
June 27, 2025; that I have made such corrections as  
appear noted on the Deposition Errata Page(s), attached  
hereto, signed by me; that my testimony as contained  
herein, as corrected, is true and correct.

This Declaration is executed this \_\_\_\_\_ day  
of \_\_\_\_\_, 20\_\_\_\_, at \_\_\_\_\_,  
California.

\_\_\_\_\_  
DEBORAH D.L. CHUNG, Ph.D.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25

**I, Tamara Houston, RPR, CCRR, CSR No. 7244, a  
Certified Shorthand Reporter in the State of California,  
duly empowered to administer oaths, do hereby certify:**

That said deposition was taken down by me in shorthand at the time and place therein named, and thereafter reduced to typewriting by computer-aided transcription under my direction;

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

**Dated: 1st of July, 2025.**

**TAMARA L. HOUSTON**  
**CSR 7244, RPR, CCRR 140**

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                                                                                                                                                          |                                                                          |                                                                                                                                |                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| -                                                                                                                                                                                                                                                                        | <b>11</b><br>14:6 24:8                                                   | <b>22</b><br>68:1                                                                                                              | <b>6</b>                                                                |
| --o0o-<br>6:2                                                                                                                                                                                                                                                            | <b>11:33</b><br>79:12                                                    | <b>27</b><br>6:1                                                                                                               | <b>6</b><br>49:8,13                                                     |
| --o0o--<br>6:5                                                                                                                                                                                                                                                           | <b>11:44</b><br>79:12                                                    | <b>282</b><br>9:22 20:10 21:3 26:4,11<br>28:1,13,14,22,24 29:5,<br>23 31:12 37:9 39:3<br>48:5,8,25 49:8,13 54:20<br>59:22 80:3 | <b>62</b><br>27:20                                                      |
| <b>-1006</b><br>18:9                                                                                                                                                                                                                                                     | <b>11:52</b><br>82:14                                                    |                                                                                                                                | <b>64</b><br>30:8,17                                                    |
| <b>1</b>                                                                                                                                                                                                                                                                 | <b>12</b><br>24:9 29:23 30:7,17                                          | <b>3</b>                                                                                                                       | <b>69</b><br>39:1                                                       |
| <b>1</b><br>23:23 37:8,25 39:16,18,<br>21,23 40:1,14,18 41:2,<br>4,9,10,14,15,17,19,20<br>42:8,11,18,20,21,22,23<br>43:7,10 46:12,21 47:3,<br>4,10 48:4,8,12 49:1,5,<br>11,14,24 50:14 51:3<br>54:19,22 55:9,11 61:14,<br>22 62:14,18,23 63:14<br>64:3 65:12 70:22 81:25 | <b>129</b><br>79:19 81:17,21                                             | <b>3</b><br>48:5 61:14 62:4,7,11,<br>13,23 63:14,16,17,21<br>64:2,14,17,21 65:12,16<br>66:13 67:6,9 68:5,8                     | <b>7</b>                                                                |
| <b>1's</b><br>40:25                                                                                                                                                                                                                                                      | <b>12:30</b><br>82:14                                                    | <b>3-D</b><br>62:23 63:2,3,4                                                                                                   | <b>70</b><br>31:14,16 35:6 39:25<br>40:9 41:2 42:8 57:7<br>85:12        |
| <b>1,000</b><br>42:22                                                                                                                                                                                                                                                    | <b>12:39</b><br>86:23                                                    | <b>30</b><br>39:25 40:1,9,14 41:2,<br>10,15,20 42:8 47:11<br>85:12                                                             | <b>7244</b><br>6:4                                                      |
| <b>10,000</b><br>42:22                                                                                                                                                                                                                                                   | <b>13</b><br>29:23                                                       | <b>33</b><br>39:1                                                                                                              | <b>76</b><br>61:13                                                      |
| <b>10,608,282</b><br>9:19                                                                                                                                                                                                                                                | <b>14</b><br>11:4 23:12 24:9                                             | <b>392</b><br>79:19,24 80:6,9,25 81:5                                                                                          | <b>8</b>                                                                |
| <b>100</b><br>42:17,21 75:17                                                                                                                                                                                                                                             | <b>140</b><br>40:3,9 41:3 42:9 85:13                                     | <b>3A</b><br>63:18                                                                                                             | <b>8</b><br>11:4                                                        |
| <b>1001</b><br>20:11 21:2                                                                                                                                                                                                                                                | <b>18</b><br>49:8,13                                                     | <b>4</b><br>17:16 81:24                                                                                                        | <b>80</b><br>40:3,9 41:3 42:9 85:13                                     |
| <b>1003</b><br>61:1                                                                                                                                                                                                                                                      | <b>1999</b><br>19:7                                                      | <b>40</b><br>39:24 40:13 41:20<br>47:11 85:4                                                                                   | <b>9</b>                                                                |
| <b>1005</b><br>79:16,18                                                                                                                                                                                                                                                  | <b>2</b><br>61:14,25 62:6,10,14,18,<br>23 64:4,12,18,19,21<br>65:12 68:2 | <b>4th</b><br>19:7                                                                                                             | <b>90</b><br>39:24 40:13,16 41:1,4,<br>21 42:7 43:8 46:21<br>47:11 85:4 |
| <b>1006</b><br>79:17,19 81:16                                                                                                                                                                                                                                            | <b>2-D</b><br>62:24                                                      | <b>5</b><br>59:22                                                                                                              | <b>95</b><br>70:20 73:22                                                |
| <b>1008</b><br>60:24 61:5                                                                                                                                                                                                                                                | <b>20</b><br>10:16                                                       | <b>55</b><br>59:23                                                                                                             | <b>96</b><br>70:20 73:25                                                |
| <b>10:13</b><br>47:22                                                                                                                                                                                                                                                    | <b>20-some</b><br>15:1 16:2                                              | <b>5</b>                                                                                                                       | <b>99</b><br>47:4                                                       |
| <b>10:27</b><br>47:22                                                                                                                                                                                                                                                    | <b>2004</b><br>10:22                                                     | <b>5</b>                                                                                                                       | <b>9:01</b><br>6:1                                                      |
|                                                                                                                                                                                                                                                                          | <b>2025</b><br>6:1                                                       |                                                                                                                                | <b>A</b>                                                                |
|                                                                                                                                                                                                                                                                          | <b>21</b><br>67:13                                                       |                                                                                                                                | <b>a.m.</b><br>6:1 47:22 79:12 82:14                                    |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                     |                                                     |                                                                                                                                                                                                                                                                                                                                  |                                                                                                |
|-------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>A/b</b><br>38:6 73:3             | <b>adjustments</b><br>32:15                         | <b>application</b><br>45:4 57:24 81:8                                                                                                                                                                                                                                                                                            | 13,19,21 78:6                                                                                  |
| <b>Absolutely</b><br>6:17           | <b>advantage</b><br>17:2                            | <b>applications</b><br>8:10 11:22 12:5,18 29:1                                                                                                                                                                                                                                                                                   | <b>assumptions</b><br>74:21,23 76:1,3,8                                                        |
| <b>abstract</b><br>18:22            | <b>advantages</b><br>17:5                           | <b>applies</b><br>33:18                                                                                                                                                                                                                                                                                                          | <b>atomic</b><br>73:8                                                                          |
| <b>academia</b><br>24:25 25:5 72:22 | <b>affect</b><br>34:25                              | <b>apply</b><br>43:10                                                                                                                                                                                                                                                                                                            | <b>attached</b><br>83:9                                                                        |
| <b>academic</b><br>72:22            | <b>affected</b><br>34:4                             | <b>approach</b><br>74:7,10 78:15                                                                                                                                                                                                                                                                                                 | <b>attention</b><br>59:21                                                                      |
| <b>accompanying</b><br>84:2         | <b>afterward</b><br>75:12                           | <b>approximately</b><br>46:15                                                                                                                                                                                                                                                                                                    | <b>attorney</b><br>8:25 19:16                                                                  |
| <b>accuracy</b><br>42:23            | <b>agitating</b><br>55:23                           | <b>area</b><br>16:5,6                                                                                                                                                                                                                                                                                                            | <b>attractive</b><br>16:5                                                                      |
| <b>accurate</b><br>7:21 46:17       | <b>agitation</b><br>34:14,17,20 35:3,12,20<br>56:20 | <b>areas</b><br>66:5                                                                                                                                                                                                                                                                                                             | <b>author</b><br>21:15 24:21                                                                   |
| <b>accustomed</b><br>13:3           | <b>agree</b><br>59:4 64:15 69:11 80:24              | <b>argument</b><br>57:18                                                                                                                                                                                                                                                                                                         | <b>average</b><br>40:2 54:3 78:24 79:2                                                         |
| <b>achieve</b><br>32:4 33:2,14 81:1 | <b>ahead</b><br>10:21 20:10 61:1                    | <b>arrive</b><br>57:23 78:3                                                                                                                                                                                                                                                                                                      | <hr/> <b>B</b>                                                                                 |
| <b>achieving</b><br>32:14           | <b>analysis</b><br>42:7                             | <b>arrived</b><br>53:23                                                                                                                                                                                                                                                                                                          | <b>back</b><br>8:18 17:16 27:19 37:8<br>38:24,25 42:6 46:18<br>54:19 57:7 61:12 79:14<br>82:16 |
| <b>add</b><br>12:7                  | <b>and/or</b><br>60:3,6                             | <b>aspect</b><br>12:22 31:20,23 32:7,15,<br>21,25 33:1,3,7,12,14,<br>19,21,25 34:1,4,18,23<br>35:8,13,18 39:25 40:2,<br>7,8 41:2,3 42:8,9 43:7,<br>8,17,18 45:13 46:21,22<br>47:3,16,17 48:13,17,21,<br>23 53:10,12,19 55:2,7,<br>13,16 56:1,11 57:3,13,<br>22 58:12,16,24 59:9<br>67:15,16 68:7 72:2<br>78:19 79:1 85:4,5,12,13 | <b>background</b><br>7:7 10:11                                                                 |
| <b>added</b><br>14:23 16:22 28:22   | <b>annotated</b><br>65:16                           | <b>aspects</b><br>15:8                                                                                                                                                                                                                                                                                                           | <b>bad</b><br>77:9,13                                                                          |
| <b>addition</b><br>15:22            | <b>annotations</b><br>8:14                          | <b>assume</b><br>43:3,4 44:17                                                                                                                                                                                                                                                                                                    | <b>based</b><br>15:2 28:13 40:25 42:7<br>46:3 48:17 66:12,16                                   |
| <b>additional</b><br>35:22          | <b>anode</b><br>13:19 14:21,24 15:4,6<br>16:18      | <b>assumes</b><br>74:1                                                                                                                                                                                                                                                                                                           | <b>Basically</b><br>59:12                                                                      |
| <b>additive</b><br>12:16 13:13,16   | <b>Anodic</b><br>14:10                              | <b>assuming</b><br>54:6,16 56:12 74:15,24<br>76:9,18 78:18 82:23                                                                                                                                                                                                                                                                 | <b>batch</b><br>32:23 33:2,11                                                                  |
| <b>additives</b><br>16:24           | <b>answering</b><br>7:12,23                         | <b>assumption</b><br>54:8 74:5,10,13 75:4,<br>10,11 76:2,11 77:5,6,8,                                                                                                                                                                                                                                                            | <b>batteries</b><br>12:21,23 13:13 14:2<br>15:4                                                |
| <b>address</b><br>16:11             | <b>apologies</b><br>11:18                           |                                                                                                                                                                                                                                                                                                                                  | <b>battery</b><br>12:18,23 13:10,14<br>14:22 16:22 28:5,16,21<br>29:4 81:2                     |
| <b>adequate</b><br>43:14 51:6       | <b>Apparently</b><br>50:6                           |                                                                                                                                                                                                                                                                                                                                  | <b>bear</b><br>7:8                                                                             |
| <b>adjust</b><br>32:21 57:22 59:9   | <b>appears</b><br>24:21                             |                                                                                                                                                                                                                                                                                                                                  | <b>beasts</b>                                                                                  |
| <b>adjusted</b><br>35:9 57:14 58:16 | <b>Appendix</b><br>75:13                            |                                                                                                                                                                                                                                                                                                                                  |                                                                                                |
| <b>adjusting</b><br>35:13 36:8,9    |                                                     |                                                                                                                                                                                                                                                                                                                                  |                                                                                                |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                       |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 36:17                                                                                 | <b>Cabana</b><br>19:2                                                                                                                                                                                                                                                                                                 | 6:4                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>chunk</b><br>64:10                                                                                                                                                              |
| <b>benefit</b><br>29:5                                                                | <b>calculation</b><br>75:24,25                                                                                                                                                                                                                                                                                        | <b>chance</b><br>17:7 31:24 52:14                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>circles</b><br>65:18,23 66:1,20                                                                                                                                                 |
| <b>big</b><br>54:14,16 63:19,22<br>64:19 67:18 68:12                                  | <b>California</b><br>6:4                                                                                                                                                                                                                                                                                              | <b>change</b><br>15:12 33:13 46:22                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>cite</b><br>83:8                                                                                                                                                                |
| <b>bigger</b><br>42:20                                                                | <b>call</b><br>8:2 24:20                                                                                                                                                                                                                                                                                              | <b>channel</b><br>31:3,4,5,8                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>cited</b><br>14:5 83:7                                                                                                                                                          |
| <b>bimodal</b><br>39:4,8,10,14,15,18,21<br>40:4,11,18 41:5 48:2,7<br>53:19 54:21 60:2 | <b>called</b><br>6:7 61:22,23                                                                                                                                                                                                                                                                                         | <b>characteristic</b><br>38:11                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>claim</b><br>23:20,23 24:3 37:8,25<br>39:16,18,21,23 40:25<br>41:17,19 42:11 43:9,10,<br>20 44:11 45:7,10,20<br>46:5,12 47:10 48:8,12<br>54:22 55:11 70:22<br>81:24,25 85:15,21 |
| <b>binder</b><br>12:16 29:16                                                          | <b>calls</b><br>8:25 19:16 48:10                                                                                                                                                                                                                                                                                      | <b>characteristics</b><br>30:24                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>claimed</b><br>42:23 84:7                                                                                                                                                       |
| <b>binders</b><br>29:1                                                                | <b>carbon</b><br>10:18 12:3 13:9,10,12,<br>22,24 14:11,20,24 15:3<br>16:4,16,20,25 17:2,5,13<br>23:24 24:3,19,20 25:3,<br>5,19,24,25 30:24 31:2<br>32:16 39:25 40:2 48:13<br>49:21 54:1 60:1 61:23,<br>24 63:17 67:2,14,15<br>68:3,6,12 78:18,21,23<br>80:10,12 81:10,11,12,<br>22 84:16 85:2,10,14,18<br>86:5,6,9,10 | <b>characterize</b><br>78:20,23                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>claims</b><br>23:14,16,21 84:3,12                                                                                                                                               |
| <b>bit</b><br>8:17 42:1 47:7 50:3<br>54:17                                            | <b>career</b><br>13:7 72:22                                                                                                                                                                                                                                                                                           | <b>chat</b><br>10:3 20:15,19                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>clarification</b><br>21:16 65:8 68:19 78:22<br>84:22                                                                                                                            |
| <b>black</b><br>13:25 16:25 17:5,13                                                   | <b>careful</b><br>28:13                                                                                                                                                                                                                                                                                               | <b>cheaper</b><br>17:1                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>clarify</b><br>15:16 25:16 29:8 58:18<br>82:19                                                                                                                                  |
| <b>boils</b><br>51:17                                                                 | <b>carefully</b><br>22:3                                                                                                                                                                                                                                                                                              | <b>chemical</b><br>15:11                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>classes</b><br>79:1,5                                                                                                                                                           |
| <b>Bosnyak</b><br>26:20 79:19,24 80:6,25<br>81:17,21                                  | <b>cartoon</b><br>62:24 63:5,21 66:7,10                                                                                                                                                                                                                                                                               | <b>choose</b><br>19:14,18                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>clean</b><br>6:14 10:5                                                                                                                                                          |
| <b>bought</b><br>32:23                                                                | <b>cartoons</b><br>62:16,20,22,23 63:2<br>64:8 65:6,14                                                                                                                                                                                                                                                                | <b>chop</b><br>33:19 34:6 35:23 56:9<br>58:6                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>clear</b><br>7:20 23:4 63:16,22<br>66:10 67:5 68:10                                                                                                                             |
| <b>box</b><br>63:3,4                                                                  | <b>case</b><br>13:17 16:12 20:21 23:8<br>24:24 26:11,23 27:2,7<br>36:14 43:9 55:24 56:2<br>57:17 59:14,15 60:13<br>70:5 71:25 75:21                                                                                                                                                                                   | <b>chopping</b><br>33:24 34:2,5,15 55:22<br>56:25 57:1,2,4 58:7,10                                                                                                                                                                                                                                                                                                                                                                                            | <b>Clive</b><br>26:20                                                                                                                                                              |
| <b>break</b><br>8:2,3,6 47:25 48:3 82:5                                               | <b>cases</b><br>69:12                                                                                                                                                                                                                                                                                                 | <b>chosen</b><br>78:1                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>closed</b><br>31:5                                                                                                                                                              |
| <b>briefly</b><br>18:22 20:2                                                          | <b>cathode</b><br>13:19                                                                                                                                                                                                                                                                                               | <b>Chung</b><br>6:6,20 7:2,10 8:11,20<br>10:10,22,23 11:10<br>12:21 13:8 14:12 15:14<br>17:17 18:4 19:4,8,11<br>20:11 21:2 22:3 23:12<br>25:10 26:5,18 27:20,22<br>28:12 29:22 30:13<br>31:15,22 34:7 35:6,10,<br>25 37:9,11 39:9 40:5,15<br>41:18 43:2 44:5,23<br>45:19 46:2,19 47:24<br>49:1,7 55:5,20 57:8<br>58:9,14 59:19,21 60:7<br>61:3,19 63:8 65:17<br>66:4,12 68:14 70:19<br>71:5 72:15 73:22 74:16<br>77:12 79:9,14,21,25<br>80:24 81:19 82:4,9,17 | <b>CNT</b><br>35:7 36:14,21 42:21<br>51:18,19 53:7 57:10,12<br>58:6,10,23 59:14,16<br>78:3 79:1,5                                                                                  |
| <b>brilliant</b><br>43:3,12                                                           | <b>Certified</b>                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>CNT-CONTAINING</b><br>32:5                                                                                                                                                      |
| <b>bucket</b><br>40:16,17                                                             |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>CNTS</b><br>31:20 32:7 35:8 36:5,7<br>37:6,7 42:17,18,21 47:3                                                                                                                   |
| <b>buy</b><br>32:16 35:17 54:1,5                                                      |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                    |
| <b>C</b>                                                                              |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                    |
| <b>C-A-B-A-N-A</b><br>19:2                                                            |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                    |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                |                                                                                              |                                                                                                                             |                                                                                 |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| 50:7 57:13 58:13,15,24<br>59:2,8 74:1 77:20,22,<br>24,25 78:4 79:1,5 80:7                                      | <b>component</b><br>13:14 14:21                                                              | <b>confirmation</b><br>30:17                                                                                                | 62:17 63:15 65:4 66:8,<br>9,11                                                  |
| <b>colleague</b><br>7:5 10:13                                                                                  | <b>components</b><br>12:14 13:10 15:10 29:4<br>81:2                                          | <b>connect</b><br>69:24                                                                                                     | <b>conveying</b><br>63:2,22                                                     |
| <b>collection</b><br>17:9 33:6 37:23 40:7<br>45:13 50:7 53:7 59:16<br>71:24 72:25 73:15<br>74:11 75:5 77:22,25 | <b>composed</b><br>68:6                                                                      | <b>connected</b><br>70:11,12,15 85:24 86:1                                                                                  | <b>conveys</b><br>62:19                                                         |
| <b>College</b><br>19:7                                                                                         | <b>composite</b><br>62:1 71:17,18,20,21,24<br>73:3,6,12                                      | <b>consideration</b><br>37:3 43:14                                                                                          | <b>copies</b><br>8:12,15 10:5                                                   |
| <b>column</b><br>23:12 24:9 30:7,17<br>49:8,13 51:4,6,11,14<br>59:22                                           | <b>composites</b><br>81:6,11                                                                 | <b>considered</b><br>17:22 37:2                                                                                             | <b>copy</b><br>10:24 20:13,20                                                   |
| <b>columns</b><br>29:23 51:3,10                                                                                | <b>composition</b><br>30:4 36:21 57:23 85:19                                                 | <b>consistent</b><br>41:16,19 67:6                                                                                          | <b>correct</b><br>9:23 21:3 43:4,5 82:20<br>84:17                               |
| <b>combined</b><br>25:20                                                                                       | <b>computer</b><br>8:11                                                                      | <b>constituents</b><br>31:3                                                                                                 | <b>correlate</b><br>54:20 55:11                                                 |
| <b>combining</b><br>38:5                                                                                       | <b>concentration</b><br>40:12                                                                | <b>contact</b><br>17:8 65:19,24 66:6,21<br>67:2,7,22 68:8,11,15,<br>22,25 69:1,9,14,15,22<br>70:4,6,7,14 85:24,25<br>86:7,9 | <b>correlation</b><br>56:1                                                      |
| <b>comfort</b><br>42:11                                                                                        | <b>concept</b><br>22:18 32:12 59:13<br>62:19                                                 | <b>contemplates</b><br>29:5                                                                                                 | <b>correspond</b><br>48:12                                                      |
| <b>commercial</b><br>32:24 55:21                                                                               | <b>concepts</b><br>21:18 22:6,16                                                             | <b>content</b><br>36:13,14                                                                                                  | <b>counsel</b><br>6:11 9:2 19:12,15 20:15<br>24:5 47:19 82:18 84:15<br>86:13,16 |
| <b>commercially</b><br>32:19                                                                                   | <b>concluded</b><br>46:20 86:22                                                              | <b>context</b><br>15:6 25:9 30:21 36:10<br>38:12 39:8 45:14,16<br>72:25 73:4                                                | <b>count</b><br>38:13,16 42:5 64:16,18<br>72:1                                  |
| <b>common</b><br>17:1 25:4,6 38:8 39:13<br>71:6 73:10                                                          | <b>concludes</b><br>82:2                                                                     | <b>continue</b><br>77:15                                                                                                    | <b>counted</b><br>43:17,18                                                      |
| <b>commonly</b><br>17:1 38:4 71:19                                                                             | <b>conclusion</b><br>25:23 48:10 66:20                                                       | <b>continuity</b><br>66:25 67:1                                                                                             | <b>counting</b><br>38:16                                                        |
| <b>communicate</b><br>9:10                                                                                     | <b>conclusions</b><br>48:16                                                                  | <b>continuous</b><br>17:10 32:1 63:24 66:24                                                                                 | <b>court</b><br>6:3 7:16,18 82:10 86:16                                         |
| <b>communicated</b><br>26:25                                                                                   | <b>conducted</b><br>13:18                                                                    | <b>contrast</b><br>17:13                                                                                                    | <b>cover</b><br>26:14                                                           |
| <b>communication</b><br>9:1                                                                                    | <b>conducting</b><br>32:2                                                                    | <b>contribute</b><br>15:13,23 30:25                                                                                         | <b>covered</b><br>84:12 85:14,21                                                |
| <b>compare</b><br>32:24                                                                                        | <b>conduction</b><br>11:23 70:5                                                              | <b>conversion</b><br>72:21,25 73:9                                                                                          | <b>current</b><br>15:9,21 69:5                                                  |
| <b>complete</b><br>80:20                                                                                       | <b>conductive</b><br>12:16 13:12,16 16:23<br>17:11 66:24 68:24 69:3,<br>13,21 70:3           | <b>convert</b><br>72:4                                                                                                      | <b>cut</b><br>33:17                                                             |
| <b>completely</b><br>40:22 44:4,23                                                                             | <b>conductivity</b><br>16:14,21 29:6,9,10,13,<br>17,21 30:9,18,21,25<br>31:9,21 32:3,5 67:20 | <b>converting</b><br>71:2 73:4,14                                                                                           | <b>CV</b><br>14:4                                                               |
|                                                                                                                |                                                                                              | <b>convey</b>                                                                                                               | <b>cycling</b><br>15:9,21                                                       |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;"><b>D</b></p> <p><b>D.L.</b><br/>6:6 7:2</p> <p><b>day</b><br/>10:13</p> <p><b>days</b><br/>7:5 8:21 10:1</p> <p><b>deal</b><br/>46:8</p> <p><b>dealing</b><br/>56:15 59:16</p> <p><b>deals</b><br/>48:13</p> <p><b>Deborah</b><br/>6:6 7:2</p> <p><b>decent</b><br/>51:4 68:18</p> <p><b>declaration</b><br/>9:15 10:22 11:3 14:7<br/>17:17,22 18:5 27:19<br/>31:14 38:25 57:8 61:2,<br/>13 70:20 72:20 75:8,14<br/>83:2,4,7,9,17</p> <p><b>decrease</b><br/>33:16 34:2,17,18,21,22<br/>57:2</p> <p><b>decreased</b><br/>34:5</p> <p><b>Decreasing</b><br/>33:17</p> <p><b>deep</b><br/>21:22</p> <p><b>defined</b><br/>56:7</p> <p><b>deformation</b><br/>34:12 62:2</p> <p><b>degree</b><br/>34:15</p> <p><b>delineating</b><br/>36:25</p> <p><b>density</b><br/>76:15,16</p> <p><b>depending</b><br/>76:16,17</p> | <p><b>depends</b><br/>34:21 42:16 52:3 55:14<br/>69:18</p> <p><b>depict</b><br/>64:22 66:1</p> <p><b>depicting</b><br/>63:11</p> <p><b>depictions</b><br/>65:4</p> <p><b>deposition</b><br/>6:12,14 7:10 8:21,23<br/>9:7,11 49:20 61:10</p> <p><b>deprived</b><br/>14:14</p> <p><b>derived</b><br/>14:13</p> <p><b>describe</b><br/>21:15 22:23 49:14,17</p> <p><b>describes</b><br/>49:4</p> <p><b>description</b><br/>49:10,23</p> <p><b>Design</b><br/>27:5</p> <p><b>detail</b><br/>73:18</p> <p><b>detailed</b><br/>75:24</p> <p><b>details</b><br/>16:3</p> <p><b>determine</b><br/>55:16</p> <p><b>determined</b><br/>49:20</p> <p><b>device</b><br/>12:15</p> <p><b>diameter</b><br/>34:2,3 35:2,7 53:5,6,13,<br/>23 54:2,3,4,7 55:14,18,<br/>22 56:7,11,12,17 57:1,<br/>5,10,13,17,19,21 58:11,<br/>15,23 59:3,6,7,9,10,12,<br/>14,17 60:10,19,20 74:1,<br/>12 75:4 76:2,14 77:19,<br/>22,24 78:1,4,24 79:3,6</p> | <p><b>diameters</b><br/>35:1 53:8,18 54:10,16<br/>56:2 60:3,15 74:6,16,24<br/>78:19</p> <p><b>dictionaries</b><br/>19:23 20:2,5</p> <p><b>dictionary</b><br/>19:7,15,19,20</p> <p><b>difference</b><br/>36:8 54:14</p> <p><b>difficult</b><br/>33:22</p> <p><b>diligent</b><br/>46:16 84:20 85:2,10</p> <p><b>dimensional</b><br/>62:11,14,15</p> <p><b>dimensions</b><br/>72:11</p> <p><b>direct</b><br/>59:21 69:1 70:19</p> <p><b>directed</b><br/>36:24 44:8 61:15,20</p> <p><b>directly</b><br/>69:15</p> <p><b>dirty</b><br/>86:19</p> <p><b>disclose</b><br/>80:6 81:21</p> <p><b>discloses</b><br/>80:9</p> <p><b>disclosure</b><br/>66:19</p> <p><b>discrete</b><br/>39:24 40:2 49:21 60:1<br/>80:7,12,21 81:21 82:1<br/>85:20</p> <p><b>discreteness</b><br/>80:15</p> <p><b>discussed</b><br/>70:23</p> <p><b>discussing</b><br/>27:25</p> <p><b>discussion</b><br/>20:24 56:5 84:9 85:23</p> | <p><b>discussions</b><br/>47:24</p> <p><b>disentanglement</b><br/>80:17</p> <p><b>dispersibility</b><br/>67:14</p> <p><b>dispersing</b><br/>28:4,15</p> <p><b>distinct</b><br/>52:8</p> <p><b>distinguish</b><br/>33:7</p> <p><b>distributed</b><br/>61:24</p> <p><b>distribution</b><br/>39:4,8,10,11,13,15,19,<br/>22 40:4,6,11,18 41:5<br/>45:12 47:2,16 48:3,8<br/>53:19 54:21 55:6 60:2,<br/>10,11,14,18,20 63:3<br/>78:18,24</p> <p><b>distributions</b><br/>79:6</p> <p><b>divided</b><br/>34:1</p> <p><b>document</b><br/>8:16,18 11:12 20:18<br/>21:18 22:7 60:23</p> <p><b>documents</b><br/>8:10 9:2,13 17:21 18:1,<br/>3,15 83:1,3,5,6,8,16</p> <p><b>dots</b><br/>68:7</p> <p><b>double</b><br/>53:5 54:13</p> <p><b>download</b><br/>10:4</p> <p><b>draw</b><br/>66:20</p> <p><b>drawing</b><br/>64:10</p> <p><b>drawn</b><br/>64:9 65:14</p> <p><b>Dresselhaus</b><br/>10:15</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>due</b><br>15:12 81:8<br><br><b>duly</b><br>6:7<br><hr/> <p style="text-align: center;"><b>E</b></p><br><b>earlier</b><br>22:15 28:14 39:16<br>55:20 56:5,19 57:9<br>58:11 70:23 71:5 83:21<br>84:10 85:23<br><br><b>easier</b><br>10:6 24:6 57:20 60:25<br>63:20 64:18<br><br><b>easily</b><br>17:11<br><br><b>easy</b><br>57:20<br><br><b>Ed</b><br>19:7<br><br><b>educated</b><br>50:12<br><br><b>effect</b><br>35:2,3 57:1<br><br><b>electric</b><br>69:5<br><br><b>electrical</b><br>11:8,17,21,22,23,25<br>12:8 13:16 15:11 16:13,<br>21 29:6 31:21 32:5<br>63:24 67:15,18,19,20<br>68:4,5,8,10,14,21,25<br>69:13 70:5,6 85:24<br><br><b>electrically</b><br>12:16 13:12 16:23<br>17:10 32:1 66:23 69:9,<br>23 70:11,12,13,14<br>85:24 86:1<br><br><b>electro</b><br>11:14<br><br><b>electrochemical</b><br>11:12 12:10,13,15 13:5<br><br><b>electrochemistry</b><br>12:24 13:1,3<br><br><b>electrode</b><br>13:17 | <b>electrodes</b><br>12:15 16:22<br><br><b>electrolyte</b><br>29:19,20,25 30:3,9,19<br><br><b>electrolytes</b><br>29:2<br><br><b>electromagnetic</b><br>11:24<br><br><b>electron</b><br>49:22 50:4,24<br><br><b>electronic</b><br>18:20 20:1,2 29:9,13,17<br>30:22<br><br><b>embodiment</b><br>61:15,20 63:12<br><br><b>emphasize</b><br>63:25<br><br><b>English</b><br>61:6<br><br><b>entangled</b><br>82:1<br><br><b>entire</b><br>41:19,24 44:7 47:6<br>56:13 71:16<br><br><b>entirety</b><br>66:22<br><br><b>entity</b><br>25:12<br><br><b>equal</b><br>72:12,16 76:2<br><br><b>equate</b><br>46:10<br><br><b>error</b><br>42:15,20,25 43:14 44:2<br>51:18<br><br><b>essentially</b><br>34:3<br><br><b>establishing</b><br>32:1<br><br><b>exact</b><br>63:9,11 64:3<br><br><b>EXAMINATION</b><br>6:19 82:15<br><br><b>examine</b><br>33:5 50:7 | <b>Examples</b><br>11:23<br><br><b>excellent</b><br>67:13<br><br><b>excuse</b><br>49:19 78:11<br><br><b>exfoliated</b><br>80:10,16,21 81:13<br><br><b>exfoliation</b><br>80:16,19<br><br><b>exhibit</b><br>10:22 17:18 18:16<br>19:10 20:11 21:2 60:24<br>61:1,5 81:16 83:9,17,18<br><br><b>exhibits</b><br>10:1 18:12,13 79:16<br>83:11<br><br><b>expect</b><br>23:4 63:6<br><br><b>expected</b><br>23:5 81:12<br><br><b>experiment</b><br>45:2<br><br><b>experimental</b><br>42:15,24<br><br><b>expert</b><br>11:7 12:20,22,25 13:2<br><br><b>explain</b><br>11:9 12:11 43:22 50:2<br><br><b>explained</b><br>73:18<br><br><b>explanation</b><br>57:19<br><br><b>exploiting</b><br>66:24<br><br><b>expressed</b><br>67:17<br><br><b>extent</b><br>8:24 49:23 54:24<br><br><b>extract</b><br>78:3<br><br><b>extrusion</b><br>34:12 | <p style="text-align: center;"><b>F</b></p><br><b>face</b><br>26:15<br><br><b>fact</b><br>75:25<br><br><b>fails</b><br>79:8<br><br><b>fair</b><br>7:25 18:11,13 20:4,9<br>22:2 26:3,12 27:18 28:2<br>62:10,24 64:21 82:23<br>83:15<br><br><b>fall</b><br>85:12<br><br><b>falls</b><br>85:13<br><br><b>fashion</b><br>63:3<br><br><b>feasible</b><br>33:17 67:1<br><br><b>feeding</b><br>11:24<br><br><b>feel</b><br>10:5 20:12<br><br><b>fiber</b><br>16:16 25:9,11,12,14,19,<br>24<br><br><b>fibers</b><br>23:24 24:13,19,21,25<br>25:5,7,14 81:25 82:1<br><br><b>fielding</b><br>11:25<br><br><b>figure</b><br>48:4,11,17 49:1,5,11,<br>14,18,24 50:14 51:3<br>54:19 55:9 61:22,25<br>62:4,6,7,10,11,13,23<br>63:16,17,18,21 64:2,12,<br>14,17,18,19 65:16<br>66:13 67:6,9 68:2,5,8<br><br><b>figures</b><br>61:14,16,20 62:14,18,<br>23 63:9,14 64:3,21<br>65:12 84:2,6<br><br><b>filament</b><br>17:2 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>filaments</b><br>14:11,20,24 15:3 16:4,16<br><b>film</b><br>30:19<br><b>films</b><br>30:1,4,5,10<br><b>find</b><br>19:7 78:9,16 83:4<br><b>finds</b><br>85:3,11<br><b>fine</b><br>82:10<br><b>finish</b><br>7:23<br><b>Fish</b><br>6:23<br><b>flaw</b><br>76:3<br><b>flawed</b><br>73:24 75:11,12 76:4<br><b>flaws</b><br>74:6 77:16<br><b>flow</b><br>69:5<br><b>follow</b><br>24:7<br><b>force</b><br>32:6<br><b>form</b><br>6:12,13,15 15:15 17:23<br>21:12 22:10 24:14 25:2,<br>15,21 28:6,17,23 29:7<br>30:2 31:1 32:10 33:4,15<br>35:16 36:11 38:2,19<br>39:17 40:20 41:7,22<br>42:13 43:11,21 44:13<br>45:8,23 46:24 47:13<br>48:9,18 49:2,16 50:5,<br>15,19 51:1,16 52:1,11,<br>20 53:2 54:11,23 55:12<br>56:4,24 58:2,17 59:11<br>60:8,16 62:12,25 63:13<br>64:5,24 65:22 66:14<br>67:11,24 69:2,16 70:9<br>71:9 72:8,23 74:8,18<br>75:2 76:5,22 77:4,10<br>80:8,14 81:3,23 | <b>formed</b><br>17:11<br><b>forming</b><br>17:7 63:23 66:23<br><b>found</b><br>19:3<br><b>fourth</b><br>23:23 39:6<br><b>fraction</b><br>35:7,24 36:3,5,6,9,12,<br>13,15,16,18,21,22 37:5,<br>6,13,17,18,19,20,21,25<br>38:1,3,4,7 57:22 71:14,<br>20,21,22 72:1,11,12<br>73:2,5,14<br><b>fractional</b><br>54:14<br><b>fractions</b><br>36:4<br><b>free</b><br>10:5 20:12<br><b>FRIDAY</b><br>6:1<br><b>full</b><br>6:25 80:19 86:18<br><b>fully</b><br>80:21 81:13<br><b>function</b><br>12:8,13 81:6<br><b>functions</b><br>11:8,12,17,22 12:10,14<br>13:5<br><b>fundamentally</b><br>73:24<br><b>funding</b><br>27:10,13 | 22:22,25 23:7 27:25<br>47:15 81:9<br><b>generally</b><br>14:18 16:19 28:15<br><b>generate</b><br>50:13<br><b>generated</b><br>49:11,15,18<br><b>Gido</b><br>18:5 61:2 71:1 74:17<br>75:8 76:3 77:18 78:17<br><b>Gido's</b><br>73:23 74:6 75:13 78:15<br><b>gist</b><br>45:10<br><b>give</b><br>23:6 51:15 56:1 59:19<br><b>Glenn</b><br>6:11,18 8:24 9:5,8<br>11:11,18 15:15,25<br>17:23 19:16 20:14,17<br>21:12 22:10,21 24:5,14<br>25:2,15,21 28:6,17,23<br>29:7,15 30:2 31:1 32:10<br>33:4,15 35:16 36:11<br>37:15 38:2,19 39:17<br>40:20 41:7,22 42:13<br>43:11,21 44:13 45:8,23<br>46:7,24 47:13,19 48:9,<br>18 49:2,16 50:5,15,19<br>51:1,16 52:1,11,20 53:2<br>54:11,23 55:12 56:4,23<br>58:2,17 59:11 60:8,16<br>62:12,25 63:13 64:5,24<br>65:22 66:14 67:11,24<br>69:2,16 70:9 71:9 72:8,<br>23 74:8,18 75:2 76:5,22<br>77:4,10 79:11 80:8,14<br>81:3,23 82:5,9,11,15<br>84:23,25 86:12,18<br><b>good</b><br>6:20 14:25 16:3,15<br>38:12 51:22<br><b>graduate</b><br>42:4,6 43:3,12 44:9<br>46:17 47:1 52:25 84:20<br>85:2,11<br><b>great</b><br>7:3 8:9,13 9:16,25 10:4<br>11:2 79:23 | <b>Gretchen</b><br>10:13<br><b>grounding</b><br>11:25<br><b>group</b><br>43:24,25 59:8<br><b>guaranteed</b><br>34:21<br><b>guess</b><br>26:8 50:16,20 52:21<br><b>guesses</b><br>50:12 |
| <b>H</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |
| <b>half</b><br>26:6,8<br><b>hampered</b><br>81:8<br><b>Han</b><br>6:23<br><b>happy</b><br>10:17 52:5<br><b>hard</b><br>8:12,15 10:5,24 20:13<br>23:3<br><b>hear</b><br>26:4,22 49:12 58:19<br><b>heard</b><br>26:10<br><b>height</b><br>51:11<br><b>held</b><br>20:24<br><b>helped</b><br>29:16,20<br><b>helpful</b><br>20:13<br><b>helps</b><br>15:13<br><b>high</b><br>16:5<br><b>higher</b><br>17:6 29:6 31:20,21,23<br>32:3,4,25                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |
| <b>G</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |
| <b>gap</b><br>68:17,21 69:4,8,25<br><b>gave</b><br>82:18<br><b>geared</b><br>66:23<br><b>general</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>hire</b><br>42:4<br><b>histogram</b><br>47:2,7,10,16 48:20,22,<br>23 50:8,23 51:20 53:1,<br>9,11,12 54:21 55:11,24<br><b>histograms</b><br>52:3<br><b>hit</b><br>23:3<br><b>hollow</b><br>31:3<br><b>homework</b><br>73:10,11<br><b>honored</b><br>10:17<br><b>horizontally</b><br>62:3<br><b>hour</b><br>8:3 47:20<br><b>hours</b><br>9:6,9<br><b>Houston</b><br>6:3 7:18<br><b>humps</b><br>39:11<br><b>hundreds</b><br>52:18<br><b>hybrid</b><br>38:6<br><b>hypothetical</b><br>53:21,23 84:11 85:1,9,<br>14 86:4<br><b>hypothetically</b><br>43:2<br><b>Hyun</b><br>6:22 | <b>illustrating</b><br>59:13<br><b>imply</b><br>69:25<br><b>important</b><br>7:22 36:23 65:13<br><b>importantly</b><br>63:16<br><b>impossible</b><br>77:8<br><b>improve</b><br>16:13,21<br><b>improved</b><br>15:21 28:5,16 30:25<br>31:10 81:1<br><b>improvements</b><br>15:13 16:9 30:9,18<br><b>improving</b><br>15:6<br><b>inability</b><br>81:9<br><b>include</b><br>11:23 12:3,15,17 19:13<br>28:4<br><b>included</b><br>14:4 28:9,25<br><b>includes</b><br>15:8 80:2<br><b>including</b><br>11:16 15:9 74:24<br><b>increase</b><br>32:7<br><b>indicating</b><br>67:7<br><b>individual</b><br>81:13 82:1<br><b>individualized</b><br>81:10<br><b>individuals</b><br>26:22<br><b>industry</b><br>24:24 25:4<br><b>infeasible</b><br>78:25 79:4 | <b>information</b><br>45:22 55:10 72:10,19,<br>20 73:7,19 83:22 84:2,6<br><b>injection</b><br>34:12 62:1 68:3,4<br><b>inserted</b><br>31:4<br><b>instance</b><br>13:11 14:24 34:9 42:10<br>72:2 73:8<br><b>instruction</b><br>82:17<br><b>instructions</b><br>82:18<br><b>intention</b><br>67:5,6<br><b>interchangeably</b><br>24:17,22 25:1<br><b>interested</b><br>16:7<br><b>interface</b><br>69:19 70:1<br><b>interference</b><br>11:25<br><b>intertwined</b><br>13:6<br><b>intervening</b><br>69:12 86:5,7<br><b>intimate</b><br>69:22,25 70:3<br><b>invention</b><br>46:10<br><b>inventions</b><br>84:7<br><b>inventor</b><br>21:15<br><b>inventors</b><br>26:17 48:25 80:3<br><b>investigated</b><br>13:11<br><b>involve</b><br>74:21 80:19<br><b>involved</b><br>13:9 76:8 | <b>involvement</b><br>27:1,6<br><b>involves</b><br>34:11 39:18 76:9 80:16<br><b>involving</b><br>48:22,23<br><b>ionic</b><br>29:10,21 30:22,23,25<br>31:9<br><b>IPR</b><br>9:18<br><b>IPR2024-01012</b><br>9:18 |
| <hr/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <b>J</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <b>James</b><br>79:10<br><b>Jennifer</b><br>6:23<br><b>Jin</b><br>6:22<br><b>joined</b><br>6:22<br><b>journal</b><br>23:2<br><b>jumping</b><br>38:24<br><b>JUNE</b><br>6:1                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <hr/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <b>K</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <b>kind</b><br>13:5,22 18:21 21:22<br>39:12 54:8 62:6 73:9<br><b>Kurt</b><br>26:20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <hr/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <b>L</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |
| <b>labeled</b><br>17:17<br><b>laboratory</b><br>33:13 36:17<br><b>language</b><br>40:25 43:9 44:11 45:7                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                 |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                  |                                                                                    |                                                                                       |                                                                |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------|
| 46:5                                                                                                                             | 83:9,17,18                                                                         | <b>making</b><br>32:17 65:19 66:5,21<br>71:15,18                                      | <b>measurements</b><br>43:4 46:18 50:25 52:9,<br>19,25         |
| <b>large</b><br>45:11,13 52:13 67:16<br>68:7                                                                                     | <b>listed</b><br>18:16 26:17 83:16                                                 | <b>manner</b><br>7:20                                                                 | <b>measures</b><br>85:3,11                                     |
| <b>laymen's</b><br>50:3                                                                                                          | <b>literature</b><br>18:19,20                                                      | <b>Marinkovic</b><br>26:21                                                            | <b>measuring</b><br>53:14 77:24                                |
| <b>lead</b><br>16:9 33:24                                                                                                        | <b>lithium-ion</b><br>12:18,21 14:2,21                                             | <b>marked</b><br>68:7                                                                 | <b>mechanical</b><br>15:11 16:9,12 33:18<br>34:10,11 62:1 81:1 |
| <b>leave</b><br>22:24                                                                                                            | <b>live</b><br>8:19                                                                | <b>market</b><br>32:18                                                                | <b>meets</b><br>57:23                                          |
| <b>left</b><br>26:16                                                                                                             | <b>load</b><br>81:10                                                               | <b>marking</b><br>8:17,19                                                             | <b>mention</b><br>10:12 81:5                                   |
| <b>legal</b><br>48:10                                                                                                            | <b>logic</b><br>57:20                                                              | <b>mass</b><br>72:10 73:2,7,14 76:10,<br>13 82:1                                      | <b>mentioned</b><br>15:14,20 30:4 77:20                        |
| <b>length</b><br>34:1,3,17 35:4 48:13,22<br>50:7 53:4,11,13,14,18<br>55:1,6,14,15,18,25<br>56:13,21 57:3,5 60:11,<br>18,21 76:15 | <b>long</b><br>6:14 13:7 17:2,4,6,11<br>25:11,13                                   | <b>material</b><br>32:6 36:6,7,14 71:13,<br>16,18 86:5,7                              | <b>mentions</b><br>75:4                                        |
| <b>lengths</b><br>49:20 53:8,17 55:23<br>56:10 60:3,14                                                                           | <b>longer</b><br>61:22                                                             | <b>materials</b><br>11:8,16,21 12:4,10,22<br>13:22 28:5,16 71:17                      | <b>met all</b><br>85:20                                        |
| <b>LG</b><br>8:16 27:13 83:13                                                                                                    | <b>looked</b><br>20:1 75:9                                                         | <b>math</b><br>75:7,9,11 76:1                                                         | <b>method</b><br>35:3,12,20 50:23 78:17<br>79:8                |
| <b>LG's</b><br>18:12 27:15                                                                                                       | <b>lot</b><br>7:6 17:1 53:14 71:25<br>72:10,18 73:4 75:19                          | <b>matrices</b><br>28:25                                                              | <b>methodologies</b><br>71:2 73:23 76:7                        |
| <b>LGES-1001</b><br>17:25                                                                                                        | <b>lower</b><br>33:1                                                               | <b>matter</b><br>64:10                                                                | <b>methodology</b><br>76:9 77:17 78:8                          |
| <b>LGES-1005</b><br>18:9                                                                                                         | <b>Lu</b><br>14:8                                                                  | <b>meaning</b><br>11:13 51:15                                                         | <b>methods</b><br>34:8                                         |
| <b>LGES1001</b><br>8:17                                                                                                          | <b>M</b>                                                                           | <b>meaningful</b><br>51:8,11                                                          | <b>microscope</b><br>50:4 64:8 65:6                            |
| <b>life</b><br>58:1,5,6                                                                                                          | <b>made</b><br>6:16 25:14,19 46:17<br>67:7 68:9 74:10                              | <b>means</b><br>7:15 11:9 17:6 23:20<br>26:16 33:17,19 36:3<br>60:9 62:19 67:19 68:11 | <b>microscopy</b><br>49:22 50:24                               |
| <b>lightening</b><br>11:24                                                                                                       | <b>main</b><br>63:24 74:6                                                          | <b>meant</b><br>60:6 62:14 66:7                                                       | <b>middle</b><br>14:7 31:3                                     |
| <b>limitations</b><br>85:15,20                                                                                                   | <b>maintained</b><br>68:5                                                          | <b>measure</b><br>38:17,20 50:7 53:13<br>55:17,25 56:2                                | <b>million</b><br>42:18 43:24 46:16,20<br>47:3                 |
| <b>limited</b><br>15:2                                                                                                           | <b>maintaining</b><br>59:10                                                        | <b>measured</b><br>43:6 46:19 50:13 84:19                                             | <b>millions</b><br>44:15 50:18                                 |
| <b>lines</b><br>39:23 65:9,10,11,12,19                                                                                           | <b>make</b><br>7:20 8:7 10:7 20:23<br>38:6 48:16 50:8,12<br>51:18 52:25 60:25 84:7 | <b>measurement</b><br>51:19 53:18                                                     | <b>Milos</b><br>26:20                                          |
| <b>list</b><br>17:18 18:1,7 19:10                                                                                                | <b>makes</b><br>10:6 38:12 65:24 71:25                                             |                                                                                       | <b>mind</b><br>22:8                                            |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>mine</b><br>20:19<br><b>minimum</b><br>51:14<br><b>minute</b><br>31:15 59:19<br><b>minutes</b><br>47:20<br><b>mischaracterizes</b><br>11:11 22:11 41:23<br>45:24 47:14 48:19<br>54:24 56:23 58:3 64:6<br>66:15 69:17 71:10<br><b>mislabeling</b><br>63:18<br><b>misleading</b><br>44:22<br><b>missed</b><br>30:12<br><b>MIT</b><br>10:14<br><b>mixing</b><br>34:10<br><b>molding</b><br>34:12<br><b>Molecular</b><br>27:5<br><b>morning</b><br>6:20,21 7:9 10:10<br><b>morning's</b><br>82:25<br><b>move</b><br>70:17 81:16<br><b>MRD</b><br>18:13 27:5,6<br><b>MRD-2006</b><br>18:18 19:1<br><b>MRD-2007</b><br>18:19 19:2<br><b>MRD-2008</b><br>19:6<br><b>multimodal</b><br>60:2<br><b>multiple</b><br>51:18 58:15,24 | <b>multiwall</b><br>36:25 54:15<br><hr/> <b>N</b><br><b>nanofiber</b><br>13:12,24 15:3 16:4,17<br>17:12<br><b>nanofibers</b><br>12:4 13:10 14:21<br><b>nanotech</b><br>10:14<br><b>nanotube</b><br>17:8,9 23:24 24:13,20,<br>25 25:3,5,19,24 26:1<br>31:25 32:17 37:4 41:19<br>42:5 52:9 55:17,18,21<br>56:6,14,22 57:2 61:22,<br>23,24 63:2,17 65:20<br>67:14,16 69:23,24 70:4,<br>6 78:18,21,24 80:22<br>86:5,6,9,10<br><b>nanotube's</b><br>35:1<br><b>nanotubes</b><br>10:19 12:4 13:9 15:12,<br>22,23 16:21 24:3,13,19<br>25:1 28:4,15,22,25<br>30:24 31:2 32:17,18,21,<br>23,25 33:1,2,6,7,11,24<br>34:7,18 35:17,22 37:3,<br>10,17,22,23 38:10,11,<br>14,17,18,21,22 39:25<br>40:2,7,12,16,17 41:1,3<br>42:4,7,9 43:6,17 44:7,8,<br>10,15,16,25 45:1,3,5,<br>10,13,19,20 46:4,6,9,<br>11,16,20 48:14 49:21<br>50:10,13,18 51:4,9,14<br>53:17,22 54:2,6,15<br>56:16,17,21 57:17 60:1,<br>15,18,21 63:23 64:13<br>65:18 66:5,21,25 67:3,<br>8,23 68:3,6,12,15,16<br>69:14,20 70:24 71:24<br>72:1,12 73:1,13,15,19<br>74:11 75:5 76:13,18<br>80:10,13,17,20 81:1,6,<br>8,10,11,13,14,22 84:11,<br>16,19 85:2,10,14,18,25<br>86:6 | <b>nature</b><br>69:18<br><b>necessarily</b><br>35:15 70:7<br><b>needed</b><br>13:17<br><b>neglected</b><br>37:18<br><b>network</b><br>17:7,11 63:24 68:4,6<br><b>nice</b><br>53:24<br><b>note</b><br>71:1<br><b>noted</b><br>22:15<br><b>notes</b><br>8:14<br><b>notion</b><br>63:22<br><b>number</b><br>6:4 9:19 24:6 37:10,17,<br>19,20,21,22,25 38:14<br>39:24 40:1,16 41:1,2<br>50:13 51:4,7,14 52:2,<br>13,14,24 65:7,11 70:23<br>71:3,7 72:1,5,11 73:14<br>75:16 76:7,10,17<br><b>numerous</b><br>15:8<br><hr/> <b>O</b><br><b>oath</b><br>7:13<br><b>object</b><br>11:13 42:13<br><b>objection</b><br>6:13,15 8:24 11:11,18<br>15:15,25 17:23 19:16<br>21:12 22:10 24:14 25:2,<br>15,21 28:6,17,23 29:7,<br>15 30:2 31:1 32:10<br>33:4,15 35:16 36:11<br>37:15 38:2,19 39:17<br>40:20 41:7,22 43:11,21<br>44:13 45:8,23 46:24<br>47:13 48:9,18 49:2,16 | 50:5,15,19 51:1,16<br>52:1,11,20 53:2 54:11,<br>23 55:12 56:4,23,24<br>58:2,17 59:11 60:8,16<br>62:12,25 63:13 64:5,24<br>65:22 66:14 67:11,24<br>69:2,16 70:9 71:9 72:8,<br>23 74:8,18 75:2 76:5,22<br>77:4,10 80:8,14 81:3,23<br><b>objections</b><br>6:13 22:21 46:7<br><b>observed</b><br>44:9 50:10<br><b>obtain</b><br>53:17 78:25 79:4<br><b>obtained</b><br>49:5,24<br><b>occur</b><br>10:3<br><b>open</b><br>8:10 31:4,6<br><b>opinion</b><br>79:7 83:16<br><b>opinions</b><br>10:10 83:4<br><b>opposed</b><br>36:4 38:1 39:11 70:24<br>71:7<br><b>order</b><br>13:4 57:22 67:1 69:23<br>80:15<br><b>Overview</b><br>27:21<br><hr/> <b>P</b><br><b>p.m.</b><br>82:14 86:23<br><b>pack</b><br>26:8<br><b>pages</b><br>28:7,9,12 75:19,22<br><b>paper</b><br>14:8,17 16:20 51:13,25<br>52:10<br><b>papers</b><br>50:23 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>paragraph</b><br/>11:4 27:20 31:14,16,20<br/>35:6 39:1,6 49:14 57:7<br/>61:13 67:13 68:1 70:20<br/>73:22,25</p> <p><b>part</b><br/>12:9 23:6,16</p> <p><b>particle</b><br/>68:24 69:4,13,19,21<br/>70:3</p> <p><b>particulate</b><br/>17:14</p> <p><b>parties</b><br/>71:12,15</p> <p><b>parts</b><br/>28:21 63:12</p> <p><b>party</b><br/>69:6,7 70:12</p> <p><b>pass</b><br/>82:3</p> <p><b>past</b><br/>7:5,6</p> <p><b>patent</b><br/>9:19,22,23 17:25 20:10<br/>21:3,5,8,10,17,24 22:2,<br/>9,16,20 23:5,12,14<br/>24:6,16 25:23 26:5,8,<br/>11,14,16 27:4 28:1,13,<br/>14,22,24 29:5,23 31:12<br/>37:9 39:3 45:16 48:5,8<br/>49:1,4,8,14 54:20 59:22<br/>66:23 67:4 80:3,9 81:5<br/>83:23 84:3,7</p> <p><b>patent's</b><br/>84:1,5</p> <p><b>patents</b><br/>22:22 23:8 26:7</p> <p><b>path</b><br/>32:2 66:24</p> <p><b>pause</b><br/>78:10</p> <p><b>peak</b><br/>39:12</p> <p><b>peaks</b><br/>39:11,13 40:10</p> <p><b>peer</b><br/>23:2</p> | <p><b>pending</b><br/>8:5</p> <p><b>people</b><br/>71:13,19</p> <p><b>percent</b><br/>39:24 40:1,13,14,16,18<br/>41:1,2,4,9,10,14,15,20,<br/>21 42:7,8,20,21,22,23<br/>43:7,8 46:21 47:4,11<br/>85:4</p> <p><b>percentage</b><br/>37:10,16 70:23,24,25<br/>71:6,7 72:5,6</p> <p><b>percentages</b><br/>41:20 71:3</p> <p><b>perfect</b><br/>18:8,10 28:20</p> <p><b>perfectly</b><br/>20:20</p> <p><b>perform</b><br/>33:1 56:21</p> <p><b>performance</b><br/>14:10 15:5,6,8,21 28:16<br/>32:25</p> <p><b>performing</b><br/>56:22</p> <p><b>personally</b><br/>24:18</p> <p><b>pertain</b><br/>12:13</p> <p><b>pertains</b><br/>57:16</p> <p><b>petition</b><br/>83:18</p> <p><b>petitioned</b><br/>79:7</p> <p><b>Petitioner</b><br/>6:24 74:1 83:10 86:14,<br/>20</p> <p><b>PH.D.</b><br/>6:6</p> <p><b>Ph.d.s</b><br/>10:14</p> <p><b>photos</b><br/>64:8 65:6</p> | <p><b>physical</b><br/>65:19 66:5,21 67:2,7,22<br/>68:11,15 69:1 70:7 86:9</p> <p><b>picking</b><br/>41:25</p> <p><b>piece</b><br/>40:12 56:6,8,9,13</p> <p><b>pink</b><br/>8:17 65:23,25</p> <p><b>places</b><br/>66:1</p> <p><b>playing</b><br/>42:17</p> <p><b>plural</b><br/>58:12,13,25</p> <p><b>plurality</b><br/>59:2</p> <p><b>point</b><br/>30:7 63:25 67:10</p> <p><b>points</b><br/>44:1</p> <p><b>polymer</b><br/>81:11</p> <p><b>polymers</b><br/>29:1</p> <p><b>population</b><br/>44:7</p> <p><b>portion</b><br/>67:9 68:7</p> <p><b>POSITA</b><br/>23:20 32:4,11,14,16<br/>34:6 36:17 38:17 56:20<br/>60:14 84:3,6</p> <p><b>position</b><br/>45:22 46:2 63:10 67:10<br/>68:8</p> <p><b>positions</b><br/>65:24</p> <p><b>potentially</b><br/>38:17</p> <p><b>practical</b><br/>22:24</p> <p><b>practically</b><br/>78:25 79:4</p> | <p><b>preparation</b><br/>9:11,14</p> <p><b>prepare</b><br/>8:22</p> <p><b>preparing</b><br/>9:7 17:22 61:10</p> <p><b>presence</b><br/>15:12 69:20</p> <p><b>present</b><br/>41:21 46:4 69:24</p> <p><b>presents</b><br/>49:18</p> <p><b>pretty</b><br/>22:3 66:22</p> <p><b>prevent</b><br/>68:2</p> <p><b>previous</b><br/>6:12</p> <p><b>problem</b><br/>11:20 75:10,25 76:1<br/>78:14</p> <p><b>proceeding</b><br/>9:18 83:18</p> <p><b>proceedings</b><br/>86:22</p> <p><b>process</b><br/>33:2 68:4</p> <p><b>processes</b><br/>34:16,25 56:20</p> <p><b>processing</b><br/>34:10,11 62:2</p> <p><b>produce</b><br/>81:9</p> <p><b>product</b><br/>8:25 19:17</p> <p><b>professor</b><br/>10:15 43:13 46:25</p> <p><b>promotes</b><br/>32:1</p> <p><b>promoting</b><br/>31:24</p> <p><b>properties</b><br/>16:12 28:5 67:15,19<br/>81:2</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                 |                                                                                                                                                                                                                                                      |                                                                               |                                                         |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------|
| <b>proposing</b><br>84:15                                                                                       | <b>quickly</b><br>20:22                                                                                                                                                                                                                              | 53:24                                                                         | 25:24,25 55:9 56:22<br>60:13 65:16 75:23<br>79:18       |
| <b>protection</b><br>11:24                                                                                      | <b>quote</b><br>35:6                                                                                                                                                                                                                                 | <b>realize</b><br>53:3 80:2                                                   | <b>refers</b><br>37:22                                  |
| <b>provide</b><br>17:5 31:21 32:3 49:10<br>50:22 84:2                                                           | <hr/> <b>R</b> <hr/>                                                                                                                                                                                                                                 | <b>realized</b><br>24:17                                                      | <b>regard</b><br>18:21                                  |
| <b>provided</b><br>71:1                                                                                         | <b>ran</b><br>10:15                                                                                                                                                                                                                                  | <b>realm</b><br>72:4                                                          | <b>reinforcing</b><br>81:6                              |
| <b>providing</b><br>66:25                                                                                       | <b>range</b><br>41:19 47:17 54:4,16<br>72:2 78:19 85:5,12,13                                                                                                                                                                                         | <b>reason</b><br>8:4 14:23                                                    | <b>relate</b><br>37:5,6                                 |
| <b>publications</b><br>14:1 16:25 23:2                                                                          | <b>ranges</b><br>79:2                                                                                                                                                                                                                                | <b>reasonable</b><br>19:13 52:24                                              | <b>related</b><br>9:19 14:1                             |
| <b>purchase</b><br>35:22                                                                                        | <b>ratio</b><br>31:21,24 32:25 33:1,8,<br>12,14,19,21,25 34:1,4,<br>23 39:25 40:2,7,8 41:2,<br>3 42:8,9 43:7,8,18,19<br>46:21,22 47:16,17<br>48:13,17,21,23 53:10,<br>12 55:2,7,13,16 57:3<br>58:12 67:15,16 68:7<br>72:2 76:7,10 79:2 85:4,<br>5,12 | <b>reasons</b><br>16:6 53:9                                                   | <b>relates</b><br>28:18 54:25 55:3,5                    |
| <b>purchased</b><br>33:12                                                                                       | <b>ratios</b><br>32:7,15,21 33:3 34:18<br>35:8,14,18 45:13 47:3<br>53:20 56:1,11 57:13,22<br>58:12,16,24 59:10 71:2<br>76:12 78:19                                                                                                                   | <b>Rebar</b><br>27:5                                                          | <b>relationship</b><br>55:7                             |
| <b>purchasing</b><br>55:21                                                                                      | <b>re-ask</b><br>7:8                                                                                                                                                                                                                                 | <b>recall</b><br>14:17 20:4 70:22 75:20                                       | <b>relevant</b><br>23:22 46:19                          |
| <b>purely</b><br>62:6                                                                                           | <b>read</b><br>11:14 30:20 31:15<br>42:10 81:7                                                                                                                                                                                                       | <b>receive</b><br>27:9,12                                                     | <b>reliably</b><br>81:9                                 |
| <b>purpose</b><br>38:8,9                                                                                        | <b>reading</b><br>25:22 58:22                                                                                                                                                                                                                        | <b>recess</b><br>47:22 79:12 82:14                                            | <b>relied</b><br>83:6                                   |
| <b>put</b><br>20:15 31:7 38:5 65:17                                                                             | <b>ready</b><br>79:20,22                                                                                                                                                                                                                             | <b>recognized</b><br>20:7 41:25                                               | <b>relies</b><br>78:17                                  |
| <hr/> <b>Q</b> <hr/>                                                                                            | <b>real</b><br>58:1,5,6 74:23 79:10                                                                                                                                                                                                                  | <b>recollection</b><br>14:25 15:2 16:3,15<br>18:8,10 20:3                     | <b>reluctant</b><br>46:10                               |
| <b>quantification</b><br>36:24                                                                                  | <b>Real-life</b><br>58:7                                                                                                                                                                                                                             | <b>record</b><br>7:1,21 20:22,24 47:21<br>78:10 79:10 82:7,11,13,<br>16 86:17 | <b>rely</b><br>83:3,16                                  |
| <b>quantify</b><br>36:13,20                                                                                     | <b>reading</b><br>25:22 58:22                                                                                                                                                                                                                        | <b>red</b><br>65:18 66:20                                                     | <b>relying</b><br>66:19                                 |
| <b>question</b><br>7:23 8:5,25 15:17 25:16<br>30:14 33:10 40:22<br>41:16 44:6,8,24 81:17<br>82:19,22 84:23 85:7 | <b>ready</b><br>79:20,22                                                                                                                                                                                                                             | <b>red-circled</b><br>66:5                                                    | <b>remember</b><br>16:16 26:6 82:17 83:24<br>84:13 86:2 |
| <b>questionable</b><br>42:24                                                                                    | <b>realistic</b><br>74:12,21 76:24,25 78:2,<br>5                                                                                                                                                                                                     | <b>reduce</b><br>56:21                                                        | <b>repeat</b><br>30:14                                  |
| <b>questioning</b><br>10:2 82:3,6                                                                               | <b>reality</b>                                                                                                                                                                                                                                       | <b>refer</b><br>20:12 24:5 63:19                                              | <b>rephrase</b><br>22:12 40:21 45:25<br>66:17 85:7      |
| <b>questions</b><br>7:7,11,12 9:18 10:11<br>79:15 86:12                                                         |                                                                                                                                                                                                                                                      | <b>reference</b><br>19:2,3 60:24 61:6,9<br>79:25 80:6 81:18                   | <b>replicate</b><br>75:7                                |
| <b>quick</b><br>79:10                                                                                           |                                                                                                                                                                                                                                                      | <b>references</b><br>18:18                                                    | <b>report</b><br>43:13                                  |
|                                                                                                                 |                                                                                                                                                                                                                                                      | <b>referring</b><br>9:23 10:2 12:11 21:2                                      | <b>reporter</b><br>6:3,4 7:18 21:16 65:8                |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                          |                                                                                       |                                                                                  |                                                                        |
|----------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 68:19 78:22 82:10<br>84:22 86:16                         | <b>reversed</b><br>63:19                                                              | <b>scientific</b><br>21:20 22:18                                                 | <b>showing</b><br>47:16 48:7 63:9,10                                   |
| <b>representative</b><br>44:15,21,25 63:15               | <b>review</b><br>9:13 18:3,15,17 23:16,<br>17 28:13 47:9 61:9<br>75:13,21 79:24 81:18 | <b>search</b><br>18:19,20 19:3 20:6                                              | <b>shown</b><br>64:3 68:2,5                                            |
| <b>represented</b><br>44:17                              | <b>reviewed</b><br>9:2 18:1,5,9,12 21:5,7<br>22:2 23:3 83:1                           | <b>searches</b><br>20:1                                                          | <b>shows</b><br>47:10 61:22                                            |
| <b>representing</b><br>6:24                              | <b>revise</b><br>46:14                                                                | <b>second-to-the-last</b><br>24:2                                                | <b>side</b><br>23:12 26:16                                             |
| <b>reproduced</b><br>61:14                               | <b>revisit</b><br>57:8                                                                | <b>select</b><br>43:23                                                           | <b>significant</b><br>30:8 84:9                                        |
| <b>reproducibility</b><br>52:14                          | <b>Richardson</b><br>6:23                                                             | <b>selected</b><br>18:23                                                         | <b>silicon</b><br>49:21                                                |
| <b>reproducible</b><br>52:3                              | <b>Riffe</b><br>7:5                                                                   | <b>SEM</b><br>50:6                                                               | <b>similar</b><br>50:22 54:10,12,17<br>78:19 79:2,6                    |
| <b>requests</b><br>21:16 65:8 68:19 78:22<br>84:22 86:17 | <b>rupture</b><br>68:2                                                                | <b>SEM-BASED</b><br>52:25                                                        | <b>similarly</b><br>60:19 71:21                                        |
| <b>required</b><br>39:22 51:14 52:2 54:21<br>72:19       | <hr/> <b>S</b> <hr/>                                                                  | <b>sense</b><br>8:7 10:7 15:23 38:13<br>71:25                                    | <b>simplistic</b><br>59:14,15                                          |
| <b>requirement</b><br>39:15 42:11 57:23                  | <b>S-T-R-E-I-T</b><br>19:1                                                            | <b>sensing</b><br>12:7                                                           | <b>simultaneously</b><br>67:16                                         |
| <b>requires</b><br>68:15 73:6                            | <b>safe</b><br>21:10                                                                  | <b>sentence</b><br>11:16 35:5 49:12 57:9,<br>16 58:22 59:1,5,13                  | <b>single</b><br>33:2 36:25 42:5 53:5<br>54:13 56:22 58:10,23          |
| <b>research</b><br>10:14 13:4,9 27:9,12                  | <b>sake</b><br>57:18                                                                  | <b>separated</b><br>80:18                                                        | <b>singling</b><br>41:9 77:25                                          |
| <b>resistance-based</b><br>11:23                         | <b>sample</b><br>42:3,5,10,16,19 43:6,10<br>44:16 54:1,5 63:10<br>64:23 78:3          | <b>separation</b><br>80:20                                                       | <b>sits</b><br>86:5                                                    |
| <b>respect</b><br>16:20                                  | <b>samples</b><br>46:19 55:25                                                         | <b>separators</b><br>29:2                                                        | <b>sitting</b><br>10:17                                                |
| <b>response</b><br>10:8 30:12 44:12                      | <b>satisfied</b><br>44:12 46:5 47:1 85:16                                             | <b>set</b><br>51:19,20,21 52:8,12,15<br>53:7 54:7 55:17,18<br>56:15 73:13 79:1,5 | <b>situation</b><br>17:14 22:25 34:22<br>46:11,12 56:16 70:10<br>71:19 |
| <b>restart</b><br>84:24                                  | <b>satisfy</b><br>43:20 45:6,20 47:9<br>50:25                                         | <b>sets</b><br>51:19,24 52:2,4,6,16                                              | <b>size</b><br>42:16,19                                                |
| <b>restrict</b><br>6:12                                  | <b>scanning</b><br>49:22 50:4,24                                                      | <b>shorter</b><br>61:23                                                          | <b>skip</b><br>7:6                                                     |
| <b>result</b><br>34:15 67:13                             | <b>scenario</b><br>46:14                                                              | <b>Shorthand</b><br>6:4                                                          | <b>slightly</b><br>33:10 46:15                                         |
| <b>resulting</b><br>57:4                                 | <b>science</b><br>21:18 22:5,16,23 23:1,<br>3,4,6 25:4                                | <b>show</b><br>47:2,6 53:19 61:16                                                | <b>small</b><br>52:14,15 63:20 66:2<br>67:14                           |
| <b>results</b><br>43:13 44:1                             |                                                                                       | <b>showed</b><br>20:19                                                           | <b>smaller</b><br>25:14,20 33:25 42:19                                 |
| <b>revealed</b><br>21:19 22:7,17                         |                                                                                       |                                                                                  |                                                                        |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                 |                                                                          |                                                                                                            |                                                                                                                        |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>smart</b><br>46:16                                                           | <b>state</b><br>6:25                                                     | <b>subranges</b><br>40:8                                                                                   | 70:23                                                                                                                  |
| <b>solely</b><br>66:13                                                          | <b>states</b><br>78:20                                                   | <b>subset</b><br>38:21 78:3                                                                                | <b>tallest</b><br>51:6                                                                                                 |
| <b>solid</b><br>29:25 30:3,9,19                                                 | <b>statistic</b><br>51:10                                                | <b>subsidiaries</b><br>27:15,17                                                                            | <b>Tamara</b><br>6:3 20:21                                                                                             |
| <b>Son</b><br>60:24 61:6,14,17 65:4,<br>14 66:8,19,23 67:4,9,19<br>68:1,10 74:2 | <b>statistical</b><br>51:15                                              | <b>substance</b><br>10:9                                                                                   | <b>tasks</b><br>77:23                                                                                                  |
| <b>Son's</b><br>71:2                                                            | <b>statistically</b><br>46:17,19 51:7,10                                 | <b>sufficiency</b><br>83:22                                                                                | <b>teaches</b><br>39:3                                                                                                 |
| <b>sort</b><br>14:7                                                             | <b>stick</b><br>7:7                                                      | <b>sufficient</b><br>47:17 53:19 54:10 84:2,<br>6                                                          | <b>techniques</b><br>34:10                                                                                             |
| <b>span</b><br>13:8                                                             | <b>story</b><br>62:9                                                     | <b>sufficiently</b><br>13:18 21:19 22:6,9,17,<br>19 45:11 52:13                                            | <b>technology</b><br>27:21 28:1                                                                                        |
| <b>speak</b><br>9:4                                                             | <b>straight</b><br>62:7                                                  | <b>supplier</b><br>32:24                                                                                   | <b>tedious</b><br>33:8 73:20 77:23 78:5                                                                                |
| <b>speaking</b><br>9:7 10:18                                                    | <b>strands</b><br>25:20                                                  | <b>support</b><br>67:10                                                                                    | <b>telling</b><br>28:8                                                                                                 |
| <b>specific</b><br>16:5 20:5                                                    | <b>Streit</b><br>19:1                                                    | <b>supposed</b><br>8:18                                                                                    | <b>ten</b><br>43:16,23,24,25 44:8,10,<br>15,17,20,25 45:1,3,4,<br>10,15,19 46:3,5,8,11<br>47:20 84:16 85:2,3,10,<br>11 |
| <b>specifically</b><br>15:24 75:4                                               | <b>stretched</b><br>62:2                                                 | <b>surface</b><br>16:5,6                                                                                   | <b>tend</b><br>32:11 34:20,22 36:24<br>57:2                                                                            |
| <b>specification</b><br>84:1,5                                                  | <b>strike</b><br>31:13 80:5 84:23 85:6                                   | <b>Swogger</b><br>26:20                                                                                    | <b>tending</b><br>31:21 32:2                                                                                           |
| <b>spent</b><br>9:7                                                             | <b>structure</b><br>62:17 65:5                                           | <b>sworn</b><br>6:7                                                                                        | <b>term</b><br>23:19 24:19,25 25:3,5,<br>6,24                                                                          |
| <b>spirit</b><br>46:9                                                           | <b>structures</b><br>63:15                                               | <b>T</b>                                                                                                   | <b>terms</b><br>22:8 24:13,17,22 33:7<br>48:21 50:3 60:10,11<br>63:17                                                  |
| <b>spoken</b><br>26:25                                                          | <b>student</b><br>42:5,6 43:3,13 44:9<br>46:17 52:25 84:20,21<br>85:3,11 | <b>takes</b><br>51:9                                                                                       | <b>testified</b><br>6:9 83:21                                                                                          |
| <b>stability</b><br>16:10                                                       | <b>student's</b><br>47:1                                                 | <b>talk</b><br>31:20 35:24 58:12,24<br>67:22 71:13,19,23<br>73:12                                          | <b>testifying</b><br>7:16                                                                                              |
| <b>start</b><br>6:11 10:10 82:6                                                 | <b>students'</b><br>73:10                                                | <b>talked</b><br>28:14 35:13 55:20 57:9<br>82:25                                                           | <b>testimony</b><br>22:11 41:23 45:24<br>47:14 48:19 54:24<br>56:24 58:3 64:6 66:15<br>69:17 71:10 82:25<br>84:10      |
| <b>started</b><br>26:7,11                                                       | <b>study</b><br>23:1 75:22                                               | <b>talking</b><br>7:24 19:12 21:23,24<br>29:9,13,25 30:22 41:15<br>44:7 48:2 56:19,25<br>58:23 73:13 77:16 | <b>theoretical</b>                                                                                                     |
| <b>starting</b><br>11:3,15 30:8 31:19<br>49:8,13 57:9 59:23<br>79:24            | <b>stuff</b><br>31:8                                                     | <b>talks</b><br>30:3,8,18 37:10 40:6,8                                                                     |                                                                                                                        |
| <b>starts</b><br>7:24 75:17                                                     | <b>submitted</b><br>18:13                                                |                                                                                                            |                                                                                                                        |
|                                                                                 | <b>subrange</b><br>35:8 41:10,14,25 42:1<br>57:14                        |                                                                                                            |                                                                                                                        |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                     |                                                                   |                                                                                          |                                                                                                                   |
|---------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 58:7 76:23                                                          | 70:17                                                             | 14:13                                                                                    | <b>V</b>                                                                                                          |
| <b>theoretically</b><br>72:6 76:21 77:2                             | <b>total</b><br>20:3                                              | <b>U</b>                                                                                 | <b>vague</b><br>54:13                                                                                             |
| <b>theory</b><br>57:25 76:25                                        | <b>touch</b><br>63:23 68:17 86:8                                  | <b>U.S.</b><br>9:19                                                                      | <b>values</b><br>79:2                                                                                             |
| <b>thick</b><br>64:13 65:10,12,20,24,<br>25 66:1,25 67:2,7          | <b>touches</b><br>66:2                                            | <b>unable</b><br>45:18,21 46:4                                                           | <b>Vapor-deprived</b><br>14:11                                                                                    |
| <b>thicker</b><br>65:18                                             | <b>touching</b><br>17:8 31:24,25 80:22                            | <b>understand</b><br>7:11 9:20 21:10,24<br>40:22 44:4,23 57:20<br>60:15 63:18 82:20 84:3 | <b>vapor-derived</b><br>14:19                                                                                     |
| <b>thin</b><br>17:3,4,6,12 25:11,13<br>65:10,11 66:2                | <b>transcribing</b><br>7:19                                       | <b>understanding</b><br>21:14,20,21,23 23:19<br>59:1 66:12                               | <b>variable</b><br>53:4,5                                                                                         |
| <b>thing</b><br>8:5 19:13 28:8 37:13<br>49:19 53:22 55:2 62:4       | <b>transcript</b><br>86:16,19                                     | <b>understood</b><br>8:20 17:15 23:10 82:23                                              | <b>varies</b><br>56:17                                                                                            |
| <b>things</b><br>10:19 11:8 15:20 60:25<br>80:25                    | <b>transfer</b><br>81:11                                          | <b>undertake</b><br>13:4                                                                 | <b>variety</b><br>53:8                                                                                            |
| <b>thought</b><br>14:15 22:19                                       | <b>transistor</b><br>45:4                                         | <b>uniform</b><br>56:12                                                                  | <b>vary</b><br>76:16                                                                                              |
| <b>three-dimensional</b><br>62:17                                   | <b>translated</b><br>61:6                                         | <b>unimodal</b><br>60:2                                                                  | <b>varying</b><br>53:17                                                                                           |
| <b>Tim</b><br>7:5                                                   | <b>trick</b><br>66:9                                              | <b>unit</b><br>25:12,13                                                                  | <b>vendor</b><br>54:3                                                                                             |
| <b>time</b><br>8:3,11 10:20 21:7 26:10<br>28:9 45:19 61:12          | <b>triple</b><br>53:6                                             | <b>universal</b><br>84:10                                                                | <b>verbal</b><br>10:8                                                                                             |
| <b>times</b><br>10:16                                               | <b>trivial</b><br>73:18                                           | <b>universe</b><br>44:11,21 45:6,12 84:11,<br>15 85:1,9,14                               | <b>verbally</b><br>7:20                                                                                           |
| <b>titled</b><br>14:10                                              | <b>true</b><br>21:20                                              | <b>unnecessarily</b><br>11:13                                                            | <b>versa</b><br>72:6                                                                                              |
| <b>today</b><br>7:19 9:14,17 10:18,20<br>26:16 55:20 79:15<br>82:18 | <b>trustworthy</b><br>20:8                                        | <b>unrealistic</b><br>74:23 77:21                                                        | <b>version</b><br>61:6                                                                                            |
| <b>today's</b><br>7:10 8:22 9:11 61:10                              | <b>truth</b><br>6:8,9 7:15                                        | <b>unreasonable</b><br>76:11,19                                                          | <b>versus</b><br>73:2                                                                                             |
| <b>told</b><br>73:1                                                 | <b>turning</b><br>76:7                                            | <b>upload</b><br>10:3,21 20:10,14 60:23<br>61:1 79:16                                    | <b>vice</b><br>72:6                                                                                               |
| <b>top</b><br>62:5,7,8                                              | <b>turns</b><br>42:4                                              | <b>uploading</b><br>20:18                                                                | <b>view</b><br>40:15,19 41:6,18 54:19<br>55:10 63:8 64:3 65:17<br>68:14                                           |
| <b>top-bound</b><br>64:3                                            | <b>type</b><br>30:21 37:3 41:4,5<br>47:11,12 50:22 55:11<br>72:21 | <b>Utilization</b><br>81:7                                                               | <b>voltage</b><br>15:9,20                                                                                         |
| <b>topic</b>                                                        | <b>types</b><br>34:17                                             |                                                                                          | <b>volume</b><br>35:7,24 36:3,4,5,6,9,12,<br>15,18,22 37:4,5,13,19<br>38:1,3,7,18,20 57:22<br>63:11 64:3,22 70:25 |
|                                                                     | <b>typically</b><br>32:16 81:12                                   |                                                                                          |                                                                                                                   |
|                                                                     | <b>typo</b>                                                       |                                                                                          |                                                                                                                   |

# THE SULLIVAN GROUP OF COURT REPORTERS

|                                                                                                                     |                                                                                                    |  |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--|
| 71:6,14,19,20 73:2,5                                                                                                | <b>withdrawn</b><br>11:19                                                                          |  |
| <hr/> <b>W</b>                                                                                                      | <b>witness's</b><br>22:11 41:23 45:24<br>47:14 48:19 54:24<br>56:24 58:3 64:6 66:15<br>69:17 71:10 |  |
| <b>wafer</b><br>49:21                                                                                               | <b>word</b><br>54:12 70:12                                                                         |  |
| <b>wait</b><br>7:22 78:12                                                                                           | <b>work</b><br>8:25 19:17 27:9,12<br>53:14                                                         |  |
| <b>waived</b><br>6:15                                                                                               | <b>worked</b><br>16:24                                                                             |  |
| <b>wall</b><br>36:25 53:5,6 54:13                                                                                   | <b>working</b><br>13:23 26:7,11,23 47:18                                                           |  |
| <b>walls</b><br>76:17                                                                                               | <b>world</b><br>19:6 25:4                                                                          |  |
| <b>wanted</b><br>10:10 32:4,24                                                                                      | <b>worries</b><br>6:18                                                                             |  |
| <b>wanting</b><br>45:12                                                                                             | <b>wrong</b><br>24:20 25:6 85:8                                                                    |  |
| <b>ways</b><br>36:13,20,23 74:20                                                                                    | <hr/> <b>Y</b>                                                                                     |  |
| <b>web</b><br>20:1                                                                                                  | <b>year</b><br>26:6,9                                                                              |  |
| <b>Webster</b><br>19:20 20:7                                                                                        | <b>years</b><br>10:16 15:1 16:2                                                                    |  |
| <b>Webster's</b><br>19:6                                                                                            | <b>Yesterday</b><br>21:9                                                                           |  |
| <b>Wednesday</b><br>7:6                                                                                             | <hr/> <b>Z</b>                                                                                     |  |
| <b>weight</b><br>23:6 36:4,9,12,16,18,22<br>37:6,20 38:1,4,7,18,21<br>70:24 71:2,6,14,21,22<br>72:5,11 73:5,8 76:19 | <b>Zinda</b><br>9:5,8                                                                              |  |
| <b>Weiming</b><br>14:8                                                                                              | <b>zone</b><br>42:12                                                                               |  |
| <b>weird</b><br>14:16                                                                                               |                                                                                                    |  |
| <b>well-recognized</b><br>19:19                                                                                     |                                                                                                    |  |
| <b>wiggly</b><br>65:9,10,11,12,19,24,25<br>66:1,2                                                                   |                                                                                                    |  |
| <b>window</b><br>10:3                                                                                               |                                                                                                    |  |
| <b>wishful</b><br>54:17                                                                                             |                                                                                                    |  |