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## ABSTRACT

This paper describes how Potawatomi and Santa Clara Pueblo children came to create a virtual tour of cultural exhibits from the National Museum of the American Indian (NMAI). The first part of this paper explores the nature of museums, how people interact with them, the concept of a virtual museum, and a brief history of NMAI. In addition to three physical spaces, NMAI is developing a "Fourth Museum" to extend access to and use of NMAI's holdings, especially for Native communities remote from the museum sites. As part of the Fourth Museum, in 1999 NMAI, students and teachers from two reservation schools, and University of Texas educators involved in the Four Directions project began a unique collaboration. Four Directions proposed that members of Indian communities be involved with museum personnel in presenting and interpreting cultural objects using technology such as Web page authoring and QuickTime Virtual Reality (QTVR) software. One component would be development of a virtual tour of NMAI exhibits at the George Gustav Heye Center (New York City), as seen through the eyes of Native American children. NMAI agreed, and two schools were chosen on the basis of written plans and school administrative support. Elementary students from Santa Clara Day School (New Mexico) and Hannahville Indian School (Michigan) were chosen through an essay process and traveled with their teachers to New York, where they created QTVR object movies of cultural items on exhibit and QTVR panoramas of the museum space. The current virtual tour (at <http://www.conexus.si.edu/main.htm>) includes 19 panoramas and 26 objects along with the students' interpretive essays. (SV)

# CREATING A VIRTUAL TOUR OF THE AMERICAN INDIAN

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## Creating a Virtual Tour of the American Indian

It is a chilly early morning in March 1999. White-gloved museum staff at the National Museum of the American Indian (NMAI) in Manhattan are working in the temporary quiet before the museum opens to school tours and others coming to view the two permanent and one rotating exhibits. The staff have just removed a one-and-a-half foot by two-and-a-half foot late eighteenth century/early nineteenth century cedar box from a case where it has been visible to the public as part of the “Creation’s Journey” exhibit. They carefully transfer the box to an extemporaneous in-house digital photography lab. There, two Santa Clara (New Mexico) Pueblo fourth graders, their teacher, and a community elder wait to receive the artifact. In this secure location, the children will rotate the box 360 degrees on a turntable and take multiple, overlapping photographs.

A floor above the lab, in the Museum’s Resource Center, two other Santa Clara children are writing text describing and interpreting the artifacts that they will photograph during their shift in the photographic lab. The children are surrounded by reference

works and supported by the cultural memories of the museum staff. Sitting along side the humming radiators and in view of the falling snow, the children write stories of the objects after reading about and discussing the objects' derivation, their creators, and significance. Their culturally based commentary is to accompany virtual images of artifacts located in the Museum's exhibits. The children add their own cultural stories, imprinted with the stamp that says, "A Santa Clara Pueblo child viewed this artifact through his or her own eyes, imbued with his or her culture." In advance of his travel to New York City, Galvin chose the objects he wanted to photograph from the exhibit catalogs. One of his chosen artifacts is a pottery plate, created by Maria Martinez in the black-on-black style that she made famous and is now forever associated with Santa Clara Pueblo. Galvin wrote the story of the plate, a story that was the oral history of his family, the oral history of a community art form:

"My auntie Maria Martinez made this pottery plate. She is famous for her pottery work. When she gathered the clay it was dirt. She sifted the dirt to remove stones. Then she wet the clay and made a piece of art. She polished the surface with round river rocks to make the pottery shiny. Then she brought the pottery outside, covered it with dry cow manure and wood, put tin and metal sheets on the wood, and fired the pottery. Some black-on black

pottery has designs for kiva steps, rain clouds, and feathers.”

The Santa Clara children worked at the museum for five days, dividing their time between writing text and digitizing information. Three months later, children from the Nah-Tah-Wahsh School (Potawatomi) in Michigan’s Upper Peninsula also traveled to New York to contribute their skills and perspectives. Together, these children created a virtual tour of the museum’s exhibit areas, a tour that will present cultural objects to the world through the eyes of Native American children.

Today I will tell the story of how this virtual tour, now available to the public through the NMAI web page, came to be. In the words of NMAI Director, Rick West, “We have reached yet another milestone at the NMAI, one that will enable us to provide technical support to help Native people proudly describe their own communities in a virtual reality format to the world.”<sup>1</sup>

First, let us explore the nature of museums, how people interact with them, the concept of a virtual museum, and a brief history of the National Museum of the American Indian.

### **What is a museum?**

A museum is an organized collection of objects, located within a space according to some practice and often illustrating one or more subjects or themes. Museums have served multiple purposes. Traditionally, these were to collect, store, and preserve materials and provide access to materials by an audience that initially only included scholars. Bearman and Trant point out that while museums have often excelled in their caretaking role, they also function to isolate cultural objects from their contexts. Museums, like libraries, are social institutions and respond to changes in society. As libraries have evolved from the “warehouse of knowledge” model, so too have museums. Museums are no longer only storage areas and instead are spaces that initiate learning and open their doors to a wider audience.

### **How do people interact with museums?**

Museum informatics is an area of growing academic inquiry. A conference on Museums and the Web, occurring each spring since 1997, and the International Cultural Heritage Informatics meetings, held in odd-numbered years since 1991, evidence this. Interest in museum informatics is also seen in the

emergence of such publications as published proceedings of the aforementioned conferences and coverage in other publication venues, such as a special topics issue of JASIS, the *Journal of the American Society for Information Science*, on the theme of “When Museum Informatics Meets the World Wide Web.”

What is apparent is that the use of information technology in museums is progressing from use for clerical purposes to the creation of local and networked databases and interactive environments for end users. People encounter museums through physical, social, and visual interaction. Technology is being used now to simulate and enhance actual museum visits to museums and may be a welcome tool for visitors engaged in sensemaking within museum environments.

### **What is a Virtual Museum?**

Paolini, et al., identify four different approaches to creating a virtual visit to a museum. These are described as follows.

1. First is the “traditional website that reproduces the organization of the museum.” This website provides information on the museum’s collection(s) and how they are organized, presented, or arranged but it does not impart information about the physical structure that houses the collection(s).

2. A second type of visit is made via a “traditional website that does not reproduce the organization of the museum.” This website neither reproduces the physical structure of the building nor does it indicate how the collection(s) are arranged.
3. A third type of virtual visit is “a ‘virtual’ representation of the actual building hosting the museum.” This idea is to attempt to mirror the architecture of a museum including mimicking the sequence of display of artifacts within it.
4. A fourth type of visit is through a “‘virtual’ representation of an imaginary ‘hyper’-building.” This visit is to a virtual space that does not closely resemble an actual existing museum but instead provides new ways for visitors to interact with and learn from a museum setting.<sup>2</sup>

Each of these four types of configurations for a virtual tour balances issues of control and access and they each serve different purposes. A tour that provides a simulation of a building, for example, may replace a visitor’s need to visit a facility as well as provide some level of access to a homebound audience. The “hyper-building” may not represent the building that actually houses a collection but instead may provide an opportunity for visitors to engage in a self-directed mode of learning about the content and context of museum artifacts.

A virtual museum can serve as a diary for a museum visit. It can help document exhibits, which are sometimes temporary



gatherings of materials. As artifacts rotate on and off exhibit, their representations can be captured and displayed, thus aiding in preserving the object while retaining visual access. A virtual museum can blur the lines between curator and visitor. It can bring the curator out from the anonymous background or enable the visitor self-direction in interacting with the artifact and its interpretation. A virtual museum can enhance educational experiences by enabling future visitors to preview a location and its physical facility. Sequencing of viewing and reading text can be altered to suit the visitor's preference.

Cultural objects removed from their origins are placed within a museum's classification system. This coherence, while intellectually supported, still may set the objects outside of their cultural context. Such hierarchical structure has been used in the past primarily for administrative purposes. A virtual museum brings with it a new classification and a new way to display connections between objects. This new taxonomy may provide an alternate ways to show subordination, hierarchy, similarities and dissimilarities. Such a museum may make hierarchy clearer, more understandable, and thus promote access to user clientele. In more

popular terms, a virtual museum may serve as a bridge to barriers to access.

As the general public becomes more proficient at locating information on the web, their expectations of what they will find on museum web pages may be greater. Bowen conducted several user studies following a methodology of collecting data through on-line surveys. He found that in 1998, there were 2,810,285 hits counted on virtual museum pages. Nearly three-fourths (74%) of visitors to virtual museum sites expected to find some on-line exhibits. Nearly nine out of ten (87%) expect to find images. Their reasons for seeking museum information were to pursue topics of personal interest, learn about a museum geographically distant from their home, and for enjoyment.

### **The NMAI: A Brief History**

The story of the creation of the National Museum of the American Indian (NMAI) is one of money, politics, and little concern for the Native peoples whose material objects comprised the museum's collection. The museum's story begins in 1897 when an independently wealthy engineer, George Gustav Heye, began a sixty-year hobby of acquiring objects created by indigenous people

of North, Central, and South America. By 1916, Heye had established the Museum of the American Indian (MAI)-Heye Foundation. In 1927, the Museum opened in the Washington Heights area of New York City to house the 400,000-item Heye collection. By the 1960s, it became apparent that the MAI was in trouble; its location deterred tourists and its fiscal situation was precarious. When the MAI started exchanging or selling artifacts for cash, this activity was reported in The New York Times. As a result, in 1975, the Office of the Attorney General of the State of New York took over supervision of the MAI, requiring an inventory of its holdings, removing the Director, and dissolving the Museum's Board of Trustees. After Roland Force was appointed Director, he began a twelve-year battle to move the Museum's holdings to better quarters and to find more secure funding. Mayor Ed Koch, the American Museum of Natural History, H. Ross Perot, Morris K. Udall, Ben Nighthorse Campbell, and a new Board of Trustees played prominent roles in this battle. In March 1989, the Museum became officially joined with the Smithsonian. Finally, on November 28, 1989, President Bush signed the National Museum of the American Indian Act. In addition to establishing the NMAI, the act called for the construction of a

400,000 square foot new facility to be built on the National Mall in Washington, D.C. In June 1990 the Supreme Court of the County of New York rendered a decision that supported the construction of the new museum while maintaining a continuing exhibit area at the Alexander Hamilton U.S. Custom House located at One Bowling Green in Manhattan. In 1996 the NMAI began construction of a new Cultural Resources Center (CRC) in Suitland, Maryland, eight miles from the National Mall. Construction was completed in 1999. The 145,000 square foot facility will house 800,000 objects as well as provide space for conservation and care of collections and a library. The groundbreaking for the new National Museum of the American Indian took place on September 28, 1999. Scheduled for completion in 2002, the new NMAI will be one of a trio of NMAI structures: the Custom House, which will remain an exhibit space; the Cultural Resources Center; and the new NMAI, located near the Air and Space Museum.

In addition to these three physical spaces, the NMAI will also develop a Fourth Museum. The Fourth Museum consists of efforts to extend the access and use of the NMAI's holdings through educational programs, publications, and multimedia, especially to Native communities remote from the museum sites.

One extension of the Fourth Museum concept for the NMAI is the construction of a virtual tour representing the permanent exhibits at the George Gustav Heye Center. The next portion of the paper will describe the chronology of activities that lead to the development of this tour.

### **Creating a Virtual Tour of the American Indian**

In the spring of 1999, the National Museum of the American Indian (NMAI), students and teachers from two schools on reservations, along with educators at the University of Texas at Austin began a unique collaboration. The purpose of this joint venture was to create a virtual museum information space of the permanent exhibitions at the NMAI's George Gustav Heye Center located in the Alexander Hamilton U. S. Custom House in Manhattan. The results of this collaboration were recently made public on the NMAI web site at <http://www.conexus.si.edu/main.html>.

Planning and financial support for this project came about through the Four Directions project, a five-year initiative funded through the U.S. Department of Education and managed by the Pueblo of Laguna, New Mexico. Four Directions provides assistance to selected Bureau of Indian Affairs and tribally

controlled schools to develop culturally responsive curriculum using technology. Four Directions representatives prepared a concept paper for the NMAI, proposing that members of Indian communities be involved with museum personnel in presenting and interpreting cultural objects using technology such as web page authoring and QuickTime Virtual Reality software. The virtual museum projects have two components. One, a virtual museum developed at the participating schools, specifically for the schools' curriculum, using the resources within the communities. The second component is the development of a virtual tour of the NMAI permanent exhibits at the Heye Center as seen through the eyes of Native American children.

After securing a commitment from the NMAI to proceed, Four Directions issued a call for participation to the nineteen schools involved in Four Directions. Two schools were nominated for the virtual museum project on the basis of written plans and evidence of support from school administration: Santa Clara (Pueblo, New Mexico) Day School and Hannahville (Potawatomi, Michigan) Indian School. Four Directions team members at Santa Clara selected a teacher and cultural leader from the community and coordinated an essay-process whereby children would be

chosen. In December 1998, two adults from Santa Clara traveled to New York City to tour the NMAI exhibit area and meet with museum staff to plan the details of the project.

### **Technical Aspects of the Virtual Tour**

Mark Christal, a Four Directions researcher at the University of Texas Austin, pioneered the use of technology allowing the creation of interactive movies of objects and panoramas of physical spaces that can be shared on the WWW. QuickTime Virtual Reality (QTVR) had been identified at the beginning of the Four Directions project as having a unique potential in educational applications. Very recent developments in affordable digital cameras and user-friendly QTVR software helped to make the technology accessible to K-12 schools.

There are two types of QTVR movies and both types may be played in any application that supports QuickTime movies. QTVR panoramas (panos) are made from a series of overlapping photographs taken from a tripod using a specially designed panning head. Software “stitches” the photographs into one seamless 360° scene. When viewed on a computer monitor, you simply press the mouse button and move the mouse cursor in the

direction you wish to “look” and the pano scrolls in that direction. Placing an object on a turntable and taking a series of pictures at evenly spaced angles as the object is turned make QTVR objects. To interact with the finished object movie, you press the mouse button and move the mouse cursor in the direction you wish to rotate the object. A specially designed object rig enables the QTVR photographer to move a camera around an object vertically, in order to make more complex object movies with both vertical and horizontal rotation.

You may zoom in or zoom out of both types of QTVR movies. Also, invisible regions called hot spots may be painted anywhere on QTVR movies. Hotspots trigger special actions when clicked on, such as launching a new web page, labeling a spot on an object or in a pano, or bringing up close details of an object. These features of QTVR and other “immersive imaging” technologies enable the creation of especially engaging virtual museums, making the Four Directions/NMAI collaboration a timely one.

Christal traveled to Santa Clara in order to demonstrate the technology and to involve and train the students and staff. The Santa Clara students examined catalogs of the two permanent



NMAI exhibits, "All Roads Are Good" and "Creation's Journey," and identified a number of artifacts they would like to feature in the virtual exhibit. This list was forwarded to the museum staff who then determined whether objects could be removed and handled without damage. Marty Kreipe de Montañño, director of the NMAI's Resource Center, prepared a deinstallation plan that would enable staff to remove objects prior to the museum's opening hours and transport them to a space that would serve as a virtual reality photography studio. The children and adults from Santa Clara traveled to the NMAI in March 1999. During their week's stay, the children worked in pairs to create QTVR object movies of cultural items on exhibit, such as a Chehalis sheep horn bowl, a Seneca head dress, and a Haida house model. They also created QTVR pano movies of the exterior and interior of the museum space. The children made use of the NMAI Resource Center to research their interpretive essays about the objects. Students and teachers from Hannahville traveled to New York City in June 1999 to continue the work by creating additional content for the NMAI Virtual Tour following the model established by the Santa Clara team. The current Virtual Tour includes nineteen panoramas and 26 objects along with their interpretive essays. This

spring, one more Four Directions school team will go to the NMAI to extend the Virtual Tour to 40 or more objects.

The current tour, prepared by Mark Christal and NMAI staff, is now integrated into the NMAI web page. By typing in the URL (<http://www.conexus.si.edu/main.htm>) in a web browser, the user sees the NMAI home page. Currently, the virtual tour is highlighted on the home page under a photographic montage with text that reads, "A Virtual Tour of NMAI Exhibits." By clicking on the images, the user will be brought to the virtual tour home page. The page features a picture of Mr. Christal assisting Santa Clara students as they photograph the panorama of the Old Custom House building that opens the virtual tour. Clicking on this picture or the "Begin Tour" link below it takes the visitor to the first QTVR panorama featured in the tour. An acknowledgement of the virtual museum project partners appears near the bottom of the tour home page. Since QuickTime 3.0 or newer is required to view the QTVR content, a link to Apple's QuickTime page is provided, where a free version of the software may be downloaded by those who do not have a recent version of QuickTime installed on their computers.

All virtual tour pages provide a navigation bar with buttons labeled: “Conexus Home,” “Tour Home,” “Project Story,” “Tour Maps,” and “Tour Tips.” “Tour Home” and “Conexus Home” takes the visitor back to the initial page of the virtual tour or the NMAI Conexus home page, respectively. Clicking on the “Project Story” button takes the visitor to an illustrated essay describing the development of the Virtual Tour. The “Tour Tips” page provides advice on how to improve the visitor’s enjoyment of the tour, such as maximizing the browser window, resizing the frame windows, using the tour maps, and interacting with QTVR media. The “Tour Maps” page provides floor plans the Gustave Center’s two permanent exhibition halls presented as image maps. Each map has indicates the locations of the QTVR panos and the artifacts that were photographed by the students. The “Creation’s Journey” map shows the locations of nine panoramas and the fourteen object movies depicting exhibit artifacts. The “All Roads Are Good” map locates the seven panoramas and twelve object movies of that exhibition hall. The user can enter the tour at any of the panoramas by clicking on the location of a panorama on the image map.

Upon entering the virtual exhibition space, the visitor is presented with a screen split into two frames. The left frame

provides a user interface for taking the tour. At the top of the left frame is the current panorama. The panoramas have hot spots on them to jump to adjacent panoramas in the tour or pick out the featured items in the virtual exhibition. When the visitor clicks on a featured item in a panorama, its QTVR object movie and student essay appear in the right frame of the virtual exhibition space. Below each panorama is an image map of the relevant section of the exhibition hall floor plan. The visitor can also go to adjacent panoramas and view the featured items by clicking on the sectional image map. Interactivity is the operative term that describes the visitor's experience. The visitor may "look around" in the panoramas, zooming in and deciding where to go next or which virtual object to bring up with a click of the mouse. The visitor may zoom in for a closer look with the click of the mouse or press of a key. Objects may be rotated horizontally or vertically. Close ups of interesting features on some objects fill the object movie window by clicking on a hot spot. Image maps and the ubiquitous navigation bar provide alternative ways of accessing the tour content.

## Findings

We have found that children as young as eight years old can actively participate in the design and creation of multimedia products. The children's involvement in creating the virtual museum was documented in still photographs, on video, through direct observation, and in their own words. They were interviewed on site. Marty Kreipe de Montano reported that "We had high expectations of the students...Once they were given that kind of trust they made the project a success." The children wrote about their travel to New York:

"There was a lot of cheap stuff you could buy in Chinatown. For example, yoyos, T-shirts, and watches...What I liked in New York was the subway. The first time we rode it, all of the teachers flew back and hit each other...I liked the milk and pizza 'cause they were made by real Italians."

And, they wrote about the work they did:

"What I learned about making panoramas (was) we had to make sure you didn't have any reflections in any glass exhibit boxes."

"I also learned that you have to turn the turntable really slow so the objects won't fall off the turntable."

## **Future Plans**

Future plans include extending the tour within the NMAI collections, enhancing features of the tour, collaborating with other cultural museums, and producing local virtual museums within Native communities. The project also provides an opportunity to develop policies, especially those pertaining to intellectual and cultural property rights, to promote a training model for others interested in virtual museum construction, and to engage in research on the use of virtual museums.

The initial virtual tour of selected objects at the NMAI can be expanded to include more objects. It could also incorporate other media such as sound. Further development could incorporate interactive features such as simulations of shared visits. A shareable visit may allow users to interact with each other and/or with a curator while jointly 'examining' virtual objects on the web. The tour may also be available at dedicated stations in the educational areas of the new NMAI facility and the Cultural Resource Center. These efforts could extend internationally to create an international indigenous virtual museum, allowing cultural people and others an opportunity to create a universal

exhibit of Native cultural objects dispersed to museums and private collections around the world.

The virtual museum project may also extend to the development of virtual museums for community use. This concept is in congruence with Fuller's ecomuseum, "an agent for managing change that links education, culture, and power."<sup>4</sup> The Santa Clara Day School is planning a community virtual museum centered on traditional gardening. Hannahville Indian School is developing a museum of cultural artifacts, beginning with contemporary craft work, such as birchbark baskets and quill work. Both Santa Clara and Hannahville are contacting museums that hold objects from their culture to negotiate an exchange of information and technological access.

Our experiences in developing this virtual tour have highlighted the need for local planning and involvement, the necessity for policy statements, the need for culturally responsive communication, and the requirement of detailed memoranda of agreement in working across cultural institutions. This project begs discussion of issues related to intellectual and cultural property rights. Who is enabled to know about Native cultures? What knowledge is valid? Who speaks for Native Americans and for

their material culture? Who is allowed to interpret artifacts? Who is allowed to handle artifacts? Such programs require a flexible technological training model that is adaptable to varying learning styles.

Research on the virtual tour can examine its construction and use. Virtual museums are impacted by the limitations of technology and those involved in its construction. They are often dependent on photographic processes and thus are subject to their limitations in reproducing scale, perspective, and color. Who uses the virtual tour? For what purposes do the visitors use the tour? How do they use the tour? What features do they find the most useful? When might a visitor to a virtual museum be in need in intermediation? What social exchanges are lost when a visitor views a virtual tour instead of a tour that occurs within a museum setting? These questions might lead to studies of wayfaring, cognitive mapping, and how humans acquire spatial knowledge.

### **Summary**

The virtual museum project has challenged traditional museum practice. It is an example of how museums can expand their educational program to include their primary clients in the



development of educational resources. The virtual tour piloted an approach for Native people to become involved in telling the stories of their cultural objects. Here, children are modeling how other Native American children and their communities can plan and develop virtual museums that inform the world at-large while they return images of objects to their cultural homelands. The virtual museum tour is a dynamic way to organize data to reproduce a current museum exhibit space. Created by Native people, it provides a venue for cultural exchange. It is an act of cultural recovery as it returns to the Native community objects long removed from their origins. It is a way for native communities to “digitally repatriate” precious items of their cultural heritage.

## End Notes

1. "Santa Clara Pueblo Students Create Virtual Museum Tour," NMAI Runner 99-2 Summer 1999): 6.
2. Paolo Paolini, et al., "Visiting a Museum Together: How to Share a Visit to a Virtual World," *Journal of the American Society for Information Science* 51 (1) (January 1, 2000), 33.
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