

BioQuest Woods

Designing a Large-scale, Outdoor, Aesthetic Science-learning Exhibition

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BioQuest Woods

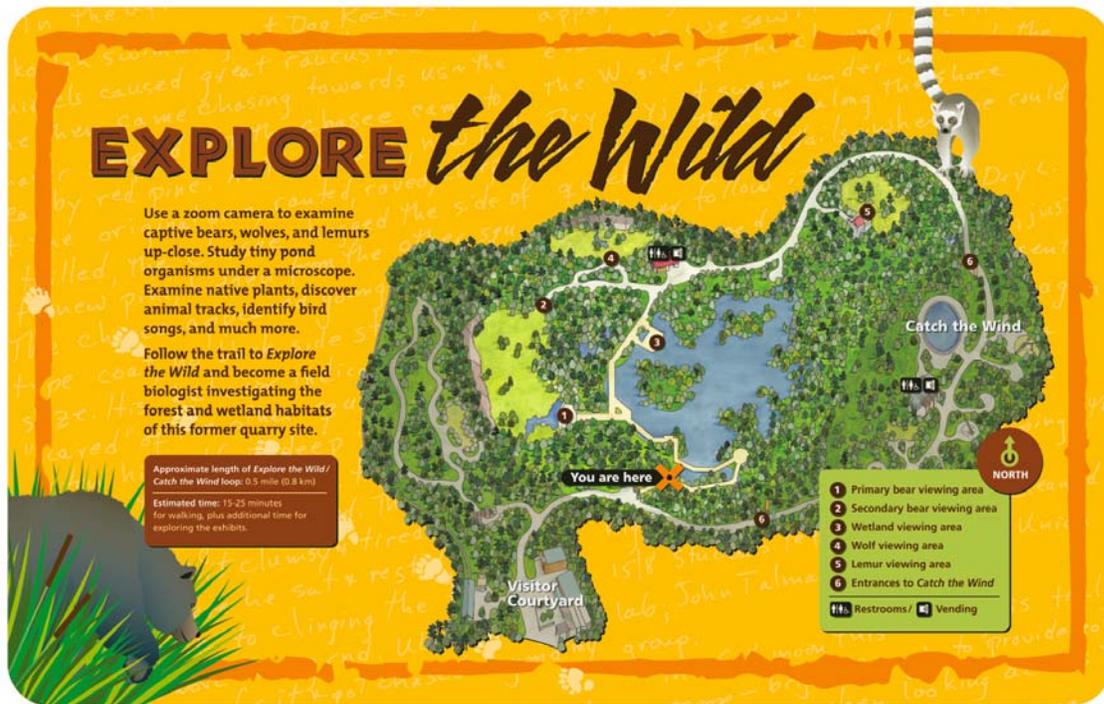
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A WALK THROUGH *BIOQUEST WOODS*

Visitors to the Museum of Life and Science (MLS) in Durham can now explore acres of new exhibition space, called *BioQuest Woods*. To get to *BioQuest Woods*, visitors walk outside and away from the Museum building a quarter of a mile, passing Loblolly Park, the Farmyard, the trail to the Butterfly House, and Grayson's Café. Upon approaching *BioQuest Woods*, they encounter a fork in the trail where they can choose to enter one of two exhibition areas: *Catch the Wind* or *Explore the Wild*. On the backside of either exhibition area, people can choose to take a full loop (which is a total of a half-mile) through the whole of *BioQuest Woods*, or they can spend time in just one of the two thematic areas. A large map showing the layout of the whole exhibition landscape guides visitors in making their decision.

Explore the Wild



Map of *Explore the Wild* courtesy of the NC Museum of Life and Science

If visitors choose the left fork of the trail, they enter *Explore the Wild*, where they immediately encounter a 750-foot, zigzagging boardwalk that winds its way down a hill and alongside a lush wetland area. From contiguous vantage points along the way, they can overlook a large pond, and the birds, insects and amphibians that inhabit it, as well as the surrounding forest.



Boardwalk Entrance to *Explore the Wild*

As visitors walk down the path, they first come to the black bears alcove. Here, rocks and stone surround visitors as they look over an old quarry site that is now bear habitat. In this alcove, they can use a zoom camera to locate and study the bears up-close as the bears climb the stone walls and trees in the habitat, or splash in the pond at the front of the enclosure. Visitors can also use several exhibits that allow them to touch real bear fur, preserved scat, and bear skulls. To the left of the bear viewing area, visitors use a multi-media kiosk where they can learn more about the ecology and habitat of the bears, and get answers to frequently asked questions.

Further down the path to the right is the wetland exhibit area. Here, on a wooden deck perched directly over the pond, visitors encounter a number of interactive exhibits. At the Stream Table, people use an array of tools to play with sand and water. Visitors study water samples from the pond with a microscope. There is also an exhibit that simulates duck feet and the physics of how ducks swim. At the Twiddly Tadpoles exhibit, children see and feel how tadpoles wiggle through the water. Near the front of the deck, visitors can use an exhibit that helps them match photos with sounds of common wetland animals. Nearby signs tell the story of how the mining and quarry created the space the wetland now inhabits.

As visitors continue their journey through *Explore the Wild*, a trail to the left takes them to an enclosure that features red wolves. Here there are activities similar to those in the bear alcove, including skulls and fur to touch and a multimedia kiosk. Further up the trail, visitors enter an exhibit area about lemurs. In this alcove, visitors look over an open enclosure, bordered by trees, where they can observe lemurs up close. There are cameras and computer kiosks related to lemurs, similar to those in the red wolf and bear alcoves.

Throughout *Explore the Wild*, the computerized kiosks and touch stations are accompanied by audio-descriptions, so as to be accessible to people with limited or no vision. All these interactive exhibits are placed so that there is an open, unobstructed railing where visitors can stand and simply observe the bears, wolves and lemurs in their large, naturalistic enclosures, and the wetland – with nothing encumbering the view.

Catch the Wind



Map of *Catch the Wind* courtesy of the NC Museum of Life and Science

If visitors choose the right fork at the entrance to *BioQuest Woods*, they enter *Catch the Wind*. As visitors walk down the paved, wooded path, they can see blue telltale flags—hung at different heights all around the exhibition area—that flutter when the wind blows. Throughout *Catch the Wind*, as visitors enter one area, they can catch tantalizing glimpses of the other exhibit areas through the trees.

In the distance to the right, a tall Seed Tower looms like a construction crane. Before coming to the Seed Tower, visitors can sit quietly in the Birds in Flight area and observe many different kinds of bird feeders hanging from whimsical sculptures made by a local artist. The birds—although briefly frightened when visitors enter the area—quickly return and feed as people watch. Just past the Birds in Flight alcove, people can explore the Plant Fan where they can control a large fan and watch how plants adapt to moving air.

Up the trail to the right at the Seed Tower alcove, visitors send models of different-shaped seeds up the tower. The seeds drop from the top; people observe how each shape travels differently as it falls. Past the Seed Tower alcove, visitors are attracted to the fog rising and flowing around the Vortex Rings alcove. Trees surround this intimate area on all sides. Visitors can use four air ring machines to send vertical rings of air onto shimmer panels in front of them or onto the leaves of the trees, where invisible air is

revealed as a pattern of movement. Another exhibit allows visitors to shoot air rings vertically; the label explains how these rings form.

Past the Vortex Ring alcove is the Mist Garden. Here, visitors can experiment with mist at several exhibit stations: building structures for the mist to move through, exploring how mist moves through plants, and observing how mist behaves when fanned. Past this alcove, a large Sailboat Pond allows people to work at one of four kiosks, from which eight radio-controlled boats can be sailed across the pond. Next to the big pond is a smaller, hands-on version of the exhibit designed for small children. They can mechanically adjust the sails of small plastic boats, which move across the water powered by a fan.

At the far end of *Catch the Wind* is the Ornithopter exhibit. Here, visitors sit on a bench in a cage-like structure that has large “wings” attached to the outside. A staff operator then raises the cage, and visitors can push a button to make the giant wings flap. Next to the Ornithopter is an insect wing exhibit, where children can manually flap a model of large wings to compare the back-and-forth flight pattern of some insects to the up-and-down pattern of birds shown in the Ornithopter.

THIS PAPER

Over the last ten years, Inverness Research Associates¹ has had the privilege of working with MLS staff, as both the formative and summative evaluators of *BioQuest Woods*. As part of our work, we have been documenting the development process since the inception of this project.² This paper summarizes what we learned, and aims to provide insight into the unique design challenges of *BioQuest Woods* and how the MLS addressed those challenges. The audience for this paper is the MLS, the NSF and anyone in the field of informal science education who may be interested in embarking on a similar endeavor.

¹ For more information about Inverness Research Associates, please see our website at: <http://www.inverness-research.org>.

² See the appendix to this paper for a brief description our study.

THE HISTORY AND INTENTION OF *BIOQUEST WOODS*

BioQuest Woods represents a major commitment of staff, resources, time and hard work on the part of the MLS to create a very large-scale exhibition. We see this project as a merging of exhibit and environment—a unique kind of endeavor that is neither a zoo, nor outdoor science park, nor a regular science museum exhibition, but one that combines elements of all these things. We learned that significant accomplishments and learnings emerged from the *BioQuest Woods* project that are germane for science centers and other institutions seeking to provide meaningful science learning and outdoor experiences for their visitors.

In 1996 the Museum of Life and Science received a grant³ from the National Science Foundation (NSF) to design and build the ambitious outdoor exhibition area we described above called *BioQuest Woods*. Starting in November 1996 and completing the project in 2007, the MLS created this exhibition area which includes two parts, each with their own thematic focus: *Explore the Wild* and *Catch the Wind*.

The current MLS website describes *BioQuest Woods* as follows:

Catch the Wind transforms four acres into seven large-scale exhibits expressing how wind influences our environment. *Explore the Wild* is a six-acre woodland habitat and wetland site where you can walk in the steps of a wildlife biologist. Interactive exhibits, naturalistic animal observation areas and enclosures, field cameras, remote sensing devices, outdoor microscopes and state-of-the-art computers facilitate your investigation of this dynamic landscape.⁴

The *BioQuest Woods* project represents a particularly long-term investment, where much work was put into design, front-end and formative evaluation, constant re-examination of the project in light of institutional goals and mission, and ongoing fund-raising. This exhibition was initially envisioned in the late-1980's, when the Museum was embarking on creating a master plan for the institution. The MLS was fortunate to have a large, mostly undeveloped, open space adjacent their building, and they wanted—as part of their larger institutional plan—to develop this asset in a way that built on and augmented the natural environment and animal habitats that were already established. Designers wanted to be very careful not to cover up or distract from these important assets. According to a project team member, “we wanted to take the interactive hands-on experience [from inside the Museum] outdoors, and to link plants and animals with those tools, devices and experiences in ways that are appropriate for a science center.”

In *Explore the Wild*, the Museum focused on the topic of biology. The MLS already was home to several black bears and red wolves, and designers wanted to build on and augment visitors' natural interest in these animals. In addition, staff wanted to provide

³ NSF Award # 9627030

⁴ From: <http://www.MLS.org/>

an authentic experience of what it feels like to be a wildlife biologist. In *Catch the Wind*, the focus on adaptations to wind was based on the fact that a large part of the undeveloped land was open space. Here, there was a particular opportunity to capture and show air movement, and to let visitors explore how plants, animals and people adapt to and take advantage of wind conditions.

Because of peoples' intrinsic interest in large, live mammals, it is easy to understand how visitors might compare *Explore the Wild* with a zoo, and to bring their expectations and preconceived notions about zoos to their experience. The designers of *BioQuest Woods* wanted to be careful to place the exhibition focus (particularly in *Explore the Wild*) not only on educating about the importance of conservation, but also on giving visitors the chance to experience what it is like to be a wildlife biologist.

In the process of studying other large-scale, outdoor exhibits, the *BioQuest Woods* designers found that there were not many examples of what they envisioned "over and above flip book interactives at zoos..." Staff told us "we thought we could make a good contribution to the field with this project."

After these initial forays into what other museums and zoos had in place in terms of outdoor interactive exhibits, in 1995 the MLS felt poised to submit their proposal to the NSF; later the following year they were funded. Over the course of the project, in addition to the NSF grant, MLS received funding from the county through bond issues and a local corporate partner, GlaxoSmithKline. During that time, they also completed several other major projects, including the Butterfly House.

DESIGN CHALLENGES AND THE MLS RESPONSE

The scale of the *BioQuest Woods* project, the habitats for live animals, and the development of exhibits that could withstand the natural elements, all created a set of unique design challenges. In this section, we highlight some of the key challenges developers faced as they created *BioQuest Woods*, and we discuss how they responded to those challenges.

Preserving and enhancing the inherent beauty of the natural landscape

A fundamental challenge the Museum faced was to design exhibits, signage, paths and experiences that would complement and flow with the natural landscape. In addressing this challenge, Museum staff chose to trust and respect the visitors and their interactions with the environment. As one designer told us, “We want *BioQuest Woods* to be a window on nature.” This metaphor shows how designers conceptualized the visitor experience. They wanted to create a deeply affective and personalized experience for visitors by framing (rather than explaining), the natural assets of the site.

This is perhaps the dimension of design in which project developers were most successful. An example of how this approach was implemented is the boardwalk entering *Explore the Wild*, which is designed so that there are no visual impediments to visitors’ direct encounter with the wetland. Even the style of fencing chosen is ‘see-through’ so that young children can crouch down and be quite close to a turtle sunning on a rock, and still be safe. Also, the designers very carefully chose which trees, native plants, and other features of the landscape to leave intact. This creates a sense that visitors are in a more natural (rather than highly manicured) environment. Additionally, exhibit developers incorporated poetry into many of the labels, so that visitors could have not only a scientific and ecological explanation, but also a more personal, affective interpretation of the environment.

Maximizing the use of space in accessible and family-friendly ways

Another challenge Museum staff faced as they developed the project was to take full advantage of the acreage they had to work with – that is, to use the scale of the space to maximum advantage, while at the same time creating an exhibition that was accessible for all visitors including those with disabilities, a space that was family-friendly, and one that was comfortable for visitors year-round.

Designers met this multi-layered challenge in many ways. In terms of maximizing the vastness of the space, designers worked in *Explore the Wild* and *Catch the Wind* to create both a feeling of expansiveness and closeness. For example, in both thematic areas, the scale and layout of the smaller sub-thematic alcoves within the broader landscape were appropriate and accessible. These alcoves felt intimate, allowing for close interaction with the phenomenon at hand, while being spacious enough to not feel crowded, and

accommodating the natural flow of visitors. This design also allowed for easy supervision and containment of young children.

Designers took advantage of the huge amount of space they had to work with and designed large exhibits to put in them. In *Catch the Wind* the scale of the Seed Tower, the Sailboat Pond, and the Ornithopter was congruent with that of available space. Visitors could get glimpses of the Seed Tower and Ornithopter from far down the path, which encouraged people to continue their tour and explore the entire area.

In terms of accessibility, the MLS has maintained a long-term commitment to making their exhibits, and the Museum as a whole, as accessible as possible to people with a range of physical limitations. They have done this by hosting accessibility workshops for their national peers and colleagues, and by constantly drawing on local disability advisors for advice. This vision for the visitor experience, and their institutional mission to be a place where the whole community feels welcome, drove the staff to make design choices that affected the final product for all visitors. Examples include the inclusion of "Story Benches" in *Catch the Wind*, where visitors can listen to stories about birds in the 'Birds in Flight' alcove, and to stories about sailing and wind at the Sailboat Pond. Additionally, audio descriptions augment the written labels at most of the exhibit alcoves in *BioQuest Woods*. The path throughout both *Explore the Wild* and *Catch the Wind* is paved, allowing for those in wheelchairs to move easily.

In one case, the priority of making exhibits physically accessible led to a less-than-ideal visitor experience. Designers chose to make the Ornithopter exhibit large and robust enough to be used by people in wheelchairs. When the exhibit was scaled up to allow for this, visitors were not able, as initially conceived, to feel they were actually affecting the exhibit, nor were they able to as dramatically the phenomenon of lift.

In terms of being "family friendly," staff included both a small and large sailboat pond, touch components at a low height at all the animal stations, and the design of exhibits so that people in groups can gather around them (for example, at the Stream Table in *Explore the Wild*, and the Mist Garden alcove in *Catch the Wind*).

Design staff also took into careful consideration visitor comfort. There are numerous shade umbrellas throughout *BioQuest Woods*, as well as misting stations and trees that provide natural shade. There are also many benches where visitors can rest along the way.⁵

⁵ In certain times of the year, we think additional access to shade and water may be needed.

Incorporating exhibits and technology in ways that enhance – rather than impede – the visitor experience with animals and nature

Perhaps the biggest challenge designers faced was in their desire to be respectful of the natural landscape and aesthetics of the place, as well as people's inherent interest in live animals, while at the same time incorporating computers and other technologies that would educate visitors. As one staff person said:

The potential conflict of wanting to exploit the natural characteristics of the site and the animal habitats, and then to thrust something within that environment that might compete, was a major challenge.

In addressing this challenge, the designers made a conscious decision to keep the viewing areas to the animals unobstructed. The interactives in the animal alcoves are mostly positioned away from the viewing points, so that there is nothing except a fence, and some low signs, between the animals and the viewers. Those few interactives that are close-by are ones that allow visitors to take a better look at the animals, such as the zoom cameras.

Designers were successful in keeping and building on visitors' keen interest in the bears and wolves previously established at the Museum site. With few exceptions, developers created an interface that helped to educate visitors, while not being so didactic or overwhelming as to alter or get in the way of the authentic assets of the site.

Incorporating exhibits and technology that would be durable and withstand the elements

Creating robust and accessible exhibits and labels that can withstand the heat, humidity and rain of Durham is an obvious challenge for a project like this. Doing so in a way that still accomplished the goals of the project – to create attractive, relevant and accessible exhibits – was an added test. Customizing the controls for the Remote Control Sailboats, designing lightweight blocks for the Mist Garden, and sourcing reliable outdoor rocker switches used throughout the exhibitions are three examples. In addressing these particular challenges, staff worked tirelessly to find, test and use the most effective and durable technologies available within the budget of the project. Meanwhile, the *BioQuest Woods* team is still experimenting to find a UV-resistant material for the air cannon membrane that can withstand ongoing visitor use and produce the desired effect.

Conducting formative evaluation of components out of context

Given all of the above challenges, we think it is important to note that the MLS was mostly successful in implementing a rigorous design and prototyping process. The Museum has a long history of conducting formative evaluation with visitors as they

develop exhibits. However, this was a particularly difficult challenge with *BioQuest Woods*, because visitors could not test out prototypes in the actual landscape where the exhibits were going to be placed, due to the schedule of final exhibition development. Staff addressed this by conducting ongoing, internal evaluation with visitors in Loblolly Park outside the Museum. They provided context for the activities being tested by providing exhibition descriptions and photos, and by testing almost every sign, exhibit prototype, and general concept. Additionally, they worked with Inverness Research at key development points along the way. Even with the limitations of the prototyping process in this context, developers made major improvements between exhibit iterations.

VISITORS' EXPERIENCES AND RESPONSE TO *BIOQUEST WOODS*

In our summative evaluation of both *Explore the Wild* and *Catch the Wind*, we found the exhibitions to be very well-received by visitors. They spent considerable time in each of the two areas and were highly positive about their experiences. In this section of our paper, we highlight the main findings from our observations of and interviews with visitors during our summative study.

***BioQuest Woods* provided engaging experiences and in-depth inquiry opportunities for visitors.**

The Museum was highly successful in designing activities within the larger context of *BioQuest Woods* that provided in-depth and fun experiences with animals and scientific phenomena. In addition, the individual activities throughout *BioQuest Woods* provide multiple opportunities for visitors to pursue a line of inquiry.

An example of this is in the Mist Garden alcove. Small children were fascinated by the Build a City station, where they could construct with the blocks in any way they wanted and observe the way the mist interacted with the blocks. We observed many visitors spending considerable amounts of time coming up with inquiries and pursuing them at this station.

Vignette: A seven year-old girl at the Mist Garden

A young girl made tunnels for the mist to go through and a cross with a hole in the middle. She observed the way the mist moved through this structure for a moment; then she placed a block on top of her structure so that the mist would not be allowed to come out the middle. She spent over five minutes at this exhibit, trying different structures and quietly observing the results.

The opportunities visitors had for pursuing a line of inquiry frequently involved family members of different ages working together. For example, we interviewed a grandmother at the Sailboat Table exhibit who was – at the time – simply watching her grandchildren play with the small boats. She mentioned she was a sailor and that she wanted to be able to change the rudder on the small boats. Her husband discovered the large remote control boats at the Sailboat Pond and called her over. She ended up sailing one of the large boats for over 30 minutes, working with her granddaughter who was using one of the other boats, in several self-made challenges (such as getting both boats all the way across the pond and passing one another). As she left the exhibit area, she said, “I could do that all day!”

Another example was at the Sailboat Table exhibit, where a teenaged boy and his two younger brothers worked together through a series of inquiries related to different sail types. They placed one boat with one sail type in the water, watched how it moved,

then switched to another sail type, observing along the way the movement of the boat in relation to the various sails.

In *Explore the Wild*, visitors were able to have a meaningful experience around the themes of wildlife biology and respect for the environment through their observations of the live animals and use of exhibits. As one visitor noted,

Explore the Wild is inspirational. Especially if someone doesn't already have a career path, this could inspire them to explore a career in conservation biology. Especially the wolf story – I like that you can feel, as just one person, that you can get involved in something like this that makes a difference.

Sometimes these themes came through in more subtle ways. For example, at the red wolf enclosure, the wolves are largely inactive during the heat of the day and frequently difficult to find. A seven year-old boy wondered how much the Museum should add components to the exhibit to enhance visitors' ability to see the wolves. He said:

I am trying to decide if it should be better for the wolves or better for the people. I want to be able to see them, but it wouldn't be as good for the wolves if they didn't have a place to hide.

Visitors reported that they learned from their experience in *BioQuest Woods*.

We found that visitors learned new information from their time in *BioQuest Woods*. Not surprisingly, the kinds of things that people learned about reflected the broad range of phenomena that can be explored in this exhibition.

For example, visitors learned about biology and ecology topics in *Explore the Wild*:

-At the lemur station, a young visitor reported: *Look at the lemur skull, momma. It is smaller than the wolf skull and that is smaller than the bear skull.*

-*I was listening to 'Are Lemurs Endangered?' They used to be here in North America, and in Africa and Europe. I learned that they eat dirt!*

-At the bear station, a young visitor noted: *Did you know that bears eat both plants and animals? It said so on this thing (pointing to audio descriptor at skull). And they can tell by looking at a momma bear's teeth if she had a cub!*

-A man excitedly spoke of how the specimen display in *Explore the Wild* solved a mystery for him. He had often found cicada shells outside, but didn't know what they were until this visit.

-In the wetland station, an adult expressed in surprise: *Oh! It's cicadas we hear at night, not crickets.*

In *Catch the Wind*, visitors reported the following insights that they had not known before:

- I never thought before about how us humans only feel big breeze, but even a little breeze feels big to insects and plants.*
- I never thought about how smoke rings worked before.*
- I like [the Seed Tower exhibit] because you never know where [the seed will] land. You learn about different shapes. Natural shapes fall better.*
- This exhibit makes me think stuff about the wind I never knew – about seeds falling.*
- [At the Mist Garden] you can explore the physics of nature, of air and wind.*
- This exhibit shows clouds and fog... The paddle shows the way air moves and how you can make it swirl and how air and wind moves.*

In addition to visitors learning new things, there were also many visitors who told us how their experiences in BioQuest Woods reconfirmed and reinforced things they had learned previously. We feel this is an important part of the learning process.

Visitors responded positively to the natural surroundings.

As we mentioned previously, the designers made a conscious choice to “sit lightly on the site” – that is, to build from and around the natural landscape. Visitors were attentive to and reacted positively to the aesthetic experience designers provided for them. We heard numerous comments about the beautiful setting and the atmosphere, with visitors describing it as “relaxing,” and “peaceful.”

In both exhibition areas, there was a balance between the activities and developed areas and the natural, undeveloped areas. Visitors enjoyed the expansive views from the boardwalk, where they could simply be in and observe nature, as well as the more developed exhibition areas, like the sailboat pond and the bear habitat. This balance was viewed as a key feature by visitors and was commented on by many. For example:

I'm thrilled that they left so many trees. I like that it is not a show garden or overly landscaped like at the zoo. There's lots of native plants here.

Most visitors responded positively to the use of technology-based exhibits to teach about animal ecology in this context.

In general, visitors were engaged by the animals and their surroundings as well as by the interactive exhibits. We observed them getting used both when there was animal activity and when there was not. For most people the exhibits and animals complemented and enhanced each other. Visitors noted:

This is the best bear enclosure ever. I like the exhibits too. My daughter went straight to the computer. It is good to have both the live animals and the exhibit.

My son likes the exhibits; he has used almost all of them. It is great to have different things to do here.

However, in a minority of cases, the exhibits were distracting to visitors. Some complained about the multimedia kiosks being too loud – an issue later addressed in remediation – and detracting from the authentic experience of seeing the animals firsthand. Also, a few adults commented that their young children were occupied by the computer kiosks at the expense of having a direct experience of the animals. As one parent said,

It is interesting that the kids went straight for the camera, when the lemurs are right here in front of them!

Visitors brought their own experiences in nature to the exhibitions and spoke of how they had taken ideas from the exhibitions back to their lives.

Perhaps as a result of the attention designers paid to having a balance of undeveloped and developed areas, there was space for visitors to both bring their own experiences with nature to their visit to *BioQuest Woods*, and to take their experiences in *BioQuest Woods* back home with them. For example, visitors brought their knowledge about sailing to the Sailboat Pond. Visitors also commented on the birds they saw in the Birds in Flight alcove that they had seen in their backyards.

Visitors also commented on getting creative landscaping ideas for including exhibits in their own backyards. Several visitors commented on wanting sculptures that were part of the Birds in Flight exhibit area. In addition, others mentioned wanting air cannons at home.

Another example of visitors' taking ideas from the exhibits back home emerged from our mediated interviews with two young visitors who had previously been to *Catch the Wind*. These girls mentioned seeing the image of a dolphin creating an air ring under water in exhibit signage. Both of them had gone to swimming pools after their experience in this alcove, and learned how to create their own air rings underwater.

Visitors came away from their experiences in *BioQuest Woods* with a renewed interest in the Museum.

One of the most striking findings from our summative evaluations in *Explore the Wild* and *Catch the Wind* was the number of repeat visitors these sites were drawing. For example, during our two-day study in *Catch the Wind*, we interacted with many visitors who told us they were returning to the exhibit area for a second or third time, when the exhibition area had only been open for a few weeks. In addition, several visitors in *Explore the Wild* were parents and grandparents of children who had visited the area on a school field trip and who wanted to return. We also observed many of the same

visitors using *Catch the Wind* on both days of our evaluation, a rare occurrence for us in conducting similar studies.

Every time we come to the Museum, we try to come out here.

We come [to BioQuest Woods] all the time now. It is our favorite place.

I would definitely tell people to come, and I will come back every chance I get.

Visitors, including members, talked about how the new exhibition areas provided something more, and “fresh” things to do, at the MLS. A visitor told us:

I thought the Museum was getting a little tired, but this new exhibit just amazed me! I so pleased with this.

In some cases, these new exhibit areas were helping bring older children to the Museum. Several parents told us how their children had outgrown what the Museum had to offer, but felt there was plenty in *BioQuest Woods* that was appropriate for them now.

We speculate the ever-changing features inherent in *BioQuest Woods* – including daily and seasonal changes in animal behavior, transformations in the plants, and variable weather conditions – all create a context that makes the site ever-new. In addition, the open-endedness of most of the activities allows people to have new experiences each time they visit.

INVERNESS RESEARCH ASSOCIATES' REFLECTIONS ON *BIOQUEST WOODS*

MLS staff accomplished much in the ten-year period of design and development of *BioQuest Woods*. From our perspective, their ability to maintain the vision over the life of the project – and to fully integrate this project within the larger vision, mission and goals of the Museum – are remarkable achievements.

Designers were able to maintain the integrity and intent of the BioQuest Woods vision over many years, while working with a wide range of investors and partners.

To achieve the ambitious goals of this project required a strength, clarity and sustainability of vision, as well as of final project execution. This large project took place over a long period of time, and involved not only Museum staff, but also multiple outside contractors, decision-makers and funders. It turned out that the vision for the project was, indeed, maintained over its long life.

An additional contribution to maintaining the vision was that – unlike at many science museums where rapid staff turnover is quite common – there was continuity in the majority of core staff and designers, outside fabricators, and evaluators over the life of the project. This contributed to the sustainability and implementation of the strong original vision for *BioQuest Woods*.

Designers created an exhibition that supports the Museum's broader goals for the type of experiences they want visitors to have.

According to the Museum's website, "The Museum of Life and Science is dedicated to furthering education in the natural and physical sciences for people of all ages.... packed with highly interactive, state-of-the-art exhibits, the Museum of Life and Science features hands-on experimentation and nature exploration."

As part of an envisioning statement for the long-term mission of the Museum, they note:

Our new mission – to become a member-focused organization and to earn their loyalty – forced us to think about creating experiences and environments where people of various ages and diverse interests learned something new every time they visited the Museum campus or visited our web site. We needed to entice people not only to visit on occasion but to participate in an ongoing relationship where they would see the Museum as a "portal to learning."

The MLS is committed to creating experiences where visitors can have their own (less mediated) encounters with the phenomenon at hand, and to be participants in their own learning. This is not the case in every science museum; even though many museums boast “hands-on” experiences, often these consist of relatively didactic displays, where the visitor is the “empty vessel” and the museum is the “expert” imparting information. The MLS’ vision for and execution of *BioQuest Woods* was situated within and congruent with their larger institutional mission to be visitor-centered, and to celebrate and encourage exploration of the natural environment.

With the addition of BioQuest Woods, the MLS made significant strides towards several of their long-term institutional goals: to extend and enhance the indoor exhibits, and to create reasons for people to return to the Museum.

In the development of *BioQuest Woods*, designers were successful in their efforts to extend the indoor museum experience, in that the *BioQuest* exhibits reflect and build on exhibits visitors encounter inside. As one visitor noted:

BioQuest Woods is a nice bridge to other things in the Museum, like the Mist Gardens connects to the Sea of Clouds exhibit inside, and the Butterfly House, and butterflies flying around.... this [project] is a natural progression from indoors to outdoors.

It's Explore the Wild and exhibits that are coming [Catch the Wind] that make it seem worth a membership renewal.

SUMMARY

In summary, the *BioQuest Woods* project created a model of informal science education that respects both the visitors' interest and experience, and the integrity of the natural landscape. The Museum also created a place that integrates indoor and outdoor exhibits and environments, thereby extending the Museum experience. By creating minimalist boundaries between constructed exhibits and nature, the MLS has created a new form of "eco-touring," where visitors can experience, engage with, and learn about nature in carefully mediated ways. This design strategy encourages visitors to have in-depth conversations about science, to raise their own questions, and perhaps most importantly, to have a positive and inspiring experience of the natural world.

Although this ambitious project took a very long time, a very large budget, and much patience on the part of many partners, the investment clearly paid off. The primary design staff on the project persisted in holding on to the original vision of *BioQuest Woods*. Because of this, the MLS now has added an in-depth, beautiful and intriguing landscape to their assets, one which will always be changing as it is embedded in the natural world. We speculate that this ongoing natural change – along with the whimsical, mostly robust, and relevant exhibits – will keep visitors coming back to the MLS. As they do so, the public is very likely to begin to see the Museum not simply as a tourist attraction – to visit only when friends or family are in town – but rather as an ongoing resource that is available year-round, and where family members of all ages can have fun, engaging experiences with science and nature.

APPENDIX

THE EVALUATION: A BRIEF OVERVIEW

Inverness Research Associates conducted both formative and summative evaluations of *BioQuest Woods*. In our formative work we observed and talked with visitors using exhibit prototypes, and then provided detailed feedback to staff about the navigational issues and concepts that visitors encountered. Our findings from these early evaluations were shared with MLS staff in the form of internal documents that were used to refine the exhibits.

In the summative evaluation, we worked alongside staff to learn about the kinds of physical and intellectual experiences visitors were having in *BioQuest Woods*, and to gather the overall lessons learned about this project. In order to learn about the visitor experience of *BioQuest Woods*, we – with significant support from and direct participation of MLS staff – conducted mediated⁶ and exit⁷ interviews, as well as naturalistic observations of visitors. We also conducted short, informal conversations with visitors as they were using the individual exhibit stations in the two thematic areas of *BioQuest Woods*.

Additionally, we conducted interviews with staff all along the way in this project. Their ideas and concerns influenced the design of the evaluation, the questions we asked visitors, and to some extent, the interpretation of our evaluation findings.

⁶ Rather than conducting traditional “tracking” studies that are part of many summative evaluations, where visitors are followed and timed at the exhibits in question, Inverness researchers decided to focus on getting more in-depth, spoken feedback from visitors. Therefore, we conducted what we call “mediated” interviews, where we recruited eight family groups in advance (four groups each at *Explore the Wild* and *Catch the Wind*) to walk through the whole exhibition with us, giving detailed feedback all along the way as well as summarizing their experience at the end of the interviews.

⁷ These exit interviews were conducted as people were leaving *Catch the Wind* and *Explore the Wild*. Questions were summary in nature about the experience of these outdoor areas as a whole (rather than focused on individual exhibit components).