

1 as its next witness Brian Land.

2 JUDGE BHATTACHARYYA: Good morning, Mr. Land. Do
3 you understand you're under an obligation to tell the truth
4 in your testimony today?

5 THE WITNESS: Yes.

6 BRIAN LAND,
7 having been first duly sworn and/or affirmed
8 on his oath, was thereafter examined and testified as
9 follows:

10 JUDGE BHATTACHARYYA: Thank you.

11 MR. MUELLER: May I proceed, Your Honor?

12 JUDGE BHATTACHARYYA: Yes, please.

13 DIRECT EXAMINATION

14 BY MR. MUELLER:

15 Q. Good morning, Mr. Land. Could you please
16 introduce yourself to Her Honor?

17 A. Yes. My name is Brian Land. I live in Woodside,
18 California, and I work at Apple.

19 Q. Sir, could you please describe your educational
20 background starting with college?

21 A. Yes. I have a Bachelor's of Science in Material
22 Science and Engineering from Cornell University, and I have
23 a Master of Science in Material Science and Engineering from
24 Stanford University.

25 Q. Mr. Land, what year did you earn your Master's

1 from Stanford?

2 A. 1992.

3 Q. And what did you do next?

4 A. I went for work -- to work at a startup company
5 that designed sensors, specifically gyroscopes and
6 applications that integrated sensors and gyroscopes.

7 Q. What was the name of that company?

8 A. It was called Gyration.

9 Q. For how long did you work at Gyration?

10 A. I worked there 12 years.

11 Q. What type of work did you do in that time?

12 A. It was a small company. It was a startup, so I
13 had to wear a lot of hats. But the main tasks were
14 designing gyroscopes, designing test equipment, and
15 manufacturing equipment to build and test gyroscopes, and
16 then designing applications that integrated the gyroscopes
17 into bigger systems that we could try to sell to customers.

18 Q. Sir, what did you find interesting about working
19 on these types of sensors?

20 A. Well, I really like sensors because they require
21 engineering knowledge across multiple domains, examples
22 being electrical, mechanical, physics. And the best design
23 requires really an understanding of all of them, and so I
24 got to apply many engineering skills. And I also
25 particularly like sensors because they interface with the

1 world at large, they tell us something about the outside
2 world, and the world is complex, and, because it's complex,
3 it's a challenging engineering problem.

4 Q. Now, sir, when did you leave Gyration to go to
5 work at Apple?

6 A. It was spring of 2005.

7 Q. And why did you make the decision to join Apple?

8 A. Gyration was -- I really enjoyed working there,
9 but it was a small company and the products that we sold
10 were sold in modest numbers, and we did excellent
11 engineering work, we made great products, but I felt like I
12 had an opportunity to make a bigger impact at a company like
13 Apple, which is, you know, has been a premier company in the
14 electronics and computer space for many years.

15 Q. What is your current position at Apple?

16 A. It's -- my title is distinguished engineer.

17 Q. Sir, what does it mean to be a distinguished
18 engineer at Apple?

19 A. It's a title and a job level that is granted upon
20 engineers and technical people at Apple who have achieved
21 technical excellence during their time at Apple in
22 developing Apple products.

23 Q. And, Mr. Land, in your responsibilities as a
24 distinguished engineer today, which group do you work with
25 at Apple?

1 A. I lead a hardware development team called Health
2 Sensing Hardware.

3 Q. How many engineers work under your supervision?

4 A. It's about 55 or 56.

5 Q. Which Apple products does the Health Sensing
6 Hardware Group that you head up contribute to, which Apple
7 product in the market today?

8 A. It's primarily the Apple Watch, the health
9 sensors for the Apple Watch.

10 Q. Now I want to just briefly rewind to when you
11 joined the company and the period between when you joined
12 Apple and when you began working on Apple Watch.

13 Do you have that time period in mind?

14 A. Yes.

15 Q. In that time period, sir, what were some of the
16 other products that you worked on?

17 A. I've worked on many types of Apple products. I
18 worked on the first iPhone. I've worked -- I developed -- I
19 was part of the team that developed the touchscreen for the
20 first iPhone. I was part of the team that developed the
21 touchscreen for the first iPad.

22 I've also worked on optical sensors, such as an
23 optical proximity sensor, which would be used in a phone to
24 turn the screen off when you bring it near your head so your
25 cheek doesn't push a button by mistake.

1 I've also worked on ambient light sensors, which
2 look out into the room to determine how bright the room is,
3 or if you're outdoors and can adjust the screen brightness
4 to a level that's appropriate for the room brightness.

5 Q. Fair to say, you and your colleagues at Apple had
6 worked on many different types of sensors before the Apple
7 Watch?

8 A. Yes.

9 Q. Let me take you to the Apple Watch. The very
10 first Apple Watch was called the Series 0; is that right,
11 sir?

12 A. Yes, that's correct.

13 Q. And that was released to the general public in
14 April of 2015. Do I have that right?

15 MR. RE: Leading, Your Honor.

16 A. Yes, I think that's approximately correct. It
17 was in the spring of 2015.

18 JUDGE BHATTACHARYYA: I didn't rule on the
19 objection.

20 Mr. Mueller, can you rephrase so it's not
21 leading.

22 MR. MUELLER: Sure.

23 Q. When was the first Apple Watch, the Series 0,
24 released to the general public?

25 A. It was the spring of 2015. I don't remember the

1 exact date.

2 Q. And when did you personally start work on what
3 became the Series 0?

4 A. It would have been fall of 2012.

5 Q. What were your responsibilities with respect to
6 the Series 0?

7 A. I was in charge of the team that was tasked with
8 developing multiple optical sensors for the Apple Watch.
9 There were three.

10 One was the optical heart rate monitor, the
11 second was a optical, what we called wrist detection sensor,
12 which could determine when you removed the watch from your
13 wrist for purposes of data security, it would lock the watch
14 up if you removed it from your wrist, and I also worked on
15 the ambient light sensor for the Apple Watch.

16 Q. Let's focus, if we could, on the heart rate
17 sensor.

18 What were some of the engineering challenges that
19 you and your colleagues confronted in designing the heart
20 rate sensor for the Series 0?

21 A. Well, first of all, making a heart rate
22 measurement at the wrist was particularly challenging
23 because the wrist doesn't have a lot of blood volume there
24 to measure optically. But even on top of that, which was
25 already a daunting problem, we had to fit into a very small

1 product. As I mentioned, I've worked on many products, and
2 the watch was the smallest of all of them. So we did not
3 have much space to fit the sensor itself.

4 The battery was small, so we had to make sure
5 that the heart rate worked with as low power as possible.
6 And we also had to work, because it was a mobile device, we
7 had to work in all these use cases throughout the day for
8 people, people are different size, different shapes, they
9 choose different bands, they choose different tightness of
10 bands, and we needed to make sure that the heart rate
11 monitor worked well in all the use cases that our customers
12 would expect.

13 Q. Mr. Land, what was the engineering impact, if
14 any, of the industrial design of the Apple Watch?

15 A. Yeah. Industrial design is an important part of
16 the Apple product. It defines, not only the outside shape
17 of the product, but the look and the feel, and the design
18 language, the aesthetics.

19 So we not only had to make a product that checked
20 all the boxes of low power, fit in this tiny form factor,
21 worked well across all the use cases, but we also had to
22 make sure that it was beautiful and compatible with the look
23 and feel of what the ID studio was going for for the product
24 vision.

25 Q. Now you succeeded in meeting these challenges.

1 Do I have that right?

2 A. Yes.

3 Q. And what were some of the components in the heart
4 rate sensor for the Series 0 watch?

5 A. We had an LED package, which had a couple of
6 different LED wavelengths in it, and we had packaged
7 photodiodes so LEDs emitted light, the photodiodes collected
8 the light.

9 We also had the apertures that the LEDs and
10 photodiodes were lined up to shine light through, and we
11 also had optical barriers to provide isolation internally.
12 And we built a custom electrical chipset that drove the LEDs
13 and processed signals from the photodiodes.

14 Q. Mr. Land, what was the shape of the back crystal
15 in the Series 0 watch?

16 A. It was dome-shaped.

17 Q. Why was it dome-shaped?

18 A. My understanding is the primary reason that it
19 was dome-shaped was to provide a little extra space to fit
20 the coils that were part of the wireless charging system.
21 The Apple Watch charges wirelessly through a dock that has a
22 complementary shape, and the dome-shape, when in combination
23 with the charging cradle, in addition to providing
24 additional space for the charging coils, it also provides a
25 self-centering mechanism so that, when you place it on the

1 cradle, it aligns itself well to the other -- the charger
2 for efficient wireless charging.

3 MR. MUELLER: Your Honor, if we could go on the
4 Apple confidential record.

5 (Whereupon, the hearing proceeded in confidential
6 session.)

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5 Q. Who is Paul Mannheimer?

6 A. Paul Mannheimer is an Apple employee who I hired
7 and has worked -- in late 2014 -- and has worked at Apple
8 ever since, and he was one of the [REDACTED] contributors for the
9 blood oxygen development.

19 Q. What were some of the challenges that you and
20 your team faced in developing the blood oxygen sensor for
21 the Apple Watch?

22 A. The challenges were -- were many. The first was
23 we had to fit into the small form factor of the watch and we
24 were trying to hit a moving target, because every -- it
25 seemed like as every year went by the watch got a little

1 smaller.

2 And we also had to work across -- at the wrist,
3 which was unprecedented -- at the time that we kicked off
4 the blood oxygen sensing at the wrist, there were no
5 commercially available products that did blood oxygen
6 sensing at the wrist.

7 We also had to fit into a product that had very
8 little space for the resources needed were accurate, and, of
9 course, we had to work across all of the human variation
10 that existed in the world. Those were some major
11 challenges.

[REDACTED]

16

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

5 (Whereupon, the hearing resumed in open session.)

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1 O P E N S E S S I O N

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3 JUDGE BHATTACHARYYA: Moving to the public
4 record.

5 BY MR. MUELLER:

6 Q. Now, sir, the health sensing hardware developed
7 by your team, there are, of course, other components beyond
8 that hardware in the Apple Watch; is that fair?

9 A. Yes.

10 Q. Let's take a look at RX-0319. And this is a
11 public technical specification for the Apple Watch Series 6.

12 Can you give Her Honor just a few examples of
13 other features and functions in the Series 6 beyond the
14 features developed by your team?

15 A. Yes. There's audio, which can be used to listen
16 to music or make a phone call, speaker microphone. There
17 are motion sensors that can be used to track your motion,
18 steps, your calories burnt through the day. There is a
19 near-field communication sensor that you can use for a
20 point-of-sale display.

21 There's all sorts of wireless connectivity,
22 Bluetooth, Wi-Fi, including cellular networks for network
23 connectivity, and that's one of the particularly challenging
24 module that's in the Apple Watch, because there's a powerful
25 transmitter that needs to talk with cell phone towers that

1 are perhaps miles away, and that's a potential source of
2 interference for all the sensors.

3 There's also other health sensors. There's an
4 ECG sensor. There's a touchscreen. There's -- and it's
5 really kind of a miniature computer in addition to all the
6 sensors.

7 Q. If we go to RX-0306, a Watch Series 7 Technical
8 Specification, is there a similarly broad array of features,
9 sir?

10 A. Yes. The list between Series 6 and Series 7 is
11 quite similar. There's a few I didn't mention, like GPS, to
12 tell you where you are on a map, there's a compass to give
13 you a heading if you're walking through a map, et cetera.

14 Q. Now I think you touched on some of the challenges
15 posed by all of these different components.

16 Can you tell us a bit more about the challenges
17 of developing a blood oxygen sensor in light of all of the
18 other components that we see on the specifications that
19 we've gone through?

20 A. Yes. The Apple Watch is very compact.
21 Everything is co-located in a very tight space. And every
22 single one of these sensors and modules is run by
23 electricity. It can be a source of interference,
24 interference into the blood oxygen sensor.

25 And we had to, in addition to making an excellent

1 blood oxygen sensor, we also had to consider all of these
2 interference sources and design the integration of the blood
3 oxygen sensor into the watch in a way that avoided these
4 interference sources and worked under the use cases that we
5 care about.

6 Q. And were you able to develop a reliable, accurate
7 sensor, notwithstanding those challenges?

8 A. Yes, we were.

9 Q. Now last few questions. You understand there's
10 five patents that are being asserted by the Complainants in
11 this case?

12 A. Yes.

13 Q. Before this investigation, Mr. Land, had you
14 heard or seen anything about these five patents?

15 A. No.

16 Q. You are the head of the Health Sensing Hardware
17 team at Apple for the Apple Watch; is that correct?

18 A. Yes.

19 Q. To the best of your knowledge, sir, did any of
20 the software or hardware developed by your team come from
21 ideas that originated at Masimo?

22 A. No.

23 Q. Did Marcelo Lamago contribute any ideas to the
24 software or hardware of the Apple Watch?

25 A. No.

1 Q. Did Dr. Michael O'Reilly contribute to the ideas
2 to the software or hardware of the Apple Watch?

3 A. No.

4 Q. Who did come up with the ideas for the software
5 and hardware for the blood oxygen sensor in the Apple Watch?

6 A. My team in conjunction with Steve Waydo's team
7 did all of the work to develop the blood oxygen sensor of
8 the Apple Watch.

9 Q. My final question. Are you proud of the work of
10 you and your team?

11 A. Yes, absolutely.

12 MR. MUELLER: Thank you, sir.

13 I pass the witness, Your Honor.

14 CROSS-EXAMINATION

15 BY MR. RE:

16 Q. Good morning, Mr. Land. My name is Joseph Re.
17 Nice to meet you.

18 A. Nice to meet you.

19 Q. Are you at least generally aware of how Apple
20 markets the Series 6 and Series 7 watches?

21 A. Somewhat, yes, a little bit.

22 Q. And are you aware of the fact that Apple has made
23 a conscious effort to move from the consumer space into the
24 health care space?

25 A. No.

1 Q. Have you ever looked at Apple's websites,
2 particularly Apple Health Care?

3 A. Apple Health Care? I'm not aware of that
4 website.

5 Q. Are you aware of how Apple markets the watch to
6 clinicians and doctors and hospitals on their website?

7 A. No.

8 Q. Are you aware of any company directive or
9 announcement that Apple is making an effort to move from
10 consumer electronics into the health care sector?

11 A. I'm sorry. Can you repeat the question? I
12 didn't follow.

13 Q. Are you aware of any company directive,
14 announcement, speech where Apple has made it very clear to
15 the world that they are moving from the consumer space into
16 health care and hospitals?

17 A. No.

18 Q. Okay. Let me take a look and show you --
19 We're going to go on the Apple confidential
20 portion.

21 (Whereupon, the hearing proceeded in confidential
22 session.)

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