

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

Case No. IPR2024-00491

- - - - - X

FOX FACTORY, INC.,

Petitioner,

- against -

SRAM, LLC,

Patent Owner.

U.S. Patent No. 10,328,993 B2

- - - - - X

October 23, 2024

11:07 a.m.

VIDEO RECORDED DEPOSITION of ALEXANDER
SLOCUM, Ph.D., an Expert Witness herein, taken
by the Patent Owner, held remotely via Zoom
video conference before Sara K. Killian, a
Registered Professional Reporter, Realtime
Certified Reporter and Notary Public.

Page 2 1 2 APPEARANCES: 3 4 FINNEGAN HENDERSON FARABOW GARRETT & DUNNER, LLP 5 Attorneys for Petitioner 6 3300 Hillview Avenue, 2nd Floor 7 Palo Alto, California 94304 8 BY: ARPITA BHATTACHARYYA, ESQ. 9 XIRUI ZHANG, ESQ. 10 11 12 LEWIS RICE LLC 13 Attorneys for Patent Owner 14 600 Washington Avenue, Suite 2500 15 Saint Louis, Missouri 63101 16 BY: MICHAEL DURBIN, ESQ. 17 18 19 ALSO PRESENT: 20 BRAD THOMPSON, Videographer 21 22 23 24 25	Page 4 1 2 THE VIDEOGRAPHER: Good 3 morning. We are going on the record at 4 11:07 a.m. on October 23, 2024. 5 Please note that this 6 deposition is being conducted 7 virtually. Quality of recording 8 depends on quality of camera and 9 internet connection of participants. 10 What is seen from the witness 11 and heard on screen is what will be 12 recorded. Audio and video recording 13 will continue to take place unless all 14 parties agree to go off the record. 15 This is video unit one in the 16 deposition of Alexander Slocum Ph.D. 17 taken by counsel for respondent in the 18 matter of Fox Factory LLC v SRAM LLC, 19 filed in the United States Patent and 20 Trademark Office, Case IPR2024-00491. 21 My name is Brad Thomas from 22 Veritext. The court reporter today is 23 Sara Killian from the firm of Veritext 24 as well. 25 I'm not authorized to
Page 3 1 2 STIPULATIONS 3 4 IT IS HEREBY STIPULATED AND AGREED by 5 and among counsel for the respective parties 6 hereto, that the sealing and certification of 7 the within deposition shall be and the same are 8 hereby waived; 9 10 IT IS FURTHER STIPULATED AND AGREED 11 all objections except as to form of the 12 question, shall be reserved to the time 13 of the trial; 14 15 IT IS FURTHER STIPULATED AND AGREED 16 that the within deposition may be signed before 17 any Notary Public with the same force and effect 18 as if signed and sworn to before the Court. 19 20 * * * 21 22 23 24 25	Page 5 1 2 administer an oath, I'm not related to 3 any party in this action, nor am I 4 financially interested in the outcome. 5 If there is any objections to 6 proceeding, please state them at the 7 time of your appearance. 8 Counsel and all present, 9 including remotely will state their 10 appearances and affiliations for the 11 record beginning with the noticing 12 attorney. 13 MR. DURBIN: My name is Michael 14 Durbin for patent owner, SRAM. 15 MS. BHATTACHARYYA: My name is 16 Arpita Bhattacharyya from the law firm 17 Finnegan on behalf of Fox Factory and 18 the witness and I'm joined today by my 19 colleague Xirui Zhang, also from 20 Finnegan, and on behalf of Fox. 21 ALEXANDER SLOCUM, Ph. D., 22 after having first been duly sworn, was 23 examined and testified as follows: 24 EXAMINATION BY 25 MR. DURBIN:

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SRAM EXHIBIT 2019, PAGE 2 OF 170

Page 6 1 A. Slocum, Ph.D. 2 Q. Good morning, Dr. Slocum. 3 A. Good morning. 4 Q. Dr. Slocum, since you've been 5 deposed previously in the related litigation 6 in district court, as well as in a number of 7 different depositions in other inter partes 8 reviews, I will spare you a long 9 introductory discussion about deposition 10 procedures. 11 I'll follow that up by asking 12 if you have any questions before we get 13 started about how things will proceed today. 14 A. I don't. 15 Q. As always, if you need a break, 16 please let me know. All I ask is that you 17 finish whatever open line of questioning we 18 have and we'll accommodate you in any way 19 that we can. 20 A. Okay. 21 Q. Is there anything that would 22 prevent you today from giving truthful 23 testimony? 24 A. No. 25 Q. Are you under the influence of	Page 8 1 A. Slocum, Ph.D. 2 room, please let me know so we could note 3 that for the record. 4 A. Okay. 5 Q. What have you done to prepare 6 for today's deposition? 7 A. In the period of time leading 8 up to this deposition, I have reviewed my 9 reports and the related documents referenced 10 in my reports -- excuse me -- just for 11 this -- the report for this case. There's 12 another deposition tomorrow and then one 13 more on Friday. 14 So anyway, I reviewed my '993 15 report for the IPR and the documents 16 referenced and then I flew in -- I landed 17 late morning Monday and I met with Arpita, 18 though, ostensibly Monday afternoon and then 19 some yesterday. 20 Q. In your previous answer, you 21 referenced your report. 22 By report, are you referencing 23 your declaration, 1003? 24 A. Correct, and I have a copy of 25 it here.
Page 7 1 A. Slocum, Ph.D. 2 any medications, alcohol or any other 3 substance or do you have any condition that 4 can prevent you from answering my questions 5 truthfully and completely? 6 A. I'm not under the influence of 7 anything and I will be answering truthfully. 8 Q. And I do have to ask before we 9 get started, do you understand that you're 10 under oath today to answer my questions 11 truthfully and completely? 12 A. Yes, I do. 13 Q. Okay. Let's get started. 14 Where are you appearing today 15 for this deposition? 16 A. I'm in the Finnegan law offices 17 in Palo Alto, California. 18 Q. Is your counsel present with 19 you there? 20 A. She is in the room next door, 21 but I am in this conference room by myself. 22 Q. Okay. 23 If at any time there's -- I can 24 only see a small portion of your room. If 25 anybody else is present with you in your	Page 9 1 A. Slocum, Ph.D. 2 Q. Okay. 3 Is that okay if we refer to 4 that document interchangeably both as your 5 report or your declaration? 6 A. That's fine. 7 Q. So you mentioned this briefly, 8 but who did you speak with during your 9 preparations? 10 A. Arpita and then Xirui was in a 11 brief Zoom meeting. That would be 12 Ms. Zhang. Sorry. 13 Q. When did you speak with both 14 Arpita -- let's start with Arpita. 15 When did you speak with Arpita? 16 A. Well, we were -- excuse me. 17 Like I said, I landed Monday 18 morning and came down here late morning and 19 had lunch and so from let's call it late 20 Monday morning through -- I don't know -- 21 midday yesterday. I think Robert McCauly 22 also stopped by briefly, but just for a 23 moment. Then so Ms. Zhang, I think it was a 24 Zoom call yesterday. 25 Q. In your preparations for this

Page 10 1 A. Slocum, Ph.D. 2 matter in general -- not necessarily just 3 for this deposition -- have you spoken with 4 anyone else in your preparation for the 5 report or any other advice that you've given 6 in this matter? 7 A. No. 8 Q. Have you spoken with anyone 9 from petitioner, Fox Factory, with regards 10 to this matter? 11 A. No. 12 Q. What about in your preparations 13 for the underlying district court case? 14 A. Not that I recall. I think it 15 was just with the attorneys. 16 Q. Did you review any documents in 17 your preparations for this deposition? 18 A. As I said, I reviewed my 19 declaration and the documents referenced 20 therein. 21 Q. Did you review any documents 22 not referred to in your -- in your 23 declaration? 24 A. No. 25 Q. Have you communicated with any	Page 12 1 A. Slocum, Ph.D. 2 art references included in your declaration? 3 A. Okay. So I assume we'll go 4 into this in more detail later, but the 5 starting point was these particular 6 references were provided to me by Arpita and 7 she said here's a starting point, if you 8 think you need anything else, feel free to 9 search or let us know. So that was the 10 beginnings of it. 11 And I looked through them, I 12 knew, as referenced in my report, a 13 handbook -- because I had done this type of 14 design analysis before -- exactly where to 15 go to reference the handbook equation. So 16 that wasn't a search. I already knew about 17 that. 18 Q. Has your son, Alexander Slocum, 19 Junior, been involved with this matter? 20 A. He is not. He is a surgeon and 21 also a mechanical engineer and he -- I don't 22 know if he's been helpful on other cases or 23 not, but he's not involved in this bicycle 24 frame case. Well, steering tube, but 25 everything associated with it.
Page 11 1 A. Slocum, Ph.D. 2 third parties in your preparations for this 3 deposition? 4 A. No, other than telling my wife 5 where I'm going to be. 6 Q. Understood. 7 Have you communicated with any 8 third parties regarding this matter at any 9 time? 10 A. No, just my wife. 11 Q. Have you done anything to 12 prepare for this deposition that you have 13 not already discussed today? 14 A. No. Just had a good night 15 sleep. 16 Q. Did you perform any prior art 17 searches for this matter? 18 A. I did not. 19 Q. Did you request that anyone 20 else perform prior art searches for this 21 matter? 22 A. I'm not sure I understand the 23 question. I guess that goes to how I 24 prepared my declaration. 25 Q. How did you come upon the prior	Page 13 1 A. Slocum, Ph.D. 2 Q. What is your familiarity with 3 the bicycle industry? 4 A. Well, I've been riding bicycles 5 since a kid. I've done 22 full length 6 Ironmans, lots of riding. I have helped 7 Specialized with the design of their very 8 nice wind tunnel and been in some design 9 reviews. Designed and built -- well, I 10 didn't do the welding -- I'm a very bad 11 welder -- but my own stainless steel frame. 12 It's ostensibly a mixed bike, gravel on 13 road, depending on which wheels I put on it. 14 But I don't have any, if you 15 will, paid consulting or design work with 16 any bicycle interest at this time. 17 Like I said, for a bit of time, 18 I helped Specialized ostensibly mostly with 19 their wind tunnel, but that was some years 20 ago. 21 Q. What was your role in helping 22 to design Specialized's wind tunnel? 23 A. The force plate. So the force 24 plate they had was okay and I assisted with 25 how to make it more sensitive and also more

Page 14 1 A. Slocum, Ph.D. 2 tolerant of, shall we say, when you 3 initially load might it be knocked out of 4 kilter. 5 Q. Where is that tunnel located? 6 A. It's down south of here. What 7 is it -- it's right at Specialized's 8 headquarters. I always forget the name of 9 the little town it's in. 10 Q. What are some companies that 11 you associate with the bicycle industry? 12 I believe you've already given 13 us Specialized, but are there any others? 14 A. I don't understand your 15 question. Associate with the bicycle 16 industry? 17 Q. I will ask another question. 18 Are you familiar with bicycle 19 retailers in the United States? 20 A. Yes. I've bought many bicycles 21 from different retailers. 22 Q. Are you familiar with the Trek 23 Bicycle Corporation? 24 A. I am in that I own Treks. 25 There's a store name -- it was named	Page 16 1 A. Slocum, Ph.D. 2 magazines. I know they sell gravel bikes. 3 I don't know if they sell a road bike. 4 Q. I will let you know that's my 5 understanding also. 6 Are you familiar with 7 Petitioner's Fox Factory's business? 8 A. From this case, I don't have 9 any large collection of Fox products. I 10 think there might be a shock -- I mean, I 11 have many different bicycles, so some of 12 them may have the Fox shocks on them. 13 I do know that at least three 14 of my bicycles -- four, actually -- have 15 SRAM red component sets and two of them are 16 the electronic shifters that I like very 17 much, much better than the Shimano 18 electronic shifters. 19 Q. What sort of products does Fox 20 Factory sell in the bicycle industry? 21 A. I'm familiar with the shocks. 22 They may sell many others, but I haven't 23 studied that. There's been various cases 24 where for different things that -- like some 25 of the gear sets, the axle I've become aware
Page 15 1 A. Slocum, Ph.D. 2 Goodale's in the Concord, New Hampshire area 3 where over the years I bought many bicycles 4 from them. 5 And a few years ago, Trek 6 bought the chain. So I still take some of 7 my bikes there to be serviced. They have a 8 very nice deal. If you buy a bike, you get 9 quite a bit off on service and Trek has been 10 very good about honoring them, carrying that 11 deal through for people who bought from 12 Goodale's. A month ago, two months ago, I 13 bought my grandson his very first real pedal 14 bike from our Trek store in Hooksett that 15 he's learned to ride and now he's quite the 16 riding demon at three. 17 Q. That's wonderful. 18 Are you familiar with Santa 19 Cruz bikes? 20 A. I know of them. I do not have 21 one. 22 Q. Do you know what type of 23 bicycles are sold by Santa Cruz bikes? 24 A. They sell mountain bikes I'm 25 aware of from just reading bicycle	Page 17 1 A. Slocum, Ph.D. 2 of through some of the patent lawsuits. 3 But with regard to my own 4 personal knowledge of them, no. The only 5 ones I'm familiar with are some of the 6 shocks, which like I said, I have a large 7 collection of bicycles and there's different 8 shocks on different ones. Some I know are 9 Fox and some are RockShox. I think there's 10 a Manitou -- I think I pronounced that right 11 -- on one of my mountain bikes. 12 I keep just -- because you're 13 wondering why I have all these bicycles, I'm 14 a professor and I bring up crops of student 15 and we go trail riding. That's one of the 16 things I do, is try to interact -- not just 17 in the classroom -- with students. So I -- 18 it's a good excuse to have a stable of 19 bicycles. 20 Q. I'm also an M plus one cyclist. 21 I think I have at least nine frames. I used 22 to restore them. 23 You had mentioned Fox Factory, 24 at least in part, sells shocks. 25 By shocks, do you refer to rear

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Page 18 1 A. Slocum, Ph.D. 2 shock absorbers? 3 A. Well, yes. A rear shock 4 absorber and I think they also sell forks, 5 although I don't think I have any Fox forks. 6 I don't remember, but I know at least one 7 bike has a Fox rear shock on it, as well as 8 others have RockShox. 9 Q. I believe you mentioned 10 RockShox. 11 What does RockShox sell? 12 A. Well, they started out in the 13 fork business and I think then SRAM -- I 14 don't remember what -- SRAM bought them at 15 some period of time -- I don't recall 16 when -- and they also have for a full 17 suspension bike a rear shock. 18 Q. Okay. 19 Dr. Slocum, I would know like 20 to introduce an exhibit that's already been 21 marked. It is Exhibit 1001. 22 A. Okay. I just have to try to 23 figure out which folder it's in. Ahh. Oh, 24 I think this is -- okay. I see this. 25 Q. What is this document?	Page 20 1 A. Slocum, Ph.D. 2 don't worry about in the infringement 3 issues. So that's why I'm fine for this IPR 4 to not have claim construction. 5 The other issue that is of 6 concern related to the function is it 7 doesn't define a coordinate system. So even 8 if you give me a function, I don't have an 9 orientation and that relates to the plane of 10 travel. 11 To me, that would be the plane 12 of the frame of the bicycle. You know, that 13 diamond shape, which is ostensibly the frame 14 shame or you could even concatenate it to 15 say the triangular-ish frame. 16 For some reason, in the 17 district court claim, Fox wanted to design 18 it another way, which is weird to me because 19 when you're turning the bicycle, there is no 20 plane because it's an arc and an arc is not 21 a plane. So that was very confusing to me. 22 But anyway, so that's why I say 23 in my declaration here for the IPR, I'm just 24 going to go with what I believe is the plain 25 and simple meaning of plane, because that's
Page 19 1 A. Slocum, Ph.D. 2 A. Well, wait a second. Hold on. 3 Which document is this? 4 Q. Exhibit 1001. 5 A. I think I'm in the wrong 6 folder. Hold on. Okay. I see it now. I 7 was in the wrong folder. I'm sorry. 8 Yeah, this is the '993 patent, 9 the patent in question. 10 Do you want me to open it? 11 Q. Not at this time? 12 A. Okay. 13 Q. Do you offer any claim 14 constructions in your declaration? 15 A. So for this IPR, I say we don't 16 need anything. For the district court case, 17 there is a couple issues that arise and that 18 is -- one is claim one talks about a 19 function -- a mathematical function is 20 implied, but I think we need to define that 21 for the district court case because only the 22 elliptical shape is shown. 23 For this IPR, I don't need to 24 have the function because all I need to do 25 is find something that has a function, so I	Page 21 1 A. Slocum, Ph.D. 2 all I need with respect to looking at prior 3 art. 4 Q. Were you able to apply the 5 claims of the '993 patent to the prior part 6 in your declaration? 7 A. I was, with my understanding of 8 what plane -- I can look up the exact -- 9 claim one defines plane as, I think, plane 10 of travel. 11 Let me just make sure I get the 12 wording exactly right. 13 But I didn't have a problem 14 with my understanding of that because I just 15 stated -- let me get the exact term. 16 Yeah, it's plane of travel. So 17 I read that and I say plane of travel is 18 when the bicycle is going straight ahead 19 because there's no arc. So it's clear to me 20 what that is. And now, even if it's just 21 for that one instance of that definition, or 22 that definition is for just one instance of 23 the motion of bicycle, that's all I need 24 when I go to look at the prior art. 25 Q. Were you able to allege that

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Page 22 1 A. Slocum, Ph.D. 2 each claim was rendered obvious by at least 3 one ground in a petition? 4 A. Yes. For all the claims I 5 listed, which I think is all of them. 6 There's a lot of claims there, so I would 7 have to go to my report to make sure I 8 didn't say yes for all of them and maybe 9 there was one that was not referenced. 10 Q. I'm not trying to catch you in 11 that. I do not believe that all of the 12 claims were referenced and I think we can 13 agree that the caveat there is that the 14 claims involved in the petition. 15 A. We agree. For the claims 16 involved in the petition, I believe I find 17 reference in the prior art. 18 Q. And none of the prior art 19 references in this matter anticipates any 20 claim of the '993 patent, correct? 21 A. Correct. I did not find each 22 and everything exactly fully clearly in one 23 of the references. 24 Q. No single reference includes 25 every element of any claim of the '993	Page 24 1 A. Slocum, Ph.D. 2 tube is contained within what's called the 3 head tube or that tube in the very front of 4 the bicycle that faces forward, and that 5 projects down to the ground at an angle and 6 if you imagine the imaginary contact point 7 of where that line extending down through 8 the center of the tube touches the ground, 9 that is actually forward of where the 10 bicycle tire makes contact with the ground 11 and that distance is called -- often called 12 trail. 13 Okay? 14 And that affects the 15 steerability of the bicycle, but what that 16 also means is because the forces from the 17 ground to the bicycle go up perpendicular to 18 the ground through the tire, they create a 19 bending moment in the plane of travel that 20 tries to bend the forks upward, which puts a 21 bending moment on the portion of the fork 22 that is the steering tube -- remember, the 23 fork is the whole thing -- and those loads 24 can be a lot, especially if you take a jump 25 or something or you impact the ground or you
Page 23 1 A. Slocum, Ph.D. 2 patent, correct? 3 A. That's correct. It's not 4 explicitly present. 5 Q. What is disclosed in the '993 6 patent? 7 A. You want -- my quick broad 8 understanding is I think what your question 9 is? 10 Q. Yes, please. 11 A. Okay. So the '993 patent is 12 concerned broadly with how to increase the 13 strength of the tubular member and 14 specifically the steering tube, which is 15 part of the fork in the forward direction or 16 the plane of travel. 17 And that comes from, 18 particularly in racing -- and I race -- 19 every gram of mass is important to remove if 20 you can. So like an aerospace structure, 21 for example, you put material where you need 22 it to provide the strength you need and you 23 don't put it where you don't need it. 24 So in a bicycle, the physics of 25 riding are as you move forward, the steering	Page 25 1 A. Slocum, Ph.D. 2 just hit a curb or speed bump. You get 3 quite a lot of upward force, which creates a 4 big bending moment. 5 So if I can make the tube 6 stronger in that bending in that plane 7 without adding weight to the bicycle, that's 8 a good thing and the only way I'm going to 9 make it stronger without adding weight is to 10 take mass from the portion of the tube that 11 never really sees a lot of weight -- sorry, 12 load -- which is the size of the tube. 13 That's it. 14 Q. What is the basis for your 15 statement that making the tube stronger and 16 that bending in that plane without adding 17 weight to the bicycle is a good thing? 18 A. Okay. So as I stated, when 19 you're racing, grams make a difference in 20 your performance. This is -- I know this 21 is -- personally, although I'm not that 22 fast, but working with people who are that 23 fast -- for example, with Specialized in the 24 work we do in the tunnel -- races are 25 decided by split seconds sometimes, so you

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Page 26 1 A. Slocum, Ph.D. 2 need to be able to provide the strength and 3 stiffness of the bicycle according to the 4 rider's needs for the type of riding they 5 do. 6 Then I do a fair amount of work 7 for the aerospace industry, for example, 8 where huge -- it works out to about \$100 per 9 pound you're willing to spend to reduce 10 weight to increase efficiency. 11 And I can't give you a number 12 like that in terms of fuel consumption for 13 bicycling, but it's the similar type of mode 14 where high performance bicyclists will pay 15 good money to have a lighter bicycle. 16 Q. Are you familiar with the 17 organization Union Cycliste Internationale, 18 also known as UCI? 19 A. I've heard it, but I'm not 20 familiar. I don't subscribe to any news 21 feeds or anything. 22 Q. Are they a governing body for 23 cycling sports? 24 A. I don't recall. They might be, 25 but I don't, like I said, work with them or	Page 28 1 A. Slocum, Ph.D. 2 are some races that have a minimum weight 3 requirement? 4 A. That is my understanding, but I 5 can't -- that's just from reading, like, 6 Popular Press and talking with some of my 7 bicycle aficionado friends who do race. 8 Q. Ironman regulations for the 9 cycles themselves are typically much more 10 open than other forms of racing; is that 11 correct? 12 A. Correct. The person with whom 13 I talk about these things quite a lot is a 14 fellow by the name of Jimmy Riccitello and 15 his son now is a competitive road cyclist, 16 hopefully to race in Tour de France one day. 17 He's quite good, young Michael. 18 So we have around the dinner 19 table in France quite often these types of 20 discussions. They're most entertaining and 21 as a technical person, I find them fun. 22 Q. Do the steering tubes disclosed 23 in the '993 patent have the wall thickness 24 being a maximum in the plane of travel of 25 the bicycle?
Page 27 1 A. Slocum, Ph.D. 2 have any continual contact, so ... 3 Q. What is your involvement with 4 bicycle racing? 5 A. Well, I do Ironman races, which 6 you know have a 112-mile ride. That's a 7 long ride. 8 So every year -- most years, I 9 go to Alpe d'Huez where friends and I, we 10 rent a space up in Villard-Reculas for a 11 week and we try to make sure we're always 12 there when the tour comes through because I 13 do like watching the tour and going to the 14 mountain passes and watching. So in other 15 words, as a spectator. 16 Q. In the racing events that 17 you've been involved in, have there ever 18 been regulations that require a minimum 19 weight for a bicycle? Yes, a minimum 20 weight. A weight in which the bicycle 21 cannot be lower than? 22 A. I haven't personally. I'm 23 aware of such regulations, but I don't know 24 which races to which they apply. 25 Q. So you understand that there	Page 29 1 A. Slocum, Ph.D. 2 A. That's one. Let me make sure 3 there's not another embodiment. 4 But that's generally what 5 they're focused on. So hold on one second 6 while I -- right. So you if you look at for 7 example, figure 16, 17 -- 8 Q. Are you referring to Exhibit 9 1001? 10 A. I am. 11 So all of -- you see where it 12 says P? There's a vertical line that has a 13 P indicated, that's the plane of travel. 14 Which would -- as I mentioned, I'm 15 assuming -- and in figure four, it's very 16 clear by showing the crown from the fork. 17 That's why I'm assuming for now 18 that the plane of travel is always 19 ostensibly worst case defined as the plane 20 of the front wheel, but for the impact loads 21 and things we're talking about where this is 22 really of concern, it'll be also that it 23 goes through the mainframe. 24 There, so in other words, all 25 the examples shown have the tube wall

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Page 30 1 A. Slocum, Ph.D. 2 thickness thicker in the plane of travel 3 than transverse to the plane of travel. 4 Q. In figure 16 of Exhibit 1001, 5 is this showing a bird's eye view down on a 6 piece of tubing, a plan view? 7 A. A plan view, yes, which I guess 8 you could say bird's eye. But it's a cross 9 section plan view. 10 Q. So is this wall thickness being 11 at a maximum in the plane of travel of the 12 bicycle a property of this piece of tubing? 13 MS. BHATTACHARYYA: Objection. 14 Form. 15 A. I don't know how you say a 16 property. It's a feature. Normally when 17 you think of property, you are referring to 18 the material characteristics or I'll use the 19 thickness in the calculation of the moment 20 of inertia, but this is a dimension or a 21 feature. 22 Q. I'll re-ask my question. 23 Is the wall thickness being at 24 a maximum in the plane of travel of the 25 bicycle a feature of this piece of tubing?	Page 32 1 A. Slocum, Ph.D. 2 tubing extend? 3 MS. BHATTACHARYYA: Objection. 4 Form. 5 A. Well, the rotation you're 6 referring to -- you see, now it depends upon 7 what you say is P. If P is the plane 8 through the frame, then it would be 9 45 degrees off axis. If we assume that P 10 rotates -- in other words, the plane goes 11 through the front tire -- then this maximum 12 thickness would still be aligned with the 13 axis P. 14 So that becomes -- I don't know 15 whether or not P stays fixed or not. But if 16 I assume P rotates with it because P is 17 following the tire, then the thickness would 18 still be aligned and the reference to P -- 19 see where P is at the top of the page? 20 That's called top dead center. 21 So if the plane rotates with 22 the tube, maximum thickness would retain at 23 top dead center. And also for this 24 particular drawings, you'd have a similar 25 thicker section at bottom dead center. So I
Page 31 1 A. Slocum, Ph.D. 2 A. That is correct. 3 Q. Would you agree with me that 4 the axis of rotation for this piece of 5 tubing would extend through the center of 6 this piece of tubing, into the page and out 7 of the page? 8 MS. BHATTACHARYYA: Objection. 9 Form. 10 A. Okay. Correct. If you'll 11 notice -- and this is discussed in the 12 patent -- that the outside is a circle of a 13 diameter OC -- and this is all with respect 14 to figure 16. 15 So this tube would be mounted 16 in bearings in the head tube of the bicycle. 17 This allows the steerer tube to rotate. 18 That center of rotation is the center of OC 19 and that would form an axis coming out of 20 the plane through the center of the circle 21 defined by the diameter of OC. 22 Q. If we were to rotate this 23 tubing along that axis of rotation 24 45 degrees clockwise, in what direction 25 would the maximum wall thickness of this	Page 33 1 A. Slocum, Ph.D. 2 also don't know who is top and who is 3 bottom, but I can make that assumption for 4 this line here. 5 Q. In either case, the maximum 6 thickness would move by 45 degrees, correct? 7 MS. BHATTACHARYYA: Objection. 8 Mischaracterizes prior 9 testimony. 10 A. Well, if I start with figure 16 11 and now I take this cross section defined by 12 OC and I don't rotate the dotted line with P 13 and I just rotate the cross section by 14 45 degrees -- and I'm restating what I think 15 you're asking me. Is that correct? 16 Q. Yes. 17 A. Okay. Then the maximum 18 thickness would now also be at an angle of 19 45 degrees with respect to that vertical 20 dashed line denoted by P. 21 Q. Is there any embodiment in the 22 '993 patent where the maximum thickness of 23 the tube itself -- scratch that. 24 Does the '993 patent disclose a 25 steer tube that's able to dynamically change

Page 34 1 A. Slocum, Ph.D. 2 its cross sectional thicknesses? 3 A. I really don't understand your 4 question. You mean in terms of mechanically 5 things move around or you're talking about 6 mathematically with respect to reference 7 frames? 8 Q. Mechanically, Dr. Slocum. 9 MS. BHATTACHARYYA: Objection. 10 Form. 11 A. Mechanically, the cross section 12 is what it is. There's no mechanism in the 13 cross section itself to morph that cross 14 section. 15 Q. Does the '993 patent claim a 16 bicycle? 17 A. I don't think it claims the 18 bicycle. It talks -- let me go look at the 19 claims. 20 It talks about -- it says in 21 claim one a steerer tube for a bicycle, the 22 steerer tube comprising. So the preamble is 23 telling me what it's used for, but I don't 24 see it actually claiming a bicycle itself. 25 I don't think you can.	Page 36 1 A. Slocum, Ph.D. 2 to see if there was something specific for a 3 suspension fork. But in the disclosure 4 itself, the embodiments, I don't find a 5 particular thing for suspension forks. 6 If you look at figure 12, which 7 is kind of a generic type fork, the fork 8 legs, 106 and 108, are big chunky tubes that 9 one in the bicycle world would, you know, 10 may read and look and say oh look, that 11 looks like a suspension fork, but I'm not 12 limited to it. I think that's just meant to 13 be a generic fork picture. If you look at 14 figure one, a suspension fork is shown. 15 And when I say these things, 16 I'm cycling through and I'm assuming you're 17 scrolling on your screen also. 18 Q. I am. 19 A. So there's a suspension fork. 20 There's no rear suspension. You know, this 21 could also be a gravel bike. But that is a 22 suspension fork, which should explain the 23 chunkiness, but I don't think it limits it 24 to a suspension fork. At least I don't read 25 that limitation in claim one.
Page 35 1 A. Slocum, Ph.D. 2 Q. Is the disclosure of the '993 3 patent limited to bicycles? 4 A. Let me check to see if it also 5 includes motorcycles. I mean, I think my 6 recollection is it just talks about 7 bicycles, but motorcycles are often 8 included. 9 Yeah. It says in column one, 10 line six, invention relates in general to 11 bicycles. So you might be able -- to me, 12 that would also include, you know, for 13 example, motorcycles, there's this kind of 14 blurring now between what's a bicycle and 15 what's a motorcycle, especially because of 16 the electric bikes. They share many of the 17 same technologies and issues, other than the 18 motor. 19 Q. Are the claims limited in the 20 '993 patent to suspension forks? 21 A. Let me check. I don't believe 22 I -- I don't think that they're limited to 23 suspensions. I mean, claim one is not. I 24 don't remember. I'd have to go back and 25 review all of it. There's a lot of claims	Page 37 1 A. Slocum, Ph.D. 2 Q. I believe you have already 3 answered this question, at least in part, 4 but I'd like to re-ask it just for clarity's 5 sake. 6 What is a steering tube? 7 A. So a bicycle fork is -- there's 8 comprised of the two legs that come down 9 that straddle the wheel and there are 10 bicycle forks -- I think it was -- I can't 11 remember who introduced it. It only had one 12 leg. That was a fad for a while, but that 13 didn't go over too well. 14 So ostensibly, you have a 15 bicycle fork has two legs or prongs you 16 could call it coming up and joined to the 17 crown, which is a cross bar that connects 18 them, and then there's the steerer tube that 19 projects upwards from that. 20 That's all built at the factory 21 because that has to be monolithic because 22 it's very high stress. 23 So if you think of a fork, like 24 you eat with a fork, a fork has a handle and 25 then a cross bar and then two prongs, at

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Page 38 1 A. Slocum, Ph.D. 2 least two prongs. Some forks have four 3 prongs, three prongs. Some of them only 4 have two, like the fork you use to take meat 5 off a dinner plate. 6 Okay? So the steerer tube is 7 that upward projection from the forks and it 8 goes through the bearings in the head tube. 9 This is what allows you to steer the 10 bicycle. So it acts as the spindle 11 sometimes you can refer to it. 12 In other words, a round shaft 13 supported by bearings is called a spindle. 14 Not many people in the bicycle industry call 15 it a spindle, they will call it the steerer 16 tube, but the generic term for a shaft and 17 bearings is a spindle. My German friends 18 use that term, for example, even on some 19 bike stuff. 20 Anyway, I hope I answered your 21 question. I get all excited about 22 technology of bicycles. 23 Q. Is a steerer tube a part of a 24 bicycle fork? 25 A. Yes. I don't know of any way	Page 40 1 A. Slocum, Ph.D. 2 Q. How are steerer tubes attached 3 to bicycle forks? 4 A. There's many different ways. 5 It depends on the materials. You could have 6 a press fit with a slight taper. You can 7 have a bonding. It can be a weldment. 8 There are many different ways, but for all 9 intents and purposes, it forms an integral 10 connection. 11 If it comes apart, you have 12 serious problems if you're actually riding. 13 It's not something like the pedals where you 14 routinely can swap them out. 15 Q. How are bicycle forks attached 16 to bicycle frames? 17 A. Okay. So the fork with the 18 steerer tube slides up through the bearings 19 in the head tube, projecting upward and 20 there's -- the king bearing was a popular -- 21 there was a patent, I think. On that a 22 while back. 23 Anyway, it slides up through 24 the bearings and then there's typically 25 there's a tapered plug within a screw
Page 39 1 A. Slocum, Ph.D. 2 you buy anything other than having the whole 3 fork, the two prongs down and the steerer 4 tube. 5 They're assembled at the 6 factory. It's a very highly stressed joint 7 between the steerer tube and the crown and 8 then the fork legs. So for all intents and 9 purposes, the bike shops or me, someone who 10 is building a bicycle, they buy the whole 11 thing as one unit. 12 Q. How are steerer tubes -- 13 scratch that. 14 Would you agree with me that 15 steerer tubes are also often referred to as 16 steering tubes? 17 A. I believe I've heard it that 18 way also. I would say that those terms 19 would be synonymous. 20 Q. And would you agree that if 21 either of us refer to either a steering tube 22 or steerer tube, we're referring to the same 23 part? 24 A. I think that's a fair thing to 25 agree upon.	Page 41 1 A. Slocum, Ph.D. 2 fitting on the top that pre-loads the 3 bearings and now gives you ability to take 4 loads in both directions. 5 Because if you take air weave, 6 you don't want there to be an axial shifting 7 of the steerer tube and the head tube. It 8 has to be fully constrained in all 9 directions other than rotation through the 10 bearings. 11 Q. Now, you mentioned a tapered 12 plug with a screw fitting on top that 13 pre-loads the bearings. 14 What is meant by pre-loads the 15 bearings? 16 A. Okay. So you have a lower 17 bearing and an upper bearing, right -- and 18 there's different bearing designs, so it's 19 very hard to speak in generality -- and you 20 put the steering tube through and now how do 21 you constrain it axially? Right? 22 On some steering tubes, you can 23 tighten it so the taper plug t will expand 24 and now make sure there's no clearance 25 radially. Other ones you don't need to do

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Page 42 1 A. Slocum, Ph.D. 2 that because it's really an exacting fit and 3 you can save weight and then all you have to 4 do is tighten the nut that now actually 5 constrains you. 6 Q. Is the screw that's related to 7 the tapered plug pressing against something 8 called a top cap? 9 A. Well, the top cap is what 10 constrains the -- when you put the top cap 11 on, that now prevents the steering tube from 12 falling out the bottom of the bicycle. 13 That's what makes contact with the upper 14 bearing. Remember, you don't have to have 15 the tapered plug in. It depends on the 16 design. That was one particular type. 17 Q. How does the top cap prevent 18 the steering tube from falling out of the 19 bottom of the bicycle from a mechanical 20 perspective? 21 A. Okay. So I wish I could draw a 22 picture. But to resist the loads -- 23 right? -- you have -- excuse me -- two 24 bearings, a lower bearing and upper bearing. 25 The lower bearing will take vertical loads	Page 44 1 A. Slocum, Ph.D. 2 A. I don't understand your 3 terminology, communicate tension to the 4 bearings. 5 Can you bring up a cross 6 section, please, because I'm trying to 7 describe things in general and there are 8 different designs for bearing 9 configurations? 10 Q. Are you familiar with headset 11 spacers? 12 A. Yes. The bearings in the head 13 tube are often -- it's part of what you 14 would call the headset, but again, you've 15 got to bring up a drawing if you want to ask 16 me about specific parts please. 17 Q. Would you please look at figure 18 one of Exhibit 1001? 19 A. I am. There's the bicycle 20 right there. 21 Q. If you need me to share my 22 screen, please let me know. 23 A. Okay. 24 Q. Do you understand where the 25 head tube 204 is in this figure?
Page 43 1 A. Slocum, Ph.D. 2 upward or forces. So if you will think 3 about it, when you're riding, the weight of 4 the rider is resisted by the road, so 5 there's a force that travels upwards from 6 the road through the wheel into the forks, 7 into the crown and then presses on the lower 8 bearing such that you now are resisting 9 those upward forces. 10 There's nothing to keep the 11 tube from sliding out and now the upper 12 bearing depends upon your bearing designs, 13 but typically now will be able to take the 14 loads in the other direction, but you have 15 got to be able to pull on it somehow and 16 that's where the top cap will now act 17 against the upper bearings race to take the 18 loads downward. 19 Like for example, you get air 20 or you're just transporting your bike and 21 the weight of the wheel is there, you don't 22 want to be driving down the highway and have 23 your front wheel slide out. 24 Q. What parts communicate tension 25 from the top cap to the bearings?	Page 45 1 A. Slocum, Ph.D. 2 A. I do. 3 Q. And then above the head tube at 4 the top, presumably attached to the steering 5 tube, is a stem. 6 Do you see that? 7 A. Well, it's not labeled and the 8 stem is sometimes referred to what connects 9 the top of the steerer tube to the 10 handlebars, so that would be your stem 11 length. 12 Q. That's what I'm referring to. 13 A. Okay. 14 Q. Then what spans the distance 15 between the stem and the head tube? 16 A. Okay. It's not labeled, but if 17 you zoom in, you see it almost looks like 18 a -- it's not a bellows, but it looks like 19 concentric rings are drawn, so it depends on 20 the bicycle whether or not you see that 21 spacer there or the head tube goes all the 22 way up to just underneath the stem. So it 23 depends on the bicycle. 24 Q. So would those apparent 25 concentric rings be headset spacers.

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Page 46 1 A. Slocum, Ph.D. 2 A. I can't see. I think that's 3 what they're called. I don't remember 4 exactly. My bike doesn't have them, so I'm 5 not concerned with them. 6 Q. Would the steerer tube be 7 within those headset spacers? 8 A. Yeah, the steerer tube will 9 take all the force from your -- grabbing the 10 handles -- oh, I shouldn't use my hands on 11 the video. 12 All the force of the bicyclist, 13 the rider, forward in terms of their dynamic 14 loads and also the steering loads, the 15 turning has to be transmitted ultimately to 16 the wheel and the most efficient way to do 17 is that direct contact or coupling between 18 the handlebars, stem and steerer tube. 19 To put some kind of 20 intermediate structural or coupling, someone 21 might have at one time or not, but that had 22 not be an efficient or safe, in my book, way 23 to couple things. 24 Q. In figure one of the '993 25 patent, can we see the exterior surface of	Page 48 1 A. Slocum, Ph.D. 2 connects the front wheel to the rear wheel. 3 It supports the crank and the seat, so it is 4 the structure that ties together all the 5 dynamic elements of the bicycle to give the 6 rider control of the bicycle. 7 Q. What is the top tube? 8 A. So the top tube in figure one 9 is 206 and that connects the seat post to 10 the head tube across the top. 11 Now, that is ostensibly what 12 would be referred to as a bicycle in the old 13 days, a men's bicycle. And a women's 14 bicycle, it would be bent downwards to allow 15 women with skirts. But all the women I know 16 ride bicycles that they all look the same 17 that way. 18 There are different dimensions 19 for the women, but I think the bent top tube 20 is an artifact of some old days. 21 Or a cruiser bikes men and 22 women ride on the beach -- because I like 23 going to the beach on the Strand in LA -- 24 and then having a top tube bent is actually 25 handy whether you're a man or a woman or
Page 47 1 A. Slocum, Ph.D. 2 the steerer tube? 3 A. I do not see it in that image. 4 Q. Is the steerer tube covered by 5 other parts? 6 A. Well, that's why I cannot see 7 it. 8 Q. So in other words, the steerer 9 tube is not visible? 10 A. I think you can see just the 11 very bottom of it. At the bottom of the 12 crown, do you see where it looks like 13 there's concentric circles in there? 14 Again, that's not the intent, I 15 think, of figure one is to try to convey 16 that particular information. 17 So at first glance, you really 18 can't see anything that tells me any detail 19 about the steerer tube in figure one, other 20 than I know it's there because it's part of 21 the forks and you need a steerer tube to 22 steer a bicycle. 23 Q. What is a bicycle frame? 24 A. A bicycle frame is the 25 collection of elements that structurally	Page 49 1 A. Slocum, Ph.D. 2 anything in between, just to get on and off 3 the thing easily, which you often do at the 4 beach, to stop and hang out and chat with 5 folks. 6 Q. The lower placement of the down 7 tube on the seat tube allows for easier 8 standing over the tube and easier 9 foot-over-the-tube action, correct? 10 A. If you're going to either have 11 the top tube lower down or have a bend in 12 it, yes, but structurally, it's stronger, 13 the bicycle, if it's as drawn in figure one, 14 which is why -- that's the way -- all my 15 bicycles are that way, except I do have one 16 cruiser bike that I keep at my dad's in LA. 17 Q. What is the seat tube? 18 A. So the seat tube there, it's 19 not labeled, but that's the tube that 20 extends from the seat downward. 21 Do you see the vertical tube 22 here in the back that goes from the top tube 23 to the down tube, which is not labeled 24 either there? 25 So the seat tube takes the

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Page 50 1 A. Slocum, Ph.D. 2 weight of the rider and then there's a 3 squeeze collar you can see at the base right 4 near where the rear forks come up to the top 5 tube and that squeezes the seat tube and 6 takes the vertical load and then the seat 7 tube extends down in several diameters to 8 now take bending loads. 9 Which again, when you're 10 riding, you'll shift your weight on the seat 11 according to the type of terrain and riding 12 you're doing. 13 Q. What is the down tube? 14 A. So the down -- it's not labeled 15 here. That's the big diagonal going from 16 the head tube back down to the crank. 17 Q. You mentioned that the down 18 tube is welded to the head tube. 19 What tube is the down tube 20 connected to on its other end? 21 A. That's down at the crank. So 22 there's a transverse tube. Hold on. Let me 23 see -- I don't think they give me a number. 24 They're not talking about any 25 other tubes then, everything right at the	Page 52 1 A. Slocum, Ph.D. 2 I'm not exactly sure with when you're 3 talking about the frame we should -- if you 4 want to talk about the seat tube that's on 5 part of the frame itself always and not the 6 tube that slides into it that goes up to the 7 seat that's another tube, we just have to 8 agree on what we want to call those. 9 Q. So have you received Exhibit 10 1005 yet, Dr. Slocum? 11 A. I have not. Let me try 12 clicking in and out. No. I just have 1001. 13 Let me try opening and closing it. 14 Q. Dr. Slocum, I'm going to try 15 again to introduce Exhibit 1005. 16 A. What is it, so I can look at my 17 paper? Old reliable paper. 18 Q. Exhibit 1005. 19 A. Yes. 20 Q. I will represent that it is the 21 German language version of what I believe 22 you're referring to as Denk. 23 A. Okay. It says 1006 on my 24 paper. 25 MS. BHATTACHARYYA: Just for
Page 51 1 A. Slocum, Ph.D. 2 head tube and the steerer tube. Let me look 3 at one of my other references. 4 Q. Is that traverse tube referred 5 to as the bottom bracket? 6 A. It is the bottom bracket. Hold 7 on. 8 Yeah. You know, if you look at 9 Denk for example, Denk is calling out all 10 of, you know, the seat tube, which is the 11 vertical piece that receives the tube from 12 the seat and the down tube they label as 13 101, but it's not labeled in the '993. 14 Q. I'd like to introduce what's 15 already been marked Exhibit 1005. 16 A. Okay. I've got to see how to 17 get there. I guess that'll appear in my 18 Veritext thing here. 19 I just want to clean up one 20 little bit. The seat tube extends from the 21 seat downward, but the tube on the frame is 22 also often called the seat tube, so you have 23 two tubes that support the seat. 24 So again, the patent doesn't 25 call out those elements, but just for -- so	Page 53 1 A. Slocum, Ph.D. 2 the record, Dr. Slocum, that's the 3 English translation of it. 1005 is the 4 German version of it. 5 THE WITNESS: Ahh, okay. 6 Sorry. 7 MR. DURBIN: I was attempting 8 to lay a foundation -- I'm happy -- we 9 all know that Exhibit 1006 is the 10 English language translation of 1005. 11 I will now be introducing Exhibit 1006. 12 BY MR. DURBIN: 13 Q. Do you have Exhibit 1006 in 14 front of you, Dr. Slocum? 15 A. I have the paper -- okay. Now 16 1005 just popped up. I don't have 1006 17 electronically, but I do have it in old 18 reliable paper. 19 Q. Okay. 20 What is Exhibit 1006? 21 A. This is the English translation 22 of German patent application DE 19629740 A1. 23 Q. Would it be acceptable to you 24 if we refer to this exhibit as either 25 Exhibit 1006 or Denk?

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Page 54 1 A. Slocum, Ph.D. 2 A. Let's please use Denk. There 3 are too many exhibit numbers running around 4 in my head. It's better if we could use the 5 name of the patent. 6 Q. I will endeavor to do so, Dr. 7 Slocum. 8 A. Okay. Thank you. 9 Q. Dr. Slocum, what are seat 10 stays? 11 A. On the bottom of the seat, 12 these are the structures that enable the 13 seat to be attached to the bicycle, the rest 14 of the bicycle. 15 Q. I believe I was finally able to 16 upload Exhibit 1006, Denk, to the Exhibit 17 Share. 18 A. It just appeared. 19 Q. Dr. Slocum, what are chain 20 stays? 21 A. So this is also to hold the 22 chain in place, so I'm not sure -- you want 23 me to find this in Denk or -- 24 Q. Would you please turn your 25 attention to Exhibit 1001, the '993 patent,	Page 56 1 A. Slocum, Ph.D. 2 axle? 3 A. Gee, I wish I could put a 4 number on it. The rear axle goes through 5 and the wheel is straddled by a structural 6 member on either side of the wheel. But 7 there's not labeled. 8 Q. Is that structural -- scratch 9 that. 10 Is that structural member on 11 either side of the wheel part of the bicycle 12 frame? 13 A. That's all welded together, so 14 when you buy the frame, you basically get 15 two triangles that share the seat tube as a 16 common member. 17 I don't know of any that -- I 18 mean, you order frames and you can have, for 19 example, the chain stay, you'll sometimes 20 have them carbon fiber and so -- but then 21 again, you buy the whole thing built at the 22 factory, so it's not something that you as 23 the user are going to bolt on yourself. 24 Right? 25 So you have the rear wheel
Page 55 1 A. Slocum, Ph.D. 2 figure one? 3 A. Okay. 4 Q. Are the chain stays shown in 5 this picture? 6 A. Wait a second. You want me to 7 go to 1001 again? 8 Q. Yes, the '993 patent. 9 A. Okay. Hold on. I need to get 10 there. It's not responding real fast. Why 11 is it dumping me out? 12 Okay. If you go to, for 13 example, figure one, I see the rear wheel 14 stays. Those are the structures on the 15 frame where the rear wheel is held in place. 16 What was your question? You 17 want to know where the chain stays are? 18 They're not labeled here in figure one. I 19 can't point to a number. 20 But the stay is like -- the 21 rear wheel stay, that's the structure that 22 holds -- that the rear wheel goes through. 23 It depends what kind of axle you're using. 24 Q. Do the chain stays extend 25 between the bottom bracket and the rear	Page 57 1 A. Slocum, Ph.D. 2 stays which project down from the union near 3 the top tube to where the axle goes and then 4 the chain stays again from there forward, 5 but those -- my wife and I have one, too. 6 One of the bikes, it's a 7 titanium frame and those stays are carbon 8 fiber, but that's the way the frame came. 9 Everything was all welded and bonded. 10 Q. Is the fork a part of the 11 frame? 12 A. No. The fork is a separate 13 component that fits into the frame. When 14 you buy a bicycle frame, it doesn't include 15 a fork. You have to specify the fork you 16 want. 17 That's my opinion anyway. Some 18 people may look at the thing and say that's 19 the frame of the bike, but that's not what I 20 would call the frame. I mean, they have to 21 work together, otherwise you don't have a 22 bicycle. 23 Q. Is your understanding that the 24 frame does not include a fork in line with 25 how the term is used by sellers of the

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Page 58 1 A. Slocum, Ph.D. 2 bicycles in the United States? 3 MS. BHATTACHARYYA: Objection. 4 Form. 5 A. I don't understand your 6 question. 7 MR. DURBIN: I'd now like to 8 introduce a new exhibit that I will be 9 marking 2016. 10 (Whereupon, Exhibit 2016 was 11 marked for identification.) 12 THE WITNESS: You'll have to 13 give me a minute to -- what seems to 14 help this thing upload is I click out 15 of the folders, wait a minute and then 16 click in again. Okay. It's not here 17 yet. Okay. It just came in. 18 BY MR. DURBIN: 19 Q. Would you please direct your 20 attention to the exhibit labeled 2016? 21 A. Okay. That's where I am. 22 There's three pages. 23 Where do you want me to go? 24 Q. Please start on the first page. 25 A. Okay.	Page 60 1 A. Slocum, Ph.D. 2 Q. Mountain bikes in particular 3 have gotten very expensive, haven't they? 4 A. Yeah. Well, they have a lot of 5 features. But yes, my original mountain 6 bike, an old Trek Liquid from I think it was 7 '91 or '2 I bought it was, like, less than a 8 thousand dollars. I still have that 9 bicycle, by the way. 10 Q. Does this bicycle come with a 11 fork? 12 A. Yes, this is the whole -- looks 13 to be that they're giving you the whole 14 thing here. They picked the component set 15 for the derailleur, the crank. No pedals, so 16 that's a very personal choice is pedals. 17 Fork, disk brakes, a seat. A seat is 18 typically also a very personal thing, so I'm 19 a little surprised that they're including a 20 seat. 21 But yeah, they're giving you 22 something that's ready to go except for the 23 pedals. 24 Q. Can you tell who manufactured 25 this fork?
Page 59 1 A. Slocum, Ph.D. 2 Q. What is shown in the image on 3 the page? 4 A. This is the Santa Cruz high 5 tower frame. I can't tell -- it looks like 6 it includes the shock for the rear. It 7 certainly has the linkage and then you see 8 down at the base between the down tube and 9 the seat tube, it includes the shock. I'm 10 pretty sure -- yeah, that's definitely the 11 shock absorber. Let me zoom in. Okay, 12 yeah. It definitely includes the shock. I 13 can't tell you whose shock that is, though. 14 Q. Does this frame include a fork? 15 A. There is not a fork included 16 here. It's the structure of the frame and 17 the shock. 18 Q. Would you please direct your 19 attention to the second page of this 20 Exhibit 2016? 21 A. Okay. That's the whole bike 22 for -- that big red arrow is pointing to the 23 R version. I presume that's for the 24 components that come with it for \$4,999. 25 What a deal. Buy two.	Page 61 1 A. Slocum, Ph.D. 2 A. This is the link, so I think 3 this is going to be -- that's a RockShox, so 4 that would be SRAM. 5 Let me just zoom in closer. 6 Yeah, Lyrik. So now I can see, 7 now that I zoomed in. That's a RockShox 8 Lyrik fork. 9 Q. Would you please direct your 10 attention to the third page of this exhibit? 11 A. Hold on. I've got to zoom out. 12 Here it is. I was right. I 13 had to zoom in. It's kind of crunchy, but 14 yeah, it's a RockShox lyrik. 15 And the rear shock, as it says 16 here, is a Fox Float Rhythm. And again, it 17 depends which one you buy. The R1 we're 18 looking at is the RockShox fork. The S 19 version has a Fox fork, as does the GX. 20 (Whereupon, Exhibit 2017 was 21 marked for identification.) 22 MR. DURBIN: Dr. Slocum, I'd 23 now like to introduce an exhibit that 24 I've labeled 2017. 25 THE WITNESS: Okay. I've

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Page 62 1 A. Slocum, Ph.D. 2 closed the previous one and now I have 3 to wait a minute. 4 MS. BHATTACHARYYA: Mr. Durbin, 5 we've been going over an hour. 6 Whenever it's a good time to take a 7 break ... 8 MR. DURBIN: Arpita, if you'd 9 like to take a break right now, that's 10 okay. Otherwise, I have less than a 11 handful of questions with this exhibit 12 and I'd say it may be more practical to 13 end after those two or three questions. 14 Would you rather go now or in 15 five minutes? 16 MS. BHATTACHARYYA: It's fine. 17 I can wait five minutes. 18 I just wanted to say at some 19 point sooner rather than later, let's 20 take a break. But yes, let's finish 21 your round of questions about the next 22 exhibit and then we can take a break. 23 MR. DURBIN: Great. That was 24 my plan, too. Thank you. 25	Page 64 1 A. Slocum, Ph.D. 2 what I see and what the particular 3 specifications are and marketing is not 4 always consistent, so I'm not going to try 5 to claim one word or another. If the word 6 frame is it in, it's got to at least have a 7 frame. But I'm not willing to opine on 8 setting new international standard 9 terminology. 10 MR. DURBIN: Completely 11 reasonable, Dr. Slocum. 12 That concludes my questioning 13 with this exhibit. How long do we need 14 for a break? Maybe ten minutes? 15 THE WITNESS: Yeah, ten minute 16 is also fine to -- 17 MR. DURBIN: Is that enough? 18 Do you need 15? 19 MS. BHATTACHARYYA: Let's say 20 let's come back -- it's 9:27 my time. 21 Let's come back at 9:40. 22 MR. DURBIN: That works. Thank 23 you, all. I'll speak with you then. 24 We could go off the record now. 25 THE VIDEOGRAPHER: Time is
Page 63 1 A. Slocum, Ph.D. 2 BY MR. DURBIN: 3 Q. Dr. Slocum, what is shown in 4 this exhibit? 5 A. This is a Trek from the 6 website. It's showing the 1120 frame set 7 from Trek. And then there's a second page 8 which shows -- it talks about the frame, you 9 can click on wheels, drive train, but those 10 elements aren't there. It's a piece of a 11 website. I would have to click to get more 12 pieces. 13 But this is just describing the 14 frame's structure itself. The 1120 frame 15 set it's called. 16 Q. Does the frame include a fork? 17 A. This frame set does not include 18 a fork. It has the head tube for the fork 19 to go into, but the frame in itself does 20 not, as advertised here. 21 Q. Do you know why it's called a 22 frame set and not a frame? 23 A. I don't know. To me, that's 24 the same type of wording. So whenever I'm 25 looking at bicycle stuff, I look and see	Page 65 1 A. Slocum, Ph.D. 2 12:28 p.m. We're off the record. 3 (Recess taken) 4 THE VIDEOGRAPHER: We are on 5 the record. 6 The time is 12:40 p.m. 7 BY MR. DURBIN: 8 Q. Dr. Slocum, at any time during 9 this past break did you discuss your 10 testimony with anyone? 11 MS. BHATTACHARYYA: Dr. Slocum, 12 I would instruct you not to answer any 13 questions about any contents of any 14 discussions. 15 You can give a yes or no 16 answer. 17 A. I'm sorry. Now I'm -- I was 18 not discussing the content of my deposition. 19 Q. Thank you, Dr. Slocum. 20 Dr. Slocum, what is an 21 applicant admitted prior art? 22 A. So in a patent -- in the 23 background of a patent -- well, application 24 and then it becomes a patent -- you're often 25 talking about what is known and that's

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Page 66 1 A. Slocum, Ph.D. 2 useful for helping to identify what might be 3 lacking and therefore the basis for what 4 you're then going to try to claim as an 5 invention. 6 Q. Do you also refer to applicant 7 admitted prior art as the initialism AAPA? 8 A. I do in my declaration. 9 Q. Does applicant admitted prior 10 art serve as the basis for any obviousness 11 grounds in your declaration? 12 MS. BHATTACHARYYA: Objection. 13 Calls for a legal conclusion. 14 A. Well, it forms part of -- if 15 you consider this that's known in the 16 context of this other art I'm citing, now a 17 claim can be obvious, for example. But we 18 would have to go to a specific claim, 19 specific cited art for me to say anything 20 more than that general generalization. 21 Q. How are steerer tubes attached 22 to the rest of the bicycle fork? 23 A. Well, the bicycle fork includes 24 the steerer tubes and then the tubes, it 25 would extend downward to the wheel and also	Page 68 1 A. Slocum, Ph.D. 2 So if you say I have carbon 3 fork tubes, I'll know you're talking about 4 the tubes that go down from the -- extend 5 from the crown to the wheel. There are 6 bikes I've seen where there's carbon 7 actually for the steerer tube, but those are 8 pretty rare. 9 I'm trying to think of anybody 10 who -- other than just demos I've seen, I'm 11 not aware of any commercial carbon steering 12 tubes. I'm sure it exists somewhere. 13 Q. Are you familiar with the 14 steerer tubes that are accused of 15 infringement in the related district court 16 case? 17 A. I had not examined those, so 18 I -- if you showed me one, I wouldn't be 19 able to identify it. 20 Q. Is the crown also known as 21 ridge? 22 A. It can be referred to it as 23 that because, again, it acts like -- you got 24 one tube going down on each side of the 25 wheel and you've got to join them, so you
Page 67 1 A. Slocum, Ph.D. 2 the crown. 3 So in general, the term bicycle 4 fork is the whole thing. You have the 5 steerer tube, you have the lower tube, so 6 they're all tubes because everything in a 7 bicycle is going to be tubular when 8 possible, except the crown. 9 So the crown is what joins the 10 steerer tube -- right? -- to the tubes that 11 extend down through which the wheel axis -- 12 there's different types, whether you have a 13 skewer or an axle. There is various ways of 14 attaching a wheel to those front tubes. 15 Q. Do the tubes that extend 16 downward to the wheel have another name 17 other than tubes? 18 A. Well, sometimes they're 19 referred to as the lower fork tubes or fork 20 tubes, prongs. Because it's a fork -- 21 right? -- so there's prongs. 22 When someone says fork tubes, 23 you right away -- I start, anyway, at the 24 axle and then I go on all the way up to the 25 handlebars.	Page 69 1 A. Slocum, Ph.D. 2 can refer -- some refer to it as a ridge. I 3 refer to it as the crown. 4 Q. Dr. Slocum, I'm now going to 5 introduce an exhibit that's already been 6 labeled Exhibit 1003. 7 A. Okay. I'll wait for it. 8 Okay. That's my declaration. 9 Q. Did you draft your declaration 10 in this matter? 11 A. I did. I started out -- I 12 don't know about how -- do you want me -- 13 this is to be parsed or just the general how 14 it came to be? 15 Q. Did you physically type out 16 your declaration? 17 A. Big chunks. The way it starts 18 was I met with Arpita. What do you want me 19 to do? Well, I want you to look at the '993 20 patent, read it, understand it. Here's some 21 references and here are the claims that we 22 want you to specific address. If you need 23 anything else, let me know. 24 So it starts with I got a 25 boilerplate from her of the legal

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Page 70 1 A. Slocum, Ph.D. 2 understanding because that's the legal 3 boilerplate and then the claims that she 4 wanted me to look at. That was all the -- 5 well, the initial document. 6 And then as I started to read, 7 I would start to type in and fill in what I 8 thought was relevant and I found that 9 corresponds to what's obvious and by what 10 and then we bounced back and forth. 11 So she essentially was my 12 scribe initially to get it started and then 13 I fill in. And it has to be in a particular 14 format, so again, she does the formatting to 15 make sure it's the way it needs to be 16 presented, but all the opinions are mine. 17 And I typed a lot. You can see, like, the 18 spreadsheets and the technical descriptions. 19 That's -- again, it has to be edited, 20 because I just blast things in, but yeah. 21 Q. What is your hourly -- strike 22 that. 23 What is your hourly rate for 24 work in this matter? 25 A. For any matter, it's \$800 an	Page 72 1 A. Slocum, Ph.D. 2 altogether? 3 A. Again, I said it's more than a 4 few days and it certainly is not months. It 5 was a while ago and I do a lot of things. I 6 have two companies that I run that I design 7 stuff for. I'm a quite active person. So 8 any one particular thing doesn't ring a bell 9 in terms of time allotment that I can think 10 of. 11 Q. Does your answer include work 12 in the underlying district court or was it 13 limited just to this inter partes review? 14 A. I thought you were asking about 15 just this declaration. The district court, 16 that was a long time ago in my timeframe, so 17 I really have zero clue about -- again, it 18 would be more than a day or two probably, 19 but it certainly is not months by any means. 20 Q. Would you please turn your 21 attention to paragraph 60, starting on page 22 39 of your declaration, Exhibit 1003 23 A. Okay. I'm on page 39, 24 paragraph 60. 25 Q. What do you mean when you state
Page 71 1 A. Slocum, Ph.D. 2 hour. 3 Q. How much have you billed in 4 this matter? 5 A. I don't remember what it took 6 to do the declaration. I didn't review that 7 for this. 8 And again, that's where Arpita 9 acts as the scribe because they don't want 10 to pay and I just don't have the time to do 11 a lot of the formatting that's required. I 12 focus on just the technical part. 13 Q. Do you have an estimate of how 14 much you billed in this matter up to date? 15 A. You know, I don't. It was many 16 months ago that I turned this report in, so 17 I just don't. It wasn't a huge amount. You 18 know, it wasn't months. It wasn't a day or 19 two. So somewhere between that. But that's 20 all I can estimate. 21 Q. Now, this is a related 22 question, but maybe it has a different 23 answer. 24 Do you know approximately how 25 much time you spent working on this matter	Page 73 1 A. Slocum, Ph.D. 2 in your declaration that a POSITA would have 3 known to and then it goes on to say affix 4 the upper end of the steerer tube to a 5 handlebar or handlebar stem and affix the 6 lower end of the steerer tube to a fork 7 crown by a nut? 8 A. So a fork crown can -- sorry. 9 The steerer tube can go in the 10 fork crown where you have a taper and it 11 goes in the taper and then the nut -- you 12 can use a nut then to pull it -- snug it 13 into the taper. 14 And when you have a tapered 15 fit, you can shrink it in or you can pull it 16 in with a nut. Either way, that type of a 17 fit, it will be as good as -- essentially it 18 acts like an integral connection. 19 If it was all the same or 20 similar alloy, you could weld it, you could 21 bond it, braise it. There's a number of 22 ways. But one way you can do it is if you 23 have a taper and then you pull it tight with 24 a nut. 25 Q. Please now turn your attention

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Page 74 1 A. Slocum, Ph.D. 2 to paragraph 67 on page 42 of your 3 declaration, beginning on page 42. 4 A. Okay. Hold on. Let me read. 5 Okay. 6 Q. Why do you cite to applicant 7 admitted prior art in this paragraph? 8 A. Well, again, it boils down to 9 when you think about when people talk about 10 the loads on a bicycle, the most severe 11 loads that people will understand -- and 12 that would be -- I would have to go back to 13 the '993 itself if you want me to cite a 14 particular part that's being discussed. The 15 maximum loads that you're nominally 16 designing for are going to be when you're 17 traveling straightforward and then that's 18 the earlier discussion from this morning 19 about the plane of travel would be aligned 20 with the frame for the nominal discussion of 21 when you're looking at loads and actually 22 sizing members in the bicycle, when you 23 start to turn, now you're tracing out a 24 tangent to an arc and now I don't know which 25 one you're talking about.	Page 76 1 A. Slocum, Ph.D. 2 a plane for which I'm going to now talk 3 about, so I can understand at least in one 4 instance if I define this plane, now I can 5 put some sense to what's thicker and what's 6 thinner with respect to this plane. 7 Q. Does this paragraph 67 explain 8 how you believe that the prior art shows at 9 least one element of the claimed invention 10 of the '993 patent? 11 A. I'm not sure I understand your 12 question, because I'm not referring to any 13 particular element here. 14 Again, I'm setting up my basis 15 for understanding what directions are, so 16 when I read prior art and I can understand 17 what directions are being stated there, so 18 we have a commonality of understanding of 19 direction and what -- which plane -- in 20 other words, which planes we're talking 21 about with respect to loads on the bicycle. 22 Q. So would you agree with me that 23 you do not rely on this paragraph or on 24 the -- scratch that. 25 Would you agree with me that
Page 75 1 A. Slocum, Ph.D. 2 So you would either -- the only 3 two planes that would make -- well, there's 4 three if you really want to go. 5 Anyway, two planes that make 6 sense are the planes that go through the 7 front wheel and the plane that goes through 8 the frame. You know, the triangle or 9 diamond shape. 10 And let's just please say the 11 frame is nominally a diamond shape. You 12 know, some people -- or a triangle. 13 Triangle is even better, simpler, because 14 it's technically a rhombus, not a diamond. 15 Anyway, the triangle of the 16 mainframe, we're not talking about the 17 stays, which they're in the mainframe. So 18 that's what I'm talking about. 19 Q. Does this paragraph serve as a 20 basis for any grounds in your declaration? 21 MS. BHATTACHARYYA: Objection. 22 Calls for a legal conclusion. 23 A. I'm not sure I understand what 24 you're asking. 25 What I'm doing is I'm defining	Page 77 1 A. Slocum, Ph.D. 2 you do not rely on the applicant admitted 3 prior art to show any limitation that 4 requires the vertical plane of travel of the 5 bicycle to be aligned with the fore aft 6 direction of the bicycle -- 7 MS. BHATTACHARYYA: Objection. 8 Form. 9 Sorry, go ahead. 10 BY MR. DURBIN: 11 Q. -- and the pivoting of the 12 front wheel about the steering axis in the 13 vertical plane of travel? 14 MS. BHATTACHARYYA: Objection. 15 Form. 16 Calls for a legal conclusion. 17 A. Can I please have the question 18 again because you were talking and then 19 there was an objection and I'm very confused 20 because it was a rather long string of 21 words. 22 BY MR. DURBIN: 23 Q. I will repeat the question. 24 Would you agree with me that 25 you do not rely on the applicant admitted

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Page 78 1 A. Slocum, Ph.D. 2 prior art to show any limitation that 3 requires the vertical plane of travel of the 4 bicycle to be aligned with the fore aft 5 direction of the bicycle and the pivoting of 6 the front wheel about the steering axis in 7 the vertical plane? 8 MS. BHATTACHARYYA: Objection. 9 Form. 10 Calls for a legal conclusion. 11 A. I'm sorry. I just don't 12 understand your question. 13 The reasoning is the claim 14 itself -- right? -- there's some ambiguity 15 there particularly when we consider the 16 whole district court claim construction. 17 So I'm merely stating here for 18 the purposes of my opinion for this IPR, 19 this is going to be the plane with respect 20 to what I'm referring to when I look at the 21 prior art. 22 The admitted prior art, in my 23 mind, is supportive of me stating this is 24 the vertical plane about which I'm talking 25 and the steering axis in that plane, I'm	Page 80 1 A. Slocum, Ph.D. 2 A. Correct. 3 Q. And the limitation described by 4 element 1A is an elongate hollow body 5 arranged around a steering axis located in a 6 vertical plane of travel of the bicycle. 7 Correct? 8 A. Correct. 9 Q. Does Denk disclose an elongate 10 hollow body arranged around a steering axis 11 located in a vertical plan of travel of the 12 bicycle? 13 A. It does. The Denk, for 14 example, head tube -- right? -- is an 15 elongate hollow body arranged around a 16 steering axis. 17 So if I go to Denk figure 2A, 18 for example, you see there is the head tube 19 103 and then as I show here, now if we go to 20 column five and figure 11, it is now 21 going -- I'm sorry. 22 Cross section -- not figure 11. 23 Denk column five. Let me go back there to 24 column five, figure 1L. 25 So column five states --
Page 79 1 A. Slocum, Ph.D. 2 also going to assume that it is oriented 3 where the front wheel is forward. 4 We earlier discussed this with 5 respect to remember you were asking me about 6 well, if I rotate the steering tube 45 7 degrees. So we had this discussion earlier 8 about -- analytically I have to be able to 9 define what's with respect to what. 10 So if I just say look, prior 11 art -- admitted prior art is a vertical 12 plane through the frame and I'm going to 13 align everything with that and just look now 14 at my prior art, the patent is to see is 15 there prior art patents that have tubes 16 thicker in that fore and aft -- this is 17 where I need to know which plane in 18 alignment is -- than out of plane, the other 19 direction, transverse. 20 Q. Would you please turn your 21 attention to page 41 of your declaration, 22 Exhibit 1003? 23 A. Okay. 24 Q. This page lists claim element 25 1A; is that correct?	Page 81 1 A. Slocum, Ph.D. 2 there's figure 1A and then figure one, it's 3 not 11, 1L. It shows a longitudinal view of 4 the exemplary embodiment according to figure 5 1A. 6 So here is figure 1A and then 7 1L way at the bottom right -- do you see 8 that tube down there on the lower right of 9 Denk, just to the right of figure 1H? I 10 guess that's not an L. That's an I. 11 Capital I. I don't know why they didn't use 12 lower case also. 13 Q. Is it your position that 14 element 103 in Denk discloses what is 15 described in element 1A of the '993 patent? 16 MS. BHATTACHARYYA: Objection. 17 Calls for a legal conclusion. 18 A. 1A through H, as it says, shows 19 various cross sectional shapes of the 20 lightweight component according to the 21 invention. 22 If you look at Denk in -- hold 23 on, let me find it -- I just need to read 24 through here. Hold on. 25 There's a paragraph in Denk

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Page 82 1 A. Slocum, Ph.D. 2 where it talks about you apply this to any 3 tube in the bicycle -- and I want to get the 4 right -- here we go. 5 Column four, let's see, one, 6 two, three, fourth paragraph down on column 7 four. It says preferred uses of the 8 invention have been described above and 9 it -- and later on, it even talks about the 10 chain stays, for example, you could use this 11 in. 12 But anyway, here it says: 13 Thus, the lightweight component for bicycles 14 is suitable for practically all tubular 15 components, i.e. top tube, down tube, seat 16 tube, head tube, fork tubes, rear wheel 17 stays, seat posts, handlebars, handlebar 18 stem and the like. 19 So it's teaching me that 20 anywhere you have a tube in a bicycle, look 21 to see can this give you more strength and 22 less weight. And this gets back to the 23 plane I was talking about earlier in the 24 admitted prior art. 25 You have to pick a nominal	Page 84 1 A. Slocum, Ph.D. 2 understanding your question. 3 Q. Can you explain to me how Denk 4 discloses this claim element? 5 A. Well, that's what I'm 6 showing -- I'm describing in my paragraph 65 7 and then I show on page 42 the pictures 8 through Denk 1L with the cross section 9 corresponding to that, which shows the 10 variation in thickness and -- you see the 11 line six in Denk? I'm showing Denk figures 12 1A and 1L. 13 So if we go to the Denk figures 14 and the Denk text and specifically that 15 direction six, that line that goes as six, 16 labeled as six -- and I can go and pull it 17 out of Denk, if you would like -- that is 18 the direction of where I am going to need to 19 have maximum strength. 20 So the moment of inertia of 21 this section about which I calculate the 22 strength would be five, the line five in 23 figure 1A and that's transverse or 24 perpendicular to the plane of travel. 25 And we could go through, you
Page 83 1 A. Slocum, Ph.D. 2 plane about which you're going to analyze 3 the loads of the bicycle as your starting 4 point for design and the default is always 5 just traveling straight ahead. 6 Q. In that portion of Denk that 7 you just read and reviewed, does Denk 8 disclose an elongate hollow body arranged 9 around a steering axis located in vertical 10 plane of travel in the bicycle? 11 A. That's the head tube. 12 Q. So in paragraphs 65 through 72 13 of your declaration, you are relying on the 14 head tube disclosed in Denk as disclosing 15 this element of claim one of the '993 16 patent? 17 MS. BHATTACHARYYA: Objection. 18 Form. 19 A. I think I understand your 20 question as when I read 1A, it's not telling 21 me there whether or not that is the steerer 22 tube or the head tube because an elongate 23 hollow body arranged around a steering axis, 24 well, that describes the steering tube and 25 the head tube. So I think that's how I'm	Page 85 1 A. Slocum, Ph.D. 2 know, how you calculate the moment of 3 inertia based on distance from the neutral 4 access, et cetera, et cetera. I don't think 5 you want that discussion at this point. 6 Q. The question that I'm looking 7 to have answered is where does Denk disclose 8 the steering axis? 9 A. You see figure 1L2? Do you see 10 that it's labeled two? Let me go there. 11 When you look at -- hold on. 12 Let me find it. 13 Column four where, again, it 14 says you can use this for seat tube, head 15 tube, fork tubes, any tube. So now figure 16 2A, the head tube is 103, and the axis of 17 the tube is going to be the steering axis, 18 as we discussed earlier, because the 19 steering tube slides through 103 and 20 bearings in 103. 21 Remember we had the discussion 22 earlier about the bearings and how you 23 preload everything so the front wheel 24 doesn't fall out? 25 That axis is the same as two in

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Page 86 1 A. Slocum, Ph.D. 2 figure 1L and figure 1A can be a cross 3 section through 1L, the center of that line 4 six and line five, that's the center of the 5 circle defined by three. 6 Remember we talked earlier 7 about all of these steerer tubes have a 8 round outside, so it goes through the 9 bearings? A circle -- a round circle has a 10 center. That's the center of those 11 crosshairs, if you will. It's the same -- 12 that longitudinal axis has been the steering 13 axis. The steering axis will be through the 14 center of the head tube, 103. 15 Q. Does Denk state that center 16 line two is a steering axis? 17 A. It's inherent in a head tube 18 that that is a steering axis. Denk doesn't 19 have to tell me one plus one is two. An 20 axis is an axis to a POSITA when you're 21 looking at the frame of a bicycle. 22 So I presume they could, but 23 they don't also give me all the equations 24 for calculating the moment of inertia. 25 Again, it's going to assume you're going to	Page 88 1 A. Slocum, Ph.D. 2 Q. I like it when they put the 3 arrows on the pedals so that I know which 4 way to turn them with my wrench. 5 A. I can look in the thread and 6 tell you because I do enough threads, but to 7 be honest with you, I use a Sharpie and 8 label them when they're not labeled because 9 sometimes, you know, you're assembling your 10 bike and it's dark and ... 11 Q. Would you please turn to 12 paragraph 166 of your declaration, which is 13 on page 107? 14 A. Okay. Let me take a look. 15 Q. Yes. Please review the 16 paragraph. 17 A. Okay. 18 Q. Why do you cite to applicant 19 admitted prior art in this paragraph? 20 A. This is the same discussion we 21 just had. Because when I start talking 22 about Valat -- I assume that's how you 23 pronounce it -- 24 Q. That works for me. 25 A. Okay. I just want to make sure
Page 87 1 A. Slocum, Ph.D. 2 go to a handbook and just apply that. You 3 could, but you don't need to is my 4 understanding. But I'm not a lawyer. 5 Q. Do any of the prior art 6 references state that center line two is a 7 steering axis? 8 MS. BHATTACHARYYA: Objection. 9 Form. 10 A. I'd have to go and look 11 particularly. Again, it's something that 12 everyone knows that the steering axis goes 13 through the center of the head tube. I've 14 never seen a head tube where the bearings 15 were eccentric. I just can't even think of 16 it. 17 So, you know, one plus one is 18 two. There's a left pedal and a right pedal 19 on a bicycle. It's just -- that's just the 20 way it is. The left pedal has a left hand 21 thread and the right pedal has a right hand 22 thread, even though you would think it would 23 be opposite. We can get into -- it's a very 24 interesting physics about why that is, 25 so ...	Page 89 1 A. Slocum, Ph.D. 2 that when I start talking about art, we're 3 all agreeing on what is the vertical plane 4 of travel. 5 Q. Dr. Slocum, I'm now going to 6 introduce an exhibit that's already been 7 marked Exhibit 1007. 8 A. Okay. I've got to click in and 9 out a couple of times until it -- okay. 10 There it is. Valat. 11 Q. What is this document, Dr. 12 Slocum? 13 A. This is a very old patent -- 14 European -- on improvements for tubes and 15 cycles and like frames. So I believe he 16 even refers to motorcycles. 17 Q. Is this document that is 18 labeled Exhibit 1007 what you have 19 previously referred to as Valat? 20 A. It is. And if we could again 21 use the name instead of the exhibit number, 22 it would be appreciated. 23 Q. I can agree to do my best to 24 refer to it at least as Valat. 25 Would you please turn your

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Page 90 1 A. Slocum, Ph.D. 2 attention back to Exhibit 1006, which we 3 refer do as Denk. 4 A. Okay. You know, I'm not going 5 to click back and forth because that takes 6 time. I'm going to just use my paper, 7 unless you need me to show something on the 8 screen. 9 Q. That works and if we come to 10 that point, we can mutually agree to look at 11 the screen together. 12 A. Okay. So I am back now in 13 Denk. 14 Q. What does Denk disclose? 15 A. I'm not sure I understand your 16 question. You mean broadly? 17 Q. I'll ask a new question. 18 What does Denk disclose in a 19 broad sense? 20 A. That you can take a tube that 21 has a round outside and give it a different 22 shape on the inside in order to orient the 23 strength properties in a direction to give 24 you strength in one direction without really 25 necessarily increasing the mass because	Page 92 1 A. Slocum, Ph.D. 2 record. 3 The time is 1:21 p.m. 4 BY MR. DURBIN: 5 Q. Dr. Slocum, where does Denk 6 mention a vertical plane? 7 A. I mean, that's the plane of the 8 frame they're showing, but let me see if he 9 specifically uses that term. He talks about 10 the center plane five. Hold on. Let me -- 11 I'll go through and read the whole thing and 12 see if he uses the terms vertical versus, 13 for example, sample plane. 14 But I can't say yes or no he 15 used that specific term vertical plane. 16 When you're looking at a bicycle frame like 17 2A, if it's lying on the table, that's not 18 vertical. That's horizontal. Right? 19 So again, this gets back to I 20 have to define a plane if I want to 21 understand the loads that are being applied 22 and what those orientations are. 23 So when I'm in the context of 24 everything Denk is teaching, all I have to 25 know is which -- the plane that passes
Page 91 1 A. Slocum, Ph.D. 2 you're going to take mass from another 3 direction that you're not so concerned about 4 and use it in the direction about which you 5 are. 6 Q. Would you agree with me that 7 the abstract listed on the front page of 8 Denk is congruence with your previous 9 answer? 10 MS. BHATTACHARYYA: Objection. 11 Form. 12 A. Yes. I was trying to put my 13 answer in more layperson terms. I could 14 have just read the abstract and -- 15 congruence or whatever the word you used -- 16 synonymous is how I would have said it. I 17 presume that congruency thing is a legal 18 thing, but I would use the term synonymous. 19 THE VIDEOGRAPHER: Counsel, I 20 apologize to interrupt. 21 We need to go off the record. 22 The time is 1:20 p.m. 23 We're off the record. 24 (Recess taken) 25 THE VIDEOGRAPHER: We're on the	Page 93 1 A. Slocum, Ph.D. 2 through the frame and whether it's vertical 3 or horizontal, that descriptor doesn't 4 matter. It's the plane of the frame. 5 Then when you're riding it and 6 it's vertical, then that tells me where the 7 loads are coming into the wheel, through the 8 fork and then through the bearings into the 9 rest of the frame. That will tell me where 10 to orient my cross sections. 11 Q. In column two of Denk, the 12 paragraph that begins with a consideration 13 of the load on a bicycle frame -- 14 A. Oh, okay. Yeah. There's the 15 vertical plane right there. See, I would 16 have found it if I kept on reading, but ... 17 Okay. Same answer. 18 Q. This portion of Denk, this 19 paragraph of Denk -- scratch that. 20 In this paragraph of Denk, is 21 Denk discussing a bicycle frame? 22 A. He is. 23 Q. Would you please review the 24 following paragraph that begins with: The 25 design according to the invention now

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Page 94 1 A. Slocum, Ph.D. 2 allows ... 3 A. Okay. Hold on. Let me read. 4 Okay. 5 Q. In this paragraph of Denk that 6 you just reviewed, is Denk discussing a 7 bicycle frame? 8 A. That particular paragraph is 9 talking about the frame and then it 10 continues with other components other than 11 just the frame in the next paragraph and 12 then he even goes on to talk about golf 13 clubs as another example of where you could 14 use this. 15 So he has specific paragraphs 16 for different specific parts, but he covers 17 everything from the frame to the seat post 18 and again on column four to the forks to the 19 chain stays to the wheel stays. Anything 20 that's a tube. 21 And it's -- again, it's 22 referenced with respect to that plane, 23 vertical plane or -- you lay this thing on 24 the table to analyze it and it's a 25 horizontal plane. So that's where I define	Page 96 1 A. Slocum, Ph.D. 2 anywhere you want to direct particular 3 strength properties to and in particular 4 here, you could use this on the frame. 5 That's my understanding of the paragraph. 6 Q. And you had mentioned in your 7 prior response that Denk may also apply to 8 golf clubs; is that correct? 9 A. Well, before that, the seat 10 post is an example there he's picking and 11 then it says it also applies for other 12 applications, which is a golf club, for 13 example. 14 Q. Does Denk also suggest that its 15 component may be used for objects capable of 16 flight? 17 MS. BHATTACHARYYA: Objection. 18 Form. 19 A. I don't understand what you 20 mean, for flight. You mean like airplanes? 21 Q. Would you please direct your 22 attention to the third paragraph of column 23 one? 24 It begins with: Lightweight 25 components of the type under the discussion
Page 95 1 A. Slocum, Ph.D. 2 the plane through the frame. 3 But he uses the term vertical 4 frame when he's specifically talking about 5 loads from the road as we were discussing 6 earlier. 7 Q. Dr. Slocum, I'd like to re-ask 8 the question again because I believe I was 9 successful in limiting my question to this 10 paragraph, but the paragraph that begins 11 with the design according to the invention 12 now allows, that paragraph in particular is 13 discussing the bicycle frame. 14 Correct? 15 A. Kind of. It says: The design 16 according to the invention now allows the 17 cross section of the tubular portion of the 18 lightweight component to be designed in such 19 a way that the force absorption of the 20 components of a bicycle frame -- 21 So they talk about the 22 invention and now I'm going to specifically 23 apply it in the particular instance to the 24 bicycle frame. So the beginning of the 25 paragraph is saying the invention is	Page 97 1 A. Slocum, Ph.D. 2 here -- 3 A. Okay. 4 Q. Would you please review that 5 paragraph? 6 A. Lightweight components of the 7 type under discussion here are preferably 8 used in sectors in which stringent 9 requirements for strength and rigidity 10 conflict with low component weight. 11 In general, this is more the 12 case for objects capable of flight, for 13 example, hang gliders, lightweight aircraft, 14 et cetera, and sports, for example in the 15 manufacture of ski poles, paddles for 16 canoes, kayaks, golf clubs, tennis rackets, 17 fishing rods and the like. 18 That's like what I was talking 19 about earlier this morning. You'll pay 20 about \$100 a pound for weight reduction in 21 an airplane is a typical metric. 22 Q. Does Denk disclose any methods 23 for making Denk's component? 24 A. Yeah. He has quite a lot of 25 discussion on manufacturing. If you go to

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Page 98 1 A. Slocum, Ph.D. 2 column nine, for example, five paragraphs on 3 the bottom, about two-thirds of the way 4 down, it says: A first method for 5 manufacturing the lightweight component -- 6 and I could go through it if you would like. 7 I mean, if you'd like, we could 8 go through it and I can have a little 9 discussion of rotary forging and then 10 turning an even similar grinding to get 11 tapered tubes. 12 Q. Not at this time, Dr. Slocum, 13 although we may get there. 14 A. It's confined to all of those 15 machines, so happy to help with your 16 understanding if you need it. 17 Q. Does Denk disclose a method of 18 forming Denk's component that may be 19 referred to as swaging or swaging? 20 A. It's swaging and that's what 21 the rotary hammer does. The rotary swaging 22 machine. Yes. And that's in particular you 23 can form -- particularly useful for making a 24 tapered tube. 25 Q. But Denk does disclose	Page 100 1 A. Slocum, Ph.D. 2 and 2C give me -- I would say 2B and 2C are 3 actually -- okay, so whether or not those 4 are variations of 1B, you can debate or even 5 1 A. Potentially, eight, nine, ten -- on 6 the order of ten different cross sections. 7 Q. Does Denk restrict its 8 embodiments to having a longitudinal profile 9 like that found in figure 1I or L, 1I or L? 10 Scratch that. 11 Dr. Slocum, would you be 12 agreeable to referring to what we believe is 13 figure 1I as either 1I or 1L? 14 A. Yeah. Again, it's very 15 confusing because everything is a lower case 16 and what's shown there is a lower case L, 17 which looks like a one, which is why I said 18 figure 1I. It's not L. It's 1I, so I don't 19 know why they did that. 20 Q. I tend to agree with you that 21 it looks an awful lot like it says 1L or 22 even 1I. It would make most sense it was 23 1I. 24 I just want to make sure for 25 the record we both agree we're looking at
Page 99 1 A. Slocum, Ph.D. 2 additional methods of manufacturing Denk's 3 component, correct? 4 A. Correct. Like for example, 5 turning. So a very common thing is you'll 6 use a rotary swage or a hammer -- I'm going 7 to just call it a rotary hammer because 8 that's a form of swaging -- and then you'll 9 use turning then to clean up and give you 10 the specific outside round you want. 11 Q. How many embodiments are 12 discussed in Denk? 13 A. I would have to -- several. I 14 would have to go back and count them, if you 15 would like me to. But if we just look at 16 the figures -- you see in the figures, in 17 particular, 1A through H, there's quite a 18 few different cross sections and you're 19 going to pick the cross section to optimize 20 strength by minimizing weight for depending 21 on what part of the structure you're looking 22 to design for. 23 So at least one, two, three, 24 four, five, six, seven, eight. There's 25 eight different cross sections on there. 2B	Page 101 1 A. Slocum, Ph.D. 2 the figures that has both labels one and two 3 and then a cross section II across that two, 4 one? 5 A. Correct. Let's just say again 6 that's figure 1I because that's what it 7 should be. 8 Q. I'll do my best to call it 9 figure 1I. 10 Are the embodiments in Denk 11 limited to having a profile like that shown 12 in 1I, figure 1I? 13 A. I don't believe they're limited 14 to it. That's an example. 15 Q. So the number of embodiments 16 may balloon even above the dozen or so we 17 discussed before because they may have 18 different longitudinal profiles? 19 A. I'm not exactly sure I 20 understand your question when you say may 21 balloon. What Denk is showing is that the 22 outside profile may be round, may be 23 non-round. The inside may be round or 24 non-round. 25 And then Denk is providing many

Page 102 1 A. Slocum, Ph.D. 2 different examples, including a hexagon, an 3 ellipse. If you look in 1E, that's -- I 4 don't know what I would call the inside 5 center. But he's certainly showing -- and 6 then what he's describing in -- hold on. 7 When he goes to talk about all 8 these components, his general description 9 is -- again, you have to look at the loads 10 of which your section is subject to and put 11 mass where you want it -- mass or area, 12 excuse me -- in order to give you the 13 stiffness you need to resist those loads. 14 This is going to be up to the 15 design person then to pick the cross section 16 that most meets those demands and that's, 17 for example, in my report, the spreadsheet, 18 the second one I put in where I'm showing 19 here is the type of calculation a POSITA 20 will understand how to do in order to do 21 that optimization. 22 So when you think about -- let 23 me just say generically, okay, let's look at 24 figure 1A. Do you see I have a circle on 25 the outside and then four -- as I believe he	Page 104 1 A. Slocum, Ph.D. 2 What that's telling one skilled 3 in the art is circle on the outside, ellipse 4 on the inside and the elliptical major and 5 minor semi axis, in this particular case, 6 it's thicker, as it describes here -- but 7 when you set up your spreadsheet or math lab 8 or whatever, you will pick the ration yore 9 of A to B, as -- A and B are the major and 10 minor semi axis of ellipse, the radii, not 11 the diameters. 12 You're going to pick the ratio 13 of those two and the ratio of those two with 14 respect to the outside circle to give you 15 the stiffness you need. That's called the 16 moment of inertia calculation. 17 So when you say balloon, well 18 there's an infinite number of ones -- 19 right? -- because I can take a start with a 20 tube, rotary swage it and then get any wall 21 thickness I want in any. Right? So there 22 could be an infinite number. But it still 23 obeys that -- for an ellipse -- mathematical 24 description. 25 Now, you'd have a similar
Page 103 1 A. Slocum, Ph.D. 2 refers to four in that particular case as an 3 ellipse, but let me check to make sure he 4 specifically called it an ellipse. I think 5 he did. Yeah. 6 So if you look at the top of 7 paragraph -- sorry -- column six. The 8 exemplary embodiments -- that's one -- 9 according to figure 1A shows a cross section 10 of a two of a tube having a circular outer 11 cross sectional contour, three, and an 12 elliptical intercross sectional contour, 13 four, arranged symmetrically with respect to 14 a center line or center plane five. 15 Okay? 16 Then he talks about in this 17 exemplary embodiment, the highest strength 18 and rigidity values occur in a plane that is 19 directed perpendicularly with respect to a 20 line six, so that's defining the neutral 21 axis of the section and that perpendicularly 22 intersects the plane of symmetry, five. In 23 other words, the optimal rigidity factor is 24 perpendicular to the plane of symmetry, 25 five.	Page 105 1 A. Slocum, Ph.D. 2 discussion for the mathematical function 3 describing the other shapes they show, or he 4 shows. It's just one. 5 Q. And by an infinite number, 6 you're referring to embodiments in Denk 7 because things can be changed around, 8 altered? 9 A. Well, because the wall 10 thickness, it may be one millimeter, it may 11 be .99 millimeters. Figure 1A is a 12 particular embodiment -- right? -- of round 13 and ellipse. That's one embodiment. Now, 14 there's sub embodiments I guess you'd call 15 it based on what the ratios of the 16 elliptical axis are, but a design person 17 will now exactly how to optimize. 18 You write that code like I did 19 that spreadsheet and then I will write a sub 20 function in there that says calculate the 21 weight and then calculate the stiffness and 22 then Excel is particularly good or if you 23 use math lab or whatever, you set up what's 24 called a penalty function for optimizing one 25 thing -- includes maximizing one thing and

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Page 106 1 A. Slocum, Ph.D. 2 minimizing the other. 3 So that's what a POSITA who 4 designs this stuff does. Okay? 5 Now, that's elliptical and 6 oval. Then Denk goes in and shows now I've 7 got in figure 1B -- I'm sorry -- elliptical 8 and round. Round and round, but I'm going 9 to offset the round inner round. 10 See the eccentricity there 11 between 13 and 12? That's not at all 12 uncommon for composite fibers because 13 different composites -- excuse me -- may 14 have difference between the compressive and 15 tensile strength of the fiber because you're 16 worried about buckling. So that's, for 17 example, where 1B would come into play. 18 I don't know how many -- I 19 mean, again, a POSITA will understand with 20 these basic primitive shapes, I can orient 21 them and optimize wall thickness according 22 to what the loads are as long as I know what 23 plane you're talking about with respect to 24 the loads. That's very important. 25 Q. Earlier in your testimony you	Page 108 1 A. Slocum, Ph.D. 2 specific tube size from which to start. 3 Q. Does Denk state that its 4 figures are drawn to scale? 5 A. I don't know if he -- I don't 6 think he explicitly states it. You are not 7 supposed to scale a patent drawing, so a 8 POSITA would not take it and scale it even 9 if he tried to say it was. But let's see. 10 If you go to bottom of column 11 five -- okay. So first of all, the top of 12 column five, he says particularly the 13 material of the tubular component is 14 advantageously selected corresponding to the 15 given requirements. 16 It is particularly preferred to 17 use an alloy that contains aluminum and 18 particularly elasticity behavior, i.e. the 19 modulus of elasticity should also be taken 20 into account in selecting the alloy 21 components. 22 So the modulus of elasticity of 23 the aluminum, regardless of the alloy, will 24 be the same. I don't know what units you 25 want, but nominally 10 million PSI and the
Page 107 1 A. Slocum, Ph.D. 2 stated that A and B are the major and minor 3 axes of an ellipse or the ellipse -- 4 A. I'm sorry. Mathematically, in 5 general, the major and minor radii will be 6 along the major and minor axes of an 7 ellipse. That's how you define how oblong 8 it is. 9 Q. Are values are for the major 10 and minor axis provided in Denk? 11 A. Yes. If we go to -- hold on. 12 Denk does not give me any millimeters in 13 terms of I think that's what your question 14 is, is he giving me particular sizes. 15 It's just saying -- talking 16 about there being an elliptical profile. He 17 did not give particular sampling sizes. 18 He's giving the example in terms of a 19 bicycle. 20 So when you go to, for example, 21 my spreadsheet, you'll start with whether 22 nominally standard tube sizes are close to 23 that and then you'll work out from a nominal 24 standard. So that's something a POSITA 25 would know to do. He did not give me a	Page 109 1 A. Slocum, Ph.D. 2 in imperial system, you divide by 6.9 to get 3 megapascals. So nominally, 66,000 4 megapascals. 5 So anyway, so when he says you 6 choose the modulus of elasticity, he's 7 talking about moving away from aluminum to 8 some other material. Then also -- so he's 9 talking about you can injection mold it, you 10 can use carbon fibers. 11 So that's telling me that wow, 12 these cross sections that you are showing 13 below are going to be exemplary. I'm not 14 going to scale those because it's going to 15 very much change according to the material. 16 Then that's reinforced with 17 after -- at the very bottom after big 6A and 18 B, it says: A plurality of various 19 cross-sectional shapes for the lightweight 20 component according to the dimension are now 21 described. 22 So these are all telling me 23 here is the shapes to consider, but if 24 you're going to actually size these things, 25 you need to go back and pick the material

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Page 110 1 A. Slocum, Ph.D. 2 and the loads it'll be subject to. 3 Q. Just for my own edification, is 4 megapascals an acceptable unit for modulus 5 of elasticity? 6 A. Right. Because a megapascal or 7 MPa is one newton per square millimeter of 8 pressure. One PSI is one pound per square 9 inch. If you want to convert real fast 10 one -- you take one KSI, which is 1,000, and 11 multiply it times seven -- I'm sorry -- and 12 you'll get megapascals. 13 So for example, the yield 14 strength of a typical aluminum alloy -- 60, 15 61, T651, the 51 means you stretch it so 16 doesn't move on you -- yield strength will 17 be around 30 KSI. So how many megapascals 18 is that? Multiply times seven, 210 19 megapascals. 20 The finer resolution is you 21 multiply times 6.9 and think of yin and 22 yang. Right? Yin-yang? If someone in the 23 metric system wants to be able to 24 communicate and have a good design time with 25 someone in the imperial system, then they	Page 112 1 A. Slocum, Ph.D. 2 MR. DURBIN: That works great 3 for me. 4 THE VIDEOGRAPHER: The time is 5 1:49 p.m. 6 We're off the record. 7 (Recess taken) 8 THE VIDEOGRAPHER: We are back 9 on the record. 10 The time is 2:03 p.m. 11 BY MR. DURBIN: 12 Q. Dr. Slocum, I'd like to turn 13 your attention to the exhibit labeled 1007, 14 which we referred to as Valat. 15 A. Okay. Let me get my paper 16 because I like paper. 17 Okay. 1007, right? 18 Q. Yes, Dr. Slocum. 19 A. Okay, got it. 20 Q. What does Valat disclose 21 broadly speaking? 22 A. Okay. So Valat is particularly 23 focused on the steering tube and how to, 24 again, optimize the structure for the loads 25 that you may be encountering.
Page 111 1 A. Slocum, Ph.D. 2 yin-yang it, go around and around as 6.9 and 3 now you're a little more accurate. But most 4 people won't remember that, so they feel 5 lucky and they multiply it by times seven. 6 This is what I have to teach 7 because the cross industries in the US and 8 outside, yeah. 9 MR. DURBIN: We've been going 10 on a little more than an hour, folks. 11 Do we want to break now? Do we 12 want to break for lunch? 13 THE WITNESS: I'm always 14 hungry. 15 MS. BHATTACHARYYA: Me too. 16 MR. DURBIN: How about we break 17 for lunch. How much -- 18 MS. BHATTACHARYYA: It's too 19 early for our lunch -- 20 MR. DURBIN: Okay, I can wait. 21 MS. BHATTACHARYYA: Let's take 22 a ten-minute break now. It's 10:48. 23 Let's plan to be back at, you 24 know, 11:00, and then maybe an hour 25 later, we could take another break.	Page 113 1 A. Slocum, Ph.D. 2 Q. Does Valat disclose a bicycle 3 frame? 4 A. Not the frame as we were 5 talking to it. It's talking about 6 associated with the fork. So a fork 7 includes the steerer tube and then the forks 8 that extend down to straddle the wheel. But 9 it's focusing on the steering tube portion 10 of the fork. 11 Q. And what is Valat's intention? 12 A. Well, if you read on page -- 13 I'm sorry. There's only two pages, but the 14 first page down around line 22, he says it 15 has already been proposed to provide drawn 16 seamless tubes with internal helical ribs of 17 long pitch. 18 And he goes on, it's also been 19 proposed to produce tapered tubes from 20 parallel tubes by flattening portions of the 21 sides and then forcing the flats into V 22 section gutters by means of press tools. 23 Then he says according to the 24 present invention, the tubes are provided 25 with solid internal ribs or reinforcements

Page 114 1 A. Slocum, Ph.D. 2 by the swaging process so that a continuous 3 external service is produced and such 4 reinforcements preferably follow helixes of 5 long pitch. They must be provided over the 6 whole length of the tube or confined to 7 those parts which are subject to sheer. 8 Then he goes on -- basically, 9 he is telling you how to do something to the 10 inside of the tube and he leads you to 11 figures three, four and five to show here's 12 different things that can be there. 13 The term helixes of a long 14 pitch -- so anything, any structure, any 15 motion thing can be defined by a screw. 16 It's called screw theory. And a screw has a 17 pitch. So an infinite pitch is a straight 18 line. Okay? And a shallow pitch would be 19 like the thread on a bolt. 20 And then there's everything in 21 between and in dynamics, the screw theory 22 says when something moves, how does it move. 23 In structures, what he's 24 referring to is he's giving me a generic 25 mathematical indication of the outside is	Page 116 1 A. Slocum, Ph.D. 2 you'd see an artifact, but you don't. 3 Q. Would it be possible that the 4 inventor chose to only show a particular 5 cross section and therefore omit the shadow 6 artifacts? 7 MS. BHATTACHARYYA: Objection. 8 Mischaracterizes the record. 9 A. You know, I don't know what the 10 inventor was thinking, but in general, 11 particularly the older patents, the drawings 12 are very accurate and you're not going to 13 omit something because if you look at figure 14 one, for example, and figure two -- and even 15 the figure two has the plan view where the 16 axes are labeled and then up top you see 17 the partial cutaway side view. That's why 18 it's all figure two. 19 When I look at figure two, the 20 plan view, I see the helical structures and 21 I see the shadows or what you called 22 artifacts -- or maybe I called them 23 artifacts -- so he was very explicit there. 24 When it's a helix, he shows it, 25 so I see no reason why figure three, four
Page 115 1 A. Slocum, Ph.D. 2 going to be smooth and round and then I'm 3 going to be put something on the inside. It 4 can be straight, it can be literally a 5 helical coil. You can look at it and then 6 he gives examples of different flavors of 7 that between figures two, three, four and 8 five. But all -- it's showing everything 9 here for this steerer tube. 10 Now, that's the embodiment. 11 The claims just say tubes. 12 Q. And what is forming the helical 13 coil is a set of ribs; is that correct? 14 A. It could be. Again, if you 15 look at figure three, I wouldn't call those 16 ribs. You know, three, four and five, I 17 wouldn't call any of those ribs. They're 18 down looking cross sections, so they're 19 telling me that the pitch is infinite. 20 They're straight. 21 If it was a helical coil like 22 you see in figure two cross section, you 23 would see, like, a shadow artifact of the 24 helix coiling. But three, four and five are 25 infinite pitch. Otherwise, like I said,	Page 117 1 A. Slocum, Ph.D. 2 and five there was an intent to be a 3 non-infinite pitch that he wouldn't put it 4 in there. So that's my understanding. 5 Q. Looking at lines around 40, the 6 sentence that is read: They may be provided 7 over the whole length of the tube or 8 confined to those parts which are subjected 9 to shear winning use. 10 Do you see that? 11 A. I do. 12 Q. What does that mean? 13 A. Okay. So if you look at -- let 14 me reference actually the '993. 15 Remember when you were asking 16 me about the handlebars and does the steerer 17 tube project up through the top bearing? 18 Then if we go to my report, 19 I'll show you -- it's the bending moment 20 diagram. That'll explain what the shear is. 21 I have to find it. Hold on. 22 You can probably search, if you 23 have electronic, for bending and it'll give 24 me the page where I talk about I drew the 25 bending moment diagram for what happens in

Page 118 1 A. Slocum, Ph.D. 2 the steerer tube to explain the forces. 3 Q. I believe I know what you're 4 talking about. Would you turn to page 86 of 5 your report, please? 6 A. There we go. Thank you. 7 So this is from Moechnig. And 8 you see the blue triangle there where I show 9 the diagram? That's the bending moment. 10 And then I'm the labeling F lower bearing, F 11 upper bearing, so those would be the -- 12 those bearing forces are shear -- is what 13 he's referring to as the shear forces. 14 Okay? So the load from the wheel is reacted 15 by those shear forces. 16 The tube -- steering tube -- 17 projects upward to then where the handlebars 18 are attached, so you don't have large radial 19 forces or the shear forces, so you don't 20 need additional reinforcement in that upper 21 region. That's what that means. 22 Q. Would you please review the 23 paragraph around line 45? It begins with: 24 Among the parts of a bicycle ... 25 A. Okay. Okay.	Page 120 1 A. Slocum, Ph.D. 2 from the geometry. 3 Q. And Valat is concerned with 4 reinforcing the steerer tube against shear 5 forces in this region? 6 A. Well, that is one of the 7 regions. That's why it says in the previous 8 paragraph around 40, they may be provided 9 over the whole length or confined to those 10 parts, which are subject to shear. 11 So then now he's providing in 12 45 one of the particularly egregious reasons 13 will be where you have that stress 14 concentration, because that will amplify 15 stresses due to shear from the lower 16 bearing. 17 Q. So the lower bearing is in 18 contact with the steerer tube at or around 19 this region? 20 A. Yeah, correct. Because that's 21 where the steerer tube enters the head tube 22 and the lower bearing in the head tube is 23 right at that -- some few millimeters above 24 it. You'll have a seal and other 25 structures, but nominally, right there.
Page 119 1 A. Slocum, Ph.D. 2 Q. What is the perimeter at entry 3 to the fork ridge? 4 A. Okay. If you look at figure 5 two, you see where the line or the label -- 6 and they're not trying to label it, but you 7 see where the line from E extends to touch 8 one of the helixes on the inside and you see 9 where that line crosses? It looks like the 10 interface -- it's shown as a dotted line for 11 the crown and then the vertical line for the 12 steerer tube -- that's where you'll have the 13 maximum stress, you know, shear stress in 14 this system. 15 Then indeed, that's where the 16 maximum shear would be from that lower 17 bearing. You also have a stress 18 concentration. Whenever you have a 19 demarcation or a discontinuity in a 20 structure from one shape to another, you'll 21 amplify whatever stress you have due to 22 bending, for example, at that point. 23 Q. So that discontinuity exists 24 where the steerer tube contacts the ridge? 25 A. Correct. And you can tell just	Page 121 1 A. Slocum, Ph.D. 2 Q. Does figure two in Valat 3 comprise two images? 4 A. Correct. It's the plan view 5 where you see the ribs E, D -- D, E, F, G 6 going clockwise and you can see there very 7 specifically that the helix, through the -- 8 looking down, but also the shadow or that 9 artifact as it lines around and then right 10 above it -- and that's common, you know, 11 orthographic projection drawing nomenclature 12 to show above it. If you flip it 90 degrees 13 and look, you'll see figure two, but then 14 also you can tell by the cross section B 15 carved away part of the tube so you can look 16 inside. 17 Q. So is it your opinion that 18 those two images in figure two are related? 19 A. Well, correct. One comes from 20 the other. I mean, you could have started 21 with the top and then flipped it to get to 22 the bottom, but the more conventional would 23 be you start at the bottom one and flip up 24 the upper one and then carve away a piece. 25 It's called a partial cutaway.

Page 122 1 A. Slocum, Ph.D. 2 Q. In figure two, what would be 3 considered the lateral direction and what 4 would be considered the fore aft direction? 5 A. Okay. So the fore aft 6 direction would be conveniently, although 7 that's not the intent -- do you see where 8 that vertical line in the lower part of 9 figure two intersects the four of the 10 lettering in figure four. That would be the 11 fore aft. 12 Then the bulbous side pieces 13 you can see, those would be the portions of 14 the fork that extend downward to the wheel 15 and then so that orthogonal dash line would 16 be the lateral. 17 Q. Do the bulbous projections in 18 the lower image of figure two show fork 19 tubes then or prongs? 20 A. Well, that's the top of the 21 crown and then coming down from them beneath 22 that image, he doesn't have -- you know, if 23 you looked at that and it had the tubes, the 24 fork tubes, you would actually see them 25 curl. You'd see the shadow of them curling	Page 124 1 A. Slocum, Ph.D. 2 a very specific case, but I don't read a 3 limitation into it or direction. 4 If you look at paragraph 64 -- 5 starting at 60, he says: Figure two shows 6 the finish tube mounted on a fork ridge with 7 helical reinforcements of a long pitch. 8 Then it continues on: Finally, 9 figures three, four and five show cross 10 sections of tubes with various arrangements 11 of reinforcement. It is evident that the 12 number of combinations may be indefinite 13 without the principle of the invention being 14 in any way affected. 15 So again, he's telling me that 16 look, you're one skilled in the art, you'll 17 go ahead and write a -- they didn't have 18 spreadsheets back then -- but you'll go 19 ahead and create the design table and you 20 typically do a graph in those days and study 21 that to get the maximum stiffness for the 22 minimum weight you want. 23 Usually what you would do back 24 then or even now, you would do a handful of 25 design points and then you see what the
Page 123 1 A. Slocum, Ph.D. 2 forwards, but he doesn't include that. He's 3 just focusing on the crown and the steerer 4 tube portion. He's not attempting to show 5 any other part. 6 Q. And they curl forward because 7 of the need for what you referred to I 8 believe earlier as rake? 9 A. Well, rake is the difference 10 between where the contact point of where 11 projection of the head tube hits the surface 12 and where the tire makes contact or the 13 wheel. And that offset between the contact 14 patch of the tire and the projection of the 15 line from the steerer tube axis to the 16 ground, those two points on the ground, 17 that's the rake or commonly referred to as 18 the rake. 19 Q. Does Valat make a distinction 20 in reinforcing its tubing based on either 21 the fore and aft or lateral direction? 22 A. Well, generically, the way 23 Valat stars out is you put the reinforcement 24 where you want it, to accomplish the 25 function you want. And then he's providing	Page 125 1 A. Slocum, Ph.D. 2 shape of the curve is and you connect the 3 curve and then you interpolate along the 4 curve when it get to it looks like a region 5 you want to be in. 6 Q. Dr. Slocum, in the portion of 7 Valat you just read, which is in around line 8 61 to 63, what does -- what do the words 9 "the finished tube" mean? 10 A. Okay. So if we start a little 11 earlier around 58, figure one -- what Valat 12 is showing is here is a way that you can 13 make figure two, that you can start with a 14 tube that has external protuberances and 15 then -- I've got to see if it uses forging 16 for -- you know, what's the particular 17 process. Wait a second. Here we go. Line 18 96. He's using a swaging process to now 19 take the external features and pound them 20 in. 21 Q. Literally pound them in? 22 A. Literally. That's the way 23 swaging -- like a rotary swage works. I 24 mean, it's metal, it's soft. You could move 25 it around. And the way they move it in a

Page 126 1 A. Slocum, Ph.D. 2 swaging machine, it's a gradual process. It 3 doesn't go wham in one thing. It's a whole 4 series of little bang, bang, bang, bang, 5 bangs and a rotary swage has hammers that go 6 in a circle, so you can time by camshaft who 7 you want to hit where and how hard. 8 Q. I believe that I read that 9 swaging can provide a nice exterior finish 10 and that can be one advantage; is that 11 correct? 12 A. It can. It can be a finish, 13 but you won't get necessarily the accuracy 14 or shape you need for mounting a bearing on 15 it. You generally can get finish or a 16 shape, accurate shape for a bearing. It's 17 hard to get both. For that, you typically 18 would turn to turning, not forming. 19 Swaging through a fixed die as 20 opposed to a rotary hammer, that can give 21 you a form and finish. For example, on a 22 cartridge for a rifle, you swage it to get 23 the narrowing of the neck and that has to be 24 very accurate and a good finish. 25 Q. Is that ladder process you just	Page 128 1 A. Slocum, Ph.D. 2 A. Let me move my teacup so I 3 don't make a mess. 4 Okay. 5 Q. What is shown in the annotated 6 image on page 98 of your declaration, 7 Exhibit 1003? 8 A. So what I show here is figure 9 one for Moechnig and now on the right, I'm 10 now taking from Valat's figure one and I'm 11 showing with the red arrows how that can be 12 applied to within the steering -- I'm 13 sorry -- within the head tube of Moechnig -- 14 Valat's steering tube, for example. 15 Q. In particular, the tubing shown 16 in figure one? 17 A. Correct, for example. 18 Q. Would you please turn your 19 attention to page 103 of your declaration? 20 A. Okay. 21 Q. What is this annotated image 22 showing? 23 A. So here I'm saying on the left 24 you have Valat, figure one, and Valat is 25 showing the cross section is changing,
Page 127 1 A. Slocum, Ph.D. 2 described the one where it's, like, four 3 parts come in on to the tube and then they 4 spin around the tube? 5 A. That would be a rotary hammer 6 or rotary hammer swage or rotary swage. 7 Q. And what is a fixed die swage? 8 A. So that would be a section that 9 has a mouth, an opening and then it tapers 10 down to the particular shape you want. So 11 for a rifle cartridge casing, for example, 12 the casing starts out as a tube and then 13 it's forced into the swage where the mouth 14 of the swage is the same diameter as the 15 tube. And as you continue to force the tube 16 inside, it forces it to neck down to a 17 smaller diameter to receive the bullet. 18 Q. I'm familiar with the term neck 19 down at least. I understand what you're 20 saying. Thank you. 21 A. It's hunting season back home, 22 so anyway ... 23 Q. Dr. Slocum, would you please 24 turn your attention to page 98 of your 25 declaration?	Page 129 1 A. Slocum, Ph.D. 2 although if you think about what Valat was 3 also showing in his figure one, you're going 4 to take that and forge it on the outside to 5 go to the inside. 6 But when you're a POSITA 7 looking at the art and you say wow, that's a 8 different cross section and I'm doing 9 something to it -- let's look at Denk, for 10 example. 11 Oh, yeah. Denk teaches a 12 varying cross section and indeed Denk even 13 claims a cross section, applying Denk to the 14 bicycle fork. That's one of his fundamental 15 claims. 16 I think it was -- let me see. 17 There's a lot of claims in Denk, too. I 18 remember in column four of Denk he talks 19 about applying all kinds of tubes -- okay, 20 here it is. 21 Claim 18 of Denk: The 22 lightweight component according to at least 23 one of claims one through 12 characterized 24 in that the lightweight component is 25 designed in such a way that it is formed as

Page 130 1 A. Slocum, Ph.D. 2 part of a bicycle fork. 3 So that's -- I'm looking at 4 Denk and Valat. Denk is telling me hey, use 5 this in the part of a fork, so Valat is part 6 of a fork, steering tube. Okay. That's why 7 I put that together, that combination. 8 Q. Dr. Slocum, would you please 9 turn your attention to page 105 of your 10 declaration? 11 A. Okay. Hold on. Okay. 12 Q. What is this annotated figure 13 showing on page 105 of your declaration? 14 A. Yeah, so as I show here and 15 discuss, I'm labeling -- just labeling 16 what's already in Valat, that you have a 17 steerer tube on the left, which is figure 18 one, and you have a steerer tube in figure 19 two being mated with the fork bridge or the 20 crown and in paragraph 161, it's stated very 21 simply: As shown below, Valat discloses a 22 steerer tube for bicycle connected to a fork 23 bridge. 24 Q. Does this annotated image 25 suggest a relationship between figures one	Page 132 1 A. Slocum, Ph.D. 2 said page 156? 3 Q. Paragraph 156, please. 4 A. Okay. I'm there. Let me read. 5 Okay. 6 Q. When you state that an 7 elliptical inner contour would provide 8 smoother and consistent transition and wall 9 thickness to reduce stress and would be 10 easier to manufacture, what do you mean by 11 reduce stress? 12 A. Okay. When you look at any 13 cross section and for example, let's look at 14 Valat figure three, compare three to five. 15 Do you see the way five is an 16 octagon and there are -- it looks almost 17 like the cross section through a socket, you 18 know, like a socket for use in a socket 19 wrench. Yeah. 20 You have sharp corners there 21 and in figure three, you have very nice 22 smooth rounds everywhere. You don't have 23 any sharps. So that will have lower stress 24 concentrations. Remember we talked earlier 25 about the stress concentrations?
Page 131 1 A. Slocum, Ph.D. 2 and two? 3 A. I'm not sure I understand your 4 question because when you read Valat, Valat 5 specifically says figure one shows an axial 6 section of the tube before the 7 reinforcements are formed and showing two of 8 them in dotted lines and then figure two 9 shows the finished tube mounted on a fork 10 bridge. 11 That seems to be telling me 12 that here is a steerer tube where you start 13 on the left, you finish it and then it 14 appears connected to the fork bridge as 15 shown in figure two. 16 Again, Valat is pretty explicit 17 in saying here are examples and you could do 18 all kinds of different variations of it. 19 That's one particular reading on it -- or 20 embodiment. Excuse me. 21 Q. Would you please turn your 22 attention to page 100 of your report at 23 paragraph 156, your report being Exhibit 24 1003? 25 A. Okay. I'm on page 100. You	Page 133 1 A. Slocum, Ph.D. 2 So figure three, the one 3 skilled in the art looks at it and then 4 looks at even helical where there is a 5 defined pitch like in figure two, and you 6 say you know, I really want to have 7 reinforcements that are preferably just big 8 and round as possible to reduce stress 9 concentration. That's what figure three 10 shows. 11 You look at figure three and 12 you say you know, why not just continue on 13 with that, for example, and that would lead 14 you to an oval or an ellipse, excuse me. 15 So an ellipse is a natural 16 progression from right to left from figure 17 five down to figure three. The next step 18 would lead you to the ellipse. 19 Q. Does figure two show what you 20 referred to as sharps on the anterior? 21 A. You can look at figure two, the 22 cross section and you see the way -- you 23 always have a round, but the amount of 24 stress concentration will nominally be 25 proportional to the radius, the relative

Page 134 1 A. Slocum, Ph.D. 2 radii that the stress has to transform 3 through. 4 So to assess the stress 5 concentration, you have to look at the 6 radius of that blending from the inner 7 diameter to the rib. The ratio of those two 8 radii will be indicative of a stress 9 concentration. 10 There's a well known 11 handbook -- it's called Peterson's Handbook 12 of Stress Concentrations -- that has just 13 about everything you could imagine. 14 And this is what a POSITA will 15 -- you just know this as a mechanic -- a 16 designing mechanic -- sorry -- as a 17 mechanical engineer designing structures, 18 you're always wary of transitions. They 19 should be smooth and gentle. 20 Q. Now, does the negative effect 21 of sharps -- strike that. 22 Can you compare for me the 23 negative effect of sharps on an exterior 24 versus sharps on an interior? 25 A. I have to see a specific	Page 136 1 A. Slocum, Ph.D. 2 sharps which appear to be labeled 64 that 3 could be regions of high stress? 4 A. So what Denk is doing there, he 5 has quite a generous ground, so you are not 6 going to have a stress deep concentration -- 7 remember, stress concentration happens when 8 the stress as it's flowing through has to 9 suddenly change direction. Okay? 10 So the fibers and bending here 11 are the stress because they're out of the 12 page. In bending, you wouldn't. In 13 torsion, you would start to see some there. 14 Let's see what they call 64. 15 That's why I said earlier I really have to 16 understand how it's loaded to go anything 17 beyond the simple generality. 18 Q. Dr. Slocum, torsion is a twist 19 about the axis that extends longitudinally 20 through a tube? 21 A. Correct. Okay. So if you look 22 at Denk in seven, third paragraph, rotate, 23 second, the exemplary embodiment, according 24 to figure 1G, shows a light line tube 25 through which the outer contour 60 has a
Page 135 1 A. Slocum, Ph.D. 2 loading case. Here, you wouldn't put -- you 3 have to show me a particular case. It 4 depends what the loads are. 5 On the outside, you could say 6 well, I'm farthest away from the neutral 7 access and so the stress is higher, so it's 8 more sensitive. But I really want to see 9 the particular load case. 10 Q. You would agree with me, 11 though, that the further you are from the 12 neutral axis, the stress would be higher for 13 a same or similar shape? 14 A. Yes. Subject to bending, for 15 example. That's what's implied when you say 16 from the neutral access. I'm assuming 17 you're applying a bending load. 18 Q. In the application matters, 19 perhaps most of all; is that correct? 20 A. Correct. 21 Q. Would you please turn your 22 attention to figure 1G as in George in Denk, 23 which is Exhibit 1006? 24 A. Okay. I'm at G. 25 Q. Does figure 1G in Denk have	Page 137 1 A. Slocum, Ph.D. 2 hexagonal design. 3 Here as well the design is such 4 that the transition region is provided with 5 rounding 64 in the transition from a first 6 side face 61 to a second side face 62 in 7 order to avoid rigidity jumps. 8 A rigidity jump brings about a 9 change in stress, the direction of stress 10 and that's what causes the stress 11 concentration. You want to avoid that. 12 Denk is from -- this is a 13 translation from the German and it's 14 actually pretty good. My German is very, 15 very, very rough, but structurally, it's a 16 pretty good translation. 17 Q. I just have to ask: Do you 18 rely on the German version in your 19 understanding of German for your 20 declaration? 21 A. No. I used the English. I 22 looked through the German just -- I used to 23 spend a lot of time with German grinding 24 machine companies, and so, you know, you -- 25 I looked and then I see things where it's

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Page 138 1 A. Slocum, Ph.D. 2 similarity, oh, do I remember that word and 3 stuff, but it's getting rusty, so no, I just 4 rely on the English translation and the 5 figures are the same. 6 Q. Would you please direct your 7 attention back to paragraph 156 of your 8 declaration, Exhibit 1003? 9 A. Wait a second. I seem to have 10 misplaced -- that is the problem with paper. 11 It got absorbed into Denk. All right. 156. 12 Q. In the sentence that reads: 13 But as discussed above, an elliptical inner 14 contour would provide smoother and 15 consistent transition and wall thickness to 16 reduce stress and would be easier to 17 manufacture, what do you mean by would be 18 easier to manufacture? 19 A. It's always easier to 20 manufacture something of a continuous 21 contour and the more smooth transitions are 22 between features, it's easier to achieve 23 that. 24 When you want to have sharper 25 transitions, for example, by swaging, it's	Page 140 1 A. Slocum, Ph.D. 2 looking -- not sure why I did it in this 3 order -- but paragraph 55 of your 4 declaration, Exhibit 1003? 5 A. Okay. 6 Q. Would you please review the 7 paragraph? 8 A. Okay. Hold on. Okay. 9 Q. Would you agree with me that 10 this sentence -- it's both a paragraph and a 11 sentence -- scratch that. 12 Would you agree with me that 13 this sentence includes as one of two reasons 14 a POSITA would have found a benefit in 15 modifying the last year or two to include 16 Denk's elliptical inner cross sectional 17 contour was to reduce the weight of this 18 steerer tube to provide a lighter weight 19 machine? 20 MS. BHATTACHARYYA: Objection. 21 Form. 22 A. Yes, that's exactly what I 23 said. 24 Q. How do we know this 25 modification would reduce weight?
Page 139 1 A. Slocum, Ph.D. 2 much harder to get them. You can get them, 3 but it's not as easy as a gradual smooth. 4 Q. Can you quantify the amount of 5 difficulty? 6 A. No. I'd have to take the exact 7 shape and I'd have to go to your local 8 rotary swaging shop and get a price quote 9 because a lot of that will be dependent upon 10 what machines they have. 11 Q. My follow-up question is could 12 you quantify the additional cost it would 13 require? 14 A. No. I have to go and see 15 what the -- what the manufacturers have. If 16 they have the machine and the programming, 17 it's no additional cost. If they don't have 18 it or they have to make special tooling, 19 then it adds to the cost. So I can only just 20 generally say the simpler it is, the easier 21 it is, generally the cheaper. But sometimes 22 shops have tooling from another job and it 23 doesn't cost anything. 24 Q. Please turn your attention now 25 to one paragraph above where we've been	Page 141 1 A. Slocum, Ph.D. 2 A. So -- and that's one of reasons 3 why I provided my spreadsheet to -- and the 4 formulas in the spreadsheet -- to 5 specifically show how a POSITA would do that 6 calculation and assess what the weights are 7 and then I provided examples, relative major 8 and minor radii of the ellipse. 9 I could go there and we could 10 go through the spreadsheet if you would 11 like. But this is what a POSITA commonly 12 does when optimizing structures and 13 particularly non-uniform wall tubes. 14 That's why it's even a handbook 15 equation in Roark's Formula for Stress and 16 Strain. It's just not uncommon to do that. 17 So again, you write a penalty 18 function it's called for, if you will, the 19 stiffness divided by the weight, depends on 20 how you define penalty. 21 Then you write a little bit of 22 code and it comes back with here is the 23 optimal elliptical shape with respect to the 24 circle for all the loads I'm doing to 25 minimize weight and maximize strength. It's

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Page 142 1 A. Slocum, Ph.D. 2 commonly referred to as the 3 strength-to-weight ratio for a section. 4 Q. Does your spreadsheet include 5 any calculation or statement of the weight 6 of Valat's steerer tube? 7 A. That particular spreadsheet was 8 just looking at elliptical shapes. I did 9 not put in one of Valat's cross sections, 10 you know, three, four or five. I could have 11 very easily, but I did not. I can do it 12 pretty simply, but I'm not sure you want 13 that. 14 Q. Do you state in your 15 declaration a comparison between the weight 16 of Denk's steerer tube and the weight of 17 Valat's steerer tube? 18 A. Neither of them give me 19 specific dimensions, so I did not make that 20 specific statement. I go through -- as I 21 said here, a POSITA will know that a smooth 22 ellipse is easier to do and when you 23 actually do the calculation of stress in the 24 cross section, you'll find it's a better 25 shape.	Page 144 1 A. Slocum, Ph.D. 2 figure one and two, figure one shows an 3 axial section of the tube before 4 reinforcements are formed and showing two of 5 them in dotted lines. Figure two shows the 6 finished tube mounted on a fork ridge. 7 So that's the tube I'm talking 8 about if that's what you mean by definite 9 article. I think that's maybe a legal 10 term and I don't use those terms too much 11 when talking to students. 12 Q. It's a grammatical term, but I 13 would like to follow up with a question -- 14 A. I'm sorry. So that's the tube 15 I'm talking about. Take that tube and gee, 16 I'd be better off doing the elliptical cross 17 section of Denk. 18 Q. How do you know that the change 19 from Valat's tube to Denk's tube would 20 result in a weight reduction? 21 A. Okay. You look at Valat and 22 now the fore aft we defined earlier -- 23 right? -- and you see the way that E and D, 24 those ribs, straddle the fore aft line -- 25 right? -- I am adding mass for -- mass or
Page 143 1 A. Slocum, Ph.D. 2 And then in my spreadsheet, I 3 show the area which is indicative of the 4 weights, so you can get the 5 strength-to-weight ratio calculation for -- 6 and then I show various ratios of the 7 elliptical diameters. 8 Q. In paragraph 55 of your 9 declaration -- 10 A. Hold on. Let me go there. 11 Q. 155. My apologies. 12 A. Okay. Let me go back. 13 All right. In 155. 14 Q. In paragraph 155 of your 15 declaration where you state reduce the 16 weight of the steerer tube to provide a 17 lighter weight machine, would you agree with 18 me that the steerer tube uses a definite 19 article? 20 A. I don't know what you mean by a 21 definite article. You mean am I referring 22 to a specific steerer tube? 23 Q. Yes. 24 A. Yes, because if you look at 25 Valat, Valat says when he's talking about	Page 145 1 A. Slocum, Ph.D. 2 area, they're synonymous here. 3 I'm adding cross sectional area 4 nominally further away from the neutral 5 axis, which goes left to right. Okay? But 6 it's not all the way at the top. It's down 7 about the -- almost at the 45-degree angle. 8 So what that tells me as one 9 skilled in the art, it's not fully 10 optimized. I want the maximum thickness at 11 the top dead center and bottom dead center 12 and then to gradually thin out as I approach 13 the neutral access. 14 So as a structural person, I 15 say okay, what he's got there will help, but 16 gee, you could do better by actually moving 17 the mass according to what's called the -- 18 well, how you calculate the moment of 19 inertia of a section and it's the integral 20 of as you go around in a circle, you know, Y 21 squared DA. 22 So you take an increment of 23 area times its distance from the neutral 24 assess squared and now you integrate all way 25 around the central axis, although it's not

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Page 146 1 A. Slocum, Ph.D. 2 a polar integral -- you could set it up that 3 way if you want -- to maximize the area of 4 the section away from the neutral axis. 5 That maximizes the stiffness to 6 weight and because Valat, when you look at 7 it, doesn't have maximum thickness farthest 8 away, that tells me it's not as efficient as 9 I could do. 10 And that's engineering 11 mechanics 101. It's taught to every 12 sophomore. I think even freshman physics 13 covers. It's called the second moment of 14 the area. Right? It takes me just a few 15 minutes to teach you how to do that, if 16 you're interested. 17 But that's what I do not 18 spreadsheet. When you look at the formulas 19 in there, that's what they're embodying. 20 Q. You would agree where me, 21 though, that your spreadsheet does not 22 include a comparison between the weight of 23 Denk and the weight of Valat? 24 A. It wasn't intended to. The 25 spreadsheet was there to show you how you	Page 148 1 A. Slocum, Ph.D. 2 that its tubing is lightweight? 3 A. Valat does. That's where the 4 figures three, four and five come into 5 account. So what Valat is showing 6 explicitly and then also suggesting -- and 7 not even suggesting, stating explicitly -- 8 is when Valat is talking about three, four 9 and five, Valat is saying put the area, the 10 mass where you want it to resist stress. 11 And where that is, it depends upon what the 12 loadings are. 13 So Valat, you know, is being 14 very explicit in terms of listen, you can 15 optimize this any way you want. I was just 16 taking figure two and saying listen, that's 17 not the best one. You'd be far better off 18 doing an ellipse, something more closer to 19 figure three or to the left of figure three 20 like we talked about. 21 Ever seen any of those morphing 22 things where they take one picture and they 23 kind of change it into something else, like 24 the human into the werewolf -- 25 Q. Oh, yeah.
Page 147 1 A. Slocum, Ph.D. 2 optimize an elliptical section and as I just 3 explained, a POSITA would look at Valat and 4 say okay, I get what you're trying to do, 5 but gee, you know, you should have put all 6 of it -- all of that added area should be 7 farthest away from neutral axis. So nice 8 try, it helps in the right direction, but I 9 could do better. 10 Q. I think I understand now. 11 Does it require you to compare 12 materials for Valat and Denk to determine 13 reductions in weight? 14 A. No. You're going to assume 15 they're both aluminum or they're both steel 16 or they're both the same material. But the 17 mechanics of calculating the moment of 18 inertia are independent of the material, 19 unless it's an anisotropic. 20 But now you're -- I don't know 21 if you want to go into anisotropic 22 materials. Most of these things are metal, 23 which is isotropic, for all intents and 24 purposes here. 25 Q. Does Valat at least suggest	Page 149 1 A. Slocum, Ph.D. 2 A. -- because it is becoming 3 Halloween, so I'm getting a little furrer. 4 So as you do a morphing 5 function from figure five to figure four to 6 figure three, as I discussed earlier, maybe 7 over two steps to the left, figure three 8 would turn into an oval inside. 9 Q. Would you please review 10 paragraph -- it's a long one -- 157, which 11 begins on page 101 of your declaration, 12 Exhibit 1003 and continues on to page 102? 13 A. Okay. Okay. 14 Q. In the sentence that reads: 15 This is because this plane is the neutral 16 axis for bending, caused by forward motion 17 loads on the bicycle, at the neutral axis, 18 bidding stresses are smaller, essentially 19 zero, as compared to the vertical plane. 20 What does this mean? 21 A. Okay. So when you're moving 22 forward on the bicycle or, you know, rolling 23 along and you hit a bump or something, as we 24 discussed earlier, that puts a load up 25 through the wheel which causes a bending

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Page 150 1 A. Slocum, Ph.D. 2 moment on the forks. 3 The lower forks that straddle 4 the wheel and the upper part of the fork, 5 the steerer tube. So it wants to -- imagine 6 taking your pen and putting it down -- you 7 know, or a pencil, you're pushing hard with 8 a pencil as you write and bang, the lead 9 snaps. That's the bending power on the lead 10 caused by that downward motion or force. 11 Now, the neutral -- when you 12 bend something, one part is in compression 13 and one part is in tension. That means 14 between the two, part of it is not in 15 anything. That's the zero stress line. 16 That's why it's called a neutral axis. It's 17 not a positive or a negative stress. 18 There's nothing. 19 Now, the reason I said bending 20 stresses are smaller or essentially zero is 21 because if you have any out of plane loads 22 in addition to these, you will have some 23 stress at that neutral axis, which is 24 corresponding to the primary stress forward 25 one.	Page 152 1 A. Slocum, Ph.D. 2 forward bending loads, but you are putting 3 lateral loads on the forks and the -- all 4 the way up from where it attaches the wheel 5 into the handlebars. 6 Q. Is that phenomenon referred to 7 as pedal bob? 8 A. Yeah, but pedal bob would be, 9 for example, as I'm just pedaling forward in 10 a straight line or up a hill, if I'm not 11 putting even loads continually as the crank 12 goes around in a circle -- and this is why 13 some people use instrumented pedals, to help 14 them become better pedalers. 15 You can tell yourself without 16 all that fancy electronics, you just train 17 people -- as you're riding, try to keep your 18 hands just off of the handlebar or lightly 19 touching it. If you find you're putting a 20 lot of load between your right hand and left 21 hand, as you're pedaling, you have pedal 22 bob. Like Bob, you're pedaling wrong. That 23 was a joke, the last one. 24 But you don't need electronics 25 to teach people how to pedal properly.
Page 151 1 A. Slocum, Ph.D. 2 That's why I said maybe I'm 3 being too pedantic, I should have just said 4 zero. 5 Q. For example, in a turn, you 6 would have stresses along the neutral axis? 7 A. The neutral axis of forward 8 bending, correct. 9 Q. I meant the neutral axis of 10 forward bending, yes. Okay. I understand 11 now. 12 A. I'm sorry if I was just being 13 too pedantic there. 14 You also get them when you're 15 driving or moving forward. You know, 16 straightforward, if someone is not pedaling 17 well -- to pedal properly, you know, 18 downward force is the same as the upward 19 force. You're using your quadriceps and 20 your hamstrings. Or, you know, when people 21 are riding up a hill and they're out of the 22 saddle and they're really pumping back and 23 forth and you can see the bicycle rolling 24 left and right, left and right, you're 25 putting really high -- not as high as the	Page 153 1 A. Slocum, Ph.D. 2 Because remember, they didn't have 3 electronics a long time ago. That's how I 4 was taught, by a person without electronics. 5 This was Mr. Riccitello. Actually, probably 6 came before him, but he definitely 7 reinforces that. 8 Q. Dr. Slocum, would you please 9 turn your attention now to page 116 of your 10 declaration, which is Exhibit 1003? 11 A. And then sometime please start 12 thinking about for us it'll be a lunch 13 break. Because it's noon, so you can finish 14 this question if you want, but then maybe 15 I'll go get something to eat. 16 Q. Yes. We're talking two minutes 17 max. 18 A. Okay. 19 Q. Are you -- 20 A. Go ahead. 21 Q. What is shown in this annotated 22 image? 23 A. So this is taking from figure 24 one and two from Valat. We start with the 25 elongated hollow body or what Valat

Page 154 1 A. Slocum, Ph.D. 2 describes as the starting point for what 3 will become the steering tube in Valat's 4 figure two. 5 And I'm just labeling what's 6 the wall, what's the inner diameter and 7 what's the outer diameter there and then up 8 top in the cross section, I am pointing out 9 with the red concentric circles what you 10 would refer to internal and external 11 diameter and inward of the internal diameter 12 you could see in the upper right-hand 13 picture is the helical structures -- or he 14 describes them as helical in this 15 instance -- E, F -- sorry, D, E, F and G, 16 they're inboard of that inner diameter, the 17 nominal inner diameter. 18 Q. The figure on the left in this 19 annotated image is from figure one, correct, 20 of Valat? 21 A. Correct. 22 Q. And the image on the right is 23 from figure two? 24 A. Correct. I believe I stated 25 that earlier, but if I didn't, that is	Page 156 1 A. Slocum, Ph.D. 2 couple of questions about his 3 background and, like, his CV. 4 Would it be -- would Fox 5 Factory agree to allow admission of 6 this transcript and the remainder of 7 the depositions that will be happening 8 this week so that I don't have to tread 9 over that stuff again? 10 I also believe it's probably 11 admissible under hearsay exceptions, 12 but the parties could agree to it. 13 MS. BHATTACHARYYA: I can -- 14 I'll only allow it if it's related to 15 the CV part of it. I don't know if 16 that's what you intend to do. 17 We can create boundaries, say 18 that, you know, from here onward, I'm 19 just going to be asking about CV and 20 background questions and parties agree 21 this can be applied to the other two 22 IPRs. 23 Then if you create markers that 24 way, that would be fine with me. 25 MR. DURBIN: Okay. That works
Page 155 1 A. Slocum, Ph.D. 2 correct. 3 MR. DURBIN: That's the rest of 4 the questions I have for this figure, 5 so if the parties would like to take a 6 break now, that works for me and just 7 let me know how much time you'll need 8 and we'll meet back there. 9 What works for you, Arpita? 10 MS. BHATTACHARYYA: Half an 11 hour. 12 MR. DURBIN: Absolutely. 13 I see it's 2:05. Do you want 14 to meet back here at 2:40 Central Time? 15 MS. BHATTACHARYYA: Sure. 16 MR. DURBIN: Thank you. 17 Actually, while we're still on 18 the record, Arpita, can we handle a 19 small bit of housekeeping? 20 MS. BHATTACHARYYA: Sure. 21 THE WITNESS: I'm going to sign 22 off while you guys housekeep. Is that 23 okay? 24 MR. DURBIN: That's fine. 25 I plan on asking Dr. Slocum a	Page 157 1 A. Slocum, Ph.D. 2 for me as well, Arpita. So I will -- 3 go on. 4 MS. BHATTACHARYYA: I didn't 5 hear what you said. 6 This is different technologies, 7 like forks and shocks, like I don't 8 know if you want to ask about all of 9 them together today. 10 The other thing is, you know, 11 that you have now more time for the 12 other depositions. So that's why the 13 hesitation is to just, like, blankly 14 allow -- I don't know how much time 15 you're planning to use -- 16 MR. DURBIN: We could maybe 17 revisit -- I could put down the markers 18 and we could revisit it and you could 19 make that judgment call afterwards. 20 MS. BHATTACHARYYA: Yeah, that 21 should be fine. 22 MR. DURBIN: Thank you. Okay. 23 That works. 24 THE VIDEOGRAPHER: Time is 25 3:07 p.m.

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Page 158 1 A. Slocum, Ph.D. 2 We're off the record. 3 (Recess taken) 4 THE VIDEOGRAPHER: We're on the 5 record. 6 The time is 3:41 p.m. 7 BY MR. DURBIN: 8 Q. Dr. Slocum, the question I'm 9 going to ask you now is a yes or no 10 question. 11 During this past break or any 12 other breaks today, has counsel consulted or 13 conferred with you regarding the substance 14 of your testimony already given or 15 anticipated to be given? 16 Yes or no? 17 A. I don't think so. I don't 18 think so. I was talking about my bike 19 races. 20 Q. Same situation -- and this is a 21 yes or no question -- 22 A. Oh, I'm sorry. So no. 23 Q. Has counsel suggested to you 24 the manner in which questions should be 25 answered during any break today?	Page 160 1 A. Slocum, Ph.D. 2 is changing. If you kept the inside the 3 same as the outside change like that, the 4 diameters would change. 5 So what Denk is teaching is you 6 calculate what you need for strength and 7 rigidity and make the cross section what you 8 want. 9 So every POSITA knows and as I 10 showed in my vending moment diagram -- that 11 was at page 86 or whatever -- the stress 12 changes as a function of position along the 13 access of a part. It does because 14 the bending moment changes. 15 So the requirements for the 16 cross section to maximum strength to weight 17 will also change. 18 So I think it's very explicit 19 and then it's also very inherent to any 20 POSITA who designs any structures. 21 Q. Dr. Slocum, what is a cross 22 section? 23 A. If I take some body and I slice 24 through it and I look at the slice, that is 25 a cross section.
Page 159 1 A. Slocum, Ph.D. 2 A. No. 3 Q. Would you please turn your 4 attention to page 26 of your declaration, 5 which is Exhibit 1003, specifically to 6 paragraph 45? 7 A. Okay. Let me read. Okay. 8 Q. For the sentence that reads: 9 Denk discloses that the tubular body has a 10 wall thickness that changes over its cross 11 section along the length of the tubular body 12 to adapt to the loads that occur during use, 13 specifically the profile of the wall 14 thickness over the cross section may be 15 optimally adapted to the actual requirements 16 with regard to strength and rigidity, how 17 does that quotation support the statement 18 that precedes the quotation? 19 A. If you look at figure 1I, okay, 20 and it shows the cross section lines II, now 21 from left to right the outside shape is 22 changing. 23 Then Denk teaches me 24 specifically -- so by necessity the 25 diameters are changing because the outside	Page 161 1 A. Slocum, Ph.D. 2 Structurally, when we refer to 3 a cross section here, it not only typically 4 is going to be perpendicular as almost your 5 default -- and that's what's shown there. 6 When you see in that figure there, Denk 7 figure 11 with the arrows II, I don't have 8 to -- no one has to label that as being the 9 perpendicular cross section, that'll be your 10 default. If you wanted some other cross 11 section that wasn't, then you would 12 explicitly state what it was. 13 But internationally, everyone 14 know that the default is going to be the 15 perpendicular. 16 Q. In your response, I believe you 17 stated figure 11. 18 Did you mean what we've been 19 referring to as figure 1I? 20 A. Sorry. Figure 1I. 21 Q. Just trying to keep the record 22 clear. 23 What is the profile of the wall 24 thickness over the cross section? 25 A. So if you look at a cross

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Page 162 1 A. Slocum, Ph.D. 2 section and now -- and you say the wall 3 thickness over it, that's saying how does 4 the wall thickness vary across over within 5 the cross section. 6 So I take a cross section, I 7 take my calipers out and I define a 8 coordinate system so I know where I am on 9 the cross section. I can then measure what 10 that wall thickness is at any point and then 11 report back on it. 12 So when it says the profile, 13 the wall thickness over the cross section 14 may be optimally adapted, it's saying you 15 can change the wall thickness anywhere you 16 want and get what you want. 17 Q. Does that suggest changing the 18 cross section, though, over the longitudinal 19 direction, which I believe -- strike that 20 question, please. 21 Does that suggest changing 22 anything along the longitudinal direction of 23 the tubing? 24 A. Yes, that's what it's 25 specifically telling you to do. A design	Page 164 1 A. Slocum, Ph.D. 2 figure 1I, to center line two? 3 A. So that would be, for example, 4 the axis of rotation of the steerer tube or 5 of the head tube, the center longitudinal 6 access. 7 In a figure such as this, the 8 convention in mechanics or machine elements 9 is if I give you that axis too and I don't 10 say anything else about it, that's telling 11 me that is the central axis. 12 Now, nominally, that means pick 13 some reference. For example, the outside 14 diameter. It doesn't mean that that's an 15 axis for an axis of revolution because 16 everything can be an oval there, but for 17 that particular view, that is the central 18 axis. 19 So if you tell me that the 20 outside of figure 1I -- I think we're 21 talking about 1I, right? 22 Q. Right now. 23 A. Okay. Good. I'm just -- and 24 you don't tell me anything else about it, 25 the default would be that the outside is at
Page 163 1 A. Slocum, Ph.D. 2 person would specifically know to do that. 3 It's just a very common structural 4 optimization technique. You can look at 5 bridges, cranes. 6 If you look at a bridge, for 7 example, you look at an I beam, you will see 8 how come in some places in the I beam, it 9 looks like there are additional flanges 10 added and they'll taper away and you'll put 11 those additional flanges, for example, where 12 higher shear loads are. 13 Again, that's engineering 14 mechanics 101, straight out of, you know, 15 sophomore mechanics of solids class. 16 Q. Would you please turn your 17 attention to figure 1A of Denk? 18 A. Okay. 19 Q. Is figure 1A an example of a 20 profile of a wall thickness over the cross 21 section? 22 A. It is. 23 Q. Does figure 1A suggest a change 24 along the longitudinal -- strike that. 25 How would you refer, looking at	Page 165 1 A. Slocum, Ph.D. 2 least circular. 3 That's what people would assume 4 and you would have to read more in to figure 5 out do they mean something else. 6 Q. Is figure 1I necessarily round 7 in its exterior shape? 8 A. It wouldn't have to be if there 9 was text associated with it telling me that 10 the outside was oval. But in general, 11 again, barring someone telling you that the 12 outside is oval, you will assume that the 13 outside is round. 14 Q. Again, just for clarity's sake, 15 is figure -- is the exterior of figure 1L 16 necessarily circular in shape? 17 A. I'm sorry. No. I shouldn't 18 have said round. I should have said 19 symmetric. Because, for example, if you 20 look at figure 1F, which is nominally 21 squarish, although I would see other 22 lines -- or if it was a pure square, you 23 would still see axis two in the middle. 24 Q. Does the profile of the wall 25 thickness over the cross section shown in

Page 166 1 A. Slocum, Ph.D. 2 figure 1A necessarily result in a shape 3 along the axis of rotation that's two in 4 figure 1I? 5 MS. BHATTACHARYYA: Objection. 6 Form. 7 A. Can you restate that again, 8 please? 9 Q. Yes. 10 Do you agree that figure 1A 11 shows a profile of a wall thickness over 12 this cross section for an elongate body? 13 A. I do. 14 Q. Looking only at figure 1A, do 15 we know the full shape of that elongate 16 body? 17 A. If you look -- we do from the 18 fact that -- from the arrows downward. 19 Because if we go to the text, it tells me -- 20 not of the whole elongate body, but in a 21 particular direction so -- hold on. 22 Figure 1A through 1H -- I'm 23 reading from Denk, column five. It says 24 figure 1A through 1H show various cross 25 sectional shapes of the lightweight	Page 168 1 A. Slocum, Ph.D. 2 adjacent cross sections of the tubular body 3 are identical" mean? 4 A. It's telling me that as I look 5 to the left in figure 1I, you're going to 6 have the same cross section. There'll be no 7 change. As I look to the right, there will 8 obviously be because it changes. You can 9 see. 10 Then the following paragraph 11 says: However, within the scope of the 12 invention, it is also possible for adjacent 13 cross sections to have a different design, 14 and then it goes on to describe such a thing 15 and then there's figures to show that, like 16 figure 5B for example. 17 Q. What does the phrase each cross 18 section perpendicular to the line two has 19 the same cross section -- 20 A. It says exactly what it is. 21 You have to take that into context of the 22 whole invention. You can't say that it 23 never has anything other than that because 24 Denk specifically has figures that teach 25 otherwise and for other embodiments and
Page 167 1 A. Slocum, Ph.D. 2 component according to the invention. 3 Figure 1I shows a longitudinal view of the 4 exemplary embodiment according to figure 1A. 5 Here in particular Denk is 6 telling me -- and if you look in the 7 direction of arrows, looking to the left, as 8 you slice that 1I body, that is what you'll 9 see. Now, strictly speaking, it could neck 10 down again to the left and I wouldn't see 11 that in figure 1A, but for my -- you know, 12 again, unless they specifically hint or tell 13 me something like that, we're going to 14 assume that that is what you would see 15 totally looking left, at any section to the 16 left of that. 17 But it could taper and you'd 18 never know if it tapered inward. 19 Q. Would you please direct your 20 attention to the first full paragraph in 21 column eight of Denk, beginning with the 22 words: In the exemplary embodiment shown in 23 figures 1A -- 24 A. Hold on. I read it. 25 Q. What does the phrase "the	Page 169 1 A. Slocum, Ph.D. 2 specifically the following paragraph tells 3 me that. So I have to read everything in 4 context of the whole patent, not an isolated 5 phrase. 6 Q. Is Denk contemplating an 7 embodiment that would have a consistent 8 cross section over the length of the tubular 9 body? 10 A. That's one embodiment that Denk 11 contemplates. 12 Q. And I believe you mentioned 13 that Denk also contemplates embodiments 14 where there may be a change in the cross 15 sectional shape, correct? 16 A. Correct. That was the 17 following paragraph and then, for example, 18 like figures 5B for example. 19 Q. Would you agree with me that 20 this indicates that there are even more 21 embodiments in Denk than we had discussed 22 earlier? 23 A. No. I think it's the same. 24 Denk teaches you can vary the cross section 25 to have whatever you want to do to maximize

Page 170 1 A. Slocum, Ph.D. 2 your strength-to-weight ratio. 3 As I explained earlier, the 4 mathematics for that are very well known. 5 It's sophomore mechanic stuff. I teach it 6 to all my design students. Actually, just 7 people -- mechanic engineers in general -- 8 are taught that, typically second year. 9 Q. That would result in a nearly 10 infinite number of potential embodiments in 11 Denk, correct? 12 A. I don't know. Theoretically, 13 mathematically possible, if I vary something 14 by Planck's constant, ten to the minus 34, 15 so you could have ten to the 34 at least, 16 but that's not a realistic question or 17 answer I could provide. 18 Denk tells you the world of 19 structural optimization is such that you 20 write your code and you unleash the computer 21 to incremented reasonable steps and come 22 back with what maximizes strength to weight. 23 That's just what POSITAs do. 24 Q. At some point, the number of 25 embodiments are getting trivially not	Page 172 1 A. Slocum, Ph.D. 2 I slice it, take everything away to the 3 right and now look along the direction of 4 the arrows and what do I see? 5 Q. I didn't know that. 6 Is that a convention with the 7 cross sections shown in diagrams like this, 8 that the arrow indicates the prospective of 9 the cross section? 10 A. Correct. It tells you in which 11 direction to look. And that's 12 internationally -- that's everywhere. It 13 would be very confusing otherwise. 14 Q. What is the cross section at 15 line II? 16 A. Well, I've just read the patent 17 that is telling me it's figure 1A. 18 Q. Could it also be figure 1B? 19 A. It could be, but Denk is 20 specifically telling me 1A. When you look 21 in figure 1I, you see those -- there's the 22 lines which are clearly the outside and then 23 there's a whole bunch of parallel lines. 24 Right? 25 Those are meant to indicate
Page 171 1 A. Slocum, Ph.D. 2 different from each other and trivially 3 large in number, correct? 4 A. Maybe I'm misunderstanding what 5 you mean by embodiments, but in terms of -- 6 if you say an elliptical inside and a 7 circular outside is one embodiment and if I 8 vary the size of the ellipse, that's still 9 one embodiment, that's one embodiment. 10 If you tell me that every time 11 I change the ellipse, that's a new 12 embodiment, then there's, by definition, an 13 infinite number. 14 So I'm just speaking 15 practically as a POSITA. I'm probably 16 misunderstanding your question then. 17 Q. I almost said figure 1I. 18 Looking at figure 1I of Denk, 19 what does the line between the two Is 20 indicate? 21 A. That tells me the cross 22 section. I'm going to slice it there and 23 then look at the end. And the arrows tell 24 me which direction in which to look. 25 So I stand at the -- I slice --	Page 173 1 A. Slocum, Ph.D. 2 it's curved. It's not indicating what the 3 actual inside looks like. If that was to be 4 the case, they would show up as dotted 5 lines. The size of the dots or the dashes 6 would indicate are they real or are they 7 optional. 8 So there's a whole -- there's a 9 bunch of different conventions, what the 10 type of dashed or dotted line are to 11 indicate. But when they're solid like that, 12 this is from the old draftsman school of 13 indicating a curved outer surface. 14 Q. In figure 1I, are we only 15 presented with the exterior of component 16 one? 17 A. Correct. That's what I was 18 just saying. Those additional horizontal 19 lines that go towards the inside from the 20 outer most ones, they're telling me as a 21 mechanical person that the outside of that 22 thing has curves. It's not a rectangle, a 23 rigid rectangle. It's not rigid. It's not 24 a precise sharp pointed rectangle, for 25 example.

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Page 174 1 A. Slocum, Ph.D. 2 Q. And we cannot see the interior 3 contours of component one in figure 1I? 4 A. Correct. To do that, he would 5 have had to have included dashed lines. 6 Q. Would you please direct your 7 attention to column five of Denk, the last 8 full paragraph in Denk? 9 It reads: The lightweight 10 component, according to figure 1A, has 11 illustrated in a side view in figure 1I is 12 an elongate tube one, which (in the 13 exemplary embodiments shown in figures 1A 14 through 1H) extends symmetrically with 15 respect to a straight center line two. 16 A. I see that. 17 Q. What does that mean? 18 A. It means that -- it means what 19 it means. It's symmetric. So if we go back 20 to figure 1A and you see those two -- the 21 lines five and six, it tells me those are 22 axis of symmetry. 23 In other words, what's above 24 line six, if you fold that section about 25 line six, it folds over exactly onto the	Page 176 1 A. Slocum, Ph.D. 2 It can change from -- with 3 angular degrees walking around, but 4 180 degrees or opposite of it, it's going to 5 be the same. 6 Q. In this sentence that we're 7 discussing, what does the parenthetical 8 statement mean? 9 A. Well, let me go back. 10 What it's telling me is -- you 11 mean in the exemplary embodiment shown in 12 figures 1A through 1H? 13 Q. Yes. 14 A. That, again, you look at all of 15 those and I can define that they extend 16 symmetrically with respect to a straight 17 center line, so I have symmetry. 18 So for example, in 1B, I can 19 fold over left to right. Now, it's not true 20 that it's circularly symmetric, but there is 21 a symmetry. That's what the parenthetical 22 means. 23 Figure 1A wasn't circularly 24 symmetric. Figure 1B, you can see it is 25 left to right symmetric, but it's not top to
Page 175 1 A. Slocum, Ph.D. 2 shape below it. 3 Now, if you fold over from left 4 to right, you will also -- along line five, 5 it will also get the same shape. It folds 6 onto itself. 7 In other words, if I take any 8 line -- now, let's say we can -- we can 9 agree on axis two is at the intersection of 10 lines five and six. Okay? 11 So now that center line two is 12 an axis of symmetry and what that means to 13 the design person is if I draw a line, a 14 diameter line through the center, all the 15 way across figure 1A, any point let's say 16 from the quadrant where it's marked seven 17 opposite, any point in the cross section on 18 one side of the axis of symmetry, I can fold 19 over along that same straight line and I'll 20 see the exact same section on the other side 21 of it. 22 In other words, the wall 23 thickness on one side is the same as the 24 wall thickness 180 degrees away, as I walk 25 all the way around.	Page 177 1 A. Slocum, Ph.D. 2 bottom symmetric. You see what I mean? 3 You can't -- if you look in 4 figure 1B, you have axis 13 and 12. So it's 5 symmetric about line 15, but you see the way 6 there's no dashed line corresponding to axis 7 six as in figure 1A? That's telling me 8 there's no symmetry top to bottom that way. 9 And because they're not showing 10 me that axis in 1C or 1F, it's implying that 11 there's some -- something else going on. 12 To my eyes, it looks like it 13 should be symmetric, but he must have been 14 implying that there's something else because 15 you see, for example, 1D, 1E are clearly not 16 top to bottom symmetric. 17 Q. Figure 1A would perhaps have a 18 diagonal line of symmetry? 19 A. Yeah. So see where 76 goes, 20 line -- the arrow -- the arrow from 76 21 pointing to the outside, that arrow line is 22 not intended to be an axis of symmetry, but 23 you could draw one and then you could get 24 above and below that line axis. 25 To me, 1F and 1C look like they

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Page 178 1 A. Slocum, Ph.D. 2 should have horizontal lines for symmetry. 3 He didn't put them in there. Maybe there's 4 some subtle thing -- again, you're not 5 supposed to scale patent drawings, so he may 6 have a slight shift as in figure 1B. 7 Q. Dr. Slocum, would you now 8 please turn your attention to page 28 of 9 your report? 10 A. Okay. 11 Q. Can you please explain what is 12 shown in these annotated figures, the 13 difference between the non-annotated figure 14 and the annotated figure? 15 A. Between what? Sorry. 16 Q. The non-annotated figure and 17 the annotated figure. 18 A. Okay. I apologize I didn't 19 include the where in column eight. 20 But anyway, what I'm showing 21 here is that you can start with Denk figure 22 1A and Denk teaches in column eight, if we 23 go to -- one, two, three, fifth paragraph 24 down, it says: In addition, in particular 25 for the exemplary embodiments according to	Page 180 1 A. Slocum, Ph.D. 2 Dr. Slocum, would you please 3 take a look again at paragraph 47 of your 4 declaration? 5 A. Okay. 6 Q. In the fourth line down, you 7 state: In the embodiment shown in figure 8 1A. 9 What do you mean by that 10 phrase? 11 A. Exactly that. 1A shows an 12 embodiment. Denk teaches -- says that 13 specifically in that paragraph I just read, 14 embodiments according to figure 1A. 15 So that's just one 16 particular -- I've got an outside circle and 17 then an ellipse form on the inside and it's 18 symmetric. A different embodiment would be 19 like in 1B or 1E. But this embodiment is an 20 ellipse inside a circle. Figure 1B is an 21 eccentric circle. That's a second 22 embodiment. 23 Q. So when you state the 24 embodiment shown in figure 1A, that single 25 embodiment may refer to a whole range of
Page 179 1 A. Slocum, Ph.D. 2 figure 1A, it is possible for the elliptical 3 inner cross sectional contour to continually 4 transition into a circular inner cross 5 sectional contour in a certain area of the 6 tube. For example, in a middle area or an 7 end area. 8 So all I did there was by 9 drawing the red circle four -- I'm sorry -- 10 the red circle that intersects with ellipse 11 four is there I'm showing that ellipse in 12 the center transitioning to a full circle 13 shown by the red circle. And I'm just doing 14 exactly what Denk said I should do or could 15 do in that paragraph I just read. 16 Q. Does Denk's disclosure 17 necessarily result in the red circle drawn 18 in this annotated image? 19 A. It would be some circle. It 20 could be bigger, it could be smaller. I 21 just put it there. I don't have any other 22 guidelines for the specific optimization, 23 but that one could make sense. 24 Q. Would you please take a look 25 again at paragraph 47 -- scratch that.	Page 181 1 A. Slocum, Ph.D. 2 different tubing? 3 MS. BHATTACHARYYA: Objection. 4 Form. 5 Mischaracterizes the record. 6 A. I understand your question as 7 the ellipse can be at different major and 8 minor radii proportions with respect to each 9 other and the circle diameter three. In 10 that respect, correct. 11 Again, I'm going to optimize it 12 to maximize the strength-to-weight ratio for 13 how I'm loading this system. 14 Q. Would you please take a look 15 again at the -- at Denk column eight, the 16 paragraph that we've been discussing that 17 begins with: In addition, in particular for 18 the embodiments according to figure 1A ... 19 A. Okay. 20 Q. Would you agree with me that 21 Denk does not disclose what the exterior 22 diameter is of any of these embodiments? 23 A. Denk is not giving me -- has 24 not given me sizes. He just says circular. 25 And again, he shows for a bicycle, so a

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Page 182 1 A. Slocum, Ph.D. 2 POSITA would have an idea of what is the 3 range of standard tube sizes you probably 4 are in, but Denk is very specific on 5 depending on your loads, you should go ahead 6 and optimize for what your loads are. 7 Q. Denk does not state whether the 8 diameter of the exterior of the tubing 9 changes during the transition, correct? 10 MS. BHATTACHARYYA: Objection. 11 Form. 12 Mischaracterizes the record. 13 A. I disagree because all of 14 figure 1A specifically is tied to figure 1I. 15 I have to read the whole thing in context 16 and Denk has told me figure 1A corresponds 17 to 1I and 1I very clearly is the outside 18 diameter is changing over the length. 19 Q. Is it your opinion that Denk 20 does not disclose tubing without a taper? 21 Scratch that. 22 Is it your opinion that Denk 23 does not disclose a tubing without an 24 exterior diameter taper? 25 A. I don't understand that	Page 184 1 A. Slocum, Ph.D. 2 if I took my caliper out, it probably 3 doesn't. 4 Q. Would you please turn your 5 attention to column eight of Denk? The 6 paragraph that's very short, two lines long, 7 that begins all two parts are 8 manufactured -- excuse me. Scratch that. 9 All parts are manufactured from 10 a light alloy. The outer cross sectional 11 contour of all tubes is cylindrical. 12 A. I see that. 13 Q. Does Denk disclose cylindrical 14 tubing? 15 A. I don't know how to answer your 16 question. When you look at figures 1A, 1B, 17 1E, 1H, those all appear to have cylindrical 18 outsides. 1C, 1D, 1F, 1G clearly are not 19 cylindrical. 20 To me, what that paragraph in 21 eight is when he says all two parts, it's 22 referring to figure two only, which is that 23 bike frame shown there. 24 Or maybe I misunderstood your 25 question.
Page 183 1 A. Slocum, Ph.D. 2 question. 3 If you look at figure 1I, you 4 have a larger diameter and then you have a 5 very clear tapered section to another 6 smaller diameter. And Denk is teaching me 7 do whatever you need to do to the inside 8 shape or the outside shape to accomplish 9 what you want to do. 10 There very clearly is a taper 11 there. There's no indication of how long it 12 is. It's not a step. It's a taper. 13 So again, I'm going to write 14 the equation, set up my program and optimize 15 for what the loading is that I want to 16 achieve. 17 Q. Would you please direct your 18 attention to figures 2A, 2B and 2C of Denk? 19 A. Okay. 20 Q. Does 101 have a change in its 21 external diameter? 22 A. When you just look at the 23 figure itself as drawn, you can't detect 24 does it or does it not, so you would 25 default, then say just looking at it, I bet	Page 185 1 A. Slocum, Ph.D. 2 In other words, I have to read 3 all two parts are manufactured across 4 sectional contour of all tubes are 5 cylindrical, I have to read that in context. 6 I can't just read those two sentences alone 7 and assume it applies everywhere in Denk. 8 It has to -- because the figures clearly 9 show they are non-cylindrical, so I read -- 10 and as the POSITA, it makes sense that oh, 11 that just applies to the previous three 12 paragraphs, which is talking about figure 13 two in 2A. 14 Q. Dr. Slocum, would you please 15 turn your attention to figures 5A through 16 5E? 17 A. Okay. Hold on. Okay. 18 Q. From these drawings, can you 19 tell what the cross section is at all points 20 along the final tubing? 21 A. Well, this, in the text, it's 22 very specific. It's just giving me an 23 example. So if you go back to figure -- it 24 starts at figure three and you see those 25 lines, IV in figure three and five, and you

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Page 186 1 A. Slocum, Ph.D. 2 have got to go back to the text, it's 3 talking about a way to manufacture and how 4 you can vary along the length of the tube. 5 So I can't say that all along the tube. 6 That's a portion. 7 Q. Would you please review the 8 second-to-last paragraph in column three of 9 Denk, which is Exhibit 1006? 10 A. You mean a circular ring 11 shaped, it starts? 12 Q. Yes, Dr. Slocum. 13 A. Okay. 14 Q. The first sentence reads: A 15 circular ring shaped outer cross sectional 16 contour is to be preferred for visual and 17 possibly also technical reasons, resulting 18 in a lightweight component in which the 19 different wall thickness -- excuse me -- 20 thickness distribution defined by the inner 21 cross sectional contour. 22 Correct? 23 A. Correct. That's what it says. 24 Q. What does visual and also 25 possibly technical reasons mean?	Page 188 1 A. Slocum, Ph.D. 2 A. Depends what the inside of the 3 head tube is. If it's a steering tube, it 4 just becomes a -- you ask yourself why would 5 I do that when round is -- you'd have to 6 have a really good reason to not. 7 Q. Is the steerer tube visible on 8 a bicycle? 9 A. No. The head tube would be, 10 but it says, if we go back to three, visual 11 and possibly also technical. If I had the 12 projection of the steer tube coming out and 13 it was not round, I would tell the guy I 14 don't know why you do that. But someone may 15 look at it and say well, how is this thing 16 going to rotate? 17 So I -- the main thing with 18 this paragraph is you have to, again, read 19 it in context. You have to continue reading 20 on. 21 What he's basically saying is 22 look, you may have a reason for doing it, 23 but in general, you probably don't and 24 therefore if you have an outside that is 25 circular, you better market to indicate the
Page 187 1 A. Slocum, Ph.D. 2 A. When someone looks at a 3 bicycle, they may want to see clean lines. 4 If it wasn't round, it may collect dirt. 5 You know, that's an ergonomic thing that I 6 do not know how to write an equation for. 7 Technical reasons are when you 8 have a round cross section, it will be 9 easier to weld potentially for a head tube, 10 it makes mounting the bearings much simpler. 11 Now there are a lot of aero 12 bikes these days that have more teardrop 13 shapes and if you look at Denk, he shows 14 teardrop-shape sections like 1D. But 1D for 15 a steerer tube, I think, might be 16 problematic. 17 Q. Excuse me. 18 A. I'm sorry. Not a -- because to 19 mount that in bearings, you'd have to have 20 another space. I think it would be 21 problematic. Not to say it can't be done, 22 but I think it'll be problematic. 23 Q. When they mount a bearing in a 24 non-circular head tube, do they have a 25 specialized outer race?	Page 189 1 A. Slocum, Ph.D. 2 orientation of the tube, lest you mount the 3 tube in backwards or upside down. 4 Q. Does Denk state in its 5 disclosure what these technical reasons may 6 be? 7 A. Okay. So if you go -- continue 8 reading -- again, everything has to be done 9 in concept or context. 10 He says in top of column four: 11 For an elliptical or oval outer contour, the 12 inner contour may be cylindrical so that 13 optimum rigidity and strength conditions 14 with regard to loads in the place of 15 symmetry are achieved. 16 Earlier, when he was talking 17 about the applications like golf clubs or 18 aero vehicles, that's where aerodynamics can 19 be particularly important. 20 There is some debate always in 21 terms of what on a bicycle tube should be, 22 you know, tear dropped or aero shaped versus 23 just left round. That's still a point of 24 contention in some places. 25 Q. Is a diameter necessarily a

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Page 190 1 A. Slocum, Ph.D. 2 line running through the center of a circle? 3 A. The diameter runs through the 4 center of the cross section, so you can 5 define the diameter of an ellipse, the major 6 and minor diameter, and they will go through 7 the center of the ellipse. 8 So if you just say the diameter 9 of the structure without any kind of other 10 qualification, one would probably end up 11 assuming A, it's a circle and B, yes, it has 12 to go through the center. Otherwise, it's a 13 cord. 14 Q. Do irregular shapes sometimes 15 have diameters? 16 A. Well, an ellipse is an 17 irregular shape, although it has some 18 symmetry. Right? It has major/minor 19 diameter. 20 If you have let's say a 21 shamrock -- let's just pick something 22 very -- when you say the diameter of the 23 shamrock, now there's an implication of the 24 diameter that you're circumscribing the 25 shamrock.	Page 192 1 A. Slocum, Ph.D. 2 greatest than in the upper part. 3 Again, the figure I have right 4 above, where I say internal diameter and 5 external diameter, barring some other 6 quantifier, when I say diameter, it's a 7 circle and the diameter has to pass through 8 the center of a circle, again, otherwise 9 it's a cord. 10 Q. Looking again at line 70 11 through 78 of Valat, what does the same 12 external diameter over its whole length 13 mean? 14 A. That is referring to, as he 15 says more particularly, the steering tube 16 shown by way of example. So in this 17 particular embodiment, Valat is saying that 18 the outer diameter would have the same 19 external diameter over its whole length, so 20 for that particular instance shown. 21 Again, when you look at Valat 22 figure one -- figure two is if you took 23 figure one and you did the rotary swaging. 24 But I don't read Valat as requiring figure 25 one to always go into figure two. Figure
Page 191 1 A. Slocum, Ph.D. 2 So again, barring some other 3 descriptor, if there's an irregular shape 4 and I call it a diameter, it's the circle 5 into which the shape goes into. 6 Q. That's my understanding as 7 well. Would you please turn to paragraph 8 186 of your declaration which is Exhibit 9 1003? 10 A. Okay. 11 Q. Why does the lower part A have 12 a greater thickness than the upper part B? 13 A. Okay. We can go to Valat, as 14 I'm pointing to there. But ostensibly, if 15 you go back to that, the steering tube is 16 anchored in the lower bearing and then the 17 upper bearing. 18 The shear forces are greater in 19 the lower bearing. It's acting like a 20 fulcrum. And the stress is being higher 21 there. That's why you need more diameter to 22 handle the load than at the upper bearing. 23 Hold on. If I go to Valat -- 24 let's see, 70 to 78 -- yeah, which is 25 exactly what I just said. The loads are	Page 193 1 A. Slocum, Ph.D. 2 two must come from figure one, but a POSITA 3 looking and reading Valat would understand 4 that okay, I have a one diameter at the top, 5 I have a different diameter at the bottom 6 section. So you could have an embodiment 7 that would come out of that figure one. But 8 you will need figure one to get to two, but 9 you could use figure one somewhere else. 10 Q. If you swaged figure one, would 11 it still look like figure one? 12 A. It depends on how much you 13 swage it. 14 Q. Okay. 15 A. So because that's what I meant 16 by looking at figure one you can get to 17 figure two, but you don't have to. But you 18 would start with one to get to two, 19 depending on how far you want to take it and 20 that's what I believe that Valat is teaching 21 when they say this one particular 22 embodiment. So that's telling me, as a 23 POSITA, ahh, there's other things you could 24 do with it. 25 Q. Would you please turn your

Page 194 1 A. Slocum, Ph.D. 2 attention to paragraph 216 of your 3 declaration, which is Exhibit 1003? 4 A. Okay. 5 Q. Do you see the sentence where 6 you state: Such a modification would allow 7 Valat's steerer tube's lower part, lower 8 section to be reinforced with Denk's 9 elliptical inner contour for improved 10 mechanical property while maintaining 11 lightweight? 12 A. I do. 13 Q. What do you mean by improved 14 mechanical property? 15 A. So that means when I calculate 16 the moment of inertia, I would have a 17 greater weight-to-strength ratio. 18 In other words, this gets back 19 to -- if you look at Valat figure two on the 20 top, just above 216, these sections, D and 21 E, above that horizontal line, left to 22 right, that's the axis line for bending and 23 forward motion. 24 As we discussed earlier, it's 25 obvious to me that wait a second, you could	Page 196 1 A. Slocum, Ph.D. 2 I put in my spreadsheet to then demonstrate 3 here are typical size ranges and ratios and 4 what the effects are. 5 I could very easily create such 6 a spreadsheet for Valat and, you know, 7 prove, for an example, instance of like 8 cross sectional area, Denk can give you 9 higher strength-to-weight ratio. But I 10 didn't see a need to do that. If asked to 11 do so, I will. 12 Q. To follow up, did you included 13 a spreadsheet for Valat to prove instances 14 of like cross sectional area where Denk can 15 give you a higher strength-to-weight ratio? 16 A. No. I just said if asked to, 17 I'll be happy to make that. 18 If you look at a company I 19 founded called OMAX -- we make water jet 20 cutters -- gee, almost 30 years we started 21 it; we sold it a couple years ago -- this 22 was exactly the type of optimization I did 23 for the tubular cross sections. 24 We sold thousands and thousands 25 of machines. Everybody wondered how did we
Page 195 1 A. Slocum, Ph.D. 2 be more efficient by making an ellipse on 3 the inside right where I have a much thicker 4 at the top and bottom of that cross section 5 than by putting it at the 45-degree lines, 6 the reinforcements. 7 So that mechanical property 8 would be the strength of the section, given 9 the distribution of material to maximize the 10 moment of inertia or bending about the 11 horizontal axis while minimizing the weight 12 of the section. 13 Q. Where in your report is your 14 comparison between the mechanical properties 15 of Denk and the mechanical properties of 16 Valat? 17 A. As we discussed this earlier, I 18 did not do a spreadsheet for Valat. I 19 looked at Denk, I looked at Valat and I -- 20 we had this discussion before lunch about 21 putting in those ribs -- D, E, F, G -- will 22 be helpful, but I would actually, as one 23 skilled in the art, know that it would be 24 much better for me to have that smooth 25 continuous elliptical shape and that's what	Page 197 1 A. Slocum, Ph.D. 2 make the machine works so -- it's not 3 supposed to work that way, it can't. But no 4 one knew what the inside cross section was 5 except, well, me and the people who built 6 it. 7 Q. The tubes within the machine or 8 the tubes that were being cut? 9 A. The tubes within the machine 10 that formed the frame inside the bellows. 11 There was magic in there. 12 Q. Trade secrets are awesome. 13 A. The fundamental patent has the 14 formulas in it, so I did my job as an 15 inventor, you know, to teach other people 16 how to do it. No one believed it. But to 17 their demise, we sold a lot more machines 18 than we did. 19 Q. I'd like to now introduce 20 another exhibit that has already been marked 21 as Exhibit 1008. 22 A. What's the author on that? Oh, 23 I have it here. 24 Q. I will represent that I refer 25 to it as Moechnig, but if you have a

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Page 198 1 A. Slocum, Ph.D. 2 preferred pronunciation, I could probably 3 work with you. 4 A. No, that's how I would do it, 5 too. Moechnig. 6 Q. I like that better, Moechnig. 7 A. Yeah, it's more German. 8 Q. I can do that. 9 Are you familiar with Exhibit 10 1008, which we refer to as Moechnig? 11 A. Yes. 12 Q. What is Moechnig? 13 A. Moechnig is a patent, again, 14 about bicycles, particularly a steerer tube, 15 and Moechnig is talking about changing the 16 shape and making it asymmetric along the 17 length from the bottom bearing up through -- 18 you know, from the crown up through to 19 ultimately where the handlebars are. 20 Q. Does Moechnig disclose a 21 steerer tube? 22 A. He does. 23 Q. Does Moechnig's steerer tube 24 include non-circular cross sections? 25 A. It does.	Page 200 1 A. Slocum, Ph.D. 2 he wants to additional compliance, which is 3 springiness in that portion of the tube. 4 Q. Does Moechnig also seek to 5 increase a lateral stiffness to improve the 6 writer's perception of handling performance? 7 A. That is one of the things that 8 he states. Let me get the exact wording. 9 That's not in the abstract, but let me see 10 where it is in the body -- 11 Q. May I direct you to paragraphs 12 six through eight? 13 A. Yeah. Okay. That's where I 14 remember reading that. 15 He said he believes that it 16 provides a perception to have it stiffer 17 left or right. That's what he means by 18 increase lateral stiffness. Lateral would 19 be perpendicular to the forward motion of 20 the bicycle. 21 Now, his physics is wrong, by 22 the way, but we could get into the math 23 behind that. But that's what he states. 24 I think the interesting thing 25 is he says the perception.
Page 199 1 A. Slocum, Ph.D. 2 Q. Why does Moechnig state 3 Moechnig includes non-circular cross 4 sections? 5 A. You mean what is the essence of 6 the patent? 7 I don't understand your 8 question, why does he state it. 9 Q. I will withdraw my question. 10 What is the essence of 11 Moechnig? 12 A. The essence of Moechnig is that 13 he provides different diameters of the 14 steerer tube to accommodate different loads 15 and the abstract, in particular, describes 16 that he wants to have different lateral 17 stiffness with respect to front to back and 18 side to side of the steerer tube. 19 And he wants to do that to 20 better accommodate, as he says, longitudinal 21 impact absorption of the fork and wheel 22 assembly. 23 So he's putting it in there to 24 add some compliance to the tube, so it acts 25 like a spring. Everything is a spring, but	Page 201 1 A. Slocum, Ph.D. 2 Let me modify my previous 3 statement. 4 Perceptually, it may be true, 5 but in terms of physics, there's some 6 interesting things that happened when you do 7 that shape he's proposing. 8 MR. DURBIN: Give me a moment. 9 For some reason I believe 10 Moechnig never made it to Exhibit 11 Share, so I'm going to try to introduce 12 it again. 13 THE WITNESS: I have the paper, 14 so that's what I'm reading. 15 MR. DURBIN: I'll let it keep 16 uploading for a little bit. 17 THE WITNESS: Do I need to be 18 able to bring up Moechnig on Exhibit 19 Share? 20 MR. DURBIN: You let me know if 21 you do. 22 THE WITNESS: I don't. I've 23 got the paper, so I assume you either 24 have paper or electronic. 25 MS. BHATTACHARYYA: I have the

Page 202 1 A. Slocum, Ph.D. 2 copy, so I am all good, too. 3 MR. DURBIN: Thank you, Arpita. 4 BY MR. DURBIN: 5 Q. Would you please turn to 6 paragraph 43 of your declaration, which is 7 Exhibit 1003? It's on page 23 of your 8 declaration. I'm wrong. It's on page 24. 9 A. Okay. 10 Q. You state that: A POSITA would 11 have understood that the oblong radially 12 asymmetric shape taught by Moechnig is 13 structurally equivalent to varying the wall 14 thickness over the cross section, as 15 discussed in the '993 patent. 16 Correct? 17 A. Correct. 18 Q. How are they -- scratch that. 19 What do you mean by 20 structurally equivalent? 21 A. I can get the same stiffness 22 front to back or left to right and indeed 23 torsionally for the same cross sectional 24 area and still be having a round outer tube, 25 which makes it much easier in which to mount	Page 204 1 A. Slocum, Ph.D. 2 enough degrees of freedom within the cross 3 section to force the optimization to make it 4 equal. 5 MR. DURBIN: I'm at a stopping 6 point now. 7 Would we like to take a break? 8 MS. BHATTACHARYYA: Sure. 9 THE WITNESS: Yeah, it's been 10 about time since we came in for lunch. 11 Good for a bio break. 12 MR. DURBIN: How long has this 13 deposition been going for, Court 14 Reporter? 15 THE VIDEOGRAPHER: Standby. 16 Time is 4:51 p.m. 17 We're off the record. 18 (Recess taken) 19 THE VIDEOGRAPHER: We are on 20 the record. 21 The time is 5:07 p.m. 22 BY MR. DURBIN: 23 Q. Dr. Slocum, are you ready to 24 begin? 25 A. I am.
Page 203 1 A. Slocum, Ph.D. 2 the bearing from the top part of the head 3 tube. 4 Q. How do we know that you can get 5 the same stiffness over the same cross 6 sectional area? Because of the shapes? 7 A. Because I've done this type of 8 calculation before. It's a very simple -- 9 again, the integral Y squared DA and you 10 integrate around the -- the polar 11 coordinates and you calculate the moment of 12 inertia and you also calculate the area 13 simultaneously and you pick one thing and 14 then now I can vary the ellipse minor and 15 major radii proportions as well as their 16 proportion with respect to the outer circle. 17 So mathematically, I know I 18 have enough degrees of freedom to do the 19 matching. Now I just write the code and the 20 computer will spit out the answer for me. 21 In other words, any constant 22 wall thickness contour that is non-round, I 23 can pick an equivalent round with varying 24 wall to give me the same cross sectional 25 area and then moments of inertia. I have	Page 205 1 A. Slocum, Ph.D. 2 Q. May I please direct your 3 attention to paragraph 124 of your 4 declaration? 5 A. Okay. 6 Q. Would you please review this 7 paragraph? 8 A. Okay. That's what I'm doing 9 now is reading it. Okay. 10 Q. In the first sentence of this 11 paragraph 124, is the initialism OD -- 12 scratch that. 13 In this paragraph 124, does the 14 initialism OD stand for outer diameter? 15 A. It does. 16 Q. Does the initialism ID stand 17 for inner diameter? 18 A. It does. 19 Q. Where do these diameter numbers 20 come from? 21 Scratch that question. 22 Is it stated in your 23 declaration where these diameter numbers 24 come from? 25 A. It is. I say it is known a

Page 206 1 A. Slocum, Ph.D. 2 typical steerer tube size is on the order of 3 one inch OD by a seventh inch ID because 4 those are standard steerer tube sizes that 5 you can find for aluminum stainless steel, 6 high strength steel. And that would be a 7 starting point, for example. And that's a 8 wall thickness there of about 1/16th of an 9 inch. 10 Then in my spreadsheet, I go 11 and calculate what types of loads you can 12 obtain. 13 Q. Do any of the prior art 14 references in this matter state a one-inch 15 outer diameter and seven-eighths inch inner 16 diameter? 17 A. I don't recall. Most of them 18 don't say anything about specific sizing. 19 They just show, you know, exemplary figures 20 of bicycle parts. I would have to go back 21 and check. I seem to recall one of them 22 somewhere was starting to talk about sizes, 23 but most of them do not. 24 Q. At least sitting here today 25 right now, you don't know whether or not any	Page 208 1 A. Slocum, Ph.D. 2 Moechnig gave me that diameter. Hold on. 3 That is also, by the way, a -- 4 that particular sizing and metric is also a 5 standard size. So let me -- so if you look 6 at paragraph 40 of Moechnig, those are the 7 dimensions that Moechnig did. So that's 8 one-and-an-eighth inch or about 28.6. 9 That's from Moechnig. 10 Q. In the table featured on page 11 79 of your declaration, which is Exhibit 12 1003, why do you state that the wall 13 thickness is three millimeters? 14 A. Because you have an ID and an 15 OD. So if you take 28.6 minus 22.6, you get 16 six, divided by two, and I see the three 17 there -- the two numbers, three and then 18 10.49, they should both be in red. 19 Or you pick the wall thickness 20 and then you draw the ID to be in red. The 21 10.49%, that's a calculated value, so that 22 should be in red. 23 My contention -- my convention, 24 you see the top input in black, output in 25 red? So if you have an OD of 28.6 and I
Page 207 1 A. Slocum, Ph.D. 2 prior art reference states one inch outer 3 diameter and seven-eighths inner diameter 4 tubing? 5 A. I will say -- 6 MS. BHATTACHARYYA: Objection. 7 Mischaracterizes the record. 8 A. I will say I don't recall, but 9 when I designed one of my bikes, that's 10 where we started. 11 So I reserve the right to 12 change it when I go back and read through, 13 otherwise I'm going to go spend the next 14 half an hour reading carefully through all 15 of them. I don't think you want me to do 16 that. 17 Q. Although I'm contemplating, I 18 don't think I want you to either. 19 A. It's a good starting point. 20 You would work up and down from there to get 21 what you want. 22 Q. Now looking at page 79, why did 23 you choose an outer diameter of 24 28.6 millimeters? 25 A. Let me go to Moechnig. Maybe	Page 209 1 A. Slocum, Ph.D. 2 make a wall thickness of three, which is not 3 at all uncommon, that drives the ID to be 4 28.6 minus two times three and that's why 5 the ID is shown in red there. 6 See at the top where I say 7 input is in black, output is red. That 8 tells you that the red is calculated and the 9 mistake I have is that 10.49% is calculated 10 and that should be red also. I apologize. 11 I will fix that. 12 Q. Why did you choose a three 13 millimeter -- scratch that. 14 Did the three-millimeter wall 15 thickness come from any prior art reference 16 involved in this matter? 17 A. I did the answer, I'm just 18 checking. Because when you talk about 19 tubes, using the bicycle world, you're going 20 to always start with a nominal. You know, 21 the -- sometimes it's referred to as, like, 22 a standard tube. And three millimeters is a 23 standard wall thickness for this type of 24 highly stressed area. 25 So I don't know if I just

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Page 210 1 A. Slocum, Ph.D. 2 picked that or there was actually also 3 referred to -- again, I can go back and read 4 everybody if you want. But that's a -- a 5 POSITA would use that as a good starting 6 point. 7 Q. Slightly different question. 8 Is it stated in your 9 declaration where this three millimeter 10 figure comes from? 11 A. I'm just saying that -- here's 12 the basic type of calculations a POSITA 13 would do. And I chose a typical diameter of 14 28.6. In the '993, it notes an outer 15 diameter of 28.5, so that's the same -- let 16 me see if the '993 gave me a typical output, 17 I guess. 18 It either might have or, you 19 know, again, this is what a POSITA would be 20 working with. Let me find my -- I've got to 21 figure out what I did with my '993. 22 Q. If need be, I can bring it up 23 and share my screen or it should be in your 24 Exhibit Share, too. 25 A. Yeah, let me go there. Let me	Page 212 1 A. Slocum, Ph.D. 2 circle, you wouldn't -- I mean, this 3 particular part of this spreadsheet, the 4 next one goes into varying or oval. This is 5 just concentric circles on Moechnig -- not 6 Moechnig. 7 I'm just showing what would 8 happen with the circles if you varied along 9 the length of it, like if I take -- Moechnig 10 is not always a circle. 11 So anyway, that's where the 12 three millimeters comes from. If I start 13 looking at -- pick a diameter that is 14 referenced in OD, in a highly stressed area 15 like a steerer tube, three millimeters is 16 not uncommon, it's about an eighth of an 17 inch. Sometime it's thinner. But that's a 18 good a starting point. 19 Then you get a ratio ID over OD 20 that is -- again, it's a starting point. 21 Here's a standard tube and this shows what 22 the relative strength of aluminum, for 23 example, versus steel would be. Then a 24 POSITA works outward from there. 25 Q. Can you agree that Moechnig
Page 211 1 A. Slocum, Ph.D. 2 try. I wonder if I could search for thick. 3 Q. I will represent to you that 4 when I search for it, I find 19 instances of 5 the word thick at least. 6 A. This might not be a searchable 7 PDF I've got on here. 8 Q. Okay. 9 A. So let me just start reading. 10 I don't think I can search. 11 Q. I will represent to you that 12 the only place when I search for MM are in 13 columns three and four. 14 A. So that's where I'm reading. 15 It's giving ratios of diameters. I see two, 16 I see one. So that three millimeters, that 17 falls within the ratios that he's talking 18 about. If I pick an outer diameter and then 19 I start looking at some of the ratios that 20 are being referred to -- 21 Q. Did you use the '993 disclosure 22 in coming up with the figure? 23 A. No. This is constant circular 24 cross section. For the '993, which has, 25 like, for example, oval inside of the	Page 213 1 A. Slocum, Ph.D. 2 doesn't state a three millimeter wall 3 thickness? 4 A. Right. I did not find -- I'd 5 have to go through and look through the 6 whole thing -- that particular wall 7 thickness. 8 Because remember, Moechnig 9 is -- you know, I don't find that particular 10 wall thickness. This is just exemplary in 11 the range of what a POSITA would typically 12 see I put in. 13 Q. Rather than being something 14 that is stated in a prior art reference, 15 this is a figure that you as a POSITA 16 believed was reasonable? 17 A. Right. I started with the OD 18 that is stated as a typical and then I said 19 okay, what is known and a starting point for 20 the standard tube would be -- it's three. 21 If you really are pushing it to 22 the limit, you may go two and a half or even 23 two. I don't think I've ever seen any -- 24 well, yeah, some heavier load things, three 25 and a half. But three is a good

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Page 214 1 A. Slocum, Ph.D. 2 representative starting point. 3 Q. Please turn now to paragraph 4 131 of your declaration, which is Exhibit 5 1003. 6 A. Okay. 7 Q. Where did you get the 1.57 8 number stated in this paragraph? 9 A. If I look at Denk's tube -- 10 okay. So if you go to looking at Denk, at 11 the section II that's figure 1A, then I 12 scale the relative diameters or the major 13 and minor diameters, that's what I get. 14 Let me check to see if Denk 15 actually gave me a number or if I measured 16 that off the drawing as an exemplary. 17 I can't scale a drawing in term 18 of size, but I can get relative shape. So 19 let me check. I seem to recall that he was 20 giving me some ratio, but I need to read. 21 (Witness reviews document) 22 No, I'm not finding a 23 particular ratio unless I bleeped over it. 24 Other than that, I 25 recall measuring to see does that make	Page 216 1 A. Slocum, Ph.D. 2 A. Well, that's my starting point. 3 Those particular numbers -- maybe it was 4 from the '993. Let me go through in terms 5 of those particular ratios. 6 Yeah, because if you go -- the 7 following ratios come from the '993 column 8 four, starting around line 49. It says 9 ratio IC 2 to IC 1, taking a tube in 202 10 could be a range of 105 to 1.3 and more 11 preferably, in the range of 1.01 to 1.25. 12 The combined length of the 13 upper range -- it says: More preferably, in 14 the range of 1.1 to 1.25. The combined 15 lengths of the upper portion and the lower 16 portion can be chosen between 40 millimeters 17 and 200 millimeters and about 101 18 millimeters. 19 Then it says: Ratio of the 20 upper section inner diameter IA to the upper 21 section outer diameter can be chosen to be 22 in the range of .75 to .95. 23 Again, that -- this three 24 millimeters earlier from the ID and OD would 25 fall within that range. So there are the --
Page 215 1 A. Slocum, Ph.D. 2 sense, what I see in it. I do recall 3 measuring the ratio relative size. 4 But my first pass re-read of 5 it, I don't have that specific number. 6 Q. Did you use a ruler to measure 7 the relative sizes? 8 A. No, I used the dial caliper. 9 Q. Of course. 10 A. On my desk at home. Not here. 11 Q. In paragraph 131 of your 12 declaration, you don't state other than -- 13 scratch that. 14 You don't cite any portion -- 15 scratch that. 16 In paragraph 131 of your 17 declaration, you don't cite any particular 18 portion of Denk; is that correct? 19 A. I'm just saying section II, I 20 say it's about 1.57. So that's where that 21 comes from. Take two measurements, divide 22 them. 23 Q. Your support for the statements 24 in paragraph 131 of your declaration is Denk 25 figure 1A, correct?	Page 217 1 A. Slocum, Ph.D. 2 starting with here's a typical standard 3 section and here are sizes that are 4 ratiometrically on the order of what is 5 cited by the '993 and if you go and actually 6 measure Denk, that 1.57 is a starting point 7 for Denk. 8 Then Denk goes from there all 9 the way to concentric circles, so the ratio 10 would be one. 11 Q. Why are we changing to a 12 concentric circle? 13 A. Well, Denk teaches that. You 14 may want to start where things are very 15 highly stressed, with them having an ellipse 16 inside the circle and then as the stress 17 gets less, you may want to converge on 18 something more like a concentric circle and 19 then the wall thickness gets thinner. 20 Q. And a circle has a ratio of one 21 to one necessarily? 22 A. Well, the ratio -- the inside 23 diameter and outside diameter is not going 24 to be one to one. You just have a circle. 25 You don't have a cylinder.

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Page 218 1 A. Slocum, Ph.D. 2 Oh, the -- I'm sorry. The 3 ratio of the major and minor diameter in 4 terms of between the two cross sections, you 5 could go from one being oblong and then it 6 tapers down, so instead of one -- instead of 7 being elliptical, it can go to being a 8 circle. So the ratio between the two 9 different diameters will change. 10 If they're one to one, then the 11 major and minor diameter are equal and then 12 you have a circle. If they're different, 13 you have an ellipse. 14 See, that's the major 15 diameter and the minor diameter. Because 16 earlier, we were talking about OD to ID in 17 the first table and now here in paragraph 18 131, I'm talking about the ratio of major to 19 minor diameters, which is also what I was 20 just referring to from the '993 patent 21 ratios. 22 Q. Does Denk disclose any outer 23 diameter amounts? 24 A. Again, I don't think Denk gave 25 me specific numbers. It's just a bicycle	Page 220 1 A. Slocum, Ph.D. 2 So Valat is not limiting it to any one 3 particular diameter. 4 Q. Would you please turn to page 5 161 of your declaration? We're moving on 6 down. 7 A. Okay. Hold on. 8 Q. No rush. Thank you. 9 A. I flip too fast -- 10 Q. I can stop you. I think I 11 mean -- I think I mean somewhere else. Oh, 12 no. Okay -- 13 A. 161 paragraph -- 14 Q. Yeah -- strike that question, 15 please. Give me one moment and I'll find my 16 place. 17 Here we go. Would you please 18 turn your attention to page 85 of your 19 declaration? 20 A. Okay. Eighty-five. The big 21 spreadsheet. 22 Q. Is the table above where it 23 says lower in 202 what we previously 24 discussed just a few moments ago? 25 A. Correct. I am now -- because I
Page 219 1 A. Slocum, Ph.D. 2 tube and he talks about head tubes, seat 3 tubes, fork tubes. Denk talks about the 4 stays. The stays, for example, chain stays, 5 they start larger diameter and then outside 6 diameter tapers down to a smaller diameter 7 back near where the derailleur is. 8 So Denk is tapering the outside 9 diameter for the stays he's talking about in 10 figure two don't appear to be tapered, but 11 the stays will. 12 So I -- absent Denk giving me 13 specific numbers, it's going to be a POSITA 14 will know here are reasonable numbers for a 15 bicycle depending upon what type of bike 16 you're designing and what size frame. 17 Q. Does Valat disclose any outer 18 diameter amounts? 19 A. Let me check because I don't 20 recall. I just want to make sure I check. 21 He doesn't and he talks in 22 claim one a tube for cycle and motorcycle 23 frames. So those almost necessarily will 24 have very different diameters, because a 25 motorcycle is a much heavier loaded system.	Page 221 1 A. Slocum, Ph.D. 2 wrote this as a big giant thing and earlier, 3 I just put in a little piece and here, I put 4 in everything. 5 Q. Again, red-colored numbers are 6 derived, whereas black-colored numbers or 7 inputs you put into these calculations? 8 A. Correct, with the exception of 9 the wall thickness/OD ratio of 10.49%. That 10 should be red because that was calculated. 11 Q. What is shown in scenarios one 12 through five? 13 A. Okay. So what I'm doing there 14 is you can see the OD -- I'm taking from -- 15 I'm keeping the OD fixed at this 42.9 and 16 now I'm doing the ID if round and same wall 17 thickness as its top. Okay? So I'm sorry. 18 The 42.9 across the top should be black. 19 Now, I'm taking the ratio of 20 the OD lower end to upper section and now 21 I'm walking through what would happen for 22 the major and minor axes in these different 23 scenarios. And now if you go to the cross 24 sectional areas, now I calculate the cross 25 sectional areas and that will be helping me

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Page 222 1 A. Slocum, Ph.D. 2 to look at what the weight will be. 3 The moments of inertia, that's 4 that second moment of the area, so that now 5 is indicative of the stiffness and the 6 strength. And now for the design person, 7 this is what is called the structural 8 efficiency or the strength-to-weight ratio. 9 So you look at I over A. That's the moment 10 of inertia divided by the cross sectional 11 area for these different scenarios. 12 Now I'm looking at okay, let's 13 now take a base circular outside, elliptical 14 inside and I'm going to compare that to a 15 circular ID. So I'm looking to see do I 16 want to just use concentric circles with -- 17 or do I want to have a varying wall 18 thickness? According to the teachings of 19 Denk or '993, Campagnolo teaches that, 20 although he's got a multi-material and the 21 bigger number is better. 22 Q. Bigger number where? 23 A. Well, the ratio, I over A. So 24 you see these ID with top wall thickness, ID 25 minor -- so I can drive -- I can pick an	Page 224 1 A. Slocum, Ph.D. 2 if you want. 3 Q. Why did you choose the ratio of 4 OD lower end/upper section to be 1.5? 5 A. That seems, again, on the upper 6 end of what was being referred -- talked to 7 earlier. I can put anything you want. 8 It's -- again, I'm showing this 9 exemplary. It's not hard wired into the 10 woods. And what it's showing is that this 11 is the kind of calculations a POSITA will do 12 and yes, it makes sense if you want to have 13 a circular outside and an elliptical inside 14 with a thicker wall in the direction of 15 travel. 16 Q. For scenarios two through five, 17 you also chose a major diameter to minor 18 diameter, correct? 19 A. Right. That's where it's 20 changing the amount of ellipsoidness. 21 Q. But you didn't choose that 22 major diameter to minor diameter figure for 23 scenario one? 24 A. No. I meant 1.14. Again, you 25 can pick -- you can pick any scenario you
Page 223 1 A. Slocum, Ph.D. 2 elliptical section that is more efficient. 3 In other words, what is taught 4 works in all these patents where they say if 5 you want to maximize the front-to-back 6 stiffness given an outside -- a fixed 7 outside diameter, do you use just a uniform 8 wall thickness or should you have thicker 9 walls in the forward axis motion plane and 10 in the lateral direction make it thinner. 11 You know, take materials from the sides and 12 put it on the top and bottom. 13 Q. You stated that the outer 14 diameters of 42.9 in each of scenarios one 15 through five should have been black; is that 16 correct? 17 A. Yeah. Hold on a minute. Let 18 me -- I'm sorry. I withdraw that. 19 You see the way I picked ratio 20 of OD of lower end over the upper section? 21 It set it to be 1.5 and then that's where 22 now I'm getting the 42.9 and 36.9. 23 So I would have to open up my 24 computer to get to which cells I was 25 referring to. So I can do that at a break	Page 225 1 A. Slocum, Ph.D. 2 want. I'm just showing, for example, the 3 different types of -- when it boils down to 4 the end, the different types of 5 strengths-to-weight ratios you can achieve. 6 Q. For scenarios one through five, 7 you chose the wall thickness to OD ratio; is 8 that correct? 9 A. The ratio of OD of lower end to 10 the upper section. I picked one and a half 11 across it. Then wall thickness/OD ratio, 12 that's a percent. So from what I get from 13 the '993, it's 8.3 and then I start at ten 14 and I go down to eight on my different 15 scenarios. 16 Q. So you use the '993 patent as a 17 reference to come up with a range around 18 which you wanted to study? 19 A. Yes. Again, it's an exemplary 20 and the numbers are all within reason. 21 Q. Does the 1.5 ratio OD lower 22 end/upper section also come from a 23 reasonable reading of the '993 patent? 24 A. I think so. Let me go look at 25 some of the pictures for example.

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Page 226 1 A. Slocum, Ph.D. 2 You look at figure 31 or 32 -- 3 Q. Of the '993 patent? 4 A. Right. That's the Exhibit 5 1001. 6 Q. Mm-hmm. 7 A. Nineteen and 20. To me, 8 that's -- seems reasonable. You know, those 9 kinds of ratios -- 10 Q. So we're using -- 11 A. If I also look at Moechnig, 12 Moechnig has different sections along the 13 length in terms of oval and round, but 14 again, just looking at the taper in 15 Moechnig, there's one other steerer tube 16 guide. No, that's just -- I'll just keep 17 that at Moechnig in terms of the taper I see 18 there. 19 Q. Do you state in your report 20 where these black numbers come from? 21 A. No. Just here is an exemplary, 22 so let me just double check to see if I gave 23 a particular one. 24 Yeah, just look at paragraph 25 132. It's meant to represent the type of	Page 228 1 A. Slocum, Ph.D. 2 Moechnig shows taper from top to bottom, you 3 know, from near the ground up to the top and 4 they show taper and also varying cross 5 section. 6 Denk teaches taper in terms of 7 the rear chain stay, for example, and 8 varying cross section, but Denk doesn't 9 specifically show me a picture of a steerer 10 tube. Denk talks about it in terms of the 11 fork, which includes a steerer tube, and 12 Moechnig specifically is a steerer tube that 13 has taper and varying cross sections. 14 So the two just naturally fit 15 together and complement each other. One 16 speaks to the other. That was my rationale. 17 Whether it's -- again, I don't know how you 18 say most, but these two are very 19 complementary, intertwined, similar. An 20 adjective like that. 21 Q. May I now turn your attention 22 please to 161 of your declaration in this 23 matter, which is Exhibit 1003? 24 A. Exhibit 1003. 25 Q. Your declaration in this
Page 227 1 A. Slocum, Ph.D. 2 calculations a POSITA would do to compare 3 design options. I didn't have a particular 4 bicycle in mind that I could point to, but 5 this is representative of what a POSITA 6 would do. 7 Q. Dr. Slocum, you cite to 8 Moechnig in paragraph 133. 9 Do you cite to Moechnig because 10 it's the most relevant prior art patent to 11 steerer tubes? 12 MS. BHATTACHARYYA: Objection. 13 Form. 14 Mischaracterizes the record. 15 A. I don't know how to -- what do 16 you mean most? I don't understand that. 17 Q. Moechnig discloses a steerer 18 tube having asymmetric portions, correct? 19 A. Correct. 20 Q. As a result, are Moechnig's 21 teachings particularly relevant to this 22 matter? 23 MS. BHATTACHARYYA: Objection. 24 Form. 25 A. They're relevant in that	Page 229 1 A. Slocum, Ph.D. 2 matter. 3 A. Yeah, but page 161? 4 Q. As its marked at the bottom. 5 A. I stop at 150. 6 Q. Do you have Exhibit A -- 7 A. I apologize. I apologize. Did 8 I lose that page? Here we go. Page 160 is 9 Exhibit A. 10 Q. Exhibit A. 11 A. I don't have a 161. That would 12 be the front page of my CV. 13 Q. Do you have your CV with you? 14 A. I do. This is on the report, 15 but it's not marked as 161. 16 MS. BHATTACHARYYA: Dr. Slocum, 17 I believe he's referring to the bottom 18 page numbering. 19 THE WITNESS: I apologize. I'm 20 seeing my CV has a one, two, three, 21 four. 22 MR. DURBIN: I understand. 23 Oftentimes, it can be three or 24 four different numbers. Once you get 25 to appeals, there is even more.

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Page 230 1 A. Slocum, Ph.D. 2 THE WITNESS: Okay. I'm in my 3 Exhibit A -- this is called my Faculty 4 Personnel Record. 5 MR. DURBIN: If you wouldn't 6 mind, Dr. Slocum, I'd like to ask 7 Arpita if this would be an okay time 8 for me to indicate that we're going to 9 talk about Dr. Slocum's CV and his 10 background. 11 MS. BHATTACHARYYA: Sure. 12 Yeah, we can put a marker down here 13 that you're going to start asking about 14 Dr. Slocum's CV here. 15 I have to consider the 16 questions asked and testimony given 17 before we reach any agreement about 18 that. 19 MR. DURBIN: Great. 20 THE WITNESS: I'm going to 21 request a short -- I only need five 22 minutes because I've exhausted my 23 fluids and my voice is getting crunchy. 24 MR. DURBIN: We're at a good 25 time for you to take a -- let's take a	Page 232 1 A. Slocum, Ph.D. 2 then what I don't have on here are many 3 pages of students and their thesis titles 4 listed. I don't think I included -- oh, 5 wait. Maybe I did. 6 Q. I will represent to you that 7 there are some of them at least. 8 A. There's a lot of them. They're 9 not really up to date, particularly the 10 bachelor CCs. My department head howls at 11 me for that, but I'm pretty good about 12 updating it. I lost my most amazing 13 assistant who used to help with that some 14 years ago and we haven't found a new one. 15 The articles and patents I 16 think are mostly up to date. There's a few 17 more patents issued recently. 18 Q. My first question is is this 19 personnel record, we could call it, up to 20 date? 21 A. This one is from 1st of 22 December, so there's a few more articles, 23 December 2022, two more articles and patents 24 that have come out. I'm somewhat of a 25 chronic inventor, I bring out lots of
Page 231 1 A. Slocum, Ph.D. 2 five-minute break. 3 I see it's 4:50. Let's come 4 back around 4:55. 5 THE WITNESS: Good. I just 6 need to re-water things. 7 THE VIDEOGRAPHER: Time is 8 5:50 p.m. 9 We're off the record. 10 (Recess taken) 11 THE VIDEOGRAPHER: We're on the 12 record. 13 The time is 5:57 p.m. 14 BY MR. DURBIN: 15 Q. Dr. Slocum, do you have your CV 16 before you? 17 A. I do. 18 Q. What is your CV? 19 A. This is called the School of 20 Engineering Faculty Personnel Record. I 21 don't keep a separate CV according to 22 whoever defines what they are. 23 This lists my education, where 24 I am in the faculty, some previous 25 employment, awards, patents, articles and	Page 233 1 A. Slocum, Ph.D. 2 products. I mean, I teach engineering and 3 the best way to teach engineering is to do 4 engineering, I find. 5 Q. Does this personnel record 6 accurately reflect your work history? 7 A. It does. 8 Q. Do we need to caveat that 9 response and say it reflects your work 10 history up to December 1st, 2022? 11 A. Well, even until now. I still 12 work at MIT. I do not list companies for 13 which I work. Most of for whom I work do 14 not allow me to say for whom I work. You 15 can infer that when you go look at patent 16 assignments. 17 There are business strategy -- 18 or I guess you call it business strategy -- 19 reasons why certain companies don't want 20 their competitors to know I design stuff for 21 them. 22 Q. Under item five on page 161 of 23 your declaration, what is a principle field 24 of interest? 25 A. So that's the principle field

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Page 234 1 A. Slocum, Ph.D. 2 of interest. I mean, within mechanical 3 engineering, for example, fluids, 4 thermodynamics, controls, product design. 5 Precision engineering is a particular field 6 of interest. It's like -- a term like 7 mechatronics, it's a -- within precision 8 engineering, there are sub fields, but my 9 expertise within precision engineering 10 ranges from servomechanisms to structures 11 all related to instruments, machinery and 12 products. There are a number of precision 13 products, like medical instruments, for 14 example. If you look at the bearings that 15 are used in bicycles, for example, those are 16 precision bearings and then the wheel hub 17 assemblies. 18 So precision means 19 repeatability. You want that and how 20 repeatable depends on how much you're 21 willing to pay. 22 Q. What is your level of skill in 23 the precision engineering field? 24 A. I've written one of the 25 more-referenced textbooks called Precision	Page 236 1 A. Slocum, Ph.D. 2 wave or anything, that's what a damper does. 3 Dampers take input and then they convert the 4 energy of input to some output, whether it's 5 heat or electricity, but you have got to 6 gather it and then do something with it. 7 For example, OMAX machinery -- 8 I don't know if you're familiar with the 9 water jets -- I was the geek behind the 10 founding of the whole structure part of 11 that. John Olson was the pump man. His son 12 Carl then was the software geek. You work 13 with people and you have fun designing 14 stuff. 15 Q. In the field of precision 16 engineering, are you above ordinary skill? 17 A. My best students are better 18 than I am. I dress better than they do. So 19 it's always wise to say, you know, I'm not 20 bad, I'm pretty good, but I'd like to think 21 of myself as being able to make a lot of 22 people who are as good or if not better than 23 I am. Because that's what I do, right? I'm 24 a professor. I'm supposed to pass on all my 25 knowledge to others who will then do even
Page 235 1 A. Slocum, Ph.D. 2 Machine Designs. A lot of awards, patents, 3 lot of products that have done very well. 4 I'm a member of the National Academy of 5 Engineering. I was cited for my work there. 6 Every single semiconductor 7 wafer made on the planet is carried in 8 what's called a FOUP container, for which 9 I've designed, developed, brought forth the 10 standard that holds that thing. It's a 11 kinetic coupling. 12 I hate to blow my own horn in 13 that respect, but anyway, I love mechanisms 14 and machines, bearings, spindles, 15 mechatronics. I do offshore energy recovery 16 systems. 17 Some of those are -- they're 18 becoming much more important. Won best 19 paper awards for the energy harvesting 20 mechanisms on those structures. 21 I'll be flying to Malaysia. At 22 the end of the semester, we're having a big 23 meeting on particularly how do you bring 24 those things forth. 25 When you harvest energy from a	Page 237 1 A. Slocum, Ph.D. 2 better. 3 Q. Under item six, you list 4 several individuals who shared this same 5 field of interest, correct? 6 A. Correct. And the latter two I 7 think now recently became full professors. 8 Q. What does rank refer to in item 9 six? 10 A. So in the academic word, you 11 have assistant professors or the newbies, 12 and after typically, you know, two to three 13 years, they can become an associate 14 professor without tenure, so you get a pay 15 raise and you get to be on a few more 16 committees. Then you get to associate 17 professor with tenure, which give you a 18 little more money and even more committees. 19 Tenure implies that unless you 20 do something really stupid, they're not 21 going to fire you. So when we have a new 22 president and I fire off a memo that's why 23 this president is making foolish things, 24 decisions, I can't be fired for that. They 25 may threaten to put me on more committees.

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Page 238 1 A. Slocum, Ph.D. 2 But the rank of full professor, 3 that's it. That's the end of the line. 4 You're done. You're finished. So don't 5 worry about doing anything other than 6 producing more students and as much research 7 as possible. 8 Q. What is your rank? 9 A. I'm a professor, full professor 10 and a chaired professor. So I have the 11 Walter and Hazel May professorship. So a 12 chair I guess you could say is another 13 notch. So an endowed professorship or 14 chair, that gives me some extra play money. 15 Q. Does it give you authority over 16 people with a lesser rank than you? 17 A. No. The academic world is a 18 very flat -- it's very flat. Again, I'll 19 sit on -- to promote someone from assistant 20 professor to associate professor, the 21 promotion committees only have tenured 22 professors and then to go from associate 23 with tenure to full, it's only to full 24 professors. 25 Q. Please now turn your attention	Page 240 1 A. Slocum, Ph.D. 2 interesting work happening. 3 Then machine tools, you know, 4 the best of show, a whole slew of what are 5 called R&D 100 awards. So these are when 6 you bring out a new technical product, this 7 magazine -- it still is around, very good -- 8 they point out, you know, what are one of 9 the 100 best new technical products of the 10 year, so there's a whole list of products 11 shown there. 12 I worked quite a lot and spent 13 a decade specifically teaching inner city 14 high school kids and then minority kids at 15 MIT. This is before it was cool. Here is a 16 class of young people who have been ignored 17 and I have a soft spot for that, so we spent 18 quite a lot of time and I taught them how to 19 do precision design. It worked really quiet 20 well. I had a number of those kids, 21 students then go on to graduate degrees. So 22 that worked out really well. 23 American Society of Mechanical 24 Engineers, it's called the Leonardo DaVinci 25 Award and then the Machine Design Award
Page 239 1 A. Slocum, Ph.D. 2 to the next page, page 163 of your 3 declaration, Exhibit 1003. 4 A. Okay. 5 Q. What is listed in this Section 6 12? 7 A. So these are awards and honors 8 over the years from when I worked at the 9 Bureau of Standards, which was within the 10 Department of Commerce for various robotic 11 elements I did during that period. 12 And then item ten, I had a 13 specific bronze medal for federal service 14 because I was doing a lot of stuff within 15 the Bureau of Standards to help the 16 Department of Commerce and the national 17 laboratories. 18 The Royal Society Fellowship, I 19 was working in England for a year. And then 20 this Oak Ridge fellowship, you may remember 21 the Star Wars program that President Reagan 22 initiated, so I designed quite a lot of 23 machinery specifically for that. And we 24 don't need to talk about anymore details 25 than that, but it was quite a lot of	Page 241 1 A. Slocum, Ph.D. 2 specifically for my machinery designs. 3 This Star Energy Award you see 4 in 2014 -- I'm just going through some of 5 them -- that's specifically for my work on 6 energy machines, energy harvesters. This is 7 before it became I guess cool, but now such 8 things are really important, the dynamics of 9 how those machines really work. 10 Again, that's what's leading to 11 some of these current offshore energy 12 harvesters, for example. 13 Then one of them, for example, 14 in item 40, this Best Paper Award, where we 15 showed -- Jocelyn Kluger, she was my 16 doctoral student -- and specifically how you 17 mathematically define how to design these 18 oscillatory systems. So as the waves move 19 elements up and down, how to extract the 20 energy you want most efficiently. There's 21 some very specific mathematics behind that. 22 Let's see. In 2020, I was 23 elected to the National -- I'm sorry. 24 Fellow of the American Society of Precision 25 Engineering. So again, that's one of those

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Page 242 1 A. Slocum, Ph.D. 2 old guy awards for okay, I do a lot of 3 society, teaching, et cetera. 4 2017, National Academy of 5 Engineering, which was formed by Abraham 6 Lincoln and our job on the committee is to 7 do -- to give answers to the federal 8 government that are nonpartisan. Like here 9 is just what the science is. If you guys 10 want to fight about politics, that's not our 11 department. Our department is to say one 12 plus one is two. Whether you agree or not, 13 it's two. And as you can tell, some people 14 don't always agree that one plus one is two. 15 Okay. That's that section. 16 Q. Do any of these awards that you 17 just discussed directly relate to steerer 18 tubes? 19 A. In terms of vary cross sections 20 and mechanically get what you want, yes, a 21 number of them do. But not steerer tubes, 22 but the calculation of structural 23 optimization to make things happen in the 24 direction you want. 25 Would you like me to show you?	Page 244 1 A. Slocum, Ph.D. 2 another structure within the inside of it, 3 different dimensions to control how the two 4 structures move with respect to each other 5 because whenever you have a bonding layer 6 between elements, you have energy 7 dissipation. 8 So the ShearDamper has, in 9 particular, round sections with varying 10 sections on the inside to get that 11 non-linear, if you will, differential motion 12 between the two for damping. 13 Now, when you go and you look 14 at any of the spindles, like the 15 HydroSpindle or the TurboTool, those are 16 spindles for machine tools where you have to 17 optimize the rotating part, which would be 18 analogous to the steering tube, with respect 19 to the cross sectional stiffness, with 20 respect to the length of it, so at the end 21 of the tool, it doesn't vibrate too much. 22 Okay. So that's all about 23 round -- things that rotate held in another 24 thing outside that doesn't rotate and how I 25 vary the cross section along it to get the
Page 243 1 A. Slocum, Ph.D. 2 Q. Yes, please. 3 A. Okay. So the first thing is 4 when we go through -- I wish I had bigger 5 type. Hold on. 6 Q. I can zoom in on my Exhibit 7 Share -- 8 A. That's going to be very helpful 9 for my old eyes -- 10 Q. Do you want to bring it up on 11 your computer or do you want me to share my 12 screen? 13 A. It's easier if I do because 14 then I can scroll down. Let's see. It 15 would be in the end of my declaration. 16 Q. That's correct. I'm getting 17 page 163 of the PDF, 163 as its stated at 18 the bottom. 19 A. Oh, look at this. Nice big 20 text. I like that. 21 Okay, if you look at this thing 22 called -- we'll start at number 16 -- the 23 ShearDamper -- okay. What the ShearDamper 24 is, it allows you to pick -- typically, for 25 example, a round structure and then what is	Page 245 1 A. Slocum, Ph.D. 2 performance at the end to be what you want. 3 So that's all the mechanics we 4 were talking about earlier. 5 See the ShieldBeam Contactor? 6 This R & D 100 -- and there are patents for 7 each on of these things. When we get to the 8 patents, we can go through. 9 What that was, this allowed -- 10 the best way to describe it is that when 11 you -- all semiconductors -- all 12 semiconductor devices are tested when 13 they're on the wafer and then when they're 14 packaged before they're sent out. All of 15 them. 16 You have to have these little 17 springy beams that come down and touch them 18 and the springy beams are best described as 19 having an outer ground layer, an inner 20 conductor and then another outer ground 21 layer on the other side. It's like an ice 22 cream sandwich. 23 In order touch the device under 24 test, which is called a DUT, device under 25 test, with the prescribed amount of force so

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Page 246 1 A. Slocum, Ph.D. 2 you get the proper electrical impedance, 3 that little cantilever beam has to have a 4 very specific stiffness because there's a 5 range of deflections of the beam that will 6 occur based on the tolerance on the shape or 7 the size of the semiconductor device being 8 tested, particularly when it's a package 9 device. 10 And if you push too hard, you 11 leave a mark on the device, which will 12 affect how it solders. If you push too 13 light, you don't get enough electrical -- 14 good enough electrical content to do a test. 15 What the shield beam does, it 16 specifically looks at how you taper the 17 outside surfaces of these ground layers over 18 the length of those beams in order to get 19 the proper stiffness or deflection of the 20 beam over the range you want to when you're 21 trying to package it into a very small 22 space. 23 We probably sold many, many 24 tens of millions of those little detectors 25 and they for years were the de facto way how	Page 248 1 A. Slocum, Ph.D. 2 awards. We can go and start hitting up the 3 patents, if you want. 4 Q. I would like to go there, but 5 before we go there, can -- one moment, 6 please. 7 A. It's bringing back a lot of fun 8 memories. Thank you. 9 Q. Do any of these awards that are 10 listed in Section 12 directly relate to 11 suspensions -- scratch that. 12 Do any of these awards that you 13 just discussed now directly relate to 14 bicycle suspensions? 15 A. Yeah. I mean, again, it has 16 the word bicycle in it? No. Is it a 17 dynamic system described by a massive spring 18 and a damper and how you design the damper 19 and spring ratios and leading of oil through 20 orifices and direction, then -- where was 21 that? See this? The combined offshore wind 22 wave storage power system. So that 23 particular paper, we go into specifically 24 how you ratiometrically do these types of 25 designs and we also show in there that a
Page 247 1 A. Slocum, Ph.D. 2 Teradyne measured I don't know how many 3 billions of chips. So there was a lot of 4 those little thingies and some very nice 5 spreadsheets that went with that. 6 That specifically goes into how 7 you do these types of structural 8 calculations. And again, the spreadsheet 9 doesn't care whether it's a steerer tube or 10 a spindle or an electrical contact. It's a 11 mechanical structure with a defined 12 stiffness where I'm varying the cross 13 section to achieve what I want to do. 14 Okay. And then now we come 15 down to -- see here -- we'll talk about this 16 tomorrow also, these things. 17 All these energy -- energy 18 capture systems, they're typically tubular 19 and you've got to minimize cost and you have 20 to control the stiffness of them in order to 21 get the performance you want. 22 But that's a common -- that's 23 also working with the dynamics of the 24 system. 25 Okay. So that's under the	Page 249 1 A. Slocum, Ph.D. 2 fluid system is really the best way to 3 harvest energy. 4 There's a whole slew of 5 companies out there that raise vast 6 quantities of money for what looks 7 beautiful, the computer animations are 8 fantastic, but they're full of gears and 9 other things that mechanical engineers often 10 love to do, but their lifetime in the ocean 11 will be maybe a year or two before they 12 break. Hydraulics is the way to go. That's 13 the way it is. 14 Then when you get back to -- 15 you see the damping work, so all the 16 hydraulic work here, the HydroSpindle, 17 HydroGuide, TurboTool, the cylindrical 18 grinder, these are all machines that use 19 hydraulic fluid passages and when you do 20 grinding -- you create grinding machines 21 with hydrostatic bearings, you have to very 22 carefully control what is the stiffness of 23 the machine versus the damping. If it's too 24 squishy, you don't get an accurate part. If 25 it's too rigid, then the thing will chatter

Page 250 1 A. Slocum, Ph.D. 2 and you won't get an accurate part. 3 Again, the math is the same. 4 You have a mass, you have a spring and a 5 damper. For hydraulics, it's what's the 6 fluid resistance between the different 7 cavities in the bearing. 8 A lot of these bearings are 9 orifice fed, so you have to size the orifice 10 to get the right flow rate and match 11 the flow through the bearing and then out. 12 That's how all that design work is done. 13 So for example, we use quite a 14 few LEED products in these patents and one 15 of the patents that we're going to talk 16 about specifically in the next day or two, 17 if I recall, also cite from the LEED 18 catalog. So it's all the same type of 19 catalogs. 20 I forgot where we are now. 21 Q. Have you finished with your 22 discussion of the awards and how they relate 23 to bicycle suspensions? 24 A. Right. There's not one that 25 specifically says bicycle. It's a mass	Page 252 1 A. Slocum, Ph.D. 2 an inventor on that have been awarded over 3 the years. 4 Q. Do any of these patents relate 5 to bicycles? 6 A. In terms of structure and 7 damping and whatnot, yes, but they don't 8 relate in terms of specific use of the term 9 or word bicycle. 10 Q. Do any of the items listed in 11 the section specifically relate to tubing? 12 A. Yes. So if we go -- and I'm 13 not going to include tubing where this 14 rotating spindle shafts are often tubes. I 15 mean, I could, but -- that's typically what 16 they often are. 17 You have the shaft that rotates 18 as an OD and then there's an ID through 19 which you either pass coolant or you have a 20 -- it's called a draw bar to close a chuck. 21 So yeah, there you go. 22 So those are tubes, a spindle 23 that rotates within one and the stiffness 24 varies along the length because the cross 25 section varies. Although those particular
Page 251 1 A. Slocum, Ph.D. 2 spring damper and the mathematics are the 3 same and the mechanical elements are 4 actually the same, a little different size. 5 Q. Maybe different speed for some 6 of them, correct? 7 A. You know, it's interesting you 8 say that because when you get to wave 9 energy -- again, it depends if you or I are 10 riding our mountain bike, the frequency is a 11 lot different than some of these kids 12 roaring down the side of Altuez. They're 13 more like in the machine tool vibration 14 elements. 15 THE COURT REPORTER: Doctor, 16 can you please slow down? 17 THE WITNESS: Sorry. 18 MR. DURBIN: We'll try to 19 remind you in the future. 20 BY MR. DURBIN: 21 Q. I'd like to now move on to 22 Section 14 of your CV or faculty report. 23 A. Okay. 24 Q. What's listed in Section 14? 25 A. So these are patents I've been	Page 253 1 A. Slocum, Ph.D. 2 high speed spindles, they're all circles. 3 You won't be rotating an ellipse. 4 Now, when you get down to -- 5 all the hydrostatic bearings that rotate all 6 are tubes within tubes. Now, when you get 7 to -- can you see my -- it doesn't 8 highlight -- number 16. 9 That is -- that was the core 10 patent for the OMAX water jet cutters, which 11 are all tubular. The new versions which we 12 didn't patent, which we have kept a trade 13 secret, don't use rounds, they use D shapes, 14 but I don't want to say anything more. And 15 they're not constant wall thicknesses. 16 I know our competitors have 17 already bought some machines and cut them 18 apart, but I'm still not going to -- 19 vague -- anyway. 20 Okay. Then you see here in 21 item 20, Slit-Tube Replicated In-Place 22 Constrained Layer Damper, this is, again, 23 that you have to pick the relative 24 stiffnesses of the tubular components to get 25 the dynamic bending performance you want.

Page 254 1 A. Slocum, Ph.D. 2 A lot more again on the 3 spindles. So you see here -- well, again, a 4 lot of structure ones, the apparatus for 5 damping, 30 -- when you look at -- and I 6 think it's 36 -- I think it's 36. Hold on. 7 It may have been earlier. 8 This is the crane structure for 9 picking up and placing the Teradyne 10 manipulators and that's a tubular structure 11 where everything is varying to get -- again, 12 you're trying to pack everything in a small 13 place and one of the elements was a 14 telescoping ball screw, so you have 15 telescoping round shafts. 16 Okay. Here is the fundamental 17 patent on that contactor. Remember I 18 mentioned the contactor that we sold a whole 19 lot of, the little shield beams? 20 Q. Which number is that? 21 A. This is 45. This is where you 22 have varying cross sections on the top and 23 bottom layers of the connector to get the 24 stiffness you want and the electrical 25 impedance at the same time, which everyone	Page 256 1 A. Slocum, Ph.D. 2 looking for Nessie. 3 I don't know if I should say 4 this on the record, but I thought after 5 about a few drams of whiskey each, we were 6 able to definitely see Nessie. I'm not 7 exactly sure, but the tubular platform 8 worked great. It had the performance it was 9 supposed to. 10 But that's not directly related 11 to bicycles, but it was a fun tubular 12 structure. Sadly, Bob is no longer with us. 13 Okay, let me keep going. More 14 contactors, thermal systems. This is all 15 semiconductor test and managing how you test 16 things. Now there's -- there's also a fair 17 number of hydrostatic bearings or spindle 18 patents, those are also in here. 19 Now, if you look at 92, this is 20 one of the more important patents in the oil 21 and gas -- actually, geothermal industries 22 now. 23 So I'm the inventor of what's 24 called a ball piston and when you drill for 25 hydrocarbons or now for geothermal wells, if
Page 255 1 A. Slocum, Ph.D. 2 said you couldn't, but we did. 3 That's not a tube. Those are 4 plane or varying cross sections. But again, 5 you have what looks like an ice cream 6 sandwich. 7 Here, you can see this point in 8 my life, I'm doing a lot of work with our 9 semiconductor company. We had a testing 10 company called Connectrix. 11 If you look at 61, that was one 12 of the more fun ones. This was with 13 Professor Robert Rines. He was actually the 14 founder of the Franklin Pierce Law Center up 15 on Concord, which is now part of UNH. 16 Q. Indeed. 17 A. Bob and I were friends for many 18 years. He worked with his dad to help set 19 up EG & G. Then Bob and Harold Edgerton and 20 Greer, they use to go to Lochness every year 21 to look for Nessie and drink a lot of 22 whiskey and then Bob started inviting me to 23 come along and -- with this son Justin -- 24 and anyway, designed this very nice tubular 25 structure for holding the cameras for	Page 257 1 A. Slocum, Ph.D. 2 you can make the well follow the contour of 3 the strata, that means you can put one well 4 going vertically and now you can track where 5 the hydrocarbon bearing rock is or now 6 they're actually finding for geothermal 7 systems you could track the hot vein or you 8 can make the well drill in one place and 9 then many miles away, have the well pop out 10 of the ground. 11 And previous to this -- this 12 was for Schlumberger, which is renamed now 13 SLB -- you could only drill a few kilometers 14 before the special head that guides -- that 15 pushes the drill bit where you want it to 16 go, the piston, the seals would wear out. 17 These are a series of 18 single-acting pistons, so you have to be 19 able to provide a known force in one 20 direction if there's single-acting pistons 21 and then as the bit rotates, the pressure of 22 the rock will now -- I'm not supposed to 23 make noises. Sorry -- will now collapse the 24 piston, forcing the oil through a known 25 restrictor orifice, so it's a damper. If it

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Page 258 1 A. Slocum, Ph.D. 2 goes too fast or too slow, the thing can 3 shatter and you won't be able to drill. 4 So all the previous design, 5 they used seals like polymeric seals -- 6 right? -- but as you drill deep, it gets hot 7 and you're dealing with rock and drilling 8 mud, which is not necessarily the least 9 abrasive thing on the planet. So the 10 typical life of a seal may be a couple 11 kilometers of drilling. 12 So I came about this -- I've 13 been doing a lot of design work for 14 Schlumberger, a lot of my students go work 15 there and one of the people at the time said 16 Alex, do you know any good polymer chemists 17 because we're having a problem with our 18 seals. And I still remember this. I said 19 you know, you realize why fish don't have 20 propellers. What? Yep, because God knew 21 there would be a problem with the seals. 22 So I'm going to design 23 something that does not use seals and I was 24 told impossible, it'll never work. I said 25 what I wanted to do. No, it'll never work,	Page 260 1 A. Slocum, Ph.D. 2 So the mathematics, this is 3 directly related to the damping cases we're 4 doing. I don't use seals, I use a ceramic 5 ball and special shape that never wears. 6 The fluid dynamics relating to energy, 7 damping and actuation are the same math. 8 Those are good memories. 9 There's another couple of things related to 10 that that actually we didn't -- they didn't 11 want to patent because they don't want 12 anybody to know. 13 Yeah, a lot of hydraulic 14 machines for drilling holes. Okay. 15 Onward -- 16 Q. Any others related to, you 17 know, steerer tubes or bicycle suspensions? 18 A. The syringes kind of, but we 19 don't need to do that. Now, when you look 20 at -- you see these tapered bellows? Those 21 are axially steps, they're not in bending, 22 so we're not going to count those. 23 Okay. Now this is the next 24 interesting one. There's a series of them 25 with Eric Smith. So we started a company
Page 259 1 A. Slocum, Ph.D. 2 you're a fool. We thought of all this 3 before. Find us the polymer guy. 4 So I went and did it anyway and 5 I have no seals and it's a very specific cam 6 shape -- we could go into this if you want; 7 it's a very nice design -- and it's never 8 failed. 9 There's hundreds of thousands 10 of wells -- near 100,000, many tens of 11 thousands of wells have been drilled and 12 this bit will take you to ten kilometers and 13 more and it doesn't fail. 14 The hydraulic dynamics are 15 exactly as the math predicted, which some of 16 my colleagues said the math is wrong, but it 17 actually works, so the math is right. 18 This is one of the reasons why 19 the United States is actually the world's 20 largest producer of hydrocarbons because we 21 can directionally drill to depths and 22 lengths and things like the Bakken shale and 23 stuff that no one else can even start to 24 touch. Although this is used by 25 Schlumberger all over the world.	Page 261 1 A. Slocum, Ph.D. 2 called Keystone Tower Systems. We were just 3 acquired last year by NOV and this was 4 inventing a way to make tapered, spirally 5 welded, varying thickness tubes which are 6 what is in a wind turbine tower. 7 So if you look at -- it's 8 basically a steerer tube for -- gee, wow, 9 even bigger than the giants in Jack and the 10 Beanstalk because these towers are typically 11 100 meters tall, seven meters at the base 12 and some of the larger eight meters at the 13 base, tapering to four to five meters at the 14 top and the cross section varies according 15 because if you get close to the top, you 16 make it thicker because that's where the top 17 bearings are. It also is much thicker at 18 the base where you bolt it to the floor. 19 And then we are -- across the circumference, 20 we change the thickness forward the door. 21 This machine can make a 22 100-meter long tower in one piece. That's a 23 little bit long, but -- so they generally 24 make it in three pieces versus over a dozen 25 by what's called the can method.

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Page 262 1 A. Slocum, Ph.D. 2 The first machine is in Pampa, 3 Texas making towers for the Texas wind 4 industry. Texas proudly is the largest 5 producer of wind energy in the nation. I 6 know some people on the line, my friends in 7 Texas are just big oil people, but no, no, 8 no, they love wind. They just want to do 9 big stuff like energy. 10 So there's a whole series of 11 patents -- I know I don't have them all 12 listed -- but that are related to this, the 13 actual tapered tower design and then more 14 specifically, the machine that can make the 15 taper. And this is a very large machine 16 because you can imagine it makes structures 17 that are seven meters in diameter and one 18 end at 100 meters long up to. 19 And again, the math is the 20 same, whether it's a giant wind turbine 21 tower or the machine tool spindle that's 22 tapered or a steerer tube. The math is the 23 same. The spreadsheet does not care. The 24 equations are the same. 25 So here is another one on that	Page 264 1 A. Slocum, Ph.D. 2 towers for the wind turbines and how you 3 make them. This is a very interesting 4 tapered tube where we have to very carefully 5 control the stiffness along the tube which 6 is actually kind of S shaped. This is for 7 inserting a needle into the spinal cavity. 8 It's the first sensing you can do with that. 9 And then I think that was the 10 focus on tubes and stuff, but hold on, let 11 me -- again, more -- they keep coming as we 12 make advances for the company. This system 13 here, this 166 high pressure tubes for 14 hydrogen generation and storage, but I don't 15 think that's -- that's a pressure tube, so 16 we'll leave that one alone. 17 There's about another ten or 18 so, most of them related to hydrogen 19 production. I don't think there's any new 20 tube ones, so I don't think we need to worry 21 about the more recent ones. Okay. That's 22 patents. 23 Q. During your discussion of these 24 patents, were you also listing off bicycle 25 suspension-related patents?
Page 263 1 A. Slocum, Ph.D. 2 tapered structure. Now we get into these 3 non-linear springs. That's the basis of 4 some of the energy harvesting. But we'll 5 leave that alone. 6 Cardiac surgery ports, that's a 7 long tube -- you see, here's another one of 8 my ones with Eric on the tapered spiral 9 welded structure. 10 Chromatography columns, 11 I reinvented how chromatography columns are 12 made and then all these other people jumped 13 on the patent, which was -- that's probably 14 one of those legal issues, but -- what a 15 chromatography column is used for, you have 16 a plastic tube and you fill it with what's 17 called the resin and then you inject in one 18 end the liquid to be purified, be it beer or 19 pharmaceutical, and then you have to have a 20 uniform flow front going through it and how 21 you design the tube so that it doesn't 22 explode, yet it allows the fluid to flow 23 through, I totally redid how that is done 24 and cut the cost way down. 25 Again, more on the tapered	Page 265 1 A. Slocum, Ph.D. 2 A. Yeah. Those were the energy 3 harvesting. 4 Q. Mm-hmm. 5 A. And a lot of the energy 6 harvesting we published, but we 7 specifically -- this is my academic role MIT 8 wise -- have chosen not to patent some of 9 these energy ones, very specifically because 10 a lot of that research was government 11 funded. And remember I mentioned I have 12 this chair, so I can fund research that I 13 think is really important that I don't want 14 to wait a year and a half for a peer review 15 government funding board to tell me I can or 16 cannot do, so I will fund it. We also have 17 a number of fellowship students. 18 So when those kinds of things 19 are done -- at least in my part of the 20 academic world -- our goal is to publish 21 them and get them out there as soon as 22 possible for anybody in the world to use, 23 simply because well, I have the feeling the 24 planet is kind of in trouble, so some things 25 really shouldn't be patented. You know,

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Page 266 1 A. Slocum, Ph.D. 2 it's -- I have enough, right? Yeah. 3 But when we get to talking 4 about the suspensions and stuff, we can go 5 into the math behind sizing everything if 6 you'd like. 7 What next? 8 Q. Would you please turn your 9 attention to item 19 beginning on page 174 10 of your declaration? 11 What's listed -- 12 A. These are papers and 13 references. 14 Q. Are any of these papers 15 directly related to either steerer tubes or 16 bicycle suspensions? 17 A. Okay. They will be in the way 18 that the patents were. There are no 19 specific articles that say, you know, 20 optimization of bicycle steerer tube versus 21 suspension. 22 Again, there's quite a few 23 articles on structural optimization for 24 tubular systems and also on dynamic systems, 25 particularly as we were just referring to in	Page 268 1 A. Slocum, Ph.D. 2 have an elliptical cross section because 3 that would cause a hell of an imbalance. 4 But you will change the cross section, the 5 wall thickness and the diameter typically as 6 a function of length. 7 So if we go down to -- again, 8 any of the ones that deal with the 9 hydrostatic bearings will have oil flow 10 paths. You have to control the resistance 11 as the oil flow through this bearing to give 12 you the proper combination of stiffness and 13 damping so you could have the machine give 14 you the accuracy you want without chatter. 15 So the articles will go through 16 how you size the hydraulic systems and how 17 you account for typically what the natural 18 frequency is, which is, you know, the up and 19 down. You want to have it properly damp, so 20 you don't chatter. Whether it's a machine 21 tool or your teeth, you don't want to be 22 chattering them. Again, the math is the 23 same. 24 Do you see this article 54? 25 This is very specifically -- this is how
Page 267 1 A. Slocum, Ph.D. 2 terms of the energy harvesting ones. 3 You won't always find a 4 correlation between what is patented and 5 what is published, as I said before. A lot 6 of the patented stuff I'll do for companies, 7 whatever where you put in just enough, but 8 all the details that typically go into a 9 research paper are not put into a patent. 10 I tend to put more stuff in 11 than maybe I should, but -- so if it was 12 done for a company and patented, I generally 13 don't bother publishing it and I'm often 14 told I'm not allowed to. 15 So, again, I'll go through, as 16 before, pulling out specific designs -- like 17 see here, this number 13, this was actually 18 Eric Marsh's doctoral thesis. This 19 replicated internal viscous damper. There 20 was some patents associated with that 21 because early on at MIT -- a very focus 22 specific device. 23 All of these hydrostatic 24 bearings that are spindles are all tubes and 25 tubes and they're all tapered. They won't	Page 269 1 A. Slocum, Ph.D. 2 we -- it's unrelated to what we're directly 3 talking about, but this is the culmination 4 of ten years of teaching a lot of these kids 5 who came up from really rough neighbors how 6 to design stuff. So we say, listen, you 7 don't have to be subject to anybody. We 8 will teach you how to design your own world. 9 A lot of these kids have gone on and done 10 really amazing careers in tech. 11 Okay. 12 You see here this guy here, 13 item 73, harvesting energy from rotational 14 vibrations? And there's a whole series of 15 these articles on energy harvesting. This 16 is, again, you have to very carefully tune 17 the mass, the stiffness and the damping and 18 you can either do it electromagnetically or 19 fluidly. Those are your two options. 20 Again, the math is the same and then the 21 loss factors will vary. That particular one 22 was electromagnetically. 23 All of these medical tools, you 24 see these, like, endoscopic tools, item 25 82 -- can you see my cursor on the screen?

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Page 270 1 A. Slocum, Ph.D. 2 Q. I cannot? 3 A. Oh, so 82, endoscopic screw 4 delivery -- this is articulating tools. All 5 the medical device articles are all tubes 6 and many of them, you know, again, you have 7 to make the tube as small as possible so it 8 doesn't hurt so much when it goes in. If it 9 breaks, that's a bad thing. 10 I'll take more care to state 11 the number. 12 If you look at 96, when we 13 start storing energy deep underwater in 14 these -- this ocean renewable energy storage 15 system, these are all big concrete and steel 16 tubes. Again, the equations are the same, 17 whether it's a bike tube or an offshore 18 platform tube. 19 101, we're damping pressure 20 pulsations in these wave power decel 21 systems. Any time you use fluid in a 22 damping system or in a hydraulic system, you 23 have to be careful that you don't set up a 24 residence and this is particularly true in 25 pneumatic systems that do a lot of pneumatic	Page 272 1 A. Slocum, Ph.D. 2 Mr. Gutierrez, from BP where it enabled the 3 robots down below to very, very quickly 4 splice hoses that had been sliced. We did 5 the whole thing in less than two weeks and 6 again, a very special swaging tool is 7 required. We had to design from scratch in 8 order to put the fittings on in places that 9 normally you wouldn't need to be able to do 10 deep underwater. There was some very, very 11 good people involved in that in the shop. 12 Okay. 116, we take -- this 13 is -- we call it symbiotic approach in terms 14 of how do you take an offshore wind turbine 15 and there will be vibration modes in the 16 wind turbine structure and then how do you 17 put an energy harvesting system on the wind 18 turbine structure? That's a big tube. 19 As the waves are pounding it 20 and shaking it, how do we design the energy 21 harvesting system, which is a damper which 22 moves up and down, to now dampen those 23 vibrations and, again, we harvest the 24 energy fluidally. That's the most reliable 25 way, which is why I'm headed after classes
Page 271 1 A. Slocum, Ph.D. 2 bearings also. Pneumatic systems tend to be 3 more prone to resins than fluid systems, so 4 because you're often dealing with 5 compressibility or speed of sound issues, 6 you have to take that into consideration in 7 the math. 8 Number 103 and 104, energy 9 harvesting, again, this is the dynamics. 10 You design your machine to have the 11 stiffness and damping you need so you 12 don't -- you get the resonances that you 13 want. 14 This one is a fun one that 15 relates very specifically to tubes in the 16 sense of when you repair hydraulic lines and 17 fittings and couplings, how do you swage 18 them. And this was for the Deepwater 19 Horizon. I was on the Department of Energy. 20 Dr. Steven Chu, he is the Secretary of 21 Energy, his special committee -- I spent a 22 lot of time shuttling back between Boston 23 and Houston during that whole crisis. 24 And this was a machine and 25 system I designed with my friend there,	Page 273 1 A. Slocum, Ph.D. 2 are over to Malaysia, to put that into a 3 real machine we believe. 4 Then the final one here, 146, 5 this is again the wave energy harvesting. 6 Big mechanism. Basically, giant dampers and 7 as the oil flows through the damper, you 8 have to control -- you have to balance the 9 mass, the stiffness and the damping. That's 10 how you get optimal energy extraction and 11 the math is all in there and you could look 12 it up and see if we made an error. It seems 13 to work. 14 Okay. And those are the 15 peer-reviewed papers. There's a few more 16 recent ones from the medical world that I 17 know have just come out. 18 Q. Have you more recently focused 19 on medical devices? 20 A. I've been teaching a class 21 medical device design. We switched -- I've 22 been doing medical devices for at least 20 23 years. In the last ten years, that class 24 that was -- used to be called Precision 25 Machine Design. Now we've converted fully

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Page 274 1 A. Slocum, Ph.D. 2 over -- maybe a dozen years ago -- it's 3 called Design and Medical Devices. Or is it 4 Medical Device Design? Sorry. 5 It's course 2.75 and then 6 machinery I've turned into a different class 7 called Precision Product Design because in 8 the last two decades, every year there's 9 more and more interest from students and 10 companies on medical device design. 11 Q. Are these design capstone style 12 classes for engineering students? 13 A. We offer a bunch of classes 14 that you can take as a capstone class, so 15 there's not one, and then both of those 16 classes are also for graduate students and 17 then the graduate students have to -- are 18 expected to have a higher level of output 19 than the undergraduates. 20 Q. In your response -- 21 A. -- entities have those. Sorry. 22 Q. Pardon me. Would you finish 23 your statement? 24 A. Most universities or 25 engineering universities will have a	Page 276 1 A. Slocum, Ph.D. 2 in for the oil industry. 3 I believe you mentioned BP. Is 4 BP British Petroleum? 5 A. Most of my work -- BP was just 6 a short period during the Deepwater Horizon. 7 I was a member -- there was about a dozen of 8 us who worked directly with Secretary Chu 9 and our job was -- the way the Deepwater 10 Horizon thing worked, BP had a lot of 11 contractors and there was a lot of people 12 proposing a lot of things, so we would peer 13 review what was being proposed and try to 14 make sure that nothing was BP was going to 15 try would maybe make the problem worse. 16 What if you could do -- you 17 could have blown and lost the entire field, 18 so it was very touch and go. 19 Then we were also responsible 20 for if there was any particular problem they 21 had, would our expertise be able to solve 22 it. So I have particular expertise in that 23 area that was able to do that hose repair 24 job very, very quickly. 25 Most of my work for the oil and
Page 275 1 A. Slocum, Ph.D. 2 capstone type class. 3 Q. In your response, I noticed 4 that you had mentioned doing work for the 5 petroleum industry; is that correct? 6 A. Correct. 7 Q. Were you designing pipelines 8 from the oil and gas industry? 9 A. I'm a driller, so I do 10 couplings, drilling tools. All things in 11 tubes, so -- 12 Q. Were you working -- excuse me. 13 A. -- which is almost exactly like 14 what I do in the medical industry. You have 15 tubes and they have very long aspect ratios 16 and everything is optimized with respect to 17 stiffness to weight because it costs a lot 18 of money and, you know, often you have 19 dynamic issues, you have huge structural 20 issues, so all of the couplings are 21 tapered -- yeah. And again, the oil and gas 22 industry directly maps into -- and they're 23 morphing very fast -- to the geothermal and 24 renewable energy industries. 25 Q. So where does your work fit	Page 277 1 A. Slocum, Ph.D. 2 gas industry is for Schlumberger, which is 3 now called SLB, and then I also do work with 4 NOV and then another company called Canrig. 5 Again, it's all tubulars and, 6 machines to handle tubulars and tubes of all 7 types. You know, if it's a tube, whether 8 it's -- as you can see what I did with the 9 spreadsheets for here, it doesn't matter 10 whether it's a steerer tube or a tool, part 11 of the drilling tool. It's the mechanics -- 12 the mathematics are the same. 13 The similar thing on the energy 14 harvesting and damping. All of these tools 15 go in and they have to function and not 16 vibrate and shake because if they do, they 17 will tear themselves apart. 18 So, again, the mathematics are 19 the same and ostensibly almost all of these 20 use oil as the working fluid to do what they 21 want to do or drilling mud, which is, like, 22 a very light oil. 23 Q. You work with contractors that 24 come in and drill stuff, less with the 25 owners, like the BPs and the Exxons?

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Page 278 1 A. Slocum, Ph.D. 2 A. Yeah, not the contractors -- 3 well, Schlumberger is a contractor in terms 4 of they'll come in and manage -- it's very 5 complicated how they -- and I don't get 6 involved in the business end. 7 I'm on the end of helping to 8 design the tools that then once it's proven 9 out -- and it's takes seven to ten years for 10 a tool to go from I've got an idea to where 11 it's in the production and being used in the 12 field. I'm on that end, from the initial 13 concepting all the way through to making 14 sure it gets to production. 15 So there's a lot of fracking 16 tools, the directional drill and then, you 17 know, for example, couplings between the 18 casings. 19 Q. Just to be certain, the 20 Deepwater Horizon oil spill, that was the 21 2010 sort of well-known national disaster? 22 A. It was. It was a mess. 23 Q. Isn't that considered the 24 largest marine oil spill in the history of 25 the petroleum industry?	Page 280 1 A. Slocum, Ph.D. 2 allowed us to have the development of the 3 shale resources. Deepwater is starting to 4 go up again because that's where some of the 5 best gas resources are, natural gas 6 resources. 7 Q. So yeah, I'm working on new 8 tubular designs for that tube. 9 MR. DURBIN: Okay, folks. 10 I'm at a stopping point here. 11 I'm at least very close to being done. 12 If we could take a 15-minute break, I 13 could go over my notes and make sure 14 that that's the case. 15 Is that okay with everyone 16 else? 17 MS. BHATTACHARYYA: That's fine 18 with me. 19 THE VIDEOGRAPHER: The time is 20 7:00 p.m. Eastern time. 21 We're off the record. 22 (Recess taken) 23 THE VIDEOGRAPHER: Time is 24 7:16 p.m. 25 We are on the record.
Page 279 1 A. Slocum, Ph.D. 2 A. I think it's the largest that 3 was reported. Our friends in some parts of 4 the world don't always report what happens. 5 Q. Thank you for the caveat. Fair 6 enough. 7 A. It's the biggest one I know of 8 that was publically done. It was -- yeah. 9 It was the biggest. 10 Q. We think of the Exxon Valdez. 11 If you're of a certain age, you think of 12 some other stuff. But I believe that the 13 BP, the Deepwater Horizon thing dwarfed it 14 at least as far as effect and quantity. 15 A. By at least an order of 16 magnitude. Much bigger. 17 But look, every disaster 18 yields an advance. The Valdez led to double 19 hull tankers. Okay? The Deepwater Horizon 20 has led to some new tools that will allow us 21 to shut it off very fast. 22 So the next time it happens -- 23 and the whole Deepwater went away -- has 24 really subsided because on shore, we can 25 directionally drill so good. So that	Page 281 1 A. Slocum, Ph.D. 2 MR. DURBIN: Dr. Slocum, thank 3 you for your time. I have no further 4 questions at this time. 5 THE WITNESS: Okay. 6 MS. BHATTACHARYYA: Thank you, 7 Mr. Durbin. I do have a few redirect 8 questions. 9 EXAMINATION BY 10 MS. BHATTACHARYYA: 11 Q. Dr. Slocum, earlier in the day 12 do you recall being asked about claim 13 construction for this '993 patent in the IPR 14 versus the district court? 15 A. Yes. 16 Q. I'm going to read a part of 17 your testimony from the realtime record I 18 have in front of me. This was related to 19 the questions about claim construction in 20 the IPR. 21 You said: For some reason, in 22 the district court case, Fox wanted to 23 design it another way, which is weird to me 24 because when you are turning the bicycle, 25 there's no plane because it's an arc and the

Page 282 1 A. Slocum, Ph.D. 2 arc is not a plane, so that was very 3 confusing to me. 4 In this answer, did you mean to 5 say SRAM wanted to design it another way 6 instead of Fox? 7 A. I'm sorry. It's a SRAM patent 8 and that was about when you turn the wheel 9 in the 993, there's -- it should have been 10 SRAM. 11 It's clear to me when you just 12 are talking about forward motion what the 13 plane is, but I recall reading a claim 14 construction proposed -- this was in the Fox 15 and SRAM are proposing claim constructions 16 and it was a SRAM was proposing a plane that 17 wasn't just a forward plane and that was 18 what was confusing to me. That's what I 19 meant by design. 20 Q. I'll represent to you that in 21 the district court case, SRAM proposed a 22 construction for the plane of travel as 23 an -- I'm paraphrasing slightly here -- that 24 it would align with the direction -- the 25 running direction of the bicycle.	Page 284 1 A. Slocum, Ph.D. 2 straight line, the plane that goes through 3 the front wheel's middle, the frame and the 4 rear wheel, they're all coplanar or in the 5 worst case, parallel, assuming if your wheel 6 was a little off kilter. Ostensibly, 7 they're all going to be coplanar. That way, 8 there's no confusion as to just the finding 9 of a vertical plane because it goes through 10 everybody. 11 Q. Can we turn our attention to 12 the Denk reference, which is -- let's go to 13 the English translation of Denk, which is 14 marked as Exhibit 1006. 15 A. Okay. I have the paper copy 16 here. 17 Q. Denk specifically mentions that 18 its teachings about the tubular structure 19 can be applied to a bicycle fork. 20 MR. DURBIN: Objection. 21 Leading. 22 Q. Correct? 23 A. Again, I'm not sure what I'm 24 supposed to do here, but Denk talks about a 25 lot of components on the bike. The fork is
Page 283 1 A. Slocum, Ph.D. 2 And is that what you found 3 confusing? 4 A. Well, that was what I was 5 explaining, an arc. If you're turning, it's 6 an arc and there's no plane of an arc. You 7 can have a tangent plane to the arc, but I 8 now I don't know is it the tangent plane 9 from the rear wheel or the front wheel. 10 I don't know which plane, so 11 that's why I just said look, for what I'm 12 doing in the IPR, I'm just going to consider 13 only the plane of the frame, or the vertical 14 plane it's sometimes called. 15 Q. When a bicycle is in an upright 16 position with both wheels pointed in the 17 same direction, the vertical plane of the 18 bicycle frame would be coplanar with the 19 direction of the wheel, correct? 20 MR. DURBIN: Objection. 21 Leading. 22 A. Am I supposed to answer? I'm 23 not sure what I'm supposing to do now. 24 Q. Yes. You can answer. 25 A. If you're driving forward in a	Page 285 1 A. Slocum, Ph.D. 2 one of them. 3 It talks about the chain stay, 4 the real wheel stay, the head -- all the 5 tubes, the fork. 6 Claim 18, as I pointed out, 7 says claims one through 12 characterize that 8 the lightweight component is designed in 9 such a way that it is formed as a part of a 10 bicycle fork, which I pointed out earlier. 11 The paragraph in column four 12 talks about it, too. 13 Q. So a POSITA reading would 14 understand its teaching apply to a steerer 15 tube which is part of the bicycle fork, 16 correct? 17 MR. DURBIN: Objection. 18 Leading. 19 A. The steerer tube is a component 20 of the fork. You know, you'll have the 21 steerer tube, the crown and then the down 22 tubes that go through which the front wheel 23 axle goes through. 24 Those are the three principle 25 elements and the lower part of the fork may

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Page 286 1 A. Slocum, Ph.D. 2 or may not be dampened. So, you know, in a 3 road bike, you wouldn't have it being 4 damped, so you just have those two rigid 5 structural parts. 6 In a mountain bike front shock 7 you would now have the additional shock 8 absorber elements. You would have the tube, 9 the crown -- sorry -- the steerer tube, the 10 crown, then the lower legs. 11 If I search fork, it always 12 shows all of those. 13 Q. So just so that the record is 14 clear, a POSITA reading the Denk reference 15 would apply -- would understand that the 16 teachings of Denk apply to a bicycle steerer 17 tube structure, correct? 18 MR. DURBIN: Objection. 19 Leading. 20 A. Again, I think that's what is 21 described in column four and claim 18 22 specifically tells me that. So it wouldn't 23 be understanding. It just is telling me 24 that. 25 Q. Earlier, when Mr. Durbin was	Page 288 1 A. Slocum, Ph.D. 2 other. 3 There's additional loads on 103 4 from other actions of the rider, but those 5 front wheel forces all come through the 6 same. There's also the load -- you know, 7 the handlebars which we talked about 8 earlier, the attachment of the handlebars to 9 the steer tube, like when Mr. Durbin was 10 asking me about the '993, that picture with 11 the spacers. 12 Okay. So you have additional 13 loads from the rider dynamically pushing 14 forward on the handlebars that go on the top 15 of the steerer tube, but, again, they're 16 going to be transferred into the head tube 17 103. 18 Q. Would loads from the weight of 19 a rider act on the steerer tube of the 20 bicycle? 21 A. Well, as I just said, there's 22 two ways. One is just the weight, vertical 23 downward component through the front tire. 24 But when you're riding, you 25 know you sometimes lurch forward, so your
Page 287 1 A. Slocum, Ph.D. 2 questioning you, he asked you about Denk's 3 teachings related to head tube 103. 4 Do you recall that? 5 A. I believe I do. 6 Q. Your discussions about head 7 tube 103, would they apply equally to that 8 of a bicycle steerer tube? 9 MR. DURBIN: Objection. 10 Leading. 11 A. As I was discussing earlier, 12 the steerer tube goes into the center of the 13 head tube 103. The axes are concentric. 14 That's what lets you rotate to steer. All 15 of the loads that 103 see from the front 16 wheel go through the steerer tube into 103. 17 So when you design 103 18 structurally for -- to handle those loads, 19 it's the same type of structure analysis as 20 the tube because the loads go from the wheel 21 to the legs, to the crown, to the steerer 22 tube and then through the bearings and into 23 the head tube. So they're all structurally 24 tied together and the analysis I would do to 25 design one directly carries over to the	Page 289 1 A. Slocum, Ph.D. 2 forward force is not directly going through 3 the tire, but it is trying to bend the 4 steerer tube within the head tube 103 and 5 then those loads go through the top tube and 6 the down tube. They won't necessarily be 7 felt by the wheel, but within the frame of 8 the bicycle, those forward motions through 9 the handlebars, like if you launch forward 10 when you hit something, those go through 11 the -- down through the steerer tube into 12 the bearings, into the head tube and then 13 into the tubes of the bicycle. 14 It's called a structural loop, 15 but then it goes back up through your bottom 16 on the seat, flowing up through your 17 spine to your arms, which is then applied 18 the load. The structural loop that's called 19 or the force loop also it's sometimes 20 called. 21 Q. A POSITA designing a steerer 22 tube would know and understand that the 23 loads acting on the steerer tube are maximum 24 in the vertical plane of travel of the 25 bicycle frame, correct?

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Page 290 1 A. Slocum, Ph.D. 2 MR. DURBIN: Objection. 3 Leading. 4 A. Well, look, the maximum loads 5 come about in two ways. One by the weight 6 of the bicyclist and just -- and then as 7 you're riding, you have the dynamic loads up 8 and down. And those, if you will, by 9 definition occur in this plane of -- or in 10 the direction of maximum velocity. 11 So when you're riding a 12 mountain bike, careening down the mountain 13 or even just a road bike on a rough surface, 14 you're going fastest straight and because 15 the highest speed direction is 16 straightforward, that's where the maximum 17 loads will occur when you're in that highest 18 speed direction, so that'll be in the 19 vertical plane we've been talking about that 20 goes to the frame. 21 When you turn, you're not going 22 as fast as when you are in full downhill 23 mode because you'll wipe out. I mean, I 24 turn pretty fast on corners, but I'm not 25 going nearly as fast as on a straight	Page 292 1 A. Slocum, Ph.D. 2 five, four, three. Right? 3 So to me, as a POSITA, that 4 tells me okay, figure one is a starting 5 point. It's showing the cross section as it 6 is. It's smaller, tapers out to larger and 7 the dotted line is indicating that hey, you 8 can take it and swage it to get figure two 9 with helices, but the text is also very 10 clear. I think you may also want to get 11 with the cross section of figures three, 12 four, five, and Valat is also, I think, 13 clearly saying pick any cross section you 14 want and you could make figure one into it. 15 That's how I read it. 16 Q. Would you agree that you can 17 take Valat's steerer tube as shown in figure 18 one and add reinforcements as shown in 19 figures three, four and five or form an 20 internal ellipse structure as shown in Denk 21 without having to go to figure two? 22 MR. DURBIN: Objection. 23 Leading. 24 A. I think that's what I just 25 said. Figure one is the starting point for
Page 291 1 A. Slocum, Ph.D. 2 downhill, which is where you bump in and 3 rattle around and that's where the maximum 4 loads are that's occurring. 5 Q. Turn your attention to Valat, 6 which is Exhibit 1007. Go to the third page 7 of Valat. You will see figures one and two. 8 A. Okay. 9 Q. Are figures one and two of 10 Valat showing two different embodiments? 11 MR. DURBIN: Objection. 12 Leading. 13 A. Figure one is a state of the 14 tube that is different than the state of 15 figure two. So yes, by that, it means they 16 are two different embodiments. As I was 17 explaining earlier, you can take figure one 18 and as the text clearly says, then swage it 19 to yield figure two, but you do not have to 20 go there. 21 If you look and see the dashed 22 and the little dotted lines pointing to the 23 number two? Well, if I swage them so that 24 those can form the spiral helices of figure 25 two, Valat also says that I can have shapes	Page 293 1 A. Slocum, Ph.D. 2 a whole bunch of different shapes and that's 3 what the patent specifically teaches. 4 Figure two is one embodiment of it with the 5 spirals, but the patent also says you can 6 also form figures three, four, five. 7 Then again, Mr. Durbin was 8 asking me earlier, but to me, this is this 9 whole discussion of rounded features versus 10 sharp edges. So if we keep going to the 11 left in figure three, the natural next shape 12 is going to be, for example, the oval of 13 Denk. 14 And again, you would get that 15 by swaging and that's what is referred to as 16 one of the processed in Valat and it's also 17 one of the processes that's referred to in 18 Denk. 19 Q. So basically figure one of Denk 20 is a standalone steerer tube that has a 21 greater external diameter in the lower 22 section of the tube. 23 MR. DURBIN: Objection. 24 Leading. 25 Q. Correct?

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Page 294 1 A. Slocum, Ph.D. 2 A. Then the upper and the lower 3 section also has a different wall thickness 4 apparently from the upper and that gives you 5 the ability to now form it into anything you 6 want or just use it as it is. It depends 7 upon what the math says you want to do with 8 it. 9 Again, that's what Denk is 10 teaching. Here is the starting point and 11 here are some of the things you could do 12 with it. 13 Q. You said Denk. Did you mean to 14 say Valat? 15 A. I'm sorry. Valat. 16 Q. So you could take the steerer 17 tube as shown in figure one of Valat and you 18 can connect it with the crown of a fork as 19 shown in figure two, correct? 20 MR. DURBIN: Objection. 21 Leading. 22 A. I'm not sure I understand the 23 question. If I delete the tube in figure 24 two and I just have the crown, could I put 25 what's shown in figure one in figure two?	Page 296 1 A. Slocum, Ph.D. 2 A. Okay. 3 Q. Do you see the figures of Valat 4 on the top of the page? 5 A. Right. I took a piece, you 6 know, from figure one and I marked it up and 7 then I took the plane view from figure two 8 and marked it up. 9 Q. The plane view in figure two 10 is -- strike that. 11 The reason why you used figure 12 one of the Valat and the plane view from 13 figure two of Valat? 14 MR. DURBIN: Objection. 15 Form. 16 A. I heard that as why did I draw 17 what I did? What is the question? 18 Q. I just wanted to know your 19 reasoning, whether it's for illustration 20 purpose or what. 21 Strike that. Let me ask to 22 rephrase my question. 23 Is there a reason why you used 24 figure one of Valat and the plane view from 25 figure two of Valat in page 116 of your
Page 295 1 A. Slocum, Ph.D. 2 Is that the question? 3 Q. Yes. 4 A. I'd have to increase the 5 diameter of the bore as shown, but in terms 6 of making that structural connection, no 7 problem. I just increase the bore size 8 to accommodate the larger diameter of the 9 base. 10 Whether I braise it or press 11 fit it or I machine a taper into it, there's 12 a whole bunch of ways to actually do the 13 connection or the nut -- you know, we went 14 through that earlier. 15 It just has to be a rigid 16 structural connection and again, it's going 17 to -- if you're going to buy it at the 18 store, it's going to be done at the factory. 19 This is not something that's typically done 20 at a bike shop. 21 Q. Let's go to your declaration 22 which is marked as Exhibit 1003. 23 A. Okay. I have it here. 24 Q. Let's go to page 116 of your 25 declaration.	Page 297 1 A. Slocum, Ph.D. 2 declaration? 3 A. I mean, yeah. You see where 4 I've labeled the external diameter and the 5 internal diameter on the left figure of the 6 cross section and then you see the two red 7 circles on the plan view? 8 Those are corresponding to -- 9 if I were to take that simple -- well, it's 10 tapered. The tube on the left, how would it 11 mount in the crown and that's what those two 12 circles -- see, they don't include the D, E, 13 F, G spiral or helical thickenings. The red 14 circles don't. They just meant to indicate 15 the external and internal diameter if I just 16 took what's labeled the elongated hollow 17 body and now fitted it to the crown. 18 Now I may put some other 19 shapes -- not just a smooth diameter is 20 indicated, but that gets back to figures 21 three, four, five of Valat. As such as I 22 did here, it's just to round to ID and OD. 23 Q. So would it be fair to say that 24 you are using the plane view from figure two 25 of Valat in your declaration just to

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Page 298 1 A. Slocum, Ph.D. 2 illustrate how the internal and external 3 diameter of Valat's figure one would look 4 like in plane view? 5 MR. DURBIN: Objection. 6 Leading. 7 Form. 8 A. What's showing there is what 9 you would see in the cross section view 10 looking for the plane view looking down on 11 the crown, if you fitted what's in figure 12 one just as is without forming the helical 13 reinforcements, D, E, F, G. 14 That's why that -- I have two 15 concentric red circles there and I have 16 the -- on the left, you see those red 17 diameters pointing to the outer and inner 18 diameter. One is a cross section and one is 19 a plan view. 20 Q. Go to page 85, which shows the 21 calculations you performed. 22 A. Okay. 23 Q. So this -- the chart that is 24 shown on page 85 of your declaration, this 25 is taken from calculations that you	Page 300 1 A. Slocum, Ph.D. 2 because you have three degrees of freedoms 3 that define and when you define those, you 4 get the other ones and that's why they're in 5 red, because they'll be calculated. 6 Q. Numbers in black that you 7 inputted into the spreadsheet, are those 8 numbers typical of a steerer tube design as 9 would be known to a person skilled in the 10 art? 11 MR. DURBIN: Objection. 12 Leading. 13 Form. 14 Mischaracterizes the record. 15 A. Okay. So I think they're 16 typical, so if you look at the sections of 17 the spreadsheet, do you see where it says 18 upper Section 10 and lower 202? 19 So I'm looking at if you have a 20 steerer tube that has an upper end and lower 21 end, the lower end would be down near the 22 bottom bearing and I'm just saying here are 23 scenarios and I did my scenarios -- should 24 be a mountain bike, something that a big 25 chunky guy like myself -- I'm not that
Page 299 1 A. Slocum, Ph.D. 2 performed in an Excel spreadsheet, right? 3 A. Well, yeah, correct. I wrote 4 this spreadsheet to do these. 5 Q. And so you entered several 6 parameters that relate to the structure of a 7 steerer tube in black and the results are 8 shown in red, correct? 9 MR. DURBIN: Objection. 10 Form. 11 Mischaracterizes the witness's 12 testimony. 13 A. Okay. The way I write these 14 spreadsheets is in general, you put inputs 15 in black and outputs in red. In this 16 particular section, if you notice in each of 17 the columns, you have only three black 18 entries. Those are three degrees of 19 freedom. They will drive the calculations 20 of the other numbers. 21 Now, I'm going to check on the 22 formulas, as I said I would do earlier, just 23 to make sure I was consistent there on one 24 of the columns. But ostensibly, that's why 25 you see three blacks and the rest are red	Page 301 1 A. Slocum, Ph.D. 2 chunky; some of my students are pretty big 3 people. 4 You know, there different sizes 5 of mountain bikes, so I just picked one. I 6 forgot which one I was thinking of. It 7 would be within the range of what a POSITA 8 would find. So you see that's for scenario 9 one, two, three, four, five. 10 And then that was done and then 11 independent of that -- that's why I have 12 that other column. See the '993, figure 13 nine? I just said okay, now what does the 14 '993 teach. 15 Now I'm just doing a comparison 16 of what would a POSITA would do and then 17 what's in '993. Okay, yeah, the numbers are 18 all ratio-metrically making sense. 19 Again, it's showing that the 20 teachings of the '993 or Denk, whichever one 21 you want to say -- that's one of the things 22 we are doing here -- that it's not a bad 23 idea to -- if you have a circular steerer 24 tube to have the inside having an elliptical 25 cross section, for example, because the

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Page 302 1 A. Slocum, Ph.D. 2 patterns don't actually do the math. I did 3 the math to verify what the patents claim to 4 be teaching. 5 Q. Just so I'm understanding 6 correctly, you calculated scenarios one, 7 two, three, four and five and you then 8 compared those calculations to what is shown 9 in the '993 patent, correct? 10 MR. DURBIN: Objection. 11 Leading. 12 A. Yeah, I can delete that '993 13 column and just not have it. It wouldn't 14 affect anything in the other scenarios. So 15 I mean that's where I started. 16 My recollection is that I 17 did -- here's reasonable scenarios and okay, 18 now what does the patent show. Oh, look at 19 that. 20 In other words, I didn't pick 21 everybody as having 36-millimeter OD and now 22 look at different ratios. That wasn't my 23 intent. I can do it if you want me to, but 24 that wasn't my intent. 25 Q. So the numbers that are shown	Page 304 1 A. Slocum, Ph.D. 2 different, if you will, Denk type-elliptical 3 cross sections applied to one particular 4 Moechnig, assuming he had an upper OD of 5 28.6 round. 6 That has nothing to do with the 7 '993 column. They're different -- different 8 starting points. 9 Q. So earlier when Mr. Durbin was 10 questioning you, he asked you whether you 11 took your starting point numbers from the 12 '993 patent; is that right? 13 A. I mean, I don't recall. But 14 that first column is the '993. That is only 15 the first column. So yeah, I took numbers 16 from the '993 for the '993 column. Maybe I 17 don't understand the question. 18 But the '993 column has nothing 19 to do with scenarios one, two, three, four, 20 five. That 1.5 times Moechnig's 28.6 is why 21 I'm doing 42.9 all the way across for the OD 22 on scenarios one through five. 23 Q. And just so the record is 24 clear, for all of your calculations in the 25 top half of this Excel spreadsheet and the
Page 303 1 A. Slocum, Ph.D. 2 in black, which are your inputs in scenarios 3 one through five, those numbers are typical 4 numbers that would be known to a person 5 skilled in the art, correct? 6 MR. DURBIN: Objection. 7 Leading. 8 Mischaracterizes prior 9 testimony. 10 A. Okay. Correct. Look at the 11 upstairs, the upper part. See the OD of 12 28.6? Right? What's half of 28.6? It's 13 14.3. That's that ratio OD lower end over 14 upper section. So 14.3 plus 28.6 is 42.9. 15 Do you see that? 16 So scenarios one, two, three, 17 four, five, you know, I'm starting with 18 Moechnig's upper end being 28.6, which if I 19 recall correctly was actually a number from 20 Moechnig, the unknowns from Moechnig. I 21 just picked a wall thickness up there that 22 was reasonable because it's a standard tube. 23 So scenarios one, two, three, 24 four, five are -- you know, Moechnig is my 25 starting point and now I'm looking for	Page 305 1 A. Slocum, Ph.D. 2 calculations in scenarios one through five, 3 you're starting point numbers come from 4 Moechnig, correct? 5 MR. DURBIN: Objection. 6 Mischaracterizes the reference. 7 Leading. 8 A. Correct, except Moechnig did 9 not give me a wall thickness, so I picked 10 one which I believe is a reasonable wall 11 thickness, three millimeters, which is not 12 unusual. 13 I looked at my steerer tube, 14 other steerer -- you know, that plus or 15 minus some fractions of a millimeter is not 16 unreasonable. But three millimeters is a 17 standard thickness for tubing, so that would 18 be a good starting point. 19 The three millimeters is also 20 an eighth of an inch, just like the 28.6 21 being I think one and an eighth. 22 Q. When Mr. Durbin went through 23 your CV and asked you a lot of questions 24 about your work related to technologies that 25 are similar or related to bicycle suspension

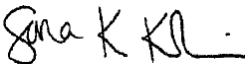
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Page 306 1 A. Slocum, Ph.D. 2 technology. 3 Do you recall? 4 A. Yeah, I went through a lot of 5 stuff in there. 6 Q. I know you pointed out a lot of 7 your work in technologies that are related 8 to steerer tubes and tubular structures. 9 Did you also cover your work 10 related to dampers that go into the shocks 11 for bicycles, in particular, rear shocks? 12 MR. DURBIN: Objection. 13 Leading. 14 A. Well, I covered a lot of 15 tubular things that also are energy 16 harvesters and if you think about the rear 17 shock or even the front shocks, they're also 18 tubular structures. All of this stuff is 19 based on tubes. 20 So while we had this break, I 21 was looking through -- now I went to the 22 section for example on conference papers, 23 which comes after the journal papers. These 24 appear to be conference papers. 25 If you go to item 165, this is	Page 308 1 A. Slocum, Ph.D. 2 access hydraulic piston based machine. 3 Again, you have pressure forced 4 in one axis to move the piston and then it 5 has the dissipater bleed out when you move 6 it in the opposite direction. 7 So that's a traditional piston 8 with a circular rubber seal. Similar was 9 that ball piston project for the -- that was 10 the invention, no seals allowed because the 11 rubber will not last and does not last deep 12 under ground. 13 Again, it's a mass, a spring, 14 there's compression and then the way the 15 hydraulic fluid is squirted, that gives you 16 the dynamic response whether it's the drill 17 head or the robot axis. 18 So you can do it as a certain 19 mechanism or you can do it as a damper, 20 which is what an energy harvester is. Most 21 of the stuff I worked with with those kinds 22 of energy harvesters tend to be tubular. 23 Tubes are nice. They're very structurally 24 efficient. You can seal them well. 25 MS. BHATTACHARYYA: That's it,
Page 307 1 A. Slocum, Ph.D. 2 the paper -- first ordered power estimation 3 of a floating oscillating column circling an 4 offshore wind turbine. 5 So here's an example, you've 6 got concentric tubes and as the waves move 7 one up and down, how do you design -- again, 8 it is a spring, a mass and a damper, the 9 damper being, you know, fluid calm and it's 10 forced through fluid passages or orifice. 11 It will dissipate the energy as heat, which 12 is what happens in a bicycle shock absorber, 13 or it dissipating the energy by spinning 14 something that does useful work. In that 15 case, a generator. 16 So it's a mass spring damper 17 and they're all based on tubular structures, 18 whether it's the rear shock or these 19 offshore turbine harvesters. 20 If you want something more 21 specifically pistonesque, then you go back 22 to the -- any of the hydraulic robots all 23 have -- if you see, for example, there's 24 this -- under awards received, this robotic 25 micro manipulator, that's a five	Page 309 1 A. Slocum, Ph.D. 2 Dr. Slocum, for me. 3 THE WITNESS: Pardon? 4 MS. BHATTACHARYYA: I have no 5 further questions for you. 6 THE WITNESS: Okay. 7 MR. DURBIN: I'm going have 8 some recross. 9 (Discussion off the 10 stenographic record) 11 THE VIDEOGRAPHER: We're still 12 on the record. 13 We just clipped seven hours. 14 MS. BHATTACHARYYA: I think 15 unfortunately, Mr. Durbin, your time -- 16 MR. DURBIN: My time was seven 17 hours on the record? 18 THE VIDEOGRAPHER: No, sir. 19 MR. DURBIN: I believe I get 20 seven hours, Arpita. 21 MS. BHATTACHARYYA: Okay. 22 So -- okay. Again, we could go off the 23 record and discuss this. I thought 24 seven hours was your time, but if it 25 included my time, then you still have

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Page 310 1 A. Slocum, Ph.D. 2 some time left. 3 THE VIDEOGRAPHER: Standby. 4 The time is 7:55 p.m. 5 We're all of the record. 6 (Recess taken) 7 THE VIDEOGRAPHER: The time is 8 8:03 p.m. 9 We're on the record. 10 EXAMINATION BY 11 MR. DURBIN: 12 Q. Dr. Slocum, do you recall 13 discussing the figure -- please turn to page 14 116 of your report, of your declaration, 15 which is Exhibit 1003. 16 A. Okay. 116. 17 Q. Page 116. 18 A. Okay. 19 Q. Do you recall discussing this 20 figure with your counsel moments ago? 21 A. Yes. 22 Q. Where do you state in your 23 declaration that figure two is applicable to 24 figure one? 25 A. Looking at paragraph 181, I say	Page 312 1 A. Slocum, Ph.D. 2 testimony. 3 MR. DURBIN: You can answer. 4 A. I didn't deny it. I said 5 figure one and then I cited from Valat where 6 it says figure two comes from figure one. 7 But Valat also says I can have figures 8 three, four, or five. It's all on the same 9 page. So you don't have to go figure one to 10 two. If you're in figure two, you do get 11 there from a figure one, but figure one can 12 also go into any of the other lower figure 13 cross sections. That's my reading of it and 14 that's -- 15 Q. I apologize. Continue. 16 A. So that's what it says. That's 17 what it shows. 18 Q. Is that opinion consistent with 19 Valat's statement that it has the same 20 external diameter over the whole length? 21 A. Well, it says for that. It's 22 talking about that one embodiment in figure 23 two. 24 MR. DURBIN: No further 25 questions.
Page 311 1 A. Slocum, Ph.D. 2 Valat discloses specifically that its 3 steerer tube body has an external diameter 4 and Valat discloses that in one embodiment, 5 the external diameter is greater embodiment 6 than the lower part A and taper C, together 7 the lower section, for the reinforcements 8 are formed compared to the upper part B. 9 So that's telling me that the 10 lower part has a bigger diameter than the 11 upper part. That was the text and here is 12 an example from it. 13 Q. Does figure one show an 14 intermediate process that is subsequently 15 processed into the structure shown in figure 16 two? 17 A. That's one thing you can do 18 with it, yes. You can also get any of the 19 other figures according to the text, like 20 three, four and five. 21 Q. What is your basis for denying 22 that it's an intermediate product? 23 MS. BHATTACHARYYA: Objection. 24 Mischaracterizes the record. 25 Mischaracterizes prior	Page 313 1 A. Slocum, Ph.D. 2 MS. BHATTACHARYYA: Nothing 3 further from me. 4 We reserve the right to review 5 the transcript and revise per the 6 rules. 7 THE VIDEOGRAPHER: Off the 8 record at 8:07 p.m. 9 This includes the testimony 10 given by Alexander Slocum, Ph.D. 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

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Page 314 1 2 3 4 I, ALEXANDER SLOCUM, Ph.D., hereby 5 certify that I have 6 read the transcript of my testimony taken 7 under oath in my examination of October 23, 8 2024; that the transcript is a true, complete 9 and correct record of what was asked, answered 10 and said during this deposition, and that the 11 answers on the record as given by me are true 12 and correct. 13 14 ALEXANDER SLOCUM, Ph.D. 15 16 Signed and subscribed to 17 before me, this day of 18 2024. 19 20 Notary Public 21 22 23 24 25	Page 316 1 2 3 4 WITNESS EXAMINATION BY PAGE 5 Dr. Slocum Mr. Durbin 5 6 Ms. Bhattacharyya 281 7 Mr. Durbin 310 8 9 10 11 12 13 14 E X H I B I T S 15 EXHIBITS DESCRIPTION PAGE 16 Exhibit 2016 Santa Cruz demonstrative 58 17 Exhibit 2017 Trek demonstrative 61 18 19 20 21 22 23 24 25
Page 315 1 2 3 I, SARA K. KILLIAN, RPR, RCR, 4 CCR, do hereby certify that ALEXANDER SLOCUM, 5 Ph.D., the witness whose examination under oath 6 is hereinbefore set forth, was duly sworn, 7 and that such deposition is a true record 8 of the testimony given by such witness. 9 I FURTHER CERTIFY that I am not 10 related to any of the parties to this 11 action by blood or marriage, and that 12 I am in no way interested in the 13 outcome of this matter. 14 IN WITNESS WHEREOF, I have 15 hereunto set my hand this 23d day of 16 October, 2024. 17 18  19 SARA K. KILLIAN, RPR, RCR, CCR 20 21 22 23 24 25	Page 317 1 Veritext Legal Solutions 2 1100 Superior Ave 3 Suite 1820 4 Cleveland, Ohio 44114 5 Phone: 216-523-1313 6 7 October 28, 2024 8 To: ARPITA BHATTACHARYYA 9 10 Case Name: Fox Factory, Inc. v. SRAM, LLC 11 12 Veritext Reference Number: 6933186 13 14 Witness: Alexander Slocum, Ph.D. Deposition Date: 10/23/2024 15 16 Dear Sir/Madam: 17 18 Enclosed please find a deposition transcript. Please have the witness 19 review the transcript and note any changes or corrections on the 20 included errata sheet, indicating the page, line number, change, and 21 the reason for the change. Have the witness' signature notarized and 22 forward the completed page(s) back to us at the Production address 23 shown 24 above, or email to production-midwest@veritext.com. 25 If the errata is not returned within thirty days of your receipt of this letter, the reading and signing will be deemed waived. Sincerely, Production Department NO NOTARY REQUIRED IN CA

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Page 318 1 DEPOSITION REVIEW CERTIFICATION OF WITNESS 2 3 ASSIGNMENT REFERENCE NO: 6933186 CASE NAME: Fox Factory, Inc. v. SRAM, LLC DATE OF DEPOSITION: 10/23/2024 WITNESS' NAME: Alexander Slocum, Ph.D. 4 In accordance with the Rules of Civil 5 Procedure, I have read the entire transcript of 6 my testimony or it has been read to me. 7 I have made no changes to the testimony 8 as transcribed by the court reporter. 9 _____ Date Alexander Slocum, Ph.D. 10 Sworn to and subscribed before me, a 11 Notary Public in and for the State and County, 12 the referenced witness did personally appear 13 and acknowledge that: 14 They have read the transcript; 15 They signed the foregoing Sworn 16 Statement; and 17 Their execution of this Statement is of 18 their free act and deed. 19 I have affixed my name and official seal 20 this _____ day of _____, 20____. 21 _____ 22 Notary Public 23 _____ 24 Commission Expiration Date 25	Page 320 1 ERRATA SHEET VERITEXT LEGAL SOLUTIONS MIDWEST 2 ASSIGNMENT NO: 6933186 3 PAGE/LINE(S) / CHANGE /REASON 4 _____ 5 _____ 6 _____ 7 _____ 8 _____ 9 _____ 10 _____ 11 _____ 12 _____ 13 _____ 14 _____ 15 _____ 16 _____ 17 _____ 18 _____ 19 _____ 20 _____ Date Alexander Slocum, Ph.D. 21 SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ 22 DAY OF _____, 20____. 23 _____ Notary Public 24 _____ 25 _____ Commission Expiration Date
Page 319 1 DEPOSITION REVIEW CERTIFICATION OF WITNESS 2 3 ASSIGNMENT REFERENCE NO: 6933186 CASE NAME: Fox Factory, Inc. v. SRAM, LLC DATE OF DEPOSITION: 10/23/2024 WITNESS' NAME: Alexander Slocum, Ph.D. 4 In accordance with the Rules of Civil 5 Procedure, I have read the entire transcript of 6 my testimony or it has been read to me. 7 I have listed my changes on the attached 8 Errata Sheet, listing page and line numbers as 9 well as the reason(s) for the change(s). 10 I request that these changes be entered 11 as part of the record of my testimony. 12 I have executed the Errata Sheet, as well 13 as this Certificate, and request and authorize 14 that both be appended to the transcript of my 15 testimony and be incorporated therein. 16 _____ Date Alexander Slocum, Ph.D. 17 Sworn to and subscribed before me, a 18 Notary Public in and for the State and County, 19 the referenced witness did personally appear 20 and acknowledge that: 21 They have read the transcript; 22 They have listed all of their corrections 23 in the appended Errata Sheet; 24 They signed the foregoing Sworn 25 Statement; and Their execution of this Statement is of their free act and deed. I have affixed my name and official seal this _____ day of _____, 20____. _____ Notary Public _____ Commission Expiration Date	

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Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and
(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

DISCLAIMER: THE FOREGOING FEDERAL PROCEDURE RULES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY. THE ABOVE RULES ARE CURRENT AS OF APRIL 1, 2019. PLEASE REFER TO THE APPLICABLE FEDERAL RULES OF CIVIL PROCEDURE FOR UP-TO-DATE INFORMATION.

VERITEXT LEGAL SOLUTIONS

COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

Veritext Legal Solutions is committed to maintaining the confidentiality of client and witness information, in accordance with the regulations promulgated under the Health Insurance Portability and Accountability Act (HIPAA), as amended with respect to protected health information and the Gramm-Leach-Bliley Act, as amended, with respect to Personally Identifiable Information (PII). Physical transcripts and exhibits are managed under strict facility and personnel access controls. Electronic files of documents are stored in encrypted form and are transmitted in an encrypted

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