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Interactive 'making-of' machines: The performance and materiality of the processes, spaces and labor of VFX production

Abstract

This article analyzes and interrogates two interactive museum installations designed to reveal behind-the-scenes visual effects (VFX) materials from *Inception* (2010) and *Gravity* (2013). The multi-screen, interactive, and immersive installations were both created in direct collaboration with the VFX supervisors who were responsible for pioneering the new and innovative creative solutions in each of the films. The installations translate these processes for a wider audience and as such they not only provide rich sites for textual analysis as new ancillary forms of paratextual access, but they also provide insights into the way that VFX sector presents itself, situated within the wider context of the current global VFX industry. The article draws together critical production studies, textual analysis, and reflections from the industry which, combined, provide new understandings of these interactive forms of ancillary film "making-of" content, their performative dimensions, and the labor processes that they reveal.

Context

This article analyzes and interrogates two interactive museum installations that were designed to reveal behind-the-scenes materials from *Inception* (2010) and *Gravity* (2013) in order to showcase the acclaimed, breakthrough visual effects (VFX) of each of the films. The two interactive installations were featured within the "Creative Spaces" section of the "Digital Revolution" exhibition¹ at the Barbican, London, 2014. They are illustrative of emergent digital delivery mechanisms through which contemporary audiences can now encounter and interact with the behind-the-scenes ancillary materials of cinema.²

The multi-screen, interactive and immersive installations were both created in direct collaboration with the VFX supervisors who were responsible for pioneering the new and innovative creative solutions in each of the films. The installations translate these processes for a wider audience and as such they not only provide rich sites for textual analysis as new ancillary forms of paratextual access, but they also provide insights into the way that the VFX sector presents itself. This article purposefully situates

their conception and presentation within the wider context of the current global VFX industry. The decadent displays of VFX excess and access presented in both installations are representative of the currently flourishing VFX industry within the UK which has been boosted in recent years, by a system of tax incentives which have been in place since 2008.³ The UK's Chancellor of the Exchequer George Osborne states:

The UK film industry is on the crest of a wave, with Oscar success and a boom in the number of new films being made here. The UK film tax relief, significantly expanded by the Chancellor at Budget 2014 targeted to support further investment in the UK visual effects industry, has played a key role in this.⁴

The UK is globally considered as an attractive center for VFX production due to these incentives and its strong domestic television and commercials market.⁵ The UK is also considered one of the world-leaders within the global VFX industry, and it is estimated that the UK VFX industry contributes

£250 million a year to the country's economy.⁶ As a result, many VFX firms and Hollywood VFX productions have migrated to London, with *Inception* and *Gravity* being just two examples of productions created on UK shores.

Introduction

This article will firstly interrogate how both installations are reflexive of the aesthetic conditions in which the cinematic innovations of each of the films were produced and which characterize each of the film's productions. Within *Inception*, the installation simultaneously mirrors the complexity of Christopher Nolan's renowned multi-layered-diegesis through its breakdown of the complex layering of the visual effects and compositing processes that were required in its production. The installation comprises of one central screen, which is reflected in two mirrors, one positioned above, and one positioned below the central screen. The installation involves the non-linear navigational playback of one key sequence in the film – where the streets of Paris fold in on themselves. Within the installation, the viewer can shuttle back and forth within this sequence and access the different compositional layers that constitute the sequences' VFX construction. Within *Gravity*, the installation involves the playback of a linear documentary, which drew from a number of different VFX resources taken from various scenes across the film. The installation is comprised of eighteen screens, sixteen of which were spatially organized in order to represent the LED light box invention that was used to emulate the hyper-realistic luminance qualities of outer space. I will contend that these reflexive aesthetics, in which the content, style, and presentation of the behind-the-scenes materials (as framed and presented within these installations) take on the representational characteristics of the film's diegetic worlds and present a conflation between the film and the processes of its making.

Secondly, each of the installations use the latest technological innovations in order to both celebrate and cohere complex visual special effects (VFX) processes, and the aesthetic and technological breakthroughs for which the films received numerous accolades.⁷ I will examine how the same digital tools and computational methods that were

deployed in each film's production are used within the installations in order to materialize, perform and reconceive VFX processes such as computational and machinic labor. I contend that through the presentation of such processes, these installations both disenfranchise the creators in their lack of presence and elevate VFX work as a creative and innovative vocation.

Thirdly, the installations are framed (by the wall-mounted exhibition placard), as being seen “*through the eyes*’ of the Oscar-winning VFX Supervisors Paul Franklin from *Double Negative* and Tim Webber from *Framestore*.” This input from the creators, coupled with the fact that the installations are designed and produced by a company which draw upon VFX techniques, technologies and practitioners in the realization of many of their own projects, suggests that these installations can be conceptualized as “worker self reflections,”⁸ which are used to educate the surrounding screen industries, and their audiences. John Caldwell, at the time was referring to “demo-tapes” (or showreels) as manifestations of this phenomenon as “tangible, industrial critical media forms,” which “define the industry and manage both its internal and external cultural significance.”⁹ Within the installations’ aesthetic manifestations of routine processes and working practices of the industry, I will explore how the installations enable the creators to understand and represent their own approaches, creative input, artistry and labor. In a similar vein to the screen trade publications that Caldwell interrogated within his investigations of industrial reflexivity, these installations could be seen to “invoke modernist notions of “cutting-edge” originality, innovation, and radicality to promote progress in their respective industries.”¹⁰ Moreover, they are symptomatic of the current social, political and cultural status of the troubled global VFX labor economy in which they are situated, where VFX work is effectively hidden, and in some cases the voices of the practitioners are silenced.

Fourthly, both installations enabled the communication of creative intentionality, which augments the critical commentary of each of the films’ productions. In their approach to demystify the technical wizardry, and the granular set of step-by-step processes, both installations represent manifestations of new screen-pedagogies within

INTERACTIVE 'MAKING-OF' MACHINES

the context of bonus materials providing educative tools, as acknowledged by a number of scholars. Barbara Klinger has previously conceptualized the DVD extra “[a]s a kind of film school in a box, DVD represents a mainstreaming of the educational imperative.”¹¹ Similarly, Jonathan Gray comments that the *Lord of the Rings: The Two Towers* (2002) extra features “[...] teach a significant amount of production literacy, familiarizing audiences with the vocabulary of pickups, Foley work, mime passes, second units, matte painting, and key frames.”¹²

In its interrogation of these four key areas, this article addresses such questions as: How do these installations privilege other forms of labor, such as machine processing, which are not normally considered in ancillary promotional content? And how does engagement with these experiences, of augmented and experiential ancillary content, assist in our sense-making activities of labor, authorial intent, understanding of technologies, within the VFX industries? Within their context of this exhibition – the installations, and the cinematic innovations that they document are historicized and take their place in the archaeology and genealogy of digital developments that were presented by the *Digital Revolution* exhibition. Their place in this exhibition also frames VFX work as an “art” form, which is of particular significance when set against the current backdrop of the VFX industry. VFX practitioners are one of a number of roles that cross both the creative and technology categories of film production. Curtin and Vanderhoef highlight the ambiguity of the VFX practitioner classification in their interchangeable use of the terms VFX worker and VFX artists, which are dependent upon the context in which they are referred to within/outside the industry by others and indeed how those professionals also refer to themselves.¹³ This has proven to be increasingly problematic to the working conditions of VFX practitioners, compared to other workers within the film industry. As Curtin and Vanderhoef explain: “Digital artists did not fit into [...] conventional labor categories and therefore became one of the few groups of Hollywood employees (along with many reality TV laborers) that today lack union representation.”¹⁴

This issue is compounded by the wider context of the VFX marketplace. VFX practitioners are currently experiencing significant unrest within an

industry characterized by bidding wars between VFX houses who are operating within a competitive global market steered by the tax incentives offered by certain countries in order to attract the work to their shores and to subsequently take it away from others.¹⁵ As such, the VFX vocation is one that has become characterized by long hours, temporary contracts and minimal benefits. This has created the conditions for a transient VFX demographic, where practitioners are forced to move from company to company, and country to country to secure temporary working contracts. The diaspora of VFX artists is illustrative of trends elsewhere in the film production cycle and the screen industries at large where below-the-line workers, operate within a “nomadic labor system.”¹⁶ I will now provide overviews of the two installations before presenting further in-depth textual and comparative analysis.

Inception

Inception is a film recognized for breaking new aesthetic and technological ground winning Oscars for Best Cinematography, Best Visual Effects, Best Sound Mixing and Best Sound Editing, its “dizzying flourishes of FX magic,”¹⁷ and its “novelty of the concept is the layering of dreams within dreams, yielding addictively vertiginous sequences of parallel action.”¹⁸ *Inception* is aesthetically characterized by its distinctive photorealist rendering of highly surreal imagery and for its complex narrative layering of simultaneous realities. *Inception's* complex plot is structured through multi-layered “hypodiegetic”¹⁹ incursions within the diegesis through the depiction of events that are occurring within the dreams of the different characters. Debra Malina has noted that further hypodiegetic levels can be articulated as thus: hypo-hypodiegetic (H2D) and hypo-hypo-hypodiegetic as (H3D) and so forth.²⁰ In the case of *Inception*, the initial dream – the first dream layer – operates on the hypo-diegetic level, the dream within a dream, the second dream layer – on the hypo-hypodiegetic level (H2D) and the dream within a dream within a dream, the third dream layer – on the hypo-hypo-hypodiegetic as (H3D), etc.

This deep layering structure, which is intrinsic to the *Inception* narrative, is used as the key organizing and aesthetic principle within the

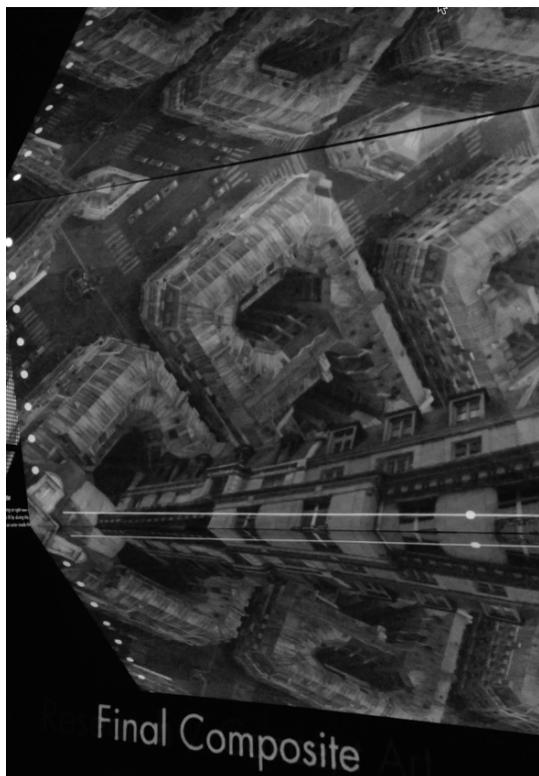


Fig. 1: The *Inception* installation simulates the aesthetics of the original scene from the film in which Paris folds into an inverted cube.

Inception installation. The different compositional layers which constituted the production process behind the film – the *antidiegesis* – that is, the conception, preparatory and preproduction work for a particular scene, is revealed to the audience within this installation using both a multi-layered visual aesthetic and a multi-layered interactive modality.

The installation consists of one central screen with two-mirrors positioned above and below the main screen, which created an effect of the image folding in on itself each time that it is changed by the gestural actions of the singular audience member operator. The installation depicts the scene where the character of Ariadne experiments with her recently discovered dream-control skills, which she successfully uses to fold the streets of Paris in on themselves to form an inverted cube city (see figure 1).

The installation reveals the digital architecture that underpins the construction of the on-screen

Paris street fold-over sequence, through access to the different layers which constituted its making – stratified in order to simplify and translate the complex compositional process, enabling the audience to drill-down and literally ‘un-pack’ the different elements which constitute the scene.

Using Leap Motion²¹ – an interactive interface tool, the installation enabled the gallery visitor to move their hand up and down on the vertical axis over an invisible sensor, which triggered the scrolling through the different compositional layers or “plates.” Swiping the hand left-to-right on the horizontal plane over the sensor triggered a shuttle control, which enabled the viewer to shuttle back and forth through the linear timeframe of the film sequence.

The eight plates included the original photography taken from Google Street View, the previsualization, the research and concept art, the untextured model, the wireframe showing the skeletons of the buildings, a textured model including cars, foreground layer separations, and the final composite. A visual indicator on the left-hand side of the screen indicated the layer ordering – and the current layer on display (see figure 2).

Many resources, such as those pictured in figure 2, have been featured in numerous making-of DVD featurettes, but in this instance, they were overlaid and synchronized to enable simultaneous and comparative access, temporally compressing the filmmaking process which took place over an extended time-period, but is rendered instantly accessible.

The installation’s use of mirrors as a method through which to simulate the fold-over cube aesthetic of the scene, reflects the use of mirrors elsewhere in another key scene within the film. Richard Slaney (Creative Director at 59 Productions – the company behind the design of

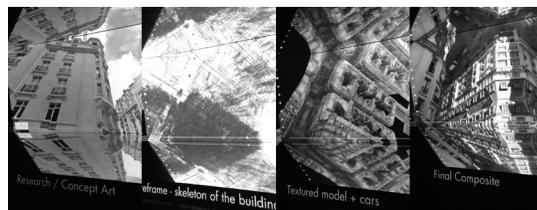


Fig. 2: The *Inception* installation enabled the viewer to cycle through the eight different layers which constituted the VFX construction of the folding Paris sequence.

INTERACTIVE 'MAKING-OF' MACHINES

the two installations) explains:

We felt that mirrors was [*sic*] a nice way to play with making it more than just a screen. Also we made the screen higher than you would normally put a screen so that you had to look *up* at it, and lean your head back, which is what the characters are doing in that shot, they're standing there and leaning their heads back as the building goes over the top of them.²²

This disclosure represents the creators' intentionality of placing the audience member of the installation in the same diegetic position as the characters in the film. The audience simultaneously inhabits both the diegetic space of the film (through the rendering of the film's diegetic environment – see figure 3) and the space of the film's production (through the layering of the VFX elements which reveal the construction of the scene). As I discuss earlier in this article, this simultaneity is an emergent characteristic of audience engagement “This dual relation exists as a tension between the absorption of the spectator into the world of the film, and the simultaneous impossibility of this absorption.”²³ This physicality and embodied dimension that Slaney describes reflects Nolan's philosophy. Anecdotal recollections by those that worked with him confirm that he was keen to keep the production techniques as physical as possible.²⁴ This manifested elsewhere in the production process within which a one-hundred-foot-long drum was created for the rotating corridor scene, which was realized through complex actor and stunt personnel



Fig. 3: The 'fold-over' moment which required the characters to crane their necks in order to watch the spectacle is simulated in the installation whereby gallery visitors are required to adopt a similar pose in order to fully appreciate the visuality of the installation.



Fig. 4: The design of the *Gravity* installation simulated the performative lightbox which was constructed as part of the making of the film.

choreography and all in-camera special effects. As Paul Franklin stated for this particular scene:

the script basically said, 'Ariadne looks down the street as it folds in on itself, forming a giant cube universe.' It reads as a great description, but it doesn't explain the process of how the elements transition into the end result. So, in designing these effects we had to address a lot of the outlying questions: How does the lighting change? What happens to the people walking and driving on the road? Should it fold as if on a hinge?²⁵

Such a creative disclosure reveals insights into where authorial intent and creative decisions reside, whereby VFX artists are reconceived as authors, and the role of the director is problematized. This will be further considered shortly after an introduction to the *Gravity* installation.

Gravity

Gravity broke new ground, achieving critical and commercial success and widespread recognition for its innovations in new filmmaking style and technique in the areas of VFX and stereoscopic 3D. One review stated: “Created through a painstaking combination of physical and digital performance that disintegrates the divide between live action and animation, *Gravity* boasts a level of sheer visual invention.”²⁶ The *Gravity* installation was designed to represent the LED light box invention that was used in the making of the film (see figure 4).

During the making of *Gravity*, cinematographer Emmanuel ‘Chivo’ Lubezki and VFX supervisor Tim Webber created a light box that was a twenty-by-ten-foot structure covered with 196 panels of 4,096 LED bulbs each to simulate the extreme light in outer space.²⁷ As Framestore explained: “The use of LEDs allowed Chivo to light the actors which much greater flexibility than traditional film lights – the different colors reflecting off the Earth, moonlight, sunlight and starlight could all be replicated.”²⁸ Such was its recognition that it received the TIME accolade for one of twenty-five best inventions of 2013.²⁹

The actors were positioned and filmed within this cramped light box, referred to on-set as “Sandy’s Cage” (named after the actress Sandra Bullock who spent most of her time on-set). The light box had the dual purpose of emitting the hyper-realistic light as well as being able to provide the actors with a visual reference, a projection of the deep-space environment on the walls of the light box, which would later be composited in the computer

generated imaging (CGI) process. Thus providing a physical rendering of the “intangible spaces”³⁰ and creating a sense of dimensionality (as opposed to being set against a blue-screen, which tends to be the case on the set of most VFX-led productions) and more effective performative environment for the actors. As the Framestore VFX team explain: “It took over a large part of the filming responsibility, helping light Sandra Bullock and George Clooney as if they were spinning in all axes while they remained relatively stationary, without having to strain and betray the gravity acting on them.”³¹

Within *Gravity*’s museum installation, there were two additional screens positioned at the front of the light box, which provided a dynamic mapping of the content of the sixteen screens to guide and instruct the gaze of the viewer, since the screens constantly changed to illustrate the complex layering of the VFX. The installation included many of the previsualization materials that were used as an integral part of the production process. As Webber stated of *Gravity*’s production workflow:

It needed to be heavily pre-vised for a number of reasons, obviously technically as we needed to work out the camera moves but also because when you’ve got a twelve-minute continuous shot and it’s set in space where you’ve got a camera that can roam absolutely anywhere and you’ve got people that can roam absolutely anywhere too [...] the degrees of freedom are much greater.³²

As John Caldwell has observed in relation to the process of previsualization: “One resilient way to aesthetically elevate a film involves documenting a high degree of authorial control on a production” which he states, includes dramatizing “complete directorial control through ‘previsualization’ via exacting storyboard-to-scene comparisons and footage of excessive preplanning.”³³

In order to produce the multi-screened synchronized content of the *Gravity* installation, eighteen streams of video were composited in the After Effects software and then exported as eighteen independent movies. This was in itself subject to a complex and lengthy rendering process, reflexive, albeit on a much more modest scale, of

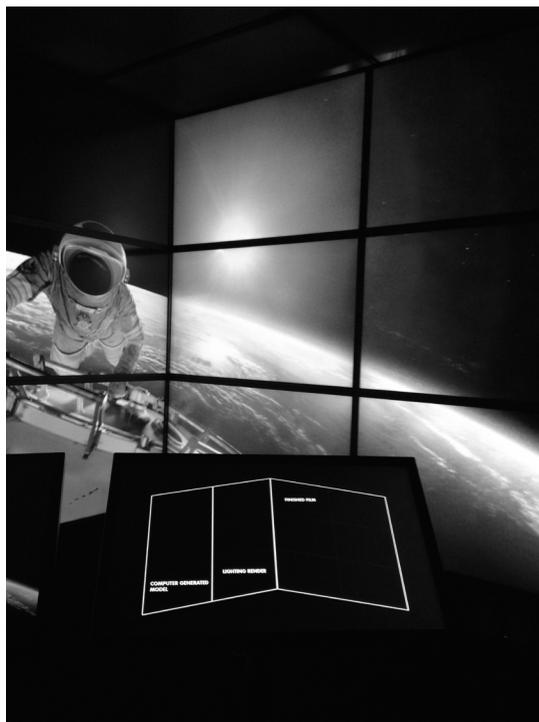


Fig. 5: The *Gravity* installation incorporated a visual screen mapping to guide the audience members attention. In one sequence, the face of the performer is removed in order to illustrate the level of CGI within the film.

INTERACTIVE 'MAKING-OF' MACHINES

the advanced rendering that took place during the production of *Gravity*. As Framestore explained:

After hitting a button the team would often have to wait more than two days to see if a particular simulation had worked [...] it wasn't just the long shots, the whole process took a very long time and an awful lot of computer power. To render *Gravity* on a single core machine with a single processor in it and be ready for 2013 you would need to start before the dawn of Egyptian civilization.³⁴

Using 5.1 surround sound, and accompanied by a voiceover from *Gravity*'s VFX supervisor, Tim Webber, the installation enabled individual audience members to step into the space and immerse themselves both visually and sonically within the light box environment, effectively placing themselves in a simulated performative space that the actors experienced during the making of the film. The images rendered the production apparatus and the behind-the-scenes technology visible, which included showing the actors in the robotic cradles that were used to achieve the on-screen zero gravity effects. As Slaney explains:

[...] some of the most effective stuff [shown within the installation] are the shots where you see the completed film but without the actor's face, so the fully lit, fully visualized version [...] because that fundamental thing that people don't get about that film is that everything is CG, and that was one of the things we were trying to get across to people, just how much was CGI.³⁵

Here, Slaney reveals the intentionality behind the production of the installation and its aim to reveal the labor behind the work. Slaney further explained the need to communicate this – “particularly as we do some of it, we do complicated animation, VFX processes sometimes, we were quite keen to show off how many people work on this stuff and how

long it takes.”³⁶

The striking image of the faceless astronaut in some ways counters this intentionality – to reveal the people behind the process – in its seeming dehumanization of both the performer and the VFX artists behind the creation, where they are both rendered invisible. A parallel can be drawn to the current global situation within the VFX industry in which a number of highly successful VFX companies have closed down,³⁷ how these companies have attempted to draw attention to their plight, and how the film industry have responded by effectively attempted to silence the situation. This was brought into sharp focus by Rhythm & Hues, the VFX company who were awarded the Oscar for Best Visual Effects for Ang Lee's stereoscopic 3D feature *Life of Pi* in 2013, eleven days after filing for bankruptcy. Upon acceptance of their award, “the award recipients were drummed off the stage by the orchestra, which played the theme from *Jaws* over Bill Westenhofer's acceptance speech just as he began to mention troubled VFX company Rhythm & Hues and the current plight of the VFX industry.”³⁸ Stated Westenhofer: “I wanted to point out that we aren't technicians. Visual effects is not just a commodity that's being done by people pushing buttons. We're artists, and if we don't find a way to fix the business model, we start to loses the artistry. If anything, *Life of Pi* shows that we're artists and not just technicians.”³⁹ Bill Westenhofer's response to this apparent “silencing” by the industry is not only indicative of the troubled VFX economy, but of the struggle for its practitioners to be appropriately recognized for the work that they do and for the significant *creative* contribution that they make to the industry and its outputs.

The vast teams of people behind the work remain hidden, and the months of messy experimentation, has been simplified, compressed and aesthetically “cleaned” within these installations. The depth of process, detail and thinking are revealed but the time it takes to achieve is much less apparent as is the human presence which becomes detached as the processes are divorced from the people behind the innovations.

Further analysis and conclusion

Although these installations differ in their approach

to their enablement of immersive and interactive access to some of the films' key post-production processes, they can each be seen to:

1. Present new forms of audience access which drawn from the palette of production aesthetics as their defining principles;
2. Provide mechanisms with which the industry both presents itself to wider audiences, advancing audience literacies of the forms through pedagogies of the screen, as well as reflecting upon itself;
3. Present a new form of conceptualizing computational and machinic labor which on the one hand disenfranchises the creators in their lack of presence, but on the other, elevates VFX work as a creative and innovative vocation.

Both installations present spatial configurations of the filmic diegesis. In the case of *Inception* the installation design materializes the Paris-cubed scene, and in the case of *Gravity*, the aesthetics of production processes are revealed and actualized. Within each of the installations the complex processes behind the making of the films and the aesthetics of the diegetic narrative universe coalesce.

The complexity of the technologically mediated constructions is bound up into audience's viewing pleasure of repetition, multiplication and replay, which are all aesthetics that define digital media. Both installations systematize VFX-led processes and post-production workflows through their use of multiple screens which show repeated action from different perspectives. This characterizes the repetitive nature and granularity of some of the less-creative and machinic VFX tasks, and the mode of labor in VFX as being one of repetition.

Through physical interactivity and immersion, both of the installations enable the gallery visitor to mentally and physically interact with the materials of production, within *Inception*, through actual tactile engagement, and through the visual navigation of the eighteen separate screens and its accompanying screen "mapping" in *Gravity* (see figure 5). Both installations afford the viewer a "virtual" filmmaking experience in which they can "over-identify with and mimic the filmmaker."⁴⁰ Moreover, each installation attempts to facilitate a

dual absorption by the audience member in both the film's fictional spaces, through simulations of those environments, and the processes of its making.⁴¹

The *Inception* and *Gravity* installations were produced after the release of the films. and, are inherently reflexive in their approach. In the instance of *Inception*, the installation was used as an internal reflexive tool. Slaney recounted how Franklin navigated the installation and further reflected on the minutia of the process: "he was standing there playing with this thing and then he went into the detail, more stuff than he'd even gone into before, when he had the big shot in front of him[...]."⁴² There are other installations that have been produced as marketing tools prior to the release of the film which include a *Game of Thrones* (2011--) "virtual elevator experience"⁴³ and the Oculus Rift *Interstellar* (2014)⁴⁴ experience, both of which enable interactive access to some of the diegetic landscapes of the two storyworlds via Oculus Rift technology. In *Game of Thrones*, the experience also includes the use of high-powered fans, a rumble deck and jets of subzero air to emulate the elevators seven-hundred-foot ascent of the fictional location of Castle Black. In the *Interstellar* experience – audience members experience virtual zero gravity tour of the 'Endurance' space craft which features in the film.

Data wrangling and machine-processing are not normally represented within ancillary making-of content, which tend to be the reserve of above-the-line personnel. The *Inception* and *Gravity* installations both elevate and celebrate the status of the VFX role, and the technologies and machines that make the work possible. Notably, neither of the film's directors was involved within the consultative process of the two installations. Within *Inception* – the directorial voice is present through its physicality and material construction, which, as previously noted, flags Nolan's philosophy and preference to use *real* in-camera special effects where possible. Within the *Gravity* installation, Cuarón's presence is less obvious. His work, characterized by the long take is disrupted by the construction of the installation in which scenes are rapidly cut across multiple fragmented screens. It is by taking a holistic view of the installation and its synchronized screens that truly reminds the viewer of Cuarón's highly choreographed and highly crafted cinematic

INTERACTIVE 'MAKING-OF' MACHINES

sequences.

The computer, as the prism through which to reveal the VFX machinery, is the site for both the production, and the performance. Through their simultaneous presentation of both rendered and unrendered materials for the audience to view and access - both installations “perform” and compress the machinic rendering of the VFX. Interestingly, the rendering system that was deployed during the production of *Gravity* is called “Arnold” humanizing the rendering machinery and emphasizing its creative agency within the filmmaking process.⁴⁵

In their aims to make visible and materialize processes and people of production behind these films, they simultaneously render them *invisible*. The stark image of the faceless astronaut featured within the *Gravity* installation is a powerful reminder of this dehumanization, where actors’ performances are increasingly augmented and replaced by the presence of VFX.

The disembodied voice of the VFX supervisor in the *Gravity* installation, and the lack of such a

voice within the *Inception* installation, set against the backdrop of the current industrial situation – in which VFX practitioners are metaphorically silenced (and also literally as they were at the 2013 Oscar ceremony) is endemic of their disenfranchisement and sense of “placelessness.” This lack of human contact within the process is emphasized in the audiences’ inability to actually physically touch anything within the invisible interfaces of the installations, and is symptomatic, of an industry dominated by technologically deterministic aesthetics.

Such ancillary texts continue to reveal just as much about the certain processes that they have chosen to amplify as they do about what, and *whom* they have chosen to hide. As both the masters and subjects behind these installations, the VFX artists have become victims of their own craft - which is at its best when they have completely erased and removed all of the traces of their own existence within the films and content that they have created.

Dr. Sarah Atkinson's research work examines narrative, text, process, apparatus and audience to map new spaces and modes of cinematic spectatorship. Her recent monograph *Beyond the Screen: Emerging Cinema and Engaging Audiences* presents an expanded conceptualization of cinema, one, which encompasses the ways film can be experienced beyond the auditorium by a networked society. The book includes considerations of mobile, web, social media and live cinema through case studies of recent and near-future developments.

Acknowledgements

Special thanks to Richard Slaney, the Managing Director & Creative Director of 59 Productions Ltd.

Notes

1. This exhibition has subsequently commenced an international tour, and at the time of writing, is showing at the Tekniska museet in Stockholm from October 2014 - August 2015.

2. Innovations such as Film4's delivery of *A Field in England's* (2013) master-class materials online on the same day as the film's release, and a new behind-the-scenes platform for the independent film - *We are Colony* (<https://www.wearecolony.com/beta/signup>) both mark a growing trend towards a 'simultaneous-shift' of paratextual access (Sarah Atkinson, *Beyond the screen: Emerging cinema and engaging audiences* [New York: Bloomsbury, 2014], 83). I use the term simultaneous shift to allude to the temporal compression of the access that audiences are granted to both the film and representations of its making, which have manifested in new home-viewing modalities, such as “second screen” which deploys audio synchronization in order to simultaneously deliver behind-the-scenes content to a tablet or smartphone, designed to directly correlate and augment the main-screen fictional action. For an in-depth exploration into this approach within the Blu-ray version of *Prometheus* (2012), see Atkinson, 2014: 83-86.

3. See HM Treasury, “Budget 2014,” London: HM Treasury, 2014, 71. “2.113 Corporation tax: film tax relief – As announced at Autumn Statement 2013, the government will make relief available at 25% on the first £20 million of qualifying production expenditure, and 20% thereafter, for small and large budget films from April 2014. The government will also reduce the minimum

UK expenditure requirement from 25% to 10% and will modernize the cultural test.”

4. George Osbourne, “News story: Special effects giant Industrial Light and Magic to create 200 jobs at new London studio,” George Osbourne, accessed January 8, 2015. <http://www.georgeosborne4tatton.com/content/news-story-special-effects-giant-industrial-light-and-magic-create-200-jobs-new-london-studi>
5. See Debashish Mukherjee et al. “And Action! Making Money in the Post-production Services Industry,” AT Kearney, Accessed November 19, 2014, http://www.atkearney.com/communications-media-technology/ideas-insights/featured-article/-/asset_publisher/4rTTGHNzcaaK/content/and-action-making-money-in-the-post-production-services-industry/10192. This report presents a global overview of the various incentives on offer across different countries.
6. Jim Taylor, “Visual effects workers in film industry ‘overworked,’” BBC, May 10, 2013, accessed January 6, 2015. <http://www.bbc.co.uk/newsbeat/22397980>
7. “Oscar win for Staffordshire men for work on Inception,” BBC, last modified February 28, 2011, accessed January 7, 2015, <http://www.bbc.co.uk/news/uk-england-stoke-staffordshire-12594569>.
8. John T. Caldwell, *Production Culture: Industrial Reflexivity and Critical Practice in Film and Television* (Durham, NC: Duke University Press, 2008), 149.
9. Caldwell, *Production Culture*, 317.
10. Caldwell, *Production Culture*, 279.
11. Barbara Klinger, “The DVD Cinephile: Viewing Heritages and Home Film Cultures,” in *Film and Television after DVD*, ed. James Bennett and Tom Brown. (London: Routledge, 2008), 26.
12. Jonathan Gray, *Show Sold Separately: Promos, Spoilers and Other Media Paratexts* (New York: New York University Press, 2010), 98.
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14. Michael Curtin and John Vanderhoef, “A Vanishing Piece of the Pi,” 13.
15. Michael Curtin and John Vanderhoef, “A Vanishing Piece of the Pi;” Debashish Mukherjee et al, “And Action! Making Money;” and Visual Effects Industry, “The State of the Global Visual Effects Industry 2013: An Analysis of Current Business Models and Better Business Practices,” July 16, 2013, accessed November 19, 2014. <http://www.visualeffectssociety.com/The-State-of-the-Global-VFX-Industry-2013>.
16. Caldwell, *Production Culture*, 113.
17. Peter Bradshaw, “Inception,” *The Guardian*, July 15, 2010, accessed January 7, 2015, <http://www.theguardian.com/film/2010/jul/15/inception-review>.
18. Tim Robey, “Inception, review,” *The Telegraph*, July 15, 2010, accessed January 7, 2015, <http://www.telegraph.co.uk/culture/film/filmreviews/7892057/Inception-review.html>.
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20. Debra Malina, *Breaking the Frame: Metalepsis and the Construction of the Subject*. (Columbus: The Ohio State University Press, 2002), 146.
21. The installation content was designed using ‘VVVV’ software, <http://vvvv.org> – a graphical interface programming environment. See <https://www.leapmotion.com>.
22. Richard Slaney, interview with the author, November 2014.
23. Richard Rushton, “Early, classical and modern cinema: absorption and theatricality,” *Screen* 45(3) (2004): 239.
24. “Meet the Filmmaker: Paul Franklin (Visual Effects Supervisor for Inception),” podcast audio, Apple iTunes, <https://itunes.apple.com/cn/podcast/meet-filmmaker-paul-franklin/id393143029?mt=2>, September 15, 2010.
25. Paul Franklin quoted in Terrence Russell, “How Inception’s Astonishing Visuals Came to Life,” *Wired*, July 20, 2010, accessed January 6, 2015, <http://www.wired.com/2010/07/inception-visual-effects/>.
26. Mark Kermode, “Gravity – review,” *The Guardian*, November 10, 2013, accessed January 6, 2015. <http://www.theguardian.com/film/2013/nov/10/gravity-review>
27. TIME, “The 25 Best Inventions of the Year 2013,” last modified November 13, 2013, accessed January 9, 2015, <http://techland.time.com/2013/11/14/the-25-best-inventions-of-the-year-2013/slide/gravitys-lightbox/>.
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33. Caldwell, *Production Culture*, 302.
34. Framestore, “Rendering the universe,” Last modified December 6, 2013, accessed January 9, 2015, <http://www.framestore.com/news/rendering-universe>.
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35. Slaney, interview.
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INTERACTIVE 'MAKING-OF' MACHINES

37. Jennifer Wolfe, "Life of Pi' Wins Oscar for Best VFX," Animation World Network, February 24, 2013, accessed January 6, 2015, <http://www.awn.com/news/life-pi-wins-oscar-best-vfx>.

38. Amid Amidi, "Hear This Uninterrupted Statement from 'Life of Pi' VFX Winner," Cartoon Brew, February 25, 2013, accessed January 6, 2015, <http://www.cartoonbrew.com/ideas-commentary/an-uninterrupted-statement-from-life-of-pi-vfx-winner-bill-westenhofer-78395.html>. Dissatisfaction amongst VFX practitioners has continued with a sustained online presence through organizations such as the Association of Digital Artists, Professionals, & Technicians, (<http://www.adaptvfx.org>) a non-profit trade association established to improve the conditions of the VFX industry. In addition, when Framestore was awarded its Oscar for Best Visual Effects in 2014 for Gravity there were reportedly 500 protestors outside the Dolby theater.³⁹ Caldwell, *Production Culture*, 303.

40. For further discussion on the viewing pleasures of this duality see Atkinson, *Beyond the screen*, 79-87.

41. Slaney, interview.

42. This will be installed in 8 cities on a worldwide tour including New York, Sydney, Belfast and Vancouver between January and August 2015 in order to promote Season 4 of the franchise. See <http://connect.hbo.com/events/game-thrones/game-thrones-exhibit/>.

43. This was installed at the AMC Metreon in San Francisco, in November 2014 to promote the film *Interstellar*.

44. "Arnold" is an advanced Monte Carlo ray tracing renderer "built for the demands of feature-length animation and visual effects," see <https://www.solidangle.com/arnold/>.