

## The Digital Stone Project

In a small industrial town along the northeast corridor, technical wonders occur daily at a place where images existing only in the virtual world become manifest in enduring marbles: limestone and granite are made to look soft as pillows; human lips are hugely scaled in stone but maintain their subject's every pore and wrinkle; and extremely difficult to carve rocks are manufactured into baroque masterpieces.

The Digital Stone Project (DSP), located near Trenton, New Jersey, is a nonprofit entity that houses the most comprehensive collection of Computer Numeric Controlled (CNC) mills and lathes used in the service of art. The DSP was formed from a pre-existing institution, Johnson Atelier (JA) Stone Division. Beginning in the late 1990s, the JA Stone Division, managed by Walter Dusenbery and Christoph Späth, assembled this impressive array of CNC stone equipment and experimented exhaustively to maximize its use to manufacture unique sculptures. During the fall of 2003, the Atlantic Foundation (administration of the Johnson Atelier) ceased operation of its foundry, including the digital stone sculpting studio. The foundation's stated plan was to disassemble the machinery and sell the equipment piece-by-piece to the architectural stone-cutting industry.

The JA Stone Division directors and their clients realized that the closing of the facility would mean the loss of a unique resource and quickly began to examine ways to preserve it. The challenge was to convince the Atlantic Foundation of the value of keeping the facility intact (even if operated by another organizational entity) and to accept a buyout at a fair market price. Considering that the machines are highly specialized and custom built in Italy and Germany, even in used condition each unit was still quite valuable—the high prices of new equipment would have made reassembling such a facility nearly impossible. After many months of intense negotiations, the Atlantic Foundation agreed to sell all of the equipment for half a million dollars—a relative bargain, but a difficult sum to raise for several mid-career sculptors.

Former Stone Division directors Dusenbery and Späth, along with sculptors Jon Isherwood, Barry X Ball, Robert Michael Smith, Lawrence Argent, Lauren Ewing, Michael Rees, and Donald Guarnieri, contributed their own money to purchase the facility. They were able to raise one-third of the funds; an anonymous donor gave the remaining \$315,000. Since the land on which the DSP is situated is not owned by the Atlantic Foundation, a new lease was negotiated, and operating capital was secured through a business loan underwritten by another anonymous supporter. Nearly a year after the facility's closing, it re-opened in July 2004 as the DSP, with Dusenbery as president and Späth as vice-president and executive director overseeing a staff of approximately six professional stone-workers and technicians.

The DSP's 10,000-square-foot studio includes three overhead cranes, the largest of which can lift up to 30 tons; several Scan-Tech laser scanners capable of

scanning models up to 15 feet; a Pellegrini Robot Diamond Wire saw with a 14-foot capacity for roughing out complex contours; a Löffler Bridge saw for making precision block cuts; and three custom-fitted Omag CNC milling machines (a huge five-axis mill with a 10-by-10-foot capacity, a four-axis large-scale lathe with a 10-by-4-foot capacity, and a three-axis lathe with a six-foot capacity for smaller works). The axes generally refer to the flexibility of the machine: there are three axes in Cartesian space—the fourth and fifth axes enable repositioning of the material and complex tool paths that can cut difficult forms, convexities, and protrusions. The studio also includes a host of hand-held power and traditional tools for finishing each project.

Works executed by the DSP's CNC machines range from huge public projects to personal sculptures and attest to the many capabilities of this equipment. Wopoli Holup's *Common Ground* (2004) was largely sculpted on DSP machines and finished by DSP staff. Organic relief patterns were CNC-milled into 400 one-meter-square panels to form the walls of the intersection of Northern Boulevard and the Brooklyn-Queens Expressway, the largest (in terms of budget) public art project awarded by the State of New York.

Many works executed on the DSP's equipment are re-scalings and material realizations of works otherwise created by traditional or "analog" means. Using data fed to the machines, contour cuts are made, and then the material is saved, drilled, and routed with ever-increasing precision as finer and finer tools are installed.

The machines can only go so far, and the human hand is ultimately reintroduced in the finishing—the smoothing of the final form, work on delicate appendages, minute details and undercutting. The digital process offers certain economic advantages since the machines are able to block out the work quite quickly and can reduce the

carving process by many months. Only in executing fine details, textures, and finishes does the human hand become less expensive than the machine.

Some sculptors have engaged the DSP's digital resources to retain verisimilar forms even when images are greatly scaled up. For instance, Jon Isherwood enlarged fingerprint patterns that were then cut into large boulders for *Prints and Passages* (2003), a site-specific work at the Bureau of Criminal Apprehension in St. Paul, Minnesota. Similarly, Lawrence Argent included mouths scanned from life models and made huge in *Whispers* (2001), his installation at the University of Denver in Colorado. Patricia Cronin was able to make a large, marble version of her funerary *Memorial to a Marriage* (2003, see *Sculpture* January/February 2003).

In other works executed on DSP's CNC lathes, the properties of one material are infused in another. Works such as Isherwood's *Temp-tress* (2003) start out as plaster models that are laser scanned. The final stone pieces retain the plaster's organic irregularity and slump even while exhibiting machine-perfect incisions and designs. Argent's *Pillow Talk* (2000), sited in Denver, includes an uncannily realistic stack of marble pillows.

Barry X Ball was one of the first artists to experiment with the DSP's CNC machines. Ball works with laser scan portraits from live models. In the virtual environment, he anatomically stretches likenesses and adds grotesque details such as punctured flesh and decorative patterning. Because digital lathes cut and grind the stone, rather than reducing it through chipping, Ball can use stone with colorful inclusions, flaws, and voids that would uncontrollably fracture with traditional carving techniques and were therefore nearly useless for sculpture. In Mexican onyx and Italian "Portoro" marble, Ball creates baroque busts with dynamic veins and "camouflage" patterns.



Lion for Ray Kaskey's pediment cut by DSP's Omag CNC five-axis mill.



View of DSP studio facility, with Barry X Ball's *Pseudogroup of Giuseppe Panza and Omag CNC three-axis lathe*.

Robert Michael Smith's works are realized primarily through digital processes, as he "sculpts" in the virtual environment.

Though executed on the same machines and in the same space, many of the works mentioned above predate the founding of the DSP. Since the DSP is only a few months old, works started last fall are still in the finishing process. Many pieces are currently in the pipeline, including a massive pediment project for a prominent cultural organization in Tennessee, which features figures by Wash-

ington, DC, artist Ray Kaskey. His one-third scale plaster model has been laser scanned, and the pediment currently being cut in limestone at the DSP will be 60 feet long and nine feet high, all in two-foot-deep relief. Projects for founding sculptors Ewing, Isherwood, and Ball are also in the works, while Späth recently received a commission to design and create the entry plaza for the Emergency Operations Center of the State of New Jersey to be located at the State Police Headquarters in Trenton. The plaza's

four monumental granite and glass sculptures will be executed at the DSP. All of these commissions are necessary for the future success of the organization since, despite its nonprofit status, the DSP has to maintain fiscal solvency through production income.

With more and more sculptors turning to CNC and rapid-prototyping machines, the DSP has an important educational mission to train the next generation of technicians and sculptors in techniques ranging from the time-honored to the cutting-edge. Affiliated institutions sponsoring student interns include Bennington College, Denver University, New York Institute of Technology, Rutgers University, the University of Maryland at College Park, the

University of North Carolina at Greensboro, and Winchester College of Art in England. Longer-term apprenticeships specializing in digital applications are also available as part of DSP's educational program.

DSP artists are enthusiastically spreading the word about the facility. Smith maintains that "there is no other comprehensive facility for digital carving of stone sculpture in the entire world." Ball extols the DSP process as "collaborative," not the sort where projects are handed off to a fabricator, but one in which "the artist can stand beside the machine and work with the facility's director." While the staff has vast knowledge and years of experience with these machines, the technology is still so new that such collaboration may result in previously unconceivable realizations in stone.

—William V. Ganis

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