

“BEING *INSIDE* THE MOVIE”

1990s Theme Park Ride Films and Immersive Film Experiences

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ABSTRACT

This article examines the influence of ride film attractions on the rise of commercial, mainstream 4D cinemas in the 2010s. While 4D cinema is typically positioned as an innovative response to declining cinema attendance, we argue that 4D cinema has its roots in earlier developments outside the multiplex cinema space and can be traced to a long history of immersive, 4D cinema experiences that offered more sensorially invasive cinematic experiences. While highlighting examples of early attempts to alter the sensory dominance of audiovision in pre-1960s cinema, the primary focus of this article will be the late 1980s, particularly, the 1990s. It was during this decade that the film industry, as part of a growing conglomerate media structure, began to experiment with and solidify multisensory cinematic experiences. This form of experimentation, which pushed the boundaries of traditional film viewing beyond a passive form of entertainment, primarily took place in the context of the theme park, which was itself emerging as a major player in entertainment culture.

SINCE THE TURN OF THE TWENTY-FIRST CENTURY, SCREEN STUDIES SCHOLARS AND INDUSTRY professionals have expressed concerns about the “death” of cinema as a result of digitization and the concomitant expanded capabilities of home entertainment technologies.¹ Thomas Elsaesser has described an “air of obsolescence” that hangs over cinema as a creative and cultural practice.² Even so, theatrical exhibition remains an important element of entertainment culture. More broadly, in line with widespread cultural shifts toward an experience-based leisure economy, cinema exhibition in the 2010s has increasingly privileged a diverse range of immersive cinematic experiences.³ In ways that parallel the extreme screen trend of the 1950s, which was in part a response to the threat posed to cinema by television, in the twenty-first century a range of immersive and experiential cinema exhibition strategies have emerged. For instance, IMAX has transitioned from a novelty museum experience to a mainstream form of feature-length film exhibition; 3D cinema has emerged from decades of sporadic novelty phases (to use John Belton’s terms) to become one of the most popular ways to access blockbuster releases, and, most recently, 4D cinema (where motion-enabled chairs, smoke, fans, water, and scent effects accompany the film) has developed as an alternative approach to cinematic experience at multiplex cinemas.

Many of these “absolute cinema experiences” that claim to offer the opportunity to be part of or “feel” the film have origins in the late 1980s, particularly, the 1990s.⁴ As will be discussed below, while the history of the cinema is populated with many examples of immersive experiences that date back to the silent era (phantom rides, widescreen, 3D, Sensurround, Smell-O-Vision, Percepto, to name but a few), the 1990s were game-changer years that would lead to the mainstreaming

and standardization of the immersive cinema experiences of the twenty-first century. In this article, it is the ride film that we examine as a form that experimented with combined film and theme park ride technologies that were intent on targeting the participant through multiple senses in order to produce an immersive effect.

The ride film incorporates film projection (in widescreen, 3D, or standard format) with ride technologies that may include roller coasters, simulation rides, or moving seats in an auditorium. Experimenting with techniques that would later be labeled “4D,” these experiences aim to engage the viewer not only through the senses of sight and sound but through a range of other senses, including smell, touch, proprioception, equilibrioception, and thermoception. In the ride film, therefore, the body of the spectator can be manipulated through a range of effects—water spurts, wafting scents, movement, fog and smoke, and in-theater lighting—that aim to draw the events and world of the film into the theater space, and vice versa, in ways that directly activate the full range of senses beyond vision and hearing. A number of factors aligned during the 1990s to position ride films as key drivers of a new era of film viewing and entertainment experiences. Changes in the entertainment industry made it possible for the ride film as sensorially invasive film attraction to move from short-term gimmick to expensively produced, technologically sophisticated norm, particularly within the context of the theme park.

Just as CGI increasingly became standard in cinema as a result of pioneering digital visual effects created for films such as *Terminator 2: Judgment Day* (James Cameron, 1991), *The Lawnmower Man* (Brett Leonard, 1992), *Jurassic Park* (Steven Spielberg, 1993), *Toy Story* (John Lasseter, 1995), and *The Matrix* (the Wachowskis, 1999), digital technology also facilitated the standardization of the ride film within the context of the theme park. Technological innovations ushered in by the digital era had a dramatic effect both on the production of visual effects in the cinema and on the generation of new dynamic ride technologies that incorporated film into their designs. Digital technologies impacted on mechanics, electronics, projection, pneumatics, lighting, sound, and optics, and the result was the production of advanced ride technologies—simulation rides, motion theaters, dark rides, and other multisensory attractions accompanied by films—the likes of which had never been seen before. These new attractions targeted human perception to

create convincing experiences of immersion into alternative fictional spaces.

The second transformation began in the late 1960s but solidified in the late 1980s and 1990s. Film, television, print, and theme and amusement park companies were incorporated into larger media conglomerates with multiple media interests. The consolidation of media companies also encouraged the diversification of properties. Entertainment conglomerates, particularly those owning film companies, began to spin off their products into cross- and transmedia experiences. Films such as *Jurassic Park*, *Back to the Future III* (Robert Zemeckis, 1990), and *Terminator 2*, for example, were reimagined as transmedia extensions in the form of rides, videogames, and/or comics. While both the combined digital revolution and transmedia phenomenon began as far back as the 1960s, it was in the 1990s that these strategies became business as usual for the multimedia conglomerates. The third change during the 1990s, which benefited from this period of media conglomeration, is the boom of the theme park.⁵ The two companies that would particularly focus strategically on extending their film franchises into transmedia spin-offs in their theme parks were Walt Disney Productions (now the Walt Disney Company) and Universal (which for most of the 1990s was part of the MCA/Matsushita, now Panasonic, merger). Disney and Universal in particular produced ground-breaking ride films that aimed to extend existing limits of cinematic immersion and sensory perception.

It was during the 1990s, therefore, that the film industry, as part of a growing conglomerate media structure, began to experiment with and solidify its focus on multisensory cinematic experiences. This form of experimentation, which pushed the boundaries of traditional film viewing beyond a passive form of entertainment, primarily took place in the context of the theme park, which was itself emerging as a major player in entertainment culture. Simulation rides, dark rides that incorporated large screens, and theater-scale 3D experiences with water, air, vibration, and smoke effects were introduced and experienced by millions. Ride films such as *Back to the Future: The Ride* (Universal Studios, Florida, 1991), *Terminator 2 3D: Battle across Time (T2-3D)* (Universal Studios, Florida, 1996), and *The Amazing Adventures of Spider-Man* (Universal’s Islands of Adventure, Florida, 1999) have tested the boundaries of human perception by introducing innovative production and projection technologies that

eventually exited the parks and influenced contemporary cinema exhibition in the form of 4D auditoriums in multiplexes such as D-Box and 4DX.

This article provides an analysis of the above rides, which were three of the most groundbreaking and successful ride films of the 1990s. They were all released at Universal Studios, which was experimenting with incorporating screen technologies into traditional ride formats during this period. Each ride represents the advance of a specific type of ride film: the simulation ride (*Back to the Future: The Ride*), the 4D theatrical experience (*T2-3D*), and the motion-based roller-coaster 3D dark ride (*The Amazing Adventures of Spider-Man*). Along with outlining some of the major technological innovations introduced by these ride films, we also examine the ways they extended film spectatorship by introducing intense embodied experiences that made literal the cinema's capacity as a perceptually powerful medium.

Focusing on Angela Ndalians's firsthand experiences of the rides, we examine each of these rides from three analytical perspectives. While we apply each theoretical perspective to three distinctive rides, our position is that each framework is shared by most of the ride films of this period, particularly, Universal Studio's ride film attractions. In the first part of this article we consider Scott C. Richmond's argument that screen representations, whether digital or photochemical, function as perceptual interfaces that attempt to convince us of the illusion of their constructed realities.⁶ We begin with an examination of earlier manifestations of immersive attractions—such as *Hale's Tours*, *The Tingler*, and *Cinerama*—and end this section with the late 1980s groundbreaking ride films *Captain EO* and *Star Tours*, analyzing the strategies applied by each of these perceptual interfaces and the immersive experiences they create. We continue with Richmond's argument in the analysis of Universal Studio's *Back to the Future: The Ride* (Douglas Trumbull, 1991). While stating that the cinema as perceptual interface relies on vision, Richmond (via psychologist James Gibson) argues that the eyes work in unison with the other senses to create a cinematic experience that aims to create an "as if" sensation of movement into the world on-screen. We argue that ride films amplify this sensation by adding literal motion and direct bodily engagement, both of which fire up the senses more directly and invasively. In the section about Universal Studio's *Terminator 2 3D: Battle across Time* (James Cameron, 1996), we extend this idea of the "as if" by arguing that there

are parallels between the ride film's sensory demands on the spectator and what Tom Gunning has characterized as the early "cinema of attractions," which aimed to produce for the spectator an "aesthetic of astonishment."⁷ However, unlike early cinema, which focused on performativity, spectacle, and wonder to the detriment of narrative, we argue that in ride films (which are based on preexisting film franchises) spectacle and narrative work together, creating an interface that places us within the (already familiar) storyworld of the franchise. In the final section, we turn to Miriam Ross's writing about the "hyperhaptic" 3D field screen, where the stereoscopic moving image engenders an unstable screen surface that is immersive rather than fixed and stable. Through a close analysis of Universal's *The Amazing Adventures of Spider-Man* (Thierry Coup, 1999) we consider Ross's hyperhaptic screen from the perspective of the ride film and argue that the immersive and hyperhaptic qualities of the screen are intensified further because of the actual motion of ride technology, which works to amplify the sensation of the mobile gaze combined with sensory engagement.⁸

CINEMA AS A PERCEPTUAL INTERFACE: FROM HALE'S TOURS TO STAR TOURS

In his article "On Learning to Fly at the Movies: *Avatar* and *How to Train Your Dragon*," Scott C. Richmond examines the opening shots of *Avatar* (James Cameron, 2009) and *How to Train Your Dragon* (Dean DeBlois and Chris Sanders, 2010), which simulate the "as-if sensation of flying through space: the illusion of bodily movement." According to Richmond, who reiterates the views of Philip Rosen and John Belton, "Digital cinema' is indeed a false revolution." Despite their reliance on digital technologies to construct their fictional worlds, groundbreaking digital films like *Avatar* and *How to Train Your Dragon* "use an impressive array of digital technologies in the service of the old-fashioned, quintessentially cinematic business of manifesting a world on-screen in which to immerse viewers." Richmond explains that, as is made clear by the flying sequences in these two films, "the ontology of the cinematic image"—whether photochemical or digital—is not important in terms of the immersive effect the moving images generate. "Rather," he states, "the impression of a world unfolding before us arises from the cinema's perceptual modulation of its viewers." The "digital ontologies" of both films and the immersive effects they aim

to achieve place them on a continuum that begins during the photochemical stage of early cinema: both constitute “a specifically perceptual technology.” As Richmond explains, regardless of its digital or photochemical status, “we must appreciate the cinema as itself a perceptual interface, a technology that manipulates its viewers.”⁹

The cinema as a perceptual interface that has immersive capabilities was evident from the beginning. From cinema’s earliest days, filmmakers experimented with various methods that could engage the audience in more bodily invasive ways, seeking to explore the potentials of this perceptual interface. One of the first significant examples was *Hale’s Tours and Scenes of the World*.¹⁰ *Hale’s Tours* aimed to simulate a train travel ride by ensconcing the audience in enclosed spaces designed to appear like train carriages and projecting “phantom ride” films shot from the front or back of a moving train. Motors under the floor would move the carriage in synchronization with the film being displayed, sound effects such as bells and whistling brakes created an ambient soundtrack that matched the events on-screen, and fans blasted air on travelers in certain areas of the carriage. While this train simulator ride did not last very long due to a lack of new film content and thus attraction development, *Hale’s Tours* helped to popularize cinema exhibition in new ways.¹¹ In fact, the site at Oxford Street in London was one of the first full-time cinema exhibition venues in London during a time when cinema tended to be an ephemeral component of multipurpose entertainment destinations at sites like vaudeville theaters.¹² Ultimately, the key attraction of *Hale’s Tours* was that it thoughtfully combined film, spatial design, and sensory effects to create the playful illusion that audiences were not simply “watching” a film but partaking in a train journey, mirroring later ride films and new film experiences like 4DX that draw “you into the movie as if you’re living inside its world.”¹³ To achieve such effects, *Hale’s Tours* fostered a particularly multilayered relationship between the body of the spectator, the exhibition space, and the cinema screen that is mirrored decades later in the interplay between immersion and emersion in the ride film.

Most earlier examples of a more all-encompassing sensory experience were short-lived cinema exhibition gimmicks (in fact, they were usually one-offs), such as those from the 1950s and 1960s by William Castle, who used in-cinema props and effects, such as the vibrating motors placed in the backs of seats for particular showings of *The Tingler*

(1959). Other early feature film experiments with the sensory capabilities of cinema’s perceptual interface focused on the incorporation of smell, such as Smell-O-Vision (which accompanied the release of *Scent of Mystery* [Jack Cardiff, 1960]) and Aroma-Rama (which accompanied the release of *Behind the Great Wall* [Carlo Lizzani, 1959]). Even during the classical Hollywood period, attempts were made by film exhibitors to heighten the level of sensory engagement during the film screening. For example, the famous movie palace entrepreneur S. L. Rothapfel (known as “Roxy”) opened one of his many film theaters, the two-thousand-plus-seater Rivoli in 1917 in New York, and this cinema was noted as revolutionizing the motion picture industry. In addition to the fifty-piece orchestra that played live music before and during the film, the theater included color symphonies that lit the interior and introduced in-theater smell. Roxy invented a new compressor machine that operated with an intricate system of atomizers. The *Motion Picture News* of 1918 stated that any “delicate odor can be wafted to any part of the house, such as incense for oriental scenes, clover and new mown hay when the setting reveals a country landscape at dusk, or any of the myriads of other combinations that may be suggested by the pictures being shown. Tentative experiments with perfume at the Rialto led to the installation of the fine new plant which promises a permanent innovation in pictures.”¹⁴ Needless to say, this innovation would not last as a new norm for film exhibition, because the film industry would be required to dramatically update its exhibition spaces. For example, the closest the industry came to standardizing the grand-scale immersive formats of the 1950s and 1960s—Cinerama, Panavision, CinemaScope, and 3D—eventually succumbed to the reality of limited standardization of theaters, a fact that was further hampered by Hollywood cinema’s financial strife during the time.

Many of these cinematic experiences offered an innovative and multilayered play with the cultural and mediated practices of cinema spectatorship. These immersive cinema practices experimented with forms of film experience that would reemerge in the late 1980s and 1990s, but this time within an industry context that would successfully advance and standardize the underlying technologies and infrastructure. The ride-based film attraction, in particular, incorporated many elements of these earlier film formats, combining a range of technological devices in an attempt to physically enfold the participant in a cinematic diegesis. The

ride film consolidated technologies and perceptual systems into new visions of immersion that, as articulated by Douglas Trumbull, one of the leading effects experts of the period, were driven by the quest to create a cinema exhibition experience that prioritized “being *inside* the movie rather than looking at the movie.”¹⁵

In the 1990s the theme park became the primary site for these innovative experiments with immersive perceptual regimes. In their article canvassing theme park trends, Sandro Formica and Michael Olsen position the 1990s as a major period of growth and development for theme parks, in part sparked by major technological developments and investments. Key to this, they suggest, is the widespread crystallization across the industry of a strategy “offered by the synergy between film productions, amusement shows and rides themed by popular movies. . . . Their goal was to exploit the fame of popular action movies and reproduce them in the amusement park with the visitors ‘in action.’ The active participation of visitors in popular movies was a valuable attractor of visitors to amusement parks and was especially effective in increasing the number of repeat visitors.” Formica and Olsen position motion-based simulators and related 4D (or what they call “virtual reality”) film experiences as a central component of this development, suggesting that such experiences allow for the creation of high-octane thrill rides that are indoors rather than outside in the elements like traditional roller coasters, thus overcoming what they describe as one of the major “environmental causes of poor company performance: bad weather.”¹⁶ For the first time in the 1990s, technological developments—particularly in the area of software and computer-generated effects—allowed for the creation of ride film attractions that could rival roller coasters on the level of thrills and visceral motion.

While film remained—and continues to remain—a perceptual interface, in the context of the theme park ride film this perceptual interface became all the more intense because of new synergies and technological advances offered by ride technologies. Two ride films in particular set the scene in the 1980s for what became standard practice in the theme park in the 1990s and beyond: *Captain EO* (Francis Ford Coppola, 1986) and *Star Tours* (Dennis Muren, 1986), both at Disneyland. In 1986, following the hiring of CEO Michael Eisner in 1984, Disney transitioned away from its traditional amusement-style rides to a new incarnation of the ride film, the influence of which continues to resonate

in the twenty-first century. Eisner was driven by the desire to revive the Disney theme parks for a new generation; one of his strategies was to introduce innovative rides with original stories based on Disney media and “licensed-in third-party properties” such as the 4D cinema experience *Captain EO*.¹⁷ Reflecting the synergistic relationship between entertainment companies that would drive such transmedia productions, this science fiction musical, starring Michael Jackson, was directed by Francis Ford Coppola and produced by George Lucas based upon a story idea from Walt Disney Imagineering. Writer and producer Rusty Lemorande suggested the innovative technique of syncing the effects in the theater with actions in the film, which, in turn, earned him the name “Father of 4D.”¹⁸ The attraction was developed during a revival of 3D cinema’s popularity in the early 1980s.¹⁹ Yet while 3D cinema was a fleeting novelty in the 1980s, *Captain EO* continued to operate across numerous Disney theme parks until 1996, highlighting the extent to which theme parks drove significant advances toward the standardization of 3D and 4D cinema during this period.²⁰

The much-hyped *Captain EO* attraction was specially designed for embodied 4D presentation, with seven-hundred-seat theaters created especially for the attraction at the Anaheim and Orlando Disney theme parks.²¹ The 3D film was projected with 70mm film projectors, and the embodied component was crafted using a range of sensory, in-theater effects, including laser lights, smoke, and scents. In later revivals of the attraction, seat motion powered by hydraulics (which moved to the beat of Michael Jackson’s songs) accompanied the screening to further amplify the sensation that the worlds of the film and the auditorium had collided.²² The success of *Captain EO* helped to spark the reemergence of the ride film—an embodied experience that, like *Hale’s Tours*, is organized around the exhibition of a film—and influenced *T2-3D* less than a decade later.²³

The other 1980s attraction that inspired 1990s ride films, *Star Tours*, was not a 4D film but rather a simulation ride that incorporated film technology into its structure. This is significant, given that simulation ride technology and experiences would later be integrated into major 1990s ride film attractions such as *Back to the Future: The Ride*. Highlighting the crucial role of conglomerate business interests in the development of 4D film attractions and ride films, *Star Tours* was the first Disney ride to feature a non-Disney property. It was part of a larger strategy to create

productive transmedia synergies between the Disney and *Star Wars* brands, a strategy that finally reached its ultimate conclusion in 2012, when *Star Wars* finally became a Disney property.²⁴ Beyond this environment of increasing corporate convergence, the ride film allowed ride designers and film directors to fully harness the creative potential of narrative cross-over between the feature film and theme park thrill ride. As Geoff King suggests of blockbuster filmmaking and ride films of this period, “The more intense experience of aspects of the spectacle offered by the films is a major factor in their appeal, but this can be heightened by carrying over narrative associations and identifications from the films and by including elements of narrative within even the most visceral thrill-based attraction.”²⁵

For *Star Tours*, Industrial Light and Magic was faced with the task of synchronizing the film with the motions of the simulators. Suchul Shin, Byoungyun Yoo, and Soonhung Han explain that the hardware for the motion platforms was based on military flight simulators, but the software was not; therefore, the motion had to be manually programmed to accord with the film events.²⁶ The end product was front-projected onto the screen of each Starspeeder (the buggy the participant sat in) from a 70mm film projector, and the result was a spectacle that was hyperrealistic, an effect achieved by Lucas’s decision to film at thirty frames per second instead of the traditional twenty-four. The aim of the *Star Tours* ride film was to work with the immersive themed space of the attraction and the motion effects to create the sensation that the rider/spectator is “entering” the film’s diegetic environment and *experiencing* rather than *watching* the events on-screen.²⁷

Captain EO and *Star Tours* became models for the new theme park attractions of the 1990s, many of which aimed to technologically outperform their 1980s predecessors. The combination of theatrical, multisensory 4D film attractions and high-tech simulation rides reverberated into the 1990s, when the technological boundaries of entertainment experiences and perceptual limits of film spectatorship were pushed further still.

ENTERING THE NARRATIVE: BACK TO THE FUTURE: THE RIDE (1991)

One of the earliest and most influential of the 1990s ride film attractions was Universal Studio’s *Back to the Future: The Ride* (Trumbull, 1991). Unlike the stand-alone *Captain*

EO, the film was based on a popular existing property. Like *Star Tours* before it, *Back to the Future: The Ride* featured an immersive short film—fifteen minutes long—that made extensive use of first-person perspective in order to effectively synchronize with the movement of the motion simulator seats. In this instance, there were twenty-four specially designed simulators, each representing the iconic DeLorean car from the films and offering a range of full motion never seen before in a theme park context. As a result, the “film” was experienced by the audience as a high-octane thrill ride. In addition, Trumbull introduced further innovations into the ride that pushed the limits of the materiality of the screen, and the changes have resonated across film viewing in the twenty-first century. The ride film was projected onto an eighty-four-foot-diameter domed Omnimax screen and filmed using a 70mm IMAX dome fish-eye process, which puts the film into proportion when projected onto a curved surface. The advantage of IMAX projection is that it offers greater resolution compared to traditional theater projection. The ride used state-of-the-art technology that radically transformed the concept of “immersive” cinema—from scale; to film resolution; to twelve-channel sound, which is transmitted through holes in the screen, speakers in the “DeLorean,” and the auditorium. Trumbull explained:

“In order to make the show, we actually had to build special IMAX cameras and motion-control systems. At the time we were doing the show, which was about 1990, there was no IMAX optical printing. We had to actually shoot everything in-camera, as much as we conceivably could . . . and we had to build these miniature IMAX cameras that were scaled down so small so that they could fit inside these miniature sets. . . . We invented a whole kinesthetic language so that the motion of the camera was corresponding to the motion of the vehicle that you’re gonna be in, so you can feel it turning or swooping or diving, accelerating or crashing or whatever.”²⁸

As Trumbull has said of his work, the appeal of crafting films for 4D attractions and motion-simulator rides rather than conventional cinema is that “it’s not somebody else who’s getting shot at or catapulted out of a rocket. It’s you. This is what I’m most interested in: the direct first-person experience.”²⁹ The first-person experience became key to the fast-paced cinematic “ride” sequences almost universally central to 1990s ride film attractions, as the combination of first-person perspective of a high-octane journey projected in 3D or on an extreme screen, seat motion, and in-theater

effects aimed to simulate the experience of visceral movement through the film's diegetic world. In part due to the rise of such attractions and the parallel revival of 3D, Ray Zone in his history of 3D cinema frames 1986 through 2005 as the "immersive age."³⁰

The industry-wide movement toward ride-based films during the 1990s is clearly heralded in the development history of *Back to the Future: The Ride*. As a news article published at the time of the ride's production reports, the designers, in partnership with the attraction's producer, Steven Spielberg, originally planned to develop a *Back to the Future*-themed roller coaster but found that a roller coaster would travel too quickly to effectively convey the level of narrative detail Spielberg and the designers desired. Thus, rather than trying to use a thrill ride to simulate a film, they decided to create a film exhibition experience that would simulate a thrill ride. With this aim in mind, a motion simulator ride was developed that positions the audience inside the film's iconic DeLorean cars on a moving platform, transforming the cinema exhibition space into a themed ride space in the manner of Disney's *Star Tours* and, earlier, *Hale's Tours*.³¹ In addition, Trumbull incorporated the theatrical effects associated with 4D into the sim-ride so that the physical and perceptual effects of the ride film, which aim to simulate a high-speed pursuit, are amplified by sprays of water, wind, and smoke.

The film at the centre of the attraction stars Christopher Lloyd and Thomas F. Wilson playing their characters, Doc and Biff, from the film franchise, thus functioning like a transmedia minisequel to the then most recently released film in the series, *Back to the Future Part III* (Zemeckis, 1990). Thus, not only did these high-budget theme park attractions function as promotional paratexts for major film releases during this decade, but they explicitly aimed to conduct narrative work, functioning like embodied, immersive sequels to the feature release that allowed guests to experience the film's diegetic world in a new way: not just in a sensory sense but in terms of narrative development. As Allen Yamashita suggests, this relationship allows not only greater narrative economy but also narrative and world-building depth in the ride experience, as "the audience arrives at the attraction with the background story well in hand so that everything is instantly recognizable and easy to follow. With experience and background knowledge of all the characters, the audience recognizes the narrative instantly—even if it's only loosely delineated within the experience."³²

Finding ourselves in a space that follows the events of *Back to the Future Part III* in 1991, we riders enter the Institute of Future Technology, founded by Dr. Emmett "Doc" Brown, which specializes in the creation of his inventions. We are no longer viewing the world of *Back to the Future* as spectators; instead, we are physically located inside the narrative. We are invited to the institute by Doc as volunteers who will test drive his new invention, an eight-passenger DeLorean DMC-12 time machine. As we physically traverse the architectural space while waiting in the queue, television screens feed us narrative information that includes excerpts of scenes from the *Back to the Future* trilogy, as well as new scenes of Doc showing the audience some of his inventions. Doc then reappears on the screens in the "present" of 2015 and explains the nature of the experiment we are about to experience. However, it is soon revealed that Biff (the "bad guy" from the film trilogies) has escaped his time continuum by stowing away on one of the DeLoreans back in 1955. As we approach our DeLorean DMC-12, Doc pleads for our help, asking us to enter the time machine in order to locate Biff in the space-time continuum and retrieve the DeLorean. Aided by a time-tracking scanner installed in the DeLorean Biff has stolen, we are launched across time and become key participants in the narrative world of *Back to the Future*. The vast Omnimax screen above and before us surrounds our vision, and speakers in the auditorium and DeLorean surround us with sound.

As the ride unfolds, we initially follow Biff at a breakneck speed through Hill Valley, the sim-ride machine lunging upward and downward and matching events on-screen as we crash into neon signs and pass iconic structures from the films, including the town square and clock tower. We then go back in time to the Ice Age period, where we plummet through caverns, our bodies heaving as the sim-ride propels us through space, threatening to smash into massive rocks. Biff again jumps time, traveling back further still to the Cretaceous period, where we find ourselves in a volcano inhabited by a *Tyrannosaurus rex* (fig. 1). Biff coaxes the *T. rex* to attack us, but we see his own DeLorean smashed, and the *T. rex* is propelled uncontrollably through space. Our own fate appears to be worse, as our DeLorean plummets through space and is swallowed by the *T. rex*, only to finally be jettisoned out. Accompanying our backward acceleration through space is the diegetic sound of combined screams and yelps of joy. As we float along a lava bed, we see Biff's vehicle



FIGURE 1. Participants travel back in time in a DeLorean and have a close call with a *Tyrannosaurus rex*. *Back to the Future Ride*, Universal Studios, Los Angeles. Photo by Angela Ndalianis.

drifting ahead; then both machines plunge over a cliff, making our stomachs feel as if they have entered our mouths. Doc steps in to save us, speeding up our DeLorean, which collides with Biff's and sends us into a vortex that returns us to our temporal starting point. When we safely land back at the Institute of Future Technology, Doc appears on-screen, and we see Biff being taken away by security. As we lift the bars that held us in place in the ride vehicle, Doc tells us to move, warning, "Hurry up! Get out before you meet yourself coming in!" As we leave, our heroic exit is accompanied by the toe-tapping rhythms of Huey Lewis and the News' "Back in Time," the song written for *Back to the Future*.

In *Back to the Future: The Ride*, we are woven into the narrative as its heroes. We witness story events unraveling before and above us on the screen, but we are also placed physically in a simulation ride machine whose minutely programmed motions aim to parallel the actions on-screen. Real and representational worlds collide, the aim being to make us feel as if we're "riding the movies." Discussing the immersive potential of cinema as represented in flight sequences in the movies, Richmond states that "the cinema manifests the illusion of bodily movement in a palpable, intense, and frankly pleasurable experience that, even though patently illusory, entails both an impression of reality and an immersion in a world unfolding onscreen." Nevertheless,

he states, experiencing the flight of Hiccup and Toothless in *How to Train Your Dragon* is not equivalent to riding a roller coaster, where we "would receive the sensory information that ensues from plunging headlong from a high altitude, not only visually, but from our richly overlapping senses; we would feel the wind in our hair, hear the roar in our ears, and cling for dear life to the harness on the dragon."³³

Influenced by ideas about visual perception outlined by psychologist James Gibson in his book *The Ecological Approach to Visual Perception*, Richmond explains that when we are on a roller coaster, "the information we receive from both our vestibular and visual systems would specify the

same movement through the environment: each informing us that we are flying into a nose dive."³⁴ He continues:

In the cinema, however, this quasi-movement is specified only through visual information. In *How to Train Your Dragon's* remarkable learning-to-fly sequence, for example, vision and balance tell us very different stories: our eyes tell us that we are skyrocketing at ludicrous speed behind Hiccup and Toothless towards the water, while our inner ear tells us that we are still in our seats in the theater. Unlike a passenger in a car or a rider of a roller coaster, we experience a suspension of the ordinary covariation between vision and balance when viewing this sequence. In a very important sense, this sort of illusion of bodily movement in the cinema and the pleasure it frequently gives are less related to the roller coasters that we often invoke than we might think.³⁵

For Richmond, this difference emphasizes "the divergence between ordinary perception and a visceral, cinematic immersion whose intensity lies precisely in its divergence from that perception." In short, this discrepancy "helps us to appreciate the cinema as fundamentally a perceptual interface" that heavily relies on vision. However, as Richmond notes via Gibson, "vision is not located in the eyes, as a discrete sense alongside four other senses." The senses combine and are activated in the body, each playing off and intensifying

the experience of the other in order to make sense of the world being perceived and experienced. For Richmond, the cinematic experience is “marked by what Gibson calls an ‘as if’ quality . . . that is, the palpable illusion of movement through the world onscreen.”³⁶ Gibson’s “as if” quality recalls Octave Mannoni’s description of the suspended disbelief required of precinematic optical entertainments as “I know very well, and all the same,” which Tom Gunning translated to the film experience as “I know very well, and yet I see.”³⁷ In creating a convincing sense of “as if,” the cinema creates an intimate relationship with the spectator’s body, one that Vivian Sobchack defines as “cinesthetic,” “a neologism that derives not only from cinema but also from two scientific terms that designate particular structures and conditions of the human sensorium: synaesthesia and coenaesthesia.” As Sobchack explains, both “point to ways in which the cinema uses our dominant senses of vision and hearing to speak comprehensibly to our other senses.”³⁸ The illusion on-screen incites the senses to respond to the illusion “as if” it were real.

Ride film attractions of the 1990s further complicate the idea of the “perceptual interface” and the “as if” quality by incorporating additional technologies of motion (through ride simulators or moving seats) and effects such as water, smoke, and wind. In addition, the ride film eliminates the difference identified by Richmond between experiencing a roller-coaster-esque sequence in a film and experiencing an actual roller coaster as the film is incorporated into a thrill ride. The experience is literally visceral because our bodies are kinaesthetically engaged (often extremely) and because our bodies no longer merely *perceive* the illusion of movement—they actually move and change in synchronization with the events on-screen to the rhythms of motion of the ride technologies. Covariation between vision and balance is thus in full play. Unlike the film-viewing experience, “the information we receive from both our vestibular and visual systems” does indeed “specify the same movement through the environment: each informing us that we are flying into a nose dive”—in the case of *Back to the Future: The Ride*, a nose dive into the mouth of a *T. rex*. The “as if” scenario is still operational, but in the case of ride films, the staging of the technologies engages us on every sensory register with the aim of fully enfolding us in an acceptance of the world “as if,” pushing this perceptual illusion to its extreme limits.

A NEW CINEMA OF ATTRACTIONS FOR THE 1990S: *TERMINATOR 2 3D: BATTLE ACROSS TIME* (1996)

Another key development that helped to sediment the ride film as a significant entertainment mode in the 1990s was Universal Studio’s *Terminator 2 3D: Battle across Time*, a thrilling attraction based around a twelve-minute 3D film set in the world of the Terminator franchise. Like both *Back to the Future: The Ride* and *Honey, I Shrunk the Audience* (Randal Kleiser, 1994)—a 4D transmedia attraction at Disneyland based on the successful film *Honey, I Shrunk the Kids* (Joe Johnston, 1989)—*T2-3D* functions like a minisquel and features actors playing their famous characters from the film, with Arnold Schwarzenegger as the Terminator, Linda Hamilton as Sarah Connor, and Edward Furlong as John Connor. Also like *Honey, I Shrunk the Audience*, the film combines live action in a theater with seat motion, wind, smoke, water, and light effects, thus making it a 4D attraction. The film is projected across three screens, Cinerama-style, each of which is twenty-three feet high and fifty feet wide, in a seven-hundred-person capacity theater, and it cost \$60 million to produce, making it the most expensive production per minute in film history, beating *Captain EO*’s previous record.³⁹ While the film was directed by James Cameron, the ride experience was designed by the Landmark Entertainment Group, led by Gary Goddard, who had earlier designed the 1980s 4D attraction *The Sensorium* (1984).

Even more explicitly than *Back to the Future: The Ride*, central to the thrill of *T2-3D* is the extent to which the 4D film experience playfully melts the boundary between screen and exhibition space: the concealed and ever-shifting boundaries of the screen are no longer an intended side effect of the attraction’s thrill ride-esque design. As Ndaliansis puts it, this attraction is primarily concerned with the “flawless articulation of an illusion that invades the audience’s space in deceptively real and immediately experiential ways.”⁴⁰ Arnold Schwarzenegger, Linda Hamilton, Edward Furlong, and Robert Patrick reprise their roles under the direction of James Cameron, but doubles for Schwarzenegger and Hamilton also appear as live actors in the theater, introducing us to the action that will eventually play out on-screen.

The narrative premise begins the minute we enter the Cyberdyne Complex and, after a preshow, are ushered into the theater, where we take our seats, not failing to notice that

T-70 models of Terminators are present in the auditorium with us, surrounding us on all sides. A host introduces the audience to the company's "cybotic" vision through a video being projected on multiple televisions. Sarah and John Connor (Hamilton and Furlong) take over the transmission and (on-screen) warn the audience that danger is imminent. Ndalianis describes the experience thus:

Amidst the battle chaos (and armed with 3D glasses), the attraction participants are seemingly caught in the cross fire of bullets fired at the Connors by the T-70s. . . . [T]he audience looks on in horror as the bullet holes embedded in the [Cyberdyne] logo [on-screen] melt and morph into the T-1000, the shape shifting cyborg antagonist from *Terminator 2*. As his liquid, blob-shape morphs into "chrome man" guise, the T-1000's head begins to fill the screen, then lunges forward, seemingly escaping the confines of the screen space as he thrusts in the direction of the audience, some members of which react to the motion by screaming and reaching out to protect their faces from the coming onslaught. The T-1000 then "moves back" into screen space . . . morphing into liquid metal form and slipping down to the lower part of the screen where, in search of his prey, he then transforms into a live actor (as a policeman form of the T-1000) on stage. Moments later, a time portal opens up in the screen, and a "live" T-800 (a Schwarzenegger look-alike) arrives on stage on a Harley-Davidson Fatboy, calling out a repeat performance of Schwarzenegger's famous one-liner to John in *Terminator 2: Judgment Day*: "Come with me if you want to live." Both then "enter" the screen reality . . . and the next stage of the story begins: a seven-minute film that dramatizes John and the T-800 trying to destroy the Cyberdyne computer mainframe in the year 2029. . . . At one stage in the film, the screen expands to 180 degrees and is flanked by two additional screens of identical size, expanding the dimensions of the screen to 23x150 feet of enveloping spectacle.⁴¹

Ndalianis argues that *T2-3D* plays a game with the audience's perceptions through the interplay of various layers of reality and representation: live actors perform onstage in ways that alternately perceptually extend the performances on-screen into our own physical reality and reflect our own physical reality onto the screen. In addition, Terminators and exploding particles appear to exit the screen and enter our own space (fig. 2). The attraction also revels in its sheer theatricality and virtuosity, which reflexively impel the audience to acknowledge the experience as one of technological wonder.



FIGURE 2. The liquid Terminator appears to exit the screen and enter the space of the audience. *T2 3D: Battle across Time*, Universal Studios, Los Angeles. Photo by Angela Ndalianis.

T2-3D pushed the limits of 3D screen technology into new digital directions. In doing so, it was unique for its day, yet it belongs to a long history of shifting film spectatorship practices that date back to the early days of cinema. As many scholars have acknowledged, the cinema of attractions that Tom Gunning first ascribed to early film up to 1907–10—and which offered an alternative model of spectatorship to the narrative-based model that came to dominate in the classical Hollywood period—did not disappear but found other modes of expression in the era that followed.⁴² As Gunning argues, the cinema of attractions has its origins in precinematic traditions that included fairground attractions, which displayed many forms of ocular entertainment (such as zoetropes and magic lanterns), as well as amusement rides, all of which aimed to produce for the spectator an "aesthetic of astonishment."⁴³ To further illuminate these practices, it is worth returning to Gunning's source: Sergei Eisenstein. Influenced by his mentor, the theater director, writer, and producer Vsevolod Meyerhold, Eisenstein believed that what was required in the modern era to shock the film spectator / theatergoer out of ideological complacency was the strategy of "attraksion" (sideshow/attraction), which is akin to those found in the fairground. In 1923 Eisenstein would adapt the idea of theater attraction to the cinema as his famous "montage of attractions." He stated that strategies of the attraction offered an alternative spectatorial reaction that was "aggressive" and that subjected the "spectator to a sensual or psychological impact."⁴⁴

Clearly, Eisenstein's motivations were to adapt fairground sensory engagements to the cinema for ideological and political

purpose.⁴⁵ Gunning explains, however, that early cinema was connected to a rich visual entertainment culture and continued to foster aesthetics of astonishment that revealed in technologically produced wondrous illusions and effects. The attractions tradition plays on theatricality—a presentational style that addresses the audience directly—and on a love of spectacle and performativity that displaces storytelling concerns in favor of an immediacy that addresses the senses. *T2-3D* and *Back to the Future: The Ride*, like many of the ride films of the 1990s, stage a return to the fairground roots of early cinema. However, they do so in new ways that also acknowledge the influence of over one hundred years of cinema and the long-standing dominance of classical narrative structures. The primary aim of these ride films is to place the “viewer” in the movies—and, more specifically, in movies that have been experienced previously as blockbuster films and that represent significant franchises for the studios that produced them and sprawling multifilm narratives for spectators. *T2-3D* relies on our awareness of the Terminator narrative universe and yet—true to the attractions tradition—aims to theatrically outperform the films on the level of spectacle and sensorial engagement.

Even though the final intent is different, both Gunning and Eisenstein stress that the attraction draws attention away from the plot or character development, becoming an experience that is reflexively about the text’s nature as attraction. However, as Gunning acknowledges, as the classical Hollywood paradigm came to dominate, the attractions tradition adapted and was incorporated into narrative-based films, most obviously in genres such as horror, fantasy, science fiction, and the musical.⁴⁶ Likewise, despite embracing technology never previously seen in cinema, blockbuster effects films of the 1990s and the ride films that were transmedia extensions of them share many features with films from the earliest phases in the history of the cinema. As Miriam Ross stresses, Gunning “does not see a binary dichotomy between attractions and narrative, but, rather, a configuration of spectatorial interaction that is distinct and has wide-reaching implications for how we might understand cinemas that are more concerned with exhibition than narrative development.”⁴⁷ However, rather than operating in a hierarchical relationship, spectacle and narrative work in unison in *T2-3D*: the attraction becomes the means by which we are immersed intensively into the storyworld of the *Terminator* franchise.

Discussing the *T2-3D* attraction, James Cameron explains that the movie attempts to “[integrate] film and the proscenium theatrical experience into the same project. We actually have characters jumping into the screen and back out of the screen, so we’re breaking down the barrier between the audience and events in the picture.”⁴⁸ The effect of this is that “the virtual onscreen image transforms into the real” throughout the experience in thrilling ways.⁴⁹ The emphasis on states of astonishment, virtuosity, theatricality, and address to the spectator echoes the early cinema of attractions tradition, yet, as Cameron makes clear, the aim is to heighten the sensation that we have been integrated into the narrative world of *Terminator* and that *Terminator*’s narrative has integrated itself into our reality. *T2-3D* pushes the boundaries of technologically mediated immersive spectacle in order to perceptually collapse the borders between the film’s narrative and our own physical space. It remains an example of the cinema of attractions because it *also* asks us to be aware of its technological virtuosity and the elaborate processes behind its perceptual illusions. Again we return to the “as if” scenario discussed above: we remain aware of the “as if” and, as such, can celebrate *T2-3D* as a technological wonder that simultaneously wraps us into its fantastical narrative world so convincingly.

“HYPERHAPTICITY” AND THE AMAZING ADVENTURES OF SPIDER-MAN (1999)

In her elucidating article “The 3-D Aesthetic: *Avatar* and Hyperhaptic Visuality,” Miriam Ross presents a model for three types of cinematic spectatorship. The first is the traditional 2D film-viewing experience, in which “the spatial and temporal location of characters and objects are clear. . . . [T]hese images tend to support the plot’s narrative drive. In the production of unambiguous images, ocular viewing is encouraged with little call to engage the senses beyond vision and hearing.”⁵⁰ The second type of screen experience is that of the haptic screen. Following Laura U. Marks’s important research on hapticity and the cinema, Ross explains that the haptic screen is engaged on a surface level and “constructs a fractured statement by refusing to position clear signs and relations between objects on its surface, which in turn draws attention to the images’ textured and tactile quality.”⁵¹ Marks argues a case for a haptic mode of visuality (particularly in intercultural films), explaining

that “haptic looking tends to move over the surface of its object rather than plunge into illusionistic depth, not to distinguish form so much as to discern texture.”⁵² Haptic visuality synaesthetically triggers the memory of other senses through its surface and textural play while also often obscuring depth—visual and narrative—into the space of the film.

The final type of screen, according to Ross—and this is the one that most interests us here—is the hyperhaptic 3D field screen. She argues that the stereoscopic image offers “an abundance of depth planes that provokes an immersive effect” that breaks up the stability of 2D film viewing and its reliance on the centered frame. The screen appears to abandon its framing logic so that

it is “merely a single technological point in a system that now extends both past the screen and into the theatre.” As Ross argues, the hyperhaptic 3D screen makes the “framing of the screen violable and open to play, [and] the 3-D film allows the potential for a fundamental haptic affect” that is immersive and that also brings into play a hapticity similar to that of “haptic cinema.”⁵³ The hyperhaptic visuality that typifies the 3D screen is found in the 3D ride films of the 1990s, as well as those of today. Coupled with the preshow experiences, which place us physically in the worlds of fictional characters and story franchises and where our senses are literally engaging with narrative spaces, the 3D ride film presents an immersive experience that tries to convince us of the violability of the frame. In this final section, we argue that the 3D ride film complicates Ross’s argument regarding hyperhapticity and the stereoscopic film because of the motion that is central to these attractions. While *Back to the Future: The Ride* and *T2-3D* fundamentally adhere to Ross’s model because the ride motion is more controlled and anchored in space, the new mode of roller-coaster dark ride films that *The Amazing Adventures of Spider-Man* (1999) helped popularize—recently reinvigorated by *Harry Potter and the Forbidden Journey* (2016)—takes the hyperhaptic screen to a whole new level because participants are literally



FIGURE 3. Peter Parker's office at the *Daily Bugle*, seen in the leadup to the 3D roller coaster experience. *The Amazing Adventures of Spider-Man* at Islands of Adventure, Universal Studios, Florida. Photo by Angela Ndalianis.

propelled through space via a ride system that operates like an indoor roller coaster.

The Amazing Adventures of Spider-Man first opened at Universal Studio's Marvel Superhero Island, one of five islands that make up the Islands of Adventure theme park in Orlando, Florida. Participants enter Peter Parker (Spider-Man)'s workplace, the *Daily Bugle*, and pass through the interior of the newsroom, a diegetic space rendered as an architectural environment. As Ndalianis describes elsewhere, objects like desks, newspapers, computer terminals, discarded food, and clothing “appear as if frozen in time as a three-dimensional realization of a comic-book world” (fig. 3). Television screens overhead provide participants with the background story: Dr. Octopus, Electro, Mysterio, and Hobgoblin are on the loose in New York and have stolen the Statue of Liberty, holding it for ransom. J. Jonah Jameson, editor of the *Daily Bugle*, tells us that it is up to the ride participants to become reporters and bear witness to the chaotic events occurring in the city. Entering a subway station, participants enter a “scoop” (a roller-coaster buggy) and begin their job as reporters. Armed with protective goggles (3D glasses), they are plunged through the streets of Marvel's New York.⁵⁴

The marvelous wonder of this ride comes from its intermingling of 3D film projection, a roller-coaster ride system,

IMAX-size screens, a set that creates the mise-en-scène of Spider-Man's New York, and sensory effects that include explosions of fire, jolts of electricity, and sprays of water. Throughout the ride, we are swiftly placed in front of and whisked away from screen after screen as the coaster soars across, up, and down "New York." At one point we are swirled around in multiple 360-degree spins (a fact that disturbs the centered vision associated with classical form), while at other times we find ourselves situated in front of 3D animations projected onto wide flat and domed screens. Our senses are fully called to attention: when Spider-Man introduces himself by jumping onto the scoopmobile in holographic form (fig. 4), then somersaulting back into one of the film screens (causing our car to rock), additional kinetics are added to the motion of the coaster that further amplify the sense of narrative immersion. At other points, holographic projections of Electro and Dr. Octopus appear and electrocute and torch the scoop, respectively, with the animated versions of electricity and fire transforming into actual electric zaps and fire that riders feel the heat of. In one of the ride's most hair-raising moments, the scoopmobile plunges downward at a forty-five-degree angle as riders appear to fall from the top of a skyscraper into an IMAX-constructed illusion of a New York sidewalk. When experiencing the ride, the screams and signs of collective shock in the scoopmobile are palpable. Spider-Man eventually saves the day, squirting a web that stops the fall and, eventually, saves New York and the Statue of Liberty. The combined effort of all of the innovative effects employed in *The Amazing Adventures of Spider-Man* makes the experience seem and feel "real."

Returning to Ross's argument, widescreen cinematic forms like Cinerama and IMAX play "with the screen's physical boundaries"; however, "3-D is the only format to suggest the impossibility of a stable surface for the moving images."⁵⁵ At times, objects from the world on-screen appear to enter our space (negative parallax), and at others, we appear to enter the space on-screen (positive parallax). *The Amazing Adventures of Spider-Man* complicates the dynamics of hyperhaptic 3D viewing by introducing movement through space. Watching a 3D film, no matter how invasive or immersive the representation on-screen appears to be, we are nevertheless still in our seats, and our vision is (relatively) centered, occasionally roaming to take in objects and actions across the screen. The rollercoaster 3D ride film, however, propels our bodies through space, and our vision, along with



FIGURE 4. Spider-Man introduces himself in 3D by jumping onto the scoopmobile. *The Amazing Adventures of Spider-Man* at Islands of Adventure, Universal Studios, Florida. Photo by Angela Ndalianis.

our other senses, must attempt to make sense of multiple, layered realities that merge into one another: from theatrical sets, to holograms, to screens. Our vision, like our bodies, is mobile; it becomes like a camera that absorbs the events unraveling in space and time. *We* are the fiction's center.

In her article about *Avatar*, Ross outlines the parallels often drawn between "deep focus and 3-D," explaining that "there is a major distinction between the editing techniques traditionally used in deep-focus filmmaking and in twenty-first-century stereoscopic feature films." Unlike recent 3D films, which tend to rely on editing, the depth of field created by deep focus is often used with the long take "so that within the scene action is given time to develop in deep space."⁵⁶ This observation is fascinating when considered in relation to 3D film dark rides, in which our vision re-creates the motions of the camera as it travels through the fictional deep space. In rides like *The Amazing Adventures of Spider-Man*, our motion through space and time becomes like a long take (one that lasts the length of the ride), and our bodies respond sensorially to an array of narrative spaces, convincing us (if fleetingly) that we are deeply immersed within them. The rapidly traveling rollercoaster maintains this perceptual illusion that we are "inside" the narrative—fostering our acceptance of "as if"—in ways that further extend devices used in motion simulator film rides like *Back to the Future: The Ride* and 4D film attractions like *T2-3D*. While in these earlier experiences the ride vehicle is fixed in a single location, relying on a synchronization between events on-screen and seat motion to simulate visceral movement through narrative space, in *The Amazing Adventures of Spider-Man*, synergies between

thrill ride and film are achieved in ways that Trumbull and Spielberg did not think possible when planning *Back to the Future: The Ride*. In *The Amazing Adventures of Spider-Man*, a rapidly traveling roller coaster works in service of our immersion in a film's narrative, rapidly transitioning riders between multiple diegetic environments and screens in ways that propel us through fictional deep space while obstructing our ability to identify the seams between the screen—and thus cinematic diegesis—and our own reality.

CONCLUSION

The rise of the ride film throughout the 1990s was entwined with corporate and formal synergies between films and theme park attractions, as well as changing strategies in theme park attraction design. Our analysis has demonstrated how three distinct types of ride film emerged and were popularized in the 1990s: the motion-simulator ride (*Back to the Future: The Ride*), the 4D theatrical experience (*T2-3D*), and the roller coaster 3D dark ride (*The Amazing Adventures of Spider-Man*). The key attraction of each of these different types of ride films is their visceral experimentation with film spectatorship and perceptual practices. Each ride extends the narrative of a well-known blockbuster property, impelling riders to compare the experience to traditional modes of cinema spectatorship while immersing them in the film's fictional world in sensorially invasive, embodied ways that play games with our ability to identify the boundary between the screen and our own reality. In their quest to extend the limits of cinema's "as if" quality—the "palpable illusion of movement through the world onscreen"—these rides challenge existing notions of cinema spectatorship, highlighting how cinema of attractions strategies can work in service of narrative immersion.⁵⁷ The ride film's popularity and success in theme parks in the 1990s have in turn come to influence mainstream cinema exhibition practices in the twenty-first century. As 4D auditoriums and other specialized or novelty forms of exhibition become increasingly popular in twenty-first-century cinemas, multiplex cinemas, in similar ways to theme parks, have started to offer a range of different spectatorial, sensory, and bodily experiences rather than simply a range of different films. As 4D cinema exhibition becomes increasingly mainstream in the 2010s, the experimentations with spectatorship and the cinema space enacted by 1990s ride films enter the multiplex cinema space, and as a result

film spectatorship is starting to encompass a more varied range of attractions with different appeals to the body.

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Notes

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3. Joseph B. Pine and James Gilmore, *The Experience Economy: Work Is Theatre and Every Business a Stage* (Cambridge, MA: Harvard Business Press, 1999).

4. "About Us," *CJ4DX*, 2019, <http://www.cj4dx.com/aboutus/aboutus.php>; "4DX," *Village Cinemas*, 2019, <https://villagecinemas.com.au/4dx>.
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6. Scott C. Richmond, "On Learning to Fly at the Movies: *Avatar* and *How to Train Your Dragon*," *JNT: Journal of Narrative Theory* 46, no. 2 (2016): 254.
7. See Tom Gunning, "The Cinema of Attractions: Early Film, Its Spectator and the Avant-Garde," *Wide Angle* 8, no. 3 (1986): 58–70.
8. Miriam Ross, "The 3-D Aesthetic: *Avatar* and Hyperhaptic Visuality," *Screen* 53, no. 4 (2012): 386.
9. Richmond, "On Learning to Fly," 254, 255, 258.
10. See Lauren Rabinovitz, *Electric Dreamland: Amusement Parks, Movies, and American Modernity* (New York: Columbia University Press, 2012), 67–68; B. S. Brown, "Hale's Tours and Scenes of the World," *Motion Picture World* 29, no. 3 (1916): 372–75; AHRB Centre for British Film and Television Studies, "Hales Tours of the World Ltd," the London Project, 2003, <http://londonfilm.bbk.ac.uk/view/business/?id=394>.
11. Rabinovitz, *Electric Dreamland*, 78, 77.
12. Chris O'Rourke, "Hale's Tours," London's Silent Cinemas Project, 2014, <https://blogs.ucl.ac.uk/events/2014/06/10/flickering-lost-forgotten-londons-silent-picture-palaces/>.
13. "About Us."
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15. Phelim O'Neill, "The Genius of Douglas Trumbull," *Guardian*, July 9, 2012.
16. O'Neill; Sandro Formica and Michael D. Olsen, "Trends in the Amusement Park Industry," *International Journal of Contemporary Hospitality Management* 10, no. 7 (1998): 306, 307.
17. Nick Sim, "20 Incredible Disney Attractions That Changed Theme Park Rides Forever," *Theme Park Tourist*, March 18, 2014. This seventeen-minute-long 3D science fiction film was at that stage the most expensive film per minute that had ever been produced, costing a total of \$30 million. See Carl Miller, "We Are Here to Change the World': *Captain EO* and the Future of Utopia," in *Michael Jackson: Grasping the Spectacle*, ed. Christopher R. Smit (Farnham: Ashgate Publishing, 2012), 120.
18. The visual effects team included Harrison Ellenshaw, who was *Captain EO*'s visual effects supervisor and who had worked on the groundbreaking space backgrounds in the *Star Wars* films; Tom Smith, who worked on the special effects for *Star Wars*; and other Industrial Light and Magic staff who were brought in by Lucas to finish the film. Andrea Shockling, "The Best 4D Movie Theme Park Experiences," *Entertainment Designer*, March 28, 2013.
19. Miriam Ross, *3D Cinema: Optical Illusions and Tactile Experiences* (Basingstoke: Palgrave Macmillan, 2015), 181.
20. Significantly, this theme park attraction cost more than even the most expensive mainstream 3D feature films of this revival period. The most expensive of these 1980s 3D films (most of which were horror sequels) was *Jaws 3D* (Joe Alves, 1983), which cost \$15 million, while *Captain EO* had a budget of \$23.7 million. While 3D cinema was a fleeting novelty in the 1980s, the *Captain EO* attraction had a long and enduring lifespan, operating across four different Disney parks from 1986 to 1996 and returning after Jackson's death in 2010, with a final showing at Epcot in December 2015.
21. Ray Zone, *3D Revolution: The History of Modern Stereoscopic Cinema* (Lexington: University Press of Kentucky, 2012), 168.
22. Alex Godfrey, "Captain EO," *Empire Australasia*, April 2016, 87–91. The premiere of *Captain EO* was marked by a sixty-hour opening weekend, and admission sales exceeded \$2 million, which, as Zone points out, broke Disney's previous, thirty-one-year-old high attendance record (Zone, *3D Revolution*, 168). Despite initial assumptions that the "film" would be a temporary attraction, it remained at Disneyland until 1994 (Godfrey, "Captain EO").
23. The producer of the 2010 revival of the attraction, Joe Tankersley, claims that the *Captain EO* experience was "so special" because it was "one of the first 4D films"—an assertion echoed by Miller, who suggests that *Captain EO* was the "first mainstream '4-D' film." Josh Young, "Six Flags Power Plant 2: Not an Amusement Park," *Theme Park University*, December 11, 2014.
24. See Brian Krosnick, "Star Tours: The Stellar Story behind the Ride That Changed Disney Parks Forever," *Theme Park Tourist*, October 17, 2016.
25. Geoff King, "Ride-Films and Films as Rides in the Contemporary Hollywood Cinema of Attractions," *Cineaction* 51 (2000): 8.
26. Suchul Shin, Byoungyun Yoo, and Soonhung Han, "A Framework for Automatic Creation of Motion Effects from Theatrical Motion Pictures," *Multimedia Systems* 20 (2014): 328.
27. *Star Tours* resulted in another sixty-hour marathon opening weekend celebration for Disneyland and remained a key attraction at Disneyland until 2010, with different versions at Tokyo Disneyland (1989–2012), Disney's Hollywood studios (1989–2010), and Disneyland Paris (1992–2016). In most of these locations, the original attraction has been replaced by *Star Tours: 3D*, an attraction that, as the name suggests, updates the attraction to include digital 3D film projection.
28. Interview with Matt Patches, "Douglas Trumbull, the Man Who Has Revolutionized Movies Several Times, Wants to Try Again," *Vulture*, December 8, 2014.

29. Cited in Janet Abrams, "Escape from Gravity," *Sight and Sound* 5 (May 1995):17.
30. Zone, *3D Revolution*, 143.
31. Susan Strother, "Designers' Ideas Took Fine-Tuning," *Orlando Sentinel*, 1990, http://articles.orlandosentinel.com/1990-06-03/news/9006030438_1_ape-kong-alexander.
32. Allen Yamashita, "Theaters of Illusion: The Continuing Evolution of Entertainment Simulation," *Computer Graphics* 28, no. 2 (May 1994): 142.
33. Richmond, "On Learning to Fly," 266, 270.
34. Richmond, 270.
35. Richmond, 270–71.
36. Richmond, 270, 272.
37. In Tom Gunning, "'Animated Pictures,' Tales of Cinema's Forgotten Future," *Michigan Quarterly Review* 34, no. 4 (1995): 471.
38. Vivian Sobchack, *Carnal Thoughts: Embodiment and Moving Image Culture* (Berkeley: University of California Press, 2004), 67.
39. Ross, *3D Cinema*, 70; Robert Firsching, "T2 3-D: Battle across Time," *New York Times*, 1996, <http://www.nytimes.com/movies/movie/475553/T2-3-D-Battle-Across-Time/overview>, no longer active.
40. Angela Ndaliansis, *Neo-baroque Aesthetics and Contemporary Entertainment* (Cambridge, MA: MIT Press, 2004), 204.
41. Ndaliansis, 200–201.
42. See, for example, the essays in Wanda Strauven, ed., *The Cinema of Attractions Reloaded* (Amsterdam: Amsterdam University Press, 2007). See Gunning, "The Cinema of Attractions." Geoff King and Miriam Ross also understand 3D and ride films as continuations of the attractions tradition. See King, "Ride-Films," 2; Ross, *3D Cinema*, 50–51, 69.
43. See Gunning, "Cinema of Attractions," 58–70.
44. Sergei Eisenstein and Daniel Gerould, "Montage of Attractions: For 'Enough Stupidity in Every Wiseman,'" *Drama Review: TDR* 18, no. 1 (1974): 78–79. First published in the Soviet journal *Lef* in May 1923. In his essay "Balagan" ("The Fairground Booth") of 1913, Meyerhold encouraged the adoption of "marketplace" reactions in the theater. See Vsevolod Meyerhold, "The Fairground Booth," in *Meyerhold on Theatre*, ed. Edward Braun (New York: Hill & Wang, 1998), 149.
45. Ndaliansis has argued elsewhere that the contemporary horror genre often engages in attractions strategies for social and political purposes. See Angela Ndaliansis, "Keep Your Demons on a Leash: Disgust and *The Walking Dead*," *Cine-Files: A Scholarly Journal of Cinema Studies* 10 (Spring 2016), <http://www.thecine-files.com/ndaliansis2016/>.
46. Gunning, "Cinema of Attractions," 69.
47. Ross, *3D Cinema*, 51.
48. Ron Magid, "Eminent Domain," *Cinescape* 2, no. 6 (1996): 27.
49. Kurt Lancaster, *Warlocks and Warpdrive: Contemporary Fantasy Entertainments with Interactive and Virtual Environments* (Jefferson, NC: McFarland, 1999), 123.
50. Ross, "The 3-D Aesthetic," 384–85.
51. Laura U. Marks, *The Skin of the Film: Intercultural Cinema, Embodiment, and the Senses* (Durham, NC: Duke University Press, 2000); Ross, "The 3-D Aesthetic," 385.
52. Ross, "The 3-D Aesthetic," 383.
53. Ross, 383–84, 383.
54. See Ndaliansis, *Neo-baroque Aesthetics*, 251–52.
55. Ross, "The 3-D Aesthetic," 386.
56. Ross, 386.
57. Richmond, "On Learning to Fly," 254.