

3-D digital carving: A new tool for an ancient art (w/ Video)

July 25 2013



Completed pieces of Dorothy, a 19-foot-tall terra cotta caryatid, are laid out at Boston Valley Terra Cotta. The project used digital tools including photogrammetry and digital laser cutting, which were introduced to Boston Valley by University at Buffalo experts. Credit: Mitchell Bring

The ancient art of shaping terra cotta is getting a modern twist at Boston Valley Terra Cotta, a Western New York manufacturer that has performed restoration work on historic buildings from San Francisco's Russ Building to Chicago's Rookery Building, and Buffalo's own Guaranty Building.

The company is one of the leading terra cotta manufacturers in the U.S.,

and its system for recreating historic terra cotta façade units such as tiles and statues involves a series of intricate steps.

First, draftsmen study and create 2-D drawings of terra cotta originals. Next, sculptors work from these drawings to build plaster or clay models of the originals. Finally, plaster is poured over these models to create hollow molds into which terra cotta is hand-pressed and shaped before drying.

The process reflects what artists have done for thousands of years, and it's time consuming.

The company is now streamlining much of this process through the integration of sophisticated digital fabrication tools—the result of a long-term partnership with the University at Buffalo School of Architecture and Planning to explore the potential of "digital craft" in terra cotta restoration.

The partnership began in 2011, when Omar Khan, associate professor and chair of architecture at UB, and Mitchell Bring, a researcher in the department, approached the company with an interest in exploring industrial applications for digital fabrication tools—technology that students and faculty had long used to test and model their designs in the school's Digital Fabrication Laboratory.

The centerpiece of Boston Valley's new arsenal of tools is a five-axis digital router, which pares blocks of material into models of the statues, ornaments and other objects the company is contracted to replicate—leaving only the sculptor's finishing work to complete the models. The tool is guided by 3-D digital drawings generated from photographs of terra cotta objects. The image-creation process, called "photogrammetry," simplifies the drafting stage of restoration.

Boston Valley's first large-scale project using the digital tools is the restoration of four copies of "Dorothy"—19-foot-tall terra cotta caryatids that overlook downtown Manhattan from a perch 21 stories up. That project employed the new photogrammetry technique as well as digital laser cutting. The first of the angels is scheduled to be installed starting this August.

Greater precision and high-efficiency workflows mean that custom projects that were once cost-prohibitive for clients are now feasible. The new technologies reduce the time it takes to create not only finished products, but also 3-D drawings, prototypes and scale-models that can help clients visualize and move forward with special orders.

And rather than eliminating the need for a highly-trained workforce, the technological shift is building smarter labor. Draftsmen learn new skills and sculptors, relieved of much of the physical labor involved in model-making, can focus on the craftsmanship that makes each piece unique.

"Our partnership with the UB School of Architecture and Planning has enabled us to compete on an international level," said John Krouse, president and general manager of Boston Valley Terra Cotta. "Working with chairman Khan, professor Bring and the student interns they have selected to train our drafting and modeling department in five-axis capabilities and 3-D software has been a great experience. The students are truly a testament to the school's ability to attract the best talent."

Experts from UB's architecture department helped Boston Valley navigate through an intensive process of research and testing, initially at the school's Digital Fabrication Laboratory and eventually on-site at Boston Valley Terra Cotta as the research moved from proof-of-concept to full production.

The partnership continues today, with Bring, a digital fabrication expert,

helping Boston Valley launch the new machines. UB architecture master's student Peter Schmidt also works on-site, using the 3-D modeling skills he learned in his graduate program to further improve digital rendering. He has transferred much of his knowledge to employees through a paid internship.

"In addition to advancing innovation in local industry, our work in digital fabrication is giving students access to design opportunities that are not available in conventional architectural practice," Khan said. "The skills they're learning make them immediately valuable to a range of companies."

So far, Boston Valley has used the five-axis router to carve plaster models of terra cotta blocks that will be used in the restoration of the dome of the Alberta Legislature Building in Canada.

The firm's senior sculptor, Michael Fritz, said that in the future, the new tool will provide alternatives to physical limitations that have traditionally challenged his team. Before, several craftsmen would work independently to build pieces of large statues and then get together to fit the disparate parts prior to adding a final surface of clay. The digital tools will alleviate much of this "heavy lifting," freeing Fritz and his colleagues to focus on large sculptural works in a more complete conceptual environment, allowing the emphasis to be on the artistic details that breathe life and beauty into clay.

Manufacturing and good design, so often at odds, can actually be complementary, Khan said: "For a long time, architects have had to concede to limits of manufactured products because customized solutions were unavailable or cost-prohibitive. Digital craft provides an opportunity to alter manufacturing in a way that enables architects to more productively influence the products they use. There is great demand for this: A new era of 'craft' may be in the works."

Khan says the partnership has also created a symbiotic relationship of knowledge transfer. For instance, sculptors at Boston Valley have begun to experiment with the modeling software as a "carving tool" to create new designs, pushing the technology—as well as Khan and his team—to new limits.

Besides tapping UB's expertise in new technologies, Boston Valley Terra Cotta has sponsored graduate studios as part of the architecture department's Material Culture Research Group. In a current studio led by Associate Professor Jean La Marche, students are creating, designing and building structures from terra cotta with guidance from Krouse and other Boston Valley staff members with the goal of understanding and reimagining the material's use in architecture.

Boston Valley also previously hired UB student Linfan Liu, who proposed a terra cotta rain screen design that the company chose to further develop.

Provided by University at Buffalo

Citation: 3-D digital carving: A new tool for an ancient art (w/ Video) (2013, July 25) retrieved 27 April 2024 from <https://phys.org/news/2013-07-d-digital-tool-ancient-art.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.