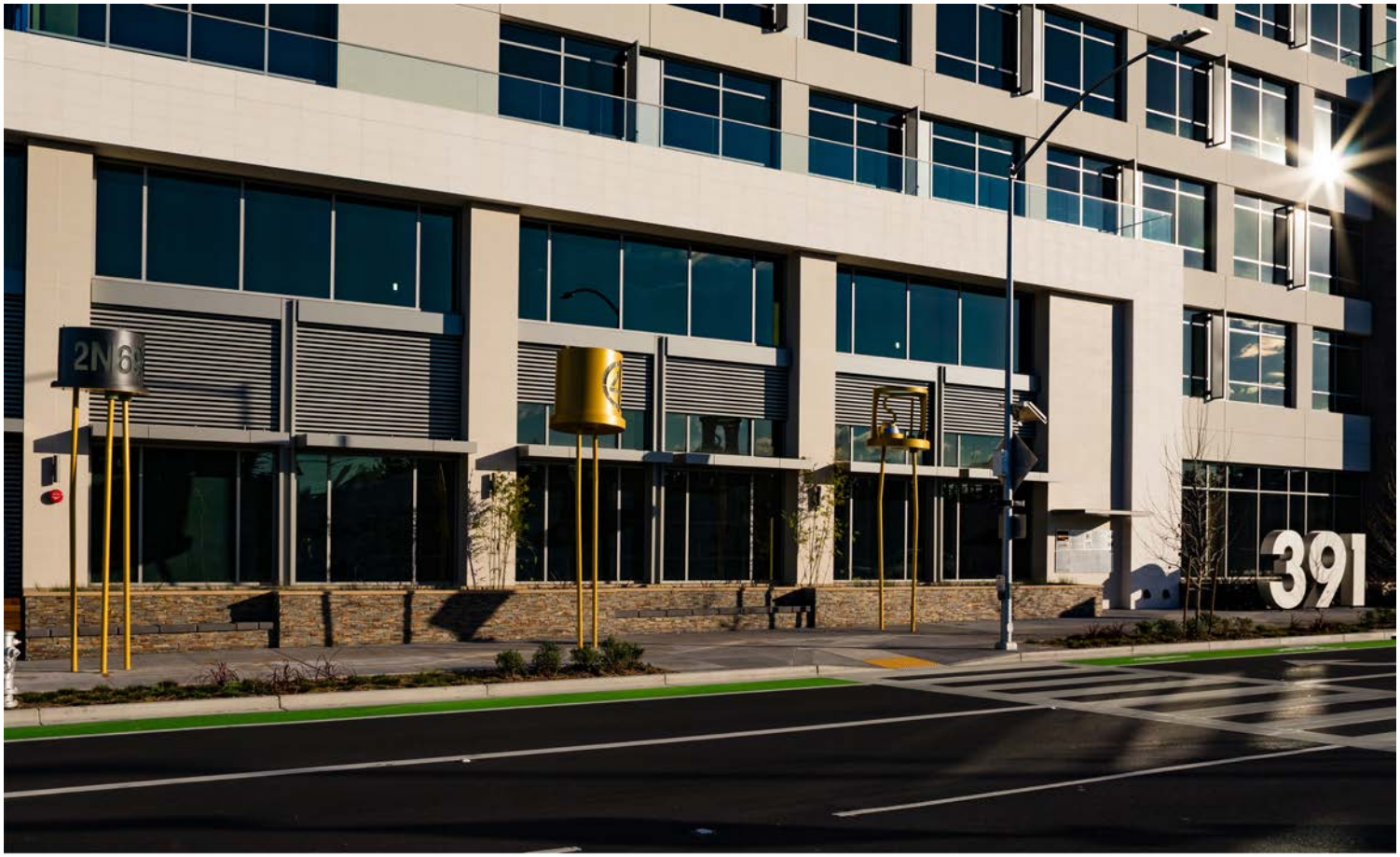


Birthplace of the Silicon Valley

Public Art Project, Mountain View, CA

Vickie Jo Sowell and Mary B. White

Birthplace of the Silicon Valley

”To see a world in a grain of sand”
—William Blake

The three tall sculptures that stride above this sidewalk location commemorate and honor the pioneering work performed by engineers of the Shockley Semiconductor Laboratory at 391 San Antonio Road in the 1950s. The sculptures are artistic interpretations of two of the earliest semi-conductor devices ever produced in Silicon Valley, the 2N696 transistor (with three prongs), and a 4 layer silicon diode (with two prongs).

In our depiction two of the three components are plugged into an etched circuit board layout on the sidewalk, producing a classic oscillating waveform. The second diode outside the circuit board has the enclosing “can” cut away, so that viewers can see a typical representation of the inside of the diode and the silicon chip location.

These early devices were manufactured with straight legs, but are depicted here slightly battered and bent, symbolic of old devices found in the historic collections.

From this location and using the concepts embodied in these solid-state components, the companies and technologies that make up the modern Silicon Valley were born.

History of the Silicon Valley Project

When plans came together for a redevelopment of the San Antonio Shopping Center in Mountain View, the developer, Merlone Geier Partners, took care to ensure that the historic legacy of the 391 address was preserved and memorialized. Merlone Geier reached out to local artists who were experienced in outdoor public artwork and held a design competition. Once invited to submit a proposal, Mary White invited Vickie Jo Sowell, a sculptor with a history of delivering large public artworks, to join and they submitted a joint proposal.

Our team worked closely with Merlone Geier on the placement and final design, producing a scale model and detailed construction specs. We had invaluable inputs from the engineering community affiliated with the nearby Computer History Museum. It was at this stage that the cutaway view of the diode and the circuit board sidewalk design emerged. We're especially grateful for the technical expertise of two of the engineers who worked at this historic location, Jacques Beaudouin and Andris Ramans.

The stacked and fused glass elements were fabricated in Mary White's Berkeley studio over an extended period, while the steel components of the three sculptures were cut and assembled in downtown Oakland by Nor-Cal Metal Fabricators.

As the pieces were completed they were transported to the Melrose Metal Finishing where the gold enamel surface was baked on.

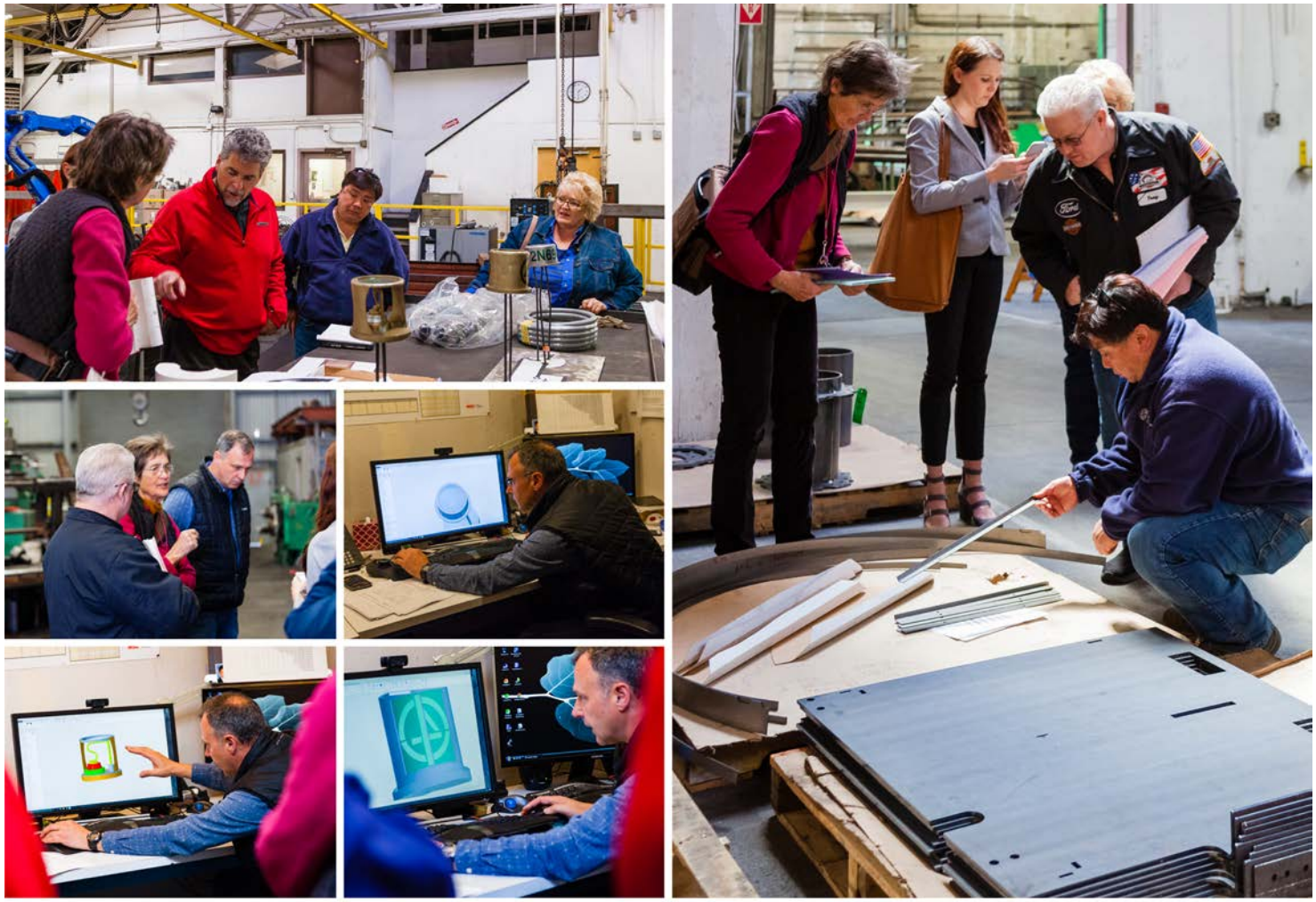
It was exciting when the glass and steel components were finally brought together! We then installed the LED lighting units (designed by Holly Solar of Petaluma) and the glass for the artworks. It all happened just in time for the installation on-site in Mountain View.

The progress photos in this album tell the story of the installation, a long but successful day of forklifting, crane-lifting and scissor-lifting. Many thanks to Devcon Construction for their help getting the sculptures into place.

Researching the Model

Researching early silicon diodes and transistors with Jacques Beaudouin and Andris Ramans, engineers who worked at the Shockley Semiconductor Laboratory.

Their invaluable information helped us develop the final model pictured below.



The CAD software at Nor-Cal allowed us to scale up these 18’ tall sculptures. The shop drawings they produced were used to cut and assemble the steel pieces.


2N60

Glass Fabrication

Two main glass techniques were used for the sculptures. The layered surface visible through the cutout numbers of the 2N696 transistor and silicon diode were produced by fusing flat lengths of window glass together vertically and slumping into a curved mold.

The glass insulators for the legs of the diodes and transistor were made using the lost wax kiln cast process and Bullseye Glass.


2N6

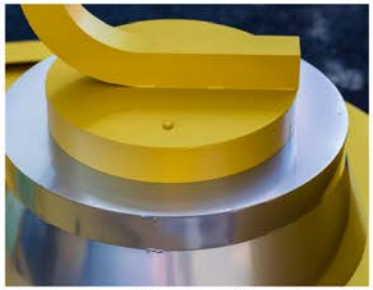
Installing canister glass Inside

The curved fused glass canister side panels were installed in the powder baked canisters with custom made gaskets.

Franklyn Berry Artifacts Engineering was an invaluable resource for the insulator and glass gasket designs.

Lighting and Electrical

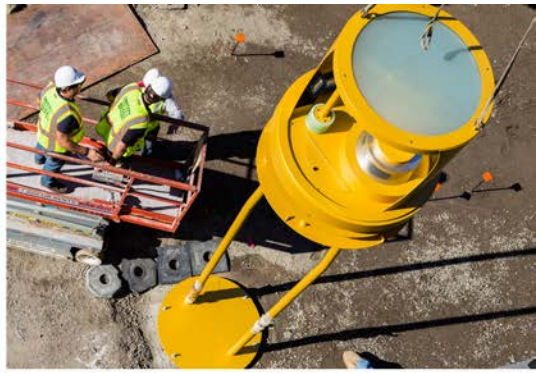
Our LED lighting fixtures were designed by Holly Solar LLC of Petaluma. All fixture installation work, both in shop and on site, was performed by Josh Hughes.



Powder Baking, Packing and Transport to Mountain View site.


AWK


King




N696


696

Night View. Installed Silicon Diode and Transistor Sculptures and etched sidewalk Circuit Board, 391 San Antonio Road, Mountain View, CA


A-1

MARY BAYARD WHITE

Mary Bayard White is a Bay Area sculptor/arts educator. She came to California from the mid-west via Colorado to earn her B.F.A. in Ceramics and M.F.A. in Glass/ Painting from the California College of the Arts.

Mary was coordinator/instructor for the Glass Area of the San Jose State University Glass Area from 1986-2005, teaching glass process to engineers and art students. She helped start the Glass Department at The Crucible in Oakland in 2002 and taught there for 10 years. Recently she taught Ecology/ Art at St. Mary's College, helped rejuvenate the Ghost Ranch, New Mexico glass program, and has given many workshops and exhibited internationally. Mary serves on the Board of Directors for the Women Eco Art Dialogue. In 2010 she completed an 18 foot high stacked glass Flood Level Marker project in Boulder, Colorado, working collaboratively with a team of scientists, artists, engineers, city officials and ecologists. From 2009-2010, she was a Fulbright Scholar and Lecturer at the National College of Art and Design in Dublin, Ireland. She continues to work on public art projects in the Bay Area and beyond.


696

VICKIE JO SOWELL

Proud and excited to be able to contribute to this Silicon Valley monument, Vickie Jo Sowell is a long-standing Public Arts Sculptor with works featured in communities throughout California and beyond.

Working primarily in large-form steel, Vickie's artworks draw upon the rich histories and cultures of our evolving region, weaving the past together with our future. Her artworks are prominently installed at locations in Richmond ("Richmond Works"), Emeryville ("Neighborhood Convergence"), Oakland ("Fruitvale Revival"), Fremont ("Niles Panorama"), and numerous other locations.

Speaking of the monumental sculptures shown here, the artist says, "It's inspiring to realize that the tiny diodes fabricated by the engineers in this location were the origin of so many big things that have come to pass in the Silicon Valley."

Ms. Sowell is a graduate of Montana State University (B.A.), and Mills College in Oakland (M.F.A.), and an active community member in her home city of Emeryville.

opened in 1956.

THE BIRTHPLACE OF SILICON VALLEY

391 San Antonio Road, Mountain View, California is the heart of Silicon Valley's humble beginnings. At a time when the semiconductor industry was concentrated on the East Coast and in Texas, Shockley Semiconductor Laboratory opened its doors to pursue silicon device research at this site in 1956. The unique confluence of creative talent, hard work, and financial incentives that developed around this technology earned the area the designation "Silicon Valley."

John Bardeen, Walter Brattain, and William Shockley shared the 1956 Nobel Prize in Physics for Bardeen and Brattain's 1947 discovery of the transistor effect at Bell Laboratories and Shockley's subsequent invention of the junction transistor. Shockley left Bell Labs and formed a partnership with Arnold O. Beckman in 1955. They established Shockley Semiconductor Laboratory as a division of Beckman Instruments, with the intention of developing new silicon devices.

William Shockley recruited a remarkable group of talented young scientists and engineers from across the United States and beyond. These bright, innovative minds were attracted to the area by the opportunity to work with Dr. Shockley and silicon devices. Here at 391 San Antonio Road, Shockley's four-layer diode was developed, Silicon Valley's first silicon transistors were made, and emerging silicon processing technologies were developed.

William Shockley, John Bardeen, and Walter Brattain received the 1956 Nobel Prize in Physics.

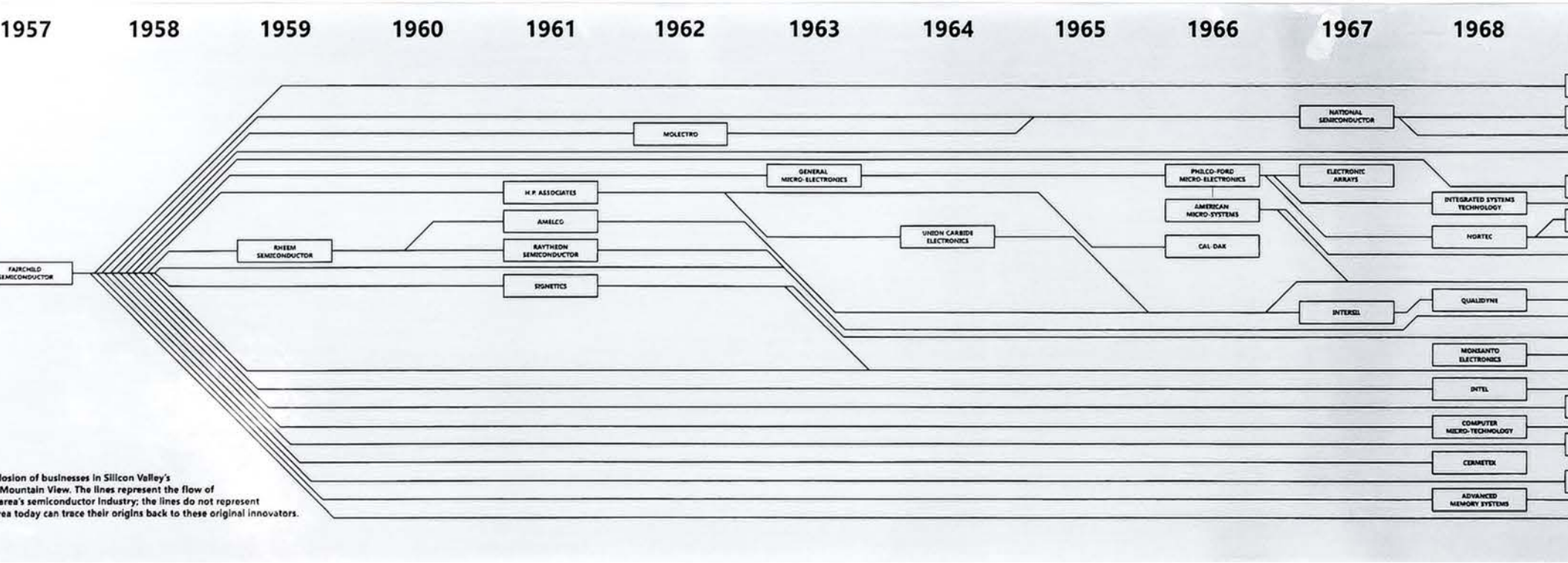
Shockley Labs' employees celebrate Dr. Shockley's Nobel Prize win together.

The sculptures located along the sidewalk are monuments to the legacy of Shockley Semiconductor Laboratory in Silicon Valley. The two-pronged sculptures depict the four-layer diode: one with its protective cap as it would have been produced, the other with its c removed showing the silicon chip. The third sculpture depicts the 2N696 silicon transistor, the first commercially available transistor manufactured in Silicon Valley.

Though Shockley was a brilliant researcher, he was not popular as a manager. Shockley had placed the importance of the work on the four-layer diode above that of the silicon transistor—a priority that the staff did not support. In 1957 a group of Shockley Labs' leading staff left to form their own business. They founded Fairchild Semiconductor in nearby Palo Alto and within months brought an advanced silicon transistor to market. Shockley doubted the future success of these men, sometimes referred to as "The Traitorous Eig but was proven wrong, as Fairchild Semiconductor became one of t most well-known success stories of Silicon Valley.

The gifted young scientists and engineers that Shockley gathered h at the birthplace of Silicon Valley became the driving force behind t ingenuity and entrepreneurship for which the area is known today. Decades on, Silicon Valley continues to be a mecca for risk taking, forward thinking, and technological innovation.

que describing of The Birthplace of Silicon Valley is mounted on the sculptures. It tells the story of how Shockley Labs came to be established in Mountain View and how its establishment defined the what became Silicon Valley.



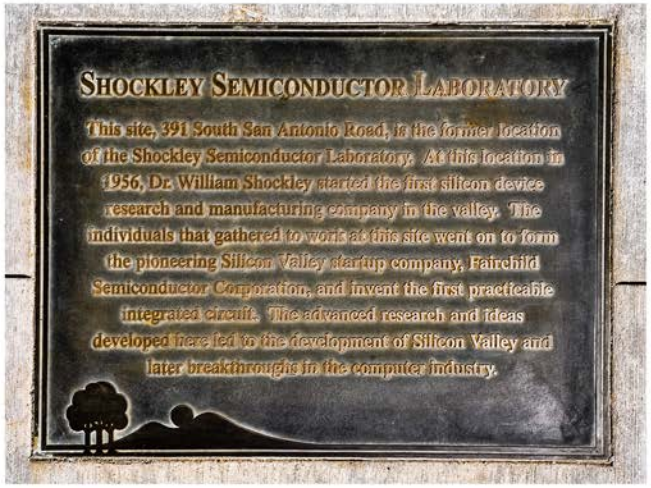
hart plaque (mounted alongside the Birthplace story from the ook) shows how the silicon electronics industry exploded in the area following Shockley Labs and the business started by its former em Fairchild Electronics, firmly establishing Silicon Valley.

Acknowledgements

Special thanks to:

Merlone Geier Partners and Kristin L. Strahl
Devcon Construction: Andrew Giba, Wing Wong
and entire Devcon Construction team
Silicon Valley Engineers: Jacques R. Beaudouin, Andy Ramans, Harry Sello
Computer History Museum
Bay Rubber, Bowlin Equipment Company, Bullseye Glass
Daniel Cho, Elin Christopherson, Chris Fine, Franciscan Glass
Franklyn Berry Artifacts Engineering, James Harriman, Peter Heymans
Mike Hollibaugh, Holly Solar, Josh Hughes, Dorothy Lenehan
Melrose Metal Finishing, Walter Work Metal, Nor-Cal Metal Fabricators
Aron Rosenberg, Daryl M. Rush Builders, Jerry Sears, Steve Skaar, Liz Strickland

Photography Director: Jeannie O'Connor
Photo credits: Jeannie O'Connor, Dennis Dowling, Hugh Stickley
Liz Strickland, Mary White



391 San Antonio Road, Mountain View, CA

Project Artists: Mary Bayard White and Vickie Jo Sowell