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16	UNITED STATES DISTRICT COURT	
	NORTHERN DISTRICT OF CALIFORNIA	
17	OAKLAND DIVISION	
18	REARDEN LLC, et al.,	Case No. 4:17-cv-04006-JST
		4:17-cv-04191-JST
19	Plaintiffs,	
	v.	
20	THE WALT DISNEY COMPANY, <i>et al.</i> ,	DECLARATION OF
		ANGELA TINWELL, Ph.D. IN
21	Defendants.	OPPOSITION TO DEFENDANTS'
		MOTIONS FOR SUMMARY
22		JUDGMENT ON CAUSAL NEXUS
		ISSUE
23	REARDEN LLC, et al.,	Judge: Hon. Jon S. Tigar
24	Plaintiffs,	Date: To be set
	v.	Time: To be set
25	TWENTIETH CENTURY FOX FILM	Ctrm.: 6, 2 nd Floor
26	CORPORATION, <i>et al.</i> ,	
27	Defendants.	
28		

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1	I, Angela Tinwell, Ph.D., declare as follows:	
2	1. I am a Senior Lecturer in the Research and Graduate School on the subject areas of	
3	Games, Film and Creative Technologies at the University of Bolton. I have personal knowledge of	
4	the facts in this declaration, unless I indicate that I have been informed of a fact by others in which	
5	case I have accepted such information as true. The opinions that I express here are based on my	
6	education, experience, and academic research on human viewer perceptions of computer graphics	
7	(CG) human-like characters appearing in films, computer games, and other media, as well as the	
8	materials referenced in this declaration.	
9	2. I have carried out numerous research projects mainly in the area of the Uncanny	
10	Valley phenomenon that relates to the areas of: Video Game Art; Video Game Design; Special	
11	Effects Development; Animation and Illustration; Character Design; Human Computer Interaction;	
12	Film Production; Creative Media; and Internet Studies. Since my first publications on the Uncanny	
13	Valley phenomenon in human-like virtual characters, my work has helped games artists, animators	
14	and special effects artists design human-like characters in industry, and has sparked much interest	
15	from the public and media. As an authority on this topic, I have been interviewed extensively for	
16	media and newspaper articles in the UK and abroad. In addition to this, I have delivered science talks	
17	to the public, consultancy to industry artists, and appeared on radio and television about my research.	
18	3. As Programme Leader on the Games and Creative Technologies programme in the	
19	Faculty of Arts and Media Technologies, I have experience teaching practical, theoretical, and	
20	research modules in Animation and Illustration; Special Effects (SFX); Character Design; 2D and 3D	
21	Concept Art; Video Games Art; Video Games Design; also, Quantitative and Qualitative Research	
22	Methods. In addition to supervising undergraduate research dissertation projects across the areas of	
23	Games and Creative Technologies, I also supervise postgraduate and doctoral research dissertations	
24	in these subject areas. Based on the quality and impact of the research that I had done on human-like	
25	virtual characters in the SFX and games industries, I was recruited in the Research and Graduate	
26	School to disseminate research methods and the research process to doctoral level students across the	
27	University of Bolton.	
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- Based on their human-like appearance, we extend this same scrutiny to human-like animated CG characters.
 - Human-like animated CG characters that lack the subtle nuances of genuine human facial expression can evoke the uncanny response and prevent the viewer from engaging and empathizing with that character due to a perception of anti-social, threatening traits in that character that cause dread, fear, and loathing.
 - Prior to the mid-2000s, digital artists using conventional key framing and low density facial motion capture animation technologies were unable to impart the subtle nuances of genuine human facial expression to their animated CG characters in films and video games.
 - Films featuring human-like CG characters with aberrant facial expression as protagonists were criticized by reviewers for the odd behavior and nonhuman-like traits of the CG characters, and tended to do poorly financially.
 - The advent of high density facial motion capture, beginning in 2006 with the MOVA Contour technology, made the complete capture of a performer’s nuanced facial expression both possible and practical for film-makers for the first time.
 - Animators who used high density facial motion capture technologies such as MOVA Contour had available to them all of a performer’s subtle and nuanced facial expression for animating human-like virtual characters.
 - In *Beauty and the Beast* (2017), given (a) the Beast’s role as a CG romantic lead protagonist character; (b) with whom the audience must empathize; and (c) with whom the audience must believe that Belle could fall in romantic love, use of MOVA Contour facial motion capture to accurately capture Dan Stevens’s facial performance as the Beast was an important factor in the film’s success.
 - MOVA Contour technology enabled the presentation of a human-like CG Beast character that that viewers could believe in, empathize with, and believe that Belle could plausibly romantically love.

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- Fewer film-goers would have seen Beauty and the Beast originally, whether in theaters, on DVD or Blu-ray, or by streaming, and fewer would have seen the film more than once, if MOVA Contour facial performance capture had not been used in the Beast’s animation pipeline.
 - In other words, at least some of the film’s revenue can be directly attributed to the use of MOVA Contour facial motion capture for Dan Stevens’s facial performance as the Beast.

IV. EXPERIENCE OF THE UNCANNY

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11. The subject of “The Uncanny” was first introduced into contemporary thought by the psychologist Ernst Jentsch in 1906 in an essay entitled “On the Psychology of the Uncanny.” In this essay, Jentsch described the uncanny as a mental state when a person cannot decide if an object is alive or dead or tell between what is real or unreal. Jentsch gave examples of life-like wax dolls such as mannequins that may, even for a small moment in time, confuse the viewer as they question if they are looking at a real person or not. This uncertainty may be exaggerated if viewing a life-size wax figure in reduced lighting as this may delay a person’s judgment as to whether the wax-figure is actually human or not.

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12. Other objects that would elicit an uncanny, eerie sensation are automata, such as machines made to imitate human movement and behaviour. An intricate mechanical doll made to look like a child and to walk or move its head and eyes may provoke ‘uncanniness’ (i.e. experience of the uncanny) as the viewer cannot decide whether the doll is animate or inanimate, alive or dead, friend or foe.

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13. Jentsch characterised the uncanny as a disturbing and unpleasant feeling that may escalate to a shocking and ghastly experience. Furthermore, the uncomfortable feelings caused by the uncanny may stay with the viewer even after the viewer has established that an object is not real, but rather an artificial man-made object. (Jentsch, 1906).

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14. Building on Jentsch’s work, Sigmund Freud wanted to better understand why we find some objects frightening and unpleasant, so he conducted a psychoanalysis on the uncanny named

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1 ‘*Das Unheimliche*’ (‘The Uncanny’). Freud described the uncanny as a unique, terrible sensation
2 associated with all that is dreadful and abhorrent. (Freud, 1919, p. 219).

3 15. Freud noted that although experience of the uncanny was common when encountering
4 a human-like artificial doll or automaton, a full comprehension and definition of the uncanny was
5 lacking. Freud suggested that the word *unheimlich* (“uncanny” in English) signifies what is “not
6 known” and “the opposite of what is familiar” (Freud, 1919, p. 222). The word *heimlich* can also
7 stand for what is hidden or obscured from view to prevent others from knowing about it, so Freud
8 used this second definition to represent the uncanny: “on the one hand it means what is familiar and
9 agreeable, and on the other, what is concealed and kept out of sight.” (Freud, 1919, pp. 224-225)

10 16. Freud asserted that uncanny objects evoke a sinister revelation of that which is
11 normally concealed from human experience. For example, identifying perceived negative traits or
12 behaviors in others that have suddenly been revealed. (Freud, 1919, p. 241)

13 V. **BUKIMI NO TANI—THE UNCANNY VALLEY**

14 17. Building on Jentsch and Freud’s earlier psychoanalytical literature on the uncanny,
15 Masahiro Mori, a Professor in Robotics at the Tokyo Institute of Technology, identified a link
16 between perceived uncanniness and robot design.

17 18. The latter part of the Twentieth Century saw a rapid increase in the use robots in the
18 workplace and in society. Not satisfied with the conventional, mechanical appearance of functional
19 robots in the workplace, engineers developed synthetic materials to mimic human flesh, skin and hair
20 that were used to disguise and hide a robot’s mechanical parts. Commonly referred to as ‘androids’,
21 these robots were also designed to mimic human behavior and interact with humans.

22 19. Mori published an essay in a Japanese academic journal named *Energy*. Mori coined
23 this ambition to simulate and even surpass human behavior as *Bukimi No Tani*, translated in English
24 as “The Uncanny Valley,” into which android designs may fall. Mori predicted that rather than liking
25 the robots with a human-like appearance, people may take a more negative stance. This adverse
26 reaction was due to subtle flaws in the robot’s appearance and behavior that deviate from the human
27 norm. According to Mori, these abnormalities in the android’s movement and behavior would evoke
28 a negative response in the viewer to the extent of fear and repulsion.

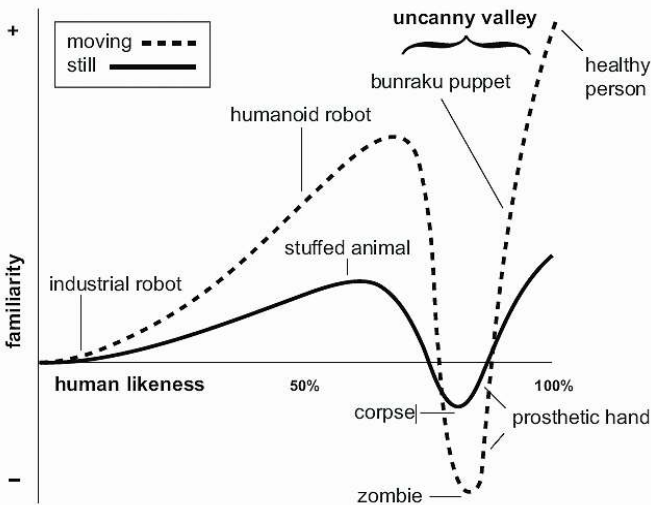
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20. To illustrate this lack of rapport towards the android designs, Mori (1970/2012) created a hypothetical graph that plotted perceived affinity towards a robot against how human-like the robot appeared:



21. An industrial robot, such as a robotic factory arm, was placed at the beginning of the plot to show a more passive reaction to this type of robot. A humanoid robot, such as a toy robot, is placed further along the horizontal axis. Although this robot has some human-like features, such as face, torso, limbs, hands and feet, it still maintains a mechanical appearance. Mori reported that the viewer, *especially children*, would prefer such robots due to their human-like traits. Despite a mechanical appearance with jerky movement, children would still be attracted to the robot’s simplistic human-like face and smile. (Mori, 1970/ 2012, [K. F. MacDorman and Norri Kageki, trans.] p. 98)

22. As the human-likeness in a robot increases, so does our perceived affinity, or sense of familiarity toward that robot. This dual increase in perceived affinity with human-likeness creates a linear ascent in Mori’s diagram, however this positive relationship is not continuous. Mori predicted that we enjoy human-like features in robots until a certain point is reached, approaching full human-likeness, when we take a sudden dislike toward a robot.

23. Viewers expect the robot to convey appropriate, accurate, and authentic facial expressions, and to respond positively to them when they engage with it. Perceived abnormalities in an android’s appearance, facial expression, movement, and behavior from the human norm evoke the

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1 uncanny, and the android is regarded as strange and unlikeable. Perceived affinity and likeability
2 rapidly decrease to the extent of repulsion as the android elicits an eerie, uncanny sensation in the
3 viewer. This shift creates a valley shaped dip, which Mori coined the Uncanny Valley, into which the
4 android falls.

5 **VI. THE UNCANNY VALLEY AND HUMAN-LIKE CG CHARACTERS**

6 24. Outside the field of robotics, technological advancements in hardware and software
7 capacity and performance have allowed for increased realism in films and computer games.
8 Specifically, CG has generated an abundance of on-screen virtual characters with a realistic human-
9 like appearance, essentially artificial humans like Mori’s robots. Yet, rather than being impressed,
10 the audience has frequently been disappointed and put off a film or game because of the ‘creepy’ and
11 ‘strange’ human-like CG characters that they are presented with. A similar uncanny effect to that
12 with androids has been repeatedly identified in academia and the trade press when viewers encounter
13 realistic, human-like virtual characters in films and games.

14 **VII. UNCANNY FACIAL EXPRESSION OF EMOTION**

15 **A. Nonverbal Communication.**

16 25. Facial expression is the preeminent communication tool, above that of speech and
17 body movements (Darwin, 1872, Ekman, 2004, Izard, 1971). Nonverbal communication (NVC)
18 takes place while we talk, especially in the upper face, and is used to understand crucial information
19 about a person’s emotional state (Ekman, 1965, 1979, 2004; Ekman & Friesen, 1969, 1978).
20 Importantly, as well as a person’s emotive state, a viewer can make accurate judgments on a person’s
21 personality, social skills, and attitude via facial NVC, regardless of their speech (Ekman and Friesen,
22 1969). Humans can make facial expressions both purposefully (that we are aware we are making),
23 and involuntarily (that occur spontaneously as an automatic response to a situation). When speaking,
24 “Conversational Actions” are purposefully made just before or with a spoken word while “Emotional
25 Expressions” occur unwittingly to semantically accentuate the meaning of a word.

26 26. Due to their contrastive movements to convey positive or negative emotions, the
27 brows are used most frequently as voluntary Conversational Actions (Ekman, 1979), therefore
28 *animators must get brow movement correct in realistic human-like characters* (Tinwell, 2014). We

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1 rely on these NVC signals in the upper face that are interpreted globally and intuitively because the
2 lips and lower face may be involved in speech.

3 27. Additional categories of NVC in the upper face include ‘Illustrators’ and ‘Emblems’,
4 (Ekman, 2004; Ekman and Friesen, 1969). These help to emphasize and augment what is being said
5 and can be tied to certain words. The word “No” is exaggerated if it is spoken with a lowered brow
6 as this facial movement is associated with negative emotions such as anger and disgust.

7 28. Such “baton-accent” that involve brow movement (Ekman, 2004, p.41) are directly
8 related to a word’s meaning. For example, a person speaking positive words such as “good” or
9 “fantastic” will raise the brows. This brow lift is linked to the more positive emotions happiness and
10 surprise, thus increasing perceived enthusiasm about what is being said.

11 29. The importance of context and accurate upper facial expression in a believable
12 human-like virtual character is essential, especially during speech. If a realistic human-like character
13 speaks the word “Excellent”, but is presented with a still or a lowered brow, then the viewer may
14 perceive that the character is being sarcastic instead of delighted with an outcome. Such an effect
15 may occur if the animator did not animate a character’s upper facial region correctly, and the viewer
16 may be put off by the character’s perceived dishonesty as they do not mean what they say (Tinwell,
17 2014).

18 **B. False or Fabricated Emotion.**

19 30. Charles Darwin (1872) found that a person’s facial expression would reveal their
20 emotional state, even if that person tried to hide how they were really feeling. As Ekman and Friesen
21 (1969) stated, a viewer is aware of being presented with a false expression because they can detect
22 involuntary, transient NVC that suggests possible deceit. (Ekman and Friesen, 1969, p.52).

23 31. The NVC leaks uncontrollable clues about a person’s real emotions even if they try to
24 control their facial expression and speech and we are hard-wired to detect that. In anger, a person can
25 stop themselves from clenching their fist, but they cannot prevent a frown expression in their upper
26 facial region, which a viewer will recognize as anger (Ekman and Friesen, 1969; Ekman, 2004).

27 32. Emblems, a specific type of NVC, are typically presented when facing another
28 person, such as raised brows and a tilting of the head back to help communicate a person’s surprise

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1 to another (Ekman and Friesen, 1969). When emblems occur unintentionally, they can also unmask a
2 person’s true thoughts and feelings, and were likened to a verbal slip of the tongue: “Like verbal
3 slips, emblematic fragments may reveal repressed information, or deliberately suppressed
4 information” (Ekman, 2004). This inadvertent NVC may be as obvious to the viewer as when a
5 person accidentally speaks their mind to reveal information not to be shared.

6 33. To better understand human emotion and facial expression, leading psychologist Dr.
7 Paul Ekman and his colleague Wallace Friesen created ‘FACS’, a visual catalogue of the facial
8 muscles involved in creating different expressions at differing intensity. The acronym FACS stands
9 for ‘Facial Action Coding System’ (Ekman and Friesen 1978). Although it was developed in the
10 1970’s, this facial expression classification system is still used today as the blueprint in facial motion
11 capture and animation modeling software packages.

12 34. Ekman further decoded the face to develop a perceptual liar detection system based
13 on identifying involuntary NVC, unique to spontaneous, felt emotion (Ekman, 2001, 2003).
14 Perception of true anger requires that the lips be pressed together as well as a lowered brow. For
15 genuine fear, the eye aperture widens to allow for increased visual field and attention, while the brow
16 wrinkles, signaling anticipation of panic and distress. A viewer will question the authenticity of an
17 emotion if these reliable expressions are not present to the extent that the viewer may perceive the
18 other as lying (Ekman, 2001, 2003).

19 35. If a human-like CG character’s facial expression is not modeled correctly and the
20 viewer suspects a false emotion due to inadequate NVC, this can work against a protagonist CG
21 character (Tinwell, 2014). Too many unintentional facial expressions may trigger in a viewer a
22 perception of deceit by the CG character, and a lack of reliable, involuntary facial expressions may
23 raise a viewer’s suspicion of false emotion and invoke the uncanny response (Tinwell, 2014).

24 **VIII. EMPATHY AND THE UNCANNY VALLEY**

25 36. In 2009, the philosopher Professor Catrin Misselhorn put forward that uncanniness
26 occurs because we cannot empathize with human-like, synthetic agents. We can anthropomorphize
27 and feel emotions towards a mechanical toy robot but cannot maintain this empathy with a human-
28 like android. I later demonstrated that aberrant facial expression may prevent a viewer from

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1 empathizing with a human-like CG character due to a perception of a lack of empathy in a character
2 towards the viewer (see Tinwell et al., 2011; Tinwell, 2014).

3 37. Emotional empathy occurs in response to “emotional displays of others” (Blair, 2005,
4 p. 699) via their facial expression and speech. Empathy serves a vital role in effective social
5 interaction (Caruso and Mayer 1998; Davis, 1983; Hogan, 1969; Mehrabian and Epstein 1972;
6 Thornton and Thornton 1995). If a viewer perceives a lack of empathy in a character, they will
7 presume that the character cannot demonstrate compassion or experience cognitive and emotional
8 empathy with the viewer or others (Tinwell, 2014).

9 38. In summary, a perceived lack of empathy in a CG character works against what we
10 would expect in terms of “normal” human response and interaction, and prevents a viewer from
11 empathizing with that character (Tinwell, 2014). As such, *it is paramount that innovative facial*
12 *motion capture techniques and animation skills communicate these more ‘humane’ personality traits.*
13 If a protagonist CG character’s facial expression does not accurately convey emotional and cognitive
14 empathy in the upper face, to show that the character genuinely cares about others, then the character
15 will likely be perceived as uncaring, cold, callous, and put in the role of an antagonist (Tinwell,
16 2014). This aberrant facial expression will increase the viewer’s uncanny response and ultimately
17 destroy any chance of the viewer building a relationship and empathizing with the protagonist CG
18 character.

19 **IX. THE EFFECT OF AGE AND GENDER ON**
20 **SENSITIVITY TO THE UNCANNY VALLEY**

21 39. Only adult participants had been used in previous Uncanny Valley experiments
22 testing aberrant facial expression in human-like CG characters. Given that so many feature films
23 using such characters were aimed at children, in 2014 Tinwell and Sloan conducted a study to test if
24 9 to 11-year-olds perceived the uncanny in animated human-like CG characters.

25 40. Sixty-seven primary school children rated humans, fully animated human-like CG
26 characters, and CG characters where movement had been disabled in the upper face presenting a
27 startled expression and happiness, for perceived strangeness, friendliness, and human-likeness.

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1 41. As found with adults, the results showed that children do experience uncanniness in
2 humanlike characters, perceived as stranger, less friendly, and less human-like than humans.
3 Furthermore, children’s perception of the uncanny was strongest in those characters with a lack of
4 upper facial movement. (Tinwell and Sloan, 2014). Interestingly, we found that *nine to eleven-year-*
5 *old girls* perceived realistic human-like characters as stranger than boys of the same age. Tinwell and
6 Sloan (2014)

7 **X. CRITICAL STUDIES OF THE UNCANNY VALLEY IN FILMS**

8 42. The Uncanny Valley phenomenon is frequently discussed by practitioners, spectators
9 and academics in the animation and games communities. As an important, often recurring issue in
10 new releases that feature human-like CG characters, the uncanny topic occurs in journal papers,
11 conference proceedings, and new media. Failure to capture the nuances of genuine human facial
12 expression in human-like CG characters intended to be viewed by the audience as protagonists or
13 empathetic has resulted in well-documented adverse audience responses to films. Following are
14 some relatively recent notable examples.

15 *Final Fantasy: The Spirits Within*

16 43. Early 21st Century motion capture (Mo-cap) techniques used in cinematic games,
17 animation and films such as *Final Fantasy: The Spirits Within* (Sakaguchi, 2001) served as a catalyst
18 for uncanniness in computer generated, human-like characters. Director Hironobu Sakaguchi
19 expected *Final Fantasy: The Spirits Within*, to be the first mainstream CG film to fully use marker-
20 based motion capture and virtual characters with a realistic human-like appearance, and with an
21 inflated budget of US\$ 137 million, to be revolutionary and groundbreaking: “We’ve created
22 characters that no longer feel blatantly computer generated... It’s something people have never seen
23 before.” (Sakaguchi, as quoted in Taylor, 2000)

24 44. However, the audience was alarmed and disappointed on this film’s release, with a
25 mutual agreement that the main protagonist CG character Dr. Aki Ross, who was supposed to take
26 the viewer on an emotional and spiritual journey in this story, failed to convince the viewer that she
27 was human, or even near human-like. Jerky movements combined with unnatural and emotionally
28 limited facial expression evoked the uncanny response. Instead of being perceived as attractive and

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1	likeable, anomalies in her facial expression and speech made her come across as unapproachable and	
2	rude (see e.g., Plantec, 2007; Tinwell 2014; Beck, Stevens, Bard, and Cañamero, 2012).	
3	45. As Peter Plantec (2007) stated, she inadvertently came across to the viewer as ... “a	
4	cartoon character masquerading as a human. As she moves, our minds pick up on the incorrectness.	
5	And as we focus on her eyes, mouth, skin and hair, they destroy the illusion of reality. Adding a	
6	voice we recognize (Ming-Na) only complicates matters.” (Plantec, 2007)	
7	46. The audience was left so alienated by this ‘phony and fake’ simulacrum of Dr. Aki	
8	Ross that even today, <i>Final Fantasy: The Spirits Within</i> (Sakaguchi, 2001) is still regarded as an	
9	uncanny failure with great lengths now taken by special effects studios to avoid a similar fate (see	
10	e.g. Beck, Stevens, Bard, and Cañamero, 2012).	
11	<i>Beowulf</i>	
12	47. In 2007, Robert Zemeckis decided to improve on motion capture technologies in his	
13	fantasy film <i>Beowulf</i> . Zemeckis chose to use marker-based motion capture as it freed the actors,	
14	including Angelina Jolie as ‘Grendel’s mother’ and Anthony Hopkins as ‘King Hrothgar’, from	
15	many constraints in live-action filming (Billington, 2007). With less focus on lighting, camera set up,	
16	an actor’s hair, make-up, or costume, more time and precision could be placed on an actor’s	
17	performance and the viewer enjoyment and experience. As Zemeckis explained, “The actors are	
18	liberated from the tyranny of a normal movie - it is absolute performance and great actors, like the	
19	ones in this movie, relish that” (Zemeckis as quoted in Billington, 2007).	
20	48. Still compromised by the limitations of early performance capture technology, this	
21	process again failed to capture the detail, subtleties, and nuances in a character’s facial expression.	
22	Despite convincing human-like CG character appearances, the audience was left to fill-in the blanks	
23	for missing nonverbal communication in close-ups of the characters’ faces when speaking or	
24	listening (Gallagher, 2007). Viewers were left unmoved by dramatic scenes in the plot as those	
25	characters that were threatened or on the verge of death failed to communicate genuine fear and	
26	anger with a lack of intensity in their facial expression (Gallagher, 2007).	
27		
28		
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1 49. The renowned characters were perceived as odd and life-less, and film critics
2 regarded Zeckemis as “a slave to technological advances” (Turran, 2007) for swapping “real” actors
3 with unsatisfactory, uncanny CG replicas.

4 *The Adventures of Tintin: Secret of the Unicorn*

5 50. To try to avoid the uncanny in his animated near human-like depiction of Tintin in
6 *The Adventures of Tintin: Secret of the Unicorn* (2011), Spielberg worked closely with the actor
7 Jamie Bell and up to sixty animators at Weta Digital to ensure careful matching of an actor’s
8 observed poses with the corresponding virtual character’s movements. A new facial performance
9 capture method involved actors wearing head-rigs as they filmed their facial expressions and speech
10 to improve both the visual and physical components of the skin texture and the underlying muscle
11 movement and physiognomy of the face. Further deformation work was then applied to the virtual
12 face shapes in 3D modelling software to create the appearance of muscle and fat beneath the skin.
13 For example, so that folds and creases in the skin and wobbly cheeks would appear as a character
14 laughed (Robertson, 2012).

15 51. But even with a blend of new facial performance capture and 3D modelling
16 technology, the combined efforts of Spielberg and Weta Digital were not able to escape the Uncanny
17 Valley. On release in 2011, the media reported that Spielberg’s human-like CG characters “had
18 fallen headfirst into the Valley and, rather than a hero, Tintin was ridiculed as a hindrance to the film
19 (Buchanan, 2011; Rose, 2011)” (Tinwell, 2014, p. 14). His abnormal facial expression evoked
20 negative attention as the viewer reported a sheer lack of emotional expressivity from this character.
21 Viewers could not perceive any differentiation in the intensity of Tintin’s emotion when he sat
22 quietly contemplating a good day’s work with Captain Haddock and communicating a more calm
23 expression, to when he was being forced to jump from tall buildings and travel at high speed through
24 busy streets in a fast-paced motorcycle chase scene (Buchanan, 2011; Rose, 2011; Tinwell, 2014).

25 52. Kyle Buchanan (2011) of *New York Magazine* observed that, while Tintin appeared
26 likeable and charming, there was a mismatch between his behavior and his near human appearance
27 “Tintin looks simultaneously too-human and not human at all, his face weirdly fetal, his eyes glassy
28 and vacant instead of bursting with animated life”.

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1 53. Spielberg intended that the viewer be gripped by this action-packed animation, but
2 Tintin’s face did not communicate spontaneous fear or surprise in response to any perilous scenarios.
3 Some characters found the main protagonist Tintin dull rather than dramatic and were left
4 unconcerned if Tintin escaped from imminent danger or not. Tintin’s glazed-over look and simple
5 expression failed to match the heightened realism of the film sets and rich qualities of Jamie Bell’s
6 voice. As such, the viewer failed to engage with and care about this distant, dead-eyed, odd
7 character.

8 *Mars Needs Moms*

9 54. The virtual simulation of actress Joan Cusack as Milo’s Mother in the motion picture
10 *Mars Needs Moms* was reported as disturbing with a “creepy Madame Tussauds vibe”, (Schager,
11 2011, p.1). Instead of being perceived as empathetic, kind and likeable, she was criticized as a blight
12 in the film for being, “strange with a wax-work complexion, dead emotionless eyes, and with the
13 emotional fidelity of a mannequin” (Tinwell, 2014, p. 114).

14 55. With a lack of essential NVC in her ‘wax-work’ face and likened to the ‘living-dead’,
15 Milo’s Mother failed to convey authentic human emotion synchronized with the context of the film
16 and the emotive tones of her speech. Milo’s mother, rather than being capable of expressing empathy
17 and love toward her family, left viewers suspicious of devious and untrustworthy traits that worked
18 against the character’s intended role as a protagonist in the film. (Tinwell, 2014).

19 56. Writing for *USA Today*, Ryan Nakashima described feedback from parents who had
20 taken their children to see *Mars Needs Moms*. Doug McGoldrick, who took his two daughters to see
21 the movie, said the faces of the main characters “were just wrong.” Their foreheads were lifeless and
22 plastic-looking, “like they used way too much botox or something,” (Nackashima, 2011). Nakashima
23 reported that another parent had said that the human-like characters were “all annoying in their own
24 way.” (Nackashima, 2011, p.1)

25 57. Ultimately the audience was left dismayed at the lack of emotional warmth from
26 Milo’s Mother and her family that this ‘feel-good’ movie was supposed to inspire. Viewers were left
27 cold by the perceived lack of sentimentality in Milo’s Mother due to her strange and inaccurate facial
28 expression.

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XI. THE FINANCIAL COST OF UNCANNY
HUMAN-LIKE CHARACTERS IN ANIMATION

58. Directors such as Sakaguchi, Zemeckis, and Spielberg promoted their films as setting new heights in human drama in animation, yet a lack of human-likeness in the protagonist’s facial expression prevented some viewers from having this heightened emotive experience as they failed to empathize with the characters and engage with the plot.

59. A comparison of estimated budgets and gross film takings suggests that there is a negative financial impact of uncanny human-like virtual characters in feature films.

60. *Mars Needs Moms* (Wells, 2011) had an estimated budget of 150 million dollars (Internet Movie Database [IMDB], 2011; Young, 2011), and when it was released in March 2011, it achieved a “disastrous \$6.9 million opening” (Young, 2011, p. 1) over its first weekend cinema debut in the United States of America (USA). This disappointing start yielded further financial failure with gross takings by June 2011 at \$21,379,315 in the United States (IMDB, 2011)” (Tinwell, 2014, pp. 192-3). And many speculated that the diminished box office performance of *Mars Needs Moms* caused the demise of Robert Zemeckis’s motion-capture studio ImageMovers Digital as the uncanny human-like characters had a negative impact on this studio’s reputation as well as their finances (Freedman, 2012; Young, 2011; Tinwell, 2014).

61. This is similar to the disastrous outcome for the special effects studio Square Pictures, which had the ambition to simulate human emotions in CG characters (Briscoe, 2002). With *Final Fantasy: The Spirits Within*’s estimated losses at over \$94 million and CNBC recording it as the ninth biggest box office bomb of all time (Bukspan, March 20, 2012), the closure of special effects studio Square Pictures was directly linked with this uncanny film (Brisco, February 4th 2002). Square Pictures closed due to the hyperbolic labor and costs to create the ineffective, unemotional uncanny human-like characters that the audience rejected. If the animation is too time and render intensive in that the animators have to fill in too much detail that low-density motion capture has missed, and the rendering requirements are disproportionately high compared to the actual output, then the film risks going over budget.

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1 62. According to figures provided by boxofficemojo.com, *The Adventures of Tintin:*
2 *Secret of the Unicorn*, which was criticized for the facial performance of its lead character, lost
3 money. And *Beowulf*, also widely critically panned for its unnatural CG characters despite the
4 casting of major film stars, roughly broke even.

5 63. Based on the above, *a causal effect can be identified between the initial facial motion-*
6 *capture technology, unpopular uncanny human-like characters, audience acceptance, and a film’s*
7 *profitability.*

8 64. Without subtle facial movements and NVC to help communicate a character’s
9 conceptual, affective, and physiological state, the viewer will fail to suspend disbelief of the
10 character as they are reminded that the character does not have the human capacity to think, feel, or
11 respond to events around them (Tinwell, 2014).

12 65. Mori (1970/2012) placed a human beyond the Uncanny Valley dip and stated that
13 before we can overcome the Uncanny Valley we must, “begin to understand what makes us human”,
14 (Mori, 1970/2012, p. 100). Philosophical and psychological studies can help us determine the
15 essence of being human and apply this learning to character designs with a human-like appearance
16 (Tinwell, 2014). The importance of upper (and lower) facial expression as a means of successful
17 communication in human-like characters is paramount in attempting to persuade the viewer that a
18 character does have the ability to think, feel, and respond appropriately and empathetically to others.

19 66. The earlier uncanny films that relied on low-density marker-based motion capture
20 and/or key framing animation remind us of the struggles that film directors and animators had in
21 these technologies to capture the essence of highly-nuanced human facial expressions that make a
22 character appear human to viewers.

23 **XII. HIGH DENSITY FACIAL PERFORMANCE CAPTURE**

24 67. Beginning in the mid-2000s, technological innovations began to permit high density
25 facial performance capture. MOVA Contour (“MOVA” herein) was publicly unveiled at the
26 SIGGRAPH (Special Interest Group on computer GRAPHics and interactive techniques) 2006.
27 “Camera System Creates Sophisticated 3-D Effects,” *The New York Times*, 7/31/2006; “Digital
28 Replicas May Change Face of Films, *The Wall Street Journal*, 7/31/2006.

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1 68. Mr. Stephen Perlman understood the practical and theoretical difficulties in capturing
2 the human form and the limitations that this was having on film production and audience enjoyment.
3 Low-density motion capture could only capture partial facial movement, thus restricting animators
4 from creating reliable facial expressions in their human-like characters. To overcome this, Perlman
5 researched, tested, prototyped, and pioneered an innovative strategy to capture acute, comprehensive
6 detail in an actor’s facial expression as they emoted and talked. An actor’s face is first covered in
7 phosphor-based makeup, and then he or she is filmed in front of an array of lights and video cameras
8 that work in synchrony to systematically (and imperceivably) capture all the dynamic movements of
9 the face and skin in heightened detail, excepting only the eye ball and inner mouth area.

10 69. Rather than a resolution of just a few points on a face, MOVA could capture
11 thousands of points of reference to provide millions of polygons for animators to work with.
12 Animators now had the volumetric MOVA facial images to provide a detailed blueprint for their
13 human-like characters and only had to track eyeball and inner mouth movement such as the tongue
14 and teeth. The MOVA captures provided not only a guide for how the upper and lower facial regions
15 moved, independently and in unison, but provided finer details of skin wrinkles, dimples, and folds,
16 with subtle eye brow movements, nostril flares, and creases around the eyes and in the forehead; all
17 of which are essential to accurately express NVC for a human-like CG character to be perceived as
18 convincing.

19 70. Importantly, animators no longer had to improvise on what the face should be doing
20 when an actor was thinking and talking. The MOVA facial captures allowed animators to work much
21 more efficiently and accurately, creating successful human-like characters with authentic human-like
22 expression and behaviour that matched their human-like appearance. Actors are expert at conveying
23 authentic human expression and emotion, and MOVA allowed all of the actor’s subtle, nuanced
24 expression to be captured and retargeted to the faces of CG characters.

25 71. Even if astute animators had studied FACS and were aware of the vital NVC that was
26 not available with low density performance capture, it is unlikely that they would be able to recreate
27 every spontaneous facial movement and it would be too labor intensive and costly to manually key
28 all of the finer nuances in facial expression precision in their human-like characters.

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1 72. Director David Fincher realized that until MOVA had been invented, a lack of human
2 behavioral fidelity in CG characters had served as a barrier for his Oscar winning film, *The Curious*
3 *Case of Benjamin Button*, and he described MOVA as revolutionary: “Instead of grabbing points on
4 a face, you will be able to capture the entire skin. You’re going to get all of the enormous detail and
5 the quirks of human expression that you can’t plan for”. (Fincher as quoted by John Markoff in The
6 New York Times, July 31st, 2006).

7 73. Ed Ulbrich, Visual Effects Producer at Digital Domain, had the challenge of making
8 Brad Pitt age backwards in *The Curious Case of Benjamin Button*, and as Ulbrich acknowledged, this
9 film would not even have been attempted without the novel MOVA system. In a TED Talk about the
10 making of the CG Benjamin Button character, Ulbrich stated that initially the film was inconceivable
11 “we had to throw in the towel. It was deemed impossible. It was beyond the technology of the day to
12 depict a man aging backwards.” (Ulbrich, TED Talk, February 2009) As Ulbrich explained, the
13 obstacle was recreating a believable virtual human, especially with a famous actor such as Brad Pitt
14 that everyone is familiar with, “The human form, in particular the human head, has been considered
15 the Holy Grail of our industry... there really was no tolerable margin of error” (Ulbrich, TED Talk,
16 February 2009).

17 74. MOVA was first used to capture Brad Pitt performing FACS poses to create a
18 comprehensive visual database of the parameters of what the actor’s facial expression could achieve.
19 Brad Pitt was also captured in real-time emoting and in dialogue for each movie scene, so MOVA
20 allowed the animators to capture the idiosyncrasies of Brad Pitt’s facial expression, characteristic of
21 who he is, regardless of age (Ulbrich, TED Talk, February 2009).

22 75. The eighty-year-old version of Benjamin Button was created using a body actor who
23 was smaller than Brad Pitt, and who performed wearing a blue cap to track his head motion. Before
24 MOVA retargeting, the character appeared with an inanimate expression, referred to on set as the
25 “Dead Head.” Pitt’s captured MOVA facial expression was retargeted onto a 3D model of the eighty-
26 year-old Brad Pitt, and then transposed onto the body actor’s body. This method was then repeated
27 accordingly for each decade as the character aged backwards.

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1	76. For the first sixty minutes of the film the viewer is watching a completely digital head	
2	of the aged protagonist Brad Pitt from the neck up. But MOVA’s high-density facial performance	
3	capture allowed the richness of Brad Pitt’s facial expression to match the emotive tones of his speech	
4	in keeping with the film’s context and his actions in each scene. In this way, the protagonist	
5	suspended the viewer’s disbelief despite Brad Pitt’s age or what he was doing on screen, and	
6	heightened audience enjoyment and experience.	
7	77. The viewer was fully immersed in the film and engaged with the protagonist	
8	Benjamin Button, rather than being distracted or annoyed by odd or unresponsive facial expression.	
9	As the first feature film to use MOVA, of three Oscars that this film was awarded, the “Best	
10	Achievement in Visual Effects” Oscar can be attributed in substantial part to MOVA.	
11	78. Ulbrich stated that MOVA is a system that allows a virtual human-like character “to	
12	do everything that a human can do” and called the process “emotion capture” rather than motion	
13	capture (Ulbrich, TED Talk, February 2009). Animators may still take time working on a character’s	
14	eyeball movement, tongue movement, hair and clothes, but without MOVA, the animators would be	
15	spending valuable time working on unsuccessful, ineffectual, inanimate CG characters. MOVA	
16	finally allowed directors and animators to effectively capture and project facial NVC in human-like	
17	characters to allow the audience to connect and empathize with human-like CG characters.	
18	XIII. THE BEAST, AND BEAUTY AND THE BEAST	
19	79. My research has found that virtual characters with a realistic human-like appearance	
20	may be perceived as less threatening and more humane when they portray more negative emotions	
21	such as sadness, anxiety, nervousness, self-consciousness, embarrassment, and shame (Tinwell et al.,	
22	2011a; 2013; Tinwell, 2014). Human viewers want human-like virtual characters to portray such	
23	vulnerable emotions, as well as positive emotions such as humor and hope, so that they can perceive	
24	and understand how the CG characters are feeling and thinking and so that they can empathize with	
25	the CG characters. In other words, viewers look to human-like virtual characters, in film and in	
26	computer games, to demonstrate a reciprocal range of human emotions and thought processes, so that	
27	we can truly engage with that character and trust that we have a mutual understanding and	
28	appreciation of one another.	
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1 *The Library Scene*

2 80. The importance of facial motion capture in achieving a rapport toward the Beast

3 character is demonstrated in a video clip by Digital Domain (herein referred to as the ‘video clip’),

4 which shows how the MOVA facial scanning and capture software allows for the accurate depiction

5 of the facial expression from the actor, Dan Stevens, to be transferred onto the animated Beast

6 character. In this video clip, the Beast humorously refers to the books in his massive library. When

7 Belle asks if he has read all of the books, the Beast responds humorously “not all of them, some of

8 them are in Greek.” A copy of the Digital Domain clip is attached as Exhibit 4, and a copy of the

9 clip as it appeared in the film is attached as Exhibit 5.

10 81. Humour can be used as an effective means of communication to befriend and

11 influence others (Kazarian and Martin, 2004). The initiator (in this case the Beast) understands that

12 humour can be used to enhance interpersonal cohesiveness and to evoke a positive response in

13 others. He understands how to make us smile and, as shown in the video clip, Dan Stevens’s facial

14 performance exquisitely expresses the joke that is then transferred onto the Beast’s animated face as

15 he muses this humorous line. In the scene, Belle immediately recognizes that the Beast is expressing

16 a new side of his character: “Is that a joke? Are you making jokes now?”

17 82. The Beast’s reciprocal gesture is not only directed at Belle, but also at the audience.

18 Viewers, like Belle, are charmed that the Beast can demonstrate this sophisticated, human theory of

19 mind, so that he can initiate a humorous response in others from his thoughts, actions, and

20 importantly, his facial expression. This affiliative humour is affirming of self and of others (Kazarian

21 and Martin, 2004) so we can better establish empathy with the Beast.

22 83. This mutual exchange of positive thoughts and feelings with the Beast allows us to

23 build a rapport with him so that we can better understand and relate to this character. In other words,

24 he is ‘winning the viewer over’ while he is encouraging Belle to like him more. The Beast’s facial

25 expression is of most significance in this exchange of emotions and humour. The Beast must portray

26 a smile that is perceived as genuine and authentic by the viewer, and to do this the non-verbal facial

27 expression in the upper face including the Beast’s forehead and eye area must be accurate. The eye

28 area must be involved in the smile as well as the mouth (Ekman, 1973; Ekman and Friesen, 1969).

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84. Humans can create a smile shape in the lower face voluntarily, so that we can smile for a winner even though we may be disappointed we have come in second place (Duchenne, 1862; Darwin, 1872; Ekman, 2003; Ekman and Friesen, 1982). However, our disappointment will be shown non-verbally in our upper face as we cannot hide this disappointment despite our best efforts to do so. We can create a smile on our lips, but our eyes will remain the same shape or down-cast as we try to be enthusiastic for the winner (Ekman, 2003; Ekman and Friesen, 1982). When we are genuinely happy, for example if we had won, then as well as a smile shape in the lower face, the facial muscle that raises the cheek does so to an extent that the eye aperture is narrowed, gathering skin inwards around the eye socket. This movement creates bulges below the eye socket and crows-feet wrinkles to the side of the eyes, both characteristic of a genuine smile (Ekman, 1973; Ekman & Friesen, 1969).

85. This is clearly shown in a screen shot from the video clip, in which we can see Dan Stevens showing a genuine smile with bulges below his eye and some wrinkles and creases to the sides of his eyes (see Figure One). As well as the smile, this nonverbal communication is remodeled in the Beast character, including the details, bulges and wrinkles around the eye sockets.



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1 86. If the Beast were to show a smile in his lower face, but a sad, or angry, or even lack of
2 expression in his upper face due to an inaccurate depiction of facial expression, such as a furrowed
3 brow, wide, sad eyes, or a neutral upper face, then we would instinctively perceive a false smile. As
4 the above image shows, the MOVA facial capture software has allowed these finer nuances of the
5 smile to be recreated on the Beast character. Without the capture of bulges and wrinkles in the
6 Beast’s skin around the eye area, we may doubt that he is feeling a more positive emotion. In this
7 way, we would interpret that the Beast is smiling, but he is not actually happy so we may be
8 confused as to what the Beast is trying to communicate to us. Is he attempting to trick Belle into
9 thinking that he is joking with her (and the audience), when he is really plotting an evil plan to
10 persuade Belle to like him while he has other more negative intentions? The Beast may convince the
11 audience that he is capable of more human thoughts and emotions, but without modeling highly
12 nuanced facial capture, this more sophisticated theory of mind could work against the Beast so that
13 he is perceived as a cunning enemy to us and Belle, rather than a likeable, humorous ally. Without
14 the perception of a genuine smile, in which the areas around the eyes must be involved and animated
15 correctly, we may perceive that the Beast is trying to trick us and that he is Belle’s enemy and a
16 possible threat.

17 87. In summary, it is imperative that the finer nuances of the facial expression around the
18 eye area are captured accurately and then modelled onto the Beast’s face, and the MOVA facial
19 capture software has allowed this to happen. The MOVA system has provided a road map for
20 animators to ensure accuracy of facial expression in the upper and lower face, simultaneously and
21 together, in keeping with the jovial emotive tones of the Beast’s speech. Without MOVA, the Beast’s
22 facial expression may not be as accurate, engaging, or effective, so that the viewer may be unable to
23 empathize with the Beast, or at worst perceive the Beast as a potential threat. As the details of skin
24 texture, tone, pores, and hair increase, so does the discernment on the part of the viewer for detecting
25 facial expressions that deviate from the human norm (Tinwell, Grimshaw and Williams, 2011b.)

26 88. Therefore, MOVA facial performance capture is crucial in achieving the correct facial
27 expressions for the Beast that match the emotive tones of his speech and the context in which an
28 emotion is being presented in the scene. Digital Domain appears to have chosen this clip to

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1 demonstrate the capabilities of the MOVA facial capture to capture the subtleties of the actor’s facial
2 expression so they are faithfully retained in the animated Beast character. If the MOVA software can
3 be used to enable the simulation of sophisticated human emotion, such as humor and a genuine, felt
4 smile, then the software was doing what it was supposed to do: to enable natural human-like traits
5 and facial expression in a CG character that the audience can grow to accept and empathize with
6 because of these human-like behaviors, thoughts, and expressions.

7 *The Waltz Scene*

8 89. One of the most popular scenes in *Beauty and the Beast* (2017) is the Waltz Scene
9 with Belle and the Beast. A copy of this clip is attached as Exhibit 6. Not a word is spoken, so the
10 intensity and heightened viewer engagement relies on the non-verbal facial communication between
11 Belle and the Beast. When Belle first approaches, the Beast does not have to say anything as we can
12 clearly see from his facial expression that he has affection for her. A distinct flaring of the Beast’s
13 nostrils, a raising of his brows, and a quiver of his lips as if trying not to gape his mouth open and to
14 maintain his composure as the sides of his mouth turn upwards, all successfully communicate his
15 surprise and appreciation at how beautiful Belle looks. As they join hands and walk to the ballroom,
16 we can see the anxiety in the Beast’s forehead as his brows lower and form a frown line between
17 them at the top of his nose, demonstrating how nervous and anxious the Beast is that things go well
18 between him and Belle.

19 90. The Beast then looks around the grand ballroom, turns back to face Belle and
20 immediately relaxes his forehead, but lifts the outer corners of his brows, which corresponds with the
21 upturned corners of his mouth and tilting of his head, at which point we can see that he is checking
22 with Belle, if she is OK? Belle responds with a reassuring smile and then curtsies before the Beast, to
23 which he bows back to her.

24 91. When Belle reaches her arms and hands out to the Beast with both palms facing
25 upwards, the Beast expresses his delight at this invitation to dance with Belle. The corners of the
26 Beast’s mouth raise even further at the same time as his inner and outer brows fully lift to widen the
27 Beast’s gaze and to spontaneously communicate his surprise as he takes her hands. As they dance,
28 we can see that the Beast has his full attention on Belle, with an intent, compassionate, and proud

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1 expression. This is demonstrated as the Beast’s outer eyebrows lift, stretching the skin across his
2 forehead, his cheeks lift forming small creases in the outer corners of his eyes, his nostrils flare
3 creating wrinkles at the top sides of his nose as the skin creases and his lips curl upwards while
4 protruding forward in a closed smile.

5 92. The viewer can perceive that the Beast grows in confidence as they dance, as he
6 maintains his raised brows, raised cheeks and lips curled upwards but pressed tightly together, to
7 communicate his assurance that things are going well and that Belle is enjoying herself. As they stop
8 dancing, the Beast’s upper and lower face fall together and he looks downwards, more uncertain of
9 himself again. Yet, when Belle links arms with his and they turn to walk off the dance floor, the
10 Beast’s brows and forehead lift, opening his eye aperture and the corners of his mouth turn upward
11 again as his head lifts and looks upwards, so the viewer can perceive renewed hope and contentment
12 in the Beast’s face.

13 93. These more complex expressions of emotions that the viewer can perceive in the
14 Beast would not have been possible without capturing the full range of facial expressions that Dan
15 Stevens performed in his MOVA facial performance capture that were retargeted onto the animated
16 Beast. *It is the Beast’s anticipation that is shared with the viewer that makes this scene such a*
17 *success; the viewer genuinely feels nervous for the Beast as we can see nervousness in his face and*
18 *we share those nerves with the Beast.* The Beast character was able to communicate more vulnerable
19 and human traits that the viewer could relate to, and thus instilled hope in the viewer that things
20 would work out positively between him and Belle.

21 94. The viewer must be able to see the man that Belle can fall in romantic love with
22 beneath the Beast’s exterior, and the MOVA system allowed for that to happen. The audience is
23 moved emotionally because they want the Beast and Belle to be happy. They understand the Beast’s
24 affection for Belle and they want their relationship to be a success because they can empathize with
25 him and with her.

26 95. This scene would be ridiculed or rejected if the viewer cannot perceive a man as a
27 romantic lead within the Beast, the man with whom Belle can fall in love. For the viewer to be
28 convinced of the romantic love story between Belle and the Beast that is so intrinsic to this film, the
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1	viewer must be persuaded that a man is really there. And it is the Beast’s human-like facial	
2	expression captured by MOVA that persuades us of more humane, empathetic traits in the Beast that	
3	contributed to this film’s success.	
4	<i>The Snowball Scene</i>	
5	96. Another well known clip is “The Snowball Scene,” in which the Beast appears	
6	shocked and surprised when he is hit from a snowball thrown by Belle. A copy of this clip is attached	
7	as Exhibit 7. The viewer can clearly see his spontaneous startled response as his eyebrows lift to	
8	open his eye aperture causing creases in his forehead, and his mouth opens to signal this heightened	
9	emotional state. Without the reliable NVC in the Beast’s upper face to signal surprise, he would look	
10	odd and strange with mouth agog as the viewer may not fully understand why he appears with his	
11	mouth open. I found in an earlier experiment with realistic human-like virtual characters that a lack	
12	of upper facial movement when presenting surprise evokes the uncanny in the viewer as they are	
13	reminded of a rigamortic, zombie-type state in a character (Tinwell et al., 2011a). In this case,	
14	MOVA has allowed for the successful capture and communication of the startle response in the	
15	Beast, to help avoid the uncanny and a ‘Frankenstein’s Monster’ effect when the viewer cannot read	
16	the Beast’s facial expression.	
17	97. When the Beast throws a snowball at Belle in return, the Beast’s facial expression	
18	first shows a mischievous look of concentration as he watches where the snowball will land, with	
19	inner brows lowered, lips pressed tightly together, and his mouth tilted upwards to one side. Then,	
20	his upper face relaxes and he suddenly breaks into a wide open genuine smile as he takes playful	
21	delight in hitting his target, Belle. The viewer can see that this is a true expression of happiness as	
22	the Beast’s cheeks raise with the corners of his mouth, causing bulges under his eyes and deeper	
23	creases to the sides of his eyes, both reliable signals of genuine, felt happiness.	
24	98. This scene has demonstrated the playful side in the Beast both to the audience and to	
25	Belle, which convinces us via his facial expression that the man within the Beast has a more	
26	lighthearted and good-natured personality in contrast with the Beast’s more serious demeanor.	
27		
28		
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The Dinner Scene

99. An important scene that was captured using MOVA involves the Beast and Belle sitting together at a dining table to have a bowl of soup. A copy of this clip is attached as Exhibit 8. As another mute scene, this clip relies on the exchange of facial expression between the Beast and Belle for the viewer to understand what is going on with the characters. Before the Beast lifts the bowl of soup to his lips to drink, the Beast hesitates and lifts his head to look at Belle with his inner brows squeezed together to form a frown line on the upper bridge of his nose, his lips pressed tightly together, corners turned downwards with his upper lip protruding over his lower lip. In doing so the Beast communicates the more complex emotions of shame and embarrassment, as he is frightened to offend Belle by drinking from the bowl. Belle responds by putting down her spoon and lifts her bowl to her mouth to drink.

100. The Beast’s frown intensifies with deeper lines on his forehead and he opens his mouth slightly in disbelief to communicate that he is confused by what Belle is doing. As the Beast realizes that Belle is drinking from the bowl to show that she accepts his behaviour and does not want to make him feel uncomfortable, the Beast appears less tense as his eyebrows lower and the corners of his lips turn upwards. These subtle facial movements signal the Beast’s understanding and appreciation of Belle’s actions. They drink together. Once finished, they share a reciprocal smile that communicates the Beast’s appreciation and Belle’s growing acceptance of him.

101. MOVA has permitted the subtle complexities of self-consciousness to be effectively communicated in the Beast via his facial expression. These more complex, human emotions that the Beast communicates convince us that there is a man beneath the Beast’s exterior who is cognitively and emotionally aware of how he is perceived by others, and what others may think of him. Such behaviour allows the audience to empathize with the Beast, because we understand why he feels embarrassed and we are just as relieved as he is that Belle has responded positively towards him.

XIV. DECLARATION AND TESTIMONY OF DR. HAO LI

102. I have reviewed the transcript of the deposition of Dr. Hao Li, and have the following comments.

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1	103. At page 52 line 4 to line 24, Dr. Li confirms my findings that human beings are highly	
2	attuned to subtle details in natural and CG faces, and that perceived unnatural expression or motion	
3	in CG faces is likely to cause the uncanny response in viewers.	
4	104. At page 52 line 25 to 55 line 23, Dr. Li confirms my opinion that hand animation	
5	technology such as key framing is less accurate in rendering natural facial expression or motion and	
6	significantly more labor intensive than dense motion capture technologies such as MOVA Contour.	
7	While hand animation technologies may produce adequate results in some applications, for example,	
8	when a CG character is at a distance or in a shadow, these technologies are too crude to efficiently	
9	capture all of the subtleties and nuance of an actor’s facial performance.	
10	105. At page 54 line 16 to 55 line 7, I agree with Dr. Li that traditional animation	
11	techniques can result in a CG character having inconsistent facial expression from scene to scene. A	
12	character’s facial expressions and mannerisms must be consistent throughout the film, to ensure that	
13	the audience perceives the character as real and can feel familiar with his characteristics and	
14	portrayed personality.	
15	106. At page 65 line 12 to page 68 line 5, Dr. Li confirms my opinion that for CG	
16	characters, human faces must be captured at very high resolution, because lower resolution capture	
17	technologies such as traditional marker-based technologies and hand-animation such as key framing	
18	cannot accurately represent the subtleties and nuances of the subject’s face, and the resulting CG	
19	character is likely to cause the uncanny response in viewers. Those subtleties and nuances of	
20	expression “come for free” when using high resolution facial performance capture systems such as	
21	MOVA Contour.	
22	107. At page 147 line 2 to 148 line 13, Dr. Li underscores the problem with trying to	
23	achieve authentic human facial expression using traditional technologies such as hand animation or	
24	key framing. If time and budget were not a consideration, if as Dr. Li states you have an infinite	
25	amount of time, these traditional technologies can in theory provide “good” or “adequate” results.	
26	But in the real world, where films are subject to strict production deadlines and budgetary	
27	constraints, I agree with Dr. Lee that even a window of three months would not provide sufficient	
28	time for artists using traditional techniques to produce CG animation of the same level of quality that	
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1 high density facial performance capture technology such as MOVA Contour inherently provides.
2 And that is true, even taking into account (as Dr. Li does in the testimony cited here and in more
3 detail in his declaration), that high density facial performance capture data requires some manual
4 cleanup.

5 108. At page 148 line 15 to 150 line 7, Dr. Li defines the uncanny valley phenomenon too
6 narrowly in my opinion. He appears to confine the uncanny response in viewers to digital characters
7 that are “a real human,” like the Paul Walker character in *Fast and Furious 7*. He draws a contrast
8 with the aliens in the film *Avatar* where, he states, their “weird colors” and “significant [anatomical]
9 difference to a real human” avoids the uncanny response. Another example he offers is that of the
10 giant gorilla in *King Kong*, to which he states the uncanny response does not apply. But Dr. Li fails
11 to take into account CG characters that fall between his binary extremes—real humans versus aliens
12 and gorillas—such as the Beast in *Beauty and the Beast*, who must be perceived by the audience as
13 simultaneously a beast *and* a “real human.” MOVA Contour’s high density facial motion capture of
14 Dan Stevens’s facial performance provided authentic subtle facial expression without which the
15 audience would not have perceived the “real human” within the Beast in my opinion.

16 109. As Dr. Li concedes at page 151 line 3 to 152 line 12, the uncanny valley exists on a
17 continuum from things that are perceived as less human to those that are perceived as more human,
18 with sensitivity to flaws in motion and expression increasing along that continuum. Unlike aliens and
19 gorillas, the Beast character must be recognizably human to the audience for the love story to
20 succeed with viewers. In my opinion, the same sensitivities to flawed human facial motion and
21 expression that provoke the uncanny response would prevent the audience from feeling empathy
22 with the Beast.

23 110. In paragraphs 26-27 of the Declaration of Hao Li, he states that after the dense facial
24 performance capture (such as MOVA Contour) is retargeted to a target rig (the digital model of the
25 CG character’s head and face), “hundreds or even thousands of hours of human labor and artistry”
26 are required to complete the CG character, including modeling, hand animation, rendering, skin
27 texturing and coloring, secondary components (such as eyeballs and hair), and lighting. If his point is
28 only to enumerate the steps in the animation pipeline between retargeting of dense facial

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1 performance capture data and the complete CG character, I do not disagree that the steps he
2 described may be part of the animation pipeline for a CG character. But if he means to imply that
3 MOVA Contour facial performance capture is trivial to viewers because the animation pipeline
4 requires these additional labor-intensive steps, I disagree with that implication. MOVA Contour
5 facial performance capture is significant to the animation pipeline precisely because it inherently
6 provides—“comes for free” as Dr. Li wrote in his dissertation—the authentically subtle and nuanced
7 facial expressions that viewers require to perceive a CG character as human and empathetic, and
8 which cannot be provided by substituting labor and artistry in a real world of budgetary constraints
9 and production deadlines.

10 I declare under penalty of perjury under the laws of the United States of America that the
11 foregoing is true and correct.

12 Executed on November _17th, 2020 Signed in _Chester_, the United Kingdom, by:

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16 Angela Tinwell, Ph.D.

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1 UNITED STATES DISTRICT COURT
2 FOR THE NORTHERN DISTRICT OF CALIFORNIA
3
4 _____)
5 REARDEN, LLC et al.,)
6 Plaintiff,)
7 vs.) No. 4:17-cv-4006-JST
8 THE WALT DISNEY COMPANY, et)
9 al.,)
10 Defendants.)
11 _____)
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13
14

15 VIRTUAL VIDEOCONFERENCE DEPOSITION OF
16 ANGELA TINWELL, Ph.D.
17 Friday, December 11, 2020
18 Volume I
19
20

21 Reported by:
22 ALEXIS KAGAY
23 CSR No. 13795
24 Job No. 4357522
25 PAGES 1 - 320

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1 A No.

2 Q Okay. Dr. Tinwell, what is your field of

3 study?

4 A My field of study is Human-Computer

5 Interaction and the Uncanny Valley, that's what I 03:50:28

6 did my Ph.D. study in.

7 I've worked in the field of design, and I've

8 worked as a web designer and talked on undergraduate

9 and post-graduate programs in the areas of creative

10 technologies, but my field of expertise is viewer 03:50:50

11 perception of the human-like virtual characters in

12 games and animation.

13 Q You mentioned your Ph.D. What is -- what

14 field of study is your degree in, your Ph.D. degree?

15 A My Ph.D. degree is an investigation into the 03:51:06

16 Uncanny Valley phenomenon and viewer perception of

17 facial expression in human-like virtual characters.

18 Q So I want to draw a distinction between your

19 thesis that you wrote for your Ph.D. and the degree.

20 Do you have the degree, the Ph.D. degree? 03:51:27

21 A I do have my -- my Ph.D. has been awarded,

22 and I offered a thesis for that. I have an

23 undergraduate degree.

24 I'm sorry, I'm not quite sure what you mean

25 by that question. 03:51:44

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1 A Yes, I have. I've published in areas of new
2 culture and game -- understanding -- undergraduate
3 game students and how they might learn in different
4 environments, because my job requires me to look at
5 different fields, but they are within the realm of 03:53:24
6 creative technology.

7 Q Okay. And have you published in any other
8 area, areas other than what you just mentioned?

9 A I've published in the articulation of speech
10 in virtual characters as well as facial expression 03:53:40
11 and lip synchronization.

12 I also bring into my papers viewer perception
13 of robots and androids as well because that's
14 relevant to the uncanny valley.

15 But I don't -- I can't recall that I 03:53:53
16 published out many other pages outside the areas of
17 HCI.

18 I've published one, on for example, popular
19 culture, infatuism, because there was a call for
20 that, and I thought it was a nice opportunity to 03:54:09
21 take a break from HCI and the uncanny valley and
22 look at my -- my skills in different areas, but the
23 majority of my work has been in HCI.

24 Q Thank you. Are you an expert in MOVA Contour
25 Technology? 03:54:28

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1 A I am familiar with the MOVA Contour

2 Technology, and I also to have an above-average

3 understanding of facial motion capture software.

4 I've never actually used any facial motion

5 capture software, but I need to understand the 03:54:42

6 process so that I can talk about it when I'm

7 providing humanistic guidelines to help design them

8 on game animation artists and special effect artists

9 to help them when they're designing their human-like

10 virtual characters. 03:54:59

11 Q Yeah, my question was just whether you're an

12 expert in MOVA Contour Technology.

13 MR. CARLSON: Objection; asked and answered.

14 BY MS. YOUNG:

15 Q You can answer the question. 03:55:13

16 And Dr. Tinwell, in these depositions, Mr.

17 Carlson is entitled to object on behalf of his

18 client, but you must answer my question unless he

19 tells you not to, okay?

20 A I would not be an expert, but I have an 03:55:23

21 above-average knowledge of facial motion capture

22 procedure, including MOVA contour.

23 Q When was the first time you heard about MOVA

24 Contour Technology?

25 A It was the -- when I had my first meeting 03:55:37

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1 BY MS. YOUNG:

2 Q So Dr. Tinwell, I was trying to understand

3 which of the sources in Exhibit 2 you relied on to

4 develop your understanding of MOVA Contour

5 Technology. 05:25:09

6 Do you remember that's sort of how we got

7 into this discussion?

8 A We -- yes, I -- I relied on sources. Would

9 you like me to read the titles out of each one or

10 the number -- the number for them? 05:25:19

11 Q I think the number is probably sufficient in

12 Exhibit 2.

13 A I think -- yeah. I relied on -- to help my

14 understanding of MOVA, it was Document 2, the

15 patents. The New York Times article, number 3. The 05:25:43

16 Wall Street Journal article, number 4. The Summary

17 Judgement on causal-nexus issue, number 5. And the

18 declaration of Hao Li, number six.

19 Q Okay. Did you rely on anything else on this

20 list in Exhibit 2 to help you understand how MOVA 05:26:09

21 Contour Technology works?

22 A I also relied on the talk that Mr. Steve

23 Perlman gave at Columbia Engineering School number

24 10. And, finally, the TED Talk, How Benjamin Button

25 Got His Face, I relied on that as well. 05:26:27

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1 that was a system that had been used to capture
2 into -- yes, to capture Dan Stevens' facial
3 expression for the film.

4 Q And is that for every shot in which his face
5 appeared in the film? 06:31:49

6 A I didn't see any -- any other types of
7 software or methods that had been use to capture Dan
8 Stevens facial performance.

9 And the way that he talks about it as well
10 when he is cited in journal -- in newspaper articles 06:32:07
11 about Beauty and the Beast and what went on and when
12 he's been interviewed, specifically when he's
13 speaking, he does only mention the lights that were
14 around and the makeup that was on and creating the
15 different facial expressions. 06:32:23

16 Q So were you assuming, for purposes of
17 offering your opinions, that MOVA Contour Technology
18 was used every time we see the Beast's face in the
19 film?

20 A I would say it would be used for the majority 06:32:34
21 of them, yes, the close-up shots, particularly the
22 close-up shots where you see the Beast speaking and
23 where there's scenes between him and Belle, where
24 there's nonverbal communications. But it's quite a
25 lengthy scene, both characters are muted, they don't 06:32:54

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1 say anything, but there's an moment between them
2 that the viewer can engage with and understand
3 what's going on between them, what they're thinking,
4 what they're doing, and they can understand the
5 context of the scene and how their relationship is 06:33:09
6 developing.

7 So it's those types of more intense scenes, I
8 suppose, where shots -- where you've got the Beast a
9 long way away or it's not a close-up of his face. I
10 don't see the MOVA may have been used for those 06:33:23
11 particular shots.

12 Q But you don't know one way or another?

13 A I would say given the quality, given the high
14 quality of the facial performance, the facial
15 expressions and the emoting of the Beauty and the 06:33:39
16 Beast, I would be -- I would say that it's more
17 likely that MOVA had been used rather than it all
18 just being key framing or hand animation or other
19 methods of capturing that particular facial
20 expression and emoting for the character. 06:33:57

21 Q So that's an assumption you're making based
22 on the quality of what you're seeing on the screen?

23 A Yes. Yes.

24 Q And -- and you're saying, it's your
25 assumptions that every time we see a close up of the 06:34:12

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1 Beast's face, MOVA contour was used?

2 MR. CARLSON: Objection; mischaracterizes

3 testimony.

4 THE WITNESS: I -- my opinion is for close-up

5 shots particularly of the Beast you'd want to ensure 06:34:29

6 the best possible outcome for that particular scene

7 at the least amount of -- with the least amount of

8 work.

9 So it takes two things. So firstly the least

10 amount of time to spend on scene, and secondly, the 06:34:41

11 best possible outcome.

12 So any tools that could be used to help make

13 the process more efficient, I would state that the

14 animators and the director would want to use the

15 best possible methods, namely, MOVA, the facial 06:34:56

16 action and the facial capturing software would be a

17 significant tool to use for close-up shots of the

18 Beast, particularly when they're emoting,

19 particularly when they're emoting and moving their

20 face. 06:35:11

21 BY MS. YOUNG:

22 Q So is the answer to my question yes?

23 MR. CARLSON: Objection; asked and answered.

24 THE WITNESS: I would agree with that, yes, I

25 would agree with that statement. 06:35:19

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1 BY MS. YOUNG:

2 Q Okay. Are you an expert in how facial motion

3 capture technologies other MOVA contour work?

4 A I'm aware of them. I have to have some

5 awareness of how they work. 06:35:46

6 For example, looking at lower density, facial

7 capture techniques, I've seen one that was -- if I

8 recall, there was a particular research students at

9 the University of Glasgow, and they were using a

10 very basic facial capture software literally with 06:36:06

11 markers on the face and creating FACS poses. So I

12 have actually observed that with professor --

13 professor -- what was his name now? Professor of

14 psychology. It will come back to me. Pollick, it

15 was Frank Pollick who actually created that session 06:36:26

16 and invited me to go watch it. It was a long time

17 ago.

18 So that's one that I actually have watched

19 with professor Frank Pollick who's written about the

20 uncanny valley, and it was one of the research 06:36:38

21 students who was using the software. So I've got a

22 brief understanding of how that works.

23 That was more of a hands-on experience of

24 facial motion and capture technology, but other than

25 that with regards to reading, seeing pictures in new 06:36:52

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1 media and press articles and new media in the press
2 articles.
3 And I've also seen performance capture at the
4 university, where people wear suits, and they
5 actually have points on their arms because a 06:37:10
6 research student called Doctor -- I'm not sure if he
7 got his Ph.D. but Gabriel Naltom (phonetic) was
8 used, so those are the two instances where I
9 actually had witnessed the facial capture.
10 I think for the one in Glasgow, they actually 06:37:28
11 used myself, and I performed some facial expressions
12 and said different things. And then we actually saw
13 the CG, what they actually built from it, and I got
14 sent some of those files.
15 But that was a few years ago when I was doing 06:37:39
16 my Ph.D., and it was because of the contact I've
17 made with professor Frank Pollick who was actually
18 an external examiner at my Ph.D.
19 Q Okay. My question was not whether you were
20 aware of other facial motion technology. My 06:37:55
21 question is whether you are an expert in how other
22 facial motion capture technologies work. Are you or
23 are you not an expert in how other facial motion
24 capture technologies work?
25 MR. CARLSON: Objection asked and answered. 06:38:08

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1 THE WITNESS: I've got -- I've got a good
2 understanding of them but not an expert.
3 BY MS. YOUNG:
4 Q Okay. Now you said -- I believe you said
5 you've only seen facial motion capture technology 06:38:19
6 used once; is that correct?
7 A Yes.
8 Q Can you give me the names of some of the
9 facial motion capture technology you're aware of
10 other than MOVA contour? 06:38:39
11 A The system for example that was used for --
12 let's have a look. The one that was used for
13 Tintin. I know the names of the software houses,
14 it's just not the actual systems themes.
15 For example, Western Digital, they used a 06:39:00
16 particular system where there before deformations
17 they were able to manipulate layers underneath the
18 skin quite effectively for characters in Tintin due
19 to the deformation of fat and muscle, and they sort
20 of do like topology approach to that, so I'm aware 06:39:18
21 that Western Digital did that.
22 I'm aware ImageMovers Digital who worked on
23 things like Polar Express with Robert Zemeckis, and
24 then things like Final Fantasy, they actually used
25 quite a low density marker system, but I don't know 06:39:38

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1 the actual name of that. So I'm not aware of the
2 actual names of the different facial capture
3 software, but I'm more familiar with the name of the
4 SFX houses that were working in conjunction with
5 movie directors because they're the things that I 06:39:52
6 cite more in the actual papers and books that I
7 author rather than specific names of software,
8 etcetera.

9 I don't tend to go into quite such technical
10 detail. I only go into how the facial and capture 06:40:06
11 software or motion capture software systems would
12 work and whether it was high density or low density
13 and the names of the SFX studios and creating and
14 developing such instances.

15 Q So I want to ask you a little bit about your 06:40:22
16 educational background, and I can obviously see it
17 in your CV, so I'm not going to go through each and
18 every one of your educational accomplishments.

19 I did want to ask, however, whether any of
20 your studies involved courses in developing CG 06:40:37
21 characters.

22 A Not specifically, no. The closest that I've
23 come to that is games op and games design. So I've
24 worked with undergraduate game students where they
25 have do have to create human-like characters and 06:40:53

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1 monster characters and cartoon-like characters, so
2 the whole spectrum of uncanny valley.
3 I've worked with illustrators as well where
4 they are creating characters so from paper to photo
5 shop or 2D software system to 3D software system 06:41:09
6 things like Mayor, Zen Brush (phonetic), other
7 software systems like that, so yes, I have.
8 I've not developed the courses myself, but
9 I've assisted on modules where students are
10 developing characters for video games and in SFX for 06:41:28
11 movies and videos as well.
12 Q Okay. So again, I -- I know this is hard,
13 but I'm trying to get clear answers to my questions,
14 and I want to unpack that a little bit.
15 So focusing on your own studies, things you 06:41:43
16 have studied in your own educational background,
17 have you taken any courses in developing CG
18 characters? It's a yes or no question.
19 MR. CARLSON: Objection; asked and answered.
20 THE WITNESS: I haven't created any CG 06:42:00
21 characters myself on the courses that I've taken.
22 BY MS. YOUNG:
23 Q Okay. Now, you also talked about helping out
24 your students; is that right?
25 A Yes. 06:42:13

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1 output, and let's mark that screenshot as our next
2 exhibit.

3 Mr. Nickels, that's tab 55, and the exhibit
4 will be 1017.

5 MR. NICKELS: 1017 is now marked and 07:53:17
6 available in the "Marked Exhibits" folder.

7 (Exhibit 1017 was marked for identification
8 by the court reporter and is attached hereto.)

9 BY MS. YOUNG:

10 Q Okay. And this one I may actually have in 07:53:27
11 your binder, so if you want to look at it on paper,
12 it's -- it should be tab 55 in your binder, but feel
13 free to do whatever is easier for you.

14 A I'm looking at it on screen. Tab number 5 is
15 a live action Beauty and the Beast -- 07:54:08

16 Q Sorry. Tab 55. I'm sorry. I probably
17 cutoff there.

18 A Yes, thank you. Yes. Yes. Got it. Thank
19 you.

20 Q Okay. And that's an image -- that's a still 07:54:28
21 image of what you were just describing as where you
22 think the MOVA tracked mesh output is depicted in
23 the DD3 video; is that right?

24 A Yes, yes.

25 Q Okay. And do you see in this -- in this 07:54:47

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1 exhibit, there's sort of a purple mesh over Dan
2 Stevens' face in the second image from the left?
3 A I do.
4 Q And do you see that the bulges that you
5 identified underneath his eyes is not covered by 07:55:00
6 that purple mesh?
7 A They're not --
8 MR. CARLSON: Objection; argumentative.
9 THE WITNESS: The cheek aperture is. So the
10 animator should -- if anything is going to be done, 07:55:10
11 the animators will see that the cheek's been lifted
12 at that point, and so they -- the area below the eye
13 should be scrunched, it shouldn't be flat at that
14 point.
15 So MOVA is providing the roadmap to show the 07:55:25
16 animator which areas need to be scrunched, deformed
17 in any particular way and so it does capture the
18 area around the eye as well to show there are
19 creases there that are being formed because the
20 cheek's rising. 07:55:44
21 And so any animator that studied anatomy or
22 is aware of this, would see this footage of Dan
23 Stevens originally, it's providing quite a good
24 roadmap to point how, okay, that needs -- that needs
25 to be filled in just there, filled out the bulge in 07:56:02

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1 there.

2 But the crows feet and the fact that it's

3 risen on that right side shows the animator, it

4 provides to them clearly what they need to do, so

5 they're not starting from scratch. They've got a 07:56:15

6 good underpinning to actually see how to create the

7 genuine smile in the Beast.

8 BY MS. YOUNG:

9 Q Right. But the purple mesh does not actually

10 cover the bulges underneath the eye, does it? 07:56:28

11 A It doesn't --

12 MR. CARLSON: Objection; asked and answered,

13 argumentative.

14 THE WITNESS: It doesn't cover under the eye,

15 but it's a very good actual depiction of the raised 07:56:40

16 cheek and the actual crows feet by the side of it

17 the has been captured that shows the animator that

18 really the animator should produce a bulge, it

19 shouldn't be flat.

20 And animators should know that, they should 07:56:58

21 be mindful of the fake smile, the smile and what

22 they may need to do to prevent that, to help prevent

23 it.

24 So it does I would say capture a good

25 proportion of Dan's face to show the types of smile, 07:57:13

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1 So for -- you could, if you had quite a
2 specialized group sample group, who may have a very
3 rare condition, and it was difficult to get more
4 than 30 participants, then you may use a rare
5 statistical analyses rather than traditional things 09:26:30
6 like persons, correlations, there may be other
7 inferential statistics or analyses that allow you to
8 use small sample sets, but that's in, for example,
9 testing people with certain impairments or with
10 special needs, and that's where I would see where a 09:26:50
11 small sample set might be acceptable.

12 Q Okay. But let's say you don't have any of
13 those -- those limitations.

14 Is a sample size lower than 30 typically
15 acceptable in your field when you want to draw a 09:27:04
16 conclusion about a broader population?

17 A I would -- if I was reviewing a paper, I
18 would question that. I would question it.

19 Q Now, for purposes of providing your opinions
20 in this case, you did not conduct any experiment, 09:27:21
21 did you?

22 A If I had conducted an experiment, I would
23 have liked to have got the Beast character, and I
24 would have liked to perhaps have Dan Stevens, the
25 fully animated Beast, and then the lack version of 09:27:34

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1 the Beast where movement was disabled in his upper
2 face or perhaps even an over articulation of mouth
3 movement, which is an overexaggeration of movement
4 to the lower face, where you modify that particular
5 experimental condition to create these more profound 09:27:52
6 stimuli, the -- people are sensitive to the uncanny,
7 and I would have compared the fully animated Beast,
8 the controlled Dan Stevens, and then the lack or the
9 over articulated Beast character to see which one
10 was regarded as the strangest, most human-like, most 09:28:11
11 friendly and most profound, most, say, threatening.

12 Those -- that's what -- that's how I would
13 have really liked to have done an experiment, but I
14 didn't conduct any experiments in my report, no.

15 Q Why didn't you conduct any experiments? 09:28:31

16 A It was partly to do with the time that I was
17 -- that I had for this particular study, and really,
18 I was asked based on the research that I had done
19 looking at characters, looking at facial
20 expressions, nonverbal expressions, to give my 09:28:53
21 opinion as to whether the Beast did authentically
22 communicate human-like emotion based on the body of
23 work that I'd already done on the uncanny valley.

24 It would, again, have just been a repeat of
25 the experiments that I had already done, and I would 09:29:11

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1 have expected the same outcome in the characters
2 where movement was disabled or balance in their face
3 or even in the lower face would have been regarded
4 as strange and more uncanny.

5 So I -- I think that the actual purpose of an 09:29:27
6 experiment in this particular case, there was -- I
7 would be surprised if the results had shown anything
8 different from the human being regarded as most
9 human-like and familiar and perhaps likable, the
10 fully animated character, then following that, and 09:29:43
11 then the liked character being regarded as the most
12 strange, the most uncanny with people struggling to
13 identify accurately the emotion that was being
14 communicated in that particular character.

15 So I don't think that the experiments with 09:30:00
16 the Beast would have helped leave much more useful
17 information.

18 It was more a question of me looking at the
19 Beast and thinking does he really convince us that
20 there is a human there and how we actually see Dan 09:30:14
21 Stevens and his idiosyncrasies and behaviorisms in
22 the Beast and that was -- that was why I was used
23 and why I authored my report for this. So that was
24 the purpose of it.

25 And that was really why I didn't see the 09:30:32

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1 2004, The Polar Express?

2 A Yes.

3 Q Okay. And that was before the advent of MOVA

4 Contour Technology; right?

5 A Yes. 10:27:41

6 Q And in your book, you describe The Polar

7 Express as a renowned harbinger of the uncanny

8 valley in children's animation. Do you recall

9 writing that?

10 A Yes. 10:27:50

11 Q So you had done the research on Polar Express

12 for your book; correct?

13 A Yes, yes.

14 Q But you chose not to mention The Polar

15 Express in your declaration; right? 10:28:02

16 A I think I may. I'm sure The Polar Express is

17 mentioned somewhere. It wasn't one of the four

18 highlighted films.

19 Let me see. I don't think -- I don't think I

20 focused on that as a particular case study. No, no 10:28:20

21 not in my declaration.

22 Q The film The Polar Express actually did quite

23 well with audiences, didn't it?

24 A It did. It did. It had quite a strong first

25 release in the cinema, but I -- in thinking about 10:28:37

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1 that, I would say it was based on a best selling
2 children's novel at the time. It had a good strong
3 character, Tom Hanks, that was very popular, and I'm
4 sure that adults would have wanted to see as well as
5 children, and it was -- it's is a Christmas movie. 10:28:55

6 And if you compare it, for example, to
7 something like Home Alone, it may have had a good
8 short term financial outcome and a good
9 profitability in a short term.

10 But if you compare it to things like A 10:29:11
11 Christmas Carol, Home Alone, those are movies that
12 people will look to to actually play time and time
13 again in the Christmas season, whereas, I don't see
14 many people thinking, oh, we'll have The Polar
15 Express again, we'll play that again this year, and 10:29:28
16 we'll repeat that one or buy that for my
17 grandchildren, I'll download that for my
18 grandchildren.

19 And I think it is because of the renowned
20 negative implications of the characters in that film 10:29:40
21 with the uncanny valley. It doesn't seem to be as
22 popular long term as other Christmas movies have
23 been, for example, and I think that that was
24 hopefully -- that that might have been their
25 objective, so it would be played as a favorite of 10:29:58

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1 Christmastime, with it being a specific Christmas
2 movie based on a children's novel.
3 But I can't say that it's had long term
4 success from people wanting to re-watch that film or
5 share it with their family. 10:30:13
6 Q Okay. Let's take a look at what we've marked
7 as -- we have as tab four in your -- well, before we
8 go there, Dr. Tinwell, one of the documents that you
9 cite in your exhibits is materials you consulted in
10 connection with preparing your report -- let me get 10:30:38
11 the name of it here. It's Thompson 2016. It's on
12 the last page of your exhibit, Exhibit 3.
13 A Yes. Thompson 2016, "The Highest-Grossing
14 Christmas Movies of all Time," yes.
15 Q And that was an article that was published in 10:31:08
16 Forbes Magazine?
17 A Yes.
18 Q That was --
19 A Yeah.
20 Q That was something you considered when you 10:31:13
21 were putting together your declaration?
22 A Yes, yes.
23 MS. YOUNG: Let's now take a look at that.
24 If you look at tab four in your -- I'm sorry, if you
25 look at tab four in your binder, Mr. Nickels, can we 10:31:27

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1 authoring the Financial Cost section of your
2 declaration?

3 MR. CARLSON: Dr. Tinwell, you'll have to
4 take time to read the documents.

5 THE WITNESS: I'm reading those. I'm reading 10:49:25
6 those. I'm on AT00004.

7 MR. CARLSON: Well, begin with 1 and go to
8 the end to answer the question.

9 THE WITNESS: Okay.

10 MR. CARLSON: She's asked if there's any 10:49:37
11 other entries.

12 THE WITNESS: Okay.

13 BY MS. YOUNG:

14 Q And just so you have it in mind, I'm just
15 interested in whether you see any other entries in 10:49:45
16 these timesheets that reflect work you spent writing
17 the Financial Cost section of your declaration.

18 A Those are the two entries that I can see
19 there, yes.

20 Q Okay. And did the hours you recorded to 10:51:19
21 draft the Financial Cost section of your declaration
22 also include the time you spent researching that
23 section of your declaration?

24 A It did, yes, yes.

25 Q Okay. So are there -- so it was three hours 10:51:31

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1 suppose, I'd already spent the time on that, doing
2 that particular research, and that's why I think
3 Mark contacted me, and probably only the one of the
4 reasons why, because a lot of the content from my
5 report was already there in the book itself. It was 10:53:14
6 just a question of looking at the Beast character in
7 a lot more detail, spending time and perseverance on
8 that Beast character, so to look at him and address
9 the issues at hand.

10 Q Okay. So did it take three additional hours 10:53:29
11 to take the learning you already had and then
12 write-up and incorporate that learning, any
13 additional research, and then write out the
14 Financial Cost section of your report?

15 A Yes. 10:53:46

16 Q Okay. Did you do additional research besides
17 what you had already done for your book to draft the
18 Financial Cost section of your report?

19 A I did look at some figures in Internet Movie
20 Database and where I could find the information, so 10:54:04
21 I was checking as I was writing and checking the
22 resources that I had. But I primarily based it on
23 the information that I previously did in my book.

24 Q Did you do any research to see if there were
25 any examples that might disprove your hypothesis 10:54:21

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1 "The sheer undifferentiated flesh
2 of a metallic sheen that it looks as
3 if it would ring if you tapped it.
4 "They don't look like youngsters
5 as such, more like robot replicants 12:07:15
6 from Planet West World."
7 That is a description of the uncanny, isn't
8 it?
9 A That would have connotations with the
10 descriptions of the uncanny, but primarily, I think 12:07:26
11 Benjamin Button was to do more with the older
12 depiction of Brad Pitt.
13 That was going to be the challenge, getting
14 him to age. So I would suspect that most of the
15 time the production time and budget went on the 12:07:42
16 older characters of Benjamin Button, where it got --
17 those are actually quite good, but perhaps less time
18 was spent on the younger versions, and that might
19 have been a detriment to the movie, if more time was
20 invested in the older type characters. 12:08:02
21 But it has been acknowledged that they were
22 good characters, but perhaps the younger versions
23 were less important or less significant in the film
24 if less time might have been spent on them.
25 But unfortunately, it shows that potentially 12:08:21

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1 less time spent on the character, then the uncanny
2 can occur.
3 Q Okay. And that's even when you're using MOVA
4 Contour Technology; right?
5 A Yes. 12:08:36
6 Q And, in fact, you don't know how much time
7 was spent on the characters, whether they were old
8 or whether they were young; correct?
9 A Yes.
10 Q And this article talks about Brad Pitt being 12:08:45
11 in his 20s; correct?
12 A Yes.
13 Q Brad Pitt was not 20 years old when this
14 movie was made, was he?
15 A No. 12:08:56
16 MS. YOUNG: Let's move on. Tab 31.
17 And Mr. Nickels, let's mark this as the next
18 exhibit, please.
19 MR. NICKELS: That will be 1026.
20 (Exhibit 1026 was marked for identification 12:09:22
21 by the court reporter and is attached hereto.)
22 BY MS. YOUNG:
23 Q Okay. So we're looking at 1026, and this is
24 a review of Benjamin Button published in New York
25 Times. Do you see that, Dr. Tinwell? 12:09:32
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1 experiments and feedback that I got from

2 participants in my experiments and looking at other

3 uncanny films and the associations of why they've

4 been made with other characters.

5 And it was to really grasp an understanding 12:17:10

6 for myself as to whether -- what the Beast was

7 trying to do in the movie and whether they were

8 successful in doing that, whether we could see Dan

9 Stevens or not. So that was primarily what my

10 report was based on. 12:17:25

11 BY MS. YOUNG:

12 Q You've ever never shown a participant in one

13 of your studies the Beast and asked them to give you

14 feedback on what he looks like; right?

15 A No, I haven't, no. 12:17:40

16 Q Okay. So your opinions about the Beast being

17 able to evoke human emotion is based on your

18 subjective review of the movie; is that right?

19 A Correct. I -- I have based that on, for

20 example, the research that I've done in my book, the 12:17:57

21 research, for example, on FACS, Ekman's work on

22 facial expression, knowledge of the uncanny valley

23 itself and where monsters actually reside in that.

24 The positioning of the Beast and where

25 viewers may position him at the beginning compared 12:18:15

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1 to the end. So it was more of the analysis that I
2 was directing in my report, thinking about the
3 theory of the uncanny valley and where characters
4 have been plotted on that, and then what the Beast
5 was trying to achieve at the end of it, and whether 12:18:34
6 I could perceive that it had actually -- the Beast
7 had actually done that.

8 Q So one person's experience in viewing Beauty
9 and the Beast doesn't explain how everybody felt
10 when they watched the movie; right? 12:18:48

11 A No.

12 MR. CARLSON: Objection; argumentative.

13 BY MS. YOUNG:

14 Q Other people may have had a different
15 experience than you did to seeing the Beast in the 12:18:56
16 movie; right?

17 A Yes.

18 Q And you didn't try to figure out how anyone
19 else actually responded to the Beast in the movie,
20 did you? 12:19:04

21 A No.

22 MS. YOUNG: Let's take a look at tab 35, and
23 we'll mark this as exhibit -- I'm sorry my Exhibit
24 Share is refreshing.

25 MR. NICKELS: 1028. 12:19:22

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1 and also taking into considerations monetary budgets

2 and time that MOVA would have presented a good

3 solution at that time to actually work on the Beast.

4 And I can't see -- can't think of any other

5 technologies that would -- other than actually just 01:16:15

6 hand rendering and key framing that particular

7 character with the animators. But that, I think,

8 would have taken the movie over budget.

9 Q You don't know that, Dr. Tinwell, right,

10 you're just speculating about that? 01:16:31

11 MR. CARLSON: Objection; argumentative,

12 mischaracterizes testimony.

13 BY MS. YOUNG:

14 Q Did you do anything to research the budget

15 for Beauty and the Beast? 01:16:39

16 A No.

17 Q Did you review any documents or deposition

18 testimony or declarations talking about the budget

19 for Beauty and the Beast?

20 A No. 01:16:50

21 Q Did you review any documents or depositions

22 or declarations from anyone talking about whether

23 the use of MOVA Contour Technology had an effect on

24 the budget one way or another?

25 A I -- not -- from what I've read about MOVA, 01:17:04

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1 it expedites the process of creating CG characters
2 for animators because they get the content for free.
3 They're given the roadmap as to how an actor
4 emotes and expresses him or herself, and that could
5 then be regenerated into either a CG replica of that 01:17:32
6 character or a character that you want to depict
7 idiosyncrasies and characteristics of that original
8 actor.
9 Q Did you review any documents or deposition
10 testimony or declaration testimony from anyone 01:17:48
11 actually involved in making Beauty and the Beast who
12 said that MOVA Contour technology saved them money?
13 A No.
14 Q Did you see any documents or deposition
15 testimony or declaration testimony from anyone 01:18:03
16 involved in making Beauty and the Beast that using
17 MOVA Contour Technology saved them time?
18 A No.
19 Q How many fewer people would have gone to see
20 Beauty and the Beast if MOVA Contour Technology had 01:18:30
21 not been used to create the Beast?
22 A I don't know.
23 Q Ten fewer people?
24 MR. CARLSON: Objection; calls for
25 speculation. 01:18:43

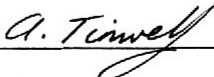
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1 I, ANGELA TINWELL, Ph.D., do hereby declare
2 under penalty of perjury that I have read the
3 foregoing transcript; that I have made any
4 corrections as appear noted, in ink, initialed by
5 me, or attached hereto; that my testimony as
6 contained herein, as corrected, is true and correct.
7 EXECUTED this 10th day of January,
8 2021, at Chester, UK.
9 (City) (State)

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ANGELA TINWELL, Ph.D.
VOLUME I

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1
2
3 I, the undersigned, a Certified Shorthand
4 Reporter of the State of California, do hereby
5 certify:
6 That the foregoing proceedings were taken
7 before me at the time and place herein set forth;
8 that any witnesses in the foregoing proceedings,
9 prior to testifying, were placed under oath; that a
10 record of the proceedings was made by me using
11 machine shorthand which was thereafter transcribed
12 under my direction; further, that the foregoing is
13 an accurate transcription thereof.
14 I further certify that I am neither
15 financially interested in the action nor a relative
16 or employee of any attorney of any of the parties.
17 IN WITNESS WHEREOF, I have this date
18 subscribed my name.
19
20 Dated: December 14, 2020
21
22 
23 ALEXIS KAGAY
24 CSR NO. 13795
25

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EXHIBIT A

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17	<i>Attorneys for Defendants</i>	
18	UNITED STATES DISTRICT COURT	
	NORTHERN DISTRICT OF CALIFORNIA	
19	OAKLAND DIVISION	
20	REARDEN LLC et al.,	Case Nos. 4:17-cv-04006-JST
21	Plaintiffs,	4:17-cv-04191-JST
22	vs.	DECLARATION OF DARREN
23	THE WALT DISNEY COMPANY et al.,	HENDLER IN SUPPORT OF
	Defendants,	DEFENDANTS' MOTION FOR
24	REARDEN LLC et al.,	SUMMARY JUDGMENT ON CAUSAL
	Plaintiffs,	NEXUS
25	vs.	Judge: Hon. Jon S. Tigar
26	TWENTIETH CENTURY FOX FILM	Date: To be set
	CORPORATION et al.,	Time: To be set
27	Defendants.	Ctrm.: 6 (2nd Floor)
28		
	HENDLER DECL. ISO MOTIONS FOR SUMMARY JUDGMENT; NOS. 17-CV-04006, 17-CV-04191	

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1 I, Darren Hendler, declare:

2 1. I am Vice President and Creative Director at Digital Domain 3.0, Inc. (“DD3”). I

3 have been employed by DD3 or one its predecessors or affiliates since October 1999. I am

4 submitting this declaration in support of Defendants’ Motion for Summary Judgment on Causal

5 Nexus Issue. The plaintiffs in this case deposed me on June 12, 2020. The contents of this

6 declaration are based on matters within my personal knowledge or (where indicated) matters as to

7 which I am reliably informed and believe to be true. If called as a witness in this action, I could

8 and would competently testify to the matters set forth herein.

9 2. I was the Digital Effect Supervisor responsible for DD3’s work on the live-action

10 film *Beauty and the Beast*, which was released to United States theaters in or around March of

11 2017 (“BATB”). My responsibilities on BATB included supervising the process by which the

12 character of the Beast was developed and animated, and supervising the look of the Beast.

13 3. I have reviewed the declaration that Greg LaSalle, a former DD3 employee,

14 submitted in this litigation. In his declaration, Mr. LaSalle stated that more than a hundred DD3

15 artists, animators, and supervisors were involved in creating shots in which the Beast appeared in

16 BATB, and that those individuals logged more than 170,000 hours working on the Beast and

17 compositing the shots in which the Beast appeared. I am informed and believe that at his

18 deposition, Mr. LaSalle testified (a) that he could not recall if the 170,000 hours referenced in his

19 declaration included hours that DD3 personnel spent on the Mova facial performance capture of

20 Dan Stevens (the actor who played the Beast) and the processing of that data using the Mova

21 software; and (b) that DD3’s payroll department likely would be able to determine how many

22 hours were spent on such tasks based on codes that employees used to track their time.

23 4. Information provided to me by DD3’s Production Finance team shows that less

24 than 1% of the time DD3 personnel spent on BATB was related to capturing facial performances

25 using Mova or to processing the resulting output using Mova software.

26 5. This is consistent with my experience working on BATB, which I described at my

27 deposition. In that experience, the vast majority of hours spent by DD3 personnel on the Beast

28 character did not involve the use of Mova software.

-1-

HENDLER DECL. ISO MOTIONS FOR SUMMARY
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1 6. Additionally, as I testified at my deposition, to the extent that Mova output was
2 used in the process of creating particular shots that included the Beast and that appeared in the
3 movie, the impact of that Mova output on the final appearance of the Beast in such shots was
4 negligible.

5 7. Below, I elaborate on and provide some examples to illustrate my deposition
6 testimony.

7 **Steps Taken to Create the Beast**

8 8. DD3 animated the Beast character for use in multiple “shots” in BATB.

9 9. A shot is a continuous piece of action between two cuts in the motion picture as it
10 appears on screen. A new shot starts every time there is a cutaway between camera framings. A
11 scene may be composed of one or more shots. A frame is a single still image. There are
12 approximately 24 frames per second of footage in a motion picture like BATB.

13 10. DD3’s work on shots including the Beast involved the work of numerous teams
14 using many different types of software and processes. The Mova team, which was responsible for
15 operating the Mova rig and processing the output of the facial motion capture session, was just one
16 of many different teams involved in the process. Shots including the Beast typically involved the
17 work of over a dozen other teams, including shot model, facial shot model, texture, rig, layout,
18 integration, matte paint, animation technical director (“atd”), rotomotion, paint, compositing,
19 compositing final gauntlet, environment, environment light, CFX (which includes clothing
20 simulation and hair simulation), fx, light, and editorial. DD3 also used many different software
21 tools besides Mova in the process of developing shots including the Beast. Those tools included
22 Direct Drive (discussed further below); proprietary WPSD software to correct face shapes to better
23 match the Beast; proprietary Copy Cat software to align facial motion to the hand-generated Beast
24 face and to layer on secondary motion; Autodesk’s Maya software and custom DD3 face software
25 to animate the Beast face to add eyes, tongue and body motion, and to create a more nuanced
26 performance and add back missing motions; and Maya, Zbrush and Mudbox Sculpt for facial shot
27 modeling. Some other software tools that DD3 used in the process of developing shots that
28 included the Beast are Substance Painter, Foundry Nuke, SideFx Houdini, SideFx Mantra, Chaos

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1 V-Ray, Z-Brush, Speed Tree, Adobe Photoshop, Bokeh (for Nuke), Ocula (for Nuke), Furnace
2 (for Nuke), Avid, Adobe Lightroom, 3D Equalizer, PhotoScan, Track, SoupTools for Maya,
3 Cyslice, RV, DMX, Packrat, and Smeat.

4 11. For each shot involving the Beast that DD3 worked on, DD3 created a virtual 3D
5 environment using computer graphics. The 3D environment on the computer screen had to
6 include numerous elements that would exist if a shot were being filmed in the physical world. The
7 environment had to include the background, the effects, and the characters such as the Beast. The
8 3D environment on the computer screen had to be virtually lit, just as lighting would be required
9 for filming a scene on a physical set. And the shot had to be filmed. For these computer
10 generated shots we use “virtual cameras.” A virtual camera serves a similar purpose to a physical
11 camera: the virtual camera exists in the virtual environment and films the action as it is taking
12 place in that environment. The virtual cameras had to be placed in the virtual 3D environment.
13 And a virtual camera, like its physical world analogue, can be moved, panned, tilted, zoomed,
14 have its lens aperture changed, etc. Mova software was not used to create the 3D environment.

15 12. The process of developing the computer-generated character of the Beast for a shot
16 involved multiple steps, not only for the Beast but for the rest of the shot. With respect to the
17 Beast, these steps included developing a foundational design and animating the Beast character for
18 specific shots. Each of these steps involved extensive work, as was also required for the remaining
19 elements of each shot.

20 13. The foundational design of the Beast included creating a 3-dimensional model of
21 the Beast’s face and body representing the skin that lay under his fur. To make the Beast’s face
22 move, DD3 created a separate face-driver rig (facial rig). This facial rig consisted of hundreds of
23 custom expressions, e.g., smile, eye blink, brows raised. These and other custom expressions were
24 all modeled individually by the modeling team. DD3 also created a separate body-driver rig that
25 would move parts of the Beast’s body. The facial rig and the body rig could be used by the
26 animation department to create motion on the Beast’s face and body. Mova software was not used
27 to create these rigs.

28 14. After DD3 designed the foundation of the Beast, we animated it for particular

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1 shots.

2 15. DD3 used Mova software for some but not all of those shots. For facial

3 performance capture sessions, which occurred separate from on-set filming, DD3’s Mova team

4 operated the Mova rig. I understand from the Mova team that the Mova software was used to

5 control the cameras, lights, and recording when Mr. Stevens’s facial motion performances were

6 captured while he was in the Mova rig. During these capture sessions, several of the cameras in

7 the Mova rig would capture video of Mr. Stevens’s performance. In this declaration I refer to that

8 video as Mova reference footage. Mova reference footage was primarily used for quality control

9 purposes, as described below.

10 16. The Mova team also used Mova software in the course of processing output data

11 from the captured performance including, most notably, for the creation of a “tracked mesh.” The

12 tracked mesh output data can be “rendered” on a computer monitor as a white mask, with empty

13 sockets where the eyes and mouth should be. Maya, from Autodesk, was used to create the mask

14 rendering of the tracked mesh output data. Figure 3, which appears in Paragraph 27 below,

15 contains an example of such a tracked mesh rendering. The tracked mesh output data does not

16 include any data points for hair, for much of the neck, or for any part of the actor’s body below

17 that. Mova software was not used at any other point in the process of creating the Beast.

18 17. We used Mova tracked mesh output data in our process for creating some, but not

19 all, of the shots in which the Beast’s face appears in BATB. Mova tracked mesh output data was

20 not used at all in the creation of almost half of the shots in which the Beast’s face appears in the

21 finished BATB film. DD3 worked on 677 distinct shots for BATB, 411 of which involved the

22 Beast. Of the 411 shots involving the Beast’s face, the animation team took delivery of Mova

23 tracked mesh output data for 227 shots. Some of the 227 did not actually use the Mova tracked

24 mesh output data.

25 18. For BATB, DD3’s Mova team delivered tracked mesh output data to DD3’s visual

26 effects team using the following process. First, the Mova team provided the BATB production

27 team (which we referred to as “editorial” and which was not a DD3 team) with reference footage

28 from the Mova capture sessions. The footage was provided to editorial in the widely used

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1 QuickTime format, which was developed by Apple and is not proprietary to Mova. Editorial
2 would select the take of the facial performance that best reflected their intentions for the shot and
3 send DD3 QuickTime files with their selection.

4 19. Upon receipt of the reference footage, DD3’s visual effects team would place a
5 copy of those files in the DMX system (discussed below) and the Mova team would begin the
6 process of generating the tracked mesh output data that corresponded to the take selected by
7 editorial. When that tracked mesh output data was ready, DD3’s Mova team provided the data and
8 the mask-like rendering of it to DD3’s visual effects team. As I said above, tracked mesh output
9 data was delivered to the visual effects team for 227 of the 411 shots that include the Beast’s face.

10 20. That tracked mesh output data was not used on all shots for which it was delivered,
11 but when it was used in the process of developing a particular shot, DD3 used the following
12 process to animate the Beast.

13 21. First, DD3’s animators took a model of the Beast with the face and body rigs and
14 animated that model, including the face. This part of the process did not involve use of the Mova
15 software or its output data and was instead modelled footage of Mr. Stevens’s on-set performance
16 (i.e., with a set, with scene lighting, and with other actors involved in the scene). During his on-set
17 performance, Mr. Stevens would be wearing a bulky body suit, looking somewhat like the
18 Michelin Man on stilts. The footage of Mr. Stevens’s on-set performance is referred to as “the
19 plate performance.” This is distinct from Mr. Stevens’s “facial performance” or “Mova plate
20 performance,” which is what Mr. Stevens did while alone in the Mova rig.

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22. A frame of Dan Stevens’s plate performance for a shot is shown below. Mova software was not used to capture footage or process data from the plate performance.



Figure 1

23. A frame showing the same shot with basic animation of the Beast (before Mova tracked mesh output data was applied to the shot and before much of the other work described in this declaration) is shown below.



Figure 2

24. True and correct copies of videos of the full shot from which the screenshots of

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1 these frames (and other frames mentioned below) were taken are attached as exhibits, and
2 described more fully below.

3 25. Second, the animators used a DD3-proprietary process called Direct Drive to apply
4 the Mova tracked mesh output data to fine-tune the facial performance animation. DD3’s
5 proprietary software retargeted the facial deformation of Mr. Stevens’s face to the Beast’s face.
6 Immediately after that process, the facial modeling team hand-sculpted corrections to many of the
7 poses. For example, retargeting the facial deformation of Mr. Stevens’s smile did not result in
8 facial deformation of the Beast that looked the way we wanted it to look, so the facial modeling
9 team modified this facial pose by hand sculpting the shape we wanted the Beast to have when the
10 Beast smiled. The facial modelling team used DD3’s proprietary WPSD tool for these hand-
11 modifications. Once the facial modelling team hand-modified a particular pose, WPSD was used
12 to automatically apply that modification to other instances of that pose. Thus, WPSD was
13 modifying the Beast’s facial poses, after the retargeting of Mr. Stevens’s facial deformations to the
14 Beast, each and every time Mova tracked mesh output data was used to partially animate the
15 Beast.

16 26. The Direct Drive process is not exclusively used with Mova tracked mesh output
17 data. Its core function is to transfer animation from one shape to another and it performs that
18 mapping function with various types of input, including data from a variety of other facial motion
19 capture performance systems. We refer to the mapping of tracked mesh output data by Direct
20 Drive as “ingestion.”

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27. The figure below shows a frame that includes a rendering of the tracked mesh output data for the shot referenced above, which looks like a white mask. That rendering is depicted side-by-side with reference footage of Dan Stevens’ facial motion performance in the Mova rig.



Figure 3

28. The figure below shows a frame of the facial rig, which looks like a hairless clay sculpture, after the tracked mesh output data is ingested into this shot by Direct Drive and applied to the animation team’s facial model of the Beast.



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Figure 4

29. The Figure below shows a version of the shot incorporating the ingested data into the shot, before any additional hand animation is done. At this stage of development, the shot is far from a finished product.



Figure 5

30. Third, DD3 animators worked to manually adjust and correct the results of the ingestion process. For example, Mr. Stevens’s facial movements, as represented in the tracked mesh output data, were often too subtle to show up clearly on the Beast’s face. When this happened, the animation team would re-animate the movements of the facial rig by hand to exaggerate the performance. The animation team did not use Mova software to make those adjustments. This work was performed by artists using their artistic talent, skill, and judgment.

31. Fourth, DD3 animators hand-animated the performance of the Beast’s eyes and made adjustments to the mouth for each shot. The animators did this without any mapping of tracked mesh output data because, as I noted above, the tracked mesh data did not include data for the eyes or much of the lips.

32. Fifth, after the face and body animations were approved, the moving 3D model of the Beast’s face and body would go to the shot model team. In many cases, the final poses of the Beast’s face or body out of animation would not be pleasing and/or would not appear realistic.

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1 These issues were largely due to the differences between Mr. Stevens’s face and the Beast’s face.
2 In these cases, the shot model team would go frame by frame, adjusting and correcting the facial
3 expressions or body poses. The shot model team did not use Mova software in their process. The
4 shot modeling was performed by artists using their artistic talent, skill and judgment.

5 33. When refining the shot, animators would sometimes rely on reference material to
6 guide and inspire their work. Reference materials may be still or video images of Mr. Stevens’s
7 recorded performances or of other individuals, animals, or objects. Most reference stills or videos
8 of Mr. Stevens’s performance came from the plate performances. Reference footage of the Mova
9 performance was occasionally used by the animators, but its utility for making refinements to the
10 Beast’s face was limited, and it was never used as a reference for the eyes, eye lines, or head
11 position. Again, this is because the actor was seated and alone in the Mova rig during the facial
12 motion capture sessions, thereby making his head pose and eye lines incorrect relative to the
13 primary plate performance. As a result, the plate performance generally depicted the goal of what
14 we were trying to achieve. The reference footage from the Mova facial performance sessions was
15 used for quality control (e.g., to compare the reference footage provided by the Mova team with
16 the reference composite video from editorial to help confirm that the Mova team had provided
17 data for the correct take, or to compare against the tracked mesh to confirm the tracked mesh data
18 was from the correct take or to check if it had internal data integrity flaws).

19 34. The result of the five steps described above was the completed model, or rig, of the
20 Beast for a particular shot. The shot would be provided to DD3’s character effects team (CFX).
21 CFX was responsible for putting the hair/fur and clothing on the Beast. Once these items were
22 applied to a shot, the CFX team had to ensure the items moved correctly with respect to all the
23 Beast’s movements (e.g., the Beast’s dancing) and environmental effects, such as wind. During
24 the CFX process, the animation team frequently would have to revisit the facial animation
25 because, for example, the fur on the Beast’s face resulted in facial expressions not reading clearly
26 enough. The CFX team did not use Mova software in this process. The CFX work was performed
27 by artists using their artistic talent, skill and judgment.

28 35. A complete shot also requires lighting. The lighting team simulated realistic

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1 lighting on the Beast, including the Beast’s fur and hair; rendered it; and checked that the lighting
2 fit into the environment of the overall shot. The impact of lighting on the character affects how the
3 Beast’s performance looks on the screen. Therefore, after lighting effects were added, the
4 animation team often again had to revise the Beast’s performance, including its facial
5 performance. The lighting and animation teams did not use Mova software in this process. The
6 lighting work was performed by artists using their artistic talent, skill and judgment.

7 36. In addition, there were teams working on environments (e.g., the castle, set
8 extensions, backgrounds) and effects (e.g. snow, Beast saliva, Beast spittle, dirt and twigs in the
9 Beast’s fur, etc.). The environment teams did not use Mova software in this process. The
10 environment work was performed by artists using their artistic talent, skill and judgment.

11 37. Another team worked on rotomotion. This is similar to but different from character
12 animation. The rotomotion team took a 3D rig capture of an actor’s body and tried to match the
13 motion of the actor’s body as captured by the 3D rig with the motion of the actor in the plate
14 performance. Other teams worked on rotoscoping and paint. The rotoscoping team outlined all the
15 regions of any character that would overlap the Beast. For example, where Belle’s hand passed
16 over the Beast’s face, we would have to cut out her hand with rotoscoping and superimpose it
17 back on the renders of the Beast. The paint team was responsible for restoring whatever
18 rotoscoping cut. Also, because the Beast had to be placed on top of plates that contained Mr.
19 Stevens’s image, we had to remove Mr. Stevens’s on-set performance from the plate to ensure bits
20 of him were not visible behind the Beast on screen. The paint team was responsible for repainting
21 and projecting portions of the background or other content to remove the actor from the plate.
22 Neither the rotomotion, rotoscoping, nor paint teams used Mova software. This work was
23 performed by artists using their artistic talent, skill and judgment.

24 38. On each shot, the work of the various animation and effects teams occurred in
25 parallel. During this process, a team working on one aspect of a shot would release a render of the
26 shot so that other teams could build upon or account for that team’s work. At various times the
27 work of multiple teams would be integrated together. Once an artist from a team had approval to
28 pass their work to the next team, they published their data for use by the next team. When some

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1 teams (e.g. animation and CFX) published their work, a render was generated to check that all the
2 elements were intact for the next team. This is called a QC render. Mova software was not used by
3 the visual effects team to create QC renders.

4 39. At various times during the development of a shot, work from multiple teams was
5 assembled together by the compositing team. This team combined renders from the teams to create
6 a complete moving image. The compositing team did not use Mova software in this process. The
7 compositing work was performed by artists using their artistic talent, skill and judgment.

8 40. The steps described above in which Mova software was not used required hundreds
9 of person hours, sometimes more than a thousand, to complete for each shot. A frame from the
10 final composite of the same shot of the Beast referenced above is shown below. DD3 created 309
11 versions of this shot. Over 250 versions of the shot were created after Mova was ingested and
12 incorporated into the shot.



Figure 6

25 41. For shots that did not use Mova tracked mesh output data, DD3 followed the same
26 process as that described above, except DD3 did not use ingested Mova tracked mesh output data
27 in the process of developing a shot. If Mova tracked mesh output data was not ingested for use in
28 developing a shot, the animation team had no way of loading or referring to that tracked mesh

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output data during the animation process.

42. For those shots in which Mova tracked mesh output data was used, the tracked mesh output data had minimal effect on the Beast’s appearance and performance in the final version of the shot. This is so for at least three reasons.

43. First, the Beast generally had to match Mr. Stevens’s plate performance. As noted above, the plate performance is the footage taken of Mr. Stevens, sometimes with other actors, in which he acted out a scene on a set, with scene appropriate lighting, etc. As also noted above, for each shot DD3 creates a complete virtual environment with animated characters and content, much like a real set would have characters and props. It is the plate performance that drives the overall configuration of the shot, including how to animate the Beast to interact with the other actors and characters, how to light the animated shot, and how to move and control the virtual camera in the animated shot. The Mova camera rig was not used to capture footage for the plate performance and Mova software was not used to process the footage of the plate performances. Because Mr. Stevens’s facial performance in the Mova rig rarely matched his plate performance, the Mova tracked mesh output data often had to be adjusted, thereby reducing the impact of that tracked mesh output data on the final version of the shot.

44. Second, the Beast’s physical geometry is very different from that of Mr. Stevens. By way of obvious example, the Beast is larger. Because of the differences in physical geometry, the mapping of Mr. Stevens’s performance onto the Beast’s performance required extensive hand animation, further diluting the impact of the Mova tracked mesh output data on the final version of the shot.

45. Third, the Beast has fur, facial features, and costuming that Mr. Stevens does not. All of these elements required their own extensive work to implement, animate, and integrate into the facial motions and expressions of the character, and the impact of this work on the appearance of the Beast and overall shot still further reduced the relative impact of the Mova tracked mesh output data.

46. Thus, whether or not we ingested Mova tracked mesh output data for use in the process of creating a particular shot, DD3 animators had to do substantial work to improve the

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1 facial performance animation from the initial rough version of the animated face to the final
2 version that appeared in the completed motion picture.

3 47. As noted, Mova is not the only technology used for facial motion performance
4 capture. Other examples are Medusa and Di4D. Any facial motion performance capture tool can
5 potentially be a useful time-savings tool. Because of the complexities of the Beast’s appearance,
6 however, the time-saving benefit from using Mova was minimal or non-existent. In hindsight, the
7 amount of work needed to manually correct the animation post-ingestion of the Mova tracked
8 mesh output data for the Beast was essentially the same, on average, as the effort that would have
9 been needed to manually achieve the same or better results.

10 **Illustrative Examples – Background**

11 48. During my deposition I testified about a holding area where Mova output would be
12 placed so as to be made available to the animation team. DD3 uses a proprietary tool called DMX
13 to manage its shots. DMX is a custom render management and review system. Each time work is
14 submitted, a render of the work is compiled into a small movie that can be reviewed. For each
15 shot, DD3’s DMX system contains (among other things) all of the stages of development of that
16 shot, which the system tracks as “versions.” Some shots for BATB have 300 or more versions,
17 others have fewer than 50. Each version generally represents work done by an artist or engineer, or
18 in the case of ingestion of Mova tracked mesh output data, the work done by Direct Drive.

19 49. Looking at the versions of a shot saved in DMX, I am able to determine whether or
20 not Mova tracked mesh output data was delivered and available for the animation team to use in
21 the process of developing the Beast’s face for use in that shot. Any data sent by the Mova team for
22 possible use in the process of developing a shot appeared in DMX. If Mova tracked mesh output
23 data was used in the process of partially animating the Beast’s face for any version of a shot, there
24 would necessarily be a version of the shot in DMX that showed the mask-like rendering of the
25 tracked mesh output data and a version that showed Dan Stevens’s head side-by-side with the
26 facial rig of the Beast. As a matter of practice there would be a version with a comment indicating
27 that it reflected the ingestion of Mova tracked mesh output data. If these three versions do not exist
28 in DMX for a shot, then Mova tracked mesh output data was never ingested into that shot.

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50. As an example, Exhibit 1 is a spreadsheet for shot MSM0250 generated from DMX. Each line of the spreadsheet reflects a different version of the shot. The information in Exhibit 1 was generated automatically from DMX. A Mova ingestion will generally be labeled with the shot name “_anim_mova_qc_v001” or similar. For example, line 85 of the spreadsheet reflects that Mova was ingested into shot MSM0250 after version 5.

51. DMX maintains videos of each version of a shot, along with thumbnails of each of those videos. I can identify if Mova was ingested for use in a particular shot by looking at the thumbnails of images in DMX to see if they show the mask-like rendering of the tracked mesh output data and images of Dan Stevens’s face side-by-side with a hairless Beast face.

52. Exhibit 2 reflects the thumbnails of the videos maintained in DMX for the different versions of shot MSM0250. Version 5 (labeled “MSM0250_v005; MSM0250_anim-mova_qc_v005”) shows the mask-like rendering of the tracked mesh output data, and Version 6 (labeled “MSM0250_v006; MSM0250_rigblast_v001”) shows the side-by-side images of Mr. Stevens and the hairless Beast face.

53. Reviewing the information in DMX, I was able to determine that Mova was ingested for 227 of the 411 Beast shots that DD3 animated. For the shots on which Mova was not ingested, Mova tracked mesh output data was not used in the process of developing that shot. When Mova tracked mesh output data was ingested, it was sometimes a dead-end in that the results of ingestion were not used as the basis for further work. But even when Mova tracked mesh output data was ingested and not abandoned, substantial additional work was done by the visual effect team, including the animation team, as explained above and illustrated below.

MSM0250: Lingerin

54. Shot MSM0250 is about six seconds long. I selected it as an example because in the shot, the face of the Beast is prominent. Shot MSM0250 took 73 versions to complete.

55. Exhibit 2 is a screenshot from DMX. It shows thumbnail representations of all the content in DMX for that shot: reference material and shot versions.

56. As discussed above, Exhibit 1 is a spreadsheet I created using DMX. The spreadsheet lists all of the content in DMX for this shot. The spreadsheets discussed below, in the

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context of other example shots, similarly list all of the content in DMX for those shots. For each version and for most of the reference material each spreadsheet includes, *inter alia*: the person who checked in that content, the time and date of the check-in, and a contemporaneous description of the content. The time between versions is only suggestive of the effort involved in each version. Because animators work on multiple shots and because other tasks may arise, it is not possible to exactly pinpoint the amount of time spent working on a particular version. Nevertheless, the amount of time elapsed between two versions produced by a team does provide a rough estimate of the amount of time devoted to the more recent version.

57. Exhibits 3 through 18 are videos. Each is a true and correct copy of a video stored in DMX and associated with shot MSM0250. I included a video for each of the entries that I discuss below.

58. I have not included all of the videos in DMX for MSM0250 or the other shots discussed below. Instead, the examples highlighted below are intended to illustrate some of the many steps involved the creation and evolution of a shot. By viewing the videos included as exhibits and reviewing the spreadsheet and thumbnails exported from DMX, one gets a general understanding of the evolution of the shot and the work involved in creating the shot. Mova software was used only in the process of capturing the facial performance for this shot and processing output data. All of the other work described below, and reflected in the 73 versions of this shot, involved the work of artists using their artistic talent, skill, and judgment, implemented using software and processes other than Mova (such as Direct Drive and other software I mentioned above).

59. Exhibit 3 is reference material for MSM0250 sent to us from editorial. My understanding of how such clips were generated is as follows. First, editorial selected the plate performance they like best for the shot. This became the master performance we were generally trying to match in the animation. Then, the Mova team sent editorial reference footage from the Mova facial capture session for the shot. This footage was delivered as a single video (in the QuickTime format mentioned above) that showed, side-by-side, the output of three of the cameras that filmed Mr. Stevens during the Mova capture session. I am informed and believe that editorial

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would then line up their selected plate performance with the takes of Mr. Stevens’s facial motion capture session that editorial thought looked closest to his plate performance. Editorial would then generate a “picture-in-picture” video, which was a composite of the selected Mova take synchronized with the place performance to which it corresponded. Editorial would send the picture-in-picture to DD3 as a Quick Time file, along with a modified version of the original video received from DD3’s Mova team. Exhibit 3 is the picture-in-picture video received from editorial for MSM0250. In Exhibit 3, Mr. Stevens’s facial motion capture performance is shown in the three-part image at the bottom left hand side of the screen, and his plate performance is shown in the background. When DD3 received this video from editorial, we used the timecodes on the facial motion capture performance included in the composite video to determine which frames from the facial motion capture session, if any, that the Mova team should provide the VFX team for possible ingestion.

60. Exhibit 4 is the result of “previsualization,” in which low resolution versions of the characters and sets are made to test out how to best shoot the various shots. This provides a guide for shooting and for VFX. It does not involve any Mova software or any Mova output data. I have included this video to illustrate some of the work that goes into preparing for a shot, unrelated to Mova.

61. Exhibit 5 is a video of version 2 of the shot. Version 2 is an attempt to track the virtual camera in relation to the contours of the environment and the characters. The wireframe seen here is not Mova output data and not from a facial motion capture session. The wire view represents the simulated version of Mr. Stevens. The fact that it largely overlaps with the plate image of Mr. Stevens demonstrates that the virtual camera is correctly positioned.

62. Exhibit 6 is reference footage of the actor’s facial performance in the Mova rig. The VFX team would receive these images when we received the Mova tracked mesh output data from the Mova group at DD3. We would primarily use this footage to quality control any Mova tracked mesh output data, as described above. Exhibit 7 is similar to Exhibit 6, but it is not head-stabilized. The head-stabilized version is an attempt to isolate the facial movement, as distinguished from the motion of the head. The Beast’s head motion was always animated to

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1 match the live action plate performance, not the Mova performance.

2 63. Version 4 of the shot (Exhibit 8) is the last version before ingestion of Mova

3 tracked mesh output data. We refer to this relatively blocky animation as a “playblast.” The

4 playblast is a quick render that allows us to see the basic performance of the Beast. The body of

5 the Beast is already partially animated, based off of Mr. Stevens’s plate performance, not his facial

6 motion capture session. The eyes and eye region are also animated, again based on the plate

7 performance, not the facial motion capture session. Mova software is not used to create the

8 playblast.

9 64. Version 5 of the shot (Exhibit 9) is a render of the Mova tracked mesh output data.

10 65. Version 6 of the shot (Exhibit 10) is the result of Direct Drive mapping the tracked

11 mesh output data to the animation team’s existing Beast model.

12 66. Version 7 of the shot (Exhibit 11) is the version of the entire shot that has utilized

13 the Mova tracked mesh output data. No other animation has been done since Version 4. When

14 comparing version 4 and version 7, notice, e.g., that the eye performance is unchanged from the

15 prior animation.

16 67. Version 8 of the shot (Exhibit 12) contains hand animation tweaking and improving

17 the shot since the ingestion of the Mova output data.

18 68. Versions 9 through 24, as described in Exhibit 1, reflect the work of the animation

19 team as well as other VFX teams.

20 69. The video of version 25 of the shot (Exhibit 13) is included as an example of the

21 cumulative effect of this additional non-Mova related work on the facial performance of the Beast.

22 Comparing this version to version 7, which is the version that utilizes the tracked mesh output

23 data, I observe that no part of the Beast’s face is unmodified, from the expressions to the timing of

24 the performance. In the lower right hand corner of the video of version 25 in Exhibit 13, there is a

25 frame counter. Around frame 1110, I can see on version 25 that the inner brows and eyes have

26 been changed to give a much more shocked and sad expression and the mouth has been opened

27 wider and dropped down. Figure 7 is a screenshot of frame 1111 in version 7. Figure 8 is a

28

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screenshot of frame 1110 in version 25.



Figure 7



Figure 8

70. Comparing version 25 to the reference footage of Mr. Stevens’s facial performance in the Mova rig, I can also see that the version does not track the Mova performance. Version 25 is

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the opposite of what Mr. Stevens was doing in the Mova rig: in the Mova facial motion capture at frames 1109-1111 Mr. Stevens starts to look down, lower his brows and raise his jaw. But Version 25 tracks more closely to the plate performance. I can observe these differences in Figure 9, which is a screenshot of frame 1109 from the picture-in-picture for this shot (Exhibit 3) showing both the facial performance in the Mova rig (in the three-part image at the bottom) and the plate performance.

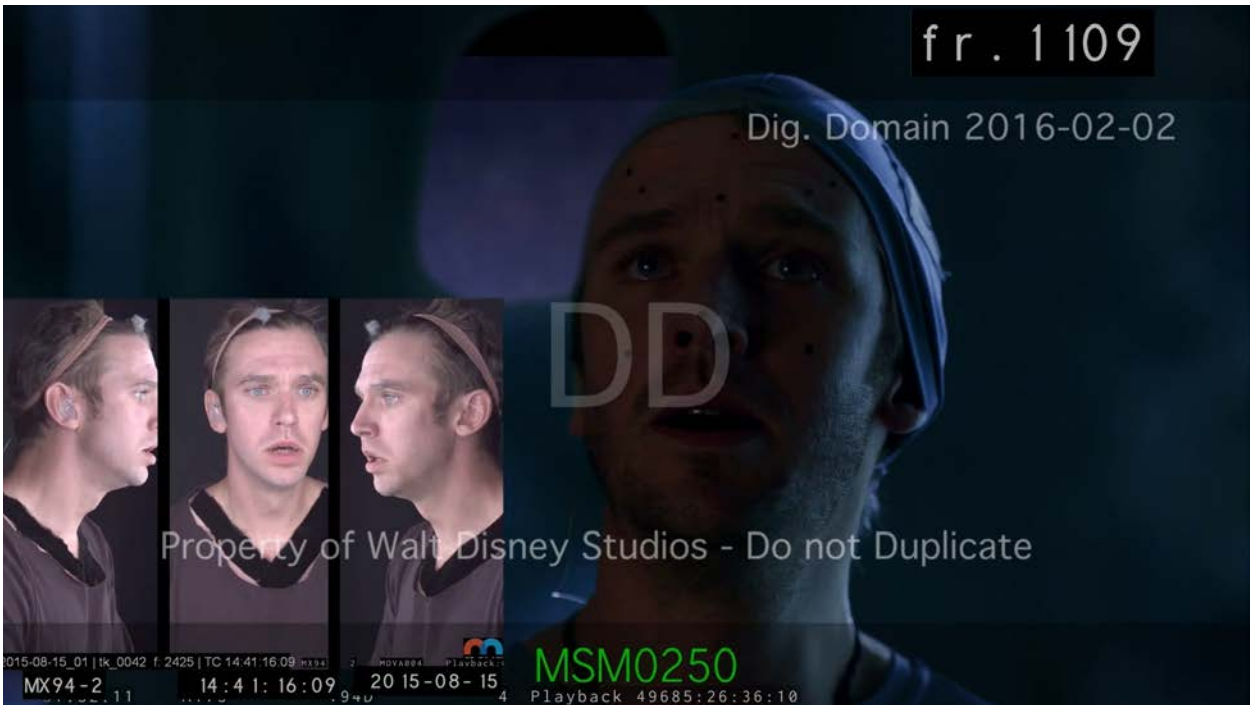


Figure 9

71. Exhibit 14 is a “QC” render. At several stages in the process the various VFX teams (e.g.: animation, rotomotion, CFX (character effects: e.g., clothing and hair), shot model, lighting, rotoscoping, paint, rigging, environments, effects, integration) will publish their latest work to be used by other teams. At various point in time, a quality control (“QC”) render is produced to ensure the process of wrapping up all the data for use by other teams was successful. Mova software was not used to generate this QC render.

72. In version 38 of the shot (Exhibit 15), the lighting team has taken the animated character, now with fur and clothing, and placed lights in 3D space to simulate the lighting of the scene as shot in the plate performance. Mova software was not used in any of this work.

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1 Overlaid on the shot is a plate performance so that the animators can account for the lighting
2 used in that performance. In this version the plate performance appears in the upper right hand
3 corner. In this version, one can also see that the Beast’s eye and eyebrow animation, completely
4 absent from version 7, have undergone extensive work. Comparing the plate performance with the
5 Beast’s face, I see that the animation changes made in version 25 modified the expressions and
6 timing to better match Mr. Stevens’s plate performance (upper left), not his facial capture
7 performance.

8 73. Version 48 of the shot (Exhibit 16) reflects work by the CFX team. The artists are
9 simulating, for example, the clothing moving and fitting against the Beast’s body. Version 49 of
10 the shot (Exhibit 17) reflects work by the CFX team on hair effects, including trying to get the
11 motion of the hair (and clothing) correct. Mova software was not used in the CFX team’s work
12 74. After another 20+ versions, version 73 of the shot (Exhibit 18) is a final shot. It is
13 the composite of all the most recent work by the various teams mentioned above.

14 **WAL0550: Waltz Shot**

15 75. Shot Wal0050 is one of 35 shots that DD3 worked on from a scene of the Beast and
16 Belle dancing a waltz. The frames depicted in Figures 1 through 6 above come from this shot.

17 76. Shot WAL0550 is an example of a shot in which Mova tracked mesh output data
18 was ingested but for which it had particularly little impact, both because the focus is rarely on the
19 Beast’s face and because there are so many other elements in the shot.

20 77. Exhibit 19 is a screenshot from DMX, similar to that included for the previous shot.
21 It shows thumbnail representations of all the content in DMX for WAL0550.

22 78. Exhibit 20 was exported from DMX. This spreadsheet lists all of the content in
23 DMX for this shot.

24 79. Exhibits 21 through 35 are videos that illustrate some of the many steps in the
25 development of this shot, which took more than 300 versions to complete. Each of these video
26 exhibits is a true and correct copy of a video associated with shot WAL0550 in DMX. Mova
27 software was used only in the process of capturing the facial performance for this shot and
28 processing output data. All of the other work described below, and reflected in the more than 300

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versions of this shot, involved the work of artists using their artistic talent, skill and judgment, and software and processes other than Mova such as Direct Drive.

80. Exhibit 21 is a reference sent to us from editorial. As with the comparable exhibit from shot MSM0250, Exhibit 21 contains video of a plate performance lined up with video of a facial motion capture performance. At DD3, we looked at the timecodes on the facial motion capture included in the reference video to determine which frames of the Mova tracked mesh output data to ingest for use in developing the shot.

81. Exhibit 22 is version 3 of the shot. This shows some of the work of DD3’s rotoscoping department. Here, that team has outlined the regions of Belle that the Beast has to go underneath or behind. For example, if her hand goes over the Beast’s face then we will eventually have to cut out her arm with rotoscoping and superimpose it back onto the renders of the Beast. Mova software was not used for rotoscoping work.

82. Exhibit 23 is a render of the tracked mesh output data, which appears as a moving mask of Mr. Stevens’s facial motion capture session for this shot. The reference footage of Mr. Stevens performing in the rig appears next to the render of the tracked mesh output data.

83. Exhibit 24 is version 18 of the shot. The video shows the result of using Direct Drive to map the tracked mesh output data to the animation team’s existing Beast model.

84. Version 49 (Exhibit 25) is the last version from the animation team before the application of the tracked mesh output data. This is the playblast that I described above. It was created without using Mova software.

85. Version 56 of the shot (Exhibit 26) is the version of the entire shot that incorporates the Mova tracked mesh output data. No additional hand animation was done on the shot between Version 49 and version 56. I can see that the difference in the Beast’s facial performance between the two versions is imperceptible. The tracked mesh output data has had almost no effect on the performance in this shot.

86. Animation is previewed in two forms: a very simple render and a more complete render with better lighting. Version 71 (Exhibit 27) is a simpler playblast, version 72 (Exhibit 28) is the more complete “comp” or composite render.

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87. Exhibit 29 is another QC render. As I stated above, at several stages in the process the work of the various VFX teams (e.g., animation, CFX, shot model, lighting, rigging, etc.) is QC'd for use by other teams.

88. Version 81 (Exhibit 30) shows paint work, as described above. Mova software was not used in paint work.

89. Version 134 (Exhibit 31) is from the shot model team. Often the face and the body of the Beast don't look anatomically correct, and this team goes frame by frame and hand sculpts the correct muscles and motion to ensure the final forms look physically correct. The shot model team did not use Mova software for shot modeling.

90. Version 214 of the shot (Exhibit 32) reflects work on the clothing effects. In particular, the CFX artists are simulating the clothing moving and fitting against the Beast's body. This is a low quality render to preview the motion.

91. Exhibit 33 is a cloth and hair effects render. The cloth and hair teams simulate the clothing against the Beast's moving body to create a physically correct clothing and hair motion. This is a higher quality render in order to better preview the motion,

92. Version 306 (Exhibit 34) is a CFX render, in which the team has simulated the computer generated Belle dress against Belle's computer generated body and the Beast's body and clothing. This is used to check the motion is correct. The CFX team did not use Mova software for CFX work.

93. Version 309 (Exhibit 35) is the final version of the shot, the "composite." A compositor assembles all the individual renders from all the different team and created a complete shot with lensing effects to look "real." The compositor does not use Mova software for compositing work.

WFA0605: Wolf Fight – Mova Tracked Mesh Data Ingested but Not Used

94. Shot WFA0605 is less than two seconds in duration and went through 146 versions. It is part of a scene that in which the Beast is fighting with wolves. As with the other shots described herein, Mova software was used only in the process of capturing the facial performance for this shot and processing output data. All of the other work described below and reflected in the

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1 146 versions of this shot involved the work of artists using their artistic talent, skill, and judgment,
2 and applying software and processes other than Mova, such as Direct Drive and the software I
3 mentioned above.

4 95. Exhibit 36 is a screenshot from DMX, similar to that included for the previous
5 shots. It shows thumbnail representations of all the content in DMX for WFA0605.

6 96. Exhibit 37 was exported from DMX. This spreadsheet lists all of the content in
7 DMX for this shot.

8 97. Exhibits 38 through 52 are videos that illustrate some of the many steps in the
9 development of this shot. Each is a true and correct copy of video content associated with shot
10 WFA0605 in DMX.

11 98. Exhibit 38 is a reference sent to us from editorial. As with the comparable exhibits
12 from the shots discussed above, it contains a plate performance lined up with a Mova
13 performance. The plate performance drives the shot and is captured without the use of Mova
14 software.

15 99. Exhibit 39 is a render of the tracked mesh output data; a moving mask of Dan
16 Stevens’s performance during his Mova capture session for this shot.

17 100. Exhibit 40 is version 6 of the shot. This is a QC render of the Mova tracked mesh
18 output data transferred onto our Beast face through the Direct Drive process.

19 101. Exhibit 41 is version 9 of the shot. It is a quick animation render of the Beast and
20 wolf. It may include the results of using Direct Drive to ingest the Mova tracked mesh output data.
21 The quality of the render makes that difficult to determine.

22 102. Exhibit 42 is a QC render that integrates the work of various teams, including the
23 animation team, CFX team, and shot model team. As discussed above, those teams did not use
24 Mova software in their work.

25 103. Exhibit 43 is version 50 of the shot. It is a reference plate of a variety of different
26 growl expressions that animators can refer to when making later modifications to the animation of
27 the face. The reference material in this version includes the facial expression of both Mr. Stevens
28 and a second actor.

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1 104. Exhibit 44 is version 57 of the shot. This is an animation comp, a higher quality
2 animation render used to check the animation in the scene. Mova software was not used to create
3 the animation comp.
4 105. Exhibit 45 is version 76 of the shot. It is a CFX render, similar to others I mention
5 above. The team simulates the strands of the Beast's hair against the Beast's moving body and
6 clothing to create a physically correct hair motion. This is a very low quality render to preview the
7 motion. The CFX team did not use Mova software in their work.
8 106. Exhibit 46 is version 83 of the shot. It is a comp from the effects team, rendering
9 bits of saliva from the wolf and the Beast's mouths. Mova software was not used to add these
10 effects.
11 107. Exhibit 47 is version 102, which is a close to final version of the animation. I have
12 lined up the animation of the Beast's face to the images from the facial performance capture
13 session and the rendering of the Mova tracked mesh output data and I can see that the timing of
14 movements on, and the performance of, the Beast's face have been completely redone and are not
15 based on the facial performance capture session or the Mova tracked mesh output data.

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1 108. For example, as illustrated in the frame screenshots I compiled in Figure 10 below,
2 when I look at frame 1043 I can see in the Mova facial capture footage (in the upper left corner of
3 Figure 10) that Mr. Stevens’s teeth are clenched, his nose is wrinkled, and his eyes are open. In the
4 animation render at frame 1043 (version 102, shown at the bottom of Figure 10) and the lighting
5 render at frame 1043 (version 144, shown at the upper right of Figure 10), the Beast’s mouth is
6 wide open, his fangs are bared, and his eyes are shut tight.

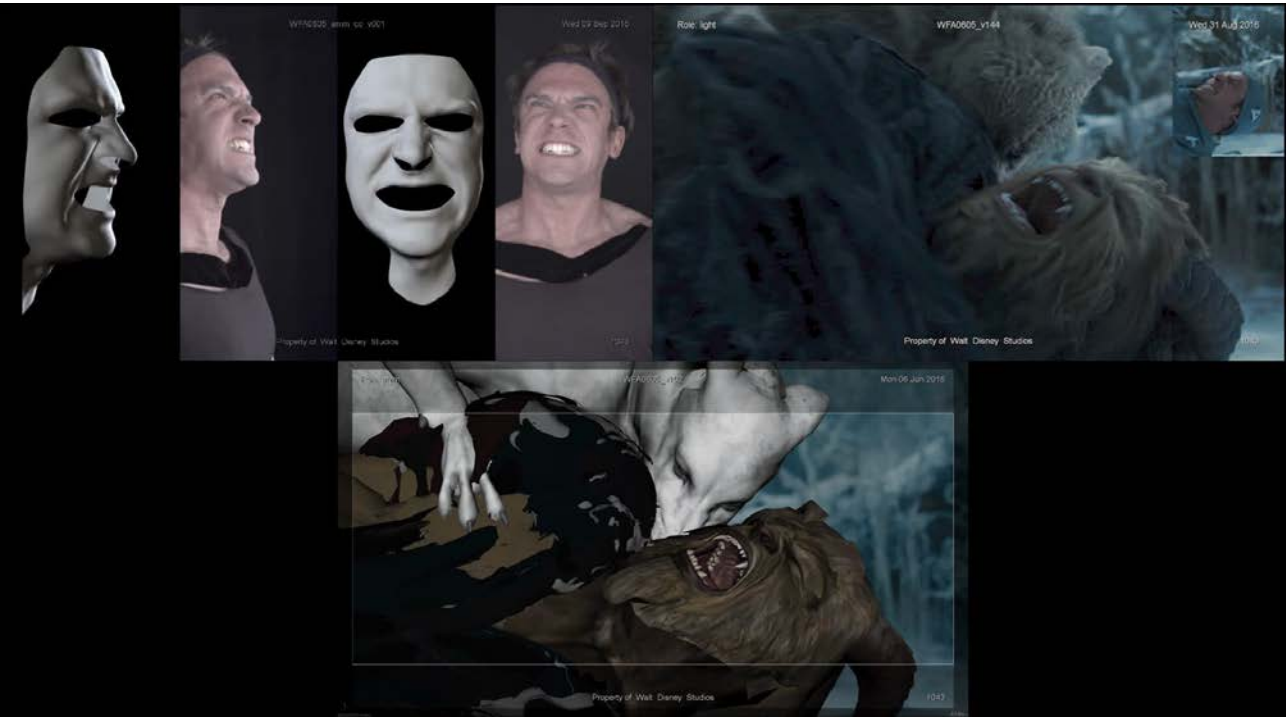


Figure 10

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109. Figure 11 similarly shows that the final version of the Beast in this shot does not track the Mova facial capture performance. Figure 11 shows screenshots I compiled of frame 1055 of the shot. In frame 1055, in the facial capture (depicted at the upper left of Figure 11), Mr. Stevens’s mouth is wide open and he is looking up and to the right, while in the animation render (at the bottom of the figure) and the lighting render (at the upper right of the figure) the Beast’s mouth is only half open and his eyes are shut.

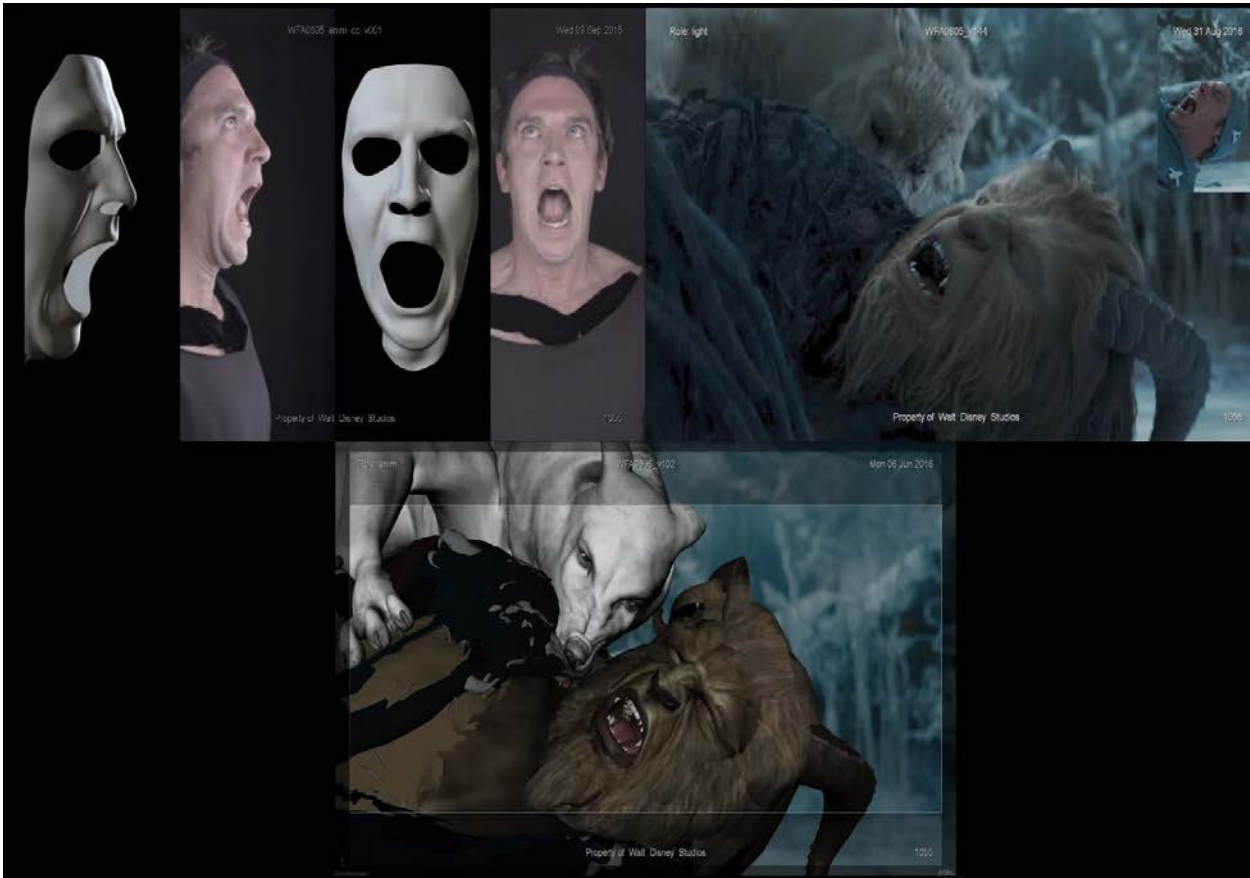


Figure 11

110. Exhibit 48 is version 130, from the shot model team. Often the face and the body of the Beast don't look anatomically correct, so this team goes frame by frame and hand sculpts the correct muscles and motion to ensure the final forms look physically correct. Mova software is not used in this shot modeling.

111. Exhibit 49 is another CFX render, focusing on clothing and hair effects, as described above. This render is a higher quality render in order to better preview the motion.

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1 112. Exhibit 50 is version 137. This is a lower quality CFX render, intended to preview
2 the motion. Again, the CFX team did not use Mova software in this work.

3 113. Exhibit 51 is version 144. The lighting team took the latest published version from
4 the CFX and animation team and placed digital/virtual lights around the 3D scene to match the
5 lighting from the plate. The team is trying to create a render of the Beast in which he looks like he
6 was in the set with the correct lighting. This is done without using Mova software. Generally on
7 these shots Mr. Stevens’s performance from the plate (not Mova) is overlayed so we can see that
8 the lighting matches and that the performance works. In this case, when I check the Beast's face
9 against the Mova capture and the live action plate, I can see this animation more closely resembles
10 the live action plate (but has been heavily modified).

11 114. Exhibit 52 is version 146 of this shot. A compositor has assembled all the
12 individual renders from all the different teams and integrated the layers together, complete with
13 lensing effects, to create a final shot that looks real. Again, Mova software is not used for
14 compositing work.

15
16 I declare under penalty of perjury under the laws of the United States of America that the
17 foregoing statements are true and correct.

18 Executed on October 13, 2020, at Los Angeles, California.

19
20
21 

22 DARREN HENDLER

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EXHIBIT 12

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30(b)(6), Confidential **Darren Hendler, Vol. 2 on 02/16/2023**

1 UNITED STATES DISTRICT COURT
2 NORTHERN DISTRICT OF CALIFORNIA
3 OAKLAND DIVISION
4
5 REARDEN LLC, REARDEN MOVA)
6 LLC, California limited)
7 liability companies,)
8 Plaintiffs,)
9 vs.) CASE NO.
10 TWDC ENTERPRISES 18 CORP.) 4:17-cv-04006-JST
11 f/k/a THE WALT DISNEY) VOLUME II
12 COMPANY, a Delaware)
13 corporation, WALT DISNEY)
14 PICTURES, a California)
15 corporation, MARVEL STUDIOS,)
16 LLC, a Delaware limited)
17 liability company, MVL FILM)
18 FINANCE LLC, a Delaware)
limited liability company,)
INFINITY PRODUCTIONS LLC,)
a Delaware limited liability)
Company, ASSEMBLED)
PRODUCTIONS II LLC, a)
Delaware limited liability)
Company,)
Defendants.)
)

19 ** C O N F I D E N T I A L **

20 VIDEOTAPED DEPOSITION OF:

21 DARREN HENDLER

22 AS THE 30(B)(6) WITNESS FOR DD3

23 AND IN HIS PERSONAL CAPACITY

24 THURSDAY, FEBRUARY 16, 2023

25 Reported by:

 Kelli C. Norden, CSR No. 7200

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30(b)(6), Confidential Darren Hendler, Vol. 2 on 02/16/2023 Page 131

1 LOS ANGELES, CALIFORNIA, THURSDAY

2 FEBRUARY 16, 2023

3 8:39 A.M.

4

5 THE VIDEOGRAPHER: This is media number

6 two in the deposition of Darren Hendler in the

7 matter of Rearden LLC, et al., versus the Walt

8 Disney Company, et al.

9 Today -- today's date is February 16,

10 2023. The time on the monitor is 8:39 a.m.

11 My name is McKenzie Massengale and I'm

12 the videographer. The court reporter is Kelli

13 Norden, and we are here with Huseby Global

14 Litigation.

15 Counsel, please introduce yourselves,

16 after which the court reporter will swear in the

17 witness.

18 MR. CARLSON: My name is Mark Carlson

19 and I am with Hagens Berman Sobol Shapiro. We

20 represent the plaintiffs, Rearden LLC and Rearden

21 MOVA LLC.

22 With me today is my client, Steve

23 Perlman.

24 MR. KLEINMAN: And this is Ben Kleinman

25 with the law firm of Kilpatrick, Townsend. I

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1 represent non-party DD3, on whose behalf Darren
2 Hendler has been designated as a 30(b)(6) witness
3 on certain topics.
4 Also representing Darren Hendler in his
5 personal capacity for the purposes of this
6 deposition.
7 Not with me at the moment but most
8 likely joining some point in the first hours will
9 be Sam Hyams, H-Y-A-M-S, also with Kilpatrick,
10 Townsend.
11 MS. YOUNG: Good morning.
12 My name is Blanca Young. I'm with the
13 law firm of Munger, Tolles & Olson. I represent
14 the defendants in this matter.
15 With me today is Jon Chow from Disney.
16 / / /
17 / / /
18 / / /
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1 Q. What is --

2 MR. KLEINMAN: I'm just going to --

3 sorry.

4 I'm just going to designate his address

5 as AEO.

6 (Designation later revoked.)

7 BY MR. CARLSON:

8 Q. What is your occupation?

9 A. I'm a supervisor, a C.G. supervisor.

10 Q. And who is your employer?

11 A. Epic, Epic Games.

12 Q. When did your employment with Epic Games

13 start?

14 A. About a year and a half ago.

15 Q. So 2021?

16 A. Yes. Wait. Yes.

17 Q. Okay. And prior to that, were you

18 employed by Digital Domain?

19 A. Yes.

20 Q. Are you represented by an attorney

21 today?

22 A. Yes, I think so.

23 Q. Okay. And who is that?

24 A. Ben Kleinman.

25 Q. Did you meet with anyone to prepare for

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1 team doing the work on Beast.

2 Q. So first the MOVA team would provide

3 MOVA reference footage to the production team.

4 Is that correct?

5 MS. YOUNG: Object to the form.

6 THE WITNESS: Yes, but in this case, the

7 production team actually refers to the Disney

8 production team.

9 BY MR. CARLSON:

10 Q. Okay.

11 A. Editorial team.

12 Q. So -- so the -- the Disney production

13 team and editorial team are the same thing?

14 MR. KLEINMAN: Objection; form.

15 THE WITNESS: I would say that the

16 editorial team is a subset of the Disney production

17 team.

18 BY MR. CARLSON:

19 Q. Okay. Do you know who is on the

20 editorial team?

21 A. I don't recall.

22 Q. Do you recall anyone who was on the

23 editorial team?

24 A. On the Disney editorial team?

25 Q. Yes.

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1 A. I don't.

2 Q. Do you recall if Mr. Condon was on

3 there?

4 A. The director?

5 Q. Yes.

6 A. When I refer to the editorial team, that

7 would've been the editors assembling the footage.

8 And so no, he would not have been on there.

9 Q. So -- so was it your understanding that

10 the persons on the editorial team were persons who

11 were employed by Disney?

12 MS. YOUNG: Object to the form.

13 MR. KLEINMAN: Objection; calls for

14 speculation.

15 THE WITNESS: Yes, I would assume so.

16 BY MR. CARLSON:

17 Q. And when you say the "Beauty and The

18 Beast" production team was not a DD3 team, you mean

19 that it was -- rather than a DD3 team, it was a

20 Disney team; correct?

21 MS. YOUNG: Object to the form.

22 THE WITNESS: Yes.

23 BY MR. CARLSON:

24 Q. Then you see that the production team

25 would select the desired take of the facial

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1 performance and send that selection to DD3 in

2 QuickTime format.

3 Is that --

4 (Speaking simultaneously.)

5 MS. YOUNG: I'm going to -- I'm going to

6 object to the form.

7 And I have a standing objection to the

8 form over the use of "production team," which has

9 been used in two completely different ways in this

10 deposition.

11 BY MR. CARLSON:

12 Q. Let me strike that and ask it a little

13 differently, Mr. Hendler.

14 Is it fair to say that in this

15 paragraph, you're saying that the editorial team

16 would select the desired take of the facial

17 performance and send that selection to DD3 in

18 QuickTime format?

19 MR. KLEINMAN: Objection;

20 mischaracterizes that paragraph.

21 THE WITNESS: Yes.

22 BY MR. CARLSON:

23 Q. Then can you give me the names or -- or

24 the group of the persons at Digital Domain that

25 would receive those selects?

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1 Object to the extent it mischaracterizes

2 the declaration.

3 THE WITNESS: Yes.

4 BY MR. CARLSON:

5 Q. So on the lower left of figure nine,

6 that's reference footage from the MOVA Contour rig

7 capturing Mr. Stevens's performance?

8 MS. YOUNG: Object to --

9 THE WITNESS: Yes.

10 MS. YOUNG: -- the form.

11 MR. CARLSON: Did we get his answer on

12 the record?

13 THE WITNESS: Yes.

14 THE COURT REPORTER: We got "yes."

15 MR. CARLSON: Okay. I apologize.

16 BY MR. CARLSON:

17 Q. And then to the -- to the right of that,

18 there's sort of a blue shaded image of Mr. Stevens.

19 That's from footage of him performing on

20 the set; correct?

21 A. Yes.

22 Q. And then you observe that in the MOVA

23 video, Mr. Stevens is looking down.

24 Is that correct?

25 MR. KLEINMAN: Objection; form.

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1 A. No.

2 Q. Okay. I think you also referred to a

3 production team associated with Disney.

4 Do you recall that?

5 A. Yes.

6 Q. And who -- who do you know to be -- to

7 have been on that production team?

8 A. I would -- I would say definitely Steve

9 Gaub, but I can't remember the names of others that

10 were involved on the Disney side.

11 Q. And was that team completely distinct

12 from the DD3 production team you talked about at

13 the start of your deposition?

14 A. Absolutely.

15 MS. YOUNG: Okay. Thank you.

16 I have nothing further.

17 MR. CARLSON: Okay. So, Mr. Hendler,

18 it's been a long day for -- for you and for all of

19 us, so I'm going to try and move us through this

20 as -- as quickly as I can.

21 Can we put up Exhibit 1187, please.

22 / / /

23 / / /

24 / / /

25

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1 Q. And how would one do that?

2 A. The -- the MOVA -- the MOVA Q.C. process

3 had standardized naming, and so it could be

4 searched.

5 Q. Okay. And then once I have generated

6 this screen in DMX, can I just print it?

7 A. You could screen grab it. Yes.

8 Q. Okay. So is this a screen grab, to your

9 knowledge?

10 A. Yes.

11 Q. And this comes from the DMX system.

12 That's a system that's under Digital

13 Domain's control?

14 A. Yes.

15 Q. So it's safe to say that this document

16 came originally from Digital Domain.

17 Is that fair to say?

18 A. Yes.

19 Q. Okay. Now, in the upper left-hand

20 corner, you can see a tile that says SMT

21 7010-underscore-MOVA.

22 Do you see that?

23 A. Yes.

24 Q. And that has the triplet picture of

25 Mr. Stevens in what -- what he calls the French

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1 mime getup: The black shirt, the black headband,
2 and the V-shaped tape over his chest; right?
3 A. Yes.
4 Q. Okay. And that same image appears as a
5 part of the next tile to the right.
6 Do you see that?
7 A. Yes.
8 Q. Okay. Is that image a MOVA reference
9 image or --
10 MR. HYAMS: Objection; form.
11 BY MR. CARLSON:
12 Q. -- MOVA reference video?
13 A. Yes. Images from the MOVA rig.
14 Q. Okay. And what would the animators or
15 rigging people do with that tile?
16 (Speaking simultaneously.)
17 MS. YOUNG: Object to the form.
18 BY MR. CARLSON:
19 Q. Could -- could we get your answer on the
20 record, please.
21 A. Nothing.
22 Q. Okay. Why is it included in DMX?
23 A. The editorial for all shots where there
24 was a -- where there was a potential MOVA take,
25 they did a lineup of what they thought could be a

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1 viable Dan Stevens MOVA performance for that shot.
2 That was just done automatically. And
3 this is their indication of this is what we think
4 potentially could work for a MOVA performance for
5 this.
6 Q. Okay. So those reflect selects from
7 editorial; correct?
8 A. Yes.
9 Q. Okay. And I am not going to go through
10 every one of these exhibits that were marked, but I
11 note that in many of them, I have that same pairing
12 of tiles in the upper left-hand corner.
13 Can we assume that your answer would be
14 the same as to all of those other exhibits?
15 A. I don't know. I -- I don't know.
16 Q. Help me help you here, sir.
17 A. If they had the same naming convention,
18 then most probably.
19 MR. CARLSON: Let's go to Exhibit 1188.
20 BY MR. CARLSON:
21 Q. You see in the upper left-hand corner,
22 we have the same pairing of tiles, one showing the
23 triptic of Mr. Stevens in the MOVA rig, and the
24 other, a scene with the MOVA rig superimposed on
25 it, those pictures superimposed on it.

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1

Do you see that?

2

A. Yes.

3

Q. So -- so this is --

4

(Speaking simultaneously.)

5

BY MR. CARLSON:

6

Q. -- an example of -- of where the select

7

appears in the collection of tiles for the scene?

8

A. Yes.

9

Q. Okay. And is it safe to assume that in

10

every one of these exhibits where I see those two

11

tiles, that that's what it is; that is, that's

12

the -- the editorial select from the MOVA video?

13

A. Yes, if it has the same naming

14

convention and appears as those first entries.

15

Q. And -- and what is the -- what do I look

16

for in the name to identify the naming convention

17

as -- as being --

18

A. It appears that the MOVA naming

19

convention is shop name-underscore-MOVA with -- it

20

looks like a specific numerical value there and

21

then the MOVA-underscore-PIP in there too.

22

Q. Okay. So where I see "MOVA" in the

23

naming convention and I see those two tiles, it is

24

safe to assume that those are the MOVA selects from

25

editorial?

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1 MS. YOUNG: Object to the form.

2 THE WITNESS: I -- yeah, if they look

3 the same as those two versions.

4 BY MR. CARLSON:

5 Q. It is safe to make that assumption?

6 A. Well, it's a broad statement. I

7 don't -- I can't -- I don't -- I don't know what

8 other ones you're going to be referring to.

9 Q. Well, okay.

10 So let's go to 1190.

11 Upper left-hand corner.

12 A. Yep.

13 Q. Two tiles.

14 Do those represent editorial selects?

15 A. Yes.

16 MR. CARLSON: Let's go to 1191.

17 BY MR. CARLSON:

18 Q. Upper left-hand corner. Top two tiles.

19 Are those --

20 A. Yes.

21 Q. -- MOVA selects?

22 1193. Do you -- can you take us to the

23 top of the exhibit.

24 Upper left-hand corner, the top two

25 tiles.

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1 Are those MOVA selects?

2 A. Yes.

3 MR. CARLSON: Let's go to 1194.

4 BY MR. CARLSON:

5 Q. Upper left-hand corner. Two tiles.

6 Are those MOVA selects?

7 A. Yes.

8 MR. CARLSON: 1195.

9 BY MR. CARLSON:

10 Q. Upper -- I'm sorry.

11 Upper left-hand corner. Two tiles.

12 Are those MOVA selects?

13 A. Yes.

14 MR. CARLSON: 1196.

15 BY MR. CARLSON:

16 Q. Upper left-hand corner. Top two tiles.

17 Are those MOVA selects?

18 A. Yes.

19 MR. CARLSON: 1197.

20 BY MR. CARLSON:

21 Q. Upper left-hand corner. Top two tiles.

22 Are those MOVA selects?

23 A. Yes.

24 MR. CARLSON: 1199.

25 / / /

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1 BY MR. CARLSON:

2 Q. Upper left-hand corner. Top two tiles.

3 Are those MOVA selects?

4 A. Yes.

5 MR. CARLSON: 1200.

6 BY MR. CARLSON:

7 Q. Upper left-hand corner. Top two tiles.

8 Are those MOVA selects?

9 A. Yes.

10 MR. CARLSON: 1201.

11 BY MR. CARLSON:

12 Q. Upper left-hand corner. Top two tiles.

13 Are those MOVA selects?

14 A. Yes.

15 MR. CARLSON: 1202.

16 BY MR. CARLSON:

17 Q. Upper left-hand corner. Top two tiles.

18 Are those MOVA selects?

19 A. Yes.

20 MR. CARLSON: Okay. 1203.

21 BY MR. CARLSON:

22 Q. Upper left-hand corner. Top two tiles.

23 Are those MOVA selects?

24 A. Yes.

25 MR. CARLSON: Let's look at 1204.

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1 BY MR. CARLSON:

2 Q. I've got a question about the right-hand

3 column.

4 Are you there?

5 A. Yes.

6 Q. In the middle, I see the -- the MOVA

7 tracked mesh mask next to Dan Stevens's face [audio

8 disruption] the rig.

9 Do you see that?

10 A. Yes.

11 Q. And does that indicate that MOVA tracked

12 mesh data was ingested for this shot?

13 A. Yeah, it's one indication.

14 Q. Okay. Are there other indications that

15 you can see on this exhibit?

16 A. Yes.

17 Q. And would you point them out for me?

18 A. Version 29, 30, 31 and 32.

19 Q. Those are the four at the bottom of the

20 page after the first tile.

21 Is that right?

22 A. Yes.

23 MR. CARLSON: Let's go to 1212.

24 That's not what I have.

25 Exhibit -- 40- -- tab 44 in the Munger,

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1 Tolles binder. I have that as 1212.

2 That looks good. Can we see the

3 exhibit.

4 All right. And can you scroll to the

5 bottom of the page.

6 And can you blow up those bottom three

7 rows a little more for me.

8 BY MR. CARLSON:

9 Q. Okay. Do you see tiles that indicate

10 that MOVA tracked mesh was ingested for this scene?

11 A. Yes.

12 Q. Where?

13 A. I can't really read those version

14 numbers, but third up -- yep. That one there and

15 the ones to the right.

16 Q. Okay. Third -- the third -- the one in

17 the third row at the center has the tracked mesh

18 mask and Mr. Stevens's image from the -- from the

19 MOVA performance.

20 That's the one you're referring to?

21 A. Yep.

22 Q. Okay. And are there any others?

23 A. If you zoom out again.

24 The fourth row, right-hand side.

25 Q. Okay.

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1 A. There. Yeah.

2 Q. And any others?

3 A. The -- well, the -- the references of --

4 so all the way to the second row, third from the

5 left. So yeah. Those three.

6 Q. Okay.

7 A. And then the ones to the tracked mesh.

8 Q. Do you see the MOVA selects on this

9 page?

10 A. I do, yes.

11 Q. And where are those?

12 A. Those are the very bottom.

13 Q. The bottom right?

14 A. Bottom right. Yes.

15 Q. Okay. Those bottom three tiles? Or --

16 A. Yes.

17 Q. -- four tiles on the right?

18 A. Yes.

19 Q. All right.

20 Can we put 1214 up.

21 Again, top right. Two tiles.

22 Does -- are those the selects?

23 A. Yes.

24 Q. Okay.

25 MS. YOUNG: Did you mean tab left?

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REARDEN LLC, ET AL. vs TWDC ENTERPRISES 18 CORP., ET AL.
30(b)(6), Confidential Darren Hendler, Vol. 2 on 02/16/2023 Page 492

1 MR. CARLSON: I'm sorry. Did I say

2 "right"?

3 MS. YOUNG: I believe you did.

4 MR. CARLSON: Sorry.

5 BY MR. CARLSON:

6 Q. Okay. The top left. Top two tiles.

7 Those are the MOVA selects; correct?

8 A. Yes.

9 MR. CARLSON: All right. You can take

10 that down now.

11 BY MR. CARLSON:

12 Q. I'm looking at your -- your IMDb page.

13 After "Beauty and The Beast," you worked

14 on "Avengers: Infinity War"; correct?

15 A. Yes.

16 Q. And --

17 (Speaking simultaneously.)

18 MS. YOUNG: Mark, I just -- hold on.

19 I'm just going to object to this. As

20 you know, that's a subject of a separate lawsuit,

21 and this is a deposition that's not in that case.

22 So I don't know where this is going, but

23 I am going to object that there are questions that

24 are seeking discovery for another lawsuit.

25 MR. CARLSON: Okay.

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18 UNITED STATES DISTRICT COURT
19 NORTHERN DISTRICT OF CALIFORNIA
20 OAKLAND DIVISION

21 REARDEN LLC et al.,
Plaintiffs,
22 vs.
23 THE WALT DISNEY COMPANY et al.,
Defendants,
24 REARDEN LLC et al.,
25 Plaintiffs,
26 vs.
27 TWENTIETH CENTURY FOX FILM
CORPORATION et al.,
28 Defendants.

Case Nos. 4:17-cv-04006-JST
4:17-cv-04191-JST

**NOTICE OF MOTIONS AND MOTIONS
FOR SUMMARY JUDGMENT ON
CAUSAL NEXUS ISSUE**

Judge: Hon. Jon S. Tigar
Date: To be set
Time: To be set

Ctrm.: 6 (2nd Floor)

MOTIONS FOR SUMMARY JUDGMENT
NOS. 17-CV-04006, 17-CV-04191

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1 **NOTICE OF MOTIONS AND MOTIONS FOR SUMMARY JUDGMENT**

2 To Plaintiffs Rearden LLC and Rearden MOVA LLC (“Rearden”) and their counsel of
3 record:

4 PLEASE TAKE NOTICE that on a date to be scheduled by further Court Order, or as soon
5 thereafter as the matter may be heard, in Courtroom No. 6 of the above-captioned Court, located at
6 1301 Clay Street, Oakland, CA 94612, all defendants in Case No. 4:17-cv-04006-JST (The Walt
7 Disney Company, Walt Disney Motion Pictures Group, Inc., Buena Vista Home Entertainment,
8 Inc., Marvel Studios, LLC, and Mandeville Films, Inc.) (collectively, “Disney”), and both
9 defendants in Case No. 4:17-cv-04191-JST (Twentieth Century Fox Film Corporation and
10 Twentieth Century Fox Home Entertainment LLC) (jointly, “Fox”) (Disney and Fox are referred
11 to collectively as “Defendants” or “Studios”), will and hereby do move the Court for an Order
12 granting Defendants partial summary judgment on Rearden’s First and Second Causes of Action
13 against Disney, and Rearden’s First Cause of Action against Fox. Specifically, Defendants move
14 for an Order holding that Rearden may not obtain as damages under 17 U.S.C. § 504(b) any
15 portion of the Studios’ profits from the at-issue motion pictures (the “Motion Pictures”)—
16 so-called “indirect profits”—on the ground that Rearden as a matter of law cannot establish a
17 causal nexus between the alleged copyright infringement and those profits.

18 These Motions are based upon these Notices of Motions and Motions; the attached
19 Memorandum of Points and Authorities¹; the contemporaneously filed Declarations of Vincent
20 Cirelli, Joe Conmy, Danielle Costa, Darren Hendler, Todd Isroelit, Gregory LaSalle, Patrick
21 Ledda, Hao Li, Mike Mulvihill, Erik Nash, Jonathan Rothbart, Mimi Steele, and Teresa Reed
22 Dippo; all other materials supporting these Motions and the Reply brief filed or manually lodged
23 in support thereof; all pleadings on file in this matter; and any other materials or arguments the
24 Court may receive at or before the hearing on these Motions.

25
26
27
28 ¹ Defined terms in these Notices of Motions and Motions (e.g., “Rearden” or “Studios”) are also
used in the accompanying Memorandum of Points and Authorities.

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1 DATED: October 14, 2020 MUNGER, TOLLES & OLSON LLP

2

3

4 By: /s/ Ginger D. Anders

5 GINGER D. ANDERS

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7 Attorneys for Defendants

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INTRODUCTION

Rearden has the substantial burden of establishing with non-speculative evidence a causal nexus between the alleged infringement (the copying of MOVA code into computer random access memory (“RAM”)) and revenues the Studios earned from the Motion Pictures. Countless components contribute to the production of a major motion picture like each at issue here, and many factors influence the decisions of consumers to see it. It is difficult to imagine any plaintiff establishing a causal nexus between a software tool used behind the scenes in the production process and motion picture revenue sufficient to entitle the plaintiff to an award of indirect profits. Rearden cannot do so here. Its remedy, if any, is not a portion of any Motion Picture’s profits but the recovery of lost revenue—most accurately measured by what Rearden charged customers for MOVA services or vendors for a license—or statutory damages under 17 U.S.C. § 504(c).

Rearden cannot allege that the Motion Pictures directly infringe Rearden’s copyright because the Court rejected Rearden’s claim to have a copyright in any MOVA “output files.” Rearden’s copyright claim is therefore limited to secondary infringement based on a narrow infringing act: copying by visual effects vendor Digital Domain 3.0 (“DD3”) of pieces of MOVA software code into RAM while recording facial performances and processing recorded data into the output files. Neither the temporary copies of code nor the output files appeared in any Motion Picture or were ever visible to anyone who saw any Motion Picture or any advertisement for the same. Rearden cannot show that the copies of code, which are temporary mechanical byproducts of the software’s use, caused consumers to choose to see the Motion Pictures.

There are limitless reasons why consumers pay to see any particular motion picture, including (among many others) stars, script, costumes, and music. It is highly speculative to say which of these factors lead people to pay to see a motion picture, but at least these are things that consumers actually see visually or hear aloud. Rearden has no evidence that consumers decided to see any of the Motion Pictures at issue here because a third-party vendor, months (or more) before the Motion Picture’s release, made temporary RAM copies of software that no consumer saw.

Rearden tries to resurrect claims this Court already dismissed by posting images of actors with facial makeup next to the completed heads of computer-generated (“CG”) characters, thereby

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1 attempting to suggest that MOVA magically transformed each actor into a CG character and so
2 drove consumers’ purchasing decisions.¹ In fact, MOVA plays a vanishingly small, principally
3 time-saving role in the long and complex process of animating a CG character’s facial movements
4 in certain scenes. The MOVA software’s only role is to record an actor’s facial movements and
5 process computer data on their geometric coordinates over time. Other non-MOVA software is
6 required to port the facial movements to a CG model, and graphic artists invest countless hours
7 fine-tuning those movements to better match the CG character’s face (particularly when the CG
8 character’s face is not proportionate to the actor’s) and creating all the other elements that go into
9 the face, including eyes, tongue, skin, hair, and many others. And even the completed *face*, which
10 is far removed from software residing in RAM, is just one part of one character, which itself is just
11 one part of a scene, which is just one part of the motion picture customers pay to see. DD3’s
12 copying of MOVA software has no causal nexus to the Motion Pictures’ profits.

13 Rearden’s indirect profits claim confuses liability under patent and copyright law.
14 Rearden’s claim is not based on DD3’s *copying* of the MOVA software into RAM through a
15 routine computer operation, but on the *use* of that software, which is protected (if at all) by patent
16 law.² Had Rearden maintained and proved its patent claims, rather than dismissing them,³
17 Rearden might have been able to seek damages based on the use of the software. But Rearden’s
18 remedies under patent law would not include claims to the Motion Pictures’ profits. Instead,
19 damages would be limited to a reasonable royalty or perhaps amounts saved by DD3’s use of
20 MOVA relative to the use of another software tool or no facial motion capture technology at all—
21 which is presumably the reason Rearden dismissed its patent claims.

22 The Ninth Circuit has said that eliminating meritless indirect profits claims “‘obviates a
23 good deal of mischief.’” *Polar Bear Prods., Inc. v. Timex Corp.*, 384 F.3d 700, 711 (9th Cir.

26 ¹ See First Amended Complaint (“FAC”) ¶¶ 37–42 (Mar. 6, 2018), Dkt. 63. References to docket
27 entry numbers in this Motion are to Case No. 17-CV-04006. Corresponding entries (with different
28 docket entry numbers) are in Case No. 17-CV-04191.
² Patent law provides liability for the unauthorized making, *using*, or selling of a product or
process covered by the claim(s) of a patent. 35 U.S.C. § 154(a)(1).
³ Dkt. 93.

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1	2004) (quoting 4 Nimmer on Copyright § 14.03[B], at 14–39). Rearden’s indirect profits claim is	
2	mischief in the extreme. The Court should dismiss Rearden’s claim for indirect profits.	
3	BACKGROUND	
4	I. THE LEGAL FRAMEWORK FOR REARDEN’S INDIRECT PROFITS CLAIM	
5	Section 504(b) of the Copyright Act authorizes the recovery of actual damages or “profits	
6	of the infringer that are attributable to the infringement.” 17 U.S.C. § 504(b). The law recognizes	
7	two types of profit claims. Direct profits come from the sale of the infringing copy. <i>Mackie v.</i>	
8	<i>Reiser</i> , 296 F.3d 909, 914 (9th Cir. 2002). Here, direct profits would be (at most) the amounts that	
9	DD3 invoiced for using MOVA. DD3’s invoices (including out-of-pocket costs) were for sums	
10	that would not justify the expense of this litigation. ⁴	
11	Rearden thus seeks “indirect profits,” i.e., “revenue that has a more attenuated nexus to the	
12	infringement.” <i>Mackie</i> , 296 F.3d at 914. The alleged infringing act is the creation of an	
13	unauthorized copy of MOVA software code residing in computers that third-party vendor DD3	
14	operated. Based on that act—which took place early in the production process, before armies of	
15	visual effects artists, engineers, and others crafted the character and performance that eventually	
16	appeared on screen—Rearden seeks a portion of the finished Motion Pictures’ profits.	
17	Mindful that this remedy incentivizes plaintiffs to “shoot the moon,” courts impose strict	
18	gating requirements for indirect profits claims. It is “particularly important for the plaintiff in [an]	
19	indirect profit action to demonstrate the alleged causal link between the infringement and the	
20	profits sought.” <i>Polar Bear Prods.</i> , 384 F.3d at 711 n.7. Ninth Circuit law is clear that:	
21	[T]o survive summary judgment on a demand for indirect profits pursuant to	
22	§ 504(b), a copyright holder must proffer sufficient non-speculative evidence to	
23	support a causal relationship between the infringement and the profits generated	
24	indirectly from such an infringement.	
25	<i>Mackie</i> , 296 F.3d at 915–16.	
26	That burden is significant. The plaintiff must show, through concrete evidence, that the	
27	infringement increased the revenue earned by the infringer. <i>Id.</i> at 911 (requiring “a link between	
28	⁴ See Steele Decl. ¶ 5; Costa Decl. ¶¶ 4–5; LaSalle Decl. ¶ 8; Conmy Decl. ¶ 5; see also Costa Decl. ¶ 6 (listing amount for visual effects provided by entity Rearden allegedly controlled for motion picture produced in 2012); Isroelit Decl. ¶ 4 (same for motion picture produced in 2009).	
	-3-	
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1	the infringement and the [defendant’s] supposedly enhanced revenues”); <i>Dash v. Mayweather</i> , 731	
2	F.3d 303, 332 & n.18 (4th Cir. 2013) (indirect profits claim could not survive summary judgment	
3	because plaintiff had “no evidence that the [infringing] playing of the [copyrighted] song ...	
4	increased any of [defendant’s] revenue streams”).	
5	A plaintiff’s indirect profits theory is amenable to testing on summary judgment. Because	
6	the causation inquiry is rigorous and indirect profits claims are often attenuated, such claims often	
7	do not survive summary judgment. 4 <i>Nimmer on Copyright</i> § 14.03[B][2][b], at p. 14 (such	
8	claims “are more frequently unsuccessful”); see <i>IBM Corp. v. BGC Partners, Inc.</i> , No. 10 Civ.	
9	128 (PAC), 2013 WL 1775437, at *3 (S.D.N.Y. Apr. 25, 2013) (“Because of the at-best highly	
10	speculative nature of all indirect profits claims ... the decision to send such claims to a jury should	
11	be extremely rare.”) (quoting 6 William F. Patry, <i>Patry on Copyright</i> § 22:131 (2010)) (alteration	
12	omitted). The Ninth Circuit and many other courts have granted summary judgment where the	
13	plaintiff is unable to proffer non-speculative evidence that the infringement increased revenues. ⁵	
14	<i>Mackie</i> demonstrates why Rearden’s claim for indirect profits cannot survive summary	
15	judgment. The district court there rejected such a claim where the defendant made an infringing	
16	copy of plaintiff’s artwork and used it on one page of a 24-page promotional brochure mailed to	
17	150,000 potential ticket buyers of the Seattle Symphony. The page with the infringing artwork	
18	directly followed a page containing information about an upcoming series called “Pops.” The	
19	plaintiff sought a share of the Symphony’s profits from the Pops series based on the inclusion of	
20	his artwork in the brochure.	
21	The Ninth Circuit affirmed summary judgment on the indirect profits claim because there	
22		
23	⁵ See, e.g., <i>Mackie</i> , 296 F.3d 909 (affirming grant of summary judgment where evidence of	
24	causation was speculative); <i>Dash</i> , 731 F.3d at 332 & n.18 (affirming grant of summary judgment	
25	where plaintiff had “no evidence that the playing of the [infringing] song ... increased any of	
26	[defendant’s] revenue streams”); <i>Bouchat v. Balt. Ravens Football Club, Inc.</i> , 346 F.3d 514, 520	
27	(4th Cir. 2003) (affirming grant of summary judgment where plaintiff offered only speculation	
28	that use of infringing logo caused increased merchandise sales); <i>Thale v. Apple, Inc.</i> , No. C-11-	
	03778-YGR, 2013 WL 3245170, at *7–9 (N.D. Cal. June 26, 2013) (granting summary judgment	
	where plaintiff “proffered no evidence that the use of the [infringing] Photo caused any iPhone	
	3GS sales, nor that the “Concert” commercial did itself”); <i>New Show Studios, LLC v. Needle</i> , No.	
	2:14-cv-01250-CAS (MRWx), 2016 WL 5213903, at *9 (C.D. Cal. Sept. 20, 2016) (granting	
	summary judgment where plaintiff “ha[d] not offered any non-speculative evidence that the	
	[infringing] videos” included in defendant’s advertising portfolio “generated profits”).	
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	Case 4:17-cv-04006-JST Document 249 Filed 10/14/20 Page 12 of 31 1 were “virtually endless” reasons that people might purchase tickets to the Pops series: “For 2 example, was it because of the Symphony’s reputation, or the conductor, or a specific musician, or 3 the dates of the concerts, or the new symphony hall, or the program, or the featured composers, or 4 community boosterism, or simply a love of music, or ... ?” <i>Mackie</i>, 296 F.3d at 916. The 5 plaintiff’s expert asserted that some people likely bought tickets as the result of seeing the 6 infringing artwork. The Ninth Circuit rejected this argument for the fundamental reason that there 7 are numerous reasons why people would buy Symphony tickets: “In the absence of concrete 8 evidence, [plaintiff’s] theory is no less speculative than our effort ... to enumerate even a 9 relatively short list of the myriad factors that could influence an individual’s purchasing 10 decisions.” <i>Id.</i> 11 The causal link between infringement and revenues in <i>Mackie</i> was closer than that Rearden 12 attempts to establish here. In <i>Mackie</i>, consumers at least saw the infringing copies in the 13 promotional brochure. Here, consumers who paid to see the Motion Pictures did not see any 14 copied MOVA code, or even any output file (in which Rearden has no copyright). As in <i>Mackie</i>, 15 the number of factors here influencing a moviegoer’s decision to purchase a ticket are so varied 16 that any attenuated link to MOVA would be pure speculation. 17 II. PROCEDURAL HISTORY UNDERLYING THIS MOTION 18 The Court granted Defendants leave to file this motion in December 2018.⁶ Defendants 19 first moved for summary judgment on February 28, 2019. Rearden’s response has been delayed 20 while it has taken an extraordinary amount of discovery on the causal nexus issue. Having 21 conducted that discovery, Rearden still has no evidence showing a non-speculative nexus between 22 DD3’s temporary copying of MOVA code and Motion Picture revenues. 23 III. FACTUAL BACKGROUND 24 Rearden’s complaints vastly overstate MOVA’s role, reprinting images from its marketing 25 materials to make it appear that going from the performance capture, to the tracked mesh, to a 26 completed CG character proceeds 1-2-3.⁷ In reality, the special effects process of creating a CG 27 28 ⁶ Dkt. 128. ⁷ FAC ¶¶ 37–42.	
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1	character is far more complex than that. MOVA software’s role in the process of creating just the	
2	<i>facial motion</i> of a single CG character is preliminary and miniscule. In terms of creating an entire	
3	motion picture, the software’s significance is dwarfed by countless creative ingredients.	
4	A. The First, And Only, Step Involving The Alleged Infringement: Temporary Copies Of MOVA Software Code Are Created In RAM	
5		
6	The alleged copyright infringement is narrow. Specifically, Rearden alleges that when	
7	third-party visual effects vendor DD3 launched the MOVA system at the start of a motion-capture	
8	or data-processing session, pieces of MOVA software code were temporarily copied from the	
9	computer’s hard drive into the computer’s RAM. ⁸ Other than the temporary copying of the	
10	MOVA software code through a routine computer operation, there is no alleged exercise of the	
11	exclusive rights of copyright, 17 U.S.C. § 106, and there is nothing more to the alleged	
12	infringement. Rearden tried to allege that it had a copyright interest in the output files, but the	
13	Court dismissed that claim at the outset of the case. ⁹	
14	B. The Next Step—Producing The Tracked Mesh—Requires Human Involvement	
15		
16	The MOVA processes of recording an actor’s facial movements and generating data points	
17	can take only a few hours. The process of taking the resulting information from the face capture	
18	and creating a CG character involves the use of <i>non</i> -MOVA software tools and substantial human	
19	artistry, and takes thousands of hours over a period of months. ¹⁰	
20		
21	1. During face capture, the MOVA code necessary for the relevant software operation	
22	resides in RAM. The code provides instructions to the physical machinery (cameras and lights)	
23	for the strobing of visible and ultraviolet (“UV”) lights and recording and synchronizing the data.	
24	The actor, wearing phosphorescent makeup (visible only under UV light), sits or stands in the	
25	physical MOVA apparatus and provides the performance. A supervisor directs the actor’s facial	
26	performance. Li Decl. ¶¶ 13–17.	
27		
28	⁸ <i>Id.</i> ¶¶ 99, 107, 115, 129. ⁹ Dismissal Order at 7–8, Dkt. 60. ¹⁰ <i>See, e.g.</i>, Li Decl. ¶ 26; Cirelli Decl. ¶ 10; Rothbart Decl. ¶¶ 9–17; LaSalle Decl. ¶ 8; Steele Decl. ¶ 4; Hendler Decl. <i>passim</i>.	
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2. During data processing, the temporary copies of MOVA code again reside in RAM and provide instructions, most notably to assist with generating an output file called the “tracked mesh.” The tracked mesh is a collection of data following the position of various points on the face in three dimensions over time. *Id.* ¶¶ 18–19.

The tracked mesh is created by processing other facial motion data called the “point cloud.” First, each frame of the actor’s performance is translated into a “point cloud.” The point cloud is the actor’s face represented by thousands of coordinates along three dimensions (x, y, and z axes) in space. Visualized on a computer display, the point cloud appears as a collection of dots arranged in a 3D form covering the major regions of the face. *Id.* ¶ 19.

Second, the tracked mesh is produced by processing the point cloud data. MOVA software supplies an algorithm that tracks specific points on the face across time to produce the tracked mesh. The tracked mesh is a collection of data specifying particular 3D coordinates that permit consistent tracking of the motion of the actor’s face. If visualized on a computer display, the tracked mesh shows as a facial mask. The data of the tracked mesh plots points only on the face (not the top or back of the head, including hair, or the ears), and excludes critical regions of the face, such as the teeth, tongue, eyes, skin around the eyes, and part of the lips. *Id.* ¶¶ 19–20. Below is a render of tracked mesh output data, shown side-by-side with the corresponding facial performance of Dan Stevens, who played the Beast in *Beauty and the Beast*. Hendler Decl. ¶ 27.



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Human involvement goes into the data processing required to create the tracked mesh. The MOVA algorithm is complex but not robust enough to accurately track complex facial movement or produce a perfectly accurate tracked mesh. The tracked mesh output file would be unusable without human intervention to supplement and correct the tracking. Li Decl. ¶ 20c.

The output files—in which Rearden has no copyright—are the point cloud, the tracked mesh, and the raw video footage of the actor’s performance. The tracked mesh is most relevant to the process of animating a CG character, whereas the video footage and point cloud may be used as reference material. *Id.* ¶ 21. No output file is alleged to be an infringing copy.

MOVA was not the only software program that could be used for capturing facial motion performance or in the creation of a tracked mesh. Industrial Light & Magic, Weta Digital, and Di4D also provided comparable facial motion performance capture software.¹¹

C. The Next Step—Creating The Facial “Rig”—Does Not Involve Copies Of MOVA Software Code

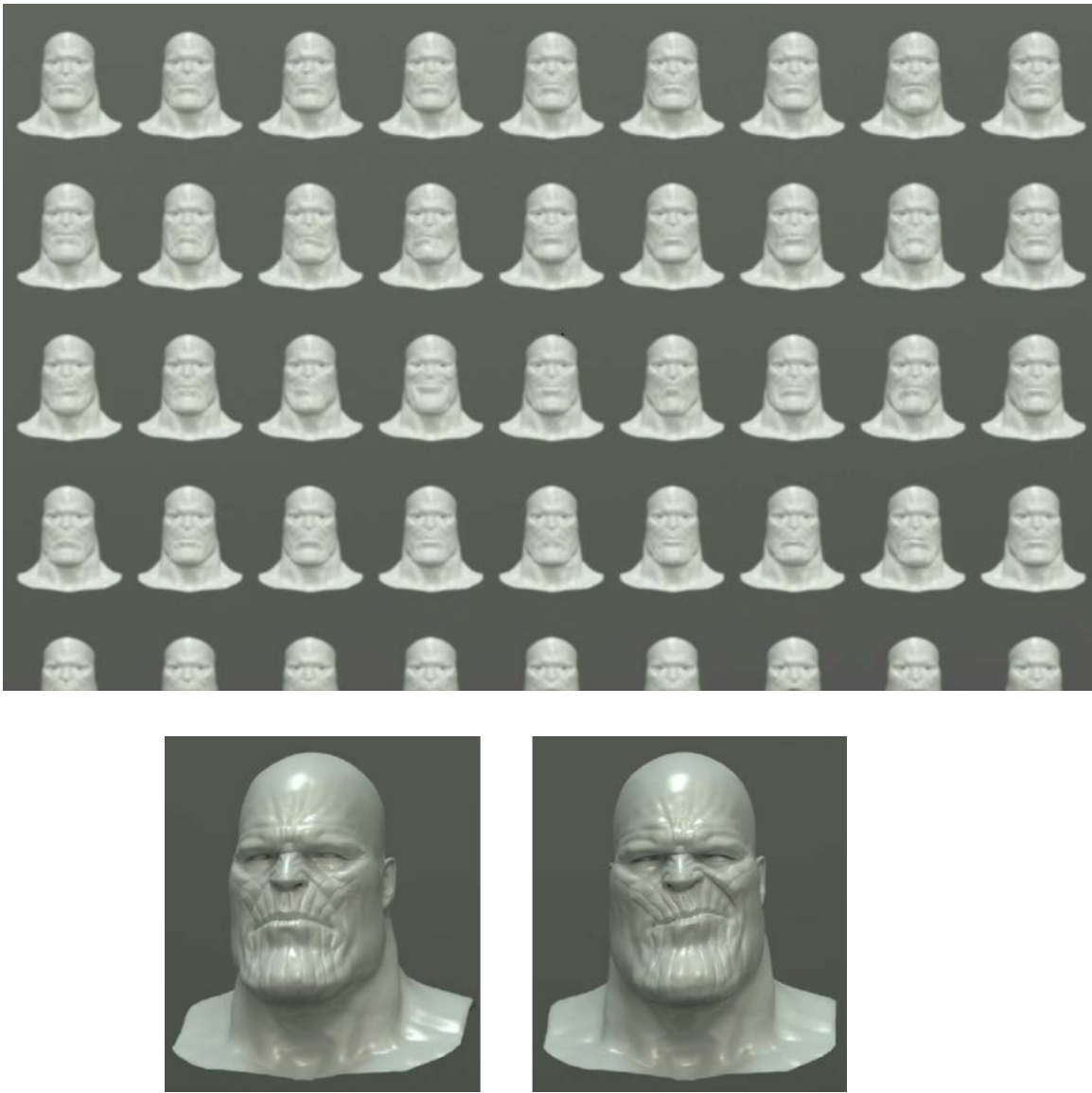
The tracked mesh is only a set of data points. To create a CG character, digital artists must separately create a 3D animation model of the character’s face, to which the data can be applied to help create facial motion. This model, called a “rig,” is like a facial puppet that can be manipulated to perform a range of facial expressions. Li Decl. ¶ 21. The rig is typically hand-crafted by animators, with assistance from non-MOVA software, and is imbued with stylistic and artistic choices. *Id.* ¶ 22; *see, e.g.*, Rothbart Decl. ¶ 11; Hendler Decl. ¶ 13. Below are three images of rigs of the character “Thanos” from *Guardians of the Galaxy* and *Avengers: Age of Ultron*: (a) at top, the Thanos rig performing a variety of hand-crafted facial expressions; (b) below and on the left, a close-up Thanos rig with a neutral facial expression; and (c) below and on the right, a close-up Thanos rig with a different facial expression. The appearance of the rig in the images below is the result of non-MOVA artistry and techniques. Cirelli Decl. ¶ 5.

¹¹ See Reed Dippo Decl. Ex. E (Li Dep. Tr. 81:18–25, 82:21–23, 86:17–22); Ex. F (Steele Dep. Tr. 124:8–125:2); Ex. D (Hendler Dep. Tr. 31:8–32:4; 89:20–91:2; 109:2–9); Hendler Decl. ¶¶ 25, 47; Steele Decl. ¶ 3.

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The desired facial performance is then mapped onto the rig in a process that requires additional non-MOVA software, and does not involve copies of MOVA software code. Li Decl. ¶ 24. The tracked mesh supplies data points that reflect the facial *motion* from the actor’s performance. But the tracked mesh typically cannot be directly applied to the facial rig because the (frequently inhuman) CG characters are often very differently proportioned from the human actors—Thanos and the Beast being two examples. A one-to-one port would result in unrealistic facial expressions. *See, e.g.,* Cirelli Decl. ¶ 7. Specially designed non-MOVA software is required to translate the coordinates in the tracked mesh to computer parameters that can control

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1 the rig’s facial movements. Li Decl. ¶ 24. DD3 uses a proprietary software program, “Direct
2 Drive,” for this purpose.¹²

3 Digital artists refine the mapped performance on the facial rig for accuracy and stylistic
4 reasons, such as the director’s preference for more exaggeration in the facial expression. Altering
5 the rig’s facial expression modifies or overwrites the expression reflected in the tracked mesh. Li
6 Decl. ¶ 25; *see also, e.g.*, Steele Decl. ¶ 4. This further delinks the facial rig from the tracked
7 mesh data that MOVA generates. For any shots that use data from the tracked mesh, animators
8 must add the movement of the eye and lip regions, which are not included in the tracked mesh, to
9 the mapped performance. Li Decl. ¶ 25; Cirelli Decl. ¶ 6; LaSalle Decl. ¶ 5. Moreover, the
10 tracked mesh supplies data only for shots based on the actor’s facial performance in the MOVA
11 apparatus. Other shots do not involve MOVA data, such as shots based on manually created
12 expressions. *See, e.g.*, Cirelli Decl. ¶ 6; Li Decl. ¶ 25; Hendler Decl. ¶ 17.

13 **D. Innumerable Additional Steps (None Of Which Involve Copies Of The MOVA**
14 **Software Code) Are Required To Create The CG Character**

15 The completed facial rig is not the completed CG character. Hundreds or even thousands
16 of hours of human labor and artistry are still needed to transform the rig into the face of the on-
17 screen CG character. These later stages may be broken down into three broad categories, none of
18 which involves MOVA software and each of which can take weeks or months to complete:

- 19 • *Modeling.* The face must be developed with color, texture, shading, hair, and other
20 details. A photoreal CG face includes pore-level details, skin tone and color,
21 changes in texture (e.g., wrinkles for particular expressions), and changes in skin
22 tone based on emotion (e.g., blood flow to the cheeks to depict anger). Each detail
23 must be designed through manual artistry or other techniques that do not involve
24 MOVA and then must be layered onto the facial rig. Li Decl. ¶ 26a; *see, e.g.*,
25 Steele Decl. ¶ 4. The images below are examples from the processes of modeling

26 ¹² LaSalle Decl. ¶ 5; Steele Decl. ¶ 3; *see also* Cirelli Decl. ¶¶ 6–7 (special effects studio for
27 *Guardians of the Galaxy* and *Avengers: Age of Ultron* developed proprietary “Face2Face”
28 software for this purpose); Ledda Decl. ¶¶ 4–5 (facial motion data was too different from target
CG character to warrant creating software script to translate MOVA data to rig); Hendler Decl.
¶ 25.

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the face of Thanos, specifically (a) layering hand-painted textures onto Thanos’s face using non-MOVA modeling software; and (b) modeling facial hair onto Thanos’s face. Cirelli Decl. ¶ 8a.



- *Animation.* Facial movement must be developed with manual animation for certain kinds of movement that cannot be created from the actor’s facial performance. Examples include movement that results from contact between a face and another object (e.g., the punching of a face), or secondary facial motion caused by the character’s movement (e.g., jiggling when jumping or shaking the head). To reproduce this movement, a technical director or animator will use computer parameters to simulate the particular movement, essentially employing a trial and error process until it “looks right.” Once the computer parameters are satisfactory, the simulation may still require further refinement based on the artistic preference of the production team. Li Decl. ¶ 26b. Below is a sample from the process of refining the movement of Thanos’s facial skin by hand. Cirelli Decl. ¶ 8b.

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- *Rendering.* The culmination of all the steps described above is a 3D version of the character’s face, visible only on a computer using appropriate 3D-viewer software. This 3D version must be converted into a 2D image that can be incorporated into a final motion picture through a process called rendering. Rendering combines all of the facial components: the shape and motion of the face, the color, the texture, the shading, and other attributes. This involves months of effort by an entire team of specialized digital artists. The rendering process is extremely complex, requiring, among many other things, the incorporation of the realistic reflection of light onto the entire scene. MOVA software is not involved in this process. Li Decl. ¶ 26c; *see, e.g.*, Rothbart Decl. ¶¶ 14–16. The images below are (a) on the left, a sample from the process of perfecting the light reflected on Thanos’s face; and (b) on the right, four sample images that show a few of the different visualizations of the Thanos face involved in the rendering process. Cirelli Decl. ¶ 8c.



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- The image below shows the final onscreen version of Thanos’s face, lacking even a shadow of resemblance to a tracked mesh. Cirelli Decl. ¶ 9.¹³



E. Countless Additional Steps Are Required To Complete A CG Character—And An Entire Motion Picture

The undertakings described above are required just to produce the CG character’s *face*. The character’s body does not rely on the facial performance: technicians conduct a separate full-body capture session, which may require performances by one or more actors or stunt doubles; body skeletons may need to be built for models; and the actor’s movement must be retargeted to the skeleton of the CG character. The development of the character’s voice may also require hours of additional work, including a separate voice performance. Li Decl. ¶ 28; *see also* Rothbart Decl. ¶¶ 4–10.

The work of creating a single CG character is just one small part in completing the overall motion picture. That character must be integrated into the full-length footage, which includes the performances of many actors. For several of the Motion Pictures in suit, the CG character in issue appeared on screen for mere seconds: In *Avengers: Age of Ultron*, “Thanos” appears only *in the closing credits* and for just over four seconds of the Motion Picture’s 141 minutes. Costa Decl. ¶ 2. In *Guardians of the Galaxy*, Thanos appears on screen for 39 seconds of the Motion

¹³ *See also* Hendler Decl. *passim* (illustrating the many steps in developing the Beast that had nothing to do with MOVA, and the vast difference between the tracked mesh output data and final rendering of the Beast).

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1	Picture’s two hours. <i>Id.</i> And in <i>Night at the Museum: Secret of the Tomb</i> , the talking bust of	
2	Augustus Caesar appears on screen for approximately 11 seconds of the Motion Picture’s 98	
3	minutes. Nash Decl. ¶ 4. Even in Motion Pictures where the character had longer screen time,	
4	many other characters were critical to the story and consumer interest. In <i>Beauty and the Beast</i> ,	
5	for example, other popular characters include Belle, Gaston, Mrs. Potts, Chip, Lumiere, and	
6	Cogsworth.	
7	The characters alone do not constitute a completed motion picture, which requires a script	
8	for all the action and dialogue, as well as a director and hundreds of other creative and technical	
9	personnel. Motion pictures also include elaborate sets (e.g., creating the French village, and Paris	
10	itself, in <i>Beauty and the Beast</i>); costumes (such as wardrobes evocative of 18th-century France);	
11	music (“Be Our Guest”); and visual effects (everything from talking teapots and other household	
12	objects to CG wolves). Innumerable elements go into creating a motion picture. ¹⁴	
13	The amounts paid for the facial motion capture process underscore the limited role of the	
14	MOVA software in the production process. DD3’s invoices for its facial capture services (which	
15	encompassed more than just the use of the MOVA software) constituted a tiny fraction of DD3’s	
16	overall special effects work, and an even smaller fraction of the overall special effects budgets for	
17	the Motion Pictures. ¹⁵	
18	ARGUMENT	
19	Summary judgment is appropriate when a “movant shows that there is no genuine dispute	
20	as to any material fact and the movant is entitled to judgment as a matter of law.” Fed. R. Civ. P.	
21	56(a); <i>Anderson v. Liberty Lobby, Inc.</i> , 477 U.S. 242, 248–49 (1986). “A dispute is genuine only	
22	if there is sufficient evidence for a reasonable trier of fact to resolve the issue in the nonmovant’s	
23	favor, and a fact is material only if it might affect the outcome of the case.” <i>LivePerson, Inc. v.</i>	
24		
25		
26	¹⁴ Defendants have lodged DVD copies of the completed Motion Pictures. See Reed Dippo	
27	Decls. ¶¶ 2–4, Exs. A–C (manual filing of Motion Pictures in each respective docket). Defendants	
28	are also submitting videos, Excel spreadsheets, and files with images illustrating the many steps	
	involved in the process of creating shots of the Beast. See Hendler Decl. Exs. 1–52.	
	¹⁵ See Costa Decl. ¶¶ 4–5; Conmy Decl. ¶ 5; LaSalle Decl. ¶ 8; Steele Decl. ¶ 5. The DD3	
	invoices include the cost of transportation, lodging, and other costs incidental to the use of the	
	software and face-capture services.	
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1	[24]7.ai, Inc., No. 17-cv-01268-JST, 2018 WL 5849025, at *3 (N.D. Cal. Nov. 7, 2018). Where,	
2	as here, the summary judgment motion pertains to “an issue as to which the nonmoving party will	
3	have the burden of proof,” “the movant can prevail merely by pointing out that there is an absence	
4	of evidence to support the nonmoving party’s case.” <i>Soremekun v. Thrifty Payless, Inc.</i> , 509 F.3d	
5	978, 984 (9th Cir. 2007).	
6	I. REARDEN CANNOT SATISFY ITS BURDEN TO SHOW A CAUSAL NEXUS	
7	BETWEEN THE INFRINGEMENT AND MOTION PICTURE REVENUES	
8	The Ninth Circuit holds plaintiffs to a substantial burden of presenting concrete, non-	
9	speculative evidence that the alleged infringement drove consumers’ purchasing decisions. For	
10	multiple reasons, this requirement is fatal to Rearden’s indirect profits claim based on DD3’s	
11	temporary copying of MOVA software into computer RAM.	
12	A. Rearden Cannot Show A Causal Nexus Because Consumers Decide To See A	
13	Particular Motion Picture For Innumerable Reasons	
14	There are myriad reasons why consumers choose to see a particular motion picture. No	
15	reasonable jury could conclude that there is a causal link between DD3’s temporary RAM copying	
16	of MOVA software and Motion Picture revenues.	
17	<i>Mackie</i> is squarely on point. The Ninth Circuit held that plaintiff failed to establish a	
18	causal link between the infringing artwork and Symphony revenues because of the innumerable	
19	other reasons why consumers might buy Symphony tickets. Rejecting a claim similar to	
20	Rearden’s here, the court found that the plaintiff’s expert’s opinion could not bridge the gap since	
21	the expert’s analysis could not “determine how many of those individuals subscribed <i>because of</i> ”	
22	the infringed artwork specifically. <i>Mackie</i> , 296 F.3d at 916. Because “the artwork was but one	
23	page in a multi-page brochure that advertised a series of concerts,” the causal “thread” was too	
24	“attenuated” to connect purchasing decisions to the infringement; any such effort would be “[r]ank	
25	speculation.” <i>Id.</i>	
26	Similarly, the Fourth Circuit in <i>Dash</i> rejected the plaintiff’s attempt to establish a causal	
27	nexus between music played during Floyd Mayweather’s entrance into the ring at two wrestling	
28	events and profits from videos of those events. <i>Dash</i> , 731 F.3d 303. Even though the infringing	
	content was used in the video and was audible to consumers, the court found the infringing use	
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1	“form[ed] only a small, incidental portion” of the videos, and that it “defies credulity that a	
2	consumer would purchase” the videos because of the infringing song. <i>Id.</i> at 332 (internal	
3	quotation marks omitted).	
4	<i>Mackie</i> and <i>Dash</i> undermine Rearden’s indirect profits claim. The list of elements that	
5	could have contributed to consumer interest in the Motion Pictures is limitless: Each had stars,	
6	scripts, other special effects, music, and costumes, to name just a few elements that consumers	
7	could perceive with their eyes and ears in the finished Motion Pictures. A multitude of other	
8	factors likewise could have caused people to see the Motion Pictures, including the genre (e.g.,	
9	superhero or romance); that they were part of a series with a huge fan following (e.g., Marvel	
10	Cinematic Universe); or, in the case of <i>Beauty and the Beast</i> , that the Motion Picture was a live-	
11	action remake of an incredibly popular animated classic. Rearden can offer nothing but	
12	speculation to show that people paid to see any of the Motion Pictures “because of” DD3’s	
13	copying of MOVA into RAM. <i>See Mackie</i> , 296 F.3d at 916.	
14	B. Rearden’s Causal Nexus Claim Is Even More Speculative Than The Claims	
15	Rejected In <i>Mackie</i> And <i>Dash</i>, Because No Consumer Ever Saw (Or Could	
16	See) The Ephemeral Copies Of MOVA Software Residing In RAM	
17	The nexus between infringement and revenues in <i>Mackie</i> and <i>Dash</i> was hopelessly	
18	speculative, but still was closer than the nexus Rearden alleges in this case. In those cases, the	
19	infringing copy was or could have been seen (or heard) by prospective consumers. Rearden’s	
20	theory is even more attenuated, because no consumer saw (or could have seen) the infringing copy	
21	of MOVA software residing in computer RAM. Those copies simply could not have caused any	
22	consumer to pay money to see any Motion Picture.	
23	<i>Polar Bear Productions</i> is on point. In that case, Timex launched a promotional campaign	
24	for watches that used infringing footage from the plaintiff’s video. <i>Polar Bear Prods.</i> , 384 F.3d at	
25	714. The plaintiff claimed that Timex’s display of the infringing materials at trade shows and in	
26	promotional materials generated excitement about Timex watches and “enhanced brand prestige”	
27	that “translated into consumers purchasing Timex’s products” at other locations. <i>Id.</i> at 713–14.	
28	The jury delivered a verdict for the plaintiff. The Ninth Circuit, however, even under a highly	
	deferential standard of appellate review, held that the plaintiff could not establish a causal link	
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		MOTIONS FOR SUMMARY JUDGMENT NOS. 17-CV-04006, 17-CV-04191

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1	between the trade show promotion and retail revenues. The court said there was no “evidence	
2	establish[ing] that the infringement may have actually influenced the purchasing decisions of those	
3	that bought [the infringer’s] watches at retail stores or other outlets.” <i>Id.</i> at 714–15. As in this	
4	case, “[a]ctual retail purchasers were never exposed to the infringing images.” <i>Id.</i> at 715.	
5	Here, MOVA is merely a software tool used as part of an elaborate creative process.	
6	Rearden’s only infringement claim is for the copying of MOVA code into RAM, <i>but no consumer</i>	
7	<i>sees (or could ever see) that copied code.</i> Even the tracked mesh—which is merely an output of	
8	multiple processes, in which Rearden has no copyright—is not a part of any Motion Picture or	
9	seen by any consumer.	
10	If Rearden’s causal nexus theory were correct, the owner of software used to record and	
11	process images of the <i>Mackie</i> artwork (or to lay out the brochure) would have an indirect profits	
12	claim if the use of that software were unlicensed. Rearden’s theory stretches the concept of causal	
13	nexus beyond the breaking point.	
14	C. Rearden Cannot Show Causation Because The Use Of The MOVA Software	
15	Was A Preliminary Step In An Elaborate Process Of Creating A Motion	
16	Picture	
17	Rearden’s causal nexus theory fails for yet another reason: The temporary copies of the	
18	MOVA software code were an irrelevant byproduct of the software’s use (which is not protected	
19	by copyright, <i>see</i> Section II.B, <i>infra</i>), and even the actual use of the software made only a minute	
20	contribution to the completed Motion Pictures. That contribution was dwarfed by innumerable	
21	other creative efforts, rendering Rearden’s indirect profits claim unduly speculative.	
22	<i>Lowry’s Reports, Inc. v. Legg Mason, Inc.</i> , 271 F. Supp. 2d 737 (D. Md. 2003), is	
23	instructive. The defendant, a financial services company, distributed infringing copies of daily	
24	stock market reports to its analysts. The analysts used the copied reports in formulating financial	
25	advice for clients and in making daily investment decisions. <i>Id.</i> at 751. The court explained that	
26	the infringing copies were “never distributed” to customers and were synthesized with “a variety	
27	of other information” used to produce the firm’s profitable investment analyses. <i>Id.</i> at 751–52	
28	(alteration omitted). The court rejected the plaintiff’s claim for revenues derived from the	
	defendant’s financial advice (which it earned by advising investors, buying and selling securities,	
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		MOTIONS FOR SUMMARY JUDGMENT NOS. 17-CV-04006, 17-CV-04191

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1	and managing customer assets), because “[t]he complex, variable, independent thought processes	
2	of hundreds of individual brokers intervene between the copying and any subsequent gain.” <i>Id.</i> at	
3	752; <i>see also Orgel v. Clark Boardman Co.</i> , No. 92-2, 1960 WL 8025, at *1 (S.D.N.Y. Nov. 29,	
4	1960) (rejecting causation where plaintiff argued that defendant’s copying of law treatise enabled	
5	him to increase the profits from his law practice; “[t]he subject is too remote and speculative to be	
6	susceptible of computation by a court”).	
7	Here, Rearden has asserted that “the CG character as it appears in the film is the product of	
8	two processes: one to capture a live actor’s facial performance in a lifelike manner, and the other	
9	to create a CG model,” and that because both processes make “important contributions,” the	
10	involvement of pieces of MOVA software code in the former satisfies the causal nexus	
11	requirement. ¹⁶ Rearden’s “contribution” theory overstates the significance of the temporary	
12	copies of MOVA software code and understates the innumerable processes (far more than two)	
13	that go into making the completed CG character (not to mention the full Motion Picture).	
14	The creation of the temporary RAM copies was a byproduct of using the MOVA software.	
15	The copies did not represent the output of the program or the recorded facial performance. The	
16	software program itself only provided mathematical instructions for processing the captured	
17	performance into output files representing facial motion through data points. And even the output	
18	files consisted only of preliminary data, not anything that appeared in the completed Motion	
19	Pictures. The other elements and contributions to the CG character were numerous and complex.	
20	Moreover, MOVA was not uniquely required even for the process of capturing facial data	
21	points and creating tracked meshes. Other facial motion capture technologies could have been	
22	used to do the same work. ¹⁷ For this reason, it is entirely unsurprising that the amounts paid to	
23	DD3 for its facial motion capture services (which involved many non-MOVA elements) were a	
24	minuscule percentage of the overall special effects budget. ¹⁸	
25		
26		
27	¹⁶ Letter Br. Re Filing of Causal Nexus Mot. (Dec. 21, 2018), Dkt. 127, at 6 (“Letter Br.”).	
28	¹⁷ See Reed Dippo Decl. Ex. E (Li Dep. Tr. 81:18–25, 82:21–23, 86:19–22); Ex. F (Steele Dep. Tr. 124:8–125:2); Steele Decl. ¶ 3; Hendler Decl. ¶¶ 25, 47.	
	¹⁸ See Costa Decl. ¶¶ 4–5; Conmy Decl. ¶ 5; LaSalle Decl. ¶ 8; Steele Decl. ¶ 5.	
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1 Those facts, too, undermine Rearden’s causal nexus theory. Courts have stressed that
2 “mere connection or usage alone” is “insufficient” to establish a causal nexus—even where the use
3 was “critical” to the infringer’s business. *See Complex Sys., Inc. v. ABN Ambro Bank N.V.*, No. 08
4 Civ. 7497 (KBF), 2013 WL 5970065, at *5 (S.D.N.Y. Nov. 8, 2013) (collecting cases); *see also*
5 *Point 4 Data Corp. v. Tri-State Surgical Supply & Equip., Ltd.*, No. 11 CV 726 (CBA) (RLM),
6 2012 WL 3306575, at *3–4 (E.D.N.Y. Aug. 13, 2012) (rejecting claim for indirect profits under
7 Digital Millennium Copyright Act where defendant accessed plaintiffs’ software and used it for
8 processing orders, invoices, financials, and inventories; notwithstanding that plaintiff’s “software
9 was an important tool,” connection between the underlying act and defendant’s sales was “too
10 speculative and attenuated” to permit award of indirect profits).

11 Any claimed connection between copying and indirect revenues is even more remote
12 where, as here, other software programs could have provided the same functionality as MOVA.
13 *Complex Sys., Inc.*, 2013 WL 5970065, at *11 (rejecting software owner’s indirect profits claim
14 predicated on unlicensed use of software where, inter alia, other “processing software
15 companies ... operate in the market” and “provide a certain basic set of functionality”) (quotations
16 omitted); *Dash*, 731 F.3d at 332 n.18 (“Dash was required to show not merely that Appellees
17 generated more revenue from playing ‘Yep’ than from playing no song, but that they generated
18 more revenue from playing ‘Yep’ than from playing a non-infringing song.”).

19 Ultimately, DD3’s use of the MOVA software was only a small and non-essential part of
20 DD3’s work, and pales in comparison to all the other work required to create the facial appearance
21 and motion of the particular CG character—to say nothing of the completed Motion Picture.

22 **II. REARDEN’S CAUSAL NEXUS THEORIES ARE BASED ON SPECULATION**
23 **AND A MISUNDERSTANDING OF NINTH CIRCUIT LAW**

24 In its prior filings and summary judgment discovery, Rearden previewed how it will seek
25 to establish a causal nexus. None of its arguments satisfy its burden.
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28

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A. References To “MOVA” In Interviews, Articles, And Depositions Describing Particular Shots Do Not Establish A Causal Nexus

Rearden has argued that public statements in articles and YouTube videos about the Motion Pictures establish that the alleged infringement was a “driver[] of film attendance.”¹⁹ The sources Rearden cites either discuss the facial motion capture process generally (which includes a host of hardware and software processes other than the RAM copying of MOVA software), discuss numerous other elements of the Motion Pictures, or do not refer to “MOVA” at all. None of the sources Rearden cites refer to the copying of MOVA software at all. These facts simply confirm the futility of trying to show that DD3’s copying of MOVA software drove consumer purchasing decisions.

Rearden’s showpiece example—a YouTube video of a “Paris Press Conference” featuring the director and stars of *Beauty and the Beast*—proves these points. From this video, Rearden pulled quotations of actors Dan Stevens and Emma Watson and of director Bill Condon as lead examples in its complaint against Disney.²⁰ In the video, a reporter asks about motion capture technology generally, and Dan Stevens mentions “MOVA” one time in his response. But the three-minute discussion that ensues focuses on a range of topics having nothing to do with MOVA, including the actors’ skill in performing and in dealing with the challenging aspects of incorporating special effects; the body capture; the fact that Mr. Stevens did both facial performances and on-set walkthroughs of his action; and the fact that the producers built a separate “Beast” character to which Emma Watson read some of her lines. Mr. Stevens’s reference to “MOVA” was a shorthand reference to the entire face capture process, and neither he nor any other panelist said anything about MOVA software being responsible for the financial success of the Motion Picture. And the full video of this single press conference addressed numerous other topics, including the actor Luke Evans’s stage experience; the challenge of

¹⁹ Letter Br. at 6.
²⁰ FAC ¶ 2. The video is available at https://www.youtube.com/watch?v=R9mKV_gklgw&feature=youtu.be&t=12m14s.

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1	“bring[ing] a new breath of fresh air to this classic and yet remain[ing] respectful to the	
2	original” ²¹ ; and the music and dancing in the Motion Picture.	
3	Rearden’s written discovery requests suggest it will rely on the fact that, for some shots of	
4	the Beast included in a <i>Beauty and the Beast</i> trailer, a corresponding capture of Mr. Stevens’s	
5	facial performance had been conducted in the MOVA rig. Reed Dippo Decl. Ex. G (Defendant	
6	The Walt Disney Company’s Amended Objections and Responses to Plaintiffs’ First Requests for	
7	Admission). Even if a tracked mesh from one of those sessions was used in the process of	
8	creating a shot that appeared in the trailer, <i>none of those shots (or anything else any potential</i>	
9	<i>customer saw) were infringing</i> . Rearden has a copyright only in the software—not in the tracked	
10	mesh, not in any completed shot, and not in any image in any trailer or any completed Motion	
11	Picture. ²² Rearden cannot rely on the trailer (or anything else) to argue that prospective consumers	
12	saw the allegedly infringing work or that the infringement drove their purchasing decisions.	
13	In short, none of the articles, videos, or trailers Rearden relies on imply, much less	
14	establish, any non-speculative connection between the narrow infringement that Rearden alleges	
15	and the revenues it is trying to reach.	
16	B. Rearden Cannot Base Its Claim On DD3’s “Use” Of MOVA	
17	Rearden asserts that it can establish a causal nexus based on the fact that DD3 “used”	
18	MOVA software “to capture an actor’s performance, and then to process the captured	
19	performance.” ²³ The theory fails, not only for the reasons discussed above, but also because	
20	Rearden is conflating the “use” of the entire MOVA system with the specific act alleged to	
21	infringe <i>copyright</i> (DD3’s making temporary copies of pieces of the MOVA software code in	
22	RAM). Rearden has no copyright interest in the <i>use</i> of the MOVA system or even the use of the	
23	MOVA software code.	
24	The Copyright Act is clear: “In no case does copyright protection . . . extend to any idea,	
25	procedure, process, system, [or] method of operation.” 17 U.S.C. § 102(b). In the context of	
26		
27	²¹ Paris Press Conference, <i>Beauty and the Beast</i> , YouTube (Feb. 20, 2017)	
28	https://www.youtube.com/watch?v=R9mKV_gklgw&feature=youtu.be&t=21m12s .	
	²² Dismissal Order at 7–8, Dkt. 60.	
	²³ Letter Br. at 6 (emphasis added).	
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1	computer software, Section 102(b) “make[s] clear” that the particular form of “expression adopted	
2	by the programmer is the copyrightable element in a computer program,” but “the actual processes	
3	or methods embodied in the program are not within the scope of copyright law.” <i>Computer</i>	
4	<i>Assocs. Int’l, Inc. v. Altai, Inc.</i> , 982 F.2d 693, 703 (2d Cir. 1992) (quoting H.R. Rep. No. 1476,	
5	94th Cong., 2d Sess. 54, <i>reprinted in</i> 1976 U.S.C.C.A.N. 5659, 5670); <i>cf. Apple Computer, Inc. v.</i>	
6	<i>Microsoft Corp.</i> , 35 F.3d 1435, 1443 (9th Cir. 1994) (“Apple cannot” use copyright law to “get	
7	patent-like protection for the <i>idea</i> of a graphical user interface”) (emphasis added).	
8	The process embodied in software is the proper subject of patent rather than copyright	
9	protection. 35 U.S.C. § 101 (a patent may be obtained for “any new and useful process”). But	
10	patent law would likely limit Rearden’s damages to the value of a “reasonable royalty”; and no	
11	case law would support Rearden’s patent-based claim to a portion of the ultimate profits of the	
12	Motion Pictures. 35 U.S.C. § 284; <i>see LaserDynamics, Inc. v. Quanta Computer, Inc.</i> , 694 F.3d	
13	51, 67 (Fed. Cir. 2012) (the “general rule” is that “royalties be based ... on the smallest salable	
14	patent-practicing unit”) (quotation omitted). Here, the available patent royalty would likely have	
15	been capped at the amounts that the Studios paid DD3 for its special effects services. That is	
16	presumably why Rearden chose to abandon its patent claims in this suit. ²⁴	
17	Rearden is relying on the use of the process embodied in the MOVA software code to	
18	make sweeping claims to Motion Picture profits. But only Rearden’s copyright claims remain	
19	live, and those claims involve only the temporary copies of MOVA software code in computer	
20	RAM. If Rearden can show copyright infringement, it may be entitled to the recovery of lost	
21	revenue (measurable based on what Rearden charged customers for MOVA services, or vendors	
22	for a license), or to statutory damages under 17 U.S.C. § 504(c). But Rearden is not entitled to a	
23	portion of Motion Picture profits based on DD3’s use of MOVA. <i>See</i> Goldstein on Copyright	
24	§ 14.1.1.1 at 14:8, 14:12 (identifying “lost sales,” “a reasonable royalty,” or “market value” as the	
25	appropriate measures of damages).	
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28	²⁴ Dkt. 93.	
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1 **C. Rearden Cannot Skip To The Apportionment Stage**

2 Rearden’s prior filings also argued that all of the elements besides the temporary RAM

3 copies of the software code are irrelevant to the causal nexus question, and instead are matters for

4 Defendants to prove in apportioning profits that are not attributable to the infringement.²⁵

5 Rearden has the burdens backward. Section 504(b) “creates a two-step framework for

6 recovery of indirect profits: [first,] the copyright claimant must first show a causal nexus between

7 the infringement and the gross revenue; and [second,] once the causal nexus is shown, the

8 infringer bears the burden of apportioning the profits that were not the result of infringement.”

9 *Polar Bear Prods.*, 384 F.3d at 711. Rearden must establish a causal nexus “before the parties can

10 wrangle about apportionment,” *Mackie*, 296 F.3d at 915 (emphasis added), and must do so based

11 on concrete, non-speculative evidence, *id.* at 915–16; 4 *Nimmer on Copyright* § 14.03[B][2][a].

12 Rearden cannot establish the required causal nexus and therefore never gets to the apportionment

13 stage.

14 **III. IN ADDITION TO BEING BASED ON SPECULATION, REARDEN’S INDIRECT**

15 **PROFIT CLAIMS FOR TRACK 1 MOTION PICTURES FAIL DUE TO THE DE**

16 **MINIMIS (OR NONEXISTENT) APPEARANCE OF CG CHARACTERS WHOSE**

17 **DEVELOPMENT INVOLVED ANY USE OF MOVA**

18 These cases concern six Motion Pictures, each alleged to contain one CG character for

19 which there is alleged to have been some use of MOVA software. Summary judgment for lack of

20 causal nexus is warranted for all six Motion Pictures for the reasons stated above.

21 Rearden also cannot establish a causal nexus for the four Motion Pictures in the “Track 1”

22 tier of discovery due to the de minimis or nonexistent use of MOVA.²⁶ They are (with one

23 exception) in Track 1 because of the very small amount of time the characters in issue appear on

24 screen. See Costa Decl. ¶ 2 (Thanos on screen for four seconds—in closing credits—of 141

25 minutes of *Avengers: Age of Ultron*; and for 39 seconds of two-hour *Guardians of the Galaxy*);

26 Nash Decl. ¶ 4 (Caesar bust on screen for 11 seconds of 98-minute *Night at the Museum: Secret of*

27

28 ²⁵ See Joint Am. Case Mgmt. Stmt. at 8–9 (July 18, 2018), Dkt. 97.

²⁶ “Track 1” is intended to provide for narrow discovery and early mediation. Order Adopting

Discovery Plan at 1–2, Dkt. 113.

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1	the Tomb). In the other Track 1 Motion Picture—<i>Fantastic Four</i>— the facial motion of the CG	
2	“Thing” character was not based on MOVA tracked mesh data. Ledda Decl. ¶ 4.²⁷	
3	In the Track 1 Motion Pictures, not only are the temporary copies of MOVA software code	
4	and tracked mesh many creative steps removed from the ultimate character that appears on screen,	
5	but that character itself appears on screen only fleetingly (if at all). When “the infringing content	
6	forms only a small, incidental portion of the products that generated the claimed revenue streams,”	
7	it “defies credulity that a consumer would” base purchasing decisions on that content. <i>Dash</i>, 731	
8	F.3d at 332 (internal quotation marks omitted). The same can be said for <i>all</i> of the Motion	
9	Pictures. Notably, Rearden did not take a single deposition related to any of the Track 1 Motion	
10	Pictures. Rearden’s claims based on the Track 1 Motion Pictures simply demonstrates the extent	
11	of Rearden’s overreaching to seek a remedy that has no application to the facts of this case.	
12	CONCLUSION	
13	Rearden cannot proffer concrete, non-speculative evidence of a causal nexus between the	
14	temporary copies of MOVA software—which was not and could not be seen by consumers—and	
15	Motion Picture revenues. Even the <i>use</i> of the MOVA software (which is not protected by	
16	Rearden’s copyright) was a preliminary process that was superseded by numerous artistic and	
17	technical efforts and innumerable hours of additional work even to create a single CG character.	
18	For these and the other reasons set forth above, Defendants respectfully request that the Court	
19	grant partial summary judgment on Rearden’s indirect profits claim.	
20	DATED: October 14, 2020	MUNGER, TOLLES & OLSON LLP
21		
22		
23		By: <u>/s/ Ginger D. Anders</u>
24		GINGER D. ANDERS
25		Attorneys for Defendants
26	²⁷ Rearden apparently filed a copyright claim based on <i>Fantastic Four</i> because the MOVA logo	
27	appears in the DVD/Blu-ray featurette. The Fox group responsible for the featurette had no	
28	involvement in the motion picture process. It appears the featurette included the MOVA logo	
	because DD3 provided a third-party vendor that produced the featurette with images of Jamie Bell	
	that were not in fact used in connection with the CG character that appeared in the Motion Picture.	
	Mulvihill Decl. ¶¶ 2–7; Ledda Decl. ¶¶ 3–5.	
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2021 · 01-15 | Hao Li Video Deposition
EXHIBIT MOV

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

REARDEN LLC, REARDEN MOVA)
LLC, California limited)
liability companies,)
Plaintiffs,)
v.)
THE WALT DISNEY COMPANY,)
a Delaware corporation,)
WALT DISNEY MOTION)
PICTURES GROUP, INC., a)
California corporation,)
BUENA VISTA HOME)
ENTERTAINMENT, INC. A)
California corporation,)
MARVEL STUDIOS, LLC, a)
Delaware limited)
liability company,)
MANDEVILLE FILMS, INC., a)
California corporation,)
Defendants.)

Case No. 4:17-CV-04006-JST
4:17-CV-04191-JST

CONFIDENTIAL

Deposition of HAO LI

via videoconference

Thursday, May 28, 2020

Michael P. Hensley, RDR, CSR No. 14114

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Url 4: drive.proton.me/urls/YEWTGAEB6G#1nIB3VhnAtAT

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1

Do you see that?

2

A. Okay.

3

Q. Now, I thought when we were talking about

4

real-time data capture, that was a lower resolution

5

capture. Am I mistaken about that?

6

A. Yes. So within this context, the real time does

7

not necessarily refer to as the whole pipeline being

8

real time. In this case, the real-time data capture is

9

more about capturing a recording at 30 frames per

10

second.

11

That was, back then, also sort of a novelty.

12

Q. Okay. And so you say when the purpose is to

13

capture human faces, they need to be captured at very

14

high resolution.

15

A. Right.

16

Q. Is that right?

17

A. Right.

18

Q. Okay. And why is that so?

19

A. Well, if it's low resolution, then you lose

20

details of how faces deform. And, hence, the result of

21

your output is no longer an accurate representation of

22

the person -- the subject's face. And you will end up

23

having the problem of the uncanny valley.

24

Q. Okay. So subtleties and nuances in a

25

performer's facial expression would be lost unless you

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1 are capturing at very high resolution; is that right?

2 A. That's right.

3 Q. Then if you turn to page 18 -- and I'm now

4 talking about the first full paragraph, the one that

5 begins with the word "nevertheless." Do you see that?

6 A. Yes.

7 Q. And the third sentence in that paragraph is "The

8 main advantage of using high-resolution capture data

9 over alternative animation techniques, such as physical

10 simulation or keyframing, is that realistic and complex

11 surface dynamics come for free."

12 Do you see that language?

13 A. I do.

14 Q. Okay. So I guess rather than me trying to

15 paraphrase that, can you just sort of unpack that

16 sentence for me.

17 A. Yeah. So the -- the -- so this sentence is

18 specifically trying to explain why, you know, dense

19 facial capture is important and what the motivation is

20 behind it and what its advantages or over, let's say,

21 other traditional techniques back then like traditional

22 keyframing, which is traditional animation by hand. Or

23 if things are using physical simulation, for example, if

24 you have certain activations and it would activate

25 muscles and muscles would translate into facial

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1 expressions, that is very difficult to set up.

2 Yet the argument here is that if you have the
3 ability -- if you have the ability to capture, you know,
4 a 3D representation of the face, then the data is
5 there -- right? -- so you can get it.

6 But what it doesn't mean is that -- and that's
7 why there is this whole thesis -- is that you can
8 immediately use the data. But the nice thing is it
9 comes for free, because we do see that the data is
10 there. So an analogy to this is that if I have a video
11 recording of you, every information that I'm supposed to
12 see is there. But then how I can translate that
13 information from video recording of you to an actual CG
14 character, that's -- that's the other -- that's the
15 other problem.

16 Q. And so this -- I guess --

17 What you're saying here is that, you know, if
18 you want to do realistic and complex surface dynamics,
19 you know, for -- for facial performance using physical
20 simulation or keyframing, it takes a lot of time and
21 animators to do that work, it's labor intensive, whereas
22 all of the -- you know, the -- you know, the nuances,
23 the realistic and complex nuances of a person's facial
24 expression, those -- those come along for free,
25 essentially, if you have a high-resolution capture data.

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1 MR. KLAUS: Objection. Objection.

2 Mischaracterizes the witness's testimony. Vague and

3 ambiguous.

4 You may answer, Dr. Li.

5 THE WITNESS: That's right.

6 BY MR. CARLSON:

7 Q. Okay. So now I'm going to ask you to come -- to

8 turn to page 25. And I'm interested here in Section 2.2

9 of the chapter. It's called "Dynamic Shape Acquisition

10 Techniques."

11 A. Okay.

12 Q. Let me know when you have that in front of you.

13 A. I have it.

14 Q. Okay. In this section, you're describing

15 different methodologies for real-time 3D capture; is

16 that correct?

17 A. Yeah.

18 Q. And then on page -- flip you up to page 29. On

19 page 29, you discuss dense marker capture systems. Do

20 you see those? Do you see that?

21 A. Mm-hmm.

22 Q. Okay. And so what are dense marker capture

23 systems? What are examples of those?

24 A. Let me have a look first.

25 Q. Sure.

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1 personal, hands-on experience with commercial dense
2 marker capture systems.

3 I -- I have this clone cam, or whatever it's
4 called, that you've identified as one that you had
5 personal experience with at ILM. And I recognize your
6 testimony that, well, gee, there was a lot of them. I
7 don't know.

8 But, you know, can -- can you tell me which ones
9 that you do know of, commercial dense marker capture
10 systems that you have hands-on experience with.

11 A. Well, what's important is the pipeline, the
12 internal pipelines at ILM. There are pipelines from
13 Weta Digital. And each of that's companies might have
14 different flavors of different pipelines. Clone cam is
15 one part of it. I've actually forgot the names of
16 other -- I mean, they all have code names. And I have
17 worked with, you know, some commercial ones which are
18 from -- in the research -- like, in the -- in research
19 labs at universities.

20 Q. Okay. So -- but -- can you give me the names of
21 the commercial products that you have hands-on
22 experience with, at least the ones that you recall,
23 sitting here today?

24 A. Well, I have -- well -- I mean, the -- I
25 don't -- so I don't know exactly what you're -- so with

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1 commercial, I meant that is not in university.

2 Q. Yes.

3 A. And, you know, dense marker-based systems that I

4 know of were used -- well, okay. Dense -- so are you

5 saying dense with markers or dense without mark -- or,

6 you know, just dense capturing?

7 Q. Dense -- dense capture.

8 A. Okay. Dense capture, well, I worked on data

9 from, you know, that were used at Weta Digital that I

10 worked directly on -- on capture, on processing, and

11 everything. And I work on the ones at ILM. And at

12 ILM -- actually, speaking of which, at ILM we also used

13 MOVA data for, you know, specific tests, and I was also

14 working on those.

15 THE REPORTER: Dr. Li, this is the court

16 reporter. If you could be so kind as to slow down a bit

17 on your answers to make sure I'm capturing all of that

18 entirely, I would appreciate it.

19 THE WITNESS: Okay.

20 BY MR. CARLSON:

21 Q. So --

22 MR. KLAUS: Mr. Court Reporter, I'm sorry. I

23 just noticed in the last answer you had written down

24 "mobile data." And I think Dr. Li said "MOVA data,"

25 M-O-V-A.

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1 THE WITNESS: That is correct.

2 MR. KLAUS: Thank you. Thank you.

3 BY MR. CARLSON:

4 Q. Okay. So maybe my question isn't -- isn't

5 clear. When you say you worked with MOVA data, did you

6 personally -- were you personally present for the MOVA

7 capture session or the using MOVA to create the tracking

8 mesh? Were you present for -- for either of those

9 events?

10 A. No. I was present -- so let me back up.

11 But -- so the -- I wasn't present in the actual

12 capture session, if it -- if it was regarding MOVA. I

13 wasn't present during the actual capturing session of

14 MOVA of the actors -- or, actually, as a matter of fact,

15 I've never seen the system in action, like, myself.

16 For the processing build, there have been a lot

17 interactions between -- for example, Ken Pearce and the

18 teams at ILM. And we were involved in giving feedback,

19 getting improved results. So there was a

20 back-and-forth. But most of my involvement was on using

21 the data for -- you know, how ILM was using the data.

22 And it was for building facial rigs.

23 Q. Right. So you're -- when we're talking about

24 the -- you're using the MOVA data, you weren't involved

25 in using the MOVA Contour software --

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1

A.

No.

2

Q.

-- to process that data yourself.

3

A.

No, I wasn't.

4

Q.

Correct?

5

A.

Correct.

6

Q.

And so you -- you've mentioned a couple times

7

the Weta Digital digital proprietary systems. Did they

8

have a name for those?

9

A.

No. I mean, maybe they had. I can't remember

10

or I don't know what the name is. But maybe there

11

wasn't a name. It was a -- it wasn't a -- I mean, it's

12

just -- I mean, you know, for -- it's nothing really

13

particular; right? It's basically just multiuse stereo.

14

And you do mesh tracking; right? And it's just -- I

15

mean, it's -- it's a very challenging process. But it's

16

a -- it's a standard approach; right?

17

So many -- many companies who have facial

18

performance capture systems -- I mean, there's, like --

19

probably, like, DI4D. There's a lot of venders that

20

have these kind of capabilities, and it's always more or

21

less the same. It's capturing faces and then being able

22

to generate a tracked mesh. And that's sort of like

23

the -- if -- a nice approach to get high fidelity, you

24

know, facial tracking for the effects companies.

25

Q.

Yes. And I'm just trying to get arms around

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1 CERTIFICATE OF SHORTHAND REPORTER

2

3 I, Michael P. Hensley, Registered Diplomat

4 Reporter for the State of California, CSR No. 14114, the

5 officer before whom the foregoing deposition was taken,

6 do hereby certify that the foregoing transcript is a

7 true and correct record of the testimony given; that

8 said testimony was taken by me stenographically and

9 thereafter reduced to typewriting under my direction;

10 that reading and signing was requested; and that I am

11 neither counsel for, related to, nor employed by any of

12 the parties to this case and have no interest, financial

13 or otherwise, in its outcome.

Phil Vaz

Michael P. Hensley, CSR, RDR

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16	UNITED STATES DISTRICT COURT	
	NORTHERN DISTRICT OF CALIFORNIA	
17	OAKLAND DIVISION	
18	REARDEN LLC, et al.,	No. 4:17–CV 04006-JST-SK
	Plaintiffs,	No. 4:17–CV-04191-JST-SK
19		
	v.	
20	THE WALT DISNEY COMPANY, <i>et al.</i> ,	DECLARATION OF PHILIP FIER
	Defendants.	IN OPPOSITION TO DEFENDANTS’
21		MOTIONS FOR SUMMARY
		JUDGMENT ON CAUSAL NEXUS
22		ISSUE
23	REARDEN LLC, et al.,	Judge: Hon. Jon S. Tigar
	Plaintiffs,	Date: To be set
24		Time: To be set
	v.	
25	TWENTIETH CENTURY FOX FILM	Ctrm.: 6, 2 nd Floor
	CORPORATION, <i>et al.</i> ,	
26	Defendants.	
27		
28		

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1	I, Philip Fier, declare as follows:	
2	1. Summary of your background, education and experience as it pertains to the	
3	marketing and promoting of motion pictures and the subject matter of the declaration.	
4	2. Attached hereto as Exhibit 1 is a true and correct copy of my <i>curriculum vitae</i> .	
5	MATERIALS RELIED UPON	
6	3. Attached hereto as Exhibit 2 is a list of materials provided to me by Rearden’s	
7	attorneys for my consideration.	
8	4. Attached hereto as Exhibit 3 is a list of other materials that I considered.	
9	ASSIGNMENT	
10	5. Rearden’s attorneys have asked me to express my opinions on the following subjects:	
11	(a) the gross revenue (worldwide) and estimated profit for <i>Beauty and the Beast</i> , <i>Deadpool</i> ,	
12	<i>Guardians of the Galaxy</i> , <i>Avengers: Age of Ultron</i> , <i>Night at the Museum: Secret of the Tomb</i> , and	
13	<i>Fantastic Four</i> (“the films at issue”) in the ten-year interval after their release; and (b) whether the	
14	November 14, 2016 <i>Beauty and the Beast</i> Trailer, and in particular, the CG Beast character as it	
15	appeared in the trailer, at least partially caused at least some filmgoers to purchase theater tickets,	
16	DVDs, Blu-rays, or to stream <i>Beauty and the Beast</i> (2017).	
17	6. I have been compensated for my services in this matter at the rate of \$400 per hour.	
18	SUMMARY OF OPINIONS	
19	7. The following is a summary of my opinions and conclusions as they pertain to my	
20	assignment, which are set forth in more detail in the paragraphs that follow:	
21	8. The films at issue will earn in the ten year interval after their theatrical release gross	
22	revenue of between \$220 million (<i>Fantastic Four</i>) and \$1.05 billion (<i>Beauty and the Beast</i>). The	
23	most profitable films at issue will earn in the same interval gross profits of \$436 million (<i>Beauty and</i>	
24	<i>the Beast</i>), \$377 million (<i>Deadpool</i>), \$426 million (<i>Guardians of the Galaxy</i>), and \$486 million	
25	(<i>Avengers: Age of Ultron</i>).	
26	9. Film studios distribute film trailers for the purpose of marketing the subject films to	
27	potential audiences, thereby to increase viewings and revenue.	
28	DECLARATION OF PHILIP FIER - 1 Case No.: 4:17-cv-04006-JST, 4:17-cv-04191-JST	

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1	release. Successful films like the ones analyzed herein, still have considerable value after this 10-	
2	year period as the studio continues to license the film to TV and consumers still purchase and rent it.	
3	16. I have considerable experience in estimating film performance. In my 30 years in the	
4	entertainment industry, I have provided film appraisals and/or ultimates analyses for nearly 10,000	
5	film and TV titles. These analyses have been used in bankruptcy court to settle claims, by the IRS	
6	and accounting firms to establish tax bases, by film studios in order to negotiate talent contingent	
7	compensation deals, to greenlight and/or acquire films, by investors and lenders and by buyers and	
8	sellers of film rights.	
9	17. There are two basic methodologies to estimate the “utltimates” (revenue and costs in	
10	the first ten years after release) for a feature film. The first is typically used prior to or soon after a	
11	film’s release and uses the film’s US and international box office to estimate the revenue. There are	
12	established correlations between box office and various categories of revenue. Costs are typically a	
13	proportion of the revenue. The second method is to use the typical timing of receipts and the actual	
14	receipts of the film at a particular date. For example, if it’s typical that 80% of a film’s home video	
15	revenue is collected in the first year after release, one can take this year one home video revenue and	
16	divide it by 80% to derive home video revenue the ultimate. In many cases, both methodologies are	
17	used as a check against the other. In this analysis, I used both to create the ultimate revenue and	
18	costs.	
19	18. Based on that methodology and the resources that I have available to me, I have	
20	developed the following estimates of revenue and gross profit for the films at issue. But I reserve the	
21	right to modify all of these estimates after the defendants produce detailed financial information on	
22	revenue, cost, and profits for the films at issue.	
23	Beauty and the Beast. Revenue: \$1,046 mm, Gross Profit: \$436 mm	
24	Deadpool. Revenue: \$844 mm, Gross Profit: \$377 mm	
25	Guardians of the Galaxy. Revenue: \$818 mm, Gross Profit: \$426 mm	
26	Avengers: Age of Ultron. Revenue: \$1,100 mm, Gross Profit: \$486 mm	
27	Night at the Museum: Secret of the Tomb. Revenue: \$380 mm, Gross Profit: \$70 mm	
28	Fantastic Four. Revenue: \$220 mm, Gross Loss: (\$15 mm)	
	DECLARATION OF PHILIP FIER - 3 Case No.: 4:17-cv-04006-JST, 4:17-cv-04191-JST	

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1	B. The November 14, 2016 <i>Beauty and the Beast</i> Trailer.	
2	19. To maximize the box office, which also maximizes the other revenue streams such as	
3	television licensing, the rental and purchase of physical discs such as Blu-ray and the royalties from	
4	the sale of consumer products related to the film, a distributor seeks to raise awareness of the film	
5	among consumers. Distributors use a variety of methods to not only increase awareness, but also to	
6	have likely moviegoers view the upcoming film in a positive light. Well known methods include	
7	renting billboard space, airing television commercials, creating innovative websites and making	
8	actors available to print and TV journalists for press interviews. While TV commercials on popular	
9	shows can raise awareness among viewers of that show, trailers by definition are viewed by	
10	moviegoers. By placing the trailer on a comparable film (either on one of the studio’s own similar	
11	titles or via agreement with a rival studio on one of its similar titles – for example, Fox could have	
12	run its <i>Fantastic Four</i> trailer on Disney’s <i>Avengers: Age of Ultron</i>), a studio is assured of increasing	
13	awareness of its upcoming title among the audience with the highest probability of viewing the	
14	movie in theaters. Similarly, studios run trailers on popular websites such as Youtube. While the	
15	viewing experience is not as palpable as a theater, a site like Youtube facilitates viewing with friends	
16	and multiple screenings. The length of a trailer versus a TV commercial as well as the size of the	
17	movie screen also ensures a much more immersive and memorable experience in a theater. For these	
18	reasons, studios spend significant amounts of money on creating trailers and will, for example,	
19	ensure that similar visual effects are seen in the trailer as are expected in the film.	
20	20. A 2018 report by the National Research Group (NRG) prepared entitled The State of	
21	Moviegoing concluded that film trailers were the top source of discovery of a film by potential	
22	moviegoers (Ex. 4 (FOX-REARDEN-0001326-1435 at1375)), trailers were the most trusted source	
23	of information about a movie for all age groups (<i>Id.</i> , at 0001375), trailers are the primary source of	
24	information used by parents to determine if a movie is appropriate (<i>Id.</i> , at 0001377), and for	
25	moviegoers between the ages of 18 and 45 online trailer exposure outpaced theatrical trailer exposure	
26	(<i>Id.</i> , at 0001378). Significantly, for purposes of my analysis, the NRG report found that trailer	
27	exposure correlates with theatrical attendance. <i>Id.</i> , at 0001379.	
28	DECLARATION OF PHILIP FIER - 4 Case No.: 4:17-cv-04006-JST, 4:17-cv-04191-JST	

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1	21. To test the conclusions reached in the NRG report, I independently analyzed 41 titles	
2	theatrically released between 2015-19. These are all tentpole films (e.g., big budget) with the labels	
3	Marvel, DC Comics, Pixar and Disney Animation. I ran a statistical analysis to see if the number of	
4	views on the Youtube release trailer correlated with the US and/or worldwide box office. The	
5	analysis showed a moderately strong correlation, matching the NRG findings.	
6	22. Studios engage specialized marketing data companies to assess the impact of their	
7	marketing materials on likely moviegoers. These companies will recruit volunteers, often	
8	pedestrians nearby to movie theaters, to assess their moviegoing habits, familiarity with certain	
9	upcoming films, and their opinions regarding a selection of different trailers. Big budget, tentpole	
10	films, like the Marvel super hero series, typically run two trailers – a ‘teaser’ several months prior to	
11	a film’s release and the release trailer run in the month or so prior to the release. The purpose of the	
12	former is to familiarize likely moviegoers with the storyline and characters while the latter often	
13	showcases special effects and/or thrilling action sequences. While the special effect houses are	
14	focused on completing their contracted work by a date coinciding with the film’s release, much care	
15	and expense is made to ensure that the trailer contains sufficient effects to wow moviegoers since	
16	each succeeding film must surpass what was once revolutionary but is now ordinary to frequent	
17	movie attendees. The marketing analysis to measure awareness is conducted at various points in time	
18	so studios can ascertain which element of the marketing campaign is having the desired impact	
19	allowing them to tweak the current or future campaigns based upon this new data.	
20	23. When movies were released on physical film reels 15-20 years ago, the trailers were	
21	physically attached to the feature, hence the need for rival studios to agree to attach it. Since digital	
22	projectors became ubiquitous, features and trailers are delivered either via a physical disc or	
23	electronically. In both cases, the goal is always to run the trailer on a comparable film. For tentpole	
24	films, it has become common for studios to announce the date and film on which the trailer will	
25	debut so fans can show their fealty by coming to theaters for the trailer premiere, turning it into an	
26	event itself. Some studios favor theater only premieres which can also bring attention to the film on	
27	which the trailer will run. Warner Bros did that recently, premiering the <i>Dune</i> trailer on <i>Tenet</i> .	
28	Similarly, trailers are ‘dropped’ at a pre-announced time at popular platforms such as Youtube for	
	DECLARATION OF PHILIP FIER - 5 Case No.: 4:17-cv-04006-JST, 4:17-cv-04191-JST	

2020 · 11-18 | Philip Fier Declaration
EXHIBIT MOV

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1	the same purpose. In fact, <i>Tenet</i> itself became the first movie trailer ever to premiere on the hugely	
2	popular (350 million registered players) video game, <i>Fortnite</i> . If the trailer premiere can generate	
3	publicity itself, then this bodes quite well for the box office prospects of the feature. Trailers are also	
4	an integral part of the film’s own website. Trailers shown on Youtube have the added benefit of	
5	allowing studios to show multiple trailers and to use the platform’s analytics to obtain information	
6	about the relative popularity of trailers of the same and different films.	
7	24. According to answers to Requests for Admission by The Walt Disney Company (Ex.	
8	5), the November 14, 2016 <i>Beauty and the Beast</i> trailer set a new record with over 127 million on-	
9	line views in the first 24 hours after its release, and was among the top-trending videos on YouTube.	
10	Within the first half hour of the Trailer’s launch, #BeautyAndTheBeast was the leading trend	
11	worldwide on Twitter. And the trailer was continuously available to filmgoers from November 14,	
12	2016 through at least the film’s release on March 17, 2017.	
13	25. It is also significant that the <i>Beauty and the Beast</i> trailer was released with the support	
14	of the cast and director according to an article published in <i>Variety</i> magazine on November 15, 2016.	
15	Ex. 6. As indicated by the <i>Variety</i> magazine article, the trailer’s launch and its success were reported	
16	by the media. Disney’s trailer release was supported by the film’s talent, Emma Watson, Dan	
17	Stevens, Luke Evans, Josh Gad, and director Bill Condon in a Facebook Live session, which	
18	accounted for over 29 million views on Facebook alone. Having the cast support a trailer premiere is	
19	atypical and thus reserved for trailers that are likely to make a big splash with consumers. While the	
20	<i>Beauty and the Beast</i> teaser trailer which premiered in May 2016 was extremely popular, the one on	
21	November 14, 2016 was touted as the first one showing the Beast with full visual effects and it broke	
22	all previous 24-hour viewing records for a trailer, most recently by a film in the <i>Star Wars</i> franchise.	
23	26. According to the director Bill Condon, the November 14, 2016 trailer was the first	
24	reveal of the CG Beast character to potential audiences for the film. The CG Beast appeared almost	
25	entirely through film clips that were based on MOVA facial performance capture of Dan Stevens’s	
26	performance. The trailer featured eleven clips of the Beast, and Mr. Condon confirmed that at least	
27	nine of the eleven Beast clips were based on MOVA facial performance capture.	
28	DECLARATION OF PHILIP FIER - 6 Case No.: 4:17-cv-04006-JST, 4:17-cv-04191-JST	

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1	27. Studios view trailers as the most important piece of creative advertising to increase	
2	awareness among likely filmgoers. In fact, the more a trailer is viewed for a tentpole film such as the	
3	films in this declaration, the higher the box office is likely to be. Studios spend significantly more on	
4	trailers than any other piece of creative advertising, often incorporating expensive special effects into	
5	the footage. As one of the film’s two romantic heroes, the Beast is featured prominently in the	
6	November 14, 2106 <i>Beauty and the Beast</i> trailer. The trailer was launched with the participation of	
7	key cast which often has a significant cost itself. It seems clear that Disney viewed the quality of the	
8	trailer and therefore its widespread appeal as a critical component of its marketing campaign.	
9	28. In my opinion, the November 14, 2016 <i>Beauty and the Beast</i> trailer was exceptionally	
10	successful in creating audience awareness of the film given the positive correlation between a film’s	
11	trailer exposure and its box office performance. The November 14, 2016 <i>Beauty and the Beast</i>	
12	trailer was almost certainly one of the most important factors in creating audience interest to see the	
13	film, and thus almost certainly contributed to its very strong box office performance.	
14	29. Studios utilize the vast majority of their marketing efforts and expenditures prior to a	
15	film’s theatrical release. The primary goal is to achieve a huge opening weekend. While <i>Beauty and</i>	
16	<i>the Beast</i> continued to gross at least \$1million per week for 12 weeks, the opening weekend in the	
17	U.S. comprised 35% of the total U.S. box office. In fact, looking at either the top 20 films (in terms	
18	of box office) or the 33 titles that grossed at least \$100 million in 2017, the opening weekend	
19	averaged 30% of the total box office. The opening weekend is so important that it is not unusual to	
20	see significant drops to the second weekend. In 2017, of the top three films, <i>Star Wars: Episode VIII</i>	
21	dropped 68%, <i>Beauty and the Beast</i> dropped 48% and Wonder Woman 43% in their respective	
22	second weekend. In addition to the oversized contribution toward the overall box office, having the	
23	number one film at the box office for its opening weekend spawn numerous marketing opportunities	
24	the most obvious of which is to add the tagline, #1 film in the US, to all of a film’s marketing	
25	materials Disney’s <i>Beauty and the Beast</i> opened on March 17, 2017 to an astonishing \$170 million	
26	in North America and \$350 million globally, establishing numerous new box-office records in the	
27	process. It became the top film opening of all time for a PG-rated film, both domestically and	
28	internationally. It was the seventh largest opening for a film of any rating in North America. And it	
	DECLARATION OF PHILIP FIER - 7 Case No.: 4:17-cv-04006-JST, 4:17-cv-04191-JST	

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EXHIBIT MOV

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1 is now the highest grossing PG-rated, live action film of all time, earning over \$500 million
2 domestically and \$1.25 billion worldwide. *Beauty and the Beast* is the tenth highest grossing movie
3 of any rating of all time in North America.

4 I declare (or certify, verify, or state) under penalty of perjury that the foregoing is true and
5 correct.

6 Executed on November 16th, 2020

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8 
9 _____
10 Philip Fier

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DECLARATION OF PHILIP FIER - 8
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Exhibits to Membership Interest and Asset Sale and Purchase Agreement

EXHIBIT A-1
MOVA TRADEMARKS¹

¹ “Mova Trademarks” refers to marks registered in the name of the Seller. For completeness, the Buyer is listing here all trademarks related to the Business; however, please note that the Mova marks registered in the name of Mova LLC will transfer with the assignment of the Mova LLC Interest, while those registered directly in the name of the Seller (if any) must be specifically identified to transfer, as they are outside of that membership interest.

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Exhibits to Membership Interest and Asset Sale and Purchase Agreement

Exhibit A-1

CONTOUR and MOVA Trademarks

MoFo Matter Number	Mark/Serial Number/Registration Number/Applicant	Country	Class/Goods and Services	Status
65842-6003.001	CONTOUR Serial No: 78/981,021 Reg. No: 3,628,974 Mova, LLC	United States of America	Class 41: Visual effects and motion picture production services, all in the field of entertainment; entertainment services, namely, special effects, visual effects and animation services featuring motion capture for translating movement of a real subject and mapping such movement onto a 3-dimensional computer-generated model or as a computer-generated subject	Registered App Date: 05/04/2006 Reg Date: 05/26/2009 Section 8 & 15 Due: 05/26/2015
65842-6003.100	CONTOUR Serial No: 1144177 Reg. No: 1144177 Mova, LLC	Australia	Class 09: Computer hardware for processing motion capture data, supporting motion capture systems, and displaying related information and imagery; computer software for processing motion capture data; motion capture software and hardware systems consisting of motion capture cameras, connected to a computing means running software for processing data captured by motion capture cameras, all sold as a unit; theatrical lighting controllers Class 11: Theatrical lighting fixtures Class 35: Casting services Class 41: Motion capture services, visual effects and motion picture production services, all in the field of entertainment	Registered App Date: 11/01/2006 Reg Date: 08/06/2007 Renewal Due: 11/01/2016

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MoFo Matter Number	Mark/Serial Number/Registration Number/Applicant	Country	Class/Goods and Services	Status
65842-6003.102	CONTOUR Serial No: 005431267 Reg. No: 005431267 Mova, LLC	European Community*	Class 09: Computer hardware for processing motion capture data, supporting motion capture systems, and displaying related information and imagery; computer software for processing motion capture data; motion capture software and hardware systems consisting of motion capture cameras, connected to a computing means running software for processing data captured by motion capture cameras, all sold as a unit; theatrical lighting controllers; microphones and digital audio recorders Class 11: Theatrical lighting fixtures Class 41: Motion capture services, casting services, and casting support services, visual effects and motion picture production services, all in the field of entertainment Class 42: Rental of hardware and software, licensing of hardware and software, all for use in the field of entertainment	Registered App Date: 11/01/2006 Reg Date: 01/14/2008 Renewal Due: 11/01/2016
65842-6003.103	CONTOUR Serial No: 2006101795 Reg. No: 5141949 Mova, LLC	Japan	Class 09: Computer hardware for processing motion capture data, supporting motion capture systems, and displaying related information and imagery; computer software for processing motion capture data; theatrical lighting controllers and their parts and fittings; microphones and digital audio recorders; arcade video game machines; consumer video games; electronic circuits and CD-ROMs recorded programs for handheld games with liquid crystal displays; computer software; telecommunication machines and apparatus; electronic machines, apparatus and their parts Class 11: Theatrical lighting fixtures	Registered App Date: 11/01/2006 Reg Date: 06/20/2008 Renewal Due: 06/20/2018

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Exhibits to Membership Interest and Asset Sale and Purchase Agreement

MoFo Matter Number	Mark/Serial Number/Registration Number/Applicant	Country	Class/Goods and Services	Status
			Class 41: Photographing of motion pictures, electronic image data processing of motion pictures, digital imaging services, all in the field of entertainment; movie film production; direction of making radio or television programs; art exhibitions; planning arrangement of showing movies, shows, pays or musical performances; presentation of live show performances; direction or presentation of plays; presentation of musical performances; operation of video equipment or audio equipment etc., for production of radio or television programs; providing audio or video studios; providing facilities for movies, shows, pays, music or educational training; rental of cinematographic machines and apparatus; rental of amusement machine and apparatus; rental of game machines and apparatus; rental of cameras; rental of optical machines and instruments; photography.	
65842-6003.104	CONTOUR Serial No: 758134 Reg. No: 758134 Mova, LLC	New Zealand	Class 09: Computer hardware for processing motion capture data, supporting motion capture systems, and displaying related information and imagery; computer software for processing motion capture data; motion capture software and hardware systems including motion capture cameras and software and hardware for managing the synchronisation between strobe timing on lighting fixtures and shutter speed on cameras, all sold as a unit; theatrical lighting controllers; microphones and digital audio recorders Class 41: Motion capture services, visual effects and motion picture production services, all in the field of entertainment	Registered App Date: 11/01/2006 Reg Date: 12/11/2008 Renewal Due: 05/04/2016

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MoFo Matter Number	Mark/Serial Number/Registration Number/Applicant	Country	Class/Goods and Services	Status
65842-6003.105	CONTOUR Serial No: 20063956 Reg. No: 22953 Mova, LLC	Republic of Korea	Class 09: Computer hardware for processing motion capture data; computer hardware for supporting motion capture systems; computer hardware for displaying related information and imagery; computer software for processing motion capture data; motion capture software and hardware systems consisting of motion capture cameras, connected to a computing means running software for processing data captured by motion capture cameras, all sold as a unit; lighting controllers; microphones Class 11: Theatrical lighting fixtures Class 41: Motion capture services in the field of entertainment; casting services in the field of entertainment; casting support services in the field of entertainment; visual effects production services in the field of entertainment; motion picture production services in the field of entertainment	Registered App Date: 11/02/2006 Reg Date: 04/15/2008 Renewal Due: 04/15/2018
65842-6005.000	MOVA Serial No: 78/597,127 Reg. No: 3,641,201 Mova, LLC	United States of America	Class 25: Clothing, namely, t-shirts, hats	Registered App Date: 03/29/2005 Reg Date: 06/16/2009 Section 8 & 15 Due: 06/16/2015
65842-6005.001	MOVA Serial No: 78/978,085 Reg. No: 3,235,412 Mova, LLC	United States of America	Class 25: Clothing, namely, jackets	Registered App Date: 03/29/2005 Reg Date: 04/24/2007 Section 8 & 15 Due: 04/24/2013

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MoFo Matter Number	Mark/Serial Number/Registration Number/Applicant	Country	Class/Goods and Services	Status
65842-6005.002	MOVA Serial No: 78/599,227 Reg. No: 3,843,152 Mova, LLC	United States of America	Class 42: Rental of computer hardware and software for use in the field of entertainment	Registered App Date: 03/31/2005 Reg Date: 08/31/2010 Section 8 & 15 Due: 08/31/2016
65842-6005.003	MOVA Serial No: 78/977,072 Reg. No: 3,261,205 Mova, LLC	United States of America	Class 41: Entertainment services, namely, special effects animation services for film and video featuring motion capture for translating movement of a real subject and mapping such movement onto or as a computer generated subject, preparation of special visual effects, and motion picture production services	Registered App Date: 03/31/2005 Reg Date: 07/10/2007 Section 8 & 15 Due: 07/10/2013
65842-6005.004	MOVA Serial No: 77/922,936 Reg. No: Mova, LLC	United States of America	Class 09: Computer hardware for processing motion picture data, supporting motion capture systems and displaying related information and imagery; computer software for processing motion picture data, supporting motion capture systems and displaying related information and imagery; computer software for image processing of 2D and 3D images; motion capture software and hardware systems consisting of motion capture cameras connected to a computing means running software for processing data captured by motion capture cameras, all sold as a unit; computer hardware and software for use in creating special effects Class 42: Rental of computer hardware and software for use in motion capture and creation of special effects Class 45: Licensing of computer hardware and software for motion capture and creation of special effects	Allowed - Intent to Use App Date: 01/28/2010 Reg Date: Statement of Use Due/EOT4: 02/22/2013

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MoFo Matter Number	Mark/Serial Number/Registration Number/Applicant	Country	Class/Goods and Services	Status
65842-6005.101	MOVA Serial No: 004593596 Reg. No: 004593596 Mova, LLC	European Community*	Class 09: Motion capture hardware; motion capture software Class 41: Motion capture services, casting services, and casting support services, visual effects and motion picture production services, all in the field of entertainment Class 42: Rental of hardware and software; licensing of hardware and software all for use in the field of entertainment	Registered App Date: 09/15/2005 Reg Date: 06/01/2007 Renewal Due: 09/15/2015
65842-6005.102	MOVA Serial No: 2005087983 Reg. No: 5009820 Mova, LLC	Japan	Class 35: Referral of actors; business management of actors Class 41: Photographing of motion pictures, electronic image data processing of motion pictures, digital imaging services, all for motion capture, all in the field of entertainment Class 42: Agencies or brokerage for licensing of industrial property regarding computer hardware and other equipment all for use in the field of entertainment; agencies or brokerage for copyright licensing regarding computer software all for use in the field of entertainment	Registered App Date: 09/20/2005 Reg Date: 12/08/2006 Renewal Due: 12/08/2016

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EXHIBIT A-2
MOVA PATENTS

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Exhibit A-2 Mova Patents			
Serial Number	FILE NO.	TITLE	STATUS
10/942,413	8346P308	APPARATUS AND METHOD FOR CAPTURING THE EXPRESSION OF A PERFORMER	Issued
11/066,954	8346P309	APPARATUS AND METHOD FOR IMPROVING MARKER IDENTIFICATION WITHIN A MOTION CAPTURE SYSTEM - PCT	Issued
11/077,628	8346P310	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION	Issued
2005/329027	8346P310AU	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - AUSTRALIA	Issued
2519737	8346P310CA	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - CANADA	Pending
2005/0030846.9	8346P310CN	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - CHINA	Issued
88010315	8346P310EP	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - EPO	Issued
71025976	8346P310HK	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - HONG KONG	Issued
1528/DELNP/2007	8346P310IN	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - INDIA	Pending
2008/500696	8346P310JP	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - JAPAN	Issued
2007-7008614	8346P310KR	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - KOREA	Issued
553106	8346P310NZ	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - NEW ZEALAND	Issued
11/255,854	8346P313	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES	Pending
2562657	8346P313CA	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES - CANADA	Pending
6121767.5	8346P313EP	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES - EPO	Pending
7111339.2	8346P313HK	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES - HONG KONG	Pending
550347	8346P313NZ	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES - NEW ZEALAND	Issued
11/448,127	8346P315	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE USING PHOSPHOR APPLICATION TECHNIQUES	Issued
2657309	8346P315CA	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE USING PHOSPHOR APPLICATION TECHNIQUES	Pending
9108597.1	8346P315HK	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE USING PHOSPHOR APPLICATION TECHNIQUES	Pending
11/449,043	8346P316	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE BY STROBING A FLUORESCENT LAMP	Issued
11/449,131	8346P317	SYSTEM AND METHOD FOR THREE DIMENSIONAL CAPTURE OF STOP-MOTION ANIMATED CHARACTERS	Issued
11/888,377	8346P318	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION	Issued
2007281536	8346P318AU	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION - AUSTRALIA	Pending
2659572	8346P318CA	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION - CANADA	Pending
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10/2009/7004437	8346P318KR	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION - KOREA	Pending
574599	8346P318NZ	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION - NEW ZEALAND	Issued
597473	8346P318NZD	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION - NEW ZELAND	Pending
2010256510	8346P364XAU	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP - AUSTRALIA	Pending
2.764.447	8346P364XCA	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP - CANADA	Pending
10784126.4	8346P364XEP	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP - EPO	Pending
597097	8346P364XNZ	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP - NEW ZEALAND	Pending
PCT/US2010/057318	8346P364XPCT	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP - PCT	Pending

REARDEN 000600

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EXHIBIT MOV

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Exhibits to Membership Interest and Asset Sale and Purchase Agreement						
Exhibit A-2 Mova Patent Deadlines & Fees						
BSTZ REF. NO.	SERIAL NO.	TITLE	STATUS	NEXT ACTION DUE/ACTIVITY NAME	ESTIMATE	NEXT ACTION DUE DATE
8346P308	10/942,413	APPARATUS AND METHOD FOR CAPTURING THE EXPRESSION OF A PERFORMER	Issued	First Maintenance Fee	\$575.00	5-Dec-15
				Second Maintenance Fee	\$1,450.00	5-Dec-19
				Final Maintenance Fee	\$2,405.00	5-Dec-23
8346P309	11/066,954	APPARATUS AND METHOD FOR IMPROVING MARKER IDENTIFICATION WITHIN A MOTION CAPTURE SYSTEM	Issued	First Maintenance Fee	\$583.00	15-Jun-13
				Second Maintenance Fee	\$1,450.00	15-Jun-17
				Final Maintenance Fee	\$2,405.00	15-Jun-21
8346P310	11/077,628	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION	Issued	First Maintenance Fee	\$575.00	20-Apr-13
				Second Maintenance Fee	\$1,450.00	20-Apr-17
				Final Maintenance Fee	\$2,405.00	20-Apr-21
8346P310AU	2005329027	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - AUSTRALIA	Issued	Soft Working Deadline		23-Dec-13
8346P310CA	2,519,737	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION- CANADA	Pending	No current action - Annuity paid October 2012		
8346P310CN	200580030847	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - CHINA	Issued	No current action - Annuity paid October 2012		
8346P310EP	5108358.2	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION- EPO	Issued	No current action - Annuity paid October 2012		
8346P310HK	71025976	Apparatus and Method for Performing Motion Capture Using Shutter Synchronization	Issued	No current action - Annuity paid September 2012		
8346P310IN	1528/DELNP/2007	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - INDIA	Pending	No annuities until Examination.		

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Exhibits to Membership Interest and Asset Sale and Purchase Agreement						
BSTZ REF. NO.	SERIAL NO.	TITLE	STATUS	NEXT ACTION DUE:ACTIVITY NAME	ESTIMATE	NEXT ACTION DUE DATE
8346P310JP	2008-500696	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - JAPAN	Issued	Annuity due		18-Mar-14
8346P310KR	2007-7008614	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - KOREA	Allowed	Annuity due		7-Sep-15
8346P310NZ	553106	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING SHUTTER SYNCHRONIZATION - NEW ZEALAND	Issued	Request Sealing		29-Nov-11
				Soft Working Deadline		7-Nov-14
8346P313	11/255,854	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES	Pending	Amendment and Response to Final Office Action	\$4,000.00	23-Nov-12
8346P313CA	2,562,657	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES - CANADA	Pending			
8346P313HK	7111329.2	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES	Pending			
8346P313NZ	550347	APPARATUS AND METHOD FOR PERFORMING MOTION CAPTURE USING A RANDOM PATTERN ON CAPTURE SURFACES - NEW ZEALAND	Issued			
8346P315	11/449,127	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE USING PHOSPHOR APPLICATION TECHNIQUES	Issued	First Maintenance Fee	\$575.00	16-Dec-12
				Second Maintenance Fee	\$1,450.00	16-Dec-16
				Final Maintenance Fee	\$2,405.00	16-Dec-20
8346P315HK	9108597.1	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE USING PHOSPHOR APPLICATION TECHNIQUES	Pending	Annuity Due		6-Jun-15

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BSIZ REF. NO.	SERIAL NO.	TITLE	STATUS	NEXT ACTION DUE:ACTIVITY NAME	ESTIMATE	NEXT ACTION DUE DATE
8346P316	11/449,043	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE BY STROBING A FLUORESCENT LAMP	Issued	First Maintenance Fee	\$575.00	28-Jan-13
				Second Maintenance Fee	\$1,450.00	28-Jan-17
				Final Maintenance Fee	\$2,405.00	28-Jan-21
8346P317	11/449,131	SYSTEM AND METHOD FOR THREE DIMENSIONAL CAPTURE OF STOP-MOTION ANIMATED CHARACTERS	Issued	First Maintenance Fee	\$575.00	23-Aug-13
				Second Maintenance Fee	\$1,450.00	23-Aug-17
				Final Maintenance Fee	\$2,405.00	23-Aug-21
8346P318	11/888,377	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION	Issued	First Maintenance Fee	\$575.00	26-Dec-15
				Second Maintenance Fee	\$1,450.00	26-Dec-19
				Final Maintenance Fee	\$2,405.00	26-Dec-23
				First Maintenance Fee		
8346P318CA	2,659,572	SYSTEM AND METHOD FOR PERFORMING	Pending			
8346P318EP	7836403.1	SYSTEM AND METHOD FOR PERFORMING	Issued	Annuity Due		24-Jul-13
8346P318HK	10101176.2	SYSTEM AND METHOD FOR PERFORMING	Pending	Watch for Grant		
8346P318IN	PCT/US2007/017188	SYSTEM AND METHOD FOR PERFORMING	Pending	Awaiting first exam report		
8346P318KR	10-2009-7004437	SYSTEM AND METHOD FOR PERFORMING	Pending	Pending first office action		
8346P318NZ	574599	SYSTEM AND METHOD FOR PERFORMING	Issued	Annuity Due - 7th year	\$319.01	24-Jul-14
				Annuity Due - 10th year	\$506.66	24-Jul-17
				Annuity Due - 13th year	\$938.26	24-Jul-20
8346P318NZD	597473	SYSTEM AND METHOD FOR PERFORMING	Pending	Office Action Response	\$4,500.00	30-Mar-13
8346P364XCA	2,764,447	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP	Pending	Annuity due	\$297.00	3-Jun-13
8346P364XEP	10784126.4	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP	Pending	Annuity due	\$841.00	3-Jun-13

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Exhibits to Membership Interest and Asset Sale and Purchase Agreement						
BSTZ REF. NO.	SERIAL NO.	TITLE	STATUS	NEXT ACTION DUE:ACTIVITY NAME	ESTIMATE	NEXT ACTION DUE DATE
8346P364XEP	10784126.4	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP	Pending	Office Action Response	\$4,000.00	30-May-13
8346P364XNZ	597097	SYSTEM AND METHOD FOR PERFORMING MOTION CAPTURE AND IMAGE RECONSTRUCTION WITH TRANSPARENT MAKEUP	Pending	Office Action Response	\$4,500.00	19-Jan-14

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
OAKLAND DIVISION

18 REARDEN LLC, et al.,
Plaintiffs,
19
v.
20 THE WALT DISNEY COMPANY, *et al.*,
21 Defendants.

22 REARDEN LLC, *et al.*,
Plaintiffs,
23
v.
24 TWENTIETH CENTURY FOX FILM
25 CORPORATION, *et al.*,
26 Defendants.

No. 4:17–CV 04006-JST-SK
No. 4:17–CV-04191-JST-SK

**REDACTED VERSION OF
DOCUMENT SOUGHT TO BE
SEALED R. 79-5(D)(1)(d)**

**MEMORANDUM OF POINTS AND
AUTHORITIES IN OPPOSITION TO
MOTION FOR PARTIAL SUMMARY
JUDGMENT ON CAUSAL NEXUS
ISSUE**

Judge: Hon. Jon S. Tigar
Date: To be set
Time: To be set

Ctrm.: 6, 2nd Floor

OPPOSITION TO MOTION FOR PARTIAL
SUMMARY JUDGMENT ON CAUSAL NEXUS ISSUE
Case Nos.: 4:17-CV-04006; -04191-JST
005073-12/1386821 V1

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1	B.	Defendants’ argument that infringer profits are not available in software cases because users do not see the copied code, itself, is	
2		contrary to precedent.	21
3	C.	Defendants’ argument that MOVA is only “a preliminary step” of	
4		creating a motion picture is an <i>apportionment</i> argument, not relevant to	
		<i>causal nexus</i>	23
5	D.	Rearden’s theories do not rely on speculation or misunderstand	
6		copyright.	24
7	1.	Defendants assert only credibility issues with respect to their	
		use of “MOVA” in the films at issue to act as a draw to	
8		audiences.	24
9	2.	<i>Use</i> of software is not a defense to unlawful <i>copying</i> of	
		software.	25
10	CONCLUSION		25

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1	<u>TABLE OF AUTHORITIES</u>	
2		Page(s)
3	CASES	
4	<i>Anderson v. Liberty Lobby, Inc.</i> ,	
5	477 U.S. 242 (1986)	4
6	<i>Celotex Corp. v. Catrett</i> ,	
7	477 U.S. 317 (1986)	4
8	<i>Charter Sch. Capital, Inc. v. Charter Asset Mgmt. Fund, L.P.</i> ,	
9	2016 WL 5921062 (C.D. Cal. 2016)	6, 19
10	<i>Complex Sys., Inc. v. ABN Ambro Bank N.V.</i> ,	
11	2013 WL5970065 (S.D.N.Y. 2013)	23, 24
12	<i>Dash v. Mayweather</i> ,	
13	731 F.3d 303 (4th Cir. 2013)	20, 21, 23, 24
14	<i>Ellison v. Robertson</i> ,	
15	357 F.3d 1072 (9th Cir. 2004)	6
16	<i>Frank Music Corp. v. Metro-Goldwyn-Mayer Inc.</i> ,	
17	886 F.2d 1545 (9th Cir. 1989) (<i>Frank Music II</i>)	23
18	<i>Garcia v. Coleman</i> ,	
19	2009 WL 799393 (N.D. Cal. 2009)	6, 20
20	<i>Griffo v. Oculus VR, Inc.</i> ,	
21	2018 WL 6265067 (C.D. Cal. 2018)	6, 20
22	<i>Hendricks v. Physicians Skin & Weight Centers</i> ,	
23	2014 WL 12561621 (C.D. Cal. 2014)	6
24	<i>Lowrys Reports, Inc. v. Legg Mason, Inc.</i> ,	
25	271 F.Supp. 2d 737 (D. Md. 2003)	23
26	<i>Mackie v. Rieser</i> ,	
27	296 F.3d 909 (9th Cir. 2002)	<i>passim</i>
28	<i>MAI Sys. Corp. v. Peak Computer, Inc.</i> ,	
	991 F.2d 511 (9th Cir. 1993)	21, 25
	<i>Matsushita Elec. Indus. Co. v. Zenith Radio Corp.</i> ,	
	475 US 574 (1986)	4

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1	<i>Oracle America, Inc. v. Google, Inc.</i> ,	
2	2016 WL 234365 (N.D. Cal. 2016).....	21, 22
3	<i>Perfect 10, Inc. v. Giganews, Inc.</i> ,	
4	847 F.3d 657 (9th Cir. 2017).....	6
5	<i>Point 4 Data Corp. v. Tri-State Surgical Supply & Equip., Ltd.</i> ,	
6	2012 WL 3306575 (E.D.N.Y. 2012)	24
7	<i>Polar Bear Prod., Inc. v. Timex Corp.</i> ,	
8	384 F.3d 700 (9th Cir. 2004).....	4, 5, 6, 22
9	<i>Rearden LLC v. Crystal Dynamics, Inc.</i> ,	
10	2019 WL 8275254 (N.D. Cal. 2019).....	1, 7
11	<i>SHST v. Rearden</i> ,	
12	3:15-cv-00797 ECF No. 208-1	24
13	<i>Wall Data Inc. v. Los Angeles County Sherriff's Dept.</i> ,	
14	447 F.3d 769 (9th Cir. 1984).....	21
15	STATUTES	
16	17 U.S.C. § 101	21
17	17 U.S.C. § 504(b).....	<i>passim</i>
18	OTHER AUTHORITIES	
19	Fed. R. Civ. P. 56(a).....	4
20	H.R. Rep. No. 94-1476, § 504 (1976)	4
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INTRODUCTION

Rearden LLC and Rearden Mova LLC (collectively, “Rearden”) filed this vicarious and contributory copyright infringement case against defendants for copying Rearden’s Contour Reality Capture software (“Contour program”), a program that implements the Contour facial performance capture technology (“Contour system”). In addition to its lost profits, Rearden seeks the portion of defendants’ film profits that is attributable to their infringements of the Contour program copyright as authorized by 17 U.S.C. § 504(b) of the Copyright Act. Defendants have moved for partial summary judgment on a narrow damages issue. They argue that Rearden’s claim for a portion of their film profits requires proof that the profits were caused at least in part by their infringements, and that here the causal relationship is so attenuated that there can be no “nexus” as a matter of law.

But in the pages that follow, Rearden proves that defendants chose to expressly tout their use of “MOVA” when they marketed the films at issue to filmgoers.¹ It follows that a jury could reasonably conclude that their marketing efforts had the desired effect: they influenced at least in part filmgoer purchasing decisions. *See, Rearden LLC v. Crystal Dynamics, Inc.*, 2019 WL 8275254, *9 (N.D. Cal. 2019) (touting use of MOVA in video game promotion supports a jury inference that the infringer obtained direct financial benefit from Contour copyright infringement).

For example, Disney's *Beauty and the Beast* press kits touted its use of "MOVA" to make the computer graphics ("CG") Beast character, and MOVA's first ever use to make a CG romantic hero. The film's director Bill Condon and producer David Hoberman both repeatedly emphasized to the press Disney's use of MOVA to make the CG Beast. And actor Dan Stevens, who played the Beast, repeatedly described in interviews and press conferences how Disney used MOVA to capture his performance. In Disney's trailer for the film, the CG Beast—revealed to audiences for the first time—appeared almost exclusively in MOVA-based CG. Similarly, Marvel's president Kevin Feige described the use of MOVA to capture Josh Brolin's performance as Thanos in *Guardians of the Galaxy* to the press. Marvel issued a joint press release with Luma Pictures, the visual effects

¹ Defendants refer to the Contour system as “MOVA,” the name of the Rearden entity that offers Contour. Here, the two terms will be used interchangeably as context dictates.

is a matter of apportionment. Apportionment is Defendants' burden to prove under Section 504(b) of the Copyright Act, and it has *no relevance* to the issue of causal nexus raised by Defendants motion.

Accordingly, the Court should deny defendants' partial summary judgment motion.

BACKGROUND FACTS

Rearden invented the Contour facial performance capture system, which was publically unveiled on July 31, 2006. The Contour program that controls the system is copyright-protected.

Contour is an arc-shaped rig and computers running the Contour program to control 27 cameras and panels of natural and ultraviolet lights. The actor wears phosphor-based makeup, which provides thousands of glowing points of reference in a random pattern. During the performance, the Contour program alternately flashes the natural and ultraviolet lights more rapidly than the eye can detect, and alternately opens and closes the camera apertures to capture the performance under the natural lights. The captured video is fed into the Contour program, which processes it into “raw scans.” Then the raw scans are fed back into Contour to re-process them into a “tracked mesh,” which replicates the surface of the performer’s face in three dimensions from frame-to-frame at a sub-millimeter level of precision never before achievable with conventional hand animation or marker-based technologies. VFX artists can retarget the tracked mesh to the face of a CG character, such that the character’s face displays every subtle nuance of the actor’s captured facial performance.

Contour's unveiling created a sensation. Within days, production began on the first released film using the Contour system, *The Curious Case of Benjamin Button*. The photorealistic reverse-aging of Brad Pitt's face was widely lauded as a VFX milestone, winning an Oscar for Best Visual Effects. Thereafter, film studios lined up to hire Rearden to use the Contour system in fifteen films, including Disney's *TRON: Legacy*, *Pirates of the Caribbean: On Stranger Tides*, *John Carter*, and *The Avengers*, and Fox's *Percy Jackson and the Olympians: The Lightning Thief*.

Digital Domain 3.0 (“DD3”) wrongfully appropriated the Contour system. Defendants, acting through a spider’s web of gossamer subsidiaries, contracted with DD3 to perform facial performance capture on *Beauty and the Beast*, *Avengers: Age of Ultron*, *Guardians of the Galaxy*, *Deadpool*, *Night at the Museum: Secret of the Tomb*, and *Fantastic Four* (the “films at issue”).

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Each time defendants used the Contour system, whether for facial performance capture, processing captured video into raw scans, or re-processing raw scans into tracked mesh, each computer made a copy of the Contour program in random access memory (“RAM”). Each copy infringed the Contour program copyright, *likely thousands of infringements for the films at issue*.

ARGUMENT

I. REARDEN'S BURDEN ON SUMMARY JUDGMENT

A. The Summary Judgment Standard.

Under Fed. R. Civ. P. 56(a), a court may not grant a summary judgment motion unless there is “no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law.” *Celotex Corp. v. Catrett*, 477 U.S. 317, 322 (1986). A dispute is genuine “if the evidence is such that a reasonable jury could return a verdict for the nonmoving party.” *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248 (1986). The court cannot engage in credibility determinations or weighing of the evidence. *Id.*, at 255. Rather, the non-moving party’s evidence must be believed. *Id.* And the court must draw all reasonable inferences in favor of the nonmovant. *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 US 574, 587 (1986).

B. The Gross Revenue at Issue.

The Copyright Act provides for recovery of “any profits of the infringer that are attributable to the infringement.” 17 U.S.C. § 504(b). A copyright owner is entitled to an award of the infringer’s profits “[t]o take away incentives for would-be infringers” and “to prevent the infringer from unfairly benefitting from a wrongful act.” *Polar Bear Prod., Inc. v. Timex Corp.*, 384 F.3d 700, 708 (9th Cir. 2004); H.R. Rep. No. 94-1476, § 504, at 161 (1976). Both direct profits (from sales of infringing products), and indirect profits (from sales of products marketed or promoted by infringement), are recoverable. *Polar Bear*, 384 F.3d at 708, 710. The statute also divides the evidentiary burden for proving infringer profits between the parties: “In establishing the infringer’s profits, the copyright owner is required to present proof only of the infringer’s gross revenue, and the infringer is required to prove his or her deductible expenses and the elements of profit attributable to factors other than the copyrighted work.” *Id.*, at 707; 17 USC § 504(b).

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1	Although the plaintiff must prove only “gross revenue,” “the [‘attributable to the	
2	infringement’] causation element of the statute serves as a logical parameter to the range of gross	
3	profits a copyright plaintiff may seek.” <i>Polar Bear</i> , 384 F.3d at 711. Consequently, “a copyright	
4	owner is required to do more <i>initially</i> than toss up an undifferentiated gross revenue number; the	
5	revenue stream must bear a legally significant relationship to the infringement.” <i>Id.</i> , at 711. “[T]he	
6	plaintiff in a copyright action against a multidivision, multi-product company such as General Mills”	
7	may not simply “offer an overall gross revenue number—like \$11.5 billion—and sit back.” <i>Id.</i> , at	
8	711. “[C]laiming profits beyond what <i>might be</i> attributable to the infringement” is the “good deal of	
9	mischiefs” that the <i>Polar Bear</i> court said the causation element obviates. <i>Id.</i>	
10	Here, the “gross revenue” at issue is not defendants’ overall gross revenue from all their	
11	divisions, films, and other sources of revenue, but only the revenue from the specific films that	
12	defendants made and promoted by infringing the Contour program. Thus, for example, although The	
13	Walt Disney Company reported over \$55 billion in revenue from all sources for the fiscal year ended	
14	September 30, 2017 (<i>Beauty and the Beast</i> was released in March, 2017), ² the “gross revenue” at	
15	issue for that film here is only the revenue that Disney derived from <i>Beauty and the Beast</i> in 2017	
16	and thereafter (less any deductible expenses and apportionment that defendants may later prove at	
17	the apportionment stage). Accordingly, Rearden’s “gross revenue” claims meet the <i>initial</i> “logical	
18	parameter” and “legally significant relationship” requirements of <i>Polar Bear</i> . ³	
19	C. The Causal Nexus Between Gross Revenue and Infringement.	
20	Section 504(b) “creates a two-step framework for recovery of indirect profits: 1) the	
21	copyright claimant must first show a causal nexus between the infringement and the gross revenue;	
22	and 2) once the causal nexus is shown, the infringer bears the burden of apportioning the profits that	
23	were not the result of infringement.” <i>Id.</i> , at 711. In other words, causal nexus is a procedural fact	
24	issue in a copyright damages case, to shift the statutory burden from plaintiff (to prove gross	
25	revenue), to defendant (to prove expenses and profit attributable to non-infringing factors).	
26		
27	² https://thewaltdisneycompany.com/walt-disney-reports-fourth-quarter-full-year-earnings-fiscal-2017/	
28	³ Revenue and profit estimates for the films at issue are provided in Declaration of Phil Fier, ¶18.	
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On “summary judgment, a copyright infringement plaintiff seeking to recover indirect profits damages under 17 U.S.C. § 504(b) must proffer some evidence to create a triable issue regarding *whether the infringement at least partially caused the profits that the infringer generated as the result of the infringement.*” *Mackie v. Rieser*, 296 F.3d 909, 911 (9th Cir. 2002); *Polar Bear*, 384 F.3d at 711. The causal nexus element of a copyright *damages* case parallels the “direct financial benefit” element of a vicarious *infringement* case. “*Financial benefit exists where the availability of infringing material acts as a draw for customers.*” *Ellison v. Robertson*, 357 F.3d 1072, 1078 (9th Cir. 2004). “[T]he size of the ‘draw’ relative to a defendant’s overall business is immaterial.” *Perfect 10, Inc. v. Giganews, Inc.*, 847 F.3d 657, 673 (9th Cir. 2017). Rather, “[t]he essential aspect of the direct financial benefit inquiry is *whether there is a causal relationship between the infringing activity and any financial benefit a defendant reaps*, regardless of how substantial the benefit is in proportion to a defendant’s overall profits.” *Id.*, quoting *Ellison*, 357 F.3d at 1079.

To prove a causal nexus, Rearden is not required to submit declarations from filmgoers that their purchasing decisions were because of defendants' unauthorized copying. *Polar Bear*, 384 F.3d at 715; *Griffo v. Oculus VR, Inc.*, 2018 WL 6265067 at n. 13 (C.D. Cal. 2018); *Charter Sch. Capital, Inc. v. Charter Asset Mgmt. Fund, L.P.*, 2016 WL 5921062 at n. 3 (C.D. Cal. 2016). Nor is Rearden required to show that defendants' copying of Contour was the *only* or even the *main* reason for film revenue. *Griffo*, 2018 WL 6265067 at *12; *Garcia v. Coleman*, 2009 WL 799393 at *4 (N.D. Cal. 2009); *see also*, *Mackie*, 296 F.3d at 911 (plaintiff must proffer evidence that the infringement “*at least partially* caused the profits that the infringer generated as the result of the infringement.”). And causal nexus may be proved by circumstantial evidence. *Polar Bear*, 384 F.3d at 712; *Hendricks v. Physicians Skin & Weight Centers*, 2014 WL 12561621, *3 (C.D. Cal. 2014).

II. DEFENDANTS' UNAUTHORIZED COPYING OF THE CONTOUR PROGRAM AT LEAST PARTIALLY CAUSED REVENUE AND AVOIDANCE OF EXPENSE.

A. Defendants promoted their use of “MOVA” in the films at issue to act as a draw to filmgoers for the films at issue.

Before this case was filed, defendants firmly believed that “MOVA” would serve as a draw to filmgoers, because they advertised their use of MOVA when promoting the films at issue. Based on

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1 this evidence, a jury could reasonably infer that defendants were correct in viewing MOVA as a
2 draw to filmgoers. *See, Crystal Dynamics*, 2019 WL 8275254 at *9 (advertising use of MOVA to
3 promote a video game supports jury inference that infringer benefitted directly from infringement).

4 **1. Print, press conferences, interviews, and social media “MOVA” promotions.**

5 As early as March 4, 2015, two years before *Beauty and the Beast*’s release, a film publicity
6 firm hired by Disney identified the transformation of Dan Stevens into the Beast as a subject in
7 which audiences would be interested. Rachel Kennedy, of Rachel Kennedy PR, wrote an email to
8 director Bill Condon and producer David Hoberman with the subject “B&B: Beast development
9 (Behind the scenes),” in which she said that cameramen would document Stevens’s transformation:

10 [REDACTED]

11 [REDACTED]

12
13 Ex. 1.⁴ Hoberman testified that Disney hired Ms. Kennedy to interest people in *Beauty and the Beast*
14 to get them to see the film:

15 [REDACTED]

16 [REDACTED]

17 [REDACTED]

18 [REDACTED]

19 [REDACTED]

20 [REDACTED]

21 [REDACTED]

22 [REDACTED]

23 [REDACTED]

24 Ex. 2 (Hoberman 37:1-25).

25 Disney agreed that audiences would have [REDACTED] for [REDACTED] Before
26 the film’s release, Disney prepared production notes and a press kit to provide information about the

27
28 ⁴ Unless specified otherwise, “Ex.” refers to exhibits to the Declaration of Mark Carlson.

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1 film that Disney believed would interest filmgoers. Ex. 3 (press kit); Ex. 4 (production notes); Ex. 2
2 (Hoberman 65:9-67:15); Ex. 5 (Condon 32:18-34:9; 45:2-21). The press kit repeatedly touts
3 Disney’s use of “MOVA” in the film. For example, under the heading [REDACTED]
4 [REDACTED] the press kit described how MOVA was a [REDACTED] to the film’s success:

5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 Ex. 3, at DIS-REARDEN-07968; Ex. 4, at MAND-REARDEN-01027. Disney’s press kit also
11 described how the key MOVA facial capture technology worked:

12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 Ex. 3, at DIS-REARDEN-07969; Ex. 4, at MAND-REARDEN-01028.
16 One month before the film’s release, on February 20, 2017, the director and cast of *Beauty*
17 *and the Beast* appeared at a press conference in Paris, published worldwide on YouTube, where Dan
18 Stevens, the actor who portrayed the Beast, introduced “MOVA” to the press:

19 the facial capture was done separately using a technology called
20 **MOVA**. So every ten days, two weeks, we would go into—I would go
21 into a booth—spray my face with UV paint and 27 little cameras
22 would capture the facial expressions of all the scenes that we had done
23 on previous days. [Co-star] Emma [Watson] would be sitting outside
24 of the cage, and we would play the scenes again, just capturing the
25 face. They would take that information, morph it into the Beast, his
26 face, and map it onto the body that I’d puppeteered on the set.
27 Ex. 6, at 12:10-13:18; Ex. 5 (Condon 104:14-25; 106:25-107:8); Ex. 7 at 0:55-2:32.⁵ Emma Watson,
28 who played Belle opposite Stevens’s Beast, picked up on the press kits’ “new technology” theme,
and emphasized that “when you see Beast on screen, there is something so human about him, and so

⁵ Mr. Stevens was an authorized representative and spokesperson for Disney. Ex. 8.
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1	kind of, <i>it really captures the subtlety of Dan’s facial expressions and the performance that he gives,</i>	
2	<i>which is, I don’t think the world has seen anything like it before, because its really unique to our</i>	
3	<i>film.”</i> Ex. 6 at 13:56-14:19 ⁶ ; Ex. 5 (Condon 107:10-21); Ex. 7 at 2:43-3:34. Director Bill Condon	
4	underscored MOVA’s importance to the film, continued the “new technology” theme, and credited	
5	MOVA with allowing Stevens’s performance to come through to the CG Beast in the film:	
6	And yes, to your point about, this was, this was one of the scariest	
7	challenges jumping into this movie that we had somebody who was at the	
8	emotional center of the movie, who was the romantic hero of the movie,	
9	who was going to be a CG character, you know, and it was this new process	
	which, you know usually its dots like this and then, and then animators fill	
	in the dots. <i>But this actually captured every pore of Dan’s skin, and that’s</i>	
	<i>why so much of him comes, this great performance comes through.</i>	
10	Ex. 6 at 14:34-15:01 ⁷ ; Ex. 5 (Condon, 107:22-109:9); Ex. 7 at 3:44-5:13. And he told a story about	
11	the MOVA facial performance capture for the film’s iconic waltz scene that poignantly emphasizes	
12	the impact that Disney believed audiences could expect from its use of MOVA in the film:	
13	I tell this story about a visual effects supervisor from LA, and her	
14	daughter came to visit while he was doing the oddest thing, which was,	
15	we were playing Beauty and the Beast, and Dan was just doing the	
	facial expressions imagining that he is dancing with Emma, we	
	finished the take, the girl hadn’t seen it shot live, but she was crying,	
	just from what he was expressing on his face.	
16	Ex. 6 at 15:02-15:42; Ex. 5 (Condon, 108:22-109:9); Ex. 7 at 5:13-6:19. Disney captured that	
17	performance using MOVA. Ex. 5 (Condon 19:14-20:6).	
18	Similarly, before the IMAX advance screening, broadcast on Facebook worldwide on March	
19	6, 2017 just over a week before the film’s release, Mr. Stevens re-introduced “MOVA” to the	
20	audience, and continued the theme of how Disney had used it in a new way for a romantic lead:	
21	And, uh, I would go, after a day’s filming, ... and my face would be	
22	sprayed with UV dots, about ten thousand dots, and I’d sit in this, what	
23	I liked to call the TRON cage, which is sort of a UV, UV lights and 27	
24	little cameras, and we’d play all of our scenes again. And Emma	
	would be sitting outside the cage, and I would be inside just, you	
	know, doing anything that I’d been doing the previous two weeks, uh	
	week, with my face, whether it was eating or sleeping or roaring or	
	waltzing, I would sit there and just do it all. And they’d take that	
	information, take it away, morph it into the Beast, and map it onto the	
	body that I had puppeteered on the set. <i>So it’s an amazing fusion of</i>	
27	⁶ Ms. Watson, too, was an authorized representative and spokesperson for Disney. Ex. 9.	
28	⁷ Mr. Condon was also an authorized representative and spokesperson for Disney. Ex. 10.	
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1 *these technologies and it’s never really been used this extensively*
2 *before, certainly not for a romantic lead.*
3 Ex. 11 at 11:33-12:31; Ex. 5 (Condon, 20:18-22:8, 27:11-15; 109:12-110:9); Ex. 12. Stevens made
4 virtually identical comments promoting Disney’s use of MOVA in interviews with Fox 5 Online on
5 March 4, 2017 (Ex. 15 at 2:37-4:10), People Magazine Online on March 16, 2017 (Ex. 13 at 0:59-
6 1:40), and People.com on March 17, 2017 (Ex. 14), the day of the film’s theatrical release.

7 Condon produced a set of talking points for an interview to promote the DVD release of
8 *Beauty and the Beast*, which touted Disney’s use of “MOVA” for the first CG romantic hero:

9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED]

21 Ex. 16; Ex. 5 (Condon, 28:8-31:23). And Condon admitted that it was “MOVA” that allowed the
22 capture of [REDACTED]:

23 [REDACTED]
24 [REDACTED]
25 [REDACTED]
26 [REDACTED]
27 [REDACTED]
28 [REDACTED]

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1 [REDACTED]
2 [REDACTED]
3 Ex. 5 (Condon 31:10-23). Similarly, Hoberman produced a set of interview talking points describing
4 Disney’s use of “MOVA” in the film for the press:

5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 Ex. 17; Ex. 2 (Hoberman 73:9-16; 74:14-25; 77:4-16).

14 Disney’s use of “MOVA” in *Beauty and the Beast* was picked up by journalists. In the
15 March 8, 2017 *New York Times* review, titled [REDACTED]
16 [REDACTED] the critic described the MOVA technology Disney had used to make the CG Beast:

17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 Ex. 18, at DIS-REARDEN-011288.

21 **2. “MOVA” promotion for *Guardians of the Galaxy* as a draw to filmgoers.**

22 Defendants promoted the use of “MOVA” in other films at issue, as well. For example, on
23 July 26, 2014, Kevin Feige, the CEO of Marvel Studios, described the importance of using MOVA
24 to capture Josh Brolin’s performance as Thanos in *Guardians of the Galaxy*:

25 Well, yeah. Utilizing technology is what all these movies are about. I would
26 say that the technology – it’s not just, certainly with Thanos, it’s not just a
27 vocal performance. It’s a facial performance. [...] You want a great
28 performance and the reason we were comfortable moving forward with
seeing as much Thanos as we do in *Guardians* is because we had a great actor
who was willing to put the dots on his face and do the performance.

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Ex. 19. And Marvel issued a joint press release with Luma Pictures (the VFX studio for the CG Thanos character) touting *Guardians*’s use of MOVA:



Ex. 20, at DIS-REARDEN-0942.

3. The *Beauty and the Beast* and *Deadpool* Featurettes touted “MOVA.”

Disney continued advertising its use of “MOVA” after the film’s theatrical release, for sales of DVDs, Blu-rays, and streaming. The *Beauty of a Tale* featurette featured interviews of Condon and Stevens about Disney’s use of MOVA, intercut throughout with clips of Stevens’s MOVA facial performance capture. Ex. 21, at 24:28-25:53. Condon credited MOVA’s capture of Stevens’s performance for making a Beast that audiences could believe in, and for making the film work:

Condon: And then when it came to his face, we used a technology which allowed us not to have to put a big rig of cameras around him as always happens in a CG performance. He was just himself so Emma could play off of him. But then at night, he would have to go into this rig and he would sit there and recreate his performance. *Id.*

Stevens: It’s a separate facial capture, which is a whole other challenge, so you have to kind of think yourself back into the scenes that you shot many, one or two weeks ago, and without moving your body, you know, just moving your face do, do the scenes whether they have lines in or not. *Id.*

Condon: So he gets his face sprayed, which means every single muscle is captured, every pore, and that’s why I think so much of Dan’s performance comes through, because every twitch is captured. *Id.*

Condon: There have been a lot of great CG performances. But this was a romantic hero, someone who was at the emotional center of the movie. *I always said we could get everything else in this movie right, but if we didn’t get a Beast that people believed in, then it wouldn’t work. Id.*

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1 And Condon confirmed in his deposition that he was speaking of “MOVA” in that interview:

2 [REDACTED]
3 [REDACTED]

4 [REDACTED]

5 [REDACTED]
6 [REDACTED]

7 [REDACTED]
8 [REDACTED]

9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED]
13 [REDACTED]

14 Ex. 5 (Condon 58:9-59:18).

15 Fox similarly touted its use of “MOVA” in a promotional featurette for *Deadpool*. Visual
16 Effects Supervisor Pauline Duvall described Fox’s use of MOVA in the Blu-ray/DVD/streaming
17 promotional featurette called *From Comics to Screen...to Screen: MAGIC!*:

18 Digital Domain has a great system called ‘MOVA’, which is a facial
19 capture system. You paint on the face and it creates thousands and
20 thousands of little tracking markers. At that point, you get a piece of
geometry that captures movement and acting of the actor.

21 Ex. 22.

22 **B. The Beast Reveal Trailer relied on Contour-based clips as a draw to filmgoers.**

23 On November 14, 2016, Disney unveiled a *Beauty and the Beast* trailer, revealing the CG
24 Beast to audiences. Ex. 23. The Beast appeared almost entirely in MOVA-based film clips. The
25 trailer featured eleven clips of the Beast, and Mr. Condon confirmed that at least *nine* were based on
26 “MOVA.” Ex. 5 (Condon 110:14-114:13); Ex. 23 at 0:54-57; 0:59-1:03; 1:24-:26; 1:33-:36; 1:36-
27 :40; 1:41-:43, 1:53-:54; 1:55-56; 1:56-:58; Ex. 24. Shortly after the trailer’s release on YouTube,
28 Disney reported it had set a new record with *over 127 million views in the first 24 hours*, and was

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1 among the top-trending videos on YouTube. Ex. 25 (RFA 2-3). Within the first half hour of the
2 trailer’s launch, #BeautyAndTheBeast was the leading trend worldwide on Twitter. *Id.*, (RFA 4).
3 And the trailer’s success was reported in the media. Ex. 26; Ex. 5 (Condon, 56:8-57:1).

4 A 2018 National Research Group (“NRG”) report prepared for Fox entitled [REDACTED]
5 [REDACTED] concluded that [REDACTED]
6 (Ex. 27 (FOX-REARDEN-01375)), trailers were [REDACTED]
7 [REDACTED] (*Id.*), [REDACTED]
8 [REDACTED] (*Id.*, at 01377), and for moviegoers between 18 and 45 years old, [REDACTED]
9 [REDACTED] (*Id.*, at 01378). Most pertinently, the NRG report found that [REDACTED]
10 [REDACTED]. *Id.*, at 01379. Hoberman confirmed this finding:

11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED]
16 [REDACTED]
17 [REDACTED]

18 Ex. 2 (Hoberman 55:6-17).

19 Philip Fier, former Vice President and Chief Financial Officer of 20th Century Fox
20 International and current owner of Focus Advisory Services LLC, agrees that trailers drive film
21 attendance. Fier Dec. ¶¶19-28. And he confirmed the NRG conclusion independently. *Id.*, at ¶¶20-
22 21. He testifies by declaration that the *Beauty and the Beast* trailer released on November 14, 2016
23 was exceptionally successful, that the Beast was an important factor in its appeal, and that at least
24 some moviegoers likely saw the film at least partially because of the trailer. Fier Decl. ¶¶19-29.

25 **C. The Contour system was critical to humanize the CG Beast so that audiences could**
26 **empathize with him and believe that Belle could love him.**

27 In making *Beauty and the Beast*, it was important to show the human within the Beast, so that
28 audiences could empathize with him. The Disney press kit stressed this point:

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1	[REDACTED]	
2	[REDACTED]	
3		
4	Ex. 3, at DIS-REARDEN-07968. Condon agreed. He said of the Paris press conference:	
5	[REDACTED]	
6	[REDACTED]	
7	[REDACTED]	
8		
9	[REDACTED]	
10	[REDACTED]	
11	[REDACTED]	
12	[REDACTED]	
13	[REDACTED]	
14	[REDACTED]	
15	[REDACTED]	
16		
17	[REDACTED]	
18	[REDACTED]	
19	[REDACTED]	
20	[REDACTED]	
21	[REDACTED]	
22	Ex. 5 (Condon 13:1-14:17); Ex. 6 (14:34-15:02). Hoberman agreed that showing the Beast’s human	
23	side was important so filmgoers could empathize with him and believe Belle could love him:	
24	[REDACTED]	
25	[REDACTED]	
26		
27	[REDACTED]	
28		
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1	[REDACTED]
2	[REDACTED]
3	[REDACTED]
4	
5	Ex. 2 (Hoberman 10:17-11:3). He believed that to get a Beast the audience could empathize with, it
6	was important to capture as much of Stevens’s performance as possible and transfer it to the Beast:
7	[REDACTED]
8	[REDACTED]
9	[REDACTED]
10	[REDACTED]
11	[REDACTED]
12	[REDACTED]
13	[REDACTED]
14	[REDACTED]
15	Ex. 2 (Hoberman 51:2-20).
16	Condon agreed. Ex. 5 (Condon 40:11-15). Speaking of the Facebook IMAX advance-
17	screening press conference, Condon confirmed that it was MOVA that made it possible to preserve
18	the human nuances of Mr. Stevens’s performance:
19	[REDACTED]
20	[REDACTED]
21	[REDACTED]
22	
23	<i>Id.</i> (Condon 26:25-27:10); Ex. 11 (11:33-12:31). Stevens confirmed Condon and Hoberman in his
24	People.com interview. After describing how MOVA was used to capture his facial performance in
25	<i>Beauty and the Beast</i> , he stated:
26	The British actor adds that he and director Bill Condon, along with the
27	effects team, <i>went that extra mile with facial capture in order for</i>
28	<i>audiences to be able to see Beast’s human qualities.</i>
	Ex. 14.
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Professor Angela Tinwell agrees. Dr. Tinwell is uniquely qualified to shed light on the central issue here—whether the copying of the Contour program inherent in defendants’ use of the system likely influenced filmgoers—because she studies human reactions to CG characters. Tinwell Decl. ¶¶ 1-5, Tinwell Ex. A. By declaration, she explains that human beings are intensely sensitive to subtle nuances in the facial expressions of others, and her research confirms that this sensitivity extends to CG characters. *Id.*, ¶¶ 10, 25-35. If these expressions are not faithfully captured in CG characters, viewers are likely to respond adversely. *Id.* Adverse reactions may extend from uneasiness to dread, but most pertinently, her research demonstrates that when CG characters’ facial expressions lack expected subtle nuances, viewers *are unable to empathize with the CG characters*. *Id.*, at ¶¶36-38. Her research shows that children exhibit this same adverse response to CG characters lacking natural facial expression, *and it is particularly acute in young girls*. *Id.*, ¶¶39-41.

Dr. Tinwell correlated this adverse response to CG characters lacking expected nuance in their facial expressions with examples of films that featured them and did poorly at the box office. *Id.*, ¶¶42-66. All of the poor-performing films used conventional key framing or low-density marker-based facial capture. *Id.* The subtlety and nuance of natural human facial expression was beyond these technologies to reproduce within the constraints of film budgets and production schedules. *Id.* at ¶71. Dr. Tinwell contrasted these films with the advent of high-density facial performance capture, the first being the Contour system, capable of capturing all of the subtlety and nuance of an actor's facial expression. *Id.*, ¶¶67-71. As an example, she cites *The Curious Case of Benjamin Button*, one of the first released films that used Contour. *Id.*, ¶¶72-78.

Disney used the Contour system extensively in *Beauty and the Beast* in hundreds of shots: Condon testified that *he needed a “MOVA reference” of Stevens whenever a shot included the Beast*. Ex. 5 (Condon 42:15-43:8). Rather than comment on all, Dr. Tinwell closely examined several popular scenes from *Beauty and the Beast*, and demonstrated how the Contour system captured the subtle nuances required for the CG Beast to express genuine human emotion to audiences.

The Library Scene. The Beast introduces Belle to his library. Belle, amazed, gasps “Have you read all of them?” And the Beast replies humorously, “Well, not all of them, some of them are

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1 in Greek.” Delighted, Belle asks “Is that a joke? Are you making jokes now?” Tinwell Decl. Ex. 5.
2 Hoberman reported to Condon that Alan Horn, Chairman of Walt Disney Studios, asked to fine-tune
3 the Beast’s facial expression in this scene because he regarded it as most important to show another
4 side of the Beast. Ex. 29. This scene was based on “MOVA.” Ex. 5 (Condon 50:4-51:8; 112:13-
5 22); Ex. 30. And a portion appears in the trailer. Ex. 23 at 1:36-40; Ex 24 at 2:54-3:14.

6 Dr. Tinwell viewed both this scene from the film and a clip produced by DD3 showing how
7 the Beast’s facial expressions were created using the Contour system. Tinwell Decl. ¶80; Exs. 4, 5.
8 She notes how non-verbal communication captured in Stevens’s performance and transferred to the
9 CG Beast’s face provided essential context for the audience to appreciate the new humorous side of
10 the Beast’s character. Tinwell Decl. ¶¶ 80-88.

11 **The Waltz Scene.** The Beast and Belle dance a waltz in the castle’s ballroom. Tinwell Decl.
12 Ex. 6. Not a word is spoken. As early as August 14, 2014, in a first meeting with the director,
13 Condon identified the importance of this scene, as the point where [REDACTED]
14 [REDACTED] Ex. 31. Mr. Condon confirmed that the waltz
15 scene was based on “MOVA” facial performance capture. Ex. 5 (Condon 19:14-20:6; 114:7-13).
16 And portions appear in the trailer. Ex. 23 at 1:41-43; 1:56-58; Ex 24 at 4:41-4:57.

17 In this scene, Dr. Tinwell identified subtle non-verbal communication in the flare of the
18 Beast’s nostrils, the corners of his lips, his cheeks and brows that “would not have been possible
19 without capturing the full range of facial expressions that Dan Stevens performed in his MOVA
20 facial performance capture that were retargeted onto the animated Beast.” Tinwell Decl. ¶¶ 89-95.

21 **The Snowball Scene.** The Beast and Belle are outside in the snow, and he is startled when
22 she throws a snowball at him. He throws one at her in return. Tinwell Decl. Ex. 7. Condon
23 confirmed that this scene was based on “MOVA.” Ex. 5 (Condon 149:17-150:4).

24 In 2011, Dr. Tinwell performed human experiments involving subjects viewing CG
25 characters purporting to show a startled expression, and found that a lack of upper facial movement
26 in CG characters invoked an uneasy response compared to the control group. Tinwell Decl. ¶95. In
27 the Snowball Scene, she identifies brow lifts and other non-verbal communication that the audience
28

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1 expects from a startled human-like character. *Id.* She also identifies non-verbal communication in
2 the Beast’s inner brow and cheek that allows the CG Beast to convincingly express concentration
3 (for throwing) and delight (in hitting his target). *Id.*, at ¶¶96-97.

4 Stevens’s facial performance captured using Contour gave audiences a human-like Beast they
5 could believe in, empathize with, and believe that Belle could romantically love. Tinwell Decl. ¶10.
6 “[F]ewer film-goers would have seen *Beauty and the Beast* originally, whether in theaters, on DVD
7 or Blu-ray, or by streaming, and fewer would have seen the film more than once, if MOVA Contour
8 facial performance capture had not been used in the Beast’s animation pipeline.” *Id.* Consequently,
9 “at least some of the film’s revenue can be directly attributed to the use of MOVA Contour facial
10 motion capture for Dan Stevens’s facial performance as the Beast.” *Id.*

11 **D. Use of the Contour system avoided significant cost of hand animation by VFX artists**
12 **to approximate the level of subtle nuance that “came for free” with Contour.**

13 Revenue and expense are two sides of the same coin; in other words, all else being equal, an
14 increase in revenue or reduction of expense equals increased profit. In the causal nexus inquiry, it is
15 appropriate to consider whether infringement caused avoidance of increased costs. *Charter Sch.*
16 *Capital, Inc. v. Charter Asset Mgmt. Fund, LP*, 2016 WL 5921062, *3 (C.D. Cal. 2016).

17 In his PhD thesis, defendants’ expert Hao Li wrote that [REDACTED]
18 [REDACTED]
19 [REDACTED] Ex. 32 (Li 66:7-13). He
20 agreed that high-resolution facial performance capture reduces time and labor:

21 [REDACTED]
22 [REDACTED]
23 [REDACTED]
24 [REDACTED]
25 [REDACTED]

26 *Id.* (Li 67:16-68:5). And Dr. Tinwell agrees. Tinwell Decl. ¶¶71, 104, 107. Defendants’
27 unauthorized copying of the Contour program allowed the Contour system to achieve natural, subtle,

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1 nuanced, human facial expression that otherwise would have required substantial additional animator
2 person-hours—and consequently substantial additional expense—to even approximate. *Id.*

3 **III. DEFENDANTS’ SUMMARY JUDGMENT ARGUMENTS ARE NOT PERSUASIVE**

4 **A. That defendants can hypothesize “innumerable” or “myriad” reasons why a**
5 **moviegoer might see a film does not make the causal nexus to revenue speculative.**

6 Defendants hypothesize numerous reasons why a purchaser might have seen a film, but this
7 does not make the infringement’s causal nexus to revenue speculative *per se*. Their argument runs
8 counter to longstanding Ninth Circuit precedent that a copyright owner is not required to prove
9 causal nexus by showing that the infringement was the *only* reason *or even the main reason* for the
10 infringer’s revenue. *Griffo*, 2018 WL 6265067 at *12; *Garcia*, 2009 WL 799393 at *4; *see also*,
11 *Mackie*, 296 F.3d at 911 (plaintiff seeking indirect profits must offer evidence that the infringement
12 “*at least partially* caused the profits that the infringer generated as the result of the infringement.”).

13 Defendants rely on cases that simply do not apply. In *Mackie*, 296 F.3d 909 (9th Cir. 2002),
14 the infringement was a picture of Mackie’s art, called The Tango—the dance steps of the tango cast
15 in bronze and set into a concrete sidewalk. It was inserted in a brochure for the Seattle Symphony’s
16 concert season. But the brochure “*advertised a series of concerts that were unrelated to the artwork*
17 *itself.*” *Mackie*, 296 F.3d at 916. The Symphony did not use The Tango to *make* the concert
18 performances. And the Symphony did not tell potential audiences about The Tango, how it works,
19 how the Symphony had used it in concert performances, or that The Tango was new and used by the
20 Symphony in a new way in concert performances. It did not use The Tango as a draw to audiences.

21 Similarly, in *Dash v. Mayweather*, 731 F.3d 303 (4th Cir. 2013) the infringement was a song
22 played for boxer Floyd Mayweather’s entrance to Wrestlemania events that copied Dash’s song
23 “Yep.” But World Wrestling Entertainment did not use Yep to promote the events to potential
24 audiences, it did not tell potential audiences that Yep was a new song that would be used in the
25 events in a way never before heard. It did not use Yep as a draw to audiences.

26 And in both cases, the ruling that a causal nexus had not been proved by the copyright holder
27 rested on the copyright holder’s *failure to produce proof*. The Court’s ruling in *Mackie* was based on
28 Mackie’s expert’s admission “*that he could not ‘understand’ how it would be possible to establish a*

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1	causal link between the Symphony’s infringing use of ‘The Tango’ and any Pops series revenues	
2	generated through the inclusion of the collage in the direct-mail literature.” Mackie, 296 F.3d at	
3	916. And Dash argued that he was not required to submit any evidence linking the WWE revenue	
4	streams to the infringement. Dash, 731 F.3d at 332. In that context—with no evidence linking	
5	revenue to infringement—the courts could not find a causal link where other plausible audience	
6	draws were possible. But here, Rearden has submitted on-point expert testimony from Dr. Tinwell	
7	and Mr. Fier supporting a causal nexus between Defendants’ infringements of Contour and their	
8	revenue from the films at issue, as well as substantial other evidence that defendants used MOVA in	
9	their promotion of the films at issue to act as a draw to audiences, and as a means to reduce cost.	
10	B. Defendants’ argument that infringer profits are not available in software cases	
11	because users do not see the copied code, itself, is contrary to precedent.	
12	The Copyright Act defines a “computer program” as “a set of statements or instructions to be	
13	used directly or indirectly in a computer in order to bring about a certain result.” 17 U.S.C. § 101.	
14	The Ninth Circuit has “long held that a computer program is copyrightable as a ‘tangible medium of	
15	expression.’” Wall Data Inc. v. Los Angeles County Sherriff’s Dept., 447 F.3d 769, 776-77 (9th Cir.	
16	1984). The unauthorized copying of copyrighted software into RAM made when using the software	
17	is a copyright infringement. MAI Sys. Corp. v. Peak Computer, Inc., 991 F.2d 511, 518 (9th Cir.	
18	1993). And the copyright owner is entitled to recover for this infringement its actual damages and	
19	the portion of the infringer’s profits attributable to the infringement. 17 U.S.C. § 504(b).	
20	Defendants argue that a software copyright owner cannot recover infringer profits if “no	
21	consumer saw (or could have seen) the infringing copy of ... software residing in computer RAM.”	
22	EDF No. 249 at 16. But that argument is contrary to Oracle America, Inc. v. Google, Inc., 2016 WL	
23	234365 (N.D. Cal. 2016). Oracle sued Google for infringement of its copyright in the Java software,	
24	alleging Google copied the declaring code and structure, sequence, and organization of 37 Java API	
25	packages in its Android operating system. Id., at *1. Oracle sought indirect profits from Google’s	
26	infringements, including advertising and search revenue from Android devices. Id. Obviously, no	
27	Android user who performed searches on Android devices ever saw the copyrighted Java source	
28	code on their screens. Yet when Google moved to exclude Oracle’s expert’s testimony regarding	
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1	gross advertising and search revenues on the ground that the causal nexus between infringement and	
2	revenue was too attenuated, the Court held that the expert’s rebuttal report contained a “platform	
3	contribution factor” theory that could satisfy the causal link requirement. <i>Id.</i> , at *5. There was no	
4	requirement that Oracle must prove that any Android user ever saw the copied Java code itself.	
5	Nor does <i>Polar Bear</i> support defendants’ argument. <i>Polar Bear</i> won at trial on its claim that	
6	Timex infringed its copyright in an “extreme kayaking” video that Timex used to promote its	
7	“Expedition” brand watches. The verdict awarded Timex’s profits from three sources: (1) direct	
8	sales at trade shows where the video played; (2) a promotion for a soft drink that used a video still;	
9	and (3) <i>overall enhancement of brand prestige that allowed Timex to raise prices on all Expedition</i>	
10	<i>watches based on their association with the video. Polar Bear</i> , 384 F.3d at 712. <i>Affirming</i> the	
11	verdict for <i>Polar Bear</i> on (1) and (2), the Court rejected the “brand prestige enhancement” theory.	
12	Defendants misrepresent <i>Polar Bear</i> ’s rejection of the “brand prestige enhancement” theory	
13	as resting on the fact that “[a]ctual retail purchasers were never exposed to the infringing images	
14	from the trade shows” (ECF No. 249 17:1-4). But that sentence continued “ <i>nor did the evidence link</i>	
15	<i>retail consumers to the trade show promotion,</i> ” “[<i>n</i>]or was there evidence that vendors at the trade	
16	<i>shows somehow transmitted enthusiasm to retail customers.</i> ” <i>Polar Bear</i> , 384 F.3d at 715. The	
17	Court concluded <i>Polar Bear</i> ’s evidence was insufficient to link infringement to “brand prestige”	
18	profits “because they do not explain how the infringement influenced the purchasing decisions that	
19	lead to increased prices and ultimately to increased profits.” <i>Id. Polar Bear</i> did not lay down a new	
20	rule that no copyright holder can recover infringer profits unless customers saw the infringing copy.	
21	Rather, the Court held that with no evidence that customers were exposed to the infringement <i>and no</i>	
22	<i>other evidence linking the infringement to profits</i> , the “brand prestige enhancement” theory failed.	
23	But here, the very link that was missing in <i>Polar Bear</i> is supplied by defendants, themselves,	
24	because they introduced the “MOVA” technology to potential audiences when promoting the films at	
25	issue, and used “MOVA” to act as a draw to filmgoers to see the films.	
26		
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1 **C. Defendants’ argument that MOVA is only “a preliminary step” of creating a motion**
2 **picture is an apportionment argument, not relevant to causal nexus.**

3 Defendants argue that “the actual use of the software made only a minute contribution to the
4 completed Motion Pictures,” and “[t]hat contribution was dwarfed by innumerable other creative
5 efforts” *Id.* at 17. Their “Factual Background” details each step in the CG character animation
6 pipeline after defendants’ infringing copying of Contour: the “hundreds or even thousands of hours
7 of human labor and artistry” required, “the performances of many actors,” the script, sets, costumes,
8 music, and “the work of hundreds of other creative and technical personnel.” *Id.*, at 10, 13, 14.

9 But the Ninth Circuit treats “the creativity of producers, performers and others involved in
10 staging,” costumes, and sets as matters that “will largely be taken into account when deducting the
11 defendants’ costs.” *Frank Music Corp. v. Metro-Goldwyn-Mayer Inc.*, 886 F.2d 1545, 1549 (9th Cir.
12 1989) (*Frank Music II*). In other words, they are part of the apportionment stage, where the burden
13 shifts to defendants to prove expenses and elements not attributable to the infringement. The parties
14 agree that we cannot “skip to the apportionment stage” in this motion. ECF No. 249 at 23.

15 Defendants’ reliance on *Lowrys Reports, Inc. v. Legg Mason, Inc.*, 271 F.Supp. 2d 737 (D.
16 Md. 2003) is misplaced. Lowrys owned the copyrights in stock market analyses that Legg Mason
17 infringed, and sought an apportionment of all \$4.63 billion of Legg Mason’s gross revenue. But
18 Lowrys’s expert *admitted he could not say whether the infringements were causally related to Legg*
19 *Mason’s profits. Id.* So Lowrys is like *Mackie*, where the plaintiff’s expert admitted he could not
20 say revenue was causally related to the infringement, or *Dash* where the plaintiff proffered no causal
21 evidence. *And in the absence of evidence of causation*, the court found the correlation speculative.
22 There was no evidence that Legg Mason advertised its use of Lowrys Reports as a draw to investors,
23 as defendants did here when they used MOVA to act as a draw to potential audiences. And Rearden
24 has presented on-point expert testimony of a causal link between infringement and profit.

25 Similarly, in *Complex Sys., Inc. v. ABN Ambro Bank N.V.*, 2013 WL5970065 (S.D.N.Y.
26 2013), CSI’s expert Smith, like *Mackie*, testified that he knew of no impact the infringement had on
27 Ambro’s revenue. *Id.*, at *9-11. And unlike here, the bank’s Chief Administrative Officer testified
28 that it “*does not promote its use of BankTrade [(the infringing software)] to its customers.*” *Id.*, at

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1	*12. The Court concluded “[i]n this ruling, the Court does not suggest that there is no scenario in	
2	which a copyright holder—and even CSI on a different record—could demonstrate a sufficient	
3	causal nexus, <i>even when multiple factors are contributing to a company’s profits.</i> ” <i>Id.</i> , at 14.	
4	And in <i>Point 4 Data Corp. v. Tri-State Surgical Supply & Equip., Ltd.</i> , 2012 WL 3306575	
5	(E.D.N.Y. 2012), the plaintiff sought indirect profits from a medical supply business because of its	
6	use of infringing backroom software for processing orders, invoices, financials, and inventories.	
7	Like <i>Mackie</i> , the medical supplies sold were “unrelated to” the back room infringement. Nor did	
8	Tri-State promote its use of Point 4’s software as new, never before seen, as a draw to customers.	
9	Finally, defendants argue that the availability of Disney’s own Industrial Light & Magic	
10	software (Medusa) and two other products that “could have provided the same functionality as	
11	MOVA” makes causal nexus “even more remote” here. But when this Court enjoined DD3’s further	
12	use of the Contour system on June 17, 2016 (<i>SHST v. Rearden</i> , 3:15-cv-00797 ECF No. 208-1),	
13	while DD3 was still working on <i>Beauty and the Beast</i> , DD3’s President O.D. Welch filed	
14	declarations stating that the work <i>could not be completed without access to Contour</i> . SHST ECF No.	
15	208-1 ¶13, ECF No. 222-2 ¶3. And the Special Master has found in that case that DD3 continued	
16	using Contour in violation of the injunction for over a month. SHST ECF No. 577 at 2-3. If it were	
17	true, as defendants argue, that other non-infringing software provided the same functionality as	
18	Contour, then DD3 would have opted for that software rather than continue using Contour in	
19	violation of this Court’s injunction. Defendants cite <i>Complex Sys.</i> , 2013 WL 5970065 * 11, but there	
20	the court only recited deposition testimony in the opinion’s fact section that is not relied upon in the	
21	court’s analysis. And they cite to a footnote in the Fourth Circuit’s <i>Dash</i> , 731 F.3d at 332 n. 18, but	
22	that footnote plays no role in the court’s analysis. At best, defendants rely on <i>dictum</i> .	
23	D. Rearden’s theories do not rely on speculation or misunderstand copyright.	
24	1. Defendants assert only credibility issues with respect to their use of “MOVA”	
25	in the films at issue to act as a draw to audiences.	
26	Defendants argue that in the studio, director, producer, and cast comments and studio	
27	documents touting use of “MOVA,” “[t]he references to MOVA ... are general references to the	
28	entire facial motion capture process, which comprised of a host of non-MOVA hardware and	
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1	software tools and non-copyrightable processes.” ECF No. 246 at 20. But the record belies this	
2	argument. See evidence cited at pages 7-14, above. In fact, Condon testified he did not even know	
3	about the other animation processes that defendants refer to here. Ex. 5 (Condon 185:11-186:24;	
4	187:23-189:10). Defendants argue that their witnesses meant, and their documents were intended, to	
5	say something different from what they actually said. And they are free to do so <i>at trial</i> . But this	
6	argument presents only credibility issues that cannot be resolved here on summary judgment.	
7	2. <u>Use of software is not a defense to unlawful <i>copying</i> of software.</u>	
8	Defendants try to confuse matters by arguing that Rearden’s claim for copying the Contour	
9	program is a claim for <i>use</i> of the program, and use is not protected by copyright. ECF No. 246 at 21-	
10	22. Their argument is pure sophistry. Their own expert, Hao Li, conceded that every time a	
11	computer uses the Contour program, it makes a copy of the program into RAM. Ex. 32 (Li 108:19-	
12	109:4); ECF No. 249-15 at ¶16. And the Ninth Circuit has held that, if unauthorized, this copy into	
13	RAM is a copyright infringement. <i>MAI</i> , 991 F.2d at 518. The Copyright Act does not make use of	
14	software an exception to the copyright owner’s exclusive right to make and authorize reproduction of	
15	a protected work, nor does it make use of software a defense to copyright infringement. And <i>MAI</i>	
16	refutes Defendants’ argument, because if copying software into RAM is an impermissible copyright	
17	claim for <i>use</i> of the software, then there could have been no infringement in <i>MAI</i> .	
18	<u>CONCLUSION</u>	
19	Defendants chose to use the “magic” of MOVA in repeated descriptions of its software-	
20	implemented technology to <i>promote</i> the films at issue to potential audiences, to create a sense of	
21	<i>excitement and anticipation</i> in potential audiences, to give them the impression that they would see	
22	something <i>new and revolutionary</i> in the films at issue, <u>to act as a draw to audiences</u> . And that	
23	choice paid off in some measure of film profit to be determined at the apportionment stage of the	
24	damages trial in this case. But the consequence of that choice is a trail of documentary, video, and	
25	testimonial evidence of the causal nexus between defendants’ infringements of the Contour program	
26	and revenue of the films at issue. Accordingly, the Court should deny defendants’ Motions for	
27	Partial Summary Judgment on Causal Nexus Issue.	
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1	DATED: November 18, 2020	HAGENS BERMAN SOBOL SHAPIRO LLP
2		
3		By: <u>/s/ Mark Carlson</u>
4		Mark Carlson
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	OPPOSITION TO MOTION FOR PARTIAL SUMMARY JUDGMENT ON CAUSAL NEXUS ISSUE Case Nos.: 4:17-CV-04006; -04191-JST	
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15	UNITED STATES DISTRICT COURT	
	NORTHERN DISTRICT OF CALIFORNIA	
16	OAKLAND DIVISION	
17	REARDEN LLC, et al.,	No. 4:17–CV 04006-JST-SK
18	Plaintiffs,	No. 4:17–CV-04191-JST-SK
19	v.	DECLARATION OF ROGER VAN
	THE WALT DISNEY COMPANY, <i>et al.</i> ,	DER LAAN IN OPPOSITION TO
20	Defendants.	DEFENDANTS’ MOTION TO
21		EXCLUDE PORTIONS OF
		DECLARATION OF ANGELA
22	REARDEN LLC, et al.,	TINWELL
23	Plaintiffs,	Judge: Hon. Jon S. Tigar
	v.	Date: To be set
24	TWENTIETH CENTURY FOX FILM	Time: To be set
25	CORPORATION, <i>et al.</i> ,	Ctrm.: 6, 2 nd Floor
26	Defendants.	
27		
28	DECLARATION OF ROGER VAN DER LAAN IN OPPOSITION TO DEFENDANTS’ MOTION TO EXCLUDE TINWELL DECLARATION Case No. 4:17-cv-04006; -4191-JST	

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1 I, Roger van der Laan, declare as follows:

2 1. I am currently employed by Rearden LLC as Vice President of Engineering. I have

3 personal knowledge of the facts stated in this declaration, and could testify with respect to those facts

4 under oath if called upon to do so.

5 2. I am co-inventor of MOVA[®] Contour[®] Reality Capture technology, and a co-recipient

6 of the Science and Technology Academy Award[®] for MOVA Contour. I currently hold 76 U.S.

7 Patents, of which 8 are related to the invention of MOVA Contour.

8 3. I am also Vice President of Engineering in multiple Rearden LLC companies,

9 including MOVA. A true and correct copy from MOVA’s website regarding my role is attached

10 hereto as Exhibit A.

11 4. I was directly involved in using MOVA Contour to capture Brad Pitt’s face in the

12 production of “The Curious Case of Benjamin Button” (released in 2008), working together with

13 Digital Domain’s production staff. I was informed by Digital Domain that MOVA Contour was used

14 for the shots that showed Brad Pitt looking older, but not for shots that showed him looking younger.

15 Public information later published by Digital Domain staff stated the same.

16 5. Attached hereto as Exhibit B is a true and correct copy of an interview¹ of one of

17 Digital Domain’s production staff who worked on “The Curious Case of Benjamin Button”, Eric

18 Barba, in which he states [emphasis added]:

19 ... we were going to be using Brad Pitt’s performance to drive *older* versions of

20 his physiology, basically re-targetting the performance to an *older* version of himself ...

21 we used the Mova rig to capture Brad’s facial shapes.

22 ... for the first 52 minutes of the film [when Benjamin Button is much older than

23 Brad Pitt] it’s a full 3D head, there were 325 individual shots. There’s no projection,

24 there’s no 2D techniques. Once our work stops about 52 minutes in [when Benjamin

25 Button is slightly older than Brad Pitt], Brad takes over in makeup. Ultimately as

¹ Seymour, Mike, “*The Curious Case of Aging Visual Effects*”, fxguide, January 1, 2009, https://www.fxguide.com/featured/the_curious_case_of_aging_visual_effects/

DECLARATION OF ROGER VAN DER LAAN
IN OPPOSITION TO DEFENDANTS’ MOTION
TO EXCLUDE TINWELL DECLARATION
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18	UNITED STATES DISTRICT COURT		
19	NORTHERN DISTRICT OF CALIFORNIA		
20	OAKLAND DIVISION		
21	REARDEN LLC et al.,	Case Nos.	4:17-cv-04006-JST
	Plaintiffs,		4:17-cv-04191-JST
22	vs.	DECLARATION OF VINCENT CIRELLI IN SUPPORT OF DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT ON CAUSAL NEXUS ISSUE	
23	THE WALT DISNEY COMPANY et al.,		
	Defendants,		
24	REARDEN LLC et al.,	Judge:	Hon. Jon S. Tigar
25	Plaintiffs,	Date:	To be set
26	vs.	Time:	To be set
27	TWENTIETH CENTURY FOX FILM CORPORATION et al.,	Ctrm.:	6 (2nd Floor)
28	Defendants.		
		Case Nos. 17-cv-04006, 17-cv-04191	
		DECLARATION OF VINCENT CIRELLI	

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1 I, Vincent Cirelli, hereby declare:

2 1. I am a senior visual effects supervisor at Luma Pictures (“Luma”). Luma was hired as a

3 visual special effects vendor for the movies *Guardians of the Galaxy* and *Avengers: Age of Ultron*;

4 I supervised Luma’s work for those movies, including work on the character of Thanos in each of

5 the movies. I have personal knowledge of the contents of this declaration. If called as a witness in

6 this action, I could and would testify competently to the contents of this declaration.

7 2. I understand that Plaintiffs’ claims in the above-captioned case relate to facial motion

8 capture work in connection with the character “Thanos” in *Guardians of the Galaxy* and *Avengers:*

9 *Age of Ultron*.

10 3. I supervised the creation of the Thanos character for those movies. The creation of the

11 Thanos character used facial motion capture data from the visual effects studio DD3. My

12 understanding is that DD3 used the MOVA system to assist with capturing and processing this

13 facial motion capture data. Luma’s process for creating the Thanos character for *Guardians of the*

14 *Galaxy* and *Avengers: Age of Ultron* was as follows:

15 4. We received facial motion capture data from DD3 containing data about the movement of

16 the actor’s (Josh Brolin) face excluding areas around the eyes and the lips. An image of a tracked

17 mesh with facial capture data points appears below. We compiled a full library of the actor’s

18 facial expressions in the tracked mesh.



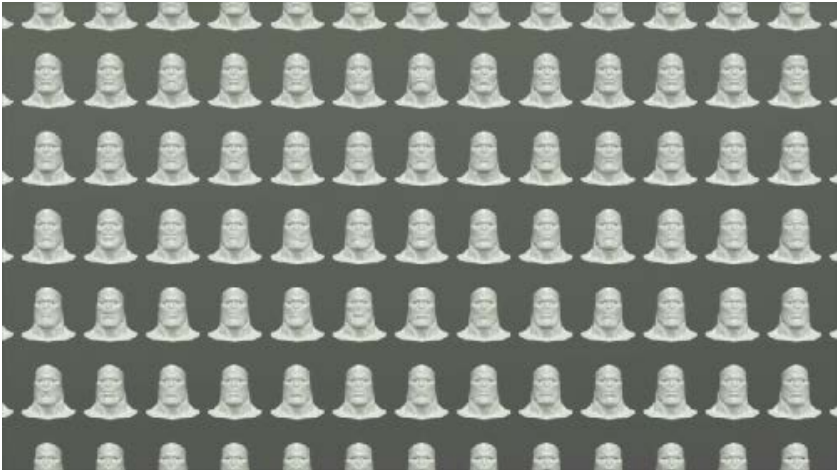
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5. We separately created a 3D model of the Thanos character, called a “rig” or “target rig.” The Thanos rig was created entirely from scratch by digital artists and animators at Luma. The Thanos rig was developed to perform a range of facial expressions; every facial expression in the library of Thanos rigs was likewise handsculpted by digital artists or animators. The following three images show (a) a set of Thanos rigs performing a variety of facial expressions; (b) a close-up Thanos rig with a neutral facial expression; and (c) a close-up Thanos rig with a different facial expression. Each of these images depicts the target rig before the use of any MOVA data. At this point the Thanos rig could be further hand animated to create dialogue if needed, and pushed through the pipeline to create a photoreal Thanos.



6. Our programmers developed a proprietary software called Face2Face, which made it possible to analyze the point movement of the MOVA-derived tracked mesh data, deriving a formula of how facial shapes contribute to the MOVA data, which then allows us to better understand timing and shapes to trigger in the Thanos rig. Even for those expressions that were based on the MOVA-captured performance processed through Face2Face, every line of the

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1 performance was either retargeted, replaced or accentuated by hand by our animators to create the
2 creature known as Thanos. This is due to the performance needing to be embellished to
3 characterize an aesthetic of the imaginary creature, and also because the proportions of Thanos
4 and the human face are very different. In addition, the original data from DD3 omits information
5 about eyelids, eyes, and the mouth—arguably the most expressive components of any character
6 performance. Accordingly, for MOVA-captured expressions, animators had to hand-sculpt the
7 eyes and lip regions of the facial expressions.

8 7. We initially experimented with mapping the tracked mesh directly onto the Thanos rig,
9 without further processing through Face2Face. This was unworkable and failed to produce usable
10 facial motion. In fact, this direct mapping produced facial motion that was memorable only
11 because it was amusing.

12 8. After facial motion was successfully built into the Thanos rig, substantial further effort by
13 animators and digital artists was necessary to develop the facial rig into the final deliverable to the
14 studio.

- 15 a. We had to model Thanos’s face to add skin color, texture, shading, and other details.
16 These details were manually designed and added to the Thanos rig, and required
17 substantial artistic and manual effort. For example, we used hand-painted computer-
18 generated textures using the software MARI to provide texture to Thanos’s skin, as
19 well as his metal armor. The purple color of Thanos’s skin was a particular challenge
20 and required substantial testing to perfect. The images below are (a) a sample from the
21 process of layering hand-painted textures onto Thanos’s face using the Mari software;



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1 and (b) a sample from the process of modeling facial hair (*i.e.*, stubble) onto Thanos’s
2 face:

3 b. We also developed additional tools in simulation to add the movement of the skin
4 across the surface of the face, as well as blood scattering, wrinkles, and other types of
5 movement. We used software called nCloth to simulate the consistency of skin, and
6 understand how it moves and slides on the face. Luma developed proprietary scripts
7 running inside MAYA to simulate blood scattering. Animators then worked to further
8 refine and perfect the skin movement. The image below is a sample from the process
9 of refining the movement of Thanos’s facial skin by hand:



16 c. Our final deliverable to the studio production team was the rendered character
17 combined with the entire scene, so we were also responsible for rendering the
18 character. Rendering is a complex process to transform the 3D computer file of the
19 character into a 2D image that can be depicted onscreen. It can be very time-
20 consuming, and involves understanding such subtle details as how the light falls on the
21 scene. The images below are (a) a sample from the process of perfecting the light
22 reflected on Thanos’s face; and (b) four sample images that show a few of the different
23 visualizations of the Thanos face that are involved in the rendering process:



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9. The following image depicts Thanos’s face as it ultimately appeared onscreen in a Luma-created shot.



10. The facial motion capture data Luma received from DD3 is a starting point—giving certain cues to our animators and digital artists for some facial movement, timing, and cues in the underlying performance—but its usefulness ends there. For instance, picking up from the point where DD3 provided the MOVA-captured data for *Guardians of the Galaxy*, nearly 60 Luma artists and supervisors were involved in creating the Thanos shots, logging nearly 4,000 hours working specifically on the Thanos character, and over 7,000 more hours on lighting and compositing Thanos and the other elements in the shots. In my experience, the lion’s share of time spent on lighting and compositing are focused on the character, especially in this situation given the Thanos character’s significance in those scenes.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct and that I executed this declaration this _____ day of February, 2019 at Los Angeles, California.


Vincent Cirelli

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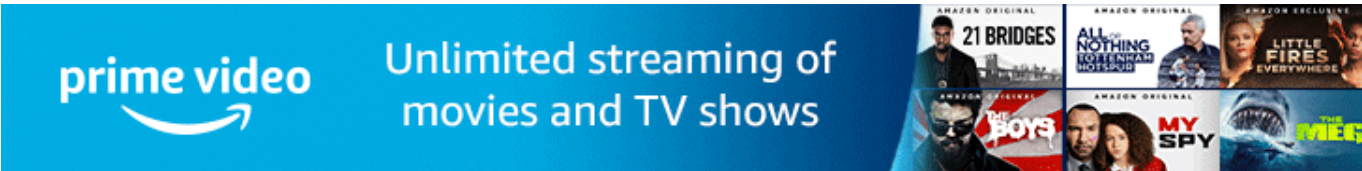
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“I’ve
been
waiting a
long time
for this”
mutters
Clu, the
digital

reincarnation of Jeff Bridges’ Kevin Flynn, echoing the thoughts of thousands of **Tron** fans worldwide. 28 years ago the original **Tron** was wowing 80’s audiences with its ground

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breaking use of visual technology. Nearly three decades on, Joseph Kosinski's *Tron: Legacy* (2010) is set to follow in its forerunner's digital footsteps. After surviving the gladiatorial battles inside the Master Control Program's 'Grid', Bridges' Flynn goes on to head the huge computer company ENCOM, achieving fame and fortune after creating games based on his time inside the digital world.

After Flynn suddenly disappears, he leaves behind an embittered son in Sam (Garrett Hedlund), and a legacy shrouded in mystery. *Tron: Legacy* joins the 27 year old Sam, shirking away from the ENCOM empire his father revitalised. When a message appears from nowhere luring him to the world that stole his father's attention, Sam finds himself transported into an unimaginable world where he must battle Clu, a digital replica of his own father, in order to escape. Fresh in the wake of James Cameron's visually inspiring *Avatar* (2009), the hugely anticipated *Tron: Legacy* pushes the realms of visual effects even further. The moment a red-rimmed 'Recognizer' hones into view, the audience is introduced to an intimidatingly dark, yet indisputably beautiful vision of an utopian digital world gone haywire.

After three years of production and post production, *Tron: Legacy's* ingenious use of the increasingly popular motion capture technology – instrumental in producing films such as *Avatar* and David Fincher's *The Curious Case of Benjamin Button* (2008) – not only allows its cast to fully integrate with the world of The Grid but also leads to a youthful Jeff Bridges appearing as Clu, inherently unaffected by ageing, throughout the film. Although at points it is obvious that Clu's face has been digitally captured and imposed, its implementation should nevertheless be applauded as it allows the story to progress in ways that would never have been imaginable just a few years ago.



The set designs and costumes, although highly modernised, also hark back to original *Tron*, whilst the world of The Grid itself offers a modernised vision of the dystopian worlds imagined in *Blade Runner* (1982), *Total Recall* (1990) and the original *Tron*. The film's unique style is further heightened by its soundtrack, composed by French electronic music

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duo Daft Punk, who seem to have been created for this purpose alone. Enhancing the visual experience by providing an awe-inspiring soundscape, Daft Punk’s score captures the very essence of the world of **Tron** effortlessly.

With **Tron: Legacy**, first time director Joseph Kosinski has created a sequel that has truly been worth the wait. For an entire generation, **Tron** marked a new era in film technology and its baton has successfully been passed on to its spectacular sequel. The only question now is whether there will be another thirty year wait for part three.

Naomi Barnwell

[http://www.player.filmtrailer.com/v3.4/player.swf?
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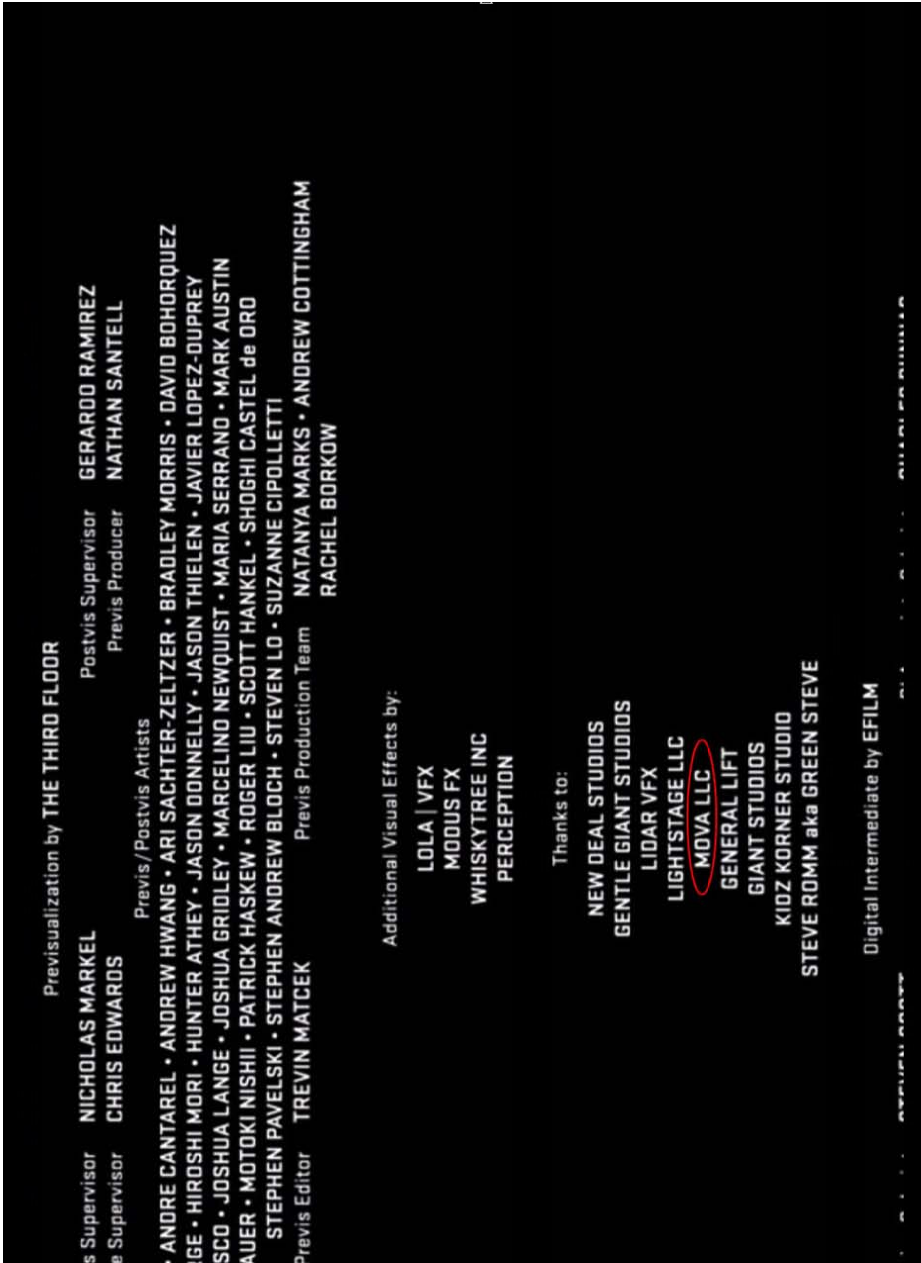
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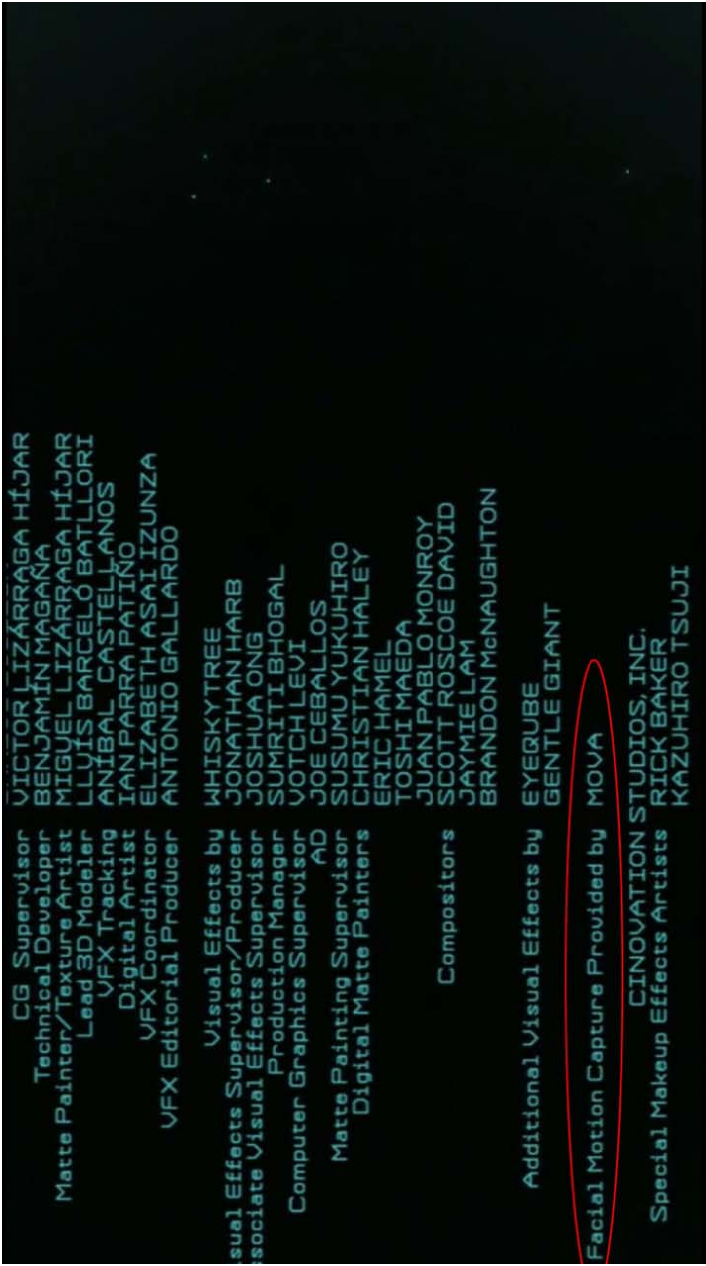
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≡ 
Award-winning writer, filmmaker

Jeff Bridges Double Feature: True Grit and Tron: Legacy

12/28/2010 03:42 pm ET | Updated Dec 06, 2017



Usually when somebody discovers that I review movies, they ask my favorite. My answer hasn't changed in nearly twenty years: *The Fisher King*. Why? Director Terry Gilliam. Screenwriter Richard LaGravenese. Oscar-winner Mercedes Ruehl. Amanda Plummer. Robin Williams. Tom Waits! Opens with Ray Charles, closes with Harry Nilsson! It's a brilliant, pertinent, modern-yet-timeless and peculiarly-moving story — set in both of the real worlds: inner and outer. For me, the movie is an absolute crackerjack of a litmus test for people's perceptions and intelligence (i.e.: When they blankly say they hate it or "don't understand it," I know I'm talking to a wall). Entertaining, yet useful. And at its heart?



Jeff Bridges is *the* actor for my generation of moviegoers. Before the Academy finally deigned to acknowledge him with an Oscar for last year’s *Crazy Heart*, we loved him in *King Kong* (1976), in *Starman* (1984), in *Tucker* (1988), in *Fearless* (1993), and in a couple of modest little art films called *The Big Lebowski* (1998) and *Iron Man* (2008). Those are just a few of his standout roles, and he always brings good stuff — but honestly, we don’t go to his movies due to any vast acting range; we go because we love Jeff Bridges.

Presently (domestically, anyway), we’re getting a terrific double-shot of Jeff, in *Tron: Legacy* and *True Grit* — a very unlikely sequel and a very unlikely adaptation, respectively.



“Dude, what’s up with your face?” Bridges gets a CG facelift to become Clu.

First off, let’s not mince words: I grew up with *Tron*, and thus *Tron: Legacy* is immensely welcome, if also — after twenty-eight years! — absurdly tardy. Briefly, for the uninitiated, the *Tron* mini-franchise concerns jilted programmer-and-videogamer genius Kevin Flynn (Bridges), who in the first movie gets zapped into the cyberspace “Game Grid” where he must compete in flashy events involving neon Frisbees and zooming “light cycles,” before teaming up with anthropomorphic, heroic and eponymous program Tron (Bruce Boxleitner) to defeat the fascistic Emperor and Darth Vader — oops, the Master Control Program and its secretary of state, Sark (both played by the chilling David Warner). It was revolutionary and cool. There is no shame in liking it.

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significantly and rather sexily evolved (examples: California is now located in British Columbia, and neon Frisbees have become neon Aerobies), but Flynn has gotten stuck in the digital domain for two decades, leaving his son Sam (Garrett Hedlund: more blank than Sam Worthington if that’s possible) to grow up, pine, pout, rev Dad’s Ducati, style himself like some generic Gap ad, do shirtless and cute-little-dog for the female box-office demographic, and eventually hit the Grid himself, to search for Dad, for bitchin’ cyber-gladiatorial contests, and for hands-down-the-hottest-chick-ever (Olivia Wilde, née Cockburn).



All I want for Christmas.

And there’s the thing: These movies give me stuff I want: from the scintillating visuals to the smart otherworldly metaphors to unabashed male gratification (Sam not only gets Hottest Chick Ever: she’s hardwired with improbably-wise-and-noble Dad’s personal programming). I know this adolescent ruse going in, so although the dialogue grows corny, the props peculiar (vintage books and roast suckling pig in cyberspace?) and now *Tron* (which aggressively borrows toys and visuals and even the “Wilhelm scream” from *Star Wars*, plus stuff from *Bond* films) is even filching elements from *The Matrix* (the fetish gear, the cyber-rave chic), a franchise which wouldn’t — couldn’t — exist without the original *Tron*, nonetheless I dig this sleek, wild, thrilling milieu. It’s basically *Alice in Wonderland* for boys — or, referencing another Disney property, *Donald Duck in Mathmagic Land* for techies.

With Bridges as guide, now playing four distinct variations (three with impressive CG facelifts: 35-ish real-world Flynn, 35-ish Grid Flynn, Flynn’s eternally-35-ish digital avatar CLU — plus 60-ish cyber-guru Flynn), *Tron: Legacy* delivers — for the Bridges fan, for the *Tron* fan, for the soundtrack fan (I’ll take Daft Punk over Philip Glass any day) and for the sci-fi/adventure fan. Out-of-nowhere director Joseph Kosinski (who teases his next movie

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exciting and captivating overall work with this sequel (from the swooping battles to those clever res-lines on the flashbacks) that I’m kicking myself for not thinking of it immediately when I graduated film school. The concepts and designs of the original *Tron* find a satisfying evolution here, and newcomers are in for an epic ride.

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Flynn seeks “a digital frontier to reshape the human condition.”

(Dude, it’s called Facebook.)

Such relatability is absolutely not the case for me with *True Grit*, which I viewed, initially somewhat reluctantly, the night before *Tron: Legacy*. Here we have beloved Bridges going whole-hog loco (and he’s superb: a Dude in decay) — but I haven’t read the book, have only seen snatches of the original movie, I don’t like Westerns, I didn’t like the Coen brothers’ ham-fisted *No Country for Old Men* (*No Movie for Bored Men*, I call it), and until now I haven’t been capable of looking at Matt Damon without feeling some terrible sense of injustice in the universe.

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Rooster carries that weight — a long time.

The happy news is that *True Grit* (2010) is tight, smart, funny and compelling, revealing co-writers/co-directors Joel and Ethan Coen in fine form, and showcasing Bridges as Marshal Reuben J. “Rooster” Cogburn — the role for which a one-lunged John Wayne won the Oscar — and Bridges rises (or is it shambles?) to the occasion. Narratively, I was instantly reminded of Luc Besson’s *Léon/The Professional*, as here we have a salty bounty hunter commissioned by and partnered with a very demanding young girl to avenge a murder in her family. But where teenie Natalie Portman gave Besson’s film a plausible vulnerability (and very few laughs), here instead Hailee Steinfeld adopts (presumably at the Coens’ insistence) a severe and icy formalism, lacing the film with outrageously arch dialogue and stopping just short of hilarious caricature.

True Grit is a minor (and surely lower-budget) Western in terms of scale and spectacle, and the characters encountered along the sporadically gruesome ride (including Damon as a persnickety Texas Ranger) are much more fun than the half-cocked heavies (Josh Brolin, Barry Pepper) at the end. But the interplay between Bridges (“I am a foolish old man who has been drawn into an adventure with a harpie in trousers, and a nincompoop”) and the disarmingly mature Steinfeld (“He is not my friend — he has abandoned me to a congress of louts”) will be fetching plentiful accolades.

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1/14/2021 Case 4:17-cv-04006-JST Jeff Bridges Double Feature - The Grit and Tron Legacy | HuffPost Document 286-12 Filed 01/15/21 Page 7 of 12



Meet the Oscar coup: Jeff Bridges and Hailee Steinfeld.

Also note that both *Tron: Legacy* and *True Grit* reveal today’s Bridges as rough-hewn guru (“You’re messing with my Zen thing, man!”), grown plump and weary on the frontier (be it Cyberspace or Old West) and aching for some useful mode of self-sacrifice. This theme is blatant in both films. However, like most fantasy films (ironically, isn’t a Western essentially a fantasy?), *Tron: Legacy* will meet with haughty critical derision — fellow movie geeks posing as manly men don’t fool me for a millicycle — but I advise closer scrutiny of its subtext. Bridges’ CG-rendered computer-program character CLU (a.k.a. Codified Likeness Utility and *Tron: Legacy*’s chief baddie) is the key: Although underwritten, I see in insane, villainous CLU the idealism of naive Baby Boomer fantasies gone sour, cynical and tyrannical — enslaving all other programs in desperate pursuit of a false and unattainable perfection, a note which the film boldly makes explicit. But there’s a moral obligation here, too: as, after all the cyber-tumbling and CG hijinks, only 60-ish Boomer Bridges, as Flynn — the Maker of the mess — is capable of, and responsible for, cleaning it all up after himself. Meanwhile, his spoilt and somewhat spiteful spawn cries to the other unseasoned and self-absorbed light-cyclists: “Hey! We gotta work together! It’s the only way!” Indeed. Good luck, Gen-Y.

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I confess my long-term love for all things fantastic, including *Tron*.

Both of these films offer the opportunity to catch Bridges at the peak of his craft, and, genres be damned, there’s true grit in *Tron: Legacy*, too. As the Master Control Program says: “End of line.”

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TRON: Legacy -Disney+ Talk

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'TRON: Legacy' is the sequel to the 1982 film 'TRON' and stars Jeff Bridges, Garrett Hedlund and Olivia Wilde. Hedlund plays Sam Flynn, son of Kevin Flynn, the original creator of the TRON game. After his father disappears, Sam finds himself thrust into the digital world that Kevin had



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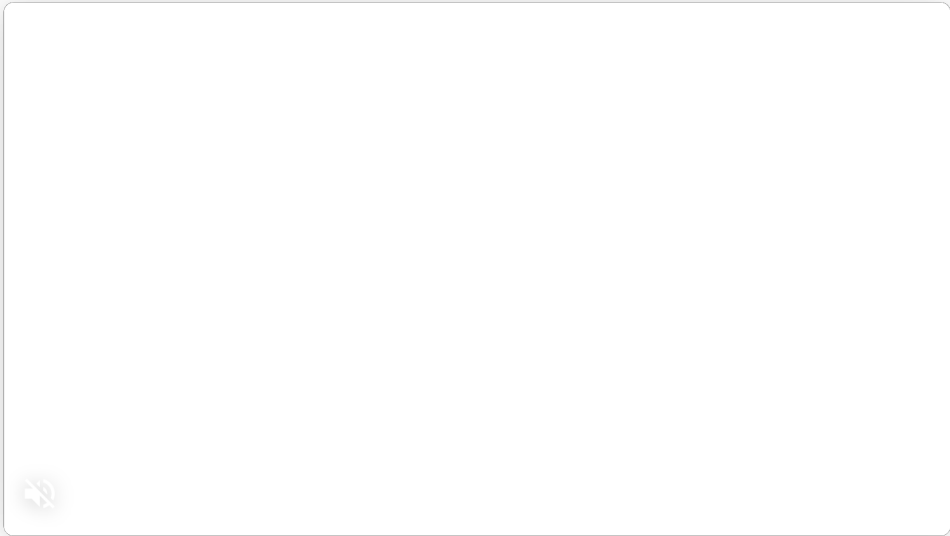
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When this film came out, I saw it three times in the cinema: once in 2D, once in 3D and once in IMAX 3D. At the time of its release, I loved the film despite it getting mixed reviews. However, I hadn't seen it since then. So, when I saw that 'TRON: Legacy' was on Disney+, I decided to give the film another watch and see whether it was a bad film disguised by the amazing 3D, the awesome soundtrack and the incredible visuals, or whether it is actually a good film.

And now that I've watched it 10 years after its initial release, I still really enjoy 'TRON: Legacy'. However, I also accept that, while the story is interesting, it's more the experience that the focus should be on. Garrett Hedlund and Jeff Bridge work well together and their father/son relationship is believable. Even Jeff Bridges is menacing as C.L.U, who is constantly thriving for his own image of perfection.



C.L.U was one of the earliest examples of Disney experimenting with de-aging technology, something that is now used in films such as 'Star Wars: Rouge One', 'Captain Marvel' and 'Avengers: Endgame'. And, while it looks a little dated now, it's not jarring to look at. This was a sign that Disney knew how to handle the technology.

The plot is a basic A-to-B type story; get Sam and Kevin Flynn out of the digital world that they're trapped in before the portal they need to use to travel back closes. However, the journey is incredible to look at. The visuals still hold up today and make the digital world look sleek and stylish. Vehicles from the source material have been given a modern makeover and, while they look a lot more updated and colourful, they're still recognizable. The visuals are a character here, and it's obvious why it was an aspect of the film that was talked about the most.



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perfect companion to this gorgeous piece of work; it was nominated for 12 awards, including a Grammy Award for Best Score and it's clear why. A soundtrack should either accompany the visuals or elevate it, and this soundtrack did both effortlessly.



The decision to have Daft Punk create it made sense; they were partly influenced by the original, so fit in perfectly. Even today, I still listen to the soundtrack.

Overall, 'TRON: Legacy' is not only a film, but an experience. It was the perfect film to watch in IMAX to really showcase what the technology could do. While the plot is something that's been repeated countless times, it's the visuals and the soundtrack that should be focused on here. And, in that regard, it's an amazing piece of work. Now, if only TRON 3 would happen...

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Megan Williams

Megan's taste in films are interesting: her favourite films are 'Space Jam', Studio Ghibli's 'The Cat Returns', as well as horror films 'Saw', 'Drag Me To Hell' and 'Ju-On: The Grudge'. When she's not watching films, she'll be spending precious hours playing 'Crash Bandicoot'.

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Rating:
Think back a bit. How many times have you heard an old man spout that time-honored cliché, "If I knew then what I know now, things would have been a lot different growing up." In *The Curious Case of Benjamin Button*, a man has the extremely rare opportunity to do just that. Adapted from author F. Scott Fitzgerald's short story by director David Fincher and Oscar-winning screenwriter Eric Roth (*Munich*, *Forrest Gump*), the film allows us to take two journeys simultaneously -- one physical, and the other psychological. At its core, *The Curious Case of Benjamin Button* is an inventive and involving mortality fantasy that isn't as much about the eponymous protagonist as it is about the people he meets along the way in life, and the profound effect they can have on his existence and world view -- even if their names tend to escape him from time to time.

Benjamin Button came into this world with the body of an old man, but the spirit of a newborn child. Raised in a retirement home after being abandoned by his father, the grandfatherly boy always assumed he was just another resident like all the rest -- until the day he met the lovely Daisy. And while initial appearances may have suggested that Daisy was merely coming into this world while Benjamin was surely on his way out, the truth is that this remarkable pair was on a most curious collision course. Later, as the old man grows into a young lad and ventures out into the world aboard a rickety tugboat piloted by crusty but kindly Captain Mike (Jared Harris), he finally starts to realize what living is all about. We experience Benjamin's life through not only the entries he has made in his diary, but the fading recollections of Daisy, who now lays dying in a New Orleans hospital as Hurricane Katrina begins to shake the skies above. As a result, we start to understand how Benjamin's unique circumstances afforded him the opportunity to view life from a perspective that most people dream about, but no one ever lives.

Director Fincher is more than up to the task of following Benjamin as he learns about life -- and women -- while working in a Russian port during World War II and becomes embroiled in a battle at sea after the Japanese bomb Pearl Harbor, and screenwriter Roth does a fantastic job of showing how Button's many experiences enriched his life while simultaneously giving him a profound appreciation for the human condition -- and the love of a beautiful woman. Together, Fincher's and Roth's talents yield a fable that wrestles with some pretty weighty concepts, but still has something for everyone.

The Curious Case of Benjamin Button is brimming with intriguing concepts and brilliant visual effects, making it a stimulating treat for both the eyes and the intellect. Perhaps it's a small miracle that Fincher never lets the story get so heady that it becomes adrift within its own elaborate, time-shifting universe and loses sight of the human drama that drives it, but then again, the story wouldn't be nearly as affecting without the many characters that guide our protagonist along the way. There's nary a moment that Brad Pitt isn't entirely believable as the humble traveler at the center of the film -- whether he's hobbling along as an adolescent septuagenarian early on, or turning up as a fresh-faced teen later in life. The chemistry he shares with co-star Cate Blanchett radiates through the masterful special-effects makeup and digital manipulation that they both don at various points in the film, and when Benjamin and Daisy both meet halfway in life, it's a joy to see them interact in their "natural" skins. Supporting players Harris, Taraji P. Henson, Jason Flemyng, and Tilda Swinton are all a pleasure to watch as well, and newcomer Rampai Mohadi makes a hearty impression with his brief role as a jovial Pygmy

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who gives Button his first taste of freedom.

As a director, the last thing David Fincher could be accused of is excessive sentimentality. Yet in The Curious Case of Benjamin Button, we begin to see a side of Fincher that wasn't afforded to us in such cool-to-the-touch classics as Seven and Fight Club. So has one of modern cinema's great cynics gone soft? In a sense, yes -- at least this time out. But while some jaded cinemaphiles might make the case that Fincher has lost his creative edge only because he isn't shredding consumerism or damning conformity outright, who's to say that force can't be equally as effective when turned in the opposite direction? After all, wasn't Jean-Pierre Jeunet's Amelie every bit as intoxicating and spirited as his dreamily dark feature debut, Delicatessen, or the frightfully bizarre City of Lost Children? Just like everyone else, filmmakers are people who change with time. Sometimes that change involves moving in a direction that may surprise fans; sometimes, sadly, it means losing their creative spark. Have no fear -- Fincher still has his spark. The only difference from before is that this time the spark serves to illuminate, rather than burn.



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- 4. This Is Us
- 5. The Resident
- 6. ...
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- 1. Sexy Beast
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- 7. Chicago

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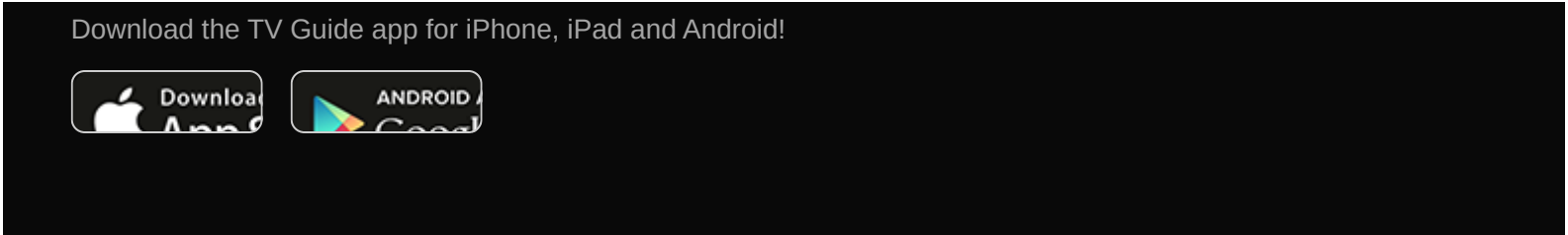
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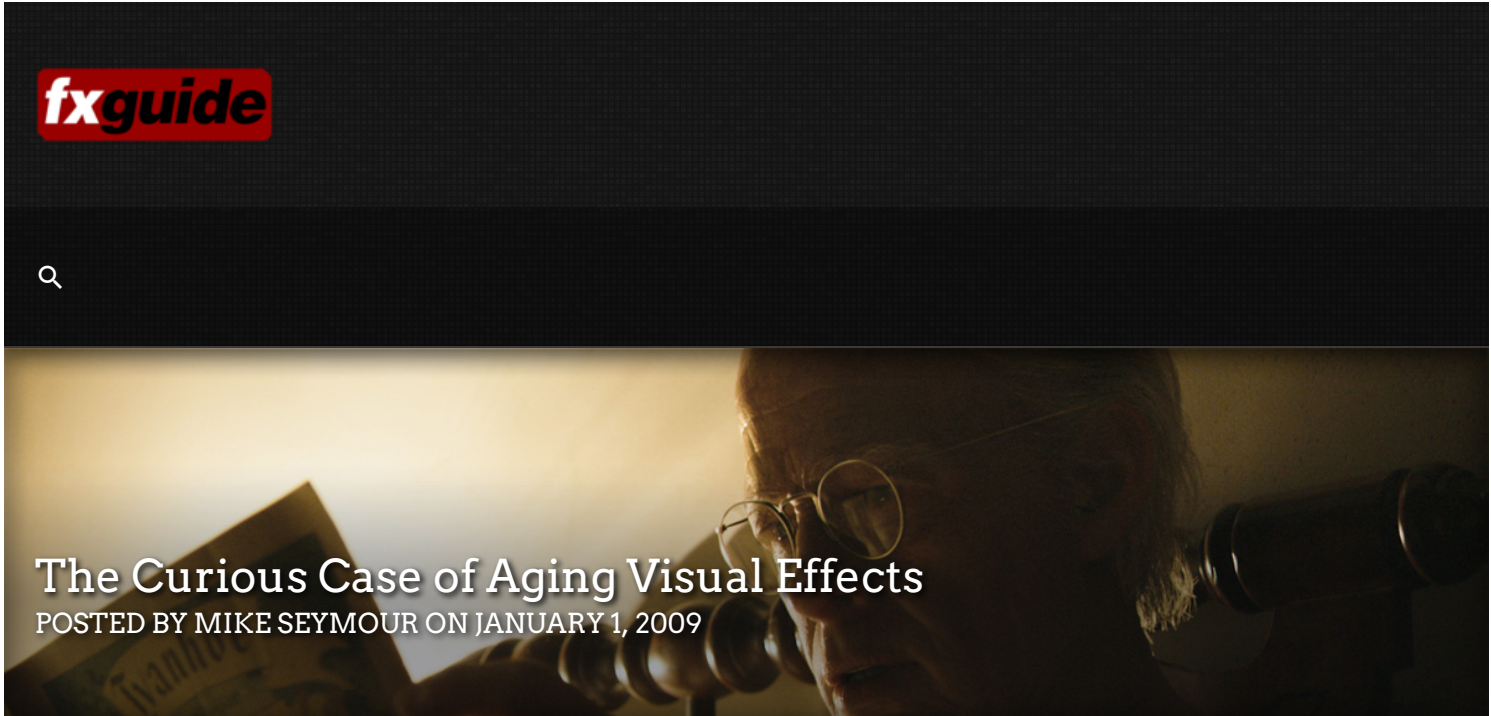
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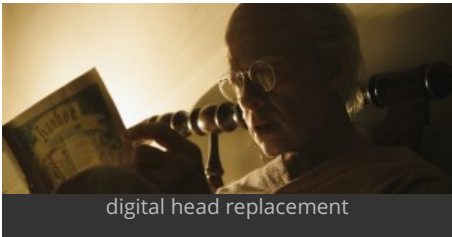
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fxg: Eric, congratulations on *The Curious Case of Benjamin Button*. You must be very pleased how it all turned out. It's a stunning film.

Eric Barba: I actually am. It's taken a long time to get to that point where I can relax and be happy with it. Now that people are really responding warmly to it, it's great.



fxg: Eric, before we talk about how you created the stunning shots for this movie, can I ask you to take us back to your initial discussion with David Fincher about Benjamin Button. How did you think you would be able to achieve the visual effects in this film?



Eric Barba: I've been working with David since 2002, working on commercials and music videos and bidding on various feature film projects. There were a dozen or more projects before *Zodiac*, but since the very early days, we have been talking about Benjamin Button. I'd heard about the project because Digital Domain had looked at it in a previous incarnation. David told me more and eventually, I got a script, then David and I would talk about it more and more while we

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were working on other projects, for instance, “How are you going to do the tracking,?” and “what do you think of this technology? ”

” At that point, David was pushing the digital workflow and we were using the Viper camera. We got really excited about *Benjamin Button* in about 2004. We were paid to do a test which we had a really short amount of time to do. We had a maquette built and did a head replacement with another actor in about 5 weeks. People thought we were crazy to attempt this. But because he did not have to talk or emote too much we could build it specifically for one shot — the scene where you first see Benjamin Button as a kid sitting at the dining table banging his spoon.

The test went pretty well and it was received very warmly by the studio. I remember showing it to producer Frank Marshall and he said that it was the most exciting thing he’d seen since the first dinosaur test walk for Jurassic Park. So then we knew we were onto something. But the movie wasn’t greenlit at that point so I went back to doing a music video and more commercials with David and ultimately Zodiac. When Zodiac finished we found that Benjamin wasn’t dead and these commercials came up that were the perfect test bed for *Benjamin Button*. ”

(These were three ads for iconic US Popcorn brand Orville Redenbacher in 2007. The ‘Colonel Sanders’ of the Popcorn world, Orville was famous for his direct to camera promotional spots that aired on US television in the 70s and 80s. After his death, Fincher used CGI techniques to bring him back for a spot in 2007).



Brad Pitt on set

“We thought we could use those spots as R&D for Benjamin Button, testing out rendering and tracking technologies. Principal photography for Benjamin Button had already begun in November of 2006. We learned what ideas wouldn’t work and what would need further refinement. We started working with the Mova Contour guys (developers of the Contour Reality Capture System) and we were really excited to be working with them. They were using similar techniques that we had used to bid the film initially but these guys had a really good handle on how it all worked.

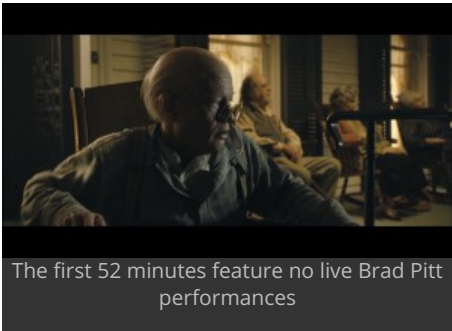
Our use of Mova Contour on the Orville Redenbacher commercials didn’t get the warmest reception. Part of the reason was we were doing a guy who was already dead so there was no way to capture a performance from him. We cast a voice that was similar and then different actors to do the face and the body, which ended up as three very disparate performances. Another problem was that as you art direct a commercial you start to get away from the original performance and you tend to move into that “Uncanny Valley” territory. Doing that commercial was a great learning experience and it also humbled my team that had previously

worked with David Fincher to put out some pretty amazing work. Up until that point, we thought we had a handle on it and then we did Orville and realized we still had a lot to do to make it all work.

fxg: What was the difference between the approach you developed for the test shot in 2004 and how you achieved the character in Benjamin Button?

Eric Barba: The part that carried over from 2004 was taking a life cast of the actor and from there a maquette is sculpted. With Orville, the maquette was not very good so we knew we would need some fantastic maquettes showing Brad at age 80, 70 and 60 that the studio could sign off on.

In the 2004 test, because we did not have the character doing a major performance, the rigging system was fairly primitive. We knew we’d have to build a much more elaborate system. When we started Orville our character supervisor, Steve Preeg, developed the rig that the animator used for Orville’s performance. We were going to use the Mova Contour data to help us on that project but it wasn’t fully mature, and we still needed to do a lot of homework on it.



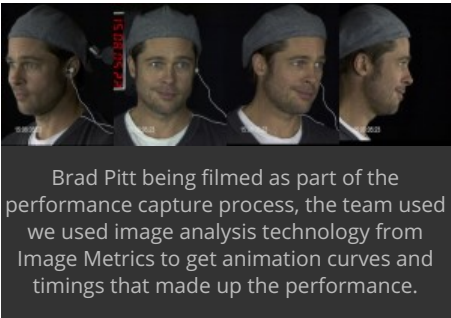
The first 52 minutes feature no live Brad Pitt performances

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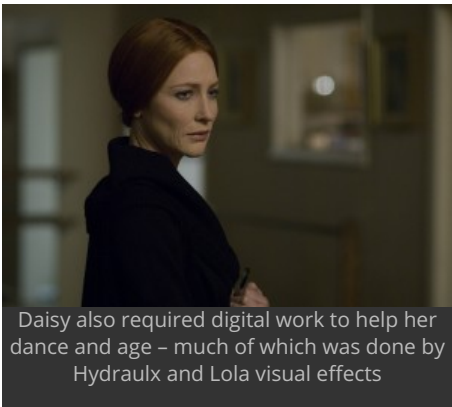
For *Benjamin Button* we could not create the performance in animation, we had to translate it from Brad's performance, so we thought about using Mova in a different way, to capture facial expressions. Steve was the character supervisor for Benjamin Button too, and he worked with a team to design the animation system and emotion capture process. We knew what we needed to get out of the Mova system and they knew how to get it all working. Six months later when we got Brad into the rig we were able to get everything we needed, which was basically a series of facial expressions. The Mova system is designed to get 24fps data and then that can be used to identically recreate that performance on a CGI version of the character. But because we were going to be using Brad Pitt's performance to drive older versions of his physiology, basically re-targetting the performance to an older version of himself, that wasn't really going to work for us. And because the Mova capture system requires that the actor is seated and you can't move very much, and we needed to put him in an environment where he is moving around and interacting with other actors, there were going to be some limitations on what we could use that data for. So we used the Mova rig to capture Brad's facial shapes and we then built systems to use Brad's performance to drive Benjamin.



fxg: Can you describe the rig that was used to capture Brad Pitt's performance?

Eric Barba: To clarify, we didn't use Mova to capture his performance, but to capture facial expressions volumetrically. The Mova Countour Capture rig is designed to hold 28 cameras in an array around the actor. They are mounted on a speed rail-like structure that surrounds about 150 degrees of the actor. like a The cameras are all aimed at the actor's face which is covered with phosphorescent make-up. This allows for frame by frame tracking of patterns and each point can be tracked in 3D space. This is the first system to truly capture someone's face moving in realtime and provide a moving mesh that can be subdivided and rebuilt then retargetted to another mesh to drive a CGI performance. Since Orville Redenbacher, Mova have been constantly working to refine the Contour capture system and we had been working with them on this. It was a collaborative effort. They were invited in to collaborate on Benjamin Button and like all of the vendors were incredibly excited.

To capture Brad's performance we shot him performing the role on a soundstage with four HD cameras and used image analysis technology to get animation curves and timings that drove our proprietary deformation rig.



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fxg: So where does the digital Brad begin and end in this film?

Eric Barba: The baby was a mixture of a live action robotic maquette which was enhanced by Hydraulx I believe. But for the first 52 minutes of the film it's a full 3D head, there were 325 individual shots. There's no projection, there's no 2D techniques. Once our work stops about 52 minutes in, Brad takes over in makeup. Ultimately as he gets younger he wears less and less makeup until it's just Brad. As he gets very young Lola did touchup work on his physical makeup then when he gets back to the Dance Studio Lola takes over doing the younger version of Brad. Ultimately there are a couple of child actors and a baby at the end. The bulk of the work in head replacement happens in the first 52 minutes. We prevized the U-boat battle and planned it out with David, and built a bunch of the assets but ultimately we handed that off to Asylum because of time and economics, and I think they did a good job of it.

"The first "digital head" shot is the one we did for the test, where there's a long dolly and pan until the audience sees Benjamin sitting at the table banging his spoon. That's the first body actor for Ben in his 80s, as he grows younger we have another body actor take over for him in his 70s, when he goes out on the tugboat with Cap'n Mike and goes to the bar. The bulk of our work is the "Ben 70" character, and "Ben 60" when he leaves home. One of our last shots is when he is reading the letter from Daisy on the back of the tugboat. The line where he tells the Captain, "Well you do drink a lot", that's where the real Brad takes over.



fxg: Did the number of head replacement shots grow during the filmmaking process, or was it always intended to be that many?

Eric Barba: David always said that he didn't want to shoot this movie around the fact that it was a CG character. He wanted to shoot it like he was shooting an actor. That means we don't shy away from difficult shots such as seeing him naked in the bathtub or getting a haircut or getting drunk and stumbling. It allowed David to tell the story the way he wanted to tell it which I think is the right way to do it. We did end up with a higher number of head replacement shots than was originally planned.

fxg: Were there many challenges in the job of attaching the digital Brad to the various bodies used during the live shoot?

Eric Barba: The body actors had different neck lengths and shoulder sizes and even the arch of the neck was different, so there was a lot of massaging that had to go on to make those heads feel like they belonged. Our tracking supervisor, Marco Maldonado, had to create a tracking system that was far more robust than traditional tracking because traditional tracking doesn't give you accurate Z depth. It doesn't give you a spine which we needed to have so the head would follow the body exactly as it moved around. During the shoot we would have four of the principal Viper cameras running in perfect sync. We devised the software to take any of the different cameras and, once the plates were locked, we could triangulate and retrack to get the accuracy we needed. This was a huge undertaking but we learned with Orville that there wasn't anything out there that could do the tracking the way we needed to have it, so that you buy the illusion every time.



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fxg: In many of the shots the Brad Pitt character is wearing a hat or glasses? Did that present additional challenges?

Eric Barba: MMy intention when we started shooting was to always shoot Benjamin with the actor wearing a hat so that the body was shadowed correctly. My character supervisor was really worried about that approach but I thought that it would help with the illusion, so the audience would not know where the plate stopped and Benjamin started. Most of the hats in the movie are the live hat.

There were some issues with lineups where Brad’s head proportion didn’t exactly match the body actor’s. We didn’t want to distort Brad’s head to fit the hat because we didn’t think that was the right way to go. So sometimes we would just add in a CG hat and hope the audience wouldn’t notice, but I thought they needed to be in the shots so that Claudio Miranda (Director of Photography) and David could frame their shots. It did help us sell the illusion ultimately. However glasses were a huge challenge. Even back in 2004 when we were doing the first test scene David said he wanted these glasses to be as big as coke bottles. He wanted the audience to be able to see the eyes enlarged through refraction so they got the sense that he cannot see. At that stage I was going “Uh, oh” because refraction adds problems. the main one being that when we are looking through refracted glasses with the thicker lens it often distorts our perception of where that person is looking. So maintaining focus and an eyeline was very challenging



fxg: Was there a lot of work in compositing as well?

Eric Barba: It was massive. One of the things that we learned from the initial test scene and Orville, where we had 15 shots in the three spots we did for Orville, was that even with some really good compositors (and I had my A-team on that project) there’s only a handful of people that have the right sensitivity that once they get these head renders and put them in a scene, that they have the sensitivity to colour that the skin tones don’t come apart, or look ashen or too pink or too red. One of my compositing supervisors for the Orville spot, Janelle Croshaw, had that sensitivity, although the spots didn’t end up working that well for other reasons. So part of our plan going into Benjamin Button was to build a lighting system that would give us as close to perfect out of the box as possible, then we needed to build a compositing template system that allowed us to hand off shots to 20 other compositors and get the same results. That’s a really tall order with normal rendered CG but for Benjamin Button it was off the meter in terms of difficulty. My hat is off to our lighting supervisors Jonathan Litt and Dan Abrams, who did an amazing job.

We used a lot of common techniques such as HDR for set reconstruction. Our lighting system was different from the normal workflow. Traditionally your tracking team hands over their data, the lighting team will render off the pieces and they will get handed off to the compositing team, so they come in last. In this show our compositing actually came in first and they really enjoyed that. The integration team that was on set with us for seven months, basically surveyed every piece of equipment on set and we took HDRs for all the different head positions as we were shooting, and then all that information was catalogued as we were shooting it. We then built a system in 3D that would ingest that data, build the HDRs, we then had modellers rebuild the set from the survey data. We built shader systems that could take HDRs and project them back onto the set geometry, because we had the tracking of the head, we could relight it within Nuke and we could reproject those HDRs onto the CG head, to recreate a corrected HDR for the head position

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Digital Domain emotion Capture Approach

– Eric Barba: “ Since our goal was not to create Benjamin’s performance in animation, but rather to ‘xerox’ Brad Pitt’s performance onto this CG head, we had to develop a brand new process that we call emotion capture.”

The overall process included:

1. Working from life-casts of Brad Pitt and body actors to create three photo-real maquettes representing Benjamin in his 80s, 70s and 60s, then shooting them in different lighting conditions using a light stage. (Rick Baker and Kazu Tsuji created the maquettes).
2. Creating 3D computer scans of each of the three maquettes.
3. Shooting scenes on set with body actors in blue hoods.
4. Creating computer-based lighting to match the on-set lighting for every frame where Benjamin appears.
5. Having Brad perform facial expressions while being volumetrically captured (with Mova/Contour), and creating a library of ‘micro-expressions.’
6. Shooting Brad in high definition performing the role, from four camera angles, and using image analysis technology data to get animation curves and timings.
7. Matching the library of expressions to Brad’s live performance of Benjamin.
8. Re-targeting the performance and expression data to the digital models of Benjamin (created from scanning the maquettes) at the specific age required in the shot
9. Finessing the performance to match current-Brad expressions to old-Benjamin physiology using hand animation.
10. Creating software systems for hair, eyes, skin, teeth, and all elements that make up Benjamin.
11. Creating software to track the exact movements of the body actor and the camera, to integrate the CG head precisely with the body.
12. Compositing all of Benjamin’s elements to integrate animation, lighting, and create the final shot.

Additional resources

An article and video by Lee Stranahan at the Huffington Post – [The Amazing Effects Of Benjamin Button](#)

CBS News story on [youtube](#)

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