

## THE CITADEL OF NIMRUD, IRAQ: A VIRTUAL REALITY INTERACTIVE MODEL AS A RESOURCE FOR WORLD HERITAGE PRESERVATION<sup>1</sup>

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ABSTRACT

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A virtual reality reconstruction of the citadel at Nimrud (ancient Calah), Iraq, originally constructed by the late Assyrian King, Ashurnasirpal II (9th c. BC), with his palace and has now expanded to the Central Palace of Tiglath-pileser III (8th c. BC). Excavated by A. H. Layard 153 years ago, it continues to be researched by the British, Italians, Iraqis and Poles. Evidence of its ancient occupation is detailed enough to embark on a full-scale interactive VR model, working across the citadel, incorporating the evidence from all excavations. The models are being developed in a PC version at Learning Sites, Inc. (Williamstown, Massachusetts: <http://www.learningsites.com>) and a supercomputer model for Immersadesk™ and CAVE™ at the Center for Computational Research (University at Buffalo: <http://www.classics.buffalo.edu/projects>). The latter will be available for distance learning across Internet II. The finished models will be excellent tools that can be used to support claims for Cultural Heritage: monuments from Nimrud have been dispersed to dozens of museums and private collections in the last 150 years, and have been robbed further in recent decades.

Since 1998, I (S.M. Paley) have been the principal investigator of a virtual reality reconstruction of the citadel of Nimrud (ancient Kalhu/Calah), Iraq at the University at Buffalo's Virtual Reality Laboratory, Department of Mechanical and Aerospace Engineering and at Learning Sites Inc. in Williamstown, Massachusetts. UB and LSInc. are collaborating in the preparation of interactive VR models, together with a portfolio of 3D images for scholarly publication and education and public interest. Models are being built that can be used for distance learning among institutions with Immersadesk™ and CAVE™ technology and a PC version, for individual and classroom use.<sup>2</sup>

Ancient Nimrud is east of the present course of the Tigris River and north of the Tigris' intersection with the Greater Zab River. King Ashurnasirpal II (883-859 BC) founded its citadel on a ridge near the edge of the Tigris flood plain. The rest of the city was laid out to the east and north. Today there are rolling farmlands, partly in the flood plain and partly to the east. When the Tigris is within its banks, the land is fed by rain and canal water. The king planned palaces and temples on the site but, in his lifetime, never finished all that he planned. Successors added their own royal and religious buildings, rebuilding and re-designing the citadel as needed.

The evidence of ancient occupation on the site is detailed enough for us to build an interactive VR model. Because of the deteriorating state of preservation and looting of the archaeological site as a result of sanctions and the second and third Gulf wars in 1991-2 and 2003, we think that one of the main resources for the preservation of the memory of Nimrud is a VR reconstruction with proper scholarly documentation available on the World Wide Web. Digital records and VR can both document the state of preservation and conservation at different periods of the site's modern history and the recovery of stolen objects from it. They can contribute to the future

history of the site by creating a resource for study of the history and culture of this ancient Assyrian capital as well as help plan for the reinstitution of the site as a museum so that scholars could visit and continue excavation and tourists can visit. All this can be made possible by publishing all material in one digital place. Iraqi permission for this plan has been in part made possible by the inclusion of the site of Nimrud, with Nineveh, in 2002, on the World Monuments Watch's list of 100 most endangered world historical sites. A VR model for study with appropriate documentation would be a useful introduction, especially to such a large site: 200 hectares. The finished VR model and documentation will be used to support claims for cultural heritage preservation and conservation.

We began the project with Ashurnasirpal's palace, one of the best-preserved monuments on the site. We have over 150 years of various kinds of documentation for this building. We are expanding to include the temple area north of the palace and the area south of it, where two other buildings, one of Ashurnasirpal and one of his son, Shalmaneser III (late 9th c. BC), were found, and where the northern part of the very much destroyed palace of King Tiglath-pileser III (8th c. BC) was located. The web pages are organized to include the VR models with the reasoning behind the model's structures, the history of the excavations, and photographic documentation of the excavation, conservation, and the present state of preservation.

Nimrud is also a site from which, for over the last 150 or more years, cultural heritage has been dispersed to more than 75 museums and private collections across the world, not including what survives in the museums of Iraq, the site museum at Nimrud itself, and any stolen pieces, whose whereabouts are unknown. Digital documentation is one rather inexpensive way to document the site as it now exists and as

## Virtual Reality

we know it from excavation records, collect the material that has been taken from the site over time and bring everything into one virtual place so that the citadel's monuments can be studied as close to the "whole" as discovered by the archaeologists who excavated it. Also, broken monuments can be restored digitally to approximate the way they were found and with good scholarly surmise even reconstruct their original state. In the event of a solution to the present situation in Iraq, this information can help in the restoration and conservation of what survives and even become part of the exposition of the monument at the local site museum when tourists return. For people who would never have the chance to visit the site or never could, a virtual model would present to them as near a real experience as they would ever have. And students would have a rich resource to use in learning about the archaeology of Assyria.

Archaeological reconstruction is needed for nearly every building on the site. Just figuring out the physical relationships among the rooms of the Great Northern Courtyard of Ashurnasirpal's palace, the city and citadel wall and the temple area on the northwestern corner of the site is full of problems as the excavation publications differ in their various iterations. Talk about the need for good data. Scholarly surmise about the various reconstructions present us with formidable choices and difficult decisions to be made among them. The plan of a building may differ; the place of a road or street may alter. And yet we must make some decisions or our project cannot go on and its benefits, with all the caveats, will not be realized.

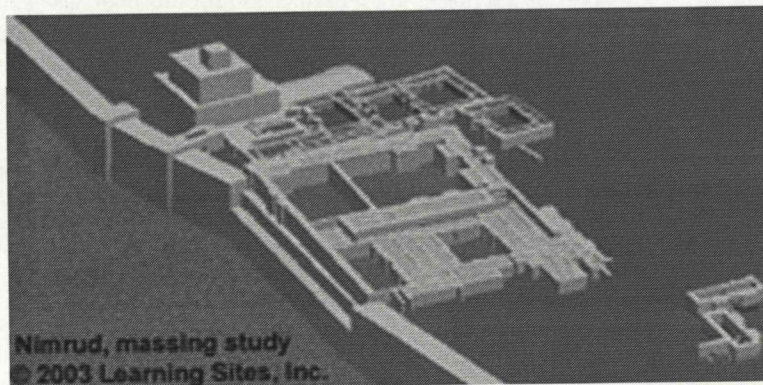


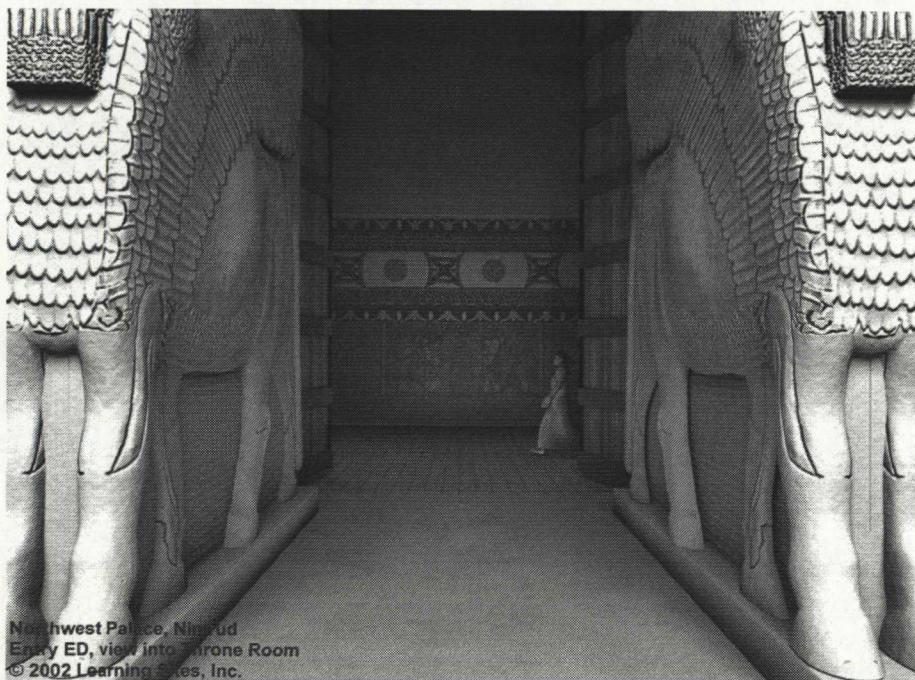
Figure 1 (Paley01\_LSIInc\_Nimrud\_massing-test\_032703.jpg) Massing model of part of the Nimrud citadel, created by Learning Sites for study of the relationships among the many buildings at the northern end of the site; image copyright 2003 by Learning Sites, Inc; reproduced with permission

Looking at a model (Fig.1) of the northwestern corner of the Nimrud citadel, we are again reminded of the problems of reconciling the data, as the widths of the city wall and the heights of the palace floor paving, temple tower, temple floor paving and palace and temple walls become relevant. We must be and are sensitized to the problems of reconstructing an archaeological site in VR and not only because we must, from time to time, make informed guesses. We agree with other scholars that we have only a part of the story and that we are making our own interpretations. And we must also deal with and be cognizant of what has been said many times, recently by Alexander Stille, about the field of archaeology and ancient studies that "...our vision of the 'past' is heavily

conditioned and distorted by what monuments happen to have survived the ravages of time."

If anything, digital archaeology and VR reconstruction can provide the means to collect and study vast amounts of data and organize material that can be retrieved and presented in ways that provide us with new possibilities to see, interpret and present. As information is added and opinions change, the VR model can be easily corrected and new data added to the database. New ways of seeing and interpreting the relationship between architecture and design in the Northwest Palace come as a result of customized research made available because it is possible to "walk" around the VR model quite freely. Standing outside doorways (Fig.2) and looking into the various rooms of the palace or stopping in doorways and looking around, or standing where the king or his courtiers or the representatives of foreign countries might have stood during the various ceremonies associated with the audience halls in the various wings of the official part of the palace, can elucidate the ways the architect/builder-contractor of the palace and the designer of the bas-relief must have worked together to arrive at their creative decisions. A room had to be so wide, the sculptures on the bas-relief arranged on the stone slabs in specific positions, the doorways so deep. It stands to reason that the position of the central doorway, which has been reconstructed from scholarly surmise and some evidence on the ground - mud brick traces, fragments of the doorway figures, parts of the threshold construction - and its relationship to the position of the images of the king across from it, behind the throne and in adjacent rooms, was at least in part the focus of the design of the whole throne room complex. These choices of place must have been part of the decisions made by artist and architect/builder as part of the planning, when they made other choices like that of the nature of the image of the king, which we know were presented for royal approval. It is implied in the claims by the king that he built the palaces. This sort of research is made easier and can be tested with VR.

Of course, the possibilities of new insights into the meaning of the palaces and the temples in the course of the reconstruction of the citadel in VR cannot be predicted. However, preservation through digital documentation of the existing remains can not only give us a picture of the current state of the ruins, but can also document all known phases in the building's history, and thus can be a major resource for new research. Maybe the only way to correlate the vast amounts of data in meaningful ways for retrieval, analysis, and teaching, is digitally, allowing customized research or collaboration on the web among scholars at different web portals in immersive virtual re-creations of the site. There are also traditional distance education possibilities and certainly localized classroom uses. In the virtual environment, a student or scholar could do things like take measurements or change or manipulate the world for personal research, just as if one was at the site in different phases of its occupation and deterioration. Exposition in both conventional and site museum settings is possible. Links between various VR methods and the heritage preservation/documentation of the



Northwest Palace, Nimrud  
Entry ED, view into Throne Room  
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Figure 2 (Paley02\_LSInc\_NWP\_Entry-ED-to-B13.jpg) Rendering from the Learning Sites virtual reality model of the Northwest Palace, Nimrud, showing the view from the Great Northern Courtyard through the main central doorway into the Throne Room, toward Relief B-13; Image copyright 2002 Learning Sites, Inc; reproduced with permission

place that allow different kinds of investigation and learning opportunities are limitless. Perhaps this "brilliant new technology", as Stille has called it, will enhance the study of antiquity and make us more informed than we ever have been before.

There are many reasons why a project like this is important for world heritage at the present moment in our history. As I stated a moment ago, because of the political and military situation in Iraq today, it is nearly impossible to maintain - both police and conserve - all the archaeological sites in Iraq sufficiently well to preserve very many of them. Alexander

Stille's recent work on the presentation of the past is fair warning of the many dangers to archaeological sites. Speaking of Egypt, he writes:

*We are faced with a dramatic paradox: soon we may have virtual realities of the tombs of the Valley of the Kings in classrooms all around the world-a genuine democratic advance-but the tombs themselves, most of which looked almost new when they were discovered in the late nineteenth and early twentieth century, may no longer exist.*

We hope of course that VR will not be the only way to remember Nimrud

<sup>1</sup> A full bibliography can be found in the CD-ROM version of this paper.

<sup>2</sup> There are several colleagues involved in this project under my direction: Dr. Donald Sanders, President of Learning Sites, Inc.; Richard Sobolewski, architect and "Second Director" of the Polish excavations at Nimrud from 1974-76; Professor Thenkurussi Kesavadas, Director of the University at Buffalo Virtual Reality Lab and his graduate assistant, Mr. Youngseok Kim; Professor Alison Snyder, Department of Architecture, University of Oregon; Professor Stuart Shapiro, Department of Computer Engineering, University at Buffalo, a specialist in natural language interface; Dr. Julian Reade, British Museum (ret.) for the painted decorations that accompanied the bas-relief; and Dr. Elizabeth Hendrix, Materials Research Laboratory at the Massachusetts Institute of Technology, a specialist on paint and painted stone. For this paper Mr. Mark Altaweel, a graduate student in Archaeology at the Oriental Institute of the University of Chicago, has provided GIS data for the preparation of the terrain maps around Nimrud, rendered by Learning Sites. We hope that we can add to the list of contributors as funding grows.

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