

An Aesthetic of Wonderment: IMAX and Affect
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Since the early 1970s the large-format film industry has become a major global provider of spectacle-based documentary motion pictures. The IMAX Corporation has always commanded this small yet lucrative offshoot of the mainstream cinematic institution. With wide-ranging involvement in film production, projection apparatus design and maintenance, theater construction, large-format equipment rental, and film distribution, IMAX is now a household name that has come to stand in for an entire medium. According to their own figures, “almost a billion people” around the world have immersed themselves in “The IMAX Experience” (one of the company’s trademarked slogans). At one time relegated to science museums, aquariums, and other educational institutions, IMAX films now screen in over 300 affiliated theaters (many of which are in commercial multiplexes) operating in over 40 countries and counting.¹ Primarily known to consumers as a destination-based attraction, IMAX has moved into the home via release on video and high definition cable broadcasting. Large-format, high-impact documentaries are now more accessible than ever before.

As such, it is odd that media scholars have had very little to say on the subject. Hovering somewhere between the realms of popular film, educational documentary, and amusement park attraction, IMAX has been difficult for scholars to pin down. Surely, the spectacular quality of the IMAX apparatus has overshadowed the films themselves and has precluded scholars from pursuing a detailed account of the large-format’s unique mode of spectatorial engagement. To some extent, this oversight is understandable considering how the industry positions its large-format products. Conventionally, the

motion picture industry sells its films as emotional experiences. In contrast, IMAX sells the apparatus *itself* as experience. According to the corporate website:

The IMAX Experience is giant visuals, superb sound and sensations so immersive, you have the feeling of being involved in the action. In any language it creates awe, surprise, laughter, and larger-than-life moments. Whether climbing Mount Everest venturing through a 3D animated world or living and working with the astronauts on the International Space Station, IMAX films, projected onto screens eight stories high and 120 feet wide transport audiences to exciting worlds.²

The IMAX corporation's emphasis on the apparatus in its publicity material has given scholars license to say very little about the films themselves. But I will argue that a careful consideration of the films is required if we are to understand the medium's unique ability to evoke emotions that conventional narrative films rarely do, or at least do so with less frequency and in different ways. Scholars take for granted IMAX's "immersive" power without exploring it in any detail, and they tend to perpetuate a fallacy of immersion glossed over with a version of cultural constructivism that only limits our ability to conceptualize affective responses to the medium.

In this essay, I will attempt to provide a more thoroughgoing account of "The IMAX Experience" than has yet been available by focusing on the films themselves. I will characterize the experience as a unique emotional and physical one by employing concepts derived from recent literature on cognition, emotion, and neuroscience.³ Using the practical framework of historical poetics as outlined by David Bordwell,⁴ I will seek to answer the following questions: How do IMAX filmmakers construct their

documentaries so as to elicit emotional responses such as wonder in spectators? To what extent are such aesthetic choices norm driven? And how do these films orchestrate and control emotion-inducing stimuli on a moment-by-moment basis given the difficulties involved in large-format film production?

First, I will review the extant film studies literature on “The IMAX Experience” in hopes of legitimizing the corrective I am proposing. Then, I will discuss the emotion of wonder from a neuro-cognitive perspective in an attempt to explore how our brains and bodies might process such overwhelming stimuli as IMAX motion pictures. Finally, I will discuss the norms of IMAX filmmaking with reference to the trade press, filmmaker statements, and the films themselves. In this section of the paper I will argue that certain formal and stylistic norms exist by virtue of their ability to elicit wonder responses, however tacitly IMAX filmmakers may understand that ability.

IMAX: Vision, Film History, and Culture

By and large, film scholars address IMAX within one of three major critical frameworks: cultural constructivism aimed at ideological critique, the historiographic problem of so-called “spectacular realities,” and the Bazinian notion of the “myth of total cinema.” Discussions of IMAX within these three frameworks are based largely on generalizations regarding spectatorial affect: tutored passivity through an illusion of mastery, an historically-determined desire for spectacular representations of quotidian experience, and representation’s illusory power over the senses, respectively. The troubling concept of immersion, in particular, runs an overwhelmingly unsubstantiated course through much of this literature. I will focus on the first two critical frameworks—

cultural constructivism and the problem of “spectacular realities”—because they set forth models of vision and affect directly at odds with my own approach.

Cultural constructivism refers in part to recent accounts of human perception that favor historical, ideological, technological, and institutional explanations over biological, evolutionary, or cognitive ones. In this framework historians conceptualize vision as a function of economic relations, power structures, hegemonic articulations, and technological apparatuses. Visuality is constructed for us and is ultimately contingent on cultural factors, or so the argument goes. Charles R. Acland, for example, theorizes spectatorial response to IMAX from this perspective. For Acland, spectators “experience the pleasure of spectatorial centrality, finding that the power of the IMAX gaze is a mastery over the film subject.”⁵ He argues that IMAX forces spectators to assume a mode of “bourgeois perception” called the “tourist gaze”:

The orchestration of the all-engulfing image places viewers in a central location as a source for the unfolding of a known and organized world; the panoramic overview is equally an educational technique to present that vision of the world to an as-yet uninitiated audience or public. The characteristics of this form of bourgeois perception, then, involve the extension and reproduction of that worldview. For this reason, the image of spectatorial centering is ideologically linked to the reinstatement of certain forms of epistemological power.⁶

As centered subjects, spectators receive ideologically determined content while positioned as the source of the coherent world projected before them. In addition to this, Acland puts a post-colonialist twist on IMAX’s unique brand of subject positioning. According to the argument, IMAX films force their spectators (or “tourists”) to assume

the active position of colonial explorer in relation to the passive position of native, who is offered up as the object of a colonialist (and presumably masculine) gaze.

Even less theoretical accounts of IMAX lapse into this cultural constructivist framework as if it were compulsory. At the end of her essay, Tana Wollen speculates provocatively about the apparatus's ideological effect:

Engulfed, almost pinned down by image and sound, the viewer... is forced through spectacularity into a worldview that is dominantly North American. Through the corporate sources of their funding... and through their filmic strategies IMAX films align our gaze with the conquerors' omniscient view, while their impact positions us as an almost victimised audience.⁷

This is a subject position so rife with paradox that it would be impossible to substantiate, even from a psychoanalytic perspective. While a cultural constructivist position on IMAX is compelling from an ideological standpoint, it cannot explain spectatorial affect and engagement fully if it insists on acknowledging only forms of perception that are culturally conditioned.

Another context in which scholars position contemporary large-format filmmaking is the cultural history of "spectacular realities." This research project attempts to extend the source of our modern distractions and entertainments, especially the cinema, further back in time to recognize earlier and earlier precedents. The cinema did not just emerge to fulfill a specific need for distraction in the late nineteenth-century; rather it is the product of a long evolution of entertainments that fulfilled the desire for the representation of every day life in increasingly spectacular ways. According to

cultural historian Vanessa Schwartz, a desire for this kind of entertainment is at the root of modern mass society, at least in the French context.⁸ For film scholars such as Allison Griffiths, a technology like IMAX assumes a position at the end of this genealogy.

Inspired by this historiographic problem, Griffiths conceives of large-format filmmaking as an heir to hyper-realist and immersive entertainments of previous centuries that were related to fascinations with travel, such as cathedrals, tapestries and panoramas.⁹ For Griffiths, then, IMAX spectatorship is historically constructed, and its immersive nature is overdetermined by its position within a genealogy of spectacular realities. Similarly, Lauren Rabinovitz situates IMAX in a history of visual culture that links Hale's Tours to the motion simulation rides of today's theme parks. She argues that amidst the backdrop of mainstream cinema's subject positioning of spectators as disembodied viewers, these technologies have in common the urge to foreground "the reflexivity of embodied spectatorship."¹⁰ She summarizes this impulse in her description of Hale's Tours: "it attempted to dematerialize the subject's body through [the body's] extension into the cinematic field while it repeatedly emphasized physical presence and the delirium of the senses."¹¹ It would seem that for Griffiths and Rabinovitz, IMAX's historical pedigree as a spectacular entertainment has determined the medium's spectatorial effects, which they might describe as historically constructed.

I have tried to two elaborate two major critical frameworks that have preoccupied film scholars interested in IMAX. I am hesitant to agree with the conclusions of either, for their models of vision and affect are determined solely by culture and history. Isn't vision a flesh and blood experience, too? The spectating subject has eclipsed the

embodied viewer in this discussion, and I believe the latter can tell us a great deal of the cinema's pleasures and allures.

Emotion Before Cognition?

Before elaborating on IMAX and its aesthetic effects, I need to lay some groundwork by summarizing (ever so broadly) the processes involved in human sense perception, cognition, and affective response.¹² There are two major strands of thought that I would like to consider, both of which will later prove useful in conceptualizing IMAX's wonder-inducing capacities. The first is a cognitive conception of emotion derived from psychology, while the second, derived from a more recent neuro-cognitive approach, suggests that some emotional responses are the product of non- or pre-cognitive neural processes.

From the cognitive psychologist's perspective, all emotions are in some fashion dependent on existing belief structures in the perceiver. As such, emotional reactions and their attendant affective responses exist by virtue of cognitive appraisals. If I stand awestruck at the foot of a giant waterfall mesmerized by its vastness and humbled by its power, my emotional responses are determined by cortical processing in the cerebral cortex, or conscious brain. The limbic system, the brain's emotional center, does not activate until higher-level brain functions tell it to. From the cognitive neuroscientist's perspective, however, some emotional responses do not require higher-level cortical processing. Instead they are the result of lower brain functions that take effect faster than cognitive assimilation and assessment.

Within the strictly cognitive framework, the sequence of neurological activities would go something like this: Visual and aural stimuli enter the body via their respective sense organs. Electrical impulses from these organs make their way to the cortex via the thalamus, whose primary function is to direct these impulses along their correct pathways depending on the nature of the information they carry. (Damage to the thalamus can result in synaesthesia, among other disorders.) Depending on its point of entry into our nervous system, information may be sent either to our right hemisphere or left. For example, in the case of vision, input in the right half of each eye goes immediately to the left hemisphere and input in the left half of each is sent to the right hemisphere. The brain is able to unify and process the information by virtue of the corpus callosum, the brain structure that separates the two cortical hemispheres and shuttles information back and forth. What emerges is a reliable cognitive representation of the stimuli, the result of activity in and cooperation among various processing centers. At this point the conscious brain can recognize the stimuli (if it fits into preexisting memory structures) and subsequently make an appraisal. The stimuli will either be worthy of an emotional response or not. After this higher-level trans-hemispheric processing, the conscious brain sends its appraisal to the limbic system, which orders the hypothalamus to prompt affective reactions. Physiological changes at a variety of levels (blood pressure, heart rate, skin conductance, hormonal levels, to name a few) register in the nervous system. These changes are monitored by lower functions in the brain that quickly communicate with the frontal cortex, which is where emotions become conscious. At this point the conscious brain can “feel” the emotion. Even though many steps are involved, the entire

process occurs instantly. For all intents and purposes, this is a cognitive account of sense perception and emotional response.

Increasingly, however, current research is demonstrating alternative ways in which the brain processes information and initiates emotional responses. A strictly cognitive account focuses on higher-level cortical processing at the expense of understanding lower and midbrain processes. After transforming sensory stimuli into electrical impulses, the sense organs send these signals along their respective cranial nerves. In addition to moving on to the cortex via the thalamus, these impulses pass through a number of structures in the lower and midbrain. These structures are not simply responsible for directing the stimuli upward; instead they actively process the raw information to provide a rough sketch of the nature of the stimulus. This rough sketch consists of enough information to elicit an immediate emotional and physical response, one that is not always reliable. Without belaboring the neuroscience of this phenomenon (of which I am, of course, not an expert) this level of processing occurs in such regions as the amygdala and the periaqueductal gray before electrical impulses reach the cortex. Researchers have documented subcortical brain activity specific to sadness, anger, fear, and happiness, which are generally accepted to be universal human emotions.¹³ According to Antonio Damasio, these emotional responses do not rely on consciousness and in fact occur in extreme cases of brain trauma in which the cortex has been effectively severed from the limbic system.¹⁴ More recently, in her discussion of emotion and the arts, Jenefer Robinson describes this class of emotional responses as “non-cognitive affect appraisals,” or emotional responses that are formed via subcortical processing of external stimuli.¹⁵ These subcortical rough sketches are always open to

revision by cognitive appraisals that come from the top down, but nevertheless neuroscientists seem to be telling us that this class of emotional response may be necessary to a comprehensive account of human emotions.

The two perspectives I have been discussing should figure prominently in any discussion of emotional responses to the cinema. For example, in her discussion of the sublime in film, Cynthia Freeland explains how such a complex emotion (a unique blend of terror and elevation) may be the result of subcortical appraisals related to fear and happiness and of cortical processing.¹⁶ Her careful and suggestive approach should be kept in mind even when addressing far simpler emotions. The emotion I would like to consider in this framework is one related to the sublime, though I believe far more frequently experienced in film viewers: wonder.

Wonder and Its Vicissitudes

Wonder is an infrequently addressed emotion (or emotional state, depending on your position) in the vast cognitive and neuroscience literature, and as we might expect, there are a number of conflicting views as to what wonder even is. I will borrow a working definition from the *Oxford English Dictionary*: “The emotion excited by the perception of something novel and unexpected, or inexplicable; astonishment mingled with perplexity or bewildered curiosity. Also, the state of mind in which this emotion exists; an instance of this, a fit of wonderment.” Wonder is a state of arousal and attentional focus elicited by an unexpected and unusual stimulus that fails to match up with our memory structures. Wonder occurs when we surrender to the sensory power of something non-aversive that we’ve never seen before.

The work of Alexander Bain, a nineteenth-century theorist of human emotion, still provides a useful explication of wonder. According to him, wonder is a relativity-based emotion; that is, it requires a transition from a common experience to an uncommon one, and the relative difference and startling transition between the two is the “*objective cause*” of wonder’s elicitation.¹⁷ Furthermore, the degree of wonder felt by a perceiver is a direct function of the abruptness of the transition from common to uncommon, hence the notion of being wonderstruck. Bain writes, “Wonder contains surprise, attended with a new and distinct effect, the effect of contemplating something that rises above common experience, which elevates us with the feeling of superiority.”¹⁸ Wonder then, like the sublime and feelings of awe, is a complex emotion involving aesthetic pleasure, confusion, curiosity, attention, excitement, and perhaps even humility. (We may be humbled, startled, or even slightly scared of the sensory array before us, but we do not experience terror in moments of wonder as we might in an experience of the sublime. Furthermore, great feelings of unworthiness or humility belong in the realm of awe more so than in that of wonder.)

Such a complex emotion as wonder bears components of so-called universal emotions, such as happiness and perhaps even fear depending in the abruptness of the stimuli’s introduction. As Freeland does with the sublime, I would like to propose that we consider wonder to be an emotion with cognitive and non-cognitive features. Certainly the sense of wonder an art historian has when examining an epic landscape painting from the Hudson River School is different than a novice’s experience. The art historian’s previous knowledge perhaps makes her more susceptible to the stimuli that the painting sets forth. But if wonder may include elements of happiness and surprise, then subcortical

processes are surely at work as well. Standing on a precipice and looking out at the ocean as it extends before me, I feel my hair stand on end or shivers run down my spine, but I surely don't have conscious control over these autonomic responses related to wonderment. A purely cognitive take on emotion would not seem to explain these features of a wondrous experience, and would seem to contradict the findings of neuroscientists. According to the cognitive model, awe-inspiring stimuli can only be as such if we *believe* them to be truly awesome. The limbic system cannot tell the conscious brain how to respond until the conscious brain has processed the information into a coherent and reliable representation of the stimuli. But surely we are hard-wired to immediately recognize perceptual vastness, especially if it is immediately threatening. (We've all stood a little too close to the edge of a cliff or skyscraper, which has only increased our sensations of wonderment and danger.)

Philosopher Philip L. Quinn ascribes to such a cognitive framework and applies it to the emotion of awe, which is closely related to wonder. He argues that awe requires our belief that the object of our awe actually exists. He rehearses an anecdote involving a deliriously tired John Ruskin drifting off to sleep while gazing out a window at what appeared to be a majestic mountain peak in the moonlight. The awe-inspiring vision was an illusion, only the snow-covered roof of a cowshed.¹⁹ While the example does demonstrate that disbelief will shatter a sense of wonderment, it fails to prove that belief is a necessary condition. In fact it would seem to be suggestive of the opposite. Interpreted another way, Ruskin's initial, partially non-cognitive appraisal of a visual array was corrected after a higher-level processing of the information. Cortical processing functions to correct, enhance, or temper subcortical emotional responses.²⁰ More research

is required to determine the nature of subcortical elicitations of happiness, but once such research is done, the strict cognitivists will likely have to revise their stern assumption that all emotions are based on cognitive belief structures.

As a topic of inquiry, wonder has almost exclusively interested humanists, namely aestheticians and religious philosophers such as Quinn. As Robert C. Fuller notes in his recent volume on the subject (a volume that I hope will spark some renewed interest in the topic), wonder is repeatedly absent from modern theories of the primary and secondary emotions (that is, those that are present at birth and those that develop as a result of maturation and social training, respectively).²¹ Fuller attributes this oversight to recent evolutionary perspectives and their focus on active emotions that have obvious adaptive functions, such as fear and anger. Wonder, in contrast to these, is far more passive. At first glance it would not seem to have any adaptive value, but like curiosity, interest, and attention, wonder is crucial to the development of our higher-order cognitive abilities and aids in our environmental assessments. If states of wonderment increase our sensitivity to detail, then individuals with a greater capacity for wonder may process their environment and acquire cognitive skills with greater efficiency. Fuller hypothesizes an adaptive function of wonder:

Just as curiosity propels children to sustain their inquiries into the causal workings of physical reality, wonder is a prime motivating factor in the acquisition of higher-order conceptions of reality. The experience of wonder is characterized by the disruption of previous cognitive schemata. Wonder, then, is an emotional experience that invites us to entertain belief in the existence and causal activity of an order of reality that lies beyond or behind sensory appearances. It is therefore

possible to argue that wonder is indispensable to the development of humanity's full cognitive potential.²²

Humans must adapt creatively to their environments, and wonder allows us to conceptualize new categories of phenomena (hence experience) that allow us to thrive in unexpected situations. We do not automatically shy away from novel stimuli; instead we create new schemas to fit uncommon experiences into our cognitive mapping of the world.²³

Evolutionary psychologists Dacher Keltner and Jonathan Haidt propose another possible function. In their discussion of awe, they take a prototype approach and present two necessary conditions of the emotion: 1) an experience of vastness (perceptual, cognitive, or social), and 2) the subject's inability to accommodate that experience according to the variable fixity of knowledge structures.²⁴ A prototypical case of awe will involve both. Keltner and Haidt base their formulation of these necessary "themes" on interdisciplinary agreement across various descriptions of awe in religion, philosophy, sociology, and psychology. (Their article only presents a research agenda in the absence of empirical evidence.) To account for the wide variety of awe-related experiences, Keltner and Haidt suggest five secondary themes that can alter the nature of the emotional experience and its valence: threat, beauty, ability, virtue, and supernatural causality. These themes can color the awe-related state with fear, aesthetic pleasure, admiration, elevation, and the uncanny, respectively.

As to awe's evolutionary function, Keltner and Haidt draw a distinction between "primordial awe" (a hard-wired, pre-cultural, evolutionarily determined, and submissive response to a powerful leader) and "elaborated awe" ("the full set of culture-specific

norms, meanings, and practices that cultures build up around primordial emotions”).²⁵

They suggest that primordial awe has an evolutionary explanation and adaptive function, and that elaborated awe builds off of this fundamental response. Ultimately, research is required to confirm or disconfirm these suggestive hypotheses. Needless to say, there seems to be a general suspicion among evolutionary psychologists and cognitive neuroscientists that wonder (or at least some of its components) may have an adaptive function, and as such, it may be a universal category of human experience.

If awe (and wonder, by extension) is adaptive then we would expect to find certain affective responses related to it that occur cross-culturally. Dutch philosopher Cornelius Verhoeven, in his 1967 volume *The Philosophy of Wonder*, explains the physiognomy of this emotion. For Verhoeven, “wonder is not a purposeful action.” It is characterized by a complete “openness” to stimuli, a self-conscious desire not to miss any fleeting detail. The wonderer is self-consciously receptive. She is not bewildered (as the *OED* might suggest), but rather fully aware of herself assimilating the awesome stimuli. Wonder entails “a moment of pause” in which the perceiver’s body ceases moving completely. Verhoeven emphasizes that this pause is involuntary and may even involve a slight holding of the breath. The perceiver stops engaging in forethought and planning. She has no desire to intervene and she withholds the impulse to speak. Wonder’s moment of pause also involves an erect bodily posture in which the perceiver stands in readiness. The mouth is often agape, which Verhoeven reads as “a sign of total and unconditional capitulation” to the world. The eyebrows raise and arch with the expectation that the chaotic array before the perceiver holds some explanation of itself.²⁶

These physical responses—the widening of the eyes, a slackened jaw, erect posture, stillness—are all indicative of attention, a response to environmental conditions that involves hormonal activity in the brain’s reticular system that shuts off unnecessary processing. Breathing and heart rate slow down, as the perceiver waits in alertness. The brainstem controls scanning of the physical environment rather than any higher-level cortical function and parts of the midbrain control sensory arousal.²⁷ It would seem that we are hard-wired for wondrous responses to overwhelming stimuli.

Poetics of Wonderment

Since the technology’s inception, the marketing apparatus that promotes IMAX has foregrounded “The IMAX Experience” as a perceptually overwhelming and emotional one. Images of spectators responding to the medium are featured prominently in IMAX promotional material, and these images (which tend to match Verhoeven’s physiognomic descriptions) present models for our own viewing behavior.²⁸ In this sense our feelings of wonderment are, to a certain degree, culturally conditioned. As Tana Wollen explains in her brief assessment of IMAX marketing, “This is not just going to the movies, it is going in order to react and feel just like these people whose eyes send wonder directly to their jaws and panic racing to the gut.”²⁹ But this cannot fully explain our response of wonder.

So how do these notions of wonder as an adaptive emotion relate to IMAX spectatorship? I would like to argue that IMAX is what Steven Pinker calls a “technology designed to defeat the locks that safeguard our pleasure buttons.”³⁰ IMAX exploits our capacity to experience wonder by tapping into certain strategies of presenting visual stimuli that are likely to elicit the emotion. Extrapolating from Keltner and Haidt’s

prototypical model of awe, I imagine IMAX as presenting images of notable vastness (epic vistas, the sensation of flying, impossible views, etc.), which present a challenge to the perceiver's assimilation abilities. I suspect the result is a low-valenced awe-related experience (what I would call wonder), at least for viewers unaccustomed to the medium. Such an emotional response would likely dissipate after repeated exposure (which is perhaps one reason why IMAX insists on continually updating its 3D system). IMAX would seem to elicit what Keltner and Haidt call an elaborated awe response flavored with aesthetic pleasure (elaborated in the sense that our awe in the face of sprawling representations of natural beauty requires some form of cultural conditioning). In terms of its content, IMAX also has the potential to engage other secondary awe-related themes such as threat (natural disasters), ability (rare skills, exploration), and virtue (expeditions in the face of danger, the pursuit of science). IMAX's dedication to nature films seems significant in this respect, for according to Keltner and Haidt, "Natural objects that transcend one's previous knowledge are more likely to produce awe than familiar objects."³¹ IMAX seems drawn to awe-inspiring natural phenomena to exploit this condition. Finally and perhaps most obviously, in terms of aesthetics, "Awe is more likely to occur in response to viewing art or artifact when the object is larger than the viewer is accustomed to seeing."³²

In this portion of the essay, I would like to explore the norms of IMAX filmmaking insofar as they have been determined by their efficacy in the production of spectatorial wonderment. These norms derive from a number of determining factors (such as, technological constraints, division of labor, budgetary concerns, and documentary form, to name a few). Many of these factors have remained consistent since the early

1970s despite the industry's growth. Although, to ensure returns on investment the large-format industry has developed conventions that function to elicit the emotional responses that keep viewers buying tickets. I will address some of these conventions individually before my concluding remarks.

Field of vision. If sensations of wonderment require an abrupt shift from the common to the uncommon, then IMAX fulfills this function by creating an image that fills the viewer's perceptual field of view. Consider conventional film projection in contrast. The presence of the frame is constant. Manipulations of the image (cutting, camera movement, etc.) occur against the stable background of a rectangular frame and a darkened theater. In IMAX these stable points of reference are significantly reduced. Since the medium's inception, filmmakers have always spoken of large-format projection as inherently "involving" for the spectator. By this I assume they mean that the viewer must actively move his head to capture various parts of the visual array. As one commentator in *American Cinematographer* puts it, "[T]he process covers 180° of the moviegoer's field of vision, so that the spectators have an actual sense of participating in the screen action."³³ The large-format's perceptual vastness and novelty contribute to its ability to elicit wonder-related responses.

Shot length. Commentators have always voiced concerns about fast cutting in the IMAX format. For the most part, these concerns are related to the size of the image and the duration required to grasp its entirety. One commentator notes, "The audience simply needs more time to scan the frame. They're busy deciding what to look at, and they do a lot of talking because they're not sure that their neighbors are looking at the same thing at the same time. They keep verbally pointing things out to each other. That's part of the

special experience of this system.”³⁴ It is easy to see why longer takes might facilitate wonderment. If given longer time to examine a complex and detailed visual array, a viewer is less likely to become frustrated, and frustration is surely at odds with wonder. It would seem that longer takes are necessary to “The IMAX Experience,” and statistically this proves to be true. Films from the 1980s and early 1990s exhibit rather long average shot lengths. The highest ASLs that I have found are 21.2 seconds in *Destiny in Space* (1994) and 19.1 seconds in *Blue Planet* (1990), but most films of this period tend to clock in at ASLs of around 12 seconds. The late 1990s and early 2000s show a general decrease in average shot length. The shortest ASLs I have found are 6.0 seconds in *NASCAR 3-D: The IMAX Experience* (2004) and 7.3 seconds in *Alaska: Spirit of the Wild* (1997). While average shot length seems to decrease the medium appears to require longer takes than conventional Hollywood films exhibited in regular theaters. A more interesting comparison would be with average shot lengths of television nature documentaries. I suspect these films also have higher ASLs than feature films, though more research must be done.

Camera movement. IMAX is known for its sweeping camera movements taken from helicopters and its fluid crane shots. Steady camera movement is central to the effect commentators used to describe as a “magic carpet” experience.³⁵ In general, the rule is to keep the frame mobile to heighten the spectator’s activity. If the spectator’s “position” is constantly changing, then she will have to train herself to process the information faster. As one filmmaker describes, “[I]f the camera is kept constantly moving during the shooting of the film, that also contributes greatly to the heightening of the involvement on the part of the audience.”³⁶ Camera movement without a visible

frame of reference for the viewer (for example, the fixed frame of conventional films) can also have highly visceral effects, such as disequilibrium and dizziness, both of which presumably threaten to lessen the degree of wonder responses. Many IMAX films rely almost entirely on camera movement. For example, *The Eruption of Mount St. Helens* (1980), a film that documents the destruction of its recent eruptions, uses a great deal of footage (2/3 of its shots, to be precise) taken from moving vehicles. Filmmakers are hesitant to take a good thing too far though. According to IMAX's own filmmaker's handbook, "Audiences love kinetic effects, but exceptional unsteadiness, swish pans and certain aerials can have a very decisive and unfortunate effect on viewers."³⁷ Needless to say, the sensation of movement while physically still is a primary component of "The IMAX Experience," and functions as one of its wonder-inducing effects.

Authenticity of mise-en-scene. A major concern for IMAX filmmakers has been the stunning clarity and detail of the image. While they have always had the dual problem of thrilling audiences while educating them—"to achieve the visually factual as well as the visually thrilling"³⁸—filmmakers have always fretted over the authenticity of what they choose to put before the camera. Here we run into a uniquely cognitive concern regarding wonder. Just as Quinn's anecdote about Ruskin demonstrated that wonder requires a lack of disbelief, an IMAX image with details that viewers cannot 'believe in' will limit the possibility of eliciting a state of wonderment. This is perhaps one reason why IMAX has only rarely experimented with narrative fiction filmmaking. This concern results in a high degree of attention to composition and mise-en-scene elements. To a large degree, this issue gets handed down from above. The IMAX corporation offers the following advice: "It's unforgiving. Just as [IMAX] technology magnifies the power of a

good shot, it exaggerates flaws. You can't cheat on backgrounds, costumes, or make mistakes as you can in other formats. Something even a little bit out of focus looks really terrible."³⁹ This is not to say that IMAX is completely averse to artificiality. Many CGI IMAX films, as well as *Siegfried and Roy: The Magic Box* (1999) and *Cirque de Soleil: Journey of Man* (2000), reveal a keen interest in artifice. If not motivated by realism, then it is reasonable to assume that there is an implicit belief among IMAX filmmakers that inconsistent design cues make the elicitation of wonder more difficult to achieve.

Shot scale. For the most part, IMAX filmmakers avoid close-up images, especially those of human faces. The dramatic effect of the close-up in conventional narrative film depends on the limits of the frame. The face has been selected to fill the frame so that emotion, narrative information, and character psychology can be that much more accessible. In IMAX the frame edges are beyond the limits of the spectator's peripheral vision. Framing as a selection of detail loses its emphatic weight. Also, the peculiarities of the IMAX system would make parts of the human face in close-up extend beyond the scope of the viewer's vision resulting in a disorienting effect. While the conventional close-up may be disorienting, there are other reasons for favoring long shots. Closer views of objects limit the available stimuli for viewers to assimilate. Since wonder depends on perceptual vastness, images will be more effective if they present more information than the viewer feels he can grasp. A film like *Whales: An Unforgettable Journey* (1997) reveals the difficulties a filmmaker can run into when forced to create immediately recognizable images. The film contains countless images of single whales against the backdrop of an empty ocean. While some viewers may find the subject matter awe-inspiring, it is not difficult to exhaust the visual information

presented. On the other hand, films such as *The Living Sea* (1995) and *Africa: The Serengeti* (1994) offer up perceptual richness that is difficult to absorb resulting in greater scanning activity. It only seems logical to assume that the greater scanning activity associated with these films is more likely to induce a state of wonder. Additionally, wider views shot with wide-angle lenses in the large format seem to be the most effective in this sense for they provide a perspective that comes closest to human perception.⁴⁰

Voiceover narration. Most IMAX films contain voiceover narration rather than sync sound because of the difficulties involved in minimizing camera noise.⁴¹ Spoken narration is also a convention of categorical documentary form. It provides a means of exposition that generally reinforces the meaning of the visual array. IMAX filmmakers have found it a useful device for purposes of transition and explication, but for the most part, they try to avoid it. One filmmaker explains, “We kept taking out more and more narration, because, as you get the audience to participate and experience the action, and have music and sound effects adding to their experience, the narrator tends to get in the way and his voice tends to short-circuit the audience’s emotional involvement.”⁴² And this is sensible from the perspective of wonder. As I explained earlier, wonder involves the heightened activation of visual and aural faculties at the expense of others such as linguistic or motor abilities. Attention placed on the visual array might only be lessened if a voice were guiding your gaze forcefully around the image. Wonder is a state of openness that involves a freedom of scanning. Furthermore, the six-channel multi-speaker IMAX sound system allows the soundtrack to mimic the directionality of the visual stimuli, a technique that becomes less effective with a persistent voice over. It is for these reasons that the best IMAX films tend to have extended stretches of running

time that lack voiceover narration. *Solarmax* (2000), for example, exploits this pattern to great dramatic effect. The periodically reappearing voiceover functions as a reprieve from intense visual scanning, thereby punctuating the episodes of wonder-inducing spectacle.

Abrupt stylistic contrasts. Perhaps the most interesting and characteristic convention of the IMAX film is the consistent use of abrupt stylistic contrasts to elicit surprise and sustain wonder. Registering at the levels of sound and image, IMAX films present periodic jolts based on binary oppositions, such as static/moving, close/wide, desaturation/saturation, sparse/dense, quiet/loud, among many others. Oddly, film scholars have had nothing to say about these effects considering how suggestive they might be as so-called attractions. Most IMAX films exploit small aperture frames against expansive dark backgrounds generally at moments of straight exposition. By limiting the field of view momentarily, the filmmaker can control our access to spectacular visual arrays. The use of these frames tends to end abruptly as music swells and the image cuts to a landscape view or helicopter shot. This has been a convention since the very start of IMAX production, and it has persisted in current films, such as *NASCAR 3-D* (2004) and *Adrenaline Rush: The Science of Risk* (2002). One filmmaker describes an early example of this in the film *To Fly* (1976): “The film opens with the image occupying only 1/6th of the huge IMAX screen, as a balloonist in 1831 prepares to ascend and float above early America. As he lifts off, the screen opens up to its full size in an explosion of color and movement.”⁴³ Similarly, we find another abrupt shift in scale at the start of *Grand Canyon: Hidden Secrets* (1984). The film opens with an internal frame of a slowly shifting cloud formation. A voiceover waxes poetic, “Man clings to the edge of eternity. Our passion to know propels us to the stars. But we are humbled by the secrets of the

earth. Is this great canyon the work of God, or a symphony of nature?” Suddenly a hard cut reveals a full screen IMAX image, a “phantom ride” helicopter shot only a few meters above the canyon floor. A swell in the program music punctuates the cut to further elicit a feeling of surprise. Moments such as these, peppered throughout IMAX films, function to sustain an emotional state of wonderment via the repetition of surprise.

I have tried to explain some of the norms of IMAX filming insofar as they relate to the economic and artistic imperatives of creating wonder-inducing experiences. I have also tried to show how some of these norms have evolved over time as filmmakers have honed their abilities to craft such experiences for spectators. What is obviously required now is an extended and more systematic analysis of IMAX films to determine the ways in which these norms of a popular aesthetic of wonderment function on a moment-by-moment basis. The sequential orchestration of wonder-inducing stimuli in IMAX films is a topic for a larger study, one that could contribute to a revision of arguments about subject positioning and the IMAX apparatus.

The problem of wonder in the cinema is also a larger topic for further inquiry. I have focused primarily on overwhelming visual and aural stimuli, but it is obvious that films do not have to be as sensually taxing as IMAX films to elicit wonder. You probably encounter wonderstruck viewers at your local multiplex every week, and surely that powerful wonder-based emotional engagement is one of the primary reasons why we continue to return to the movie theater time and again. With renewed interest in wonder among cognitive neuroscientists, philosophers, and film scholars, we might well consider

reformulating Christian Metz's infamous proclamation about pleasure: perhaps *wonder* also lies at the root of the cinematic institution's success and allure.

Endnotes

¹ See IMAX's own corporate profile at <http://www.imax.com/corporate/content/corporate/intro.jsp> (Accessed 12/04/07).

² See http://www.imax.com/corporate/content/products_services/sponsorship.jsp (Accessed 12/04/07).

³ As a film scholar, I cannot claim to be an expert on these subjects. Nevertheless, I do believe that neuro-cognitive research into the functions and processes of the human mind can and should influence the work of film scholars, especially those that are interested in emotion and spectatorial engagement in the cinema. My modest aim here is to borrow from these fields a way of thinking about emotion to see what productive insights it may yield in a discussion of aesthetics, craft practice, and spectatorial behavior.

⁴ For a detailed account of the historical poetics research program, see David Bordwell, "Historical Poetics of Cinema," *The Cinematic Text: Methods and Approaches*, ed. R. Barton Palmer (New York: AMS Press, 1989), 369-398.

⁵ Charles R. Acland, "IMAX Technology and the Tourist Gaze," *Cultural Studies* 12:3 (1998): 430.

⁶ *Ibid.*, 434.

⁷ Tana Wollen, "The Bigger the Better: From CinemaScope to Imax," in *Future Visions: New Technologies of the Screen*, ed. Philip Hayward and Tana Wollen (London: BFI, 1993), 28.

⁸ See Vanessa R. Schwartz, *Spectacular Realities: Early Mass Culture in Fin-de-Siècle Paris* (Berkeley: University of California Press, 1998).

⁹ Allison Griffiths, "Time Travelling IMAX Style: Tales from the Giant Screen," in *Virtual Voyage: Cinema and Travel*, ed. Jeffrey Ruoff (Durham: Duke University Press, 2006), 239.

¹⁰ Lauren Rabinovitz, "More than the Movies: A History of Somatic Visual Culture through *Hale's Tours*, Imax, and Motion Simulation Rides," in *Memory Bytes: History, Technology, and Digital Culture*, eds. Lauren Rabinovitz and Abraham Geil (Durham: Duke University Press, 2004), 100.

¹¹ *Ibid.*, 101.

¹² For this portion of my essay, I borrow heavily from three main sources: Ruth Carter, *Mapping the Mind* (Berkeley: University of California Press, 1998); Antonio R. Damasio, *The Feeling of What Happens: Body and Emotion in the Making of Consciousness* (New

York: Harcourt Brace, 1999); and Jenefer Robinson, *Deeper than Reason: Emotion and its Role in Literature, Music, and Art* (Oxford: Clarendon Press, 2005).

¹³ Damasio, 61.

¹⁴ *Ibid.*, 73-74.

¹⁵ Robinson, 28-56.

¹⁶ Cynthia A. Freeland, "The Sublime in Cinema," in *Passionate Views: Film, Cognition, and Emotion*, eds. Carl Plantinga and Greg S. Smith (Baltimore: Johns Hopkins University Press, 1999), 65-83.

¹⁷ Alexander Bain, *Emotion and the Will*, 4th Edition (London: Longmans, Green and Company, 1899), 83.

¹⁸ *Ibid.*, 86.

¹⁹ Philip L. Quinn, "Religious Awe, Aesthetic Awe," in *Midwest Studies in Philosophy, Volume XXI: Philosophy of Religion*, eds. Peter A. French, Theodore E. Uehling, Jr., and Howard K. Wettstein (Notre Dame: University of Notre Dame Press, 1997), 291.

²⁰ Damasio, 53-54.

²¹ Robert C. Fuller, *Wonder: From Emotion to Spirituality* (Chapel Hill: University of North Carolina Press, 2006), 9.

²² *Ibid.*, 13.

²³ For a related discussion of astonishment as a universal adaptation that increases the likelihood of survival, see John Onians, "'I Wonder...': A Short History of Amazement," in *Sight & Insight: Essays on Art and Culture in Honour of E.H. Gombrich at 85*, ed. Onians (London: Phaidon, 1994). Onians extends this hypothesis to the realm of human interaction and explores its implications for the historiographic problem of the rise and fall of human civilizations. Subsequently, Tom Gunning has interrogated Onians' history of amazement to theorize technology's strange "newness" in the cycles and discourses of modernity. See Gunning, "Re-Newing Old Technologies: Astonishment, Second Nature, and the Uncanny in Technology from the Previous Turn-of-the-Century," in *Rethinking Media Change: The Aesthetics of Transition*, eds. David Thorburn and Henry Jenkins (Cambridge, MA: MIT Press, 2003). 39-60.

²⁴ Dacher Keltner and Jonathan Haidt, "Approaching awe, a moral, spiritual, and aesthetic emotion," *Cognition and Emotion* 17:2 (2003), 297.

²⁵ *Ibid.*, 306

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- ²⁶ Cornelius Verhoeven, *The Philosophy of Wonder*, trans. Mary Foran (New York: Macmillan, 1972), 36-39.
- ²⁷ Carter, 186-187.
- ²⁸ See, for example, the image on the following page of IMAX's corporate website: http://www.imax.com/ImaxWeb/education.do?param_section=educEntertain¶m_subMenuSelect=educEntertainSelect (Accessed 12/04/07).
- ²⁹ Wollen, 28.
- ³⁰ Steven Pinker, *How the Mind Works* (New York: W.W. Norton, 1997), 526.
- ³¹ Keltner and Haidt, 310.
- ³² Ibid.
- ³³ "Unique New 'Space Theatre' for a Spectacular Multi-Media Show," *American Cinematographer* 54:8 (August 1973), 988.
- ³⁴ Roger Tilton, "Filming 'Garden Isle' in the World's Largest Film Format," *American Cinematographer* 54:8 (August 1973), 1026.
- ³⁵ "Unique New 'Space Theatre,'" 1065.
- ³⁶ Tilton, 1026.
- ³⁷ "IMAX: The 15/70 Filmmaker's Manual," 11. This incredibly informative document is available for download directly from <http://www.imax.com/corporate/pdfs/filmmaker.pdf> (Accessed 12/04/07).
- ³⁸ George Casey, "The Production of 'Voyage to the Outer Planets,'" *American Cinematographer* 54:8 (August 1973), 990.
- ³⁹ "IMAX: The 15/70 Filmmaker's Manual," 5.
- ⁴⁰ Graeme Ferguson, "The IMAX Filming of 'Man Belongs to the Earth,'" *American Cinematographer* 55:10 (October 1974), 1219.
- ⁴¹ Ibid., 1201.
- ⁴² Tilton, 1062.
- ⁴³ Greg MacGillivray and Jim Freeman, "Producing the IMAX Motion Picture: 'To Fly,'" *American Cinematographer* 57:7 (July 1976), 750.