The papers in this session reveal a growing concern with our ability to share complex cultural heritage information in digital form. But what about the vast quantities of information held by museums and institutions that lack the technical, material, and financial resources to share them in a virtual environment? If we are agreed that we should be working together to increase the amount of information about cultural heritage resources available to a broad public over the internet, we must also consider how we may include participants outside or at the periphery of the first world. In many cases, museums and cultural-heritage institutions in this category have both the desire and the human resources to present their holdings digitally -- but they lack the means to sustain programs of digital data collection and the computing power necessary to present complex documentation over the web.

[map] Over the course of a 17-year collaboration with the National Preserve of Tauric Chersonesos at the Greek, Roman, and Byzantine site of Chersonesos in Crimea, Ukraine, the Institute of Classical Archaeology of the University of Texas at Austin has sought sustainable solutions for this problem. [walls] The site includes a 40-hectare urban core, occupied continuously for almost 2000 years, and a 10000 hectare rural landscape divided into regular lots by the Greek residents of the city in the 4th or early 3rd century BC. [divisions] Thanks to the modern history of Sevastopol, both the urban center and the rural landscape remained largely undisturbed in the modern period.

Despite a long tradition of archaeological research, information from Chersonesos remained largely inaccessible to Western scholars for most of the 20th century. [stelai] One of the earliest goals of the joint project was to present some of this material to a broader scholarly audience. When the project began to receive the generous support of
the Packard Humanities Institute in 2000, we were able to expand its focus to the
digitization of some of the rare and delicate holdings of the Preserve's library and
archives. This initiative, dubbed the Megarika project, has proceeded since then under the
direction of librarian Lucy Grinenko, and now boasts a small but highly competent team
of programmers and web developers. It has recently begun to implement a more
ambiguous program of web dissemination, using as its infrastructure a database system
designed to manage the Preserve's material and documentary collections.

Despite this record of achievement, the Preserve's digitization program has never
been self-sustaining, and has relied on the ongoing support of PHI and the provision of
high-tech equipment by ICA. The Ukrainian state has not yet made a commitment to fund
the Preserve's digital infrastructure. So the will to digitize and share the Preserve's vast
collections and the human resources to do it are in place -- but the money is not. To make
a lasting documentation and dissemination strategy viable, we have had to seek solutions
that rely more on people than on equipment, and more on freely-available or open-source
software than on processor-intensive proprietary tools.

As the collaboration between ICA and the Preserve matured, we began to look for
ways in which we could transfer lightweight, sustainable documentation technologies that
could actually be put into practice with or without our help. [requirements] There were
very particular requirements for such technologies: they had to function without
complicated and expensive equipment, they had to be adaptable in difficult conditions
(the Preserve's electrical supply, for example, is erratic, sometimes surging and
sometimes going out altogether), and they could not rely on the newest and fastest
computer equipment, which we could neither provide nor support. Finally, it had to be


possible for local participants to be fully trained in these technologies and carry them out on their own without assistance.

A few years ago, the stars began to converge. As a result of a CAA encounter, ICA made contact with Cultural Heritage Imaging, a California non-profit dedicated to the use of innovative photographic and digital techniques to capture and share information about cultural heritage. Working with Tom Malzbender from HP Labs, CHI had invented an inexpensive, lightweight approach to the production of Reflectance Transformation Images (RTIs) -- still, 2D images in which the light source direction can be changed interactively and continuously by the user. This dynamic interplay of light and shadow enables the user to perceive the true 3D surface features of the depicted object. At the same time, several of our own collaborators had already been experimenting with photographic documentation techniques, and the time seemed right to plan a collaborative project.

In the summer of 2007, UT Historic Preservation student Sarah Duffy, with CHI's support, carried out some preliminary investigations of the suitability of CHI's Reflectance Transformation Imaging techniques for material at Chersonesos. She also administered a survey to students, scholars, and Preserve staff to gauge their interest in the technique. The results were promising enough that ICA, with the generous support of PHI, invited CHI to Chersonesos in the summer of 2008 to carry out a two-week workshop for a group of Preserve staff, ICA collaborators, and students from Sevastopol, Kyiv, and Lviv. The results, we feel, demonstrate the great potential of this methodology for sustainable programs of cultural-heritage documentation, carried out at low cost by engaged and empowered local participants.
CHI will discuss the technical details of this technique Wednesday morning at 9:30am and in a workshop Thursday morning at 8:30 for those who are interested, so I will not repeat them here. [setup and gem] On the most basic level, the method involves the capture of a series of photographs of the same object with a lightsource at a fixed distance but in different positions. A highlight on a reflective ball placed in the frame allows a free software program to calculate the position of the light source in each image, and a second free program uses this information to build a normal map of the imaged object, capturing its 3D surface shape in a way that permits each pixel to display all its possible lighting values.

This technique met the requirements for sustainability at Chersonesos, since it relied on equipment of moderate cost (an entire kit, including camera, cost around $3000) and freely available software that could be downloaded from CHI's website. It is also a very flexible technique, in that the equipment can be set up in various locations and configurations without difficulty, [gem and oath] and it can be used to capture information from objects ranging in size from a few millimeters to more than two meters (here, the largest and smallest objects documented by the workshop at the Preserve). Finally, it is particularly well-suited to web-based dissemination, since the resulting files can be sized for easy download and free viewers are available (more on this in the session tomorrow).

The goal of the workshop was to transfer knowledge, software, and the basic kit to the Preserve staff, to the point where they became able to create such images independently with equipment on hand. An unspoken goal, of course, was also to transmit enough excitement about the possibilities the technique offered that the local
participants would be inspired to capture this information and share it with the public through the web. [animated map] By including students from several different Ukrainian universities, we also hoped that knowledge of the technique could be distributed more widely across Ukraine.

The objects on which the workshop focused were selected to present a range of sizes, types, and reflectivity properties. [stelai and sarah] Some of these objects were portable and some not; some were horizontal and some were vertical; and several stelai were in awkward positions for photography. This created interesting challenges for the workshop participants, who thus had a chance to confront the sorts of issues that could be expected to arise if they continued to use the technique on their own.

[people] The workshop itself faced a different set of challenges, not least of which was the lack of a common language (the entire workshop was translated into Russian, which was then sometimes translated into Ukrainian -- and in the more technical discussions, retranslated from Russian into Russian by a Ukrainian computer specialist). Trying to work with local equipment also required creative approaches: since Preserve staff rarely have laptops, CHI experimented with a desktop workstation borrowed from a Preserve office. This computer made the process substantially slower, but it set a useful baseline for minimum computing criteria.

Other problems arose in relation to the spaces available for photography. In RTI production, the camera must remain absolutely still. But on the loose wooden floors of most of the Preserve buildings, the slightest movement of the photographer would move the floor and shift the camera, and the workshop was thus limited to buildings with cement floors. Occasionally participants also moved the camera or tripod during a shoot.
Normally, one would stop there and simply reshoot the sequence. But the participants in the workshop were very reluctant to admit that they had moved the camera, and thus the error was often only uncovered after the shoot was complete and a new shoot had been set up.

[Oath] Appropriately enough, one of the objects documented, this large inscription, is a document of fundamental importance in the study of democracy and civic engagement. It preserves one of the most complete civic oaths known to us from the Greek world. Fittingly, then, the culmination of the workshop was an RTI shoot of the oath open to the entire Preserve community and run entirely by the Ukrainian participants. Many members of the Preserve staff came for longer or shorter periods to hold the flash or take a shot, and thus to be involved as a community in sharing this unique monument with the world.

As an institution, the Preserve is interested in Western methods but highly suspicious of innovation and extremely resistant to change. Perhaps the best measure of the success of the workshop, then, came at the very end, when one of the Preserve staff members responsible for the collections -- and these are the most suspicious and resistant to change of the entire community -- appeared at the workshop holding a ceramic plate with relief decoration and requesting that an RTI be made.

At the end of the workshop, both personal conversations and a written exit survey established that the participants had learned enough to carry the work out on their own and were eager to do so. The real test of this will be a project funded by PHI but run by a Preserve team to document the epigraphic material at Chersonesos. Between 1885 and 1916, inscriptions from the ancient cities of the north shore of the Black Sea, including
many from Chersonesos, were published in St Petersburg in a series of volumes. The web has made the material in this once hard-to-find publication more available; [library] not only can it be downloaded in its entirety from the website of the Preserve, [epig] but the texts of the inscriptions it contains have now been published on-line with the support of PHI.

A team of scholars is now working on a new edition of this corpus of inscriptions, and plans to publish it in an on-line format as well, using the EpiDoc markup language. We have proposed to include in that on-line publication RTIs generated by the Preserve team for the epigraphic corpus at Chersonesos. [xanthos] These digital facsimiles would add substantial value for scholars, who must often examine details of individual letters and carving.

The RTI photographic and digital image creation tool chain developed by CHI is explicitly designed to enable the highly automated capture of the complete RTI image generation process metadata – essentially a scientific imaging ‘lab notebook’ that describes how the image was built and provides links to the original photographic empirical data. The next generation of RTI imaging tools CHI will introduce tomorrow includes powerful new imaging capabilities and a new RTI file format optimized for semantic metadata management. [archives] If integrated into the Preserve's own digital catalogues and archives, these digital objects could also provide a bridge between the published epigraphic texts and the contexts in which the inscriptions were found.

[k-v] During the lifetime of Karl Kostsyushko-Valyuzhinich, the excavator of Chersonesos in the 1890s and early 1900s, and for decades afterwards, the only tool scholars had to preserve and share inscriptions involved the creation of paper-pulp
squeezes -- 1:1 physical facsimiles of the stones themselves. [k-v squeezes]

Kostsyushko-Valyuzhinich's own squeezes are still kept in the archives of the Preserve, although time is taking its toll. An RTI project focused on the epigraphy of Chersonesos would create a new record that provides deeper and richer information that can be shared instantly over the web and preserved in many different places. If this project is successful, it will provide an even more compelling validation of the grassroots principles both CHI and ICA espouse. It will be a locally-managed and sustainable initiative that produces material of immeasurable importance to scholars and of great interest to the general public. As far as I know, Chersonesos would be the first ancient site to document its epigraphic collection in this way, but given the ease and power of the technique, and the way it has been embraced at a place where many factors work against such efforts, we can expect that it will not be the last. [credits]