Flight of the Butterflies
Treatment Test Report

Introduction

In March 2011, RMC Research Corporation of Portsmouth, NH was contracted by project principals to begin formative evaluation work on the large format film project, *Flight of the Butterflies*. Formative evaluation work gathers audience responses to the film in various stages of production and provides feedback which can be used in developing an engaging and content-rich final product. This document serves as the final report on the treatment test completed in June 2011.

Methodology

The treatment test seeks in-depth feedback on the preliminary treatment (script) of the film. A total of 42 individuals participated in four focus groups, in two cities. Participants were asked to read the film treatment in advance and were shown a two and a half minute video clip with the explanation that this was intended only to exemplify the type of natural history footage which would be included in the film.

Participants were then asked to complete a four-page questionnaire with open and closed-ended questions, and engaged in an hour-long discussion of the treatment. Survey and focus group questions were designed to elicit audience perspectives on the appeal and scientific content of the script, including discussion of the film concept, use of the large format medium, effectiveness and clarity of the storyline, and identification of areas which are confusing or warrant further development.

The written questionnaire and focus group questions are included in Appendix A.

Participants

Focus groups were conducted in Boston, Massachusetts and Albuquerque, New Mexico. The 42 participants ranged in ages from 19 to 70 and included 30 women and 12 men. Participants provided their highest degree completed. Responses include 4 high school graduates, 15 had college degrees, and 23 had advanced degrees. The group included individuals in a broad mix of professions, including students, artists, educators, scientists, speech therapist, cook engineer, manager, and business people.

Survey Findings

The findings section summarizes both viewers' questionnaire responses and comments made during focus groups. A list of verbatim questionnaire responses is included in Appendix B. The section concludes with a summary of findings and recommendations.

Overall impression

Ninety eight percent of respondents had an overall positive impression of the film. Thirty-six percent of those were very positive and 64% positive. Only 2% said they had a negative response, and none said very negative. (n=42)

Most of the comments following this question were affirmations that the way the script interweaves the personal story of scientists with Monarch science made for an interesting and engaging story. Fred's personal and scientific journey and the multiple butterfly generations were highlighted in these comments, several of which described these as parallel life cycle stories. Some of these comments included: "I like highlighting the Life of the Biologist along with that of the butterflies," and "Parallel stories are compelling; it engages emotions, which is very important when trying to create empathy with invertebrates, which are not always loved by people – even butterflies, which have better PR." Others were impressed by Fred's life-long pursuit of the butterfly migration and/or the realistic portrayal of the scientific process. For instance, one stated, "I liked the portrayal of a scientist, Fred, from youth through adulthood and also of multiple generations of related butterflies. Realistic science career portrayal – sometimes you have to get lucky and experiments don't always work first time (e.g., tagging butterflies)."

The mystery of the butterfly migration was compelling. For instance, one participant commented, "The plot of tracking the butterflies to their destination was captivating." Others described the film script as providing "A really good combination of human interest – following the story of Fred, the "citizen scientist", plus the science facts surrounding the Monarch butterflies – in a slowly unfolding "mystery"," and as "A fascinating mystery, dramatic story, interesting on both the micro (Fred Urquhart's dream) and macro (journey of the butterflies and all of the people who contributed to solving the mystery) levels. [And it is] visually beautiful."

However, several reviewers voiced concerns that the story or aspects of the characters were overly sentimental, for instance, "some parts of Fred's story were sappy. While his story at least seems like it's intended for kids, it sometimes sells those kids short for recognizing dramatization," "I also found it predictable and saccharine – Norman Rockwell," and "I thought the story was very interesting and thought the discovery of the flight path was fascinating. However, I thought the story of Fred as a young man and Dana's life was a bit cheesy – e.g., Dana was too anthropomorphized; segue way between the two stories a bit abrupt."

Several noted that the film would be visually beautiful. Some of these comments included, "The film [will be] visually beautiful with enough science to help the viewer [overcome] the difficulty that often comes with understanding our natural world," another noted that the film left a "positive impression because it conveyed the beauty of the forest and the impact and intensity of the myriad butterflies nesting within," and "I think the images are beautiful – but a bit dark at times. The music is a give-away as to where the butterflies migrate. I think orange butterflies against blue skies would be very beautiful."

Additional comments touched on a range of other topics. For instance, "I'd like to see more about conservation and habitat preservation and use of pesticides," "I would have liked to learn

more about how the Mexicans deal with all those butterflies -- human-butterfly co-existence," and "I'm concerned that the insects may be over-anthropomorphized, and the role of predators flavored as "bad" or "evil"."

How excited are you about seeing finished film?

All of the participants indicated they were ***somewhat* or *very excited*** about seeing the finished film; 67% of these indicated they were ***very excited***.

The far majority of responses to this question expressed excitement about seeing the executed script. Some of these comments follow: "I am interested to see butterfly footage and treatment of scientific content; less excited about live action/drama components; interested to see 3D translation," "It is a lovely story and I would like to see its completion," and "From the script I was eager to see visuals that accompanied text – anticipate some fantastic cinematography."

Some mentioned very particular things that they look forward to seeing, such as "Butterflies are delicate insects, how would one tag these butterflies and be able to follow them thru all the cycles?," "I want to see millions of monarchs that Ken saw," "I am interested in seeing the butterflies in their winter habitat. I think there is the possibility of the film to be confusing or very enlightening – depending on the film treatment," "Love to see the butterflies in flight and their winter resting place," and "Now I know the resolution to the mystery! But I'd like to see the footage of thousands of monarchs." A few particularly noted the appeal of seeing this in a large format theater. For example, "I am looking forward to seeing this movie. I really want to see the butterflies on film in the IMAX Theater. Some of the landscape scenes should be beautiful too."

Some comments addressed the age of audiences they felt the film was suited for. Some of these comments included, "The predatory scenes will have to be geared just right if you don't want to scare young children – who would be a great best audience. Learning through adventure," and "I myself am very excited to see the film but am worried about bringing my kids (10 & 5 year old) because of the scary sounding predator scenes. I know that's life, however, I am always trying to decide how to handle that!," Another felt, "I think it will be very interesting, but the age level might be too young for me."

Another group of comments touched on stewardship of the earth, and some wanted the film to more directly address these issues. For instance, "The citizen scientist is the wave of the necessary future and should be the <u>strong</u> emphasis. It is <u>our</u> future – this is a pivotal generation. What is happening to the natural world globally," "[I have a] personal interest in the environment and the human connection to it. Make a local connection, e.g., biopart. [Suggest what kinds of] action to take," and "What about threats to Monarchs? Loss of habitat, pesticides, destroying/ outlawing milkweed. What should we do? What should we plant?"

Use of the Large Format Film Medium

All of the participants (100%) indicated that the film would be **somewhat** (29%) or **very successful** (71%) in taking advantage of the large format film experience.

About half of the reviewers noted the suitability of the topic for the large format, citing the

expanses of large numbers of butterflies, butterfly eye-view, and the close up views of these small creatures. Comments related to the former include: "The image of millions of Monarchs will be incredibly compelling. POV shots of Monarch will also be amazing," "I think the large format is ideal for taking in the overwhelming experience of a valley full of butterflies," "It will be great seeing millions of butterflies in IMAX format. It will be breathtaking," and "Sheer numbers and the beauty of flight lend themselves well to IMAX."

The following are some representative comments regarding the interest in the macrophotography and close-up shots, "Butterflies are small creatures – it's great to see "up close and personal," "Macro on a large screen is fantastic. It will be awesome to see the detail. Butterflies are so small, I think its best viewed on the big screen," and "I think the details of the butterfly life cycle are well-suited and enhanced by large format film experience. It will be intriguing & beautiful that way."

A few noted in particular the 3D opportunities that the subject matter offered, "I think the 3D format will excite young children and make them feel like they are part of the scene. I liked the flying scenes – better than the stationary scenes on the trees, "and "I could picture the 3-D aspects based on the script…splattering milkweed, falling spider, nets flopping…,"

Others provided more general statements about the visual imagery, such as, "Abundance of awesome visuals," "Lots of powerful visual images are suggested by the butterfly subject," "Subject matter great; filming will be everything," "Monarch butterflies are beautiful," and "It cannot help but be beautiful."

A few registered concerns that the material might not be suitable for the large screen. These included, "Content is not as dramatic in 3-dimension as some IMAX movies. Flying insect scenes will be exhilarating however," "The butterfly sequences could be stunning. Sometimes humans don't make it on the big screen – especially facial close-ups – too much detail," and "Monarchs are small, so large format sometimes better for large landscapes."

Would you recommend this film to others?

Ninety-five percent (95%) indicated they would recommend the film to others; one indicated they would not and another was undecided.

Some comments simply affirmed that the film would appeal to a wide audience, "I would recommend this film to anyone who was going to the IMAX," "Everyone; I think it will be great for our young minds," "I think anyone could be interested in this film," and "Yes I would recommend, as it presents the life cycle and migration quite well. It will be appealing to all ages."

Many noted in particular that the film would be suitable for families, "Good for families and children," "I would love to show these films to my family because of the information, the scenes, and also it shows how we can help," and "I would recommend to people who know nothing about butterflies – it gives a great general overview. I think anyone with children should take their children to see it. I would not recommend it to anyone that has a decent science background as this would be repetitive." One noted that the 3D makes it particularly suitable to "kids and friends." However, while many had suggested the wide appeal for families,

some qualified what age children they thought would most enjoy the film. These comments included, “Would recommend to families with young children; not enough content for older children and adult audiences besides potentially stunning videography,” and “Exciting story but not perhaps for very young children or “arachnid-phobes”, also young children could become upset to see the caterpillar devoured,” and “[I would recommend the film for] science-y friends and others fascinated by butterflies; not for little kids.”

Some singled out people who enjoy nature as among those to whom they would recommend the film. A selection of these comments follow: “I would recommend it to anyone who loves nature and butterflies in particular,” “I think the film will be visually beautiful. I would most especially recommend it to artists and those who love nature,” and “Anyone who may enjoy nature. I think it is important to let people know that they, too, can help – it isn’t as daunting a task as people may think. The earth needs our help!,”

Two of the teachers participating noted that the film would be good for school groups. “Many classrooms raise butterflies – might be a nice tie into the classroom lessons,” and “I am a classroom teacher and I would take students on a field trip. I would recommend this film to friends with children.”

Others approached the question from a different perspective. Rather than suggesting particular audiences, they highlighted what they saw as the importance of the film. These included comments about the valuable content about butterflies, such as “I learn a lot, [would] recommend to fellow science friends. I think [there are] enough interesting scenes for children (Monarchs eaten, etc.),” “People love Monarchs but very few know of the details of the migration. I think they will be fascinated,” and “Yes, because the story of the Monarch migration is one of the most amazing stories of our natural world. Recommend to everyone.”

Another group of comments in this section made reference to the importance of conservation issues. “I personally would, for the simple fact that nature and the threat of losing a national treasure would be horrifying to lose,” “The Monarch Migration is a great story further promoting preservation of the habitat would be wonderful,” “Because is good to know how we can help nature and preserve and not destroy the natural habitat of the animals. I will recommend to family and friends,” “Yes, there is such a bigger learning experience than just the Monarchs. It’s about our ecosystem that needs to be saved. Monarchs are just the beginning,” and “How ecosystems work and every species struggle to survive is a must know topic.”

Film (Treatment) Description

Participants were asked to indicate which adjectives from a list provided were most likely to describe the finished film.

- Over 80% of participants selected **interesting** (88%), **beautiful** (86%), and **informative** (83%).
- At least half of the participants chose: **engaging** (67%), and **surprising**, **scientific** and **motivating** (52%).
- Between 20% and 50% selected **enlightening** (48%), **powerful** (33%) and **thrilling** (21%).

- Smaller numbers chose **slow** or **scary** (12%), **confusing**, **old news** or **repetitive** (7%), and **uninspired** or **controversial** (2%). No one chose **boring**.
- Additional descriptors provided by reviewers in the comments section included: "non-controversial," "fun," "fascinating," "predictable-saccharine," "suspenseful" and "educational/magical." Two noted that it was a "great" or "well-written story." Another noted that they wouldn't be able to tell if the film was slow until seeing it; and another that the "valley full of butterflies might be beautiful, creepy, or a little bit of both."

How would you describe the main message or theme of the film?

Several noted that the script combined anywhere from two to four distinct themes, including the stories of the scientific pursuit of the monarch migration, the personal journey of a scientist and the science of the monarch butterfly and the processes of scientific investigation more broadly. A sample of these comments follows: "A. It's not easy to be a butterfly; B. Through perseverance and hard work, years of dedication, Fred found his answers; shows the life of a Research Scientist.," "I perceived four main messages: 1. An illustration of the process of scientific investigation; frame a question, design a protocol, etc.; 2. Citizen-Scientists can make a contribution; 3. Scientific investigation requires time and persistence; and 4. The fascinating biology of Monarch butterflies," "I am a biologist & I loved the "3-part" story of the entomologist, the citizen science, & the butterflies.," and "Challenges to Monarch survival; observant naturalists are people with passion & curiosity about the world; naturalists can contribute to body of scientific knowledge – power of the observant "citizen scientist"."

Some saw the film as a message to children or others to follow their "passion" or their "dream", specifically relating to the pursuit of scientific mysteries. Many of these responses noted that perseverance and hard work were required. For example, "In following one's dream, amazing things can happen which can contribute to the universal good, especially if one involves others in the pursuit. We are all connected – to the rest of the world and to everyone and everything in it," "Perseverance in quiet, scientific pursuits like butterfly tagging can be the basis of a satisfying, fun life's work," "The excitement of scientific discovery, the amazing journey of the monarch," and "One man's dedication to solving a mystery; very good in this aspect; wonderful story about ingenuity and perseverance."

Another large group of reviewers focused on the science of the monarch butterfly as the main message. These included comments such as "The amazing migration of the Monarch," "How and where Monarchs migrate; what they eat and what they need to survive," and "The main message is that butterflies have endured a lot of hardships to become butterflies. Fortunately they reproduce in huge numbers that they go on forever."

A few felt the message of was about the beauty of nature. These included the following comments, "Nature is incredible in her splendor – diversely beauty, how everything is intertwined and mingled," "Amazement of nature, beauty," and "Butterflies are a beautiful insect but have a short life cycle."

What did you find most interesting about the film concept and treatment?

The most common responses were about the specific details of the discovery of the migration, particularly the tagging and the citizen involvement. A sample of these responses follow: "The discovery process by which the route was determined," "How they learned to tag them, and how they followed them," and "I loved the whole citizen-science aspect. By involving lots of people in his project the researcher was able to see it to a successful resolution."

Reviewers also particularly enjoyed Fred's personal story. For instance, reviewers wrote, "I love the fact that a curious child grew up to become a biologist/entomologist, and the fact was stressed that it took so long and was hard work put into such an important discovery – it did not come easy. The story of Fred Urquhart was told beautifully and realistically," "Human story, musings of a little boy set the pattern for his entire life. What a quest," and "The payoff of a hard work of a scientific study of Monarch butterflies and the resolution and understanding of their lives."

Another group described the stories of the scientist and Monarch family as parallel stories. "I enjoyed how the journey of the butterfly was told in parallel to the "Journey of the Researcher"," "The whole "circle of life" theme and the juxtaposition of the scientists and their lives." "I like the connection of the human life cycle with the butterfly life cycle, and that people that are "non-scientists" can be involved and are key!," and "I enjoyed the unique double focus – the investigation and investigators and the Monarchs themselves."

Others pointed to additional aspects of the monarch biology and migration that they found particularly compelling. These included, "The incredible details of the Monarch's migration route and patterns," "The MRI of the chrysalis emerging," "Magnetic lines that help navigation," and "The life, generations, the number of eggs that a butterfly can lay and their survival rate and reproduction means."

What did you find confusing?

About one quarter of these responses noted that the presentation about butterfly generations and super generations was confusing. "What is a "super generation?" Why do these Monarchs live 8 times as long?," "Why was Dana's granddaughter called the super generation?," "The life span of Dana, her daughter and granddaughter is unclear. The amount of time that is passing with these generations is unclear," and "The "super" offspring seemed to come out of nowhere. Unclear how/why that particular generation is called that? Is it that generation always?"

Additional science content questions varied. They included: "Are there any other valleys the butterflies migrate to or is it only that one?," "What did the tags look like? How did they attach them? The timeline was a bit confusing," "What do the adults eat? How is this supposed to impact the audience?." "How do they know that all of the monarchs go to that one valley only?," and "Some of the script was hard to understand without visuals – polarized sunlight/navigation. Unclear why so many generations before super generation."

Some respondents were confused by what the conservation message of the film was, if any. These survey respondents wanted to know "What we should do to help the butterflies?," "What does the story want me to do? They don't explain more about the hazards humans cost

to the butterflies," "What does this man want to make me feel, think, change, or improve? Is it a documentary or a story? Feel? Protect!? Change? Feed!? Improve? Grow flowers?! An instinct mode?," and "Why should we care?"

Assorted additional comments noted that the "migration aspect did not flow smoothly," or noted that they were confused by the transitions from Urquhart to Dana stories, and between the different times depicted.

Seven indicated that "nothing" was confusing.

Science Content and Learning

Participants were presented with a series of science content areas addressed in the film and asked to indicate how much they had learned of if they were confused. Complete findings are shown in the table below. Comments related to each of these areas are presented following discussion of the ratings data.

The butterfly…	Confused	Didn't Learn Anything	Learned A Little	Learned A lot
Life Cycle	5%	5%	40%	50%
Habitat	5%	7%	33%	55%
Foods		7%	50%	43%
Predators		5%	33%	62%
Migration	2%	2%	38%	57%
Navigation			61%	39%
Discovery of the route			25%	75%

Eighty-eight to one-hundred percent (88-100%) of participants indicated they learned a little or a lot about all of the different areas of butterfly science presented in the film.

- One hundred percent (100%) of participants indicated their learned a little or a lot about the *Discovery of the Migration Route* and *Butterfly Navigation*.
- Ninety-six percent (96%) learned a little or a lot about the *Butterfly Migration*, and 95% learned a little or a lot about *Butterfly Predators.*
- Eighty-eight to ninety-three percent (88-93%) learned a little or a lot about *Butterfly Foods* (93%), *Butterfly Lifecycle* (90%) and *Butterfly Habitat* (88%)

Very small numbers (1-2 participants each) indicated they were confused by information presented about butterfly lifecycle, habitat and migration.

Respondents comments about what they learned or areas they felt required greater clarification are presented below.

Science Content: The scientific discovery of the monarch migration route.

Reviewers particularly liked learning about butterfly tagging. Comments about learning about the tagging process included, "Loved the part about how they learned the tagging to track the migration," "Did not know they were tagging butterflies that long ago," and "Learning how to tag their wings and set up a network to identify where they were spotted was remarkable," among others. A more extensive comment on this was "I think it was more interesting learning how they migrated and why instead of where. Fred Urquhart dedicated his life to finding out where the butterflies went when they left Canada, but today most people know. It is the process of discovery that is so interesting. The tagging process was interesting & entertaining."

Many also noted that they learned about the role and/or the idea of citizen scientists from the film script. "I knew nothing about the process that Fred U. used and the concept of "citizen scientists" was interesting," "Citizen science is captivating," and "Hadn't realized the impact of citizen scientists."

A small number of reviewers commented that the scientific discovery story was an important contribution to the film, providing needed drama. These comments included, "This was a very interesting addition to the story," "Resolved in a very nice way," "The suspense was really well done," and "Human story interwoven here keeps the focus." One respondent provided a more nuanced view, "I liked the way the process of investigation was illustrated including the "error" part of "trial and error" and the critical role of framing a question and of persistence." A few provided critical perspectives on the story: "I found some parts about Fred seemed "scripted,"" and "I think incorporation of flashbacks to 1952 at times was confusing at times. It also has everything emphasized from Fred's point of view."

A few others commented about the migration itself. One asked the question, "What is the driving force behind the extended migration," and another offered a response, "They actually migrate to high mountains where temperature is mild, but chilly and humid enough that they can remain semi-dormant to conserve energy." Another wrote, "I look forward to great graphics."

There were some interesting miscellaneous comments on this question as well. These included: "No treatment of reaction of local community post-discovery," and "I wonder in an age of Internet, how this film sits. It seems like it took decades to discover something fairly well known to well-traveled people."

Science Content: How butterflies navigate to their destination.

Comments in this area ranged from wonder and surprise, such as "wow!," "Visualizing how they navigate was fascinating," and "Amazing with such a small brain." A few noted how they used the wind to travel these distances. Capturing the impressiveness of this, one noted, "I would think this would be the biggest question from the viewer: how do they find their way?"

Others recapped something of what they had learned about butterfly navigation, such as "The sun, body clock through their bodies," "They are equipped with a navigating system that responds to magnetic forces so they can make their flight," "Internal compass and tracking the sun is very sophisticated navigation," and "Very interesting about how some scientists think butterflies follow the sun and how others think they may have cells that detect Earth's magnetic fields."

Several others noted that this is an area of ongoing research and that the film should present this as such. Some of these comments included, "Rather a mystery still, isn't it?," "Take a stance or incite more controversy into the debate over the Monarch's navigation," "It seems there is still speculation as to how they navigate in unruly weather," "It's important to highlight the fact that we're still trying to figure it out," and "This was a bit confusing. It seems as though there is debate on this topic but that is not explicitly stated."

Several also were interested in more information on this topic. "I learned that it is not entirely clear how the butterflies navigate," "More info here would be great. I know there are more questions to be answered however that could be highlighted more," and "I know that the magnetic poles were a primary navigation area. Maybe more about seasonal cues?"

Science Content: The butterfly migration.

Quantitative data suggests that all reviewers learned something new in this area. Some offered general remarks such as "Best part," "Interesting," "Wow," or provided more extensive comments in this regard, "This is the most surprising part. I had vaguely known of the migration. I've often seen/read about bird migration but never any details about butterflies."

Others noted they "Learned about where they go," describing it as "From north to south," or "Texas to North Dakota to Southern Canada to Mexico." Several noted the distance traveled was surprising. "Very interesting about how far they travel (1,500 miles/and the route they take)," "Range is larger than I knew," and "Who would have thought they could travel thousands of miles," were some of these comments. Responses further suggested that while the information was well presented, more information on this topic could be included. For instance, one wrote "This was well presented because the aspect of the extraordinary distance was emphasized, and the toll it takes on the butterflies physically," and suggested that reprising the length of the journey would help viewers to understand the total distance, time and places involved.

The information presented about the different generations of the butterfly was new information for many reviewers. These comments included, "I knew they migrated, but did not know it was multiple generations of butterflies, nor how far north they went," and "I had heard this before but not in the context of the butterfly's complete life cycle. I missed that it was 3 generations north to one south." Many wanted additional detail, for instance, "Clarify 3 generations north and one south," "Very interested to learn about how it takes 3 or so generations to get as far north as they go, and only one butterfly journeys 2000 miles all the way back to Mexico to begin the cycle again," and "Is the migration different for the "super generation" Monarchs?"

Additional information that reviewers would like to see included were "Take the opportunity to explain about habitat loss – whether roadside weeds or pine-oak entire forests." And "I would make sure audience knows that there are other over-winter areas (e.g., CA) and some populations (e.g., HI) do not migrate if year-round conditions favorable."

Science Content Learning: The butterfly life cycle

While some respondents noted that this was an area that they were already familiar with, respondents nevertheless noted that the information was well-presented or that it would be interesting to see on the large screen. "The general life cycle of butterflies is pretty well-known but might be fun to watch on IMAX," and "I think most people that would see a nature film purposefully may know the basics of a butterfly life cycle, but this was more in-depth," "It was meaningful to trace life cycle through stages of the egg, the larvae, and the butterfly. At each stage many dangers are present," and "I thought animation of what occurs in cocoon would be very cool."

Others noted aspects that were new to them. "I didn't know their body mass dissolves and reforms in the chrysalis," wrote one respondent. However, even on this question the largest number of responses suggested that the information about the multiple generations and "super generation" was new to them, as were many of the details about the migration. For instance, "Most people may know about life cycle from elementary school and some know about the migration. Very few know about super generation, challenges to butterflies reproductive success throughout the migration route," and "It is fascinating to read the chronological order of Dana's life and all the generations of her daughter, granddaughter, etc.," and "I did not know it took several generations to reach this area or that they lay just one egg per plant."

Several included questions they had about the lifecycle and particularly about the generations, for instance, "[The script] specified the 4 stages of butterflies but where do they go, what is their next step after becoming an adult. Life can be more interesting if we know what they do after their duty," "Liked the life cycle and sequence of egg hatching and growing to an adult. Do butterflies eat as adults?," "Not entirely clear on how super generation is determined – can other butterflies not travel as far?," "Chrysalis doesn't show up to 3rd generation. Fascinating but unclear about 3 generations north and 1 super butterfly south," and "The life cycle of Dana, her daughter and granddaughter was a bit confusing. Also, I was left wondering about the generations after the great granddaughter. How long do they live – 1 month or 8 months." Finally, one suggested that "perhaps even a graphic would be helpful to have more clarity, i.e., some live longer than others. Some migrate some do not. This 2^{nd}, 3^{rd} generation references are confusing. More about the "super generation" would be helpful."

Additional comments included other suggestions for information to include in the final film, such as "Explain about Monarch mimics that are edible," "Consider introducing "instar" terminology; replace "creepy crawlies" with "insects" (pg. 4); consider replacing "sticky soup" & "magic" in narration (pg. 13)," and "The migratory fate and role of males should be included. Some comments on the life cycle of other insects, using Monarchs as a model, might add value."

Science Content Learning: Butterfly habitat

A few respondents noted that the butterfly habitats had been adequately, if subtly, addressed in the film. Some of these comments included, "This was well addressed in the film – it will help people understand why they see butterflies on certain plants, and that it is not random," and "Habitats which support and do not support Monarch butterflies described in subtle ways – not preachy, but gets point across." A few others noted what they knew about butterfly habitats. These included, "They live on trees and warm climates," and "Butterflies search out meadows and woodlands. They want to be near food source and away from enemies," "Learned about their forest habitat," and "It was interesting to learn that butterflies follow the milkweed and that explains why they migrate to certain places." Yet others referred to the location in Mexico where they live, for instance, "I knew they traveled south to Mexico, but I did not know how far their range was within the United States," and "Didn't know they returned to one valley in Mexico,"

The comments of others suggested that information about the different habitats could be presented more clearly. For instance, "I was a bit perplexed at times but I believe the location and habitat is mainly Texas, they migrated to Wisconsin, Minnesota, up to Maine in USA then to Florida and Mexico," "It would be helpful to include visuals – graphics – to show the habitats. We are familiar with the "migratory" visuals on trees, but less so, the milkweed meadows, etc. that are necessary," and "I think the map visuals will be helpful that were alluded to in script. Interesting note on how changing temperatures/food availability causes butterflies to trek so far!"

Several reviewers answered with questions suggesting some additional area for clarification. These comments include, "Do they ever hang out anywhere? Why do they go so far north?," "Why are they all at one location? What do they do meeting at same place?," and "Not sure what is meant – the final habitat?" A few noted that this was information they already know about. For instance, "Again, I knew about migratory patterns already and biomes, etc.

Science Content Learning: Butterfly foods

Most respondents commented that they acquired new information about the importance of the poisonous milkweed in the butterfly diet from the script. A selection of these comments follows: "I didn't know about poisonous milkweed as food supply. Very interesting that brightly colored wings let predators know they're poisonous," "I had heard the milkweed thing somewhere before and forgotten it. They store the poison to make themselves unappetizing – interesting," and "I knew they laid their eggs on milkweed, but didn't realize they're the only creatures to eat the sap!" Additional comments included, I "already knew their sole/primary food was milkweed as caterpillars, but did not know that some die because it clogs their mouth," and that it was "Interesting that poison is stored in adult body and cuts down on predation."

A consistent question, however, was what the butterflies (rather than the caterpillars) eat. Some of these comments follow: "I learned a lot about what caterpillars eat. The milkweed information was very interesting. But what do butterflies eat?," "Do butterflies eat as adults?,"

and “I learned about the youngling’s foodstuffs, but not too much about adult consumption.” Two offered suggestions concerning information about the diet of adults, “Butterflies depend on nectar in the flowers – low diet,” and “Would add variety of foods eaten by adults (e.g., nectar from variety of plant species).”

Science Content: Butterfly predators

Comments in this section included surprise at the number of predators, and their lack of knowledge of this topic. For instance, “Such a great amount of predators,” and “Lots of them.” Other respondents listed the predators, such as “Jumping spider; spine soldier bug; illegal logging,” and “Ants, carpenter ants, spiders are among their enemies.” Another cited “ants – a good image of “chomping” the milkweed and therefore killing the eggs. Spiders, ladybugs, lacewings also represented as predators.”

A few of the comments suggest that the film conveyed the idea that the butterflies face near constant dangers, “What are the chances of survival? Wow!” and that this emphasis on predation helped to create drama, “Will Dana’s offspring make it or not/creates empathy/tension while telling us about all the challenges to survival & beating the odds.”

One felt that the attention given to predation was “interesting,” and was “intrigued by the possibility of engaging young male audience demographic with this information.” However, a few felt there was too much attention in this area. “Lots of information about butterfly predation, but started to seem somewhat repetitive,” and “Too much on predation.”

Another group of comments related some of the information they had acquired from the script. These included, “Very interesting about brightly colored wings,” “I never knew ants would eat them,” “Fantastic that it was explained how predators avoid the poisonous aspect of their butterfly prey,” “Learned about the ants, etc. that eat them,” “Very insightful esp. page 6 the eggs being devoured by ants, ladybugs, lacewing larvae, especially pages 8 &9 on how the spined soldier bug eats Dana’s two grandchildren when they were caterpillars,” and finally, “Very interesting fact about how spiders fill their legs with blood in order to jump but what makes a butterfly good food/hunting?”

Another series of comments expressed concern that viewers might find these images as either scary or disgusting. “I might not show details of caterpillars being eaten – especially by the spider (too scary) let their imaginations fill in the blanks. Did not know lady bugs or lacewing ate them. I thought they mostly ate aphids,” “[I] hope scenes of butterflies being eaten aren’t too gross, in particular the butterfly insides being sucked out,” “I did not know specific butterfly predators. Watching butterfly predation in giant 3-D might be gross,” and “I’m concerned that close-ups of “anthropomorphized” Monarchs being consumed by predators may frighten younger children.”

One cautioned that spiders are not insects but arachnids, and another felt there was an opportunity to explain about “non-native, introduced fire ants.”

Science Content

Four-fifths of respondents felt the film had “just enough science,” 17% felt there was “not

enough science," and 2% that there was "too much science."

Discussion Themes

Appeal and Interest

Focus group participants were extremely positive about this film treatment. They enjoyed the integration of the personal and scientific stories, thought it conveyed important scientific content about butterflies, and about the discovery of the migration route. Most felt the personal story of Urquhart was inspiring and a good model for younger generations. Participants came with a wide range of knowledge of butterflies and their migration (and included an insect scientist, and several avid butterfly fans), but all felt the content was interesting. Many were astonished by the distances traveled by the butterflies, the different generations, and the unique characteristics of milkweed. The citizen science story related to the discovery of the butterfly migration route was new to most, if not all, participants. Some were also new to the idea of citizen science and were very excited about it. Some participants expressed concern about transitions between the different stories and cutting between different time periods; however others felt these would be easier to follow in the film than the written script.

While most focus group participants were excited about seeing the film, some were concerned about the potentially gruesome predator images, and whether it might be too much for young children. Some also worried that the "Bugs are scary and if little kids see an anthropomorphized insect being eaten it would be too scary. I was worried about kids' reactions to the spiders eating the butterflies." However, another noted that "Predators are bugs too and I think that kids seem to get over that especially if it is presented correctly." Further, participants noted that the ways in which the butterflies were anthropomorphized were subtle, and perhaps necessary: "I think that you need to anthropomorphize in order to make the connection to vertebrates." Another noted that they were "grateful for the part where they died because it became less hokey".

Participants were very positive about the short clip of footage and most were confident that the film would be beautiful. They were particularly excited about seeing the massive numbers of butterflies as well as the close-up images on the large format screen. Mention of other images they looked forward to seeing included the jumping spider and the dissolution and rebirth of the chrysalis.

Science Content including butterfly biology, migration, habitats, predators

The participants felt there were many scientific subjects that were well explained: the lifecycle, stripping of the butterflies, how they get the milkweed, the many generations that it takes to migrate, and that the female only lays one egg on a plant to increases chances of survival.

However, across all of the groups, participants wanted greater clarification in the story and science of the different generations. Many expressed confusion about the super generation, for instance, "Super generation-how do the younger generation learn what they have to do? Is

there some benefit to having a super generation every three years?" They didn't understand in what ways they were different from other butterflies. They also suggested including additional visuals showing the portions of the route travelled by the different generations.

The treatment raised many additional questions for the participants: "Are there still as many butterflies as there used to be? If there is a decline it is not mentioned," "Do they still do tagging," "How do the butterflies know where to migrate to all the time," "Are Monarchs just a North American issue? Do they exist elsewhere?," "What do they eat in Mexico?," and "Is it true that they are the only ones that can eat milkweed?"

The film also raised a number of questions about how much this story of migration represented all monarchs and all butterflies. Participants suggested providing some additional context for the particular monarch migration story portrayed, by including additional information about the migration patterns of other butterflies, as well as acknowledging that not all butterflies migrate. In addition, they suggested presenting some of the other final destinations of the monarch. One suggestion was to include a sequence of these different locations at the end of the film.

Participants offered other ideas for inclusion in the story: "They touch on the challenges along the migration route but don't spend a lot of time on it," "The story didn't discuss climate change to sort of update the story and how it would affect the butterflies and the land they use although they did mention the milkweed adapting to climates," "Scientifically, they never mention the male butterflies," "They should talk more about the evolutionary process and the survival of the fittest," and "There are other wintering spots that are never mentioned and there are some butterflies that do not migrate but this is not mentioned."

Conservation Message

In all groups, participants expressed a desire for a clearer conservation message, as well as suggestions for what they could do to help protect butterflies. They expressed concern about habitat loss along their migration route and at their final destination. Some suggested contrasting the "natural" predators with the human-induced challenges, such as city, smog, lack of milkweed and logging. Others suggested including a sequence showing a butterfly garden to model behavior that others can follow. "During the migration do they get any help like from feeders or other food sources along the way? Perhaps they could show some examples if in fact that happens."

Story of the discovery of the migration and the role of citizen scientists

Participants were very interested in the story of how the butterfly migration was mapped. They felt the film was successful in portraying "how scientists are born," and that it accurately portrayed the process of scientific discovery. In particular, they noted that the film "shows that experiments don't always work the first time" and the story of Ken's discovery of the butterflies suggested the importance of luck. They were particularly interested in the role of citizen scientists, and noted that "it shows that you don't have to be a PhD in biology to do this work, you can be a citizen scientist." In one group participants discussed whether the citizen scientists were being mocked with references to "big glasses" and "stepping in stool," or whether it was

meant to say that “anyone can be a citizen scientist.”

Character Development

Participants felt Fred Urquhart’s story was compelling. They enjoyed the story of his life’s pursuit and eventual success. Across all four groups, however, participants noted different aspects of the personal stories that they found “hokey” or “over the top.” In addition, several said that the story about the gun “didn’t ring true.”

Participants realized that this is a historical story, but felt that the filmmakers should be attentive to portraying women as full characters. There was much discussion about the unease many in the focus groups felt about the age difference between Ken and Catalina and the appropriateness of their relationship (teacher searching for one of his former students) and the rationale for including that aspect of the story in the film. Many felt the treatment stereotypes woman as secondary to men as scientists. For instance, reference is made to Norah’s career, but her role in the film depicts her only as supporting Fred. Participants hoped she could be shown as an equal partner. They also discussed whether girl students had been included in the citizen scientist scenes, and suggested that would be another place to depict women as contributors to the scientific process.

Young Audiences

A discussion emerged in one of the groups as to whether young audiences would simply assume that the butterfly sequences were animation rather than live action footage, and some were concerned that this be made clear. For instance, one participant commented that “There is so much CGI now in the films that kids may not be able to tell the difference between what’s real and what is animated. Kids might say “how did they do that” and not realize that it is real?” The group discussed the possibility of including a sequence on the making of the film to convey the production of the footage. Even some of the adult participants had wondered whether the footage was real or animation, “When I was looking at the short clip I was wondering if I was looking at the animation or the real thing,” and wondered, whether that detracts “from the viewing pleasure?”

Again, out of concern for how young audiences would respond to the film, another discussion touched on whether the historical story would be engaging for younger generations, and whether including mention of current technologies in butterfly imaging would be appealing. In particular, the group discussed the use of MRI’s for looking into the chrysalis. Some suggested this be integrated into the film in some way.

Native Cultures and Butterflies

Across all four focus groups, participants felt that the story of Mexican peoples and the butterfly populations was missing from the story. They noted that the final destination was a mystery only for North Americans, whereas for local populations in Mexico the butterfly arrival is an annual experience, and there is a long history of coexistence between humans and butterflies. They felt the omission of this was a problem in the script, and suggested including a brief sequence about local Mexican culture and beliefs regarding the butterflies. Some noted

that in some communities the butterfly's arrival is celebrated with local festivals, and that couples will even plan weddings to coincide with the event. They were interested in seeing more Native knowledge integrated in the story.

Recommendations

- Provide additional details about the super-generations
- Provide information situating the monarch butterfly migration in the context of other migrating and non-migrating butterflies
- Include some information about what adult butterflies eat; what butterflies do once they arrive at their final destination; details about the lives of male butterflies
- Provide additional visuals illustrating the butterfly migration in terms of different generations of butterflies, as well as re-emphasizing the distances traveled and time involved
- Temper potentially corny depictions of the human stories and characters
- Present the women characters as whole characters, with their own interests and pursuits, and not just support for the male characters
- Provide additional detail on habitat decline and other human impacts on butterfly; include suggestions for how people can contribute to butterfly conservation efforts, such as creating butterfly gardens
- Include greater mention of Mexican culture, beliefs, and celebrations related to the butterfly migration; recognize that these communities have had a long history of interdependence with butterflies
- Consider that young children may be scared by some of the imagery
- Address additional aspects about butterfly navigation, including positioning current work in this area as a new frontier of research

APPENDIX A

Written Questionnaire and Focus Group questions

Butterflies Treatment Test
Participant Questionnaire

Name: _____ Date: _____

Location: _____

a. What is your overall impression of the film treatment? (Circle one)

1	2	3	4
very negative	negative	positive	very positive

Explain:

b. Place a check next to the phrase which best describes your learning experience related to each of the topics. Include any additional questions or comments about the topic in the spaces provided.

a. The butterfly life cycle

___ confused ___ didn't learn anything ___ learned a little ___ learned a lot

Comments:

b. Butterfly habitat.

___ confused ___ didn't learn anything ___ learned a little ___ learned a lot

Comments:

c. Butterfly foods.

___ confused ___ didn't learn anything ___ learned a little ___ learned a lot

Comments:

d. Butterfly predators.

___ confused ___ didn't learn anything ___ learned a little ___ learned a lot

Comments:

e. The butterfly migration.

___ confused ___ didn't learn anything ___ learned a little ___ learned a lot

Comments:

f. How butterflies navigate to their destination.

___ confused ___ didn't learn anything ___ learned a little ___ learned a lot

Comments:

g. The scientific discovery of the monarch migration route.

___ confused ___ didn't learn anything ___ learned a little ___ learned a lot

Comments:

c. How would you describe the main message or theme of the film?

d. What did you find most interesting about the film concept and treatment?

e. What did you find confusing?

f. Would you say this film script contains

g. Not enough science
h. Just enough science
i. Too much science

j. Please check ALL the words you think will describe this film once it is completed:

_____ Interesting	_____ Boring	_____ Thrilling
_____ Surprising	_____ Controversial	_____ Confusing
_____ Engaging	_____ Informative	_____ Old News
_____ Beautiful	_____ Scary	_____ Repetitive
_____ Uninspired	_____ Motivating	_____ Scientific
_____ Enlightening	_____ Slow	_____ Powerful

k. How excited are you about seeing the finished film? (Circle One)

Not at all excited Somewhat Excited Very Excited

Comments:

l. How successful do you think this film will be in taking advantage of the large format (IMAX) film experience?

Very successful Somewhat Successful Not at all successful

Please provide some information about yourself:

____ Female ____ Male Age: _____

Which best describes the highest level of education you have completed?

_____ High School Graduate

_____ College Graduate

_____ Advanced Degree

If you have a job or profession, please tell us what it is:

Please name the last two large format (IMAX) films you have seen.

Butterflies Treatment Test
Focus Group Discussion Questions

1. What are your overall impressions of the film treatment?
    a. What did you like about the treatment?
    b. What did you dislike about the treatment?
    c. Did you find the story engaging?
2. What did you learn about butterflies, e.g. their life cycle, habitats, food, predators?
    a. Are there questions that were unanswered? Or things that weren't clearly explained?
3. What did you learn about the butterfly migration?
    a. Are there questions that were unanswered? Or things that weren't clearly explained?
    b. Was the scale of the migration – how many butterflies, and the distances travelled -- clearly conveyed?
    c. Is the discussion of butterfly navigation clear?
4. What kind of picture of science is presented in the film? What kinds of people contribute to scientific discoveries?
    a. Are there questions that were unanswered? Or things that weren't clearly explained?
5. Is there a good balance between the human story and the natural history?
    a. Does the story flow?
    b. Was Fred's story compelling?
6. Was there anything confusing in the treatment?
7. What did you think about the amount of information in this film?
8. What advice do you have for the producers?