Giant Screen Films and Lifelong Learning

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From our evaluation work, we have come to understand giant screen films as films defined not only by their visual and visceral qualities, but as films that deliver scientific knowledge, including depicting facts, processes and perspectives to audiences of a variety of ages and backgrounds, interests and experiences, that are primed and ready for learning.

Visitors come to science centers to see beautiful things, to experience new technology, and to learn. Giant screen films are among those experiences. Evaluation offers a way to understand the audiences' reactions to these experiences. In recent evaluation work, we've seen some innovative approaches to leveraging the incredible visual and visceral power of the giant screen medium in the pursuit of rich educational experiences.

Our research suggests that while catering to people of diverse ages and interests, these films have been successful in delivering both excellent science content and storytelling. Based on the large format film evaluations we've conducted over the last decade, we've found that the potential of giant screen films as an effective medium for science learning lies in fully utilizing film language and current technical abilities. Rather than relying solely on the spectacle of the giant screen, films that use cinematic language and techniques to defamiliarize the ordinary, transport viewers to new places, including worlds outside of the everyday human view; that use the medium to manipulate scale and time, such as through macrophotography and slow motion; that juxtapose perspectives; that introduce characters and human motivations; in short, that fully engage the dramatic and storytelling potential of the medium, result in effective learning.

This paper presents some highlights of what we've learned about giant screen audiences and effective science communication from a series of National Science Foundation-funded evaluations of giant screen film. [1] Evaluations are typically conducted both during formative stages of project development and at the conclusion of project implementation. Formative evaluations provide audience input that can be integrated into project design at various stages of the development to ensure both appeal and effective science communication. Summative evaluation is conducted to assess a film's success in conveying science content. Evaluators are also interested in understanding popular appeal, audience engagement, and interest in the topic of the film.

[1] RMC Research has conducted formative and summative evaluations of six NSF-funded films, *Cosmic Voyage, Lost Worlds: Life in the Balance, The Human Body, Wired to Win: Surviving the Tour de France,* and *Dinosaurs Alive*

Audiences expect great science content and great storytelling

Giant screen audiences are diverse; they include a wide age range, from young children to senior citizens, and can include experts as well as novices. The unifying factor, however, is that visitors in science centers are relatively well-educated, with a higher proportion of college and advanced degrees than held by the average American.

And while some audience members are looking forward most of all to the swooping helicopter shots, others dread those very moments and find them nauseating. But the common denominator between the thrilled and the nauseated is the expectation that a giant screen film will intellectually engage and even challenge them. In discussions, we hear time and again that audiences hope to be exposed to the latest in scientific thinking and imaging. They expect to leave with some new information, having seen fresh visualizations of science content, or gained a new perspective on something familiar. And we've never had audiences tell us there was too much science in a film.

For any particular film, we find audience members from very different background levels – from complete amateurs to professionals. For instance, we've spoken with ten year old dinosaur aficionados with extensive knowledge of paleontology in reviews of materials on a dinosaur film, and practicing doctors and biologists attending a screening of a film on human biology. Across topics we also find there are audience members with no knowledge of the content at all. So each audience member's starting point for learning varies enormously. A film can serve as an introduction to a topic for one person, a refresher for another, and an opportunity to fill in gaps of knowledge for yet another.

Over the years in which we have been conducting giant screen evaluations, we have seen changes in how the public views the medium. When the giant screen experience was still relatively new, audiences approached these films as unique science center experiences, and largely regarded them as distinct from the movies you might see at your local Cineplex. Today we find that discussions about a giant screen film are as likely to provoke comparison with other giant screen experiences, as with films and television shows. No conversation we had about *Dinosaurs Alive* occurred without reference – from adults at least - to *Jurassic Park*, and when discussing the possibility of a film on Antarctica, focus group members unfailingly referred to *March of the Penguins* and *An Inconvenient Truth*. We have found that audiences will readily discuss giant screen films in terms of both the science content and the storytelling, and critique them in the context of a wide field of media offerings. Along with this has come a set of expectations about excellent storytelling.

New developments in giant screen film

In recent evaluation work we've pinpointed some real success stories, which we hope will raise questions about different ways of thinking about learning and about these films more broadly. The examples are going to be drawn from three recent films, all of which received major National Science Foundation funding: *The Human Body*, *Wired to Win: Surviving the Tour de France,* and *Dinosaurs Alive*. In the

summative evaluations of each of these films, we surveyed audiences both pre-viewing and post-viewing (approximately 300 pre- and 300 post-viewing audience members for each) and conducted focus groups with smaller numbers of viewers.

Questions looked at the acquisition of factual content and new learning, but also at other ways in which people learned, including attitudinal change, and learning that enriched the depth and context of knowledge. We designed questions to probe learning related to content delivered in visual and in audio tracks, and conducted analysis aimed at identifying particular scenes and stories that were successful in engaging audiences in the science content. The following examples are just a small sampling of the information and issues addressed in each evaluation.

***The Human Body*: Take something ordinary and make it new**

The Human Body film (2001, Discovery Pictures/BBC co-production in association with the Science Museum, London and the Maryland Science Center, Producer/Director: Peter Georgi. Producer/Writer: Richard Dale. Executive Producer: Jana Bennett) was based on one episode of a multi-part BBC television series on the biology of the human body. *The Human Body* film explored different body systems and was loosely structured around a day-in-the life of the human body, beginning with the burning off of a retinal layer when you open your eyes in the morning. Woven into the day-in-the-life structure was an exploration of the body over the lifecycle, from the ability of new babies to hold their breath underwater to aspects of what happens when we age.

As part of the summative evaluation of *The Human Body* film, we asked audience members how they felt about their bodies. Before viewing the film, the largest number of responses referred to people's immediate bodily conditions, such as "healthy," "fit," "overweight," "good," "tired," and "out of shape." After viewing the film, the responses were markedly different. Audiences described their bodies as mechanical or organic wonders, using words such as "amazing," "marvelous," "miraculous," "awesome," "fascinating," "incredible," "fantastic," "extraordinary," "intricately made," "cool," complicated," and "complex." For instance, viewers said, "It's an amazing machine!" "Awesome! Only God could make it," "I could still use a tattoo, but it's amazing," and "I feel the same but different."

When we contacted a small group of viewers after seeing the film (anywhere from two to eleven weeks later), twenty-four of the twenty-eight interviewees said they had thought about the film since seeing it. When we asked them what they remembered from the film, it was this big picture message that they recalled most clearly, though they also had excellent recall of various visuals from the film, many of which were recalled in association with particular experiences and activities, such as surgeries and bicycle riding. Some of the respondents said that they changed how they felt about their bodies, and a few even reported changing their behavior. They related a new awareness about what happens when you eat, sleep and move, and responding to a detailed sequence about the impact of loud music on the ear, they had been concerned about their hearing.

What *The Human Body* film did so successfully was to take something ordinary and familiar to every audience member – the human body – and make it new. The universality of the topic, based on the fact that everyone has a body, allowed viewers to feel personally connected with the film. Through a carefully structured approach that presented the average, living body, the film offered an overview of different body systems, with a few deeper stories. The success was in how these stories were knit together to present the body as a single system. The film helped audiences see their bodies through a scientific lens, to see the body as a system, to think of it in terms of function, and it gave viewers a visual language for thinking about bodily structures and systems. The filmmakers were able to achieve this through an integration of medical imaging, CGI and live action footage captured in a variety of media formats, including video, 35mm film, and giant screen images.

Wired to Win: **Integrating science and story**

Wired to Win (2005, PD Productions, a division of Partners HealthCare System. Director/Writer: Bayley Silleck. Senior Producer/Project P.I: JoAnna Baldwin Mallory) built on many of the strengths of *The Human Body* film, embracing human biology as a suitable topic for a large format film, and mixing vérité footage and medical imaging. But rather than structure the film around the artifice of a day in the life, they used the Tour de France bike race to provide a dramatic narrative, and interwove this with stories of how the human brain functions in ways which allow us to do both the ordinary and extraordinary.

Again, the film had universal appeal and a strong overall message. Audience members indicated that this overall message had to do with the relationship between the brain and body, and the plasticity of the brain. A visual image of neural networks repeated throughout the film was consistently mentioned by audiences as shaping this bigger message. Audience members described their learning from this image as “How the pattern of neurons firing help shape and form the body’s action. How the brain is constantly rewiring in the learning process,” “Brain keeps changing, synapses work together over time,” “how nerves learn, nerve signals travel 300 km/hour,” “brain is always developing and learning new pathways,” and “How the wiring in the brain changes.” In addition to this larger message, the film was also successful in conveying some detailed information about other aspects of brain and body interactions.

One aspect of our summative evaluation looked specifically at which scenes, stories and themes were most effective at conveying science content to audiences. In addition to a series of pre/post questions on factual content, and self-perception of knowledge in different areas, viewers were asked to rate the film’s effectiveness in communicating key themes and scientific content, and to describe both memorable images and science learned in a series of open-ended questions.

Audience responses consistently pointed to a sequence on how the body experiences and attends to pain as standing out in its effectiveness in communicating rich science content. In this sequence, the diverse elements of the scientific and human stories came together. Focusing on the experience of a single rider as he struggled to overcome the pain of the climb, the scene combined both

traditional giant screen imagery of sweeping French landscapes, and close up shots of riders' grimaced faces. The sequence was intercut with graphics illustrating the transmittal of pain signals from leg to brain, and the body's response through the release of endorphins. And it was further enriched by the development of the rider's character, motivation for the race, and subjective voice-over describing his experience of the pain. It was a topic that viewers felt had been thoroughly presented, and could easily recall the details of the sequence, including the explanations about how the "brain feels the pain" and how "the neurons tell us the pain that we feel." They also accurately retained details about the role of endorphins in easing pain.

What we found in our analysis was that the areas of greatest learning generally coincided with extended discussion of science content in the narration, which was motivated by the characters' activities and included characters' first-person reflections on their experiences, as well as clear visuals. The wide appeal of the characters' struggles and nearly universal experience of bicycling, even though many viewers knew little about the Tour de France, was effective in engaging a wide audience. The stories of motivation and of setting goals and struggling to achieve them were compelling to viewers of all ages and backgrounds. Even some of the students who struggled with the science content of the film were drawn in by the very human struggles of the riders. And while many audience members expected that the film would profile Lance Armstrong, few were disappointed in the focus on "underdogs" instead.

Dinosaurs Alive: **Bringing science alive**

The *Dinosaurs Alive* (2007, Produced by David Clark, Inc., Giant Screen Films, Maryland Science Center, and Stardust Blue in association with the American Museum of Natural History.. Writers/Directors: David Clark and Bayley Silleck. Producer: David Clark. Executive Producers: Greg Andorfer, Don Kempf, Jim O'Leary) film is structured around a series of explorations of dinosaur science, and links paleontological study and methods as conducted during a historically significant expedition led by Roy Chapman Andrews in 1920, with contemporary field and laboratory methods and understandings. The focus on paleontological work provides opportunity for vérité sequences and human stories, and an investigation of the process of scientific discovery provides the overall theme for the film. This was a film that had, obviously, a topic highly appealing to young children – and it had also a need to appeal to the adults who accompany children. Therefore, the film-makers integrated several types of film material, including archival footage from Chapman's 1920 Gobi Desert expedition as well as computed generated renderings of different species of dinosaurs.

We found that in terms of educational impact, the stand-out scenes in this film were ones in which the computer generated images were used to bring to life hypothetical scientific phenomena and to guide viewers into the scientists' imagination. In one scene, recreations of rains and flooding were used to illustrate how dinosaur fossil deposits were created, and in another, a fossil of a feathered dinosaurs morphs into a fully rendered flying animal. Audiences were particularly impressed with these scenes, and noted them as among the most memorable

scenes. The topics dealing with the relationship of birds and dinosaurs, and the exploration of the role of climate in fossil preservation were noted as among the greatest areas of learning by viewers.

The film's successes in this regard are suggestive of the potential of the medium for taking visual evidence such as actual fossils shown in live footage, and using computer generated images to help viewers imagine the worlds investigated by science. As noted by a focus group participant, these scenes helped viewers understand the imagination necessary for scientists to develop new theories and for science to progress. Viewers were particularly enthusiastic about the information content of this film, and the use of these kinds of imaging, and way in which they were woven into a narrative structure looking at actual paleontological stories of scientific discovery, may also have contributed to the positive sense viewers had of the informational content of the film.

Summary

Each of these films has pushed the giant screen medium in significant ways. Through their use of a richer cinematic language, whether introducing footage from various film formats, vérité-style footage, character-driven stories, and innovative integration of computer animation and live footage, they all make use of cinema's ability to defamiliarize, to juxtapose, and to visualize in the creation of meaning as discussed in this paper.

What we've learned about the audience:

- Audiences bring their sophistication about media – gleaned from what is possible on television documentary and in feature films – to their experience and critique of giant screen films.
- The science center location for these films is meaningful; audiences expect first-rate science content, in terms of accuracy, cutting-edge visualizations, and opportunity for learning. Audiences are primed for learning when they walk into a giant screen presentation

Best practices for effective science communication

- Storytelling matters, and science content and story – offering drama, characters and opportunities for audiences to find personal relevance – should be well-integrated with the science content, e.g. character's can provide the motivation for exploring specific science content
- Reinforce information presented in audio and visual tracks with one another; new ideas content can be broken down both visually and in audio tracks and layered to provide more complex content
- Exploit different film formats including diverse source material, and different genres, such as documentary and archival footage, CGI, and scientific imaging to develop both story and science content
- Visualize what cannot ordinarily be seen and what is difficult to imagine, such as scientific theories and processes
- Expand the notion of landscape to include internal worlds and familiar things made new

- Address content in terms of a larger take-away message, as well as through the development and exploration of individual themes and stories.

As the number of films being made increases, there is opportunity for different kinds of films, and many possible types of successful films. From our evaluation work, we have come to understand giant screen films as films defined not only by their visual and visceral qualities, but as films that deliver scientific knowledge, including depicting facts, processes and perspectives to audiences of a variety of ages and backgrounds, interests and experiences, that are primed and ready for learning.

From our analysis of the films discussed we see that giant screen film producers are embracing new opportunities for dramatic storytelling and finding ways of deepening the science content of these films. While staying true to the unique immersive qualities of the medium, the most successful learning moments are ones in which filmmakers are drawing on a range of cinematic techniques including dramatic arcs and cinema vérité realism, and integrating multiple film formats and the use of CGI to transport viewers to new and unfamiliar worlds.