The Creative Labor of 2D-to-3D Conversion as a Reformatting Practice

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Abstract

In cinema and media studies, research on stereoscopic cinema has largely focused on aesthetic and phenomenological questions that position 3D as a distinct medium. However, an analysis of 3D cinema through the lens of production and media industry studies allows for new approaches to stereoscopy, often in ways that resist or complicate the very notion of medium specificity. This article closely examines the London-based 3D conversion company DNEG and its predecessors, Prime Focus World and Gener8. By focusing on the self-statements of DNEG professionals in publicity materials and original interviews, this article explores how these practitioners describe the creative labor of converting 2D movies into 3D. In addition to deepening our understanding of 3D cinema, the complexities of these practitioner discourses suggest how further research can critically engage with similarly adaptive textual practices of "reformatting," such as the pan-and-scan of widescreen films and the colorization of black-and-white films. Ultimately, this article argues that a critical interrogation of industrial authorship claims opens up a space to conceptualize the reformatting of movies as an act of creative interpretation.

Keywords: *Creative labor, 3D film, visual effects, production cultures, 3D conversion*

From 2010 to 2019, the Hollywood studios consistently released 3D conversions of their biggest 2D blockbusters for both domestic and international markets. During that timeframe, conversion companies worked on 3D versions for at least 48 of the 100 films that finished as one of the top ten theatrical grossers for their respective years.[2] The major studios continue to convert their high-profile films into 3D, in large part because of the format's popularity overseas, including the rapidly growing Chinese market. In fact, Chinese quotas explicitly

require a specific percentage of China's foreign imports to be 3D or IMAX films.[3] In 2019 alone, 3D companies converted thirteen of the major studios' fifteen live-action 3D releases in their entirety. Despite this continued prominence, media studies research on 3D cinema has largely focused on titles shot natively in 3D rather than those converted to 3D in post-production, with the work of Nick Jones and Miriam Ross on 3D conversion as exceptions to the rule.[4]

The relatively little scholarly attention to 3D conversion perhaps makes sense, given how research on stereoscopic cinema has largely focused on aesthetic and/or phenomenological questions.[5] For scholars making sense of 3D cinema in medium-specific terms, titles originally shot in 3D might be more representative of 3D film as a distinct cinematic mode. Multiple media scholars have discussed natively shot 3D titles including *Creature from the Black Lagoon* (1954), *Dial M for Murder* (1954), *Avatar* (2009), *Cave of Forgotten Dreams* (2010), and *Hugo* (2011).[6] However, even if films shot using 3D cameras might be ontologically representative of stereoscopic cinema, they are not necessarily representative of stereoscopic-cinema *labor*, with the time-intensive process of 2D-to-3D conversion requiring entire companies of creative workers specifically dedicated to that work. Thus, an analysis of 3D cinema through the lens of production and media industry studies allows for new approaches to stereoscopy, often in ways that resist or complicate the very notion of medium specificity.[7]

This article centers creative workers from the London-based 3D conversion company DNEG and its predecessors, Prime Focus World and Gener8. On one level, 3D conversion companies such as DNEG exemplify the actual creative labor necessary to produce stereoscopic movies. But even further, practitioner discourses about 3D conversion suggest how media industries research can conceptualize forms of "reformatting" labor by critically engaging with supposedly derivative textual practices, such as the pan-and-scan of widescreen films and the colorization of black-and-white films. Skeptics of 3D conversion might see the process as doubly imitative: As a practice, conversion "mimics" native 3D cinematography, and at the textual level, the converted films largely reiterate the original 2D film. This is perhaps best exemplified by the regularly updated website *Real 3D or Fake 3D*, which goes so far as to label films shot in native 3D as "real" and films converted into 3D as "fake." Thus, 3D conversion represents an intersection of discourses about 3D cinema and the repurposing of cinematic works for additional formats or revenue streams. By focusing on the self-statements of DNEG professionals in publicity materials and original interviews, this article explores how practitioners make sense of their work when their output is popularly conceived of as "fake" or extratextual. Ultimately, 3D conversion and its creative processes might be best understood not in terms of 3D as a unique medium but in relation to acts of creative interpretation, where practitioners closely engage with the formal properties of 2D film images to produce parallel 3D texts that are, and are not, the same as their 2D counterparts.

This article draws heavily from production studies methods and research frameworks. Media scholars have not extensively studied 3D conversion as a production practice, but existing research on digital visual effects suggests models for understanding how

practitioners can alternately assert their creative agency and subsume their work under a singular artistic vision.[8] For example, Hye Jean Chung examines how discourses of "seamlessness" simultaneously mark excellence in visual effects labor and effectively erase that same work.[9] Like Chung, I identify and analyze recurring narratives in publicity materials and interviews to highlight how 3D conversion workers make sense of their complex relationship with studios, directors, and more traditionally recognized fields such as visual effects, and how these explanations work against the grain of popular logics about 3D. Further, as will be elaborated in the following, professionals in 3D conversion speak about their work in ways that parallel, but remain distinct from, the conversations about authorial agency in an age of convergence with proliferating paratexts.[10] Although research on similar crafts influences my approach, I emphasize here that scholars should not conflate 3D conversion with visual effects or transmedia texts. Julie A. Turnock argues that, far too often, media scholars characterize different industry practices in generalized ways that erase the complexity of both the creative labor and the aesthetics associated with specific technological forms.[11] Following Turnock's lead, I emphasize 3D conversion as distinct from visual effects work, in part because 3D conversion resonates with a longer history of Hollywood studios reformatting movies for parallel and ancillary markets.

Ultimately, this article wrestles with questions of authorship arguably relevant to all below-the-line crafts. On one hand, cinematographers, costume designers, production designers, and the like sublimate themselves to the power of the director, whose singular vision has historically legitimated cinema as an art form, but on the other hand, these crafts also want to assert their own creative autonomy. The 3D conversion professionals' explanations of their work suggest how they strike the balance of claiming the work both as their own and as part of a unified creative vision. Although the notion of director-as-auteur has always flown in the face of film's collaborative nature, this problem is uniquely exacerbated in instances such as 3D conversion where the creative work may not even be recognized as a legitimate iteration of a 2D "original." That is, it is possible to see all of the films discussed in this article without seeing them in 3D, a point underlined whenever directors and cinematographers have publicly distanced themselves from the 3D versions of their films.[12] What follows is not simply an exploration of the culture of 3D as production practice but also an analysis of how industry professionals present themselves and their services to potential studio clients and to moviegoing publics when their work is, at once, fundamental and unnecessary for contemporary blockbuster filmmaking.

Prime Focus's Website as Hollywood Pitch

The London-based 3D conversion company DNEG represents an apt case study in part because the company's genealogy can be traced to the beginning of 3D conversion in Hollywood. In 2014, trade journalists reported that the visual effects company DNEG and its India-based competitor Prime Focus would merge.[13] DNEG's current 3D conversion operations

stem from the Prime Focus side of that consolidation, and indeed, those stereoscopic services continued under the Prime Focus banner until *Avengers: Infinity War* (2017), the first Hollywood blockbuster to credit "DNEG Stereo." Significantly, Prime Focus was the company responsible for converting the Warner Bros. film *Clash of the Titans* (2010), a public relations disaster that became emblematic of 3D conversion's downsides for industry insiders, film critics, and audiences.

Despite the poor first impression of *Clash of the Titans* in 2010, Prime Focus's 3D conversion operations continue on to this day under the name of DNEG. Further, today's DNEG also incorporates the personnel and technology of Gener8, a smaller Canada-based conversion vendor founded in 2011. DNEG and its predecessors, Prime Focus and Gener8, offer key entry points into 3D conversion not only because of their persistence throughout the decade-long history of 3D conversion in Hollywood but also because Prime Focus has published some of the most detailed publicly available materials about the 3D conversion process. From 2012 to 2017, Prime Focus published descriptive web pages for most of its projects, including quotes from company workers as well as other production personnel. No longer available as of this writing (except through internet archiving projects such as the Wayback Machine), these blog posts often explained the company's narrative justifications for 3D, suggesting the creative aspects of the 3D conversion process. Further, Prime Focus's project pages discussed the company's working relationships with directors and visual effects houses, emphasizing the concrete institutional networks necessary for the conversion process. Following John Thornton Caldwell's work on production cultures, I see these posts as "trade texts" that demonstrate the complex self-theorizations of 3D conversion professionals.[14] I have also contextualized and built on my analysis of these website posts through my original interviews with DNEG executives and supervisors. Thus, taken together, the defunct Prime Focus website and my interviews with professionals represent a rich body of trade discourse that demonstrates how practitioners reframe their craft using vocabulary that highlights their creative agency.

This analysis of trade speak also effectively interrogates how 3D conversion companies have presented themselves to their prospective "clients," the Hollywood studios. While open to the public, the 3D conversion companies' websites seem primarily directed at studios looking to convert their 2D content. Prime Focus's "About Us" page circa 2015 directly addressed filmmakers: "At Prime Focus, you'll never hear us question whether it is possible . . . We'll simply collectively ask . . . What do you want to create?"[15] This language demonstrates how the 3D conversion companies predominately pitch their services in artist-driven terms that counter the popular perception of their work as a commercial afterthought incompatible with cinematic creativity. The concept of *pitching* specifically appeared in my conversations with 3D conversion professionals. DNEG's Ben Breckenridge, formerly of Gener8, recalls when he and his colleagues "pitched [their] process" and their creative labor in the early Gener8 days, a time in which they were trying to make a name for themselves as a relatively smaller vendor in an initially crowded field of companies.[16] My analysis in this section thus considers the websites and the companies' networking strategies as performances in which 3D conversion companies can present their work with concrete, readily understood details to assuage studios' and filmmakers' potential anxieties concerning the effectiveness and legitimacy of 3D conversion.

Further underlining the importance of relationships within the industry, some 3D conversion executives are specifically dedicated to fostering relationships with studios and filmmakers. Paul Becker, DNEG's senior vice president business affairs at time of interview, described his job in 2019 as, in part, being a "company advocate with the client." Becker feels that he was particularly qualified to address filmmakers' concerns because he previously worked as what he calls a "guerilla filmmaker," attempting to independently make features of his own. Drawing on his experiences, Becker was "lucky enough to be able to make connections with filmmakers and let them understand that we weren't there to make their work look shitty."[17]

While there is not enough space here to fully elaborate the anti-3D and anti-conversion tropes in popular film criticism, most prominent in the early 2010s, the case of *Clash of the Titans* provides important background for trade discourses about 3D conversion labor and, more broadly, suggests the challenge of justifying parallel, "fake," or otherwise derivative texts.[18] Although *Clash* represented a financial success for Warner Bros., the 2D-to-3D conversion was widely considered a technical and creative failure, perhaps best encapsulated by the words of 3D's most prominent anti-fan, Roger Ebert. The revered film critic specifically panned the 3D conversion in an otherwise positive three-star review: "Explain to kids that the movie was not filmed in 3-D and is only being shown in 3-D in order to charge you an extra $5 a ticket. I saw it in 2-D, and let me tell you, it looked terrific. Split the difference: 'We see it in 2-D, I save five bucks, and I increase your allowance by $2.50 this week.'"[19] The jab includes two interrelated tropes that would come to define 3D conversion for skeptics: post-production conversion's assumed lack of artistic intention and the studios' financial motivations for adding 3D where it did not belong. It is precisely these types of assumptions that professionals seem to be countering when characterizing their work. As this article will explore in the following, these criticisms continue a long history of Hollywood studios controversially reformatting their texts, exemplified by the pan-and-scan of widescreen films and the colorization of black-and-white films. Thus, the analysis of 3D professionals' words in the following suggests a path forward researching not only the creative labor of stereoscopic cinema but also of other industries dedicated to the reformatting or translation of movies for different platforms.

3D Conversion as Large-Scale Operation and Artistic Collaboration

Throughout Prime Focus's posts from 2012 to 2017, a number of discursive tropes recur, but significantly, two of these recurring themes effectively preempt possible dismissals of 3D conversion as inauthentic or non-creative. Specifically, Prime Focus repeatedly highlights the efficiency of its large-scale global operations, and they also underline their artistic collaborations with the traditional 2D filmmakers for a given project. Taken together, these claims by Prime Focus attempt to counter the popular dismissal of 3D conversion as a studio-mandated financial shortcut that has nothing to do with artistic intent. At the same time, these two narratives exist in tension with each other, with jaw-dropping statistics about scale sitting sometimes uncomfortably alongside more interpersonal accounts

of key creatives working together. Indeed, because each Prime Focus post predominately justifies the 3D conversion of the particular project, the explanations sometimes contradict each other. I do not dismiss such discursive tensions as mere evidence of spin. Rather, I see these as indicative of how 3D conversion companies seek to make the most of whatever the specific production circumstances might be, both in terms of their filmmaking work and their professional self-theorizing.

As previously suggested, the narratives detailed in the following resonate with how media industry scholars have characterized the professional discourses of authorship in the age of media franchising. In particular, Denise Mann attempts to reconcile the paradoxical simultaneity of, on the one hand, the collective authorship of a transmedia franchise such as *Lost* (2004–2010), which is dispersed among hundreds of individuals, and, on the other hand, the persistence of work hierarchies that prioritize the vision of the television showrunner.[20] She offers one account of interviewing a low-level staff writer and a supervising producer at the same time, and how the lower-level writer "called the day after our interview to reassert that the more senior writer-producer's explanation of how things worked should always take precedence over his own remarks."[21] This research on 3D conversion is also interested in the contradictions of professional self-presentation, often alternately assertive and self-effacing. The 2D-to-3D conversion companies and their workers simultaneously assert their capacity for original creativity while still evoking the 2D films' director as the aesthetic visionary and legitimizing force. Thus, like Mann, I am exploring the industrial function of the author in new contexts of collaboration—here between 3D conversion practitioners and their 2D production counterparts.

From 2012 to 2017, Prime Focus's website repeatedly cited concrete numbers describing the amount of work that goes into 2D-to-3D conversion. These figures seemed designed to undermine popular assumptions that 3D conversion was an easy alternative to shooting in native 3D. This negative perception of 3D conversion as a simple add-on appears in a 2010 *IndieWire* article suggesting that, with 3D conversion, studios simply "make a film, slap on some conversion 3D to make it extra goofy and haul in the extra dough."[22] By emphasizing just how many individuals are needed for their 3D conversions on their website, Prime Focus evokes the material labor of 3D conversion, something that can otherwise be an amorphous, invisible, and thus dismissible technological trick. In a post for *World War Z* (2013), the company notes, with "nearly 400 artists working on the conversion across London and Mumbai, [Prime Focus] utilized its global pipeline to ensure that [Paramount Pictures VP of Post Production] Corey [Turner] and the filmmaking team were provided with the scale, experience and flexibility they required to ensure their stereo vision was realized."[23] Notably, Prime Focus specifically highlights a number of "artists," a term that suggests the creativity of conversion. Further, the framing of this statistic underlines how the company's global operations facilitated the labor-intensive process. Even more impressively, for Tim Burton's stop-motion animated *Frankenweenie* (2012), "2,000 artists, production and support staff" delivered "1,518 3D conversion shots."[24]

Part of the reason why Prime Focus could deliver on its promises to clients, they argued, was the globalized nature of its workforce and the pipeline that facilitated this international labor. After noting that *The Legend of Hercules* (2014) required 147 stereo shots in just three weeks,

one post quotes senior stereographer Ben Murray: "With our mature conversion pipeline out of Mumbai, we were able to work on shots around the clock, using the time difference between Vancouver and Mumbai to transfer elements between sites and share the work."[25] Thus, not only is the workforce large, but it also transcends the bounds of time. The entry for *Sin City: A Dame To Kill For* (2014) similarly suggests that "with teams crossing a total of four time zones and three continents, coordination was key to managing Prime Focus World's work on *Sin City: A Dame to Kill For*—24 hours a day, 6 days a week."[26] Prime Focus argued that its creative advantage was not simply the presence of offices around the world; rather, their unique infrastructure facilitated ease of communication throughout its global operations.

It is important to note that 3D conversion companies are not alone in emphasizing the scale of their operations, as visual effects companies have long made similar points. My point here is not to suggest that these discourses of labor and attention are somehow exceptional. Rather, in the context of 3D conversion, these themes exist in tension with the industry debate on native versus converted 3D, as well as cultural suspicions about reformatted texts perceived as outside of authorial intent. I also acknowledge that, even if these discourses potentially recuperate the labor of 3D conversion, they arguably reinforce a global economic status quo. Writing on visual effects, Hye Jean Chung criticizes such discourses of international cooperation as serving a dominant economic order: "The rhetoric of seamless integration is thus deployed to achieve neo-Taylorist objectives, such as efficiency, labor productivity, and fluid continuity."[27] One can argue that even if Prime Focus's disclosures further highlight creative labor that has been erased, they resonate with assumptions about the sanctity of global capitalism that potentially devalue that work on a more fundamental level. The politics of global production in 3D conversion represents a possible avenue for further research, but for my purposes here, I am most interested in how 3D conversion companies use such rhetoric to highlight the extent of their creative labor, in contrast with the popular perception of 3D conversion as mere afterthought.

I also acknowledge that, although these publicity materials emphasize the global nature of conversion company workforces, my focus thus far on interviewing professionals in leadership positions results in a disproportionate focus on the North America-based operations of these companies. Writing on the effects of globalization, Toby Miller et al. suggest, "The manner in which materials and people are exchanged simultaneously across the globe is profoundly asymmetrical."[28] Thus, there are raced, classed, and gendered aspects of these discourses that have not been explored in this article. Given the sensitivity of such matters, publicly available information does not address the politics of these international relationships, at least not beyond the discourses that appraise these arrangements for enabling the quality of the work. Because this article largely explores the industrial and aesthetic politics of 3D conversion as a business/creative practice, further research can take the next step of interrogating the questions of power within these companies and their operations.

While the macro discourses of scale and globalization might frame 3D conversion as more than a simple add-on, they also exist alongside more personal accounts of active cooperation with other companies and creative personnel, including visual effects houses and film directors. By evoking cooperation with other filmmakers, 3D conversion companies characterize their work as consistent with a unified artistic vision. Such a strategy makes sense, given the

historic role of auteur theory in the framing of films as art in the industry, film criticism, and academia. Virginia Wright Wexman has thoroughly demonstrated how the Directors Guild of America (DGA) actively prioritized a "creative rights" agenda that positioned film directors as the singular voices shaping aesthetic objects.[29] In the realm of film criticism, Andrew Sarris used the concept of *film director-as-author* to elevate a pantheon of American filmmakers he saw as artists, the creative authorities over the films in their *oeuvre*.[30] If film critics such as Roger Ebert take issue with conversion as financially motivated and seemingly irrelevant to authorial intent, the concept of a clear vision for a film's 3D implicitly brings stereoscopy in line with more traditional ways of thinking about cinematic art.

Further, the reality of 3D professionals increasingly converting films in tandem with 2D production, rather than simply "post" production, has facilitated collaborations with film directors and other key 2D production personnel. In other words, challenging the perception of a 3D conversion as *following* a 2D original, the 3D companies typically convert footage *during* the completion of the 2D film. On a practical level, this gives conversion companies as much time to work as possible, to make their processes more efficient without sacrificing quality. On a creative level, the simultaneity of 2D and 3D production supports professionals' narratives that their work participates in realizing a unified artistic voice.

Specific instances in the history of DNEG predecessor Gener8 illustrate the practical and creative benefits of parallel 2D and 3D timelines and workflows. DNEG's Paul Becker describes how his original company Gener8 worked simultaneously with visual effects vendors on *Ghost Rider: Spirit of Vengeance* (2012). Becker remembers potential concerns about converting the fire that emerges from the titular character's body and bike into 3D: "It's really almost impossible to make [fire] look right." To address this challenge, Gener8 converted the principal photography before visual effects were finished, and the visual effects vendor shared its match move cameras, essentially the data about the images and its camera movements that vendors use to build their effects. With all of this prep work, Gener8 could give the converted shots to the visual effects vendor, who could then "render fire and composite that onto the plate, and it looked fantastic."[31] In essence, Becker describes an integration of visual effects and 3D conversion that problematizes the notion of 3D as a corporate afterthought. Instead, 3D conversion is parallel with creative processes such as visual effects, and it is precisely this simultaneity that allows for the "native" stereo rendering of visual effects elements.

With 3D conversion increasingly coincident with 2D filmmaking processes, companies such as Prime Focus have collaborated with directors whenever possible to ensure that the stereo conversion was true to the artistic vision of the 2D "original." When directors helped with the conversion, Prime Focus inevitably highlighted this relationship on their website. The webpage for *Men in Black* 3 (2012) boasted how "director Barry Sonnenfeld and [Sony Pictures Imageworks' 3D Visual Effects Supervisor, Corey] Turner collaborated with Prime Focus World from the earliest stages of post-production to use the third dimension as a storytelling tool to further enhance the theatrical experience."[32] The mention of Sonnenfeld, a Hollywood veteran and director of the first three films in the *Men in Black* series, relies on the popular notion of the director as the creative authority of any given film. While the name Sonnenfeld might not have the cultural cachet of a Werner Herzog or a Martin Scorsese, two filmmakers with acclaimed native 3D films, the mention of a director still works toward validating the 3D

Men in Black sequel as a creatively legitimate version of the film. This particular quote also notes the timing of the collaboration. Specifically, Prime Focus was in conversation with the filmmakers in the "earliest stages of post-production." Again, references to the workflow of 3D conversion suggest the 3D versions to be more than last-minute additions. Prime Focus not only collaborated with the filmmakers, but they collaborated early.

The references to the parallel workflows of 2D filmmaking and 3D conversion represent a crucial way in which 3D conversion has effectively distanced itself from reformatting practices such as pan-and-scan and colorization. Some popular press accounts in the early 2010s specifically evoked colorization as a reference point to highlight 3D conversion's perceived shortcomings. *Screen Rant*'s Paul Young makes the comparison when discussing conversions such as *Alice in Wonderland* (2010): "I wish Hollywood would figure out that converting a 2D film to 3D is like Ted Turner converting a black and white film to color–something about it just seems . . . off."[33] In her historical account, Wexman explores how the DGA responded to the advent of colorization in the 1980s, with directors such as Frank Capra and John Huston, and even lawmakers, speaking out against what they saw as the desecration of art.[34]

On a theoretical level, David N. James's interrogation of the critical discourses surrounding colorization applies readily to Ebert and Young's criticisms of 3D conversion. James specifically evaluates the "creative intention argument" in his essay on the 1980s colorization of black-and-white films. These skeptics would argue that "black and white movies were intended by their creator(s) to be seen in black and white," and "works of art should be seen as their creator(s) intended them to be seen"; thus, "black and white movies should not be seen in color."[35] To be sure, colorizations and 3D conversions differ in terms of their temporal relationship to the original text. While the colorization of library titles typically occurs decades after the black-and-white footage was originally shot, studios usually release 2D and 3D versions of the same films on the same day, obscuring questions of which of the two parallel texts is the "original" or the "preferred" version.[36] Still, a version of the logic that James describes is at play with popular press accounts about 3D conversion: Films not shot in 3D were not "intended" for 3D and thus should not exist in 3D. By highlighting the creative labor and the collaborations necessary for their work, Prime Focus's sites participate in a larger conversation about which versions of films and, by extension, what forms of creative labor count as legitimate.

It is important to note that the relationship between 3D conversion and colorization is more than simply theoretical. Dr. Barry Sandrew originally founded DNEG's competitor Legend3D as Legend Films, a company responsible for colorizing black-and-white films. In interviews, Sandrew suggests his transition from colorization to 3D conversion was natural precisely because "at least 65 percent of the process of converting 2-D to 3-D is the same as converting black-and-white to color."[37] That is, both processes typically require the rotoscoping, referred to as "masking" in Sandrew's process, of all figures in every single shot to subsequently apply color or depth values to everything within a frame. Ultimately, a process such as 3D conversion can require frame-by-frame analysis to determine how depth can contribute to the apparent meanings or effects of a scene, a level of close analysis that would exhaust even the most adamant scholar of film aesthetics. In a Turner Classic Movies video designed to explain why the cable channel's films are letterboxed rather than pan-and-scanned, Martin

Scorsese explains how pan-and-scan is "in a sense, technically, redirecting the movie." Likely meant as a criticism, this point begs the question: If a movie is redirected during reformatting, why, by whom, and according to what aesthetic or practical considerations?

To be sure, most of the individuals interviewed for this project would likely be aghast at the analysis of a process as labor-intensive as 3D conversion in the same space as pan-and-scan. The 3D conversion companies use public outlets such as their official websites to detail their countless hours of creative labor across the globe, as well as their close engagement with stereographers and filmmakers to facilitate a unified artistic vision. By contrast, pan-and-scan versions of films are sometimes blatantly automated and are widely seen as divorced from authorial intent.[38] However, framing 3D conversion as a creative act of reformatting not only illuminates broader cultural anxieties affecting the perception of 3D conversion but also suggests creative interpretation as possible even in practices more aesthetically controversial than 3D conversion.

3D Conversion as Creative Interpretation

This article has largely situated the self-statements of 3D conversion professionals in the context of discourses on authorship and creative agency. Ultimately, although these practitioners often rely on collaborations with directors and other 2D filmmaking personnel to strategically legitimate their work and to shape their processes, these professionals practice a form of creative interpretation, where they closely engage with 2D footage and add 3D in a manner consistent with what they understand to be its meanings and effects.[39] Given the subjectivity of this process, it follows that the stereoscopic supervisors tasked with overseeing the implementation of stereoscopy can have different stylistic approaches to converting films into 3D. To this end, this final section examines the perspective of a DNEG stereoscopic supervisor to understand his creative approach to 3D conversion and how it does or does not follow from the intent of the film's director.

In his current role, Ben Breckenridge is contracted by Warner Bros. as a stereoscopic supervisor, but he continues to oversee production within the DNEG facility.[40] This hybrid job allows for a continuity of vision across films in a franchise; specifically, Breckenridge has, so far, overseen the 3D for six films in Warner Bros. Pictures' DC Extended Universe: *Batman v Superman: Dawn of Justice* (2016), *Wonder Woman* (2017), *Justice League* (2017), *Aquaman* (2018), *Shazam!* (2019), and *Wonder Woman 1984* (2020). As a supervisor at the vendor that regularly converts the DC Comics films, Breckenridge has effectively applied his own personal style of stereoscopy across films by various directors. Breckenridge says that when he first meets the director for a particular DC project, he explains the overall aesthetic approach that DNEG has taken with the 3D for the comic book franchise: one that, simply put, strives for the 3D to be as close as possible to the physical reality that was in front of the camera, with more room to play with 3D for fantastical story elements. Breckenridge then sees if the director wants to go beyond that style in any way, and he even tells the filmmakers that they can take a different direction with the 3D if they see fit. However, he recalls, "I haven't had any directors say, 'I don't like this. I want to do something completely different for my

film.'"[41] To be sure, Breckenridge describes particular instances where directors had input on specific details they wanted to approach differently, but in essence, DNEG establishes a house style for the 3D and then offers the filmmakers the freedom to work within that creative framework.[42] The contrast between this approach and the processes described in Prime Focus's past online posts underlines not only the creative labor of 3D conversion companies but how the precise nature of that work is historically contingent and always in a process of negotiation.

In addition to having his own particular style, Breckenridge is also working with a 3D conversion process that is ultimately proprietary. Thus, 3D conversion professionals often go so far as to describe how different processes dimensionalize films in different ways. Breckenridge's approach emphasizing physical reality is enabled in part by the 3D conversion process that the former Gener8 team brought to DNEG, a process they call *modeling and projection*.[43] In essence, their process takes the original 2D footage and uses camera-track software to virtually recreate the space as accurately as possible. DNEG can input information such as camera lens, whenever available, so the program's algorithm can more precisely calculate how far apart different figures and objects are from each other and from the camera.[44] Further, the company uses this camera track in conjunction with actual visual effects assets such as computer-generated characters and actor's digital doubles, further ensuring the technical accuracy of their geometry. Breckenridge and his DNEG colleague Becker both discuss how their proprietary technology differs from displacement, the 3D conversion method they described as the industry norm in the early 2010s. By contrast, displacement requires 3D conversion professionals to isolate the various objects in a given shot and assign each of them a relative depth value. Some stereographers articulate this using a number of pixels representing how much each element will appear to be in front of or behind the theatrical screen. According to DNEG's Breckenridge, "When you do it with displacement, you're just giving that 2D plate to an artist, and they are cutting it into layers and then arbitrarily sculpting the image and placing the layers in the image where they think they should go. . . . By using geometry for vehicles and characters, we get correct proportions, so there's no guesswork."[45] Here, a 3D conversion professional suggests the variability within the 3D conversion space, where supervisors and companies approach their work with unique philosophies. Whatever the popular consensus about a particular reformatting process may be, they too require creative logics and theories that, according to some, allow them to "redirect" the movie.

In this current age of collapsing theatrical windows and proliferating distribution platforms, further research on the work of reformatting is especially crucial. Stereoscopic conversion represents a unique case, both because the 3D effect is a hyper-visible textual transformation and because the resultant texts are intended for theatrical distribution. But as Stephen Prince notes, digital intermediates facilitate the many different ancillary deliverables required for a given film, meaning that there never is simply one version of a film.[46] When I conducted my interviews for this project, Breckenridge was looking ahead to his work on the 3D conversion for Warner Bros. Pictures' *Wonder Woman 1984*, a film ultimately released in the United States on the streaming platform HBO Max and in select theaters on the same day due to the COVID-19 pandemic. The studio's parent company WarnerMedia would go so far as to debut its entire 2021 film slate on HBO Max and in theaters, a clear indication of what Chuck Tryon has referred to as "platform mobility."[47] While such moves might implicitly suggest to the

public more broadly how the same text can quickly proliferate, media industries' research has the opportunity to accentuate the work of preparing these texts for different platforms, work that sometimes requires aesthetic negotiation and creative intervention.

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[2] For this figure, I used the rankings based on total gross within each calendar year in North America, not the total lifetime intake for films released each year. I include the qualifier "at least," as 3D conversion companies sometimes work on films without their creative labor credited in the final product. *Box Office Mojo*, accessed June 23, 2010, https://www.boxofficemojo.com/year/.

[3] Jonathan Papish, "Foreign Films in China: How Does It Work?" *China Film Insider*, March 2, 2017, http://chinafilminsider.com/foreign-films-in-china-how-does-it-work/.

[4] Nick Jones, *Spaces Mapped and Monstrous: Digital 3D Cinema and Visual Culture* (New York: Columbia University Press, 2020), 115–40; Miriam Ross, 3D *Cinema: Optical Illusions and Tactile Experiences* (London: Palgrave MacMillan, 2015); Miriam Ross, "Transformative Bodies in 3D Cinema: Computer Generated Morphing and Extra-sensory Depth Cues," in *The Aesthetic and Narrative Dimensions of 3D-Film*, ed. Markus Spöher (Berlin: Springer VS, 2016), 123–36.

[5] Ariel Rogers, *Cinematic Appeals: The Experience of New Movie Technologies* (New York: Columbia University Press, 2013); Ross, 3D *Cinema.*

[6] Sheldon Hall, "Dial M for Murder," *Film History* 16, no. 3 (2004): 243–55; Scott Higgins, "3D in Depth: *Coraline*, *Hugo*, and a Sustainable Aesthetic," *Film History* 24, no. 2 (2012): 196–209; Barbara Klinger, "*Cave of Forgotten Dreams*: Meditations on 3D," *Film Quarterly* 65, no. 3 (Spring 2012): 38–43; Rogers, *Cinematic Appeals*, Ross, 3D *Cinema.*

[7] Caitlin Benson-Allott's work on 3D in horror movies represents a particularly unique analysis of 3D's role in contemporary Hollywood, specifically in terms of studio film franchising. Still, although Benson-Allott considers the impacts of industrial contexts, her argument is less about the industry and more about spectatorial engagement. Caitlin Benson-Allott, "Old Tropes in New Dimensions: Stereoscopy and Franchise Spectatorship," *Film Criticism* 37, no. 3; and *Film Criticism* 38, no. 1 (2013): 12–29.

[8] In his book-length study on 3D, Nick Jones dedicates an entire chapter to 3D conversion. The first half of this chapter discusses the creative process of 3D conversion, with references to the Prime Focus website I analyze in detail in the following. However, the rest of the chapter is dedicated to analyses of films–some of which were not released with 3D versions–that emphasize how the 3D conversion process thematically resonates with the narratives of these films, as well as contemporary developments in data visualization and surveillance. Thus, Jones leaves plenty

of opportunity for scholars to further interrogate the histories and cultures of the actual 3D conversion companies. Jones, *Spaces Mapped and Monstrous*, 115–40, 247.

[9] Hye Jean Chung, *Media Heterotopias: Digital Effects and Material Labor in Global Film Production* (Durham, NC: Duke University Press, 2018).

[10] Henry Jenkins, *Convergence Culture: Where Old and New Media Collide* (New York: New York University Press, 2006); Jonathan Gray, *Show Sold Separately: Promos, Spoilers, and Other Media Paratexts* (New York: New York University Press, 2010).

[11] Julie A. Turnock, *Plastic Reality: Special Effects, Technology, and the Emergence of 1970s Blockbuster Aesthetic* (New York: Columbia University Press, 2015), 5–6.

[12] For examples, see Mike Ryan, "Louis Leterrier, 'Now You See Me' Director, On the Problems with 'The Incredible Hulk' and 'Clash Of The Titans,'" *The Huffington Post*, May 28, 2013, http://www.huffingtonpost.com/2013/05/28/louis-leterrier-now-you-see-me_n_3333311.html; Roger Deakins, comment on user DanBull, "Blade Runner 2049: 2D or 3D?" *Film Talk* (forum), https://www.rogerdeakins.com/film-talk/blade-runner-2049-2d-or-3d/page-1/.

[13] David S. Cohen, "Visual Effects Giants Prime Focus World, Double Negative to Merge," *Variety*, June 25, 2014, https://variety.com/2014/biz/asia/prime-focus-double-negative-merge-1201246452/.

[14] John Thornton Caldwell, *Production Culture: Industrial Reflexivity and Critical Practice in Film and Television* (Durham, NC: Duke University Press, 2008).

[15] "About Us," Prime Focus, March 17, 2015, accessed October 29, 2019, Wayback Machine Internet Archive, https://web.archive.org/web/20150317151809/http://www.primefocusworld.com/about/.

[16] Ben Breckenridge, in phone interview by the author, June 18, 2019.

[17] Paul Becker, in phone interview by the author, March 1, 2019.

[18] For a thorough overview of how film studies have approached 3D with specific biases and assumptions, see Jones, *Spaces Mapped and Monstrous*, 17–41.

[19] Roger Ebert, *Clash of the Titans* review, March 31, 2010, http://www.rogerebert.com/reviews/clash-of-the-titans-2010.

[20] Denise Mann, "It's Not TV, It's Brand Management TV: The Collective Author(s) of the *Lost* Franchise," in *Production Studies: Cultural Studies of Media Industries*, ed. Vicki Mayer, Miranda J. Banks, and John Thornton Caldwell (New York: Routledge, 2009), 99–114. See also M. J. Clarke, *Transmedia Television: New Trends in Network Serial Production* (New York: Bloomsbury, 2013).

[21] Mann, "It's Not TV, It's Brand Management TV," 105.

[22] Drew Taylor, "Point-Counter-Point Review: 'A Very Harold & Kumar 3D Christmas' A Funny 3D Blast or a Lazy Gimmick?" *IndieWire*, November 3, 2011, https://www.indiewire.com/2011/11/point-counter-point-review-a-very-harold-kumar-3d-christmas-a-funny-3d-blast-or-a-lazy-gimmick-115377/.

[23] Post on *World War Z*, Prime Focus, accessed May 11, 2014, http://www.primefocusworld.com/world-war-z.

[24] Post on *Frankenweenie*, Prime Focus, accessed May 11, 2014, http://www.primefocusworld.com/frankenweenie.

[25] Post on *The Legend of Hercules*, Prime Focus, accessed May 12, 2014, http://www.primefocusworld.com/the-legend-of-hercules.

[26] Post on *Sin City: A Dame to Kill for*, Prime Focus, accessed February 20, 2015, http://www.primefocusworld.com/sin-city-a-dame-to-kill-for.

[27] Chung, *Media Heterotopias*, 25.

[28] Toby Miller, Nitin Govil, John McMurria, Richard Maxwell, and Ting Wang, *Global Hollywood 2* (London: BFI Publishing, 2005), 51.

[29] Virginia Wright Wexman, *Hollywood's Artists: The Directors Guild of America and the Construction of Authorship* (New York: Columbia University Press, 2020).

[30] Andrew Sarris, *The American Cinema: Directors and Directions 1929–1968* (New York: E. P. Dutton & Co., Inc., 1968).

[31] Becker, in phone interview by the author, March 1, 2019.

[32] Post for *Men in Black* 3, Prime Focus, accessed May 10, 2014, http://www.primefocusworld.com/men-in-black-3.

[33] Paul Young, "3D Movies Run Amok: A Fad That Should Stop . . . But Won't," *Screen Rant*, March 18, 2010, https://screenrant.com/3d-movies-green-lantern-sucker-punch-alien-prequel/.

[34] Wexman, *Hollywood's Artists*, 106–17.

[35] David N. James, "On Colorizing Films: A Venture into Applied Aesthetics," *Metaphilosophy* 20, no. 3/4 (July/October 1989): 332–40.

[36] Converted titles do share a temporal gap between "original" and reformatted texts in the instances where 3D conversion companies have worked on older titles, including Prime Focus's conversions of *Star Wars: Episode I – The Phantom Menace* (2012) and *The Wizard of Oz* (2013). However, such projects make up a small fraction of the overall 3D conversion output.

[37] Mike Freeman, "Legend3D converts scenes for current Hollywood blockbusters," *San Diego Union Tribune*, February 6, 2011, http://www.sandiegouniontribune.com/sdut-ready-for-star-turn-2011feb06-htmlstory.html.

[38] For discussions of particularly egregious pan-and-scan examples, see John Belton, *Widescreen Cinema* (Cambridge: Harvard University Press, 1992), 219.

[39] For an example of these types of considerations in relation to colorization, see Jason Gendler, "Are My Eyes Really Brown? The Aesthetics of Colorization in *Casablanca*," in *Color and the Moving Image: History, Theory, Aesthetics, Archive*, ed. Simon Brown, Sarah Street, and Liz Watkins (New York: Routledge, 2012), 199–208.

[40] Ben Breckenridge, in phone interview by the author, May 21, 2019.

[41] Breckenridge, in phone interview by the author, May 21, 2019.

[42] For a characterization of Marvel Studios' relationship to 3D conversion, see Victoria Alonso, producer and executive vice president of visual effects and post-production, as quoted in Celine Tricart, *3D Filmmaking: Techniques and Best Practices for Stereoscopic Filmmakers* (New York: Routledge, 2017), 83.

[43] For a brief discussion of what might also be termed the "3D reconstruction and projection method," see Bernard Mendiburu, *3D Movie Making: Stereoscopic Digital Cinema from Script to Screen* (Amsterdam: Elsevier, 2009), 146.

[44] Breckenridge, in phone interview by the author, May 21, 2019.

[45] Breckenridge, in phone interview by the author, May 21, 2019.

[46] Stephen Prince, *Digital Visual Effects in Cinema: The Seduction of Reality* (New Brunswick, NJ: Rutgers University Press, 2012), 76.

[47] Rebecca Rubin and Matt Donnelly, "Warner Bros. to Debut Entire 2021 Film Slate, Including 'Dune' and 'Matrix 4,' Both on HBO Max and in Theaters," *Variety*, December 3, 2020, https://variety.com/2020/film/news/warner-bros-hbo-max-theaters-dune-matrix-4-1234845342/; Chuck Tryon, *On-Demand Culture: Digital Delivery and the Future of Movies* (New Brunswick, NJ: Rutgers University Press, 2013).

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