UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.
Petitioner

v.

GESTURE TECHNOLOGY PARTNERS LLC
Patent Owner

Inter Partes Review Case No. IPR2021-00921
U.S. Patent No. 8,878,949

DECLARATION OF DR. BENJAMIN B. BEDERSON

I, Benjamin B. Bederson, hereby declare the following:

I. BACKGROUND AND QUALIFICATIONS

1. My name is Benjamin B. Bederson, Ph.D and I am over 21 years of age and otherwise competent to make this Declaration. I make this Declaration based on facts and matters within my own knowledge and on information provided to me by others.

2. I have been retained by counsel for Petitioner as a technical expert in the above-captioned case. Specifically, I have been asked to render certain opinions in regard to the IPR petition with respect to U.S. Patent No. 8,878,949 (the "'949 Patent"). I understand that the Challenged Claims are claims 1-18. My opinions are limited to those Challenged Claims.

3. My compensation in this matter is not based on the substance of my opinions or the outcome of this matter. I have no financial interest in Petitioner. I am being compensated at an hourly rate of $600 for my analysis and testimony in this case.

4. In writing this declaration, I have considered my own knowledge and experience, including my work experience in the field of electrical and computer engineering; my experience in teaching in this area; and my experience working with others involved in this field, including in both the design and analysis of multimedia-

focused communication systems and subsystems. In reaching my opinions in this matter, I have also reviewed the following references and materials:

- The '949 Patent (Ex. 1001)
- The '949 Patent File History (Ex. 1002)
- U.S. Patent No. 6,144,366 ("Numazaki") (Ex. 1004)
- JPH4-73631 to Osamu Nonaka ("Nonaka") (Ex. 1005)
- U.S. Patent No. 5,666,157 ("Aviv") (Ex. 1006)
- "CCD and CMOS Imaging Array Technologies," by Stuart Taylor ("*Taylor*") (Ex. 1013)
- Dana Harry Ballard and Christopher M. Brown. 1982. "Computer Vision" (1st. ed.). Prentice Hall Professional Technical Reference (Ex. 1015)
- Wallace, R.; Ong, P.; Bederson, B.; Schwartz, E. 1993. "Space Variant Image Processing", New York University TR-1993-633 (Ex. 1016)
- "First Mobile Videophone Introduced," May 18, 1999 (Ex. 1017)
- Any additional background materials cited below

A. Educational Background

5. I received a Bachelor of Science degree in Computer Science with a minor in Electrical Engineering from Rensselaer Polytechnic Institute ("RPI") in 1986. I received a Master of Science degree and a Ph.D. in Computer Science from New York University ("NYU") in 1989 and 1992, respectively.

B. Professional Experience

6. Since 1998, I have been a Professor of Computer Science at the University of Maryland ("UMD"), where I have joint appointments at the Institute for Advanced Computer Studies and the College of Information Studies (Maryland's "iSchool"), and am currently Professor Emeritus. I was also Associate Provost of Learning Initiatives and Executive Director of the Teaching and Learning

Transformation Center from 2014 to 2018. I am a member and previous director of the Human-Computer Interaction Lab ("HCIL"), the oldest and one of the best known Human-Computer Interaction research groups in the country. I was also co-founder and Chief Scientist of Zumobi, Inc. from 2006 to 2014, a Seattle-based startup that is a publisher of content applications and advertising platforms for smartphones. I am also co-founder and co-director of the International Children's Digital Library ("ICDL"), a web site launched in 2002 that provides the world's largest collection of freely available online children's books from around the world with an interface aimed to make it easy for children and adults to search and read children's books online. I am also co-founder and prior Chief Technology Officer of Hazel Analytics, a data analytics company whose product sends alerts in warranted circumstances. In addition, I have for more than 25 years consulted for numerous companies in the area of user interfaces, including Logitech, Microsoft, the Palo Alto Research Center, Sony, Lockheed Martin, Hillcrest Labs, and NASA Goddard Space Flight Center.

7. For more than 30 years, I have studied, designed, and worked in the field of computer science and human-computer interaction. My experience includes 30 years of teaching and research, with research interests in human-computer interaction and the software and technology underlying today's interactive computing systems. This includes the design and implementation of image sensing

and image processing systems as well as software applications on mobile devices, including smart phones and PDAs, such as my work on DateLens, LaunchTile, and StoryKit described below. My consulting included helping companies apply my work on "zoomable user interfaces" to their consumer-facing audio/video access software.

8. In 1992, I completed my Ph.D. dissertation at New York University titled "A Miniature Space-Variant Active Vision System: Cortex-I" (Ex. 1011)[1] in which I worked with both CMOS and CCD image sensors and wrote image processing software using those sensors. As depicted in the VLSI circuit layout image below, I designed a custom CMOS image sensor with a radial pixel layout. Figure 2.1 from my dissertation show the result of images taken with a camera I built using that image sensor. I then built a custom CCD-based camera by manufacturing a lens that I attached directly to a commercially available CCD sensor that is shown in Figure 2.2.

[1] Ex. 1011 is a pre-publication version of my thesis, which does not include the final chapter.

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