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## PUBLIC OUTREACH

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An important component of the Rio Nuevo Archaeology project was the participation of members of the Tucson community. Desert Archaeology, Inc., used volunteers on several excavations, had guides to provide tours of the digs, and large open houses at the end of each project. Over 5,000 people viewed the work in person and thousands more saw or heard media reports on the television, radio, or newspapers. Several programs were focused on reaching a wider audience through the use of computer animation, outreach to students and teachers, and through exhibits at local museums. Each of these programs is briefly described here.

### RECONSTRUCTING THE SAN AGUSTÍN MISSION ON THE COMPUTER: CREATING A VISUAL HYPOTHESIS

What did the San Agustín Mission look like? That basic question was difficult to answer. Although photographs and floorplans for some of the buildings survive, they fail to provide a sense of the early years of the mission.

Fortunately, the rapidly evolving field of computer graphics is generating new tools for the manipulation of information. Image enhancement and computer modeling are providing archaeologists and historians new toolkits to apply to their studies.

Digital image enhancement and modeling was used by the Center for Desert Archaeology to create a “visual hypothesis.” By converting what is known about the San Agustín Mission into a digital model, a type of virtual theory of the appearance of the mission was created. This model could be examined critically and quickly modified when new data or better information was found.

Digital modeling of the San Agustín Mission incorporated many different lines of evidence to create the structure of the digital model. Photography, site plans and survey data, geographic data, and archaeological evidence were all used during the process of virtual reconstruction. A series of models were created, each one refined and made more accurate as new information became available. Meetings with

historians and architects provided additional data. In all, 12 versions of the digital model were created.

### Incorporating Photographic Data: Photometric Modeling

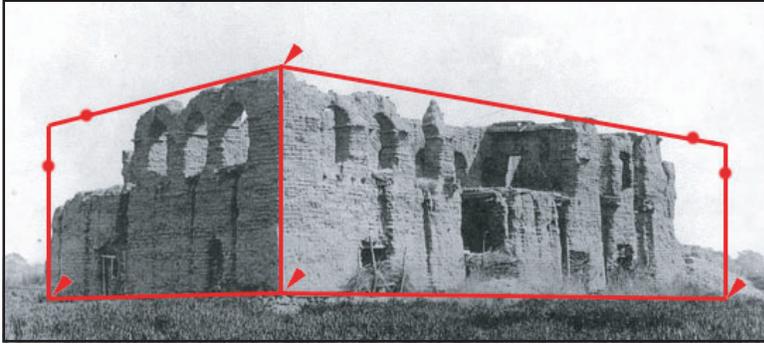
The process of photometric modeling with computer software uses multiple photographs of an object to make simple three-dimensional geometric models. The San Agustín Convento was modeled using this process.

Photometric modeling works by assuming that the objects in a photograph obey the laws of geometry, and that by marking identical points within a set of photographs of the same object, a geometric solution (or model) can be generated. This solution is very similar to what architects call a vanishing line study.

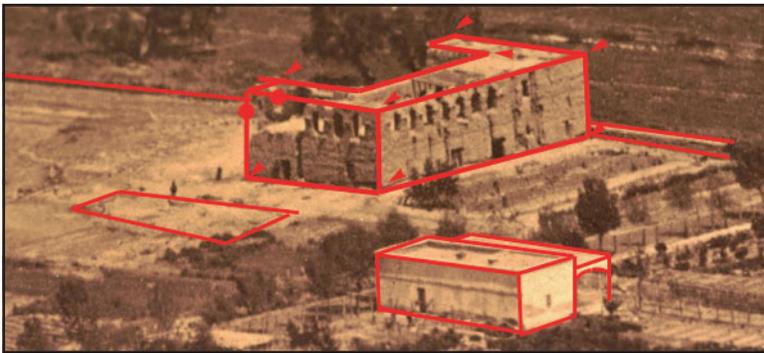
For the San Agustín Mission, photometric modeling began by locating photographs of the complex at the Arizona Historical Society, Southern Arizona Division; the University of Arizona Library Special Collections; the archives of the Arizona State Museum; and from private collections. Data from over 90 photographs were incorporated into the model.

Information from these photographs was digitized (Figure 21.1). In the second step, known points from the first photograph were marked on another photograph, and then extra points, not visible in the first photograph, were added (Figure 21.2). By continuing this process with several photographs, a composite model was ultimately generated (Figure 21.3).

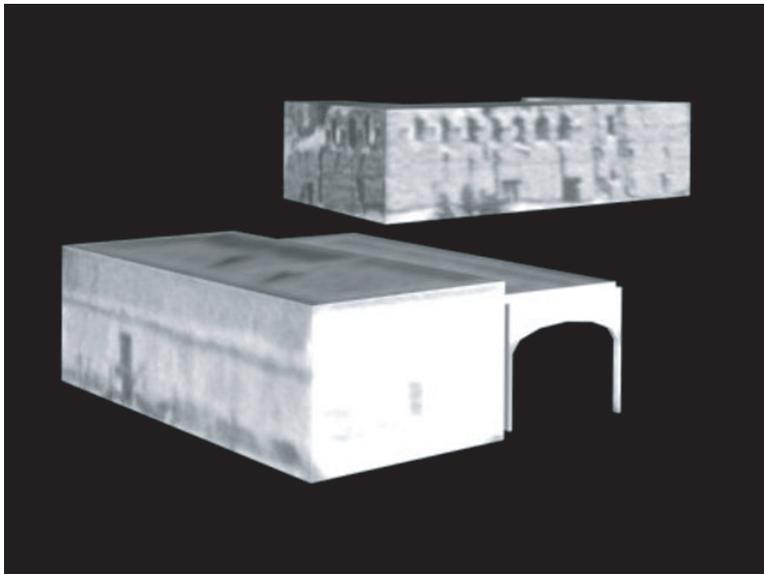
The photometric modeling process is useful for creating rough models. It is important to note, however, that the model created can only make relative measurements of objects. For example, the model was used to show that the building height was 39 percent of its length, and that an individual archway opening was roughly 1.5 percent as wide as the building was long. To make the model accurate, the real survey and mapping data needed to be used to solve the problem of recreating exact measurements of the size of the building.



**Figure 21.1.** The first step in the modeling of the convento buildings at the San Agustín Mission. (Red lines indicate the edges of the convento, triangles mark known points, and circles mark boundaries when known points cannot be seen [all computer modeling figures created by Douglas Gann].)



**Figure 21.2.** The second step in the modeling was to mark the same points in the first photograph onto a second photograph and to add extra points.



**Figure 21.3.** Composite photometric model of the Carrillo House (foreground) and the convento (background), generated from photographic data.

### Digital Modeling with Plan Views and Archaeological Data

To begin the process of modeling the structures of the San Agustín Mission, the relative dimensions of the buildings needed to first be calculated in relation to each other. Photographs and maps of the site were used to create a plan view of the mission (Figure 21.4). The next step in the modeling process was to create wireframe models of the structural aspects of the mission site.

The subsequent step in the modeling process was to take the plan view and “extrude” the structures up into a three-dimensional space (Figure 21.5). Details, such as the height of walls and the placement of arches and doorways, were resolved from careful analysis of the surviving photographs. The resulting model contained all of the structural information known about the convento, but needed surfaces to look realistic.

To increase the realism of the wireframe model, the model was covered in surfaces by a process called texture mapping (Figures 21.6-21.7). In this process, textures were applied to the model to give it a solid appearance. The surfaces created for the mission model came from a variety of sources. The color values for the adobe bricks and wall plaster came from bits of brick and plaster found during excavation of the mission site. The colors for the wood and fired clay bricks were taken from photographs of similar materials from contemporary buildings at the Mission of San Xavier del Bac and Tumacácori National Historical Park.

### Placing the Model on the Landscape

To place the model on the landscape, geographic data from sources such as the United States Geological Survey (USGS) topographic maps must be used.

This data can be enhanced with information from historic maps and other details to create a more realistic setting.

The USGS map provides details about the location of geological features, such as A-Mountain (Sentinel Peak), as well as information about changes in elevation (Figure 21.8). Based on survey data obtained during the excavation, the mission compound could be placed on the topographic map with a high degree of accuracy (Figure 21.9).

The next step in the modeling process was to convert the elevation data from the topographic lines into three-dimensional modeling data. This was accomplished by tracing the topographic lines in a computer-aided drafting program. The topographic lines were corrected to remove the down-cutting of the Santa Cruz River, which happened after 1888. The terrain could then be created by stretching a mathematical surface over the framework of the topographic lines.

The resulting terrain model was then covered with a map of the farmers' fields of Tucson, originally drawn by John J. Mills in 1862. Each of the fields was bounded by small irrigation ditches, with three larger *acequias* running south to north through the fields.

The resulting model is not complete—it is a virtual hypothesis meant for study and critique (Figure 21.10). The model represents an educated guess of what the mission may have looked like, although this is still a conjectural reconstruction. Additional evidence, yet to be found, may change current ideas about the appearance of the mission.

The computer models proved to be of great interest to members of the public. Versions of the San Agustín Mission and Tucson Presidio models were shown at open houses at the conclusion of archaeological work at each of these sites. The model was also shown at many meetings and for various groups throughout Tucson. Finally, it was incorporated into an exhibit at the Arizona Historical Society. Several hundred thousand people have had the opportunity to learn about these sites through the computer models.

#### THE ARIZONA STATE MUSEUM RIO NUEVO SCHOOL PARTNERSHIP

The Arizona State Museum School Partnership was an educational outreach component of the Rio Nuevo archaeological excavations conducted by Desert Archaeology, Inc., in downtown Tucson. Designed

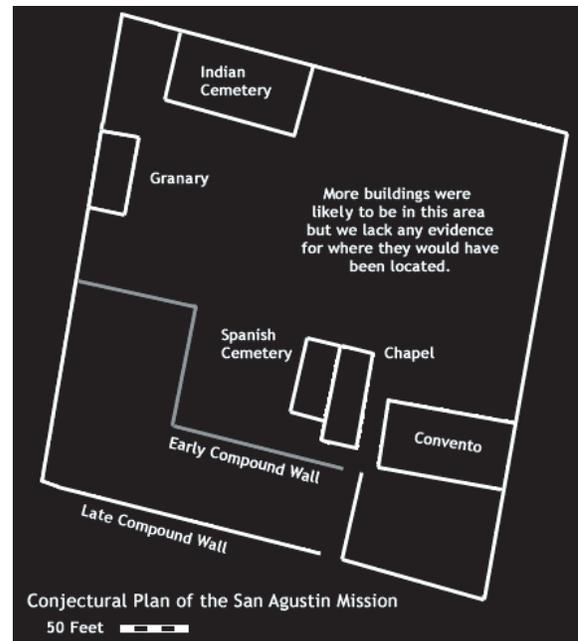


Figure 21.4. Plan view of the San Agustín Mission.

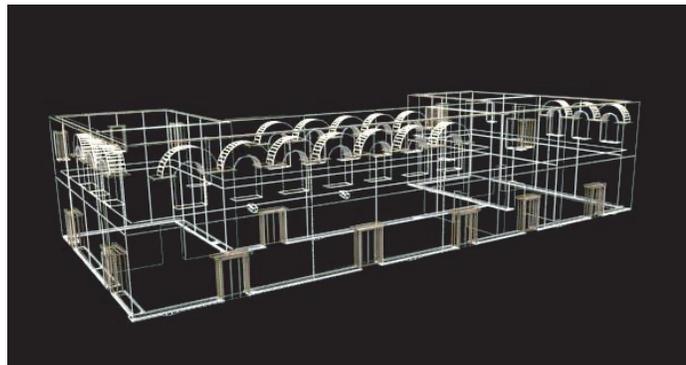


Figure 21.5. Plan view extruded into three dimensions by including wall height information.

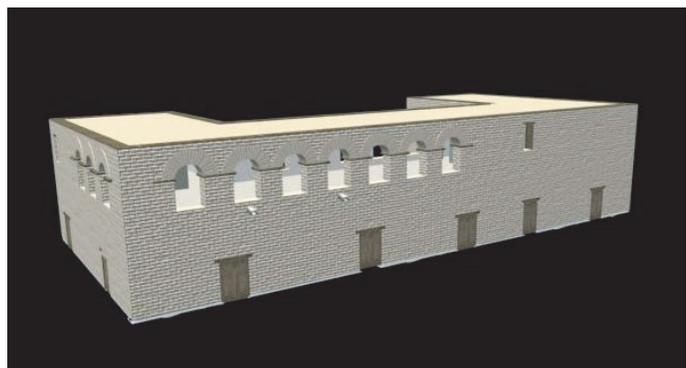
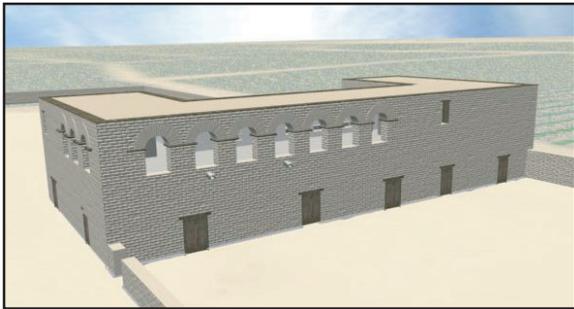


Figure 21.6. The convento model with surface textures applied.

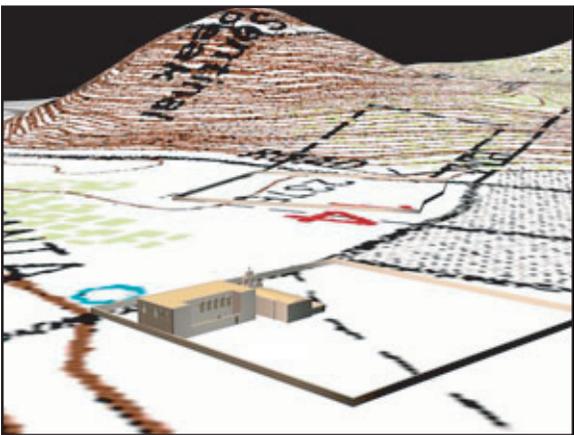
to engage the school community in the research and development phase of the Rio Nuevo project, the partnership promoted and supported student exploration of local cultural heritage and history. The primary goal of the partnership was to increase public



**Figure 21.7.** The convento model placed in three-dimensional space.



**Figure 21.8.** The terrain model, utilizing USGS topographic map data.



**Figure 21.9.** The placement of an early version of the convento and chapel model upon the landscape.

awareness about the rich cultural resources of the Rio Nuevo District, with a focus on archaeology, multi-generational learning, community-based projects, and multicultural studies.

Over the past three years, students participating in the partnership gathered oral histories, visited Rio Nuevo archaeological excavations, produced video documentaries of their historic neighborhoods, and curated an exhibit on Tucson cultural heritage. The community *was* the classroom for these students, and they discovered that their hometown is rich with resources, long on history, and populated with adults beyond the classroom walls who care about them.

### **A Sense of Place, a Sense of Identity, a Sense of Pride**

By learning about the diverse cultural groups contributing to the unique identity of Tucson, students grew to understand that the community has a cultural heritage and human stories worth learning, worth sharing, and worth preserving. In learning about other cultures, youth can better appreciate and respect people from many walks of life, they have the opportunity to reflect on and to refine their own sense of cultural identity, and they can develop pride in who they are and where they live.

Its mission, “to promote understanding of and respect for the peoples and cultures of Arizona and surrounding regions,” made the Arizona State Museum (ASM) the ideal sponsor for the Rio Nuevo School Partnership. Museum/school partnerships have been popular since the early 1980s, and are a creative way for institutions to work cooperatively to enrich classroom curriculum, to support student success, and to help teachers better utilize their community museum resources.

Built on a previous successful partnership between ASM and Tucson Unified School District’s (TUSD) Lawrence Intermediate School, the Rio Nuevo School Partnership was established in the spring of 2001, and expanded to include two schools adjacent to the Rio Nuevo redevelopment area. The partnership initially included Davis Bilingual Magnet School, Menlo Park Elementary, and Lawrence Intermediate, with Menlo Park replaced by Carrillo Magnet School during the final year of the program.

### **Partnership Resources and Programs: Special Projects**

Each school year, select partnership classrooms participate in intensive community-based special projects that culminate in public presentations or educational products that can be shared with a



**Figure 21.10.** A conjectural reconstruction of the San Agustín Mission, Tucson, Arizona, as the mission might have appeared sometime around A.D. 1820.



**Figure 21.11.** Metaja Blackwater participated in the Davis Bilingual Magnet School oral history project and discovered two of her great aunt's baskets in the Arizona State Museum collections in the process (photograph by Annamarie Schaecher).

wider audience. These special projects can take from 6-8 months, and follow a learning pattern. The first half of the program engages students in research and review of resources (human and cultural); the second half consists of writing, design, and production of a final product.

All three partnership schools participated in the 2001-2002 "Tiempos Pasados" community oral history project. Supported by a generous grant from the Arizona Humanities Council, the project consisted of a series of oral history teacher workshops, family nights with oral history interviews, and culminating oral history publications at each school.

Students in Ellen Murphy's fourth grade at Davis Bilingual Magnet School participated in an intensive "museum immersion" project during the 2002-2003 school year (Figure 21.11). After a series of educational fieldtrips, visiting experts in the classroom, behind-the-scenes museum visits, and extensive research, these youngsters developed a full-blown bilingual museum exhibition on Tucson's cultural heritage entitled "Cultural Currents/Corrientes Culturales." The exhibit opened with Davis School's own "Los Aguilitas" mariachi band.

An ongoing special project sponsored by the partnership is the Lawrence Multicultural Weaving Workshop. The brainchild of the Gloria F. Ross Tapestry Center, the Weaving Workshop brings master weavers into predominantly Yaqui classrooms to teach weaving arts, traditions, and fiber science. Students learn about unique community resources when they visit ASM to examine prehistoric and historic weavings from the Southwest and when they visit the University of Arizona Fiber Arts Studio to experiment on a wide variety of looms. The Weaving Workshop was underwritten by a generous grant from the Tucson-Pima Arts Council during the 2002-2003 school year and the Arizona Commission on the Arts in 2003-2004.

Several special projects were conducted during the 2003-2004 school year. Fourth grade students at Davis engaged in an in-depth study of the Santa Cruz River, and examined the environmental and social history of this local waterway. Several classes at Lawrence Intermediate studied ethnobotany and included this information in a discovery kit about Yaqui

culture they created themselves. Several Carrillo School students stayed busy learning documentary techniques in the process of preparing a video about a corner of their historic Barrio Viejo neighborhood.

### Learning Materials

The first materials to be developed and offered to partnership schools were artifact discovery kits and text sets (Figure 21.12). Artifact discovery kits include artifacts, children's literature, teacher background information, posters, lesson plans, and student supplies, while text sets consist primarily of children's literature grouped by themes. Partnership teachers check out the discovery kits for use in the classroom and can select from topics such as *Layers of Tucson History* (a five-kit set), *Navajo Weaving*, *American Indian Arts and Crafts*, *Día de los Muertos*, and *Tucson Oral History* (with recording equipment). Text set topics include *Ethnobotany* and *Archaeology/Arizona Prehistory*, with a *Sense of Place* set currently in development.

One of the greatest challenges for the partnership has been to provide high-interest reading materials on Tucson heritage at a fourth grade reading level. To meet that need, the partnership has developed a "Student Primer" on Rio Nuevo area history, with short readings, historic photographs, vocabulary, and questions ready to use in the classroom. These writings were based on Rio Nuevo archaeology reports published in the Center for Desert Archaeology's *Archaeology Southwest* quarterly newsletter.

### Field Trips

As adults, many of our fondest school memories involve fieldtrips, which serve to connect students to their wider community. Partnership students visited archaeological excavations, museums, historic sites, and other cultural institutions.

Excavations at the Rio Nuevo Mission Gardens were underway during the first year of the partnership, and students were able to observe archaeologists in the field as they uncovered 4,100 years of Tucson history. On guided tours, youngsters viewed the exposed foundations of the Mission Gardens wall, Hohokam pithouses, and a historic well; they even handled artifacts uncovered in the process.

In the second year of the partnership, students again witnessed Rio Nuevo archaeology in progress as a corner of the Tucson Presidio wall was excavated in the fall of 2002.

### Guest Speakers

Information is more relevant to students when it comes directly from the source. Through the partnership, guest speakers came into classrooms to share



**Figure 21.12.** Chinese celadon bowl from the "Layers of Tucson History" kit.

their knowledge with students. Native American presenters told stories about their lives and culture that would be hard to capture in a book. Mexican-American culture and history came alive in the classroom when Irma Moreno, dressed in period costume, spoke to students about her family's many generations in Tucson. At special events, Ted Ramirez was a favorite performer of traditional Mexican ballads and *corridos*. Partnership classes were also exposed to careers as various museum professionals shared their expertise about exhibit design and docent training.

### After-school Programs and Wider Audiences

Partnership activities occurred not only during the school day, but also after school and on weekends. In the spring of 2003, Menlo Park students participated in an archaeology club held after school. The club exposed students to new careers and gave them insight into the investigations being conducted in their neighborhood in preparation for Rio Nuevo redevelopment. Davis School students have also enjoyed after-school archaeology, oral history, photojournalism, and Santa Cruz River activities sponsored or cosponsored by the partnership.

Partnership events often included students' families and members of the community (Figure 21.13). Parents and students enjoyed a day on the lawn of ASM when they attended a family program based on the aerial photography of Adriel Heisey. During an evening program, the Menlo Park community learned together of the latest Rio Nuevo plans when a model of the San Agustín Convento reconstruction was unveiled. The school communities were further informed about Rio Nuevo developments during Desert Archaeology presentations at Davis and Menlo Park family history nights.



**Figure 21.13.** A collage of the Davis Bilingual Magnet School Oral History Family Night held 7 February 2002. (After musical entertainment and a presentation on Rio Nuevo archaeological findings, some audience members participated in oral history interviews.)

## Sense of Place

Reflecting on the past three years of projects and collaborations, the Arizona State Museum School Partnership has clearly been engaged in a larger educational movement referred to as “place-based education.” Place-based education makes learning meaningful because the community itself is the context for students to explore history, culture, the environment, and real issues facing their neighborhoods. Through the partnership, students developed a Tucson sense of place by learning in the community, and by welcoming the community into the classroom. Students engaged in place-based education produced materials that enrich the entire community.

As the Rio Nuevo archaeological excavations and associated public outreach activities conclude, the partnership will continue to offer learning resources developed over the past three years to Tucson’s teaching community. Place-based education makes classroom curriculum relevant and encourages students to get involved with their communities; therefore, future goals of the partnership will be to promote, encourage, and model this form of teaching.

## Arizona Historical Society

In the fall of 2000, Desert Archaeology, Inc., contracted with the Arizona Historical Society (AHS) to provide educational programming to educate and inform the public about the archaeological work connected with the Rio Nuevo project. This was a natural partnership for several reasons. The AHS Education Department staff had the background, expertise, and contacts which Desert Archaeology lacked to produce educational programs, and the AHS has a strong interest in the project, both from historical research and practical perspectives as plans continue to relocate the facility to the downtown museum complex. The result has been a happy collaboration, resulting in numerous projects and presentations both for the general public and for Tucson area teachers. Outcomes include a major exhibit, a teacher’s manual and accompanying CD, over 38 workshops, 50 presentations, and a public forum.

The collaboration was mutually beneficial to Desert Archaeology, the AHS, and the City of Tucson. The AHS contributed much administrative and facilities support and staff expertise at little or no direct cost. The result was extremely cost-effective, allowing production of exhibits, products, and events that would have cost thousands more if privately contracted. The average cost for a quality museum exhibit is between \$150 and \$200 per ft<sup>2</sup>. The AHS produced the Rio Viejo/Rio Nuevo exhibit at a cost to the city of \$41.40 per ft<sup>2</sup>. In turn, the AHS gained a

full-time staff member for the duration of the contract who was able to work with schools and teachers, creating future contacts and good will, as well as tangible and lasting products.

In addition, staff at the AHS had the pleasure of working with Desert Archaeology, Inc. We have continually been impressed with the professionalism, dedication, and skill of the archaeologists and personnel at Desert Archaeology, most notably Dr. William Doelle, Dr. Jonathan Mabry, Dr. Douglas Gann, and Mr. Homer Thiel. In the midst of busy schedules working on the archaeological mitigation, they were always available when needed, whether it was to make public presentations, review materials, or work on getting artifacts for the exhibit. It was also a pleasure to work with Ms. Marty McCune from the City of Tucson’s Historic Preservation Office, who also gave presentations, met with us monthly, and helped steer the projects.

We would also like to express appreciation for the help of AHS Exhibits Director Leslie Rowe and designer, Kevin Mills, as well as numerous other AHS staff members. Particularly, Kyle McKoy, AHS Education Rio Nuevo Project Director, should be commended. She put heart and soul into this project for the last 3.5 years. She wrote the teacher’s manual and text for the Rio Viejo/Rio Nuevo exhibit, helped direct exhibit production, facilitated workshops, and gave numerous presentations in the community. The success of this project is, in large part, due to her skill and enthusiasm.

Through this partnership, Desert Archaeology was able to use AHS expertise and resources to help educate the public about the ongoing archaeological work at Rio Nuevo, resulting in increased public support and enthusiasm for the project. The AHS will continue to build on these productive partnerships.

Rio Nuevo is a brilliant vision for Tucson’s future, allowing us to capitalize on our fascinating cultural history and resources to build pride in our community among our residents and to make Tucson a destination for numerous cultural heritage tourists. It has been our pleasure to help build public support for this project through oversight of the development of related educational programs.

## Educational Outreach

The AHS is a member of the educational outreach team formed by Desert Archaeology, Inc., for the City of Tucson’s downtown revitalization project, Rio Nuevo. The primary goals of the Society’s Rio Nuevo educational programs include educating the community about Tucson’s history and increasing community support for, and the visibility of, the Rio Nuevo project. One way to accomplish these goals

is by using Rio Nuevo archaeology to recapture and celebrate Tucson's multicultural heritage. These programs provide a unique opportunity for the community and schools to transcend the walls that previously separated them. By discovering the diversity of people who contributed to the writing of Tucson's historical narrative, students understand that the Tucson community has a uniquely inclusive multicultural heritage and identity. Learning about other cultures that helped shape Tucson's present allows youth to appreciate and respect others, as well as to develop their own cultural identity.

Place-based education uses local particulars to teach universal concepts. Students think locally and link globally. Place-based education is the notion that schools should ground classroom instruction on the culture, history, ecology, and economy of the communities they serve, and extend classroom walls to engage communities in the work of the school. By placing learning within the context of the daily lives of students and community members, place-based education improves conditions within the community. Students assume ownership for their learning experience, relate their discoveries to pride in their surroundings, and become contributing citizens of their community.

### Programs

Educational programs should build upon themselves. The Rio Nuevo excavations provided abundant information about Tucson's multicultural history on which to build. Native American groups, Spaniards, Mexicans, Chinese, and European immigrants all left their cultural footprints in the earth at the base of A-Mountain. The AHS embarked on several projects that used this information to bring their stories into Tucson-area classrooms. The AHS published a teacher's guide and an interactive CD-ROM, hosted teacher workshops and provided classroom resources, created a museum exhibit based on the archaeological excavations, made numerous public presentations to various audiences, organized an eight-part lecture series, and hosted a professional symposium.

The first stage of the project was the 2002 publication of *Downtown Under Ground: Archaeological Clues to Tucson's Past*, a teacher's guide and classroom activities book. The book traces Tucson's diverse history as revealed by the archaeological excavations performed prior to construction of the Rio Nuevo project improvements. It contains 12

lesson plans for classroom instruction, blackline maps and reproducible handouts, a timeline, a vocabulary list, and background information about the history of Tucson. It also provides a pre-visit introduction to the exhibit housed in the AHS Tucson main museum. At the time of this printing, 1,500 copies of *Downtown Under Ground* had been distributed to Tucson-area teachers. The book was also available as a free download online, creating the opportunity to reach thousands more teachers.

An intermediate magnet school has adapted the teacher's guide into its curriculum, providing ongoing community learning to 140 fourth- and fifth-grade students annually. In 2004, this school opened its doors to another grade school located on the eastern side of Tucson, spreading the imbedded place-based curriculum to more students and teachers. That the schools have taken it upon themselves to introduce place-based education into their curricula speaks to the importance of bringing community components into the classroom.

The AHS hosted 20 in-house and 18 in-service teacher workshops demonstrating how to use *Downtown Under Ground*. Following cross-curriculum state standards for an object-based, hands-on learning experience, the workshops reached more than 600 University of Arizona student teachers and professional K-12 teachers between 2001 and 2004. Ongoing in-service workshops reach many more teachers.

In May of 2003, more than 300 people attended the opening of a 1,500-ft<sup>2</sup> AHS exhibit capitalizing on the Rio Nuevo excavations (Figure 21.14). *Rio Viejo/Rio Nuevo: Uncovering Tucson's Past* displays



**Figure 21.14.** The entrance to the Arizona Historical Society exhibit entitled, *Rio Viejo/Rio Nuevo: Uncovering Tucson's Past*. (The exhibit showed how Desert Archaeology's excavations revealed evidence of Tucson's past [photograph courtesy Arizona Historical Society, Southern Arizona Division].)

Tucson's history in a timeline, beginning with the present and traveling back to prehistoric times. Features of the exhibit include: (1) the Tucson Pressed Brick Company, which operated at the foot of A-Mountain from 1896 to the 1960s; (2) American Territorial period Chinese truck farmers, who marketed produce to residents and business owners; (3) Spaniards who occupied the San Agustín Mission complex and Tucson Presidio; and (4) the Hohokam and earlier farming cultures along the banks of the Santa Cruz River. Artifacts uncovered at the various excavation sites are on display. Based on previous museum visitor counts, an estimated 47,000 adults and 10,000 students will visit the exhibit annually.

Staff of the AHS Education Department made public presentations about the Rio Nuevo project at various locations around the Tucson area. These included University of Arizona graduate classes, TUSD seminars, Tucson Newcomer's Club, museum and education conferences, AHS annual meeting, American Association of Environmental Educators, radio and television appearances, various gallery talks for fundraisers, and a public symposium. The AHS also hosted an eight-part summer lecture series that discussed the major points of the project. Together, these presentations reached more than 900 people and helped raise awareness of, and support for, the Rio Nuevo project.

The final AHS project was creation of an interactive CD-ROM for teachers that contains the *Downtown Under Ground* teacher's guide, a historic photograph archive, lesson plans and classroom activities, and computer simulations from the museum exhibit (Figures 21.15-21.16). The CD-ROM will reach an additional 500 Tucson-area teachers and librarians, and by extension, thousands of students and their families.

The AHS component of the Rio Nuevo project is a multifaceted approach to place-based education. The importance of such projects is reflected in its nomination for a 2004 Meritorious Award for Special Projects from the American Association of State and Local History.

## CONCLUSION

Place-based education is a way to engage students in their own education, as well as a means of instilling community pride by allowing students to explore their surroundings. Because Rio Nuevo is a long-term city planning project for economic growth, it is im-



**Figure 21.15.** Teachers participate in a session demonstrating how to use the CD "Downtown Under Ground: Archaeological Clues to Tucson's Past." (This was part of a series of teacher workshops conducted by staff at the Arizona Historical Society [photograph courtesy Arizona Historical Society, Southern Arizona Division].)



**Figure 21.16.** A teacher workshop on the Rio Nuevo project at the Arizona Historical Society (photograph courtesy Arizona Historical Society, Southern Arizona Division).

portant to educate and inform future citizens about preserving and protecting Tucson's diverse heritage as the community looks toward the future. Tucson's future is rooted in its past. Place-based education and the Rio Nuevo project educate students about their rich cultural heritage and community history, while instilling a sense of pride that will enrich and celebrate the community at large.