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**GRAND ILLUSIONS:
LARGE-SCALE OPTICAL
TOYS AND CONTEMPORARY
SCIENTIFIC SPECTACLE**

Abstract: *The zoetrope, a nineteenth-century optical toy that showcases illusions of motion, has enjoyed an active “afterlife” in the 20th and 21st centuries. Today, zoetropic devices are found in fine art and advertising, and are often much larger than their 19th-century counterparts. Modern-day zoetropes still captivate viewers primarily because of their adjustment in scale. Exploring a range of examples in art, entertainment, and advertising, this article discusses various technical adjustments made to successfully “scale up” the zoetrope, arguing that these new apparatus reconfigure the relationship between audience and device. Large-scale zoetropes revise the traditional conception of the user, who tactilely manipulates and interacts with the apparatus, instead positing a viewer who has less control over the illusion and is often a captive audience surrounded by the animation. It is primarily through their adaptation of scale that contemporary zoetropes successfully elicit wonder as visual and scientific spectacles from their audiences today.*

Keywords: *zoetrope; art; advertisement; large-scale; audience*

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**Velké iluze:
optické hračky velkého měřítka
a současný vědecký spektakl**

Abstrakt: *Zoetrop, optická hračka 19. století předvádějící iluzi pohybu, oživila v různých podobách ve 20. a 21. století. Dnes ji nalezneme ve výtvarném umění či reklamě a to často v mnohem větším měřítku než ve století předcházejícím. Moderní zoetropy uchvacují své diváky primárně díky tomuto zvětšení měřítka. Věnují se řadě jejich příkladů z umění, zábavního průmyslu a reklamy a sledují různé technické úpravy vedoucí k jejich zvětšení. Tyto nové aparáty proměňují vztah mezi přístrojem a publikem, přehodnocují tradiční pojetí jejich uživatele, který s ním zacházel dotykem, a předpokládají naopak diváka, který má nad iluzí méně kontroly a je často publikem, zajatým a obklopeným touto animací. Současné zoetropy jako vizuální a vědecké spektakly dokáží vzbuzovat údiv primárně díky změně svého měřítka.*

Klíčová slova: *zoetrop; umění; reklama; velké měřítko; publikum*

Introduction

In February 2009, Sony debuted a television commercial for its line of Bravia televisions featuring an enormous zoetrope constructed in a city square in Venaria, Northern Italy. Conceived by London-based ad agency Fallon, the zoetrope, which is called the Bravia-Drome, is the ad's central feature. It is comprised of an enormous drum with a series of screens affixed around its perimeter. Each screen displays one still image of a motion sequence, and when a series of shutter blades whirs around the drum in front of the band of illuminated images, they appear to come to life in smooth, fluid movement. Fallon's previous commercials for the ad campaign showcased Bravia's state-of-the-art color display by staging large-scale visual stunts and using labor-intensive techniques. In one, the production crew released a quarter of a million bouncy balls down a San Francisco street and filmed the results. Another featured a series of environmentally friendly paint bombs attached to the interiors and exteriors of buildings, which, when strategically detonated, created a colorful visual symphony. A third commercial was created with stop-motion animation and involved moving colorful large physical models in an urban setting. The Bravia-Drome commercial similarly remains devoted to public spectacle and display by relying upon a large-scale, site-specific installation. Its main thrust focuses not on the Bravia television's color display, and instead highlights its 200hz MotionFlow technology, which offers an unprecedentedly smooth televisual image by "filling in" the gaps between each image frame. Because of its ability to smoothly display rapidly changing images, it is a particularly attractive feature for watching sporting events, and in the commercial, the Bravia-Drome features footage of Brazilian soccer star Kaka juggling a soccer ball.

When devising a way to promote MotionFlow technology, Sony and Fallon gained their inspiration from the zoetrope: a persistence of vision toy first introduced in the 1830s. That Sony and Fallon used an analog technology to showcase a new digital one is perhaps unsurprising, given that new media technologies often bear the traces of earlier forms, which fall out of visibility only to resurface, adapted in other related ways. As the zoetrope resurfaced here, it had grown dramatically in scale, from a domestic tabletop toy in the nineteenth-century parlor to a gigantic public display filling a city square in Northern Italy. The histories of media technologies are rarely strictly linear. Despite our tendency to wrestle various technologies and forms into neat causal chains wherein each emerging device improves upon its predecessor in a clean narrative of technical progress, instead, technolo-

gies always emerge unevenly across complex cultural landscapes, inspired by, and, in turn, shaping that landscape as they come into being. It is thus difficult to assert that this or that technology was the very “first” of its kind. However, some superlatives are more easily or quantifiably applied, such as proclamations of size. At ten meters in diameter and capable of speeds reaching 50 kph, Sony’s Bravia-Drome established its place in history and garnered international attention by being vetted as the *biggest* zoetrope on record, a certification authenticated by a Guinness Book of World Records Adjudicator in December of 2008.¹



Figure 1: *Bravia-Drome*.

Source: © Neuropsychology: Sony BRAVIA-drome.jpg / Wikimedia Commons / CC-BY- SA-3.0.

¹ Darren MURPH, *Sony Sets Guinness World Records with BRAVIA-DROME* [online]. 2005. Available at < <http://www.engadget.com/2008/12/21/sony-sets-guinness-world-record-with-bravia-drome/> > [cit. 19. 11. 2012].

Traditionally forgotten as dead, failed, or obsolete media that merely paved the way for more technically advanced cinematic apparatus, optical toys, and particularly persistence of vision devices that showcase illusions of motion have, in the past few decades, enjoyed a robust resurgence of interest in critical, artistic, and popular circles. Much like their nineteenth-century counterparts, the contemporary zoetrope is often celebrated as a scientific spectacle, capable of entertaining and instructing with illusions of motion. However, scant critical consideration has been given to the role that scale has played in the success of contemporary zoetropes. Fine artists and advertisers have scaled up the zoetrope, reconfiguring the relationship between viewer and apparatus, and cultivating new models of spectatorship. The creators of these devices use a range of strategies to make them accessible to increasingly large audiences in public venues, galleries, and in video form. Close examination of such installations challenges the traditional conception of the audiences of these toys, positing captivated viewers in opposition to nineteenth-century users, who were capable of manipulating these interactive media themselves.

The successful afterlives of contemporary optical toys have been predicated on a number of shifts. First, the context of many of these toys has moved from the domestic to the public sphere, either into museum and gallery spaces as works of art, or woven into the everyday experience of public life in places such as the subway tunnel and city plaza. Secondly, whereas optical toys were once mainstays of popular culture, they are now often found across the cultural spectrum, in popular, commercial, and fine arts contexts. Both of these shifts are inextricably linked to the transposition of scale. Optical toys today have “gone big,” and while the perceptual and technological principles undergirding their illusions of motion are not new, their monumental size has necessitated a range of technical adjustments and innovations to ensure their functional operation as large-scale apparatus. Just as early optical toys served as parlor amusements and scientific novelties, their colossal contemporary counterparts achieve equivalent status as scientific and visual spectacles because of their commanding size.

As commercial or promotional tools, within the context of fine art, and as public installations, large-scale contemporary optical toys have enjoyed considerable critical attention. In their current iterations, traditional zoetrope effects or illusions of motion are no longer simply conjured by the user, but, rather, are propelled by strong motors or subway trains in motion. The traditional slats through which the viewer peers have been replaced by large architectural features and stroboscopic lights. With these adjustments,

the modes of looking and models of spectatorship that these devices encourage have also shifted. In their new modalities, these toys move around the user's body, are presented to them in gallery contexts that draw them in, or work in tandem with other mechanisms that move the viewer past them. At a time when technologies are often praised for growing smaller, lighter, and more mobile, the contemporary optical toy is marked not by its portability, but rather, its status as colossal.

Philosophical toys and their users: From parlor amusement to the animation of everyday life

In their initial contexts, optical toys that showcased illusions of motion were designed to demonstrate and popularize persistence of vision, the theory that if the eye was bombarded by a series of images in slightly different positions rapidly enough, the brain would combine them into a fluid motion sequence. In order for this effect to work successfully, the images would have to be shown rapidly (at least eight per second) and some kind of shutter mechanism (often a slit between each picture) had to separate each one, lest they blur into an indistinguishable continuum.² While persistence of vision has subsequently been discredited as an adequate description of how the human sensorium actually processes motion, it is still frequently used to describe the principle mechanism behind the illusion of motion in film, where the standard frame rate is twenty-four images per second. The optical toys that relied upon persistence of vision for their operation such as the thaumatrope, phenakistoscope, and zoetrope, found the most traction as novelties for mixed-aged audiences in the middle-class parlor. These toys, many of which were introduced in the late 1820s and early 1830s, fell into the category of "philosophical toy," which historian of psychology Nicholas Wade has distinguished from a scientific instrument. Wade writes that whereas the assignation of "instrument" might be given to any object "used to examine natural phenomena ... philosophical toys served the dual

² A variety of frame rate ranges have been discussed in both contemporary and historical literature. In contrast to the standard 24 frames per second for film, early literature on persistence of vision often refers to 8 images per second as a minimum number of frames, while Jimena Canales has identified the increment of one-tenth of a second as gaining new import during the nineteenth century. See Jimena CANALES, *A Tenth of a Second: A History*. Chicago: University of Chicago Press 2011.

function of scientific investigation and popular amusement.”³ They were prominent features in popular science literature for juveniles and amused their users by exploiting an optical phenomenon: the ability to trick the eye into seeing a fluid animated sequence from what was, in reality, a series of still images.

The traditional model of spectatorship associated with such toys advanced by Jonathan Crary in his seminal work *Techniques of the Observer* is fundamentally disciplinary in nature. Crary argues that in demonstrating the eye’s tendency to be tricked, these optical toys contributed to the formation of a modern observer, whose subjective vision was standardized into a quantifiable, predictable practice.⁴ Departing from this Foucauldian-inspired, predominantly disciplinary view, other scholars have introduced alternative ways of understanding the roles that optical toys have played in cultivating new forms of interaction with visual media. Mary Ann Doane, for example, has challenged Crary’s reading, asserting its failure to address the rupture or trauma that may have accompanied these toys as they exploited and revealed the eye’s vulnerability to optical deception, while Tom Gunning’s recent work on the thaumatrope posits a viewer who actively delighted in the toy as it combined both visual and literary modes of representation in its use.⁵ The importance of Crary’s work in wresting optical toys from a purely teleological history culminating in the cinema cannot be underestimated, and has enabled subsequent scholarship to incorporate these devices into new historical trajectories, such as Wanda Stauven’s theorization that they more rightfully belong in a history of games and interactive media.⁶

Common to many of these formulations is a dual focus on the form rather than the content of these toys, and on their interactive qualities. Users had to arrange their bodies in relation to the toy, to, for example, lean in to peer through the zoetrope’s slots. They also maintained the ability to manipulate the toys, to spin the drum forward and backward at varying

³ Nicolas WADE, “Philosophical Instruments and Toys: Optical Devices Extending the Art of Seeing.” *Journal of the History of the Neurosciences*, vol. 13, 2004, no. 1, p. 102 (102–224)

⁴ Jonathan CRARY, *Techniques of the Observer*. Cambridge: MIT Press 1991, p. 17.

⁵ Mary Ann DOANE, *The Emergence of Cinematic Time: Modernity, Contingency, the Archive*. Cambridge: Harvard University Press 2002; Tom GUNNING, “Hand and Eye: Excavating a New Technology of the Image in the Victorian Era.” *Victorian Studies*, vol. 54, 2012, no. 3, pp. 495–516.

⁶ See Wanda STRAUVEN, “The Observer’s Dilemma: To Touch or Not to Touch.” In: HUHTAMO, E. – PARIKKA, J. (eds.), *Media Archaeology: Approaches, Applications, and Implications*. Berkeley: University of California Press 2011, p. 148–163.

speeds, as well as to change the animated picture strips. These toys' central feature was their ability to manifest a memorable effect, the illusion of motion, rather than foreground their content. Indeed, while the makers of some of these toys attempted to represent narrative arcs, or combined the signifying systems of words and iconography, as Crary asserts, their most important attribute resided in popularizing a certain understanding of seeing as a subjective practice, through the arrangement of their formal or material attributes. Likewise, as Nicolas Dulac and André Gaudreault have suggested, one of the primary ways of distinguishing philosophical toys from the cinema, instead locating them within narratives of toys, games, or interactive media, has required emphasis on their "toy-like" qualities, such as the ability of the user to change discs or bands, conjure moving images at different speeds and in different directions, and in exhibiting a kind of activity to contrast with the traditionally "passive" cinematic spectator (itself a problematic formulation).⁷ However, both of these features: the promotion of form over content, and the interactive qualities of the devices, have radically been altered in the design and exhibition of contemporary large-scale zoetropes. Although much critical interest has arisen in relation to the earliest instantiations of these toys, equivalently thorough consideration of their contemporary counterparts has been scarce, and thus the importance of scale and its attendant influence on the modes of spectatorship these devices encourage has not been explored.

During the nineteenth century, the toy panorama offered a similarly interactive experience for its user. In his book-length study of the panorama, Erkki Huhtamo notes the prevalence of toy panoramas designed (or constructed) for domestic, which were in popular circulation the large public panoramas after which they were modeled. The effect of "scaling down" the panorama configured a new role for the user: "As the device became smaller, the human grew – or at least seemed to grow – bigger." These small versions, Huhtamo suggests, enabled the user to play the role of the exhibitor, affording

⁷ See Dulac, Nicolas DULAC – André GAUDREULT, "Circularity and Repetition at the Heart of the Attraction: Optical Toys and the Emergence of a New Cultural Serie." In: STRAUVEN, W. (ed.), *The Cinema of Attractions: Reloaded*. Amsterdam: Amsterdam University Press 2007, pp. 227–244. Dulac and Gaudreault's discussion of Reynaud's praxinoscope theatre highlights the extent to which many early philosophical toys truly possessed "toy-like" interactive qualities; they regard the praxinoscope theatre as less of a toy because its mechanisms of operation are concealed from view.

them an opportunity for engagement and control.⁸ Although these multiple forms of panorama coexisted alongside one another, the shift from large to small scale is precisely the inverse of the zoetrope's resurgence as a large-scale, public apparatus. In contrast to the move from public amusement to handheld gadget like those so prevalent in the contemporary mediascape, the contemporary large-scale zoetrope represents an interesting shift from private to public; its success is predicated on the construction of a mediated experience over which the viewer typically maintains little control.

The critical formulations that explore the ways in which early optical devices invited interaction from their users do not fully account for the way that large-scale contemporary devices are meant to engage larger audiences. As advertising and promotional tools, contemporary optical toys have relied upon scale to prioritize their products, thus asserting not only the form of the toy as a means of spectacle and novelty, but also prioritizing the content; the product being advertised. Bringing what has traditionally been a domestic entertainment into the public sphere necessarily involves scaling it up in order to equivalently increase the size of the audience able to experience it. Susan Davis has described the ways in which large-scale media advertisements, what she and others have called location-based entertainment, collapse distinctions between public and private spheres, resulting in a media saturated environment that is seemingly undifferentiated from other spaces: "Privately produced collective spaces based on and filled with familiar mass media content can create a kind of seamless world, one in which the home – currently devoted to extensive consumption of conglomerate culture – is tightly knit to and continuous with the outside."⁹ Contemporary philosophical toys, particularly those used for advertising or promotional purposes, often punctuate public spaces or become the surfaces surrounding their audiences as they move through space. Their large scale, then, redefines the relationship between people and these installations, framing them as viewers rather than users who control the animations they see. Although these contemporary forms are still dealing with wonder and excitement like the nineteenth-century zoetrope, their principle element of attraction is scale, making the illusion of motion as big as possible within these contexts.

⁸ Erkki HUHTAMO, *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles*. Cambridge: MIT Press 2013, p. 368.

⁹ Susan G. DAVIS, "Space Jam: Media Conglomerates Build the Entertainment City." *European Journal of Communication*, vol. 14, 1999, no. 4, pp. 435–37 (435–459).

Surfaces and towers: Scalar adaptations of shape and direction

While scale serves as a unifying quality in common among various contemporary philosophical toys, the particular kinds of scalar adaptations they take are more diverse. Whereas Sony's Bravia-Drome and other examples are essentially gigantic versions of the traditional zoetrope, maintaining the cyclical form of the device, other installations shift scale directionally. Deviating from the form of the round drum, other zoetropic works extend in one direction, making them particularly suitable for image sequences that do not rely on repeatability, but instead depict a steady visual progression or short narrative sequences. Linear zoetropes, for example, array their animated sequences along a straight linear path, and the animations are brought to movement not through the device's motion, but as the viewer moves past each screen or "frame." The viewer is thus less in control of the motion sequence as it unfolds. It is fleeting and ephemeral rather than repeatable, and it has a more defined beginning and end rather than a perpetually renewing cycle.

One of the most prominent such installations is Bill Brand's Masstranscope, designed and first installed in the abandoned Myrtle Avenue subway station in New York City in 1980, and later restored in 2008. Comprised of 228 hand-painted panels set behind vertical bars that act as the shutter mechanism, the installation is found along the B and Q subway lines just as Manhattan-based trains leave Brooklyn. Commercial advertisers have also capitalized on the use of public transit tunnels as prime spaces for promotional content. Already traditional posters, ads, backlit displays, and screen-based content are ubiquitous on trains and in stations, but the darkness of the subway tunnel, combined with the captive audience and movement of the train, make such spaces ideal for animated advertisements. New York-based company SubMedia, which specializes in linear zoetropic subway ads, was founded in 2001. Its first advertisement was in Atlanta's MARTA transit system, and by 2009, the firm had installed over 40 installations in cities around the world. Clients include companies in a variety of industries, and the subway installations promote products ranging from films and television shows to automobiles, airlines, and soft drinks. Since 2008, company, along with Winnipeg-based company Sidetrack Technology, which holds the markets in Boston and L. A., have transitioned to digital displays, enabling content to be changed more rapidly and easily.¹⁰ Each linear zoetrope ad

¹⁰ David GOETZL, "Underground Profits: Submedia's Corrigan Tunnels For Ads." *Media Post* [online]. 2008. Available at: <<http://www.media-post.com/publications/article/92951/un>

consists of approximately two hundred individual light boxes that are three feet square. The length of the ad's moving image is dependent on the train's speed. A convincing moving image can be perceived at speeds as low as five miles an hour, and the "resolution" or fluidity of the illusion only increases with faster moving trains. Ads last for approximately fifteen seconds as the train zips by.¹¹

The zoetrope's scale both renders it ideal for serving large audiences (particularly in areas where commuting by public transportation is more prevalent than driving), and is striking in that it is the viewer, not the images, that are in motion (though the images appear animated as the viewer moves past). Relying on subway trains propelling viewers along, commercial linear zoetropes assume a captive viewer who becomes activated and engaged as the ephemeral image rushes past, drawn to the backlit display by its contrast to the surrounding darkness. The viewer has no ability to replay or repeat the motion sequence (aside from taking the train again, which some viewers do).¹² In a moment of technological culture where images are endlessly accessible, copyable, and retrievable, the fleeting nature of such linear zoetropes, where images are only brought into motion by the motion of the train, may well contribute to the effectiveness of the advertisement. SubMedia CEO Peter Corrigan noted at least seven studies worldwide that demonstrated audience recall rate at an average of 93%, versus an only 13% retention rate associated with television spots.¹³ Such a recall rate may be linked to a sense of urgency associated with the images, over which the viewer has no control to review.

SubMedia's founder, Joshua Spodek, has also installed non-commercial zoetropic art in the New York City Subway. For example, *Union Square in Motion* (2011), a linear zoetrope placed at eye level in Union Square, is a collaboration with students at Parsons the New School for Design.¹⁴ In contrast to linear zoetropes installed along train lines, installations placed along

derground-profits-submedias-corrigan-tunnels-f.html#ixzz2FR7gJBZj> [cit. 11. 10. 2012].

¹¹ Luis M. BRILL, "Subway Advertising: Outdoor Underground." *Sign Web* [online]. 2006. Available at: <http://signweb.com/content/subway-advertising-outdoor-underground#.UNHPbIUjFNY> [cit. 11. 10. 2012].

¹² Dana FLAVELLE, "Subway Ads' Tunnel Vision." *The Toronto Star* [online]. 2006. Available at: <<http://transit.toronto.on.ca/archives/data/200604100654.shtml>> [cit. 23. 10. 2012]. Flavelle describes riders disembarking from their train to go back and re-watch ads in Toronto.

¹³ GOETZL, "Underground Profits."

¹⁴ Jen DOLL, "Union Square Subway Station Now Boasts the World's Largest Linear Digital Zoetrope." *The Village Voice* [online]. 2011. Available at: <http://blogs.villagevoice.com/runninscared/2011/09/_josh_--_its_a.php> [cit. 10. 8. 2013].

pedestrian thoroughfares function similarly to the original, hand-spun zoetrope in that the viewer maintains a degree of control in interacting with the illusion, able to stop, and to experience the zoetrope's moving image forward or backward. In scaling up the apparatus, the viewer is forced to arrange their entire body (rather than just their eyes) in relation to the display, thus maintaining the same kinds of playful, interactive qualities of their nineteenth-century counterparts. However, even such interactive linear zoetropes represent a departure from the originals, as their site-specificity mandates that viewers be in the public places where they are installed, and must manipulate themselves while the apparatus remains stationary. *Union Square in Motion* thus has the ability to transform commuters into participants and interactors.



Figure 2: *Union Square in Motion*.

Source: Union_Sq_Zoetrope_2. Photo by Metropolitan Transportation Authority / Rob Wilson, September 2011, CC-BY-2.0.

Within public transit spaces, the ephemeral, site-specific nature of linear zoetropes contributes to their status as memorable features of the built environment. Still other contemporary zoetropes have scaled up verti-

cally, creating impressive towers of animation. Vertically arrayed zoetrope installations challenge the parameters of the form by building upward. Linear zoetropes in public transit contexts are constrained by the existing infrastructures of the systems in which they are installed (for example, the distance of the tunnel between two stations or the length of a particular pedestrian walkway and the way in which foot traffic utilizes the space). Large-scale vertical zoetropes, on the other hand, encounter physical constraints with regard to their weight and volume, and the strength required to keep such apparatus in motion. These objects are heavy, cumbersome, and do not immediately lend themselves to views by large audiences simultaneously. However, they are also often constructed with the express purpose of being filmed, thus their status as enormous, handcrafted apparatus is maintained, even as their animations are recorded onto screen-based media, a highly commodifiable form.

The nineteenth-century zoetrope had to be placed squarely at the viewer's eye level in order to function: the viewer had to see the moving pictures through the slotted drum, as looking from above only produces a blurred image. The zoetrope's common tabletop placement thus primed it for child audiences (for whom the device was at eye level) and required adult viewers to arrange themselves accordingly in relation to it. In contrast, large-scale vertical zoetropes prevent a viewer from apprehending their animated sequences both due to their size, and often, by excluding a shutter mechanism, spinning for a camera to capture the animation to be viewed in video form later. The result is a unique, intricately designed physical object, both rich with details, and also impressively large. As a singular artifact, it is still able to reach mass audiences because it is designed to be animated through video. The act of filming these installations is not merely documentation; rather, the camera's frame rate functions as the shutter mechanism that brings these zoetropes to life.

Such is the case with the zoetrope designed to promote Temperley London's Spring Summer collection in 2010. New York-based transmedia company LEGS, a member of The Milk Group, and fashion firm Temperley London collaborated to design and construct a zoetrope to showcase Temperley's Spring/Summer collection. Construction of the zoetrope took a month, and the video capturing its rotation, directed by Greg Brunkalla, Georgie Greville and Jeremy Jasper, showcases the animated bands in fluid motion. The finished zoetrope is circus-themed, and is topped with a carousel-like roof. It is twelve feet tall and boasts fifteen distinct tiers of animation, each featuring a Temperley look. To record the motion, a camera

was mounted on a pulley system that runs the vertical length of the installation so that each individual tier's animation could be filmed. Although the zoetrope was displayed alongside simultaneous projections of each loop of animation, the animations can only be seen in the video footage, which furnishes the shutter mechanism.¹⁵

Filmmaker and animator Jim Le Fevre also constructed a vertical zoetrope, which was to be filmed and used in the title sequence of a Tony Roche's BBC docu-drama *Holy Flying Circus*. Le Fevre's piece, entitled "The Holy Flying Circus Phonotrope," is based on his earlier experimentations with zoetropic forms, which he has called phonotropes (early instantiations and prototypes used record player turntables). Le Fevre, a freelancer whose commercial work is represented by Nexus Productions, designed the phonotrope's animations with the computer program 3D Studio Max, and each individual image or frame was printed out and laser cut to be arranged around each of a series of platters, which were constructed into a single vertical tower. The final piece is over two meters tall, and requires ten seconds from start up to achieve its standard speed, and sixteen seconds to go from moving to stationary. When filmed, "The Holy Flying Circus Phonotrope" showcases an impressive 90-second animated sequence, which was used as the basis of the docu-drama's opening credits. Integral to Le Fevre's concept of the phonotrope is the synchronization between the spinning apparatus and the frame rate of the camera used to record its movement. In lieu of traditional zoetrope slats, or even strobe lights to provide the "moment of rest" or shutter mechanism between each individual frame, the phonotrope's illusion can only be seen when recorded and the frame rate.¹⁶

Both the Temperley zoetrope and Le Fevre's *Holy Flying Circus Phonotrope* address a central problem of the traditional zoetrope: the finitude of an individual band or strip of animation, which has to be switched out and replaced to vary the animated sequence. While the vertical zoetrope does not fully solve such a dilemma (there are physical and material limits to the size and scope of these installations), as a form, it nevertheless affords the opportunity to display multiple simultaneous animated bands, which, in these two cases, are tied thematically and offer a brief, simple narrative. By scaling up the zoetrope's form, these vertical installations prevent the viewer

¹⁵ A Q&A *With Legs on the Temperley London Spring 2010 Zoetrope* [online.] 2010. Available at: <<http://glossyinc.com/misc/legsoetrope.html>> [cit. 26. 11. 2012].

¹⁶ Jim LE FEVRE, *Holy Flying Circus Title Sequence* [online]. 2011. Available at: <<http://phonotopia.blogspot.com/2011/10/jim-le-fevre-holy-flying-circus-title.html>> [cit. 18. 11. 2012].

from observing the entire animated display at once, and in the absence of a shutter mechanism to distinguish between images or “frames,” such as rotating slots or strobe lines, the spinning apparatus does not appear animated at all. Instead, these zoetropes rely upon the video’s frame rate to function as a shutter. These vertical zoetropes then both exploit the spectacle of their size as they are prominently displayed in public (the Temperley zoetrope was displayed alongside projected images of its animation; after being filmed for the docu-drama’s title sequence, Le Fevre’s *Holy Flying Circus Phonotrope* was put on display in the lobby at Nexus), while also recommitting their animated sequences onto screen-based media, thereby reducing their physical, colossal attributes to a two-dimensional surface that can easily be distributed.



Figure 3: *Holy Flying Circus Phonotrope*.

Source: Phonotrope for Title Sequence for Hillbilly Films’ ‘Holy Flying Circus’

© Fremantle Media/Hillbilly Television/Nexus Productions. In picture: Gordon Allen & Gee Staughton assessing Phonotrope mid-build.

Vertical and linear scalar adaptations of contemporary optical toys, such as zoetropic subway ads and enormous spinning towers covered in intricate animations all engage the viewer not by giving them the agency to manipu-

late the mechanisms of motion, but by offering compelling but limited views of their animated spectacles. Linear zoetropes in public transit spaces appear as bursts of movement in dark tunnels, then abruptly disappear. Vertical zoetropes are unique physical objects that command awe, but which are best seen through a camera, which both serves to animate each image sequence as well as offers the optimum vantage point from which to view the display. The viewer is meant to appreciate the large structure and the human ingenuity that went into its construction, but is also able to enjoy its animation through a more convenient, circulatable form of the screen-based image. The artifactual qualities of these zoetropes also contributes to the production of supplementary media, such as “making of” videos, which similarly call attention to the objects’ intricacies.¹⁷ Here, the spectacle of these objects’ size is just as important as the spectacle of their moving images. The flatness of this image, along with the smooth linearity of the subway zoetrope, is in sharp contrast to another class of large-scale philosophical toys, which awaken multiple senses as they extend into the physical space of the viewer.

Animated objects and physical frames: Animation extruding into everyday life

Screen-based linear zoetropes and the vertical installations that are ultimately designed to produce screen-based products maintain a degree of versatility or flexibility in terms of how the work can be distributed, updated, or manipulated. SubMedia’s digital screen displays, for example, easily allow for content to be changed or varied, while the recorded animations of the vertical zoetropes can be shared and disseminated in as many ways as other video or animation content. In contrast to such work, many fine artists and entertainment companies have instead employed persistence of vision to construct large-scale kinetic sculptures that are most prominently characterized by their material presence and the permanence of their animated forms. Artists such as Brooklyn-based Gregory Barsamian, Peter Hudson of San Francisco, and London-based Mat Collishaw have all constructed large-scale zoetropes comprised of series of three-dimensional sculptures spinning on metal armatures and animated by external shutter mechanisms, often strobe lights. Unlike the Bravia-Drome or commercial linear zoetropes, which represent each animated frame or image on a single screen,

¹⁷ For example, the making of Le Fevre’s Phonotrope is chronicled in a short video. [online]. 2011. Available at: <<http://vimeo.com/30833811>> [cit. 10. 8. 2013].

in these artworks, each discrete position in a motion sequence is a single, often intricately constructed sculpture.

Scale has become a distinguishing factor in describing, understanding, and experiencing these sculptures, and many artists who work in this medium foreground scale and monumentality in their discussion of their work. For example, Peter Hudson, whose zoetropes have appeared at Burning Man, describes his piece *Charon* (2011) on his website in terms of its physical complexity and the labor that went into creating it. *Charon* depicts the ferry operator Charon (represented as a full-size skeleton) rowing across the River Styx. In his description, Hudson highlights its specifications and the scale of the construction process. The series of 20 skeleton sculptures (for a total of 20 “frames”) are installed as a sequence inside the rim of 34-foot tall vertically mounted wheel, and at over 7 tons, the sculpture required a principle team of 20 fabricators and artists (along with over 80 volunteers) working cumulatively over 6 thousand hours over 6 months to complete.¹⁸ Gregory Barsamian’s *Feral Font* (1996), on permanent display at the Museum of the Moving Image in New York City, is seven feet in diameter and nine feet tall, while Mat Collishaw’s *Garden of Unearthly Delights* (2009), in the collection of New York’s Museum of Arts and Design, is six and a half feet in diameter. All of these examples, much larger than the original zoetrope, create a new relationship between apparatus and viewer. Hudson has curiously called his work life-size, suggesting that such scaling up somehow puts these kinds of sculptures into a frame of reference commensurate with the scale of the human perceptual experience.¹⁹

Animator George Griffin has offered a formulation of what he calls “concrete animation,” which he sees as an emerging form of contemporary animation practice. Concrete animation, Griffin suggests, often occurs in nontheatrical settings, such as gallery, museum, and public spaces, and consists in one incarnation of “object animation which displays physical moving objects arrested in synthetic time by strobe light or shuttering devices (both low and high tech).”²⁰ Much like the artifactual status of vertically arrayed

¹⁸ Peter HUDSON, *Charon* [online]. 2012. Available at: <<http://hudzodesign.com/?p=192>> [cit. 12. 12. 2012].

¹⁹ The notion of a “life-sized zoetrope” is also evoked in the eponymous short film *The Life Size Zoetrope* (2007) directed by Mark Simon Hewis, in which a series of participants, each holding a single animated frame, are filmed on a rotating amusement park ride. <http://www.animateprojects.org/films/by_date/2007/life_size_z>

²⁰ George GRIFFIN, “Concrete Animation.” *Animation: An Interdisciplinary Journal*, vol. 2, 2007, no. 3, p. 262 (259–274).

zoetropes, Griffin highlights these sculptures' materiality in his discussion. For Griffin, a central feature of this work is that it often calls attention to rather than conceals the way that the illusion of motion is produced. His formulation also includes animated work that the user or viewer is able to manipulate and play, such as flipbooks and mutoscope machines installed in gallery spaces.

While he does not deal extensively with scale in his discussion, Griffin describes stroboscopic and kinetic sculptures such as Barsamian's (and, I would add, Hudson's) as "complex environments and contraptions which are unwieldy, clanky, and not easily portable, designed to investigate the essential mechanisms of perception in motion."²¹ In emphasizing materiality, the visibility of the mechanisms of motion, and instances where users are able to control the animation, Griffin's conclusion is that concrete animations offer an opportunity "to return some measure of freedom and control back to the viewer."²² Unlike many large-scale installations that are not user-operated, such as vertical or linear zoetropes, sculptures such as Hudson's work have the capacity to engage the onlooker as a user or manipulator of the image. However, the kind of interaction or engagement they encourage may have less to do with the tactile exploration associated with the traditional zoetrope (or devices like the mutoscope), instead cultivating a different kind of participatory network commensurate with their size. Peter Hudson's *Charon*, for example, is "user-operated," brought to motion by six pairs of users pulling on ropes to activate the enormous wheel and synchronized strobe light. By requiring a group of users to synchronize with one another to operate the sculpture, the interaction is less about manipulating the illusion (for example, the ability to spin the nineteenth-century zoetrope forward and backward), and more about achieving a goal through teamwork. The zoetrope's operation thus becomes a context-specific performance.

Many large-zoetropic installations displayed in gallery settings do not offer the viewer an opportunity to tactilely interact with the sculpture. Instead, the use of external shutter mechanisms like strobe lights deliver an experimental or exploratory experience to the viewer. For example, Gregory Barsamian's *Feral Fount* (1996) and Mat Collishaw's *Garden of Unearthly Delights* (2009) are displayed with a strobe light on a timer, demonstrating the object as it appears both with and without the strobe-shutter mechanism. The rotating sculpture on its armature never stops turning, though the

²¹ GRIFFIN, "Concrete Animation," p. 270.

²² GRIFFIN, "Concrete Animation," p. 273.

viewer is able to observe it both fully animated (when the strobe light is on and it gives the flickering illusion of objects in fluid motion) and a “behind the scenes” look with the naked eye and no strobe light (when the sculpture just appears as a blurry spinning armature to which many small objects are attached). While the viewer is not actively in control of producing the illusion, presenting zoetropic sculptures in environments with timed strobes permits viewers to compare the two modes of operation. When activated, the strobe light erases the presence of the spinning metal armature, producing a fluid animated sequence out of physical three-dimensional objects, thereby reconfiguring the status of animation, prompting consideration of whether the movement is “real.” Thus, although the viewer is not directly manipulating the sculpture, as was the case with the original zoetrope, a similar set of preoccupations emerges from these large-scale versions about how the images are produced. Barsamian’s Artist’s Statement addresses this mode of engagement: “The images exist in real time and viewers are able to share the same space with them. The illusion creates a conflict between sensory information and logic which suggests the reality of a dream.”²³ Such sculptures thus raise the question of whether the motion is real or simulated, though in their rapid rotation, they often generate a breeze or draft that the viewer can feel on their skin, thus confirming that some form of motion is actually taking place.

Conclusion

Although the basic perceptual principles that animated the earliest philosophical toys are still at play in contemporary iterations, they are produced in slightly different ways that enable them to serve larger audiences and display visual spectacle on a much bigger scale. The relationship between audience and apparatus is transformed when optical toys are scaled up; the mechanisms for creating the illusion of motion are less frequently user-controlled, thus producing an audience comprised not of users or interactors, but of viewers. When taking scale into consideration, then, theorizing contemporary optical toys moves away from the critical line of inquiry that positions them within a lineage of interactive media like games, and instead roots them in a tradition of visual and scientific spectacle.

²³ Gregory BARSAMIAN, *Artist Statement* [online]. Available at: <<http://www.gregorybarsamian.com/>> [cit. 26.11.2012].

Fine artists, advertisers, and others have employed a range of creative strategies in the design and construction of contemporary optical toys. Replacing the slotted shutter with architectural features, strobe lights, and the frame rate of a camera, these large zoetropes combine the elements of individual artwork or piece of craftsmanship with the spectacle, wide reach, and visual appeal of commercial work made for mass audiences. The resulting displays thus exhibit an interesting interplay between transience and permanence. On the one hand, in their materiality and physical presence, large-scale zoetropes are inserted into everyday public experiences in places like subway tunnels, museum galleries, and in television commercials. On the other hand, in their site-specificity and tendency to be displayed under controlled conditions (such as on a timed strobe light), their illusions remain fleeting, and unlike many forms of new media, they cannot always be retrieved or repeated at will by the viewer.

Contemporary adaptations of the zoetrope marshal feelings of wonder and awe equivalent to their early precursors and invite consideration of how their visual effects are achieved. However, their reentry into modern public life cannot simply be understood as a resurgence of a long-dormant media form without taking into account the importance of scale as a concept critical to their transformation and recent success. Adaptations in size, shape, and direction have made the zoetropic form into a media spectacle in the twentieth and twenty-first centuries, and have accordingly cultivated new forms of spectatorship as animated displays surround, pass by, and envelop the viewer.