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A RETROSPECTIVE PERSPECTIVE ON THE DIGITAL RECREATION OF MID-CENTURY SUBJECTS

ABSTRACT

This article reflects on lessons learned and suggestions for future projects focused on using the tools of virtual heritage for the representation of the recent past. The earliest project that involved this combination of virtual heritage and "living history" was Shadows of Canaveral, a project based on oral history research with those involved in the Space Industry in Florida during the creation of a launch complex. More recently, the ChronoLeap project takes participants into the past to relive the 1964/1965 New York World's Fair, and the ChronoPoints project attempts to recreate life inside mid-century structures including the Glass Bank in Cocoa Beach, Florida. The challenges and opportunities involved in this type of work result from the fact that those who are still alive can both contribute to the development of such projects and "talk back" regarding the representation of their history, lives, and culture. To that end, the article raises interesting questions about community participation, collaboration, and negotiation in contexts in which those represented can answer back and offer critiques.

KEYWORDS

Virtual heritage; heritage education; virtual environments; community participation; U.S. popular culture

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INTRODUCTION

Beginning with the 1957 launch of Sputnik, the Space-Age extended far beyond orbiting satellites and capsules. It would influence many elements of popular culture including architecture, fashion, automobiles and motion pictures. However, as the astronauts of Apollo 17 took humanity's final footsteps upon the lunar surface in 1972, it was a style that had become one of yesterday rather than the future. Few continued to appreciate the style's flamboyant traits and many commercial buildings sporting a Space-Age theme were demolished or severely altered (Walters 2015). Even the sentinels of the Space-Age, launch complexes of Cape Canaveral, faced demolition. It was a style that many in the 1970s and 1980s took for granted, and many failed to recognize the value of its preservation. To capture remnants of the era, researchers at the University of Central Florida's Institute for Simulation and Training embarked upon a digital exploration of these topics beginning in 2005.

SHADOWS OF CANAVERAL

Shadows of Canaveral was our first three dimensional educational experience, in which the user explored historic rocket launch facilities at Cape Canaveral, Florida. Throughout the 1960s, the orange gantries of the launch pads at Cape Canaveral created a skyline which rivaled New York City's as the world's most recognizable. Its outline was unmistakable, as the tall trestles of brightly painted steel rose up from Central Florida's sun-drenched sands, with each gantry tower standing as a sentinel awaiting the next launch to the heavens. But as with many Mid Century Modern traditional buildings of the era, the majority of these historic launch structures have been demolished. Their destruction represents more than a loss of a structure comprised of steel and concrete; it was a loss of a touchstone connecting us to a significant moment in our collective history - when the United States took its first steps into space.

The State of Florida's Bureau of Historic Preservation funded *Shadows of Canaveral Phase I*, in 2005/2006, to facilitate users' understanding of Astronaut John Glenn's February 20, 1962 Project Mercury mission. Detailed 3D models of significant structures and equipment were developed and presented to users on the Web through pre-rendered scenes in Adobe Flash. A first person perspective of 1962 Cape Canaveral allowed a user to tour the important sites while hearing accompanying audio describing the story behind the launch of Glenn and the contributions of thousands of aerospace workers to the success of the mission.

To place Cape Canaveral into the greater context of the era, the user in *Shadows Phase I* assumed the role of a fictitious correspondent covering Glenn's mission. By using this perspective, the development of the experience was not restricted to only exploring the Cape in isolation from the early 1960's as a whole. This connection was formed by having the user arrive at the Starlite Motel in nearby Cocoa Beach, and interacting with

period appropriate props within the interface enabling the examination of national and international topics such as network television programs and the construction of the Berlin Wall.

Shadows of Canaveral Phase II, in 2006-2007, captured an earlier transitional moment of the Cape's history – as it went from a maritime warning outpost to missile testing facility. Dating back to 1868, the historic Cape Canaveral Lighthouse and accompanying lighthouse keeper's cottage complex stood in close proximity to the launch site of the Cape's first launch complex and served as an observation tower. *Shadows Phase II* recreated the entire lighthouse, keeper's cottage complex, and nearby Launch Complex 3, as workers prepared for the Cape's first launch, Bumper 8, on July 24, 1950.

FIGURE 1 - RENDER OF LAUNCH COMPLEX 14 FROM SHADOWS OF CANAVERAL

Unlike Glenn's very public launch where tens of thousands of civilians in Cocoa Beach and neighboring communities were present to observe it, the first launch at Cape Canaveral was witnessed by only a few essential personnel. As a result, it was necessary to develop a realistic perspective for the user to observe these events. It was determined that a military photographer would have the required access and the ability to provide users a comprehensive experience. As with *Phase I,* scenes were pre-rendered and delivered through an Adobe Flash portal. Users began their journey at a photographer's darkroom at Patrick Air Force Base and were subsequently transported to explore the launch and lighthouse complex at Cape Canaveral.

Originally, it was planned to recreate all of the launch complexes at the Cape, whereby each complex was represented by a significant launch during its initial 25 years of operation. From its inception, the project was seen as a mechanism to provide an understanding of 1950s/1960s Cape Canaveral operations for a generation whose only exposure to space had been the Space Shuttle. User feedback suggested that while this cohort was responsive in "visiting" historic Cape Canaveral, they were particularly interested in the how the supplemental materials in the environment related to the era. However, it was clear that if we were to build upon this concept, the environment would possess the ability to address a wider range of subjects.

While developing *Shadows of Canaveral,* we also recognized an element of personalized intergenerational conversation between several space worker retirees who served as project advisors when they explored the Cape area recreations with their grandchildren (Walters, Hughes, and Smith 2009). However, since such a small element of the population was involved in launches at the Cape, it was evident that we needed to select a theme that had potential to elicit intergenerational conversation among a wider population. Of even greater importance was the selection of an environment that could examine a wide range of science and technology topics and be of interest and relevance to youths.

CHRONOLEAP: THE GREAT WORLD'S FAIR ADVENTURE

The 1964/65 New York World's Fair (NYWF) served as the basis for our next significant virtual environment with the development of *ChronoLeap: The Great World's Fair Adventure* (2009-2014). The backdrop of a World's Fair provided an opportunity to realistically encompass a large scope of topics in a single location, as World's Fairs are events born from a society's desire to showcase their advancements, and often spotlight science and technology. Lasting no longer than two seasons, a Fair is a temporary exposition that provides a panoramic snapshot of an era depicting the hopes, aspirations, fears, and faults of a society (Walters, Hughes, and Hughes 2011). An example of this is the Great Exhibition of 1851 which served as a showcase for Victorian technology and cultural arrogance (Rydell, Findling and Pelle 2013). The 1939–1940 New York World's Fair rose from the valley of the ashes depicted in F. Scott Fitzgerald's *The Great Gatsby* and provided Fairgoers hope as to what the future might bring beyond the Great Depression (Kuznick 1994). The 1964/65 Fair promised a world of optimism and technological advances that marked the beginning of the world we now occupy (Samuel 2007).

Coming as it did in the midst of the "Space Race" this landmark event was notably infused with science and technology. This made it an ideal environment to convey a wide array of STEM (science, technology, engineering, and mathematics) content, much of which were nascent in the mid-1960s. Unlike many virtual recreations with real world settings, *ChronoLeap*: The Great World's Fair Adventure was not designed as an exact architectural reconstruction of the Fair; rather, it was seen as a learning destination because it was rooted in the core themes of science and technology. By exploring the extensive environment, users examine the boundaries of our current technologically-driven society and forge links which promote intellectual curiosity and engagement.

The enhanced digital world of *ChronoLeap* differs significantly from *Shadows of Canaveral* in regard to topics, target audience, and delivery method. Whereas Cape Canaveral was the focus of *Shadows, ChronoLeap* utilized the 1964/65 New

York World's Fair as a backdrop to convey STEM topics and was not the focus of the project. As an Informal Science Education grant funded by the National Science Foundation, the project was designed as an informal STEM learning tool for middle school aged youth. However, as with *Shadows,* the NYWF would prove to have significant potential to provide an intergenerational learning experience by fostering discussion between the target cohort and family members who were old enough to recall the mid-1960s. Finally, while *Shadows* was restricted to pre-rendered scenes delivered through Adobe Flash, *ChronoLeap* was envisioned as an interactive 3D virtual environment given the desire to elevate the user's ability to explore in a non-sequential fashion.

Researchers have frequently cited the strong potential for virtual environments to promote learning (e.g., Bailenson et al. 2008; Dede 2009). These environments can encourage exploration and discovery that are consistent with inquiry-based and constructivist pedagogies (Dalgarno and Lee 2010; de Freitas and Neumann 2009). Virtual environments can also immerse people within new perspectives and new identities that stimulate learning (Bers 2001; Dede 2009; Ross and Tomlinson 2010; Squire 2006) and lead users to think more like experts (Lindgren, 2012). Several virtual environments have been developed and shown to have significant benefits for learning; an example is *Quest Atlantis* (now called *Atlantis Remixed*), a learning platform that mixes classroom and online activities through a series of learning quests. Studies have shown that this environment has been an effective tool for motivating students to learn and for providing productive outlets for reflection on conceptual knowledge development (Barab et al. 2005, 2010). Another virtual environment, *River City,* put students in the role of scientists and guided them through the process of hypothesis testing and research design. Large-scale studies of *River City* have shown positive effects on collaborative problem solving and higher-order thinking skills (e.g. Ketelhut et al. 2010). A final example of a virtual learning environment, which was created specifically for informal science education, is *Wolf-Quest*, a downloadable application developed by the Minnesota Zoo that allows learners to become wolves and learn about their habits and ecology (Schaller et al. 2009).

Early in the development cycle of *ChronoLeap,* focus was on technical challenges of developing an expansive sandbox learning environment. Held at the current site of New York's Flushing Meadows-Corona Park (FMCP), the Fair was comprised of over 140 pavilions in an area exceeding 660 acres. We subscribed to the theory that depictions of the past for educational purposes should be as photorealistic as possible (Roussou and Drettakis 2003). Reference images were acquired at several public and corporate archives and by networking with the New York World's Fair collector community. Additionally, texture photography of existing Fair artifacts was captured in Flushing Meadows-Corona Park.

Research at the New York Parks Department provided elevation maps for FMCP that served as the basis for a topographical map depicting the virtual World's Fair terrain.

After substantial development, formative evaluation of a portion of sandbox environment populated with pavilions and props revealed a number of issues that led to an extensive redesign of how users interfaced with the environment. The evaluation revealed that the target cohort preferred a compartmentalized leveled world rather than the sandbox environment originally envisioned. Specifically, users experienced difficulty making learning connections across the expansive virtual environment. This change also enabled the introduction of a strong storyline to assist users in feeling a purpose. We found this during the second testing phase—answering the all-important question "why am I doing this task?" (Sorathia and Servidio 2012).

FIGURE 2 – RENDER OF NEW YORK STATE PAVILION - TENT OF TOMORROW FROM CHRONOLEAP

Because of issues revealed in the formative evaluations pertaining to the sandbox environment, we developed a storyline that linked together the planned eight levels and permitted the potential for future expansion in a cost effective manner. The resulting game, *ChronoLeap,* is explored through a series of self-contained levels that we termed "Time Bubbles." A virtual representation of the Queens Museum, a project partner situated in FMCP whose structure served as a pavilion during the actual Fair, acts as the central embarkation point for the experience. The main thread of the storyline is restoring a future *Queens Museum* when a time paradox transports artifacts into the past and in doing so, disrupts the evolution of technology. Each of the eight time bubbles focuses on a specific STEM quest. Upon accepting a mission for a particular level, users are transported to a specific region of the 1964/65 Fair where the pavilions provide clues to the location of the artifact. The intent of this action is to enhance players' understanding of the technology and how each artifact they encounter influenced society and its evolution as a form of technology to the current day. The completion of each time bubble permits the user to return to the Queens Museum and embark on a new mission.

Users reported having enjoyed the developed storyline coupled with the mission-based level approach. As each mission was focused on an overriding STEM theme, it became easier for the user to make the connections between the subjects (Kitalong 2012).

Prior to 2014, all models created for our environments were developed with the software package Maya by artist modelers from photographs, blueprints, film and at times human memory as a reference. These materials permitted the creation of virtual buildings and objects of a sufficient level of detail for each project. In the case of *Shadows of Canaveral,* the scenes were rendered to play run in a static Flash environment and they could be highly detailed. *ChronoLeap* was a downloadable experience delivered through the open source object-oriented graphics rendering engine (OGRE) as the funding agency requested the use of open source resources for the project when possible. While OGRE's low-level interface provides an effective and flexible tool for building 3D game-like experiences, the effort to do so is much greater than with the Unity game engine. Moreover, the built-in visual effects found in Unity can result in a higher level of user engagement. After the 2013 launch of *ChronoLeap* we experimented with placing several of the models within the Unity engine to compare the level of realism. As anticipated, Unity greatly enhanced the visual quality and realism of the environment.

FIGURE 3 - RENDERS OF INTERIOR OF QUEENS MUSEUM FROM CHRONOLEAP/OGRE (LEFT) AND UNITY (RIGHT)

CHRONOPOINTS

With the acquisition of a FARO Focus3D S120 laser scanning unit in 2014, we embarked on a new research initiative, *ChronoPoints - www.chronopoints.com.* Laser scanning makes it possible to secure highly detailed as-built digital documentation of an existing structure. Scanned data can be used to assist in the restoration of a structure damaged by natural disaster, weather deterioration, or war as reflected in the destruction of world heritage treasures in Iraq and Syria (Farrell 2015). Laser scanners can also be used to assist in the development of 3D models that then can be used for cinematic-style visualizations or imported into popular game development tools to create interactive educational games and experiences. In the phase shift FARO Focus laser scanner, an infrared laser is emitted and reflected back to the system.

The distance between the object and the scanner is then calculated by analyzing the phase shifts in the wavelength of the return beam compared to the emitted light. The device records each laser reflection as a point within three-dimensional space, and the scanner also uses optical photography to gather color information of the point location and assigns that value to each one. After a series of scans, the data is then collectively registered, or joined, into a point cloud that provides a 3D representation of the structure/object scanned. What is remarkable about this technology is that a FARO S120 scanner can capture data with an accuracy of up to 2mm, allowing precise real and virtual recreations. When this 3D representation is created, it is still just a collection of individual points, not a model consisting of a mesh of polygons, which makes it useful for the development of motion pictures or virtual/augmented environments. Other software (e.g. Geomagic Wrap*)* is then used to transform the 3D point cloud data into a polygonal mesh model. Typically, the planned purpose of the model will determine the subsequent level of refinement work required by artist modelers. If the model is needed for a game or virtual environment, it will require the modeler to decimate the number of polygons to assure smooth rendering for the end user.

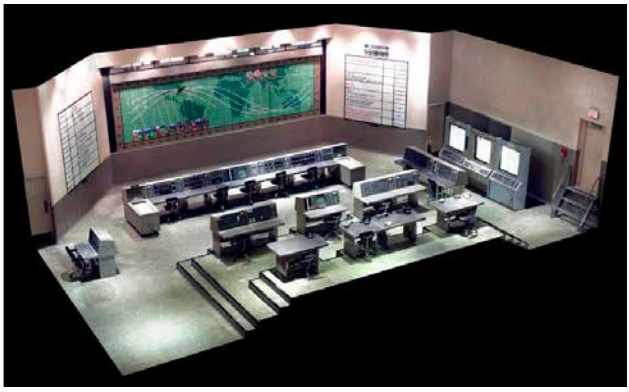

FIGURE 4 - RENDERS OF MERCURY MISSION CONTROL POINT CLOUD DATA

FIGURE 5 - RENDER OF MAYA MODEL OF MCC CONSOLE

Our first use for historic capture using the FARO scanner were the original consoles from Cape Canaveral's (Mercury) Mission Control Center (MCC). The consoles were transferred to the Kennedy Space Center Visitor Complex (KSCVC) for display after it had been determined asbestos contamination and structural issues had made the original structure at Cape Canaveral no longer safe for civilian tours. The laser scanner enabled capturing reference data with an unprecedented level of accuracy for the creation of Maya models. Previously, our visualization of MCC within *Shadows of Canaveral* was created with photographs of the units. By comparison, the laser scan data served as a template for the creation of the console model rather than being processed with Geomagic to automatically create a high polycount model. The laser scan enabled our model artists to have precise 3D measurements and to incorporate fine details into their console models.

KSCVC provides public access to many Space-Age treasures, most notably one of three existing Saturn V launch vehicles and Space Shuttle Atlantis. At a height of 363 feet, the Saturn V booster is a towering testament to humanity's unceasing desire to explore the unknown. Partnering with FARO Technologies, *ChronoPoints* laser scanned the KSCVC Saturn V and four additional Project Apollo artifacts in preparation for a planned educational experience in celebration of the forthcoming 50th anniversaries of Apollo 8 and Apollo 11. The Saturn V, Apollo 14 command module, astronaut transfer van, Command/Service Module (CSM) 119 and a remaining portion of the Saturn Launch Umbilical Tower (LUT) were scanned to provide accurate 3D measurements for the educational experience and as a digital preservation record.

While an effective modeling aid, the laser scanner can only capture what still exists. In the case of the historic launch structures at Cape Canaveral and most of the 1964/65 New York World's Fair attractions, the vast majority of the structures were demolished decades ago. *ChronoPoints* was fortunate to receive permission from the New York City Department of Parks and Recreation to scan three relics from the NYWF. Working together with CyArk, a global leader in the digital preservation of heritage sites, the Unisphere, New York State Pavilion, and the Rocket Thrower were scanned.[1] Designed by noted American architect Philip Johnson, the New York State Pavilion (NYSP) is comprised of three independent components, the Tent of Tomorrow, Astro-View observation towers and Theaterama. In the fifty years since the closing of the Fair, this once majestic calling card to the future has deteriorated into an urban ruin. While the Fair's 50th Anniversary has provided a resurgence of interest in the New York State Pavilion, its ultimate fate was uncertain. A significant grassroots movement has brought attention to its condition and seeks to bring about the pavilion's preservation and potential repurposing.

In 2016 the National Trust initiated the New York State Pavilion Ideas Competition as an "anything goes approach to radically reimagine" the rusting Space-Age relic (National Trust 2016). The goal is to find a new use for the Pavilion as meaningful as Manhattan's repurposing of an abandoned elevated railroad spur, the High Line. Our laser scan of the NYSP can be a valuable resource to the repurposing effort as it provides a more accurate representation of the Pavilion's current state than as-built drawings. Of greater significance is that will serve as digital historical record of the structure's final state prior to future repurposing, and a testament to society's continual pattern of neglecting architectural treasures of the recent past.

The Space-Age is the cornerstone of the *ChronoPoints* laser scanning initiative and perhaps no community's relationship with the era resonates deeper than that of Cocoa Beach, Florida. The city was home to thousands of aerospace engineers and technicians, and many of the buildings within the community visually mimicked the activities at nearby Cape Canaveral.

[1] For additional information about CyArk visit www.cyark.org.

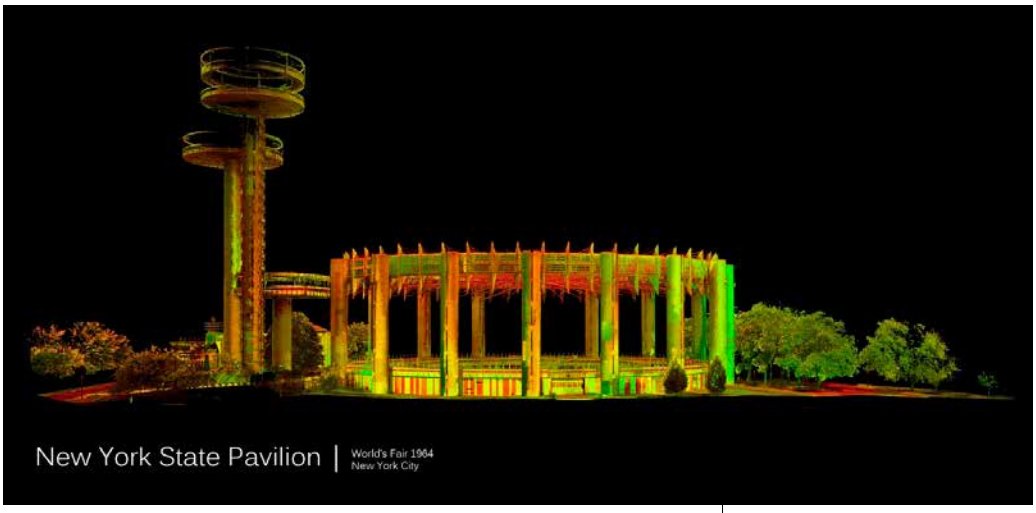

FIGURE 6 - RENDER OF NEW YORK STATE PAVILION POINT CLOUD DATA – CYARK IMAGE.

One of the finest representations, the Cocoa Beach Glass Bank, opened in April 1962 and quickly became a regional landmark. Designed by Sarasota School architect Reginald Knight, the building appeared as if an elegant glass cover had been delicately placed atop its four floors. A catwalk surrounded the top floor, providing patrons an ideal spot to watch rocket launches. By 2014 the building had fallen into a state of disrepair and was slated for demolition.

ChronoPoints was granted permission by the City of Cocoa Beach to perform a laser scan of the building prior to demolition. While the laser scan data provided a highly accurate three dimensional representation of the Glass Bank, it was one of the buildings following an early 1980s remodeling. The point cloud data enabled our artist modelers to replicate the complex exterior angles which were retained even after its remodeling. Unfortunately, the interior of the structure changed significantly and laser scans had no value. To complicate the project's goal, we had only a handful of interior images, and most focused on individuals within the frames, thus providing little assistance in the overall layout. The critical nature of community involvement will become evident in providing these details enabling the project team to recreate the 1962 Glass Bank (www.cocoabeachglassbank.com).

FIGURE 7 - RENDER OF GLASS BANK POINT CLOUD DATA

FIGURE 8: RENDER OF GLASS BANK MAYA MODEL IN UNITY

COMMUNITY INVOLVEMENT

Our focus on Space-Age topics has afforded the research team the opportunity to gather greater first-hand information on the experiences than similar 3D historic projects addressing earlier eras, such as *Rome Reborn* and *Virtual Williamsburg 1776*.[2] Community involvement was significant and of great value in the development of *Shadows of Canaveral*, as former space industry workers aided the gathering the important photographs and confirmation of the veracity of models. Prior to the inception of *Shadows,* the lead author had undertaken an oral history project designed to capture the reflections of those who worked at Cape Canaveral in the 1950s and 1960s. During these oral histories, we found that many individuals had relatively extensive holdings of photographic materials in their possession, and so we began a project to digitize these materials. Their photographs and documents were instrumental in filling voids in documentation in traditional archival repositories.

Facility images and blueprints enabled the development of accurate models of all structure exteriors. However, we did encounter issues with several interiors of the structure. Blueprints permitted the creation of the shell of a room, but the imagery failed to reveal the full breadth of interior content.

The participation of retired space workers did not cease with supplying access to physical research materials, as in several instances their recollections provided the only link to lesser known areas of the launch complex. After consultation with a panel of retired space workers, we were able to achieve a consensus on the design of furniture and room content. This was achieved through their analysis of images from other launch complexes, catalogs, and similar resources. The contribution of the retired Cape workers enabled the project to go beyond a sterile architectural recreation and tour of the facilities associated with Glenn's flight to provide the fine details that added a level of humanity (Walters, Hughes, and Smith 2009).

During the development of *ChronoLeap*, we received numerous emails from individuals who followed the progress of our project on the Internet. From engineers to Academy Award winners, each conveyed how the original Fair inspired them to their current careers. Discussions with these individuals assisted in how we presented our STEM topics within *ChronoLeap*.

Publicity for the project in New York news outlets produced contact with many individuals who attended the Fair and were willing to send us their photographic slides, which were then digitized and returned to the donors. Additionally, the official filmmaker of the 64/65 New York World's Fair invited our team to digitize his Fair slides, scan various publicity materials, and access his private films. We secured pavilion images from a number of traditional archival repositories that were helpful with documenting the more popular attractions like General Motors, Ford, or the U.S. Space Park.

[2] For additional information on Rome Reborn visit romereborn.frischerconsulting.com/ and Williamsburg 1776 visit *research.history.org/vw1776/*

However, many other pavilions such as the Underground Home, Chunky Square, or even the Churchill Center, were not well represented within the visited archives. One issue that hampered research efforts was that many of the companies represented at the Fair no longer existed and their archival records had been liquidated. During the research process, we purchased personal slide and photograph collections on the eBay online auction site, but were surprised to continually see many of the same views. This was likely attributable to the cost of photography in the 1960s, visitors sharing views, restriction of locations where they were permitted to shoot, and the fact that many exhibitors prohibited flash photography. Restriction of locations where they were permitted to shoot, and the fact that many exhibitors prohibited flash photography. However, one of the most significant sources of period imagery emanated from the 1964/65 New York World's Fair enthusiast community. The community is sizable and comprised of individuals who attended the Fair as children, a smaller number of those who worked at the various Pavilions, and others who had no direct connection to the Fair but were interested in the topic. Many have vast image and ephemera collections and were generous with supplying us with digital materials when asked. Given the number of personal slide and photo collections within the group, they often could assist with the needed materials from more obscure Fair attractions. Additionally, the project was fortunate to have had members of this community serving on our advisory board who shared their exceptional knowledge of the Fair.

The Cocoa Beach Glass Bank is highly representative of the majority of "local" structures worthy of preservation - be it physical or digital. Many buildings in this category were not designed by an architect whose name is instantly recognizable by the general public like Frank Lloyd Wright or Eero Saarinen. Neither were they part of noted historic events like the launches at Cape Canaveral or a World's Fair that generated an abundance of photographs and documents. However, they were unique landmarks in their particular locales, and given the paucity of reference materials, the virtual restoration the Glass Bank to its original 1962 configuration was challenging and the local community became an important partner in the project.

The goal of our project was not just an architectural reconstruction of a town landmark, but to share it as a vessel of Space-Age Cocoa Beach with users through an interactive experience. Therefore, it was critical to not only secure interior images, but to speak with those involved in the building's construction, with employees within it, and with members of the general Cocoa Beach community. The Glass Bank was not only home to the First Federal Savings & Loan, but Ramon's Rainbow Room also occupied the fourth floor, and it was not uncommon to see many of that era's Las Vegas headliners performing there.

The project was fortunate that the City of Cocoa and Cocoa Beach libraries held copies of a now defunct local newspaper and a series of smaller weekly publications that provided details to Rainbow Room events.

Those publications were helpful, but speaking to residents of Cocoa Beach and surrounding communities enabled the acquisition of the most detailed information. Additionally, during the demolition, Walters gave three public lectures on the history of the Glass Bank at the City of Cocoa Beach Public Library. At these events several individuals brought materials to share and were later willing to participate in formal oral history interviews. The demolition of such a key structure within the community made these lectures in many ways a community event. People came to observe and reminisce with others in attendance about the Glass Bank in its heyday. Some individuals had small micro-stories to tell and others had been intimately involved with an aspect of the building and were willing to speak with Walters.

Beyond the collection of oral histories, one of the greatest advantages researchers have when developing virtual environments from the recent past is that key individuals can give guidance to the project. Alternatively, the virtual Glass Bank was also a retrospective design tool. Walters put this tool to good effect by using the incomplete but recognizable model of the bank to tease lost details like colors, textures, layouts and furniture styles from the former bank manager Vivian Lindauer. Because Ms. Lindauer was able to "walk" through the building, the authors believe it was more evocative of memories than simply looking at a handful of black and white photos (which did not show the items in question) and being asked detailed questions. By exploring the virtual structure, she offered answers without being prompted. One might consider this a sort of reverse intergenerational experience; whereby younger cohorts create the past as a retrospective tool for those who came before them.

INTERGENERATIONAL EXPERIENCE

In both *Shadows of Canaveral* and *ChronoLeap* intergenerational engagement was a natural outgrowth of each project rather than an original research point. Still, when *Shadows* was developed, multiple levels of intergenerational exploration began and started to make itself apparent to the authors. First at the design stage, the space industry retirees were able to provide first-hand recollections of many undocumented details of the launches and launch complexes of Cape Canaveral. These individuals lived these important events and were personally invested in sharing them with a broader audience. In a second intergenerational level of participation, retirees served as guides and knowledge purveyors within *Shadows* and *ChronoLeap* as characters. Though these characters were static and non-interactive, the added authenticity of someone who did or could have participated in the events is something which would likely be accepted by users - especially youths. The third level of intergenerational engagement, where the actual space retirees and Fair attendees ventured through the experiences with youth partners, is probably the most beneficial.

An adult scaffolding a child when encountering new materials is known to assist learners to incorporate new knowledge (Vygotsky 1978).

Because of these multiple levels of intergenerational engagement and learning, perspectives on information, objects and events tend to be multiplied. Running through *Shadows, ChronoLeap* and the Glass Bank experiences are the perspectives of those individuals who participated in the actual events. Seniors share their observations of the era with children and other younger users of the way things were according to their memories.

There is the perspective of the researcher, who is guided by documents, contemporaneous news reports, photos/video, and how each site currently exists. Lastly, there is the perspective of a child or young person who has no direct connection to the objects or events seen in the virtual environments. For them, an intergenerational guide (i.e. an adult) can provide the recollections, interpretations, remembrances and support to a young person encountering a world which no longer exists.

Walters observed sharing of the event participant perspective when space industry retirees at the U.S. Space Walk of Fame Museum explored *Shadows* with young visitors at their facility. This was again observed during the testing of *ChronoLeap* as grandparents and other familiar adults would elaborate upon 1960s topics encountered within the virtual NYWF environment. What is interesting from a research perspective is that much of the joint intergenerational exploration of environments like *Shadows* and *ChronoLeap* are well supported in widely accepted educational theory. Vygotsky (1978) contends that a child's cognitive development is promoted as they interact with more knowledgeable and older people, and information is conveyed to them.

This transfer of information serves to move the child's understanding of the world to one which is more grounded in the common view of the society. Extending this theme, the type of encounters using virtual environments described are a modern version of the "situated learning" experiences from Lave and Wenger (1991). Young people learning new material in a communal fashion from experienced practitioners is viewed by them as normal and beneficial to the novice.

So, in parallel to much of this thought regarding how more experienced people support a child's learning, as well as evolving thought on how knowledge is transferred, emerged the advent of educational television. Using media to teach was a new concept when television programs like *Sesame Street* began airing, and researchers in the early 1970s were curious whether adults (typically parents) could enhance children's ability to learn the lessons conveyed (Reiser, Tessmer, and Phelps 1984; Salomon 1977). This activity was termed "coviewing" and researchers examined both active (where parents questioned and prompted their children about content viewed) and passive (where parents were present as their children viewed) forms (Barr and Brito 2012; Dorr, Kovaric, and Doubleday 1989).

In the early 2000s, with the proliferation of new forms of media, researchers began exploring what they termed Joint Media Engagement (JME) (Moorthy, Penuel, and VandenBorght, n.d.). This fully encompassed the concept of active social use of games, virtual environments and other forms of media (Takeuchi et al. 2011). This is the embarkation point for both "*Shadows'* and *ChronoLeap's*" use as more effective educational tools by encouraging their use in a more social fashion. What this draws into question for ongoing projects like the Glass Bank is 1) how we can ingrain JME from inception, and 2) what does good JME in a virtual learning environment look like?

CONCLUSION

The archiving of digital experiences and learning games are as challenging as their commercial video game counterparts (Newman 2012). Because of this, we believe the focus on archiving should be on two aspects of a project: 1) the resources used to create the experience: photographs, video, audio, oral histories, articles and notes and 2) the assets developed for the project: 3D models, videos, laser scans, audio and reports. This incentivizes the development of a large archive of materials that can be used by the resource creators and can be potentially shared with other educational institutions upon request.

As in the case of *Shadows of Canaveral,* its runtime environment, Adobe Flash*,* is being sunsetted and support for the tool will no longer be available from Adobe in the not so distant future. Our plans are to develop Web pages for each project with their details and videos so that its essence can remain on the Web. Finally, the experiences themselves will be stored so future generations who wish to view them via emulation technology could do so.

This retrospective of digital recreation and preservation efforts underway at the Institute for Simulation and Training at the University of Central Florida allows one to see depth of the issues and peer into the new directions taken. Although the subjects are varied, they share the common thread of the Space-Age. While the majority of the structures addressed in each project were constructed less than sixty years ago, many have faced demolition, lay in a state of ruin or have been substantially altered from their original configurations. Because of this the structures have required a degree of digital reconstruction equal to that of significantly older historic sites.

The ability to speak with those who have direct memory of the depicted structures and topics has provided the projects decided advantages. During production these individuals contribute lost details and fill the empty vessel of an architectural recreation with a sense of humanity. Additionally, even those individuals without connection to a project's production, can often serve as intergenerational guides and continue to contribute to the understanding of the Space-Age as a pivotal moment in human history.

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REFERENCES

BAILENSON, Jeremy N. - YEE, Nick - BLASCOVICH, Jim - et al.
2008 The Use of Immersive Virtual Reality in the Learning Sciences: Digital Transformations of Teachers, Students, and Social Context. *Journal of the Learning Sciences* 17(1): 102-141.

BARAB, Sasha A. - GRASALFI, Melissa - INGRAM-GOBLE, Adam
2010 Transformational Play: Using Games to Position Person, Content, and Context. *Educational Researcher* 39(7): 525-536.

BARAB, Sasha - THOMAS, Michael - DODGE, Tyler - CERTEAX, Robert - TUZUN, Hakan
2005 Making Learning Fun: Quest Atlantis, a Game without Guns. *ETR&D Educational Technology Research and Development* 53(1): 86-107.

BARR, Rachel - BRITO, Natalie
2012 Learning from Television during Early Childhood. *In Encyclopedia of the Sciences of Learning*. Norbert M. Seel (ed). Boston, MA: Springer US. Pp. 1869-1872.

BERS, Marina Umaschi
2001 Identity Construction Environments: Developing Personal and Moral Values Through the Design of a Virtual City. *Journal of the Learning Sciences* 10(4): 365-415

DALGARNO, Barney - LEE, Mark J. W.
2010 What Are the Learning Affordances of 3-D Virtual Environments? *British Journal of Educational Technology* 41(1): 10-32.

DEDE, Christopher
2009 Immersive Interfaces for Engagement and Learning. *Science* 323(5910): 66-69

DE FREITAS, Sara - NEUMANN, Tim
2009 The Use of 'Exploratory Learning' for Supporting Immersive Learning in Virtual Environments. *Computers & Education* 52(2): 343-352.

DORR, Aimee - KOVARIC, Peter - DOUBLEDAY, Catherine
1989 Parent-Child Coviewing of Television. *Journal of Broadcasting & Electronic Media* 33(1): 35-51.

FARRELL, Stephen
2015 Using Lasers to Preserve Antiquities Threatened by ISIS - The New York Times. News. *New York Times*. Accessed online, February 2, 2-16: www.nytimes.com/2015/12/28/arts/design/using-laser-scanners-to-preserve-antiquities-in-isiss-cross-hairs.html?_r=2.

KETELHUT, Diane Jass - NELSON, Brian C. - CLARKE, Jody - DEDE, Chris
2010 A Multi-User Virtual Environment for Building and Assessing Higher Order Inquiry Skills in Science. *British Journal of Educational Technology* 41(1): 56-68.

KITALONG, Karla
2012 Annual Report of Project Evaluator: June 1, 2011 – May 31, 2012. Interconnections Revisiting the Future. Technical Report. Date Submitted: (June 14, 2012).

KUZNICK, Peter
1994 Losing the World of Tomorrow: The Battle over the Presentation of Science at the 1939 New York World's Fair. *American Quarterly*: 341-373.

LAVE, Jean - WENGER, Etienne
1991 *Situated Learning: Legitimate Peripheral Participation*. Cambridge, UK: Cambridge University Press.

LINDGREN, Robb
2012 Generating a Learning Stance through Perspective-Taking in a Virtual Environment. *Computers in Human Behavior* 28(4): 1130-1139.

MOORTHY, Savitha - PENUEL, Bill - VANDENBORGHT, Mieke
N.d. Joint Media Engagement and Learning. Accessed online, January 13, 2015: sriinternational.org/sites/default/files/publications/ imports/ SRI_JME_ Statement_103110.pdf.

NEWMAN, J.
2012 Ports and Patches: Digital Games as Unstable Objects. *Convergence: The International Journal of Research into New Media Technologies* 18(2): 135-142. Accessed online, June 16, 2016: con.sagepub.com/cgi/doi/10.1177/1354856511433688.

NEW YORK STATE PAVILION - Ideas Competition | National Trust for Historic Preservation
N.d. National Trust for Historic Preservation. savingplaces.org/nysp-ideas, accessed February 2, 2016.

REISER, Robert A. - TESSMER, Martin A. - PHELPS, Pamela C.
1984 Adult-Child Interaction in Children's Learning from "Sesame Street." *Educational Communication and Technology* 32(4). JSTOR: 217–223. Accessed online, December 10, 2014: www.jstor.org/stable/30218146.

ROSS, Joel - TOMLINSON, Bill
2010 How Games Can Redirect Humanity's Cognitive Surplus for Social Good. Computers in Entertainment. *Computers in Entertainment CIE* 8(4): 1-4.

ROUSSOU, Maria - DRETTAKIS, George
2003 Photorealism and Non-Photorealism in Virtual Heritage Representation. *In First Eurographics Workshop on Graphics and Cultural Heritage* (2003). Accessed online, February 2, 2016: hal.inria.fr/inria-00606745/.

RYDELL, Robert W. - FINDLING, John E. - PELLE, Kimberly D.2013 *Fair America: World's Fairs in the United States*. Washington, DC: Smithsonian Institution Press.

SALOMON, Gavriel
1977 Effects of Encouraging Israeli Mothers to Co-Observe "Sesame Street" with Their Five-Year-Olds. *Child Development*: 1146–1151. Accessed online, January 13, 2015: www.jstor.org/stable/1128378.

SAMUEL, Lawrence R.
2007 *The End of the Innocence: the 1964-1965 New York World's Fair*. Syracuse, NY: Syracuse University Press.

SCHALLER, David T - GOLDMAN, Kate Haley - SPICKELMIER, Grant - ALLISON-BUNNELL, Steven - KOEPFLER, Jessica
2009 Learning in the Wild: What Wolfquest Taught Developers and Game Players. *Museums and the Web 2009: Proceedings*. Toronto: Archives & Museum Informatics. Accessed online: www.archimuse.com/mw2009/papers/schaller/schaller.html

SORATHIA, Keyur - SERVIDIO, Rocco
2012 Learning and Experience: Teaching Tangible Interaction & Edutainment. *Procedia - Social and Behavioral Sciences* 64: 265-274.

SQUIRE, Kurt
2006 From Content to Context: Videogames as Designed Experience. *Educational Researcher* 35(8): 19-29.

TAKEUCHI, Lori - STEVENS, Reed - FENWICK-NADITCH, Ashley - et al.
2011 The New Coviewing. Accessed online, January 13,
2015: www. joanganzcooneycenter.org/wp-content/uploads/2014/03/JGC_CoViewing_iPadPrint.pdf

VYGOTSKY, Lev Semenovich
1978 *Mind in Society: The Development of Higher Psychological Processes*. Cambridge: Harvard University Press.

WALTERS, Lori - HUGHES, Darin - HUGHES, Charles
2011 Interconnections: Revisiting the Future. *Games and Culture* 6(6): 538-559.

WALTERS, Lori
2015 Scanning the Space-Age. *LiDAR News Magazine* 5(2): 22-27.

WALTERS, Lori - HUGHES, Charles - SMITH, Eileen
2009 Shadows of Canaveral: The Application of VR to a Post-World War II Subject.
In *Computer Applications to Archaeology 2009*. Williamsburg, VA, USA. Accessed online, January 12, 2016: *archive.caaconference.org/2009/articles/Walters_ Contribution313_c%20(2).pdf*