

Egyptian Ceremony in the Virtual Temple Avatars for Virtual Heritage

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PublicVR, Boston
Carnegie Museum of Natural History, Pittsburgh
York University, Toronto
Puppet Showplace Theater, Boston
Axiom Gallery, Boston

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2. List of Participants

Baek, John – Oregon State University, Corvallis, Oregon

Gillam, Robyn – York University, Toronto

Handron, Kerry – Earth Theater, Carnegie Museum of Natural History (CMNH), Pittsburgh

Innes, Christopher – York University, Toronto

Jacobson, Jeffrey – PublicVR, Boston

Kayser, Heidi - Axiom Art Gallery, Boston

Kirschner, Friedrich – Boston

List, Michael – CMNH, Drama

McCallie, Ellen – CMNH, Public Programs

Michael, Nitsche – Georgia Tech, Atlanta

Ryu, Semi, Virginia Commonwealth University

Shur, Brad – Puppet Showplace Theater

3. Abstract

With Virtual Reality, students can directly interact with distant times and places, giving them greater understanding and empathy for other cultures. Egyptian religious performance and ritual were central to the culture, and monumental temples were their dramatic performance spaces. The Earth Theater at Carnegie Museum of Natural History supports the Virtual Egyptian Temple, a three-dimensional, computer-graphic simulation of a Ptolemaic Era temple. We propose to stage an important religious event from that time, the Egyptian Oracle, virtually “in” the temple at the Earth Theater and two other large-screen theaters. An expert puppeteer will control the temple virtual High Priest and lesser constructs, a live educator, and even with the audience in the role of the Egyptian public. A live puppeteer can experiment and improvise in ways no artificial intelligence can and decades of educational research show the best way to learn about a social activity is to see it and do it.

4. Narrative

4.1 Enhancing the Humanities Through Innovation

With Virtual Reality, students can directly interact with distant times and places, giving them greater understanding and empathy for other cultures. Many scholars and educators build virtual environments which represent historical monuments, artifacts, and social spaces. (CAA 2009; VAST 2009; VSMM 2009). Our Virtual Egyptian Temple embodies key features of temples from Egypt's Ptolemaic era (Troche 2010, Jacobson 2005). See **Appendix B “The Temple”** for the historical basis. In the digital Earth Theater, at Carnegie Museum of Natural History (CMNH) in Pittsburgh, educators conduct virtual tours of the temple which is thematically linked to the highly respected Walton Hall of Egyptology.

Unfortunately, most such virtual historical spaces are empty, silent and lonely. Lacking (virtual) people, they lack social context and much of their meaning. Their purpose is to help us understand our predecessor cultures, and therefore ourselves, which is difficult without representations of people. For example, performance and ritual of formal Egyptian religion were part of a discourse that permeated the entire culture. Priests acted out specific roles of gods, heroes, and sometimes Pharaoh himself, to ensure the spiritual balance of life. Monumental Egyptian temples, built to inspire awe, served as dramatic spaces for these performances. Most presentations of Egyptian temples do not include depictions of ritual.



The Virtual Temple and Priest in the Earth Theater at the Carnegie Museum of Natural History

We propose to stage an important religious event from the Ptolemaic Period, the Egyptian Oracle, to give audiences developing a deeper understanding of Egyptian culture. An expert puppeteer will control the temple's virtual High Priest, who will collaborate with lesser constructs, a live educator and the audience. In the role of the Egyptian public, the audience will further build their empathy for the culture. Egyptian performance and ritual were a deeply mature art form, rich in meaning, spectacular and compelling. A high degree of historical accuracy preserves these advantages and guarantees the educational value.

A live puppeteer can experiment and improvise in ways no artificial intelligence can; and as trained educators present artifacts, they can lead audience participation. See “**Appendix A: The Egyptian Oracle**” for historical references and an example of the narrative. We will stage multiple performances at

the Earth Theater (CMNH, Pittsburgh) and iteratively refine the interactions to build connections between the audience and the ancient culture. We will stage additional performances at Axiom gallery and the Puppet Showplace Theater. We will evaluate the process and its results, publish lessons learned, and distribute all our materials as freeware.

Why was performance and ritual important in ancient Egypt? The formal Egyptian temple represented a royal palace (Bell 1997, 133) and was a focus for community gatherings (McDowell 1999, 91-104) as well as being an important cultural and economic multiplier (Kemp 1989, 193-97). The temple kept the vast majority of the population at a distance from the vital daily cult rituals at its heart (Spalinger 1998), but it also *invited the participation of the general population in large open-air festivals* and provided a place for public prayer at the back wall of the sanctuary, which represented the bedroom or throne (“great seat”) of the god (Cabrol 2001, 580-1). Religious experience was based on “seeing” the god (Assmann 1996, 222-4; Spalinger 1998, 251-2;), and knowing that the temple and its staff kept a “balance” (*Maat* in Egyptian) (Gablin 2007, 337) between the human and divine. This reciprocal arrangement was personified by the king who was the transmission point between these two spheres (Hornung, 1982 138-142, 201-4). Successful balance maintained the necessities of life, including the flooding of the Nile and social stability in which everyone kept to their social station and was gainfully employed in their appropriate occupation in a harmonious and non-threatening natural environment (Assmann, 1979). See “**Appendix A: The Egyptian Oracle**” and “**Appendix B: The Temple**”.



The installation at Axiom Gallery will look like this, only larger.

How is the Proposed Work Innovative? To the best of our knowledge, this would be the first cultural heritage application to use skilled educational puppetry in a (life-sized screen) theater format.

Why is it Important? Large-scale projection and electronic puppeteering is now within reach of the arts and humanities communities. Public audiences are coming to expect virtual people in virtual spaces. Cultural scholars must master these new media or leave them to Hollywood and the game industry.

Why is it Likely to Succeed? Depictions of people in Virtual Heritage sites have successfully simulated people. Pedagogical avatars are already successful in training applications. Electronic puppetry has worked well in theater the arts (Anstey 2009). The tradition of Living Museums is a precedent for our life-sized theater approach. The technology and methods we propose are proven.

Why A Human Operator? Most applications in interactive digital fiction use some form of artificial intelligence to motivate the character (e.g. Cavazza 2007; Swartout 2006; Kenny 2007). Programming the priest to behave in a convincing way would be time consuming and costly, and would lack the sophistication and emotion that only a human operator can bring to a puppet (Ryu, 2005, 2008).

Why Not Open Source? Our project employs free modifications to UT2004 (CaveUT, Movie Sandbox) that took a long time to develop. Doing anything comparable on another platform would require great effort, beyond the scope of a start-up grant. UT2004 costs \$20 and is readily available via online retailers.

Who Will Use This? A variety of cultural institutions and fields will find this directly useful or informative. See section 4.6.

4.2 Environmental Scan

Virtual Puppetry: This field draws on a variety of established techniques introduced below. Artists have used virtual puppets, most notably the avatars employed in Anstey's (2009) interactive psychodramas. While most high-end VR environments for training employ AI-driven agents as instructors, which help live humans learn from each other through their avatars (e.g. Rickel 2000). In online virtual worlds, *everyone* is a puppeteer (SecondLife, 2010). This is an increasingly popular method of communication.

Public Shows about Egypt: Egypt is an important topic, the public loves it, and wants to interact with it. Museums have extensive and popular exhibits, and learning activities. Movies such as the IMAX *Mysteries of Egypt* and the planetarium show *Stars of the Pharaohs* draw crowds (E&S. 2004; Neibaur, 1998) Colleges, acting companies and museums recreate Egyptian ritual in standard performance venues. One example of a mixed reality presentation is the *Trésors Engloutis d'Égypte* at Grand Palais Museum in Paris as it previews the National Museum of Egyptian Civilization. The museum is under construction and contains a mix of physical objects, physical models, videos and live interaction. See "unesco.org".

Educational Theater: Theater has a long history in education. In the United States, it has been part of formal education since Ward developed her system of "Creative Drama" in the 1920s. Students learned a wide range of subjects and developed their personalities (Ward, 1957). Theater games, improvisation and role play are proven effective in fostering communication skills, problem-solving, social awareness and positive self-images, as well as in inspiring the quest for knowledge in the humanities.

Educational Theater for Culture Heritage: One of the most widely used forms of Theater in Education is reenactment of scenes from an historical time period: "An enactment may be cast in the past, the present, or the future, but happens in the "now of time." (Wilheim 2002, 8) This strategy encourages students to interact with the material challenging them to take on the viewpoint of a character. Decades of Constructivist and Situated-Cognition research (Jonassen 2000) shows that even moderate learner autonomy and activity has a positive effect, especially in a virtual environment (Winn 2003). Audience members' role as the Egyptian populace in the proposed narrative is limited but accessible and more likely to promote learning and retention than a passive show.

Living Museums: Some interactions for the priest can model those of an actor at a traditional Living Museum. Examples include Historic Williamsburg (www.history.org) and Fort Snelling in Minnesota (www.mnhs.org). The human reflex for empathy causes the audience to identify with the puppet engaging the consciousness more fully (Ryu). The public wants to see history acted out (Gillam 2005).

People in Virtual Heritage: "Virtual Heritage" is the use of electronic media to recreate culture and cultural artifacts as they might have been or interpret them as they are today (Moltenbrey, 2001; Roehl, 1997). The central element is usually a three-dimensional computer model of a person, place, or thing, especially an ancient monument, temple, home, or other social space (CAA 2009; VAST 2009; VSMM 2009). Today, most virtual heritage applications are intended for a desktop and are often web-delivered, and very few include virtual people. At a recent conference only the presentations by Fortel and Pietroni

and the one by Jacobson and Handron described the use of one or more virtual people (CAA 2009). Those applications which do include people fall into 4 categories. **(1)** Virtual people are simply there in the environment, going about their business (Ulicny, 2002). **(2)** The virtual people interact with the user in some meaningful way, using low-cost game technology (Champion, 2008a, 2008b). **(3)** In online worlds such as Second Life (2009) users represent themselves as ancient peoples and interact with each other and artificial people (Bogdanovych, 2009). **(4)** The experience is personal, as the user interacts with a single complex virtual person (Jacobson 2008; Economou 2001).

4.3 History and Duration of the Project

This project leverages several existing lines of research.

Drama and Performance in Ancient Egypt:

Robyn Gillam's undergraduate students in the Division of Humanities at York University in Toronto, perform a ritual documented in an Egyptian religious text from the Late or Graeco-Roman periods (Derchain, 1981). It is a powerful learning experience and reveals aspects of the ceremonies not easily evident in the text. An early production of the Mysteries of Osiris in the Month of Khoiak (Gillam, 2005, pp. 100-8) has been included in class at the Institute of Archaeology at University College, London. Additionally, Gillam collaborated with Christopher Innes and Jeffrey Jacobson to record student reenactments of Confirmation of Power in the New Year ceremonies, using the Virtual Egyptian Temple as a backdrop (Gillam, 2010).



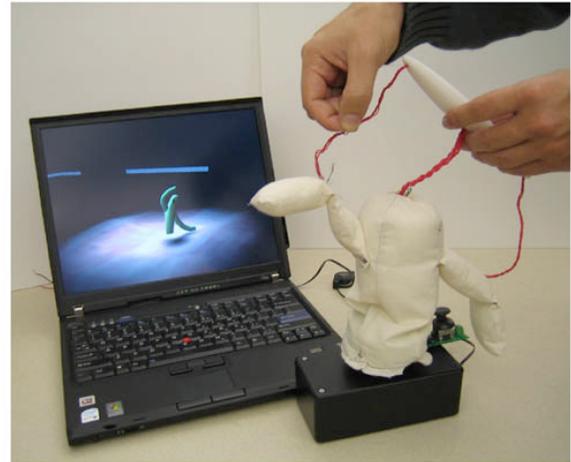
The Virtual Egyptian Temple: The temple has been a regular highlight at the CMNH's Earth Theater since 2007 (Handron, 2007, 2008). It began as part of a larger project, Interactive Ancient Egypt, in 1993 at Carnegie Mellon University. The first version was shown in The Guggenheim Soho in New York (Burgess, 1993). Since that time, it has been evolving as an open-source (free to the public) educational project (Jacobson, 2007, Jacobson 2005e, 2010), eventually becoming part of PublicVR's freeware (PublicVR, 2009). PublicVR also develops and distributes two pieces of freeware upon which this project and the temple installation depend, CaveUT and VRGL (PublicVR, 2009)(Jacobson, 2005i). Both modify Unreal Tournament so that it can display in multi-projector domes (such as the Earth Theater) and multi-screen immersive displays (CAVEs). See "**Appendix A: The Egyptian Oracle**".

Educational Research: Together, PublicVR and CMNH made the temple into a learning game for children aged 10-13. In our experiment, children who used the visually immersive dome of the Earth Theater learned more than those using a standard computer monitor (Jacobson, 2010).

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Unreal Tournament so that it can display in multi-projector domes (such as the Earth Theater) and multi-screen immersive displays (CAVEs). See “**Appendix A: The Egyptian Oracle.**”

Electronic Puppetry: We will integrate real-time puppeteering of the virtual character in the Unreal Tournament 2004. The game already gives the operator the ability to turn the avatar’s body and walk it around the environment. The puppeteer will also control its head and eye movement and trigger up to 12 individual poses/gestures, all via a standard game controller. The virtual priest will be able to point to specific parts of both the virtual and physical environment and look in the direction of individual audience members or props in the temple. We will use Movie Sandbox, a UT2004 plug-in (Kirschner, 2008) based on work at Georgia Tech’s SynLab (Nitsche, 2006; Mazalek, 2008). The software will render dialogue from the puppeteer as lip movements for the virtual character. Kirschner built similar installations for live puppeteering (“Bob Block”, 2006).



We describe the work in **Appendix C: Detailed Work Plan.**

Evaluation: With audience permission, we will videotape all performances and conduct a discussion afterward, around these questions:

- Did the audience appear to learn the most important information and ideas conveyed by the rituals?
- Did the audience develop an emotional connection with the priest and the experience as a whole? Did the experience have artistic merit? Which dramaturgical elements worked and which did not?
- What elements of the Egyptian religious performance are universal to the human experience? Would our approach work for other topics, such as other cultures?
- How does this work inform the development of artificially intelligent agents and interactive narrative? What behaviors can be programmed, and what can only be done by a human puppeteer?

Jacobson and Handron will analyze the tapes afterward, cataloguing questions asked, comments, and utterances (e.g., laughter), and where people were looking at key moments. Five randomly selected audience members take a short quiz. Innes will informally experiment with the show at York and provide detailed commentary. The results will inform our publications and follow-on projects.

Based on what we learn from this study and from the tools we develop, we will propose follow-on projects, listed here with prospective sources of funding.

- Artistic performances applying these new tools with other topics (National Endowment for the Arts).
- A project to populate the temple with priests, Egyptians, and (virtual) museum goers. We would fill it with ritual, music, and activities typical of Egypt’s Ptolemaic period. It would be a virtual Living Museum, accessible both in the museum and on the web (Institute for Museum and Library Services).
- New educational materials around the temple such as curricula for K-12 teachers, online resources, tie-ins with the Carnegie Libraries, and typical after-school activities (US Dept. of Education).

4.4 Work Plan

See Appendix C: Detailed Work Plan.

4.5 Staff

Jacobson, Jeffrey –Principal Investigator. Experimental Design, Management, Technical Integration, Evaluation, Final Report. 65 days (full time).

Handron, Kerry – Earth Theater Director (CMNH), Design for the Museum Context, K-12 Outreach, Recruiting, Management, Evaluation. Six months at 33% effort.

Gillam, Robyn – Egypt Content (e.g. Scripts) Enforcement of Historical Accuracy, General Evaluation. 20 days

Innes, Christopher –Senior Advisor/Reviewer in Dramatic Design. 12 days.

Shur, Brad –Puppeteer for performance there and at AXIOM, Interface Design.

List, Michael – Puppeteer for CMNH performances. 65 hours.

Ryu, Semi –Senior Advisor/Reviewer, Puppeteering. 4 days.

Kirschner, Friedrich – Puppet control software and hardware. 4 days

Kayser, Heidi, Supervise installation at Axiom. Recruit test audience. 4 days (total for AXIOM gallery)

Baek, John – Evaluation design and supervision. 4 days

Nitsche, Michael– Advisor, proper use of the technology for the dramaturgy, technical design. 4 days

McCallie, Ellen – CMNH, Advisor, Learning Sciences. 2 days

<**Student Interns**> - New England Institute of Art. 3D artwork and animations. Two students work a 120 hr internship at PublicVR.

<**CMNH Docents**> – Participate in performances, administer quizzes, crowd control. 50 hours.

4.6 Final Product and Dissemination

Our final product for *this* startup project will be materials that support *follow-on* studies described in section 4.3. We will report what we have learned through conferences, journals, and bulletins for history and archaeology (e.g., Computer Applications in Archaeology), educational research (e.g., AERA Proceedings), cyber-arts and performing arts (e.g., Leonardo), museums, teacher resources, and human-computer interaction design. PublicVR will distribute copies of everything through its website, including free software, design specifications, supporting educational materials and selected recordings. This will be of interest to of museums, community centers, informal learning programs, schools, academics, and public, generally. Our contribution to the humanities would be:

- (1) Using the free materials, other organizations could stage this compelling performance, which reveals aspects of Egypt the public is unlikely to see elsewhere.
- (2) Our methods and tools could be readily adapted to other cultural heritage topics.
- (3) With the increasing popularity of online virtual worlds, virtual puppeteering may become a means of mass communication. Our study would add to the body of knowledge in positive uses for new media.
- (4) Our findings and tools will support important and useful following studies.

5. Biographies

Jeffrey Jacobson

Completed his Doctorate in Information Science from the University of Pittsburgh (2008). Since 2004, he has been Director of PublicVR, a non-profit corporation dedicated to the development of freeware virtual reality for research and education, particularly for museums. He recently collaborated with Kerry Handron at the Carnegie Museum of Natural History in a learning study that produced hard evidence that middle-school children gain a learning advantage from visual immersion while playing an interactive computer game. This is a rare and important result. Dr. Jacobson has been developing live interactive tours of archaeological reconstructions since 1993, at the Carnegie Mellon University and the University of Pittsburgh, most recently through PublicVR. Museum exhibits have been at the Guggenheim (1994), DeYoung (1995/96), Gulf Coast Explorium (2007), and the Carnegie Museum of Natural History (2006-2008). Over the last sixteen years, he has been researching and publishing in the area of Virtual Reality. For more information, see www.planetjeff.net/CV.pdf

Kerry Handron

has been the director of the Earth Theater at Carnegie Museum of Natural History since 1999. It is an immersive, digital theater with a history of hosting innovative projects. She has led productions in both movie-style and live rendered productions. She is part of the NASA funded Immersive Earth Project. She is an adjunct professor with the Entertainment Technology Center at Carnegie Mellon University and has led teams investigating various interactions between audiences and computer-generated audio-visuals. She presents results from innovative projects at national and international conferences regularly. Her MS is from Rice University in Space Physics, but she has spent the last 12 years focusing on education and inspiration in museum settings.

Robyn Gillam

received an Honours B. A. from Melbourne University and studied at the Department of Egyptology at University College London between 1977 and 1981. In 1991, she gained a Doctorate in Near Eastern Studies, majoring in Egyptian Language and Literature, from the University of Toronto. Gillam is a lecturer in the Faculty of Liberal Arts and Professional Studies at York University in Toronto in the Programs of Classical and Religious Studies. She has also worked at the Royal Ontario Museum for the Egyptian Department, registering artefacts, as well as in the Schools Program and Adult Education. Gillam has also published in the field of cultural criticism. She has worked on performance-based assignments with her students in her second-year Humanities course, Egypt in the Greek and Roman Mediterranean, since 1998. Starting in 2005, she has collaborated with C.D. Innes, holder of the Canada Research Chair in Performance and Culture, in the filming of student performances of Egyptian rituals for insertion into the Virtual Temple of Horus created by PublicVR.

Christopher Innes,

holds the Canada Research Chair in Performance and Culture, and the title of Distinguished Research Professor at York University, Toronto. A Killam Fellow of the Canada Council, he is a Fellow of the Royal Society of Canada and of the Royal Society of Arts (UK). His website is www.moderndrama.com. He is author of fourteen books, which have been translated into eight different languages, and over 100 articles on various aspects of modern drama. He is also General Editor of the Cambridge "Directors in Perspective" series, Co-Editor of the "Lives of the Theatre" series, a Contributing Editor to The Cambridge Guide to World Theatre, and Co-Editor of the quarterly journal Modern Drama. He has held Fellowships at Corpus Christi College and St. John's College, Cambridge. He has been Visiting Professor at Ohtani Women's University in Osaka, Japan; at Johannes Gutenberg Universität, Mainz; at the University of Newcastle, Australia; and at Copenhagen University, Denmark.

Brad Shur

Brad Shur has been professionally involved in puppetry for nearly 10 years. He began as a performer with the Providence puppet and mask company Big Nazo while studying film and animation at the Rhode Island School of Design. He has worked in various capacities with Wood & Strings Theatre (Tennessee), and Vermont PuppetTree, and as a builder has designed and fabricated puppets for American Idol, Dollywood, and other theaters and performers from Austin, Texas to Boston, Massachusetts.

Michael List

is Program Specialist for Science on Stage with the Carnegie Museum of Natural History. He has 13 years experience in children's theater with the museum. In those years, he has written nine scripts, directed all the shows, and performed all the offerings in the museum's Science on Stage program. He also has experience in puppeteering, incorporating it into the museum shows and other areas of theater. He has been an actor for 27 years, in everything from musicals to dramas, and has performed as a mime for 3 years. He has a degree from Duquesne University in Speech, Communication, and Theater with a minor in Music. He also has a second degree in Elementary Education from California University of Pennsylvania.

Semi Ryu

is an associate professor in Kinetic Imaging at Virginia Commonwealth University, USA. She received her MFA from Carnegie Mellon University and her BFA from the Korean National University of Arts and is currently a Doctoral candidate at Planetary Collegium, CAIIA-hub, Plymouth, UK, exploring Virtual puppetry informed by Korean shamanism. Her works started from experimental 3-D animations, with the subject of interactivity in Korean shaman ritual and oral tradition of storytelling. Her animations have been widely presented in more than 15 countries, such as "Annecy Animation festival, France," "Transmediale, Germany," "Netmage, Italy," "Videobrasil, Brasil," "ISEA 2002, Japan," "SIGGRAPH 99 & 2001," and recently featured on StreamingMuseum.org, organized by Chelsea Art Museum, NYC. Her animation won numerous awards, including "The Best Young Animated Film Award" at 11th International Festival of Animated Film, Stuttgart, Germany, which is the second largest event of its kind. Her interest about interactivity has been continued in her critical view of interactive media and virtual interactive puppet performance, presented internationally in Vancouver, Zurich, Amsterdam, Milan, Beijing, Montreal, Madrid, Berlin and other locations. Her talks and papers have been frequently invited by international conferences and publications. One of her papers, "Ritualizing Interactive Media," was mentioned as being of exceptional quality in Leonardo review (MIT press, 2005) and published in Technoetic Arts 3.2, Bristol, UK. Since 2004, Multimedia lab, University of Rome, Italy, has collaborated with her for her ongoing virtual puppetry projects. Her recent collaborations are the "Experimental Virtual Wayang" project, combining Virtual and traditional shadow puppetry, performed by Gusti Sudarta, a shadow puppet master from Bali; "Parting on Z," integrated with Korean traditional oral storytelling performance; and "Pansori", performed at Chelsea Art Museum, NYC, May 27, 2009. For more information, see <http://www.semiryu.net/>

Friedrich Kirschner

is a filmmaker, visual artist and software developer. He re-purposes computer games and real-time animation technology to create animated narratives and interactive performances. His work has been shown at various international animation festivals and exhibitions, including the Laboral Gameworld exhibit in Gijon, the American Museum of the Moving Image in New York, the Ottawa international Animation festival, and the Seoul Media Art Biennale. He is currently an independent researcher and the director of the Machinima Film fest in New York.

Dr. John Baek

is an Assistant Professor of Free-Choice Learning in Science and Mathematics Education at Oregon State University (OSU). At OSU he develops and teaches online graduate courses in free-choice learning and

educational research for informal science educators around the country. He is a researcher and evaluator on numerous federally-funded informal science education proposals. His research efforts focus on how technology-enabled communities can impact the public scientific literacy through improved programs, exhibits, and media. <http://smed.science.oregonstate.edu/node/114>

Heidi Kayser

is a multimedia artist/musician, a curator, and the founder of both the Axiom Center for New and Experimental Media in Jamaica Plain, MA, and the newly formed Art Technology New England Consortium, a project of the Massachusetts Cultural Council's Adams Fund for Creative Economy Development. A graduate of the Massachusetts College of Art's Studio for Interrelated Media, Ms. Kayser also completed coursework at Boston University in the Graduate Viola Performance Studio, as well as pre-medical studies. She has exhibited at the Artists Foundation Gallery, Midway Studios, Art Interactive, the Godine Gallery, and the 2005 Boston CyberArts Festival, among other spaces. Heidi received an Urban Arts Public Art Grant in 2005 and the Jurors Award for the 2004 MassArt All School Show. Ms. Kayser has juried, facilitated and curated exhibitions for 5 years at Axiom, as well as Northeastern University, 119 Gallery, and Massachusetts College of Art. She has been a MassArt All School Show judge and a Portfolio Reviewer at the Photographic Resource Center.

Michael Nitsche

is an Assistant Professor at the School of Literature, Communication, and Culture at the Georgia Institute of Technology where he teaches courses on virtual environments and digital moving images. Michael heads the Digital World and Image Group, which works on the design, use, and production of virtual spaces, Machinima, and the borderlines between games, film, and performance. His work combines theoretical analysis and practical experiments and his collaborations include work with the National Film and Television School in London, Sony Computer Entertainment Europe, Turner Broadcasting, Alcatel Lucent, and others. He is author of *Video Game Spaces: Image, Play, and Structure in 3-D Worlds* (MIT Press 2008), and has published on game studies, virtual worlds, digital performance, games and film, and machinima in numerous publications. In a former life he was co-author for a commercial videogame, professional improvisational actor, and dramaturgist. See: <http://www.lcc.gatech.edu/~nitsche/>.

Ellen McCallie

is Deputy Director of CMNH and earned a Ph.D. from the Center for Informal Learning and Schools at King's College, London. She earned a M.Ed. at the Center for Inquiry for Science Teaching and Learning at Washington University. She served as an evaluator for the Dana Centre and Darwin Centre in London, and is currently on the board of the Visitors Studies Association. She reviews for several journals and has published widely on topics of engaging the public in dialogue in a museum setting.

<Art Institute of New England Interns>

Every academic semester, we get to three interns from the Art Institute of New England who need to work 120 hours to complete their bachelors degree in three-dimensional computer art and animation. They are trained for the game industry, and they have done well on our projects, in part because we tend to get the best and brightest. They will create animations (movements) for the priest, the boat shrine, and all needed accessories.

Appendix A: The Egyptian Oracle

We base the proposed interactive narrative on the Egyptian tradition of the public oracle. One could describe the oracle as direct communication from a divine being to a human in a controlled setting, generally in answer to a question, and it is well known in many cultures. There is little evidence for direct communication between gods and people for the earlier periods of Egyptian history (Baines and Parkinson 1997). It is best documented in the New Kingdom through the Late Period (1500-432 BCE) (Černý 1962; Kákósy 1980).

Although the central cult ritual of formal Egyptian religion took place in secret, in the sanctuary of the temple, with only initiated male priests or the king in attendance (Moret 1902, Alliot 1954 14-16, Spalinger 1998), a special image for processional purposes (Sauneron, 1962, 119ff.) allowed the god to interact with humanity in a more open fashion. All Egyptian temples, whatever their size, had a number of festivals, mostly connected with the agricultural year (Spalinger 2000). At these times this processional image would be placed in a boat-shaped shrine (boats were the main form of transport in this riverine culture) (Meeks and Favard-Meeks 1993, 82-83; Gillam 2005, 58, 77-8) The shrine would then be carried on the shoulders of highly privileged laymen or priests (Černý 1962, 36) around the halls and outdoor spaces of the temple, along purposely built processional ways (Chabrol 2001), along main thoroughfares, or even on boats on the river Nile (Murnane 1980). This was the one chance most people had to “see” the god (Assmann 1996, 222-4), that is, to have a direct religious experience. A large number of historical documents also show that it was a time when they could actually confront the god with questions (Černý 1962; Kákósy 1980), or, more rarely, the deity could actually intervene, sometimes dramatically, in human affairs (Kruchten 1986). This form of oracular communication continued throughout the Graeco-Roman period (Dunand 1997; Coulon 2001) and later, when Christianity (4th century CE and later) adapted it to its own purposes (Černý 1962, 47-48).

Oracular communication with the god could take place at the highest level of politics and society to validate a king or high priest (Černý 1962, 35-8; Römer, 1994) or in a village setting, where a corrupt official or thief could be confronted publically (Černý 1962, 40-43; McDowell 1999, 109; 174). Wishes for the health and safety of newborn children were also blessed by the god (Černý 1962, 43; Edwards 1960).

The mechanism of the oracle was not verbal but physical, through the motion of the boat shrine that the god created through the involuntary movements of those carrying it (Černý 1962, 43-5). By the late New Kingdom, there existed a terminology to describe and interpret these movements of the god (Černý 1962, 43-4; Kruchten 1997). According to one of the simpler interpretations, the god expressed a positive reaction by moving forward, and a negative one by going backward. The god could also express choice by moving toward particular people or places or in particular directions. The god could also show a preference for one written document instead of another or could react to an item in a list (Černý, 1962, 43-5). In the earlier part of the first millennium BCE, divine oracles became a significant source of legal authority, especially with respect to wills and bequests (Kákósy 1980, 601-2; Römer 1994).

The best known oracle is that of Amun-Re, the “King of the Gods” and master of the great temple at Karnak, near modern Luxor in southern Egypt (Kákósy 1980, 602; Nims 1965, 69-105). The rulers of the 18th Dynasty came from his city, Waset (Greek, Thebes) and he was credited with making Egypt an imperial power. Great wealth from foreign conquests flowed into his temple making possible its magnificent processional ways and great festivals (Assmann 1996, 202-3). Amun-Re appeared in procession in a model boat of which the cabin was the shrine for his image. However, the actual statue remained invisible behind a veil that enveloped the shrine, although the model boat and shrine were covered with images of Amun and the other gods (Černý, 1962, 36). Oracular pronouncements were

encouraged at special stopping places where the boat rested in an open kiosk, on a plinth (Gillam 2005, 83), or on “the floor of silver,” a special location within the precincts of the temple (Kruchten 1986, 325-6; Cabrol 200, 483-7). However, it was not unheard of for petitioners to unexpectedly approach the god (Gillam 2005, 82) or for the deity to depart from the expected route or script (Kruchten 1986). There is a standard format for the exchange between the oracle and petitioner. The petitioner submitted written petitions to the priests, and many petitions from the Graeco-Roman period still exist (Kákósy 1980, 600-1; McDowell 1999, 117-1, 174-5). Depictions of the oracle generally show petitioners approaching the god with arms upraised, as he is conducted on his way by a high-ranking priest (Černý 1962, 42).

Although Amun-Re has the best documented oracle, others for many other gods are known (Kákósy 1980, 602-4). Although the existence of hollowed statues and concealed chambers from the Graeco-Roman Period shows that the Greek preference for spoken oracles had some influence (Kákósy 1980, 600-1; Bianchi 1998), the existence of many written petitions show the older format remained popular (Černý 1962, 47-8).

Sample Narrative

The interactive “show” will contain a variety of interactions between the educator, puppet, and audience in and around the temple. The following is an **example**.

In front of the temple, the educator invites the audience members to think of themselves as ancient Egyptians coming to the temple on a festival day. They are awaiting the god of the temple, in his role as divine oracle who reveals their fortunes.

The doors of the temple swing open and the god processes across the courtyard. Carried by four priests (bots), his magnificent boat shrine is adorned with gold and semi-precious stones and covered with small statues of him and his heavenly entourage. It is decorated with flowers, green foliage and ostrich plumes, which move to indicate the divine presence. Under a canopy in the center of the model boat stands the shrine enveloped in many layers of the finest semi-transparent linen. The high priest leads the god in procession, purifying the air around him by burning frankincense and myrrh.

The procession nears the audience, then stops when the priest gives a signal. The educator introduces the priest avatar.

Priest Avatar: “Welcome to the temple, on this most auspicious day. Let us discuss what you wish to ask the great god, Horus.”

The educator guides the audience in choosing types of questions, including the teacher if it is a school group. The Priest confirms which questions are appropriate, and chooses the first person to ask a question.



The Barque of Khonsu from Medinet Habu (Chicago 1930). The ceremonial boat with the divine image in its shrine will look something like this.

Audience member: “Is this a good time to marry?”

The god’s model boat and the priests carrying it step forward in response to the question.

Priest Avatar: “Yes, by moving forward, Horus says this is a good time to marry.”

Further questions are presented with the Priest Avatar sharing the meaning of the moving boat, and perhaps other discussion. If a student asks an inappropriate question, the god will do nothing, indicating that it is not a good question, which the Priest Avatar will make clear. When the allotted time is past, the procession goes back into the temple.

Before or after this, the audience may see the inside of the temple, depending on the overall narrative.

The Priest and audience continue their discussion about Horus giving Pharaoh the power to defeat the enemies of ancient Egypt. The interaction ends with the educator bidding adieu to the Priest and further exploring the virtual temple where further connections await.

7. Appendix B: The Temple

Ancient Egyptian temples were constructed as divine microcosms and their architectural forms were representations of the cosmos (Wilkinson 2000, 57-65). Their purpose was to protect and house the god’s statue in which its life force was embodied. Through ritualized performance, Egyptian priests provided the god’s life forces (the *ka* and *ba*) with sustenance, clothes and a purified living space (Sauneron 2000, 76-98). Although these measures were demanded in order for the god to continue its life within the statue, it was also a means of appeasing the god and attaining *Maat*. *Maat* is the most important universal force in ancient Egypt. It can be translated as justice or truth, but also refers more generally to the cosmic balance between good (*Maat*) and evil (*isfet*) (Sauneron 2000, 28-9). The primary responsibility of Egyptian priests was to protect this delicate balance through a series of rituals and festivals which engage the temple as a main actor (Sauneron 2000, 75-91). The temple’s explicit differentiation of space, every architectural element, and each inscription were consciously planned and formulated to provide a sacred place for rituals and festivals (Dunand 2004, 86-87).

The virtual temple appears as a coherent entity rather than a decontextualized collection of images and artifacts. For example, the student experiences changes in light, space and structure while moving along the temple’s axis, ascending to the *holiest of holies* – the sanctuary of the divine statue. As a (virtual) occupant of the architectural space, the observer can see the structural features, inscriptions, and depictions in their proper alignment and context.

Any form of reconstruction demands educated guesswork. Because the temple is reconstructed in a virtual space, we can change the temple to reflect developing ideas within the academic field and adjust to diverse instructional approaches. Uniquely, the Virtual Egyptian Temple does not represent any real temple, but is an *exemplar* (Barsalou 1992, 28). This allows the virtual reconstruction to be unrestricted by site-specific limitations (like the lack of a complete and well documented excavation, or the idiosyncrasies of a specific temple which may not be characteristic of the whole). The Virtual Egyptian temple, thus, is able to embody the typical forms and constructions of a Ptolemaic period temple dating to 305 BCE to 30 BCE. Its intentional simplicity emphasizes only those elements which are characteristic of the era, which allows the temple to best support educational narratives.

The temple has the classic ordered layout: Pylon, Courtyard, Hypostyle Hall, finally Sanctuary (Arnold 1992, 29-35; Fairman 1954, 168-71). The areas are accessible by a series of doorways or portals, each one

leading to a higher and holier space (Bell 1997,133-4), which were accessible only to priests who were physically and morally pure (Alliot 1954, 181-5; Gee 2004). At a later period, women and foreigners were explicitly excluded from the temple (Sauneron 1962, 319-20; Thiers 1995). The shrine of the god in the central sanctuary or “great seat” (Goyon 1972, 19ff.) was the literal horizon (Blackman and Fairman, 1941) or “vanishing point” between vernacular and cosmic existence. When a prophet, the highest grade of priest was introduced to the god he (men only in theory) (Alliot 1954, 14-16, 146,n.4; 163.n.1; Gillam 2009) would directly cross this point and experience reality as it really was, actually seeing the gods (Kruchten 1989, 23,37-8,62-3,81-2). If the priests, standing in for the king, performed the rites for the gods correctly (according to *Maat*), feeding and clothing the image, in which the divine spirit chose to alight (Blackman and Fairman, 1941; Meeks and Favard-Meeks 1996,126-7) , the god would, in the spirit of reciprocity (Derchain 1965, 115ff.), provide for the land of Egypt and the blessings of heaven would flow to the land of Egypt.

The Virtual Egyptian Temple is free to the public for all purposes, as long as the project is properly credited. For more information, go to <http://publicvr.org>.

Appendix C: Detailed Work Plan

September

Conduct initial orientation and scheduling meeting in Pittsburgh. Assign tasks. Allocate resources. Establish communication and review protocols. Define requirements.

September (second half) and November

Develop the narratives. Each part of each narrative will go through the following steps several times. This is a cycle not a production line.

1. Robin Gillam provides workable rituals and performances,
2. Kerry Handron establishes the initial dialogue,
3. Gillam adjusts the priest’s dialogue and other aspects to be historically appropriate.
4. Jacobson chronicles the emerging dramaturgy.
5. Innes, Ryu, Kirschner, McCallie, and Nitsche review. Final acceptance by Gillam required.
6. Interns from the Art Institute of New England learn the software platform we are using, and fashion the props needed for the narratives.

November and December

The following tasks can begin once the basic requirements for the narratives are established.

- Kirschner programs the puppet control interface, with testing and support from Jacobson. Review by Nitsche
- Interns create the animations required for the High Priest and other constructs, such as lesser ranking priests. Kirschner connects these animations to the software as they are produced.
- Jacobson assists Innes in establishing a minimal installation at York University, so he can review its function and effectiveness.
- Gillam and Troche review everything for historical accuracy.

January

Test and debug everything, with many trial runs. Jacobson and Handron will chronicle the process to capture lessons learned. Informally, hold private showings for experts who may have useful input.

Early February

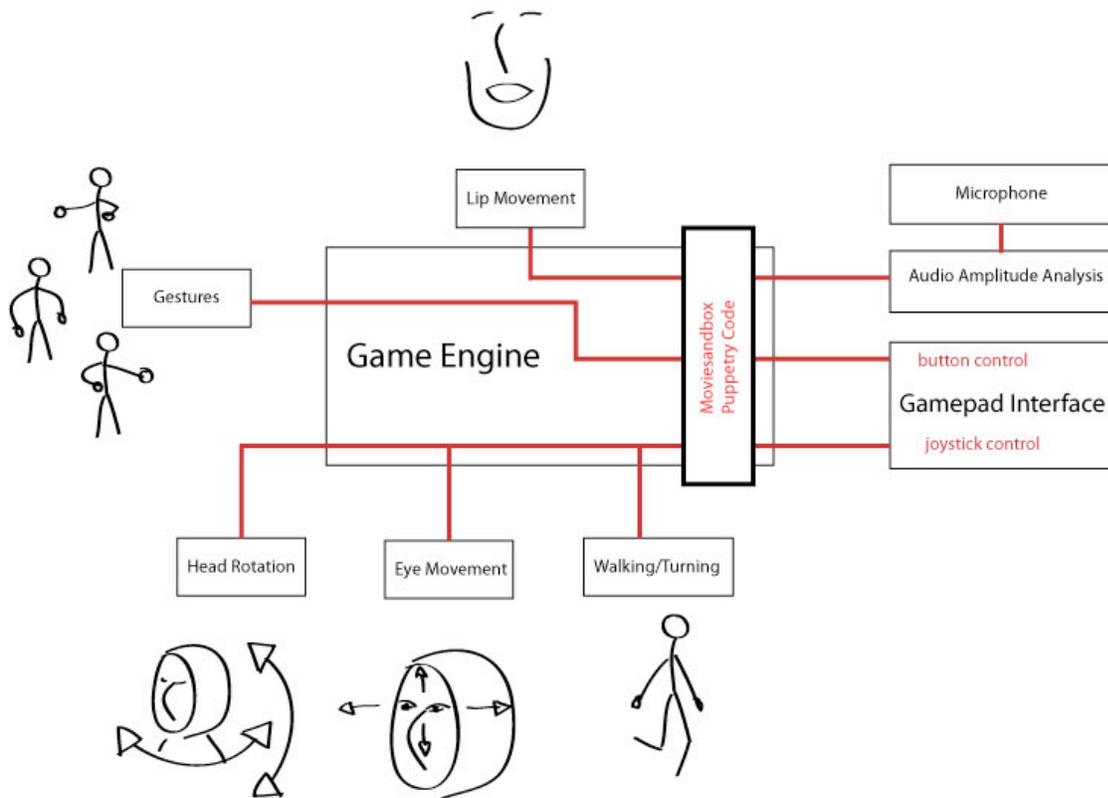
- Multiple performances at the Earth Theater (CMNH), One performance, each, at Axiom gallery and Puppet Showplace Theater. Jacobson and Handron collect data for evaluation.
- Gillam evaluates the historical accuracy of the performances.
- Innes and Ryu evaluate the theatrical effectiveness of the performances.

March

- Jacobson and Handron analyze data with Baek’s guidance. Everyone else has input.
- Package and document software for distribution: Kirschner, Jacobson.
- Prepare final report: Jacobson, Handron, Gillam. Review by Innes, Ryu, Nitsche, and Baek.

Afterward (up to one year)

- Project members will publish the results in their respective disciplines. Jacobson and Handron will have primary responsibility for sending out general notices.
- Jacobson will have final responsibility for making sure that the results of the project are disseminated as promised.
- PublicVR will use internal funds to support some of the publication related activities.
- PublicVR will provide a website from which to download project results and materials in a way that is clear and understandable to the public.



Technical map of the system

Appendix D: Bibliography

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