saw them from Griffith Observatory: The unbelievably bright fireball of September 3, 1964 (James Roth's realistic painting of this phenomenon hangs in the West Gallery of the Hall of Science), the beautiful dark red total lunar eclipse of 5-6 July 1982, and many, many more. One *less* than memorable event took place on 4 February 1962, when a partial solar eclipse coincided with a conjunction of five visible planets. Some astrological forecasts emanating from India predicted the rapid destruction of our planet. For weeks ahead of time the Observatory was barraged by phone calls—some frantic, some merely curious—and when the fateful day came, the road leading to and from the Observatory was a solid mass of cars, the largest crowd since opening day. Twenty years later, on 10 March 1982, the Observatory staff was again obliged to reassure an anxious public that the so-called Jupiter Effect—a loose grouping of all nine planets on one side of the sun—would *not* be the catalyst of the Great California Earthquake.

One of the more down-to-earth celestial wonders observed from Griffith Observatory was hailed by the press as "A Monkey on the Moon." It occurred one afternoon in 1937, when a small brown monkey escaped from the Los Angeles Zoo, scampered unnoticed into the Hall of Science and perched on an unreachable crater of the moon model for hours. (A trap baited with bananas finally proved the undoing of the simian fugitive.)

A friend tells of a faith-shaking experience she had one night while standing on the roof of the Observatory. Awed by the wonder and beauty of the dark, clear night sky, she took Jiminy Cricket's advice and wished upon a particularly bright star. A few minutes later, she saw the star land at Los Angeles Airport.

But Griffith Observatory itself remains aloft. It has survived a World War, two medium-sized earthquakes, several close brush fires, and an admission fee to Griffith Park that was in effect for two years. And although its future depends partly on such earthly trivialities as money, it, amid the unsettlingly variable skyline of Los Angeles gives the strongest impression of comforting permanence. So much so, that in 1976, when the Los Angeles Bicentennial Committee sought a safe place to install its Tricentennial Time Capsule (scheduled to be opened on January 1, 2076) the obvious choice was Historic-Cultural Monument #168, the Big O, Griffith Observatory.

Patrons inspecting this particular exhibit are often heard to speculate aloud on who, or what, will be around to open the Time Capsule in the Tricentennial year. Will they look up from time to time, as we did, and wonder about the rocky, red surface of Mars? Or will they be frequent passengers on routine trips to that planet? And if so, will they build a stately copper-domed structure on Mars, from which a curious non-scientist could gaze back at the fragile earth?

* * *

MAY SKY CALENDAR

continued from page 31.

SPECIAL EVENTS

The **Eta Aquarid meteor shower** reaches its peak on the evening of Saturday, May 4, but it is visible for several days before and after the 4th. These exceptionally swift meteors hit the earth's atmosphere at 150,000 miles per hour. They are debris shed from Comet Halley, and with Halley's imminent arrival there is great interest in seeing if the shower is stronger than its normal maximum of 20 meteors per hour per observer. Unfortunately, the light of the full moon intereferes this month.

There is a **total eclipse of the moon** on the night of May 4-5, visible from Africa, Asia, and Australia. The eclipse happens while the moon is below the horizon as seen from North America, and we shall miss it. The next lunar eclipse visible from North America happens on April 24, 1986.

A **partial eclipse of the sun** takes place at the new moon two weeks later, on May 19. The moon's shadow falls on the northern edge of the earth, and this eclipse will be visible only from Alaska, the arctic, and eastern Siberia.

Copper Threads Among the Gold

E.C. Krupp
Griffith Observatory

In 1957, on my first visit to Griffith Observatory, I saw the huge copper dome of the planetarium before I saw anything else. And it broke my heart. Rounding the last curve on the twisting road through the park and approaching the top of the hill, the view from my parents' car was eclipsed by a giant blue-green bubble streaked with rust.

I was 12 years old, and I had already decided I would be an astronomer. My father had just moved the family to Los Angeles from Chicago. The trip to Griffith was almost a pilgrimage, but my first sight of the Observatory made me feel the place was falling apart. The stains on the dome turned the whole building into something that looked shabby and neglected. As an emigrant from the Midwest, where proper houses were made of brick, I was already disoriented by the overly sweet pastels of Southern California stucco. Everything in Los Angeles looked temporary. And Griffith Observatory, I was sure, would not be with us long.

I was wrong about the imminent demise of the Observatory. This is, in fact, our 50th birthday. Twenty-seven years ago it only *looked* as if the Observatory were about to disintegrate in a Southern California replay of the fall of the House of Usher and slide ignominiously down the south slope of Mount Hollywood. But I was not wrong about how tacky the dome looked. Corrosion on the roof set the mood.

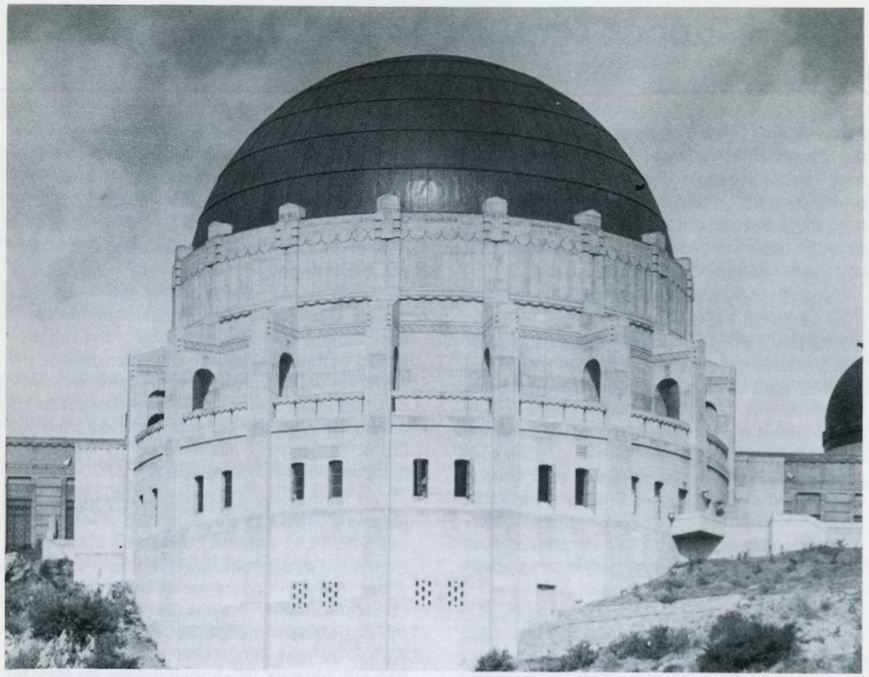
Once inside the planetarium theater—or at the eyepiece of the 12-inch Zeiss refracting telescope—whatever illness the dome had could be forgotten. There were many classy elements of the Observatory: the allegorical murals above the stately Foucault pendulum in the rotunda, the huge live image of the sun projected by the coelostat in the west gallery, the Astronomers Monument on the main walkway. But first impressions last. I never forgot those dreary ribbons of rust that dribbled from the top of the dome. I never thought I would see them eradicated. Wrong again.

The main dome of Griffith Observatory now gleams coppery red against the electric blue sky which Los Angeles sometimes still enjoys. Highlights of sunlight reflecting from the metal allow freeway drivers near Eagle Rock and Pasadena, nearly ten miles away, to pinpoint the dome on the mountainous profile of Griffith Park. The rust and stains are gone, and the dome is shining—a copper candle for its own golden birthday.

Years later, after working as a part-time



Construction of the Observatory appears to have just been completed in this aerial view that probably dates to early 1935. The main walkways are not yet in, and the texture of the domes and highlights upon them imply the copper surface is still fresh. (Los Angeles Times photograph)



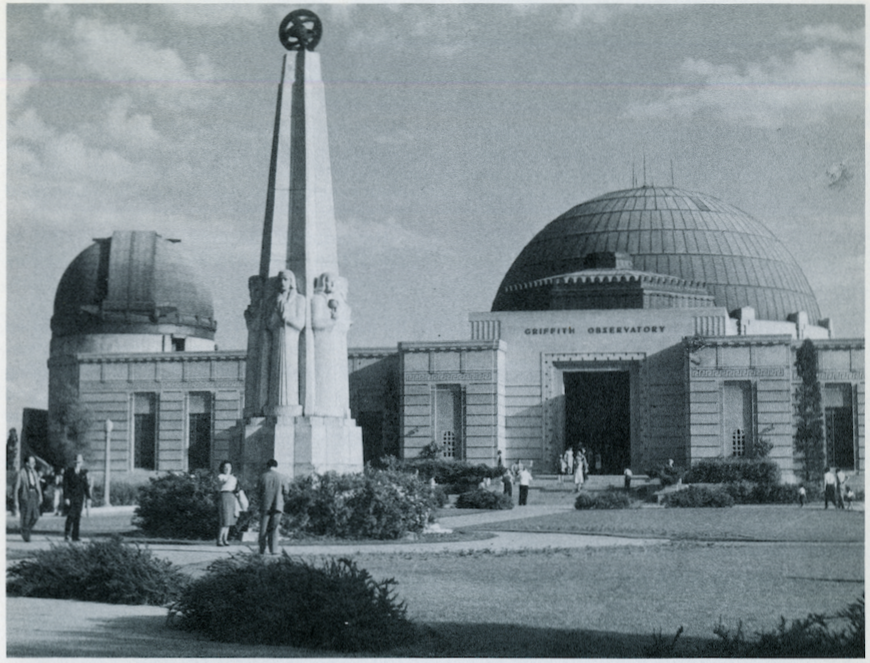
Even in black-and-white it is possible to tell the difference between patinated and unpatinated copper. The date of this photograph is not known, but certainly it is an early view, 1934-35, from the south. (Griffith Observatory archives)

planetarium lecturer while I was still in graduate school at U.C.L.A., I took my first full-time job: Curator at Griffith Observatory. Although I was primarily concerned with upgrading the exhibits in the Hall of Science, I got to talking about the still-blighted copper dome with Leon Hall, Associate Director, and Marion Emmons, Observatory Technician. Mr. Hall had been bothered by the stained patina for many years, and he had explored the possibilities for cleaning it up. But he hadn't discovered any chemical or procedure that could take the discoloration off the protective layer of green oxidation copper forms on itself over the years. Everyone was certain that the blemishes were not a natural consequence of the increasingly smoggy air in Los Angeles. The rust was instead the result of a very bad decision. In the Forties, after Observatory Director Dr. Dinsmore Alter returned from military service during World War II, the Los Angeles Police Department decided to upgrade its radio relay station at the Observatory and installed antennae on top of the largest copper dome. These antennae were mounted on an angle-iron platform, and when the rain arrived, the iron did exactly what iron can be expected to do. It rusted. And the rust streamed down the dome.

Later, in the early Sixties, the original antenna stand was replaced with a wooden support frame. According to Marion Emmons, the iron platform was removed, largely in response to the rust it was creating, but by then a good deal of the damage had already been done.

The dome had also accumulated other injuries. The entire top was blackened and bruised by exhaust, fumes, and contaminants from the Observatory's own heating system—a fuel oil boiler.

In the early 1970s it still seemed that little could be done, but from time to time, by chance, we would encounter some new, miracle product guaranteed to solve all the ills to



By this time, the copper domes had each formed a patina, and their surfaces look flat rather than shiny. An offending company of antennae protrudes from the top of the main dome and feigns innocence despite the damage they will inflict to the copper on which they stand. (Griffith Observatory archives)

which rusty copper is heir. A few of these were tried on discreet areas of copper dome, and we discovered they could remove rust. They removed the 45-year old patina as well, but we were prepared to contemplate doing that. Providing access to the entire surface of the dome was another matter. The dome is 84 feet in diameter, the largest of its kind in the United States. Scaffolding seemed out of the question, especially since the sloping ground of the hillside falls precipitously away from the entire south side of the building. Ladders wouldn't work either. They couldn't reach high enough. Steeplejack gear was a possibility.

In 1980, another gentleman showed up with a proposal to clean the domes. His firm manufactured and applied a plastic coating for renovated metal, and this technique was guaranteed to keep the metal shiny for years. So we tested the process on a portion of the copper pendulum cupola, and it seemed to work well.

Months later I was discussing this possibility with Mrs. Debra Griffith. Mrs. Griffith is the wife of Mr. Harold Griffith*, the grandson of Colonel Griffith J. Griffith. It was Colonel Griffith, of course, who gave Griffith Park to Los Angeles and whose will provided that Griffith Observatory be built. Mrs. Griffith had started organizing the Friends of the Observatory, a non-profit corporation intended to help future development of the Observatory, and she agreed that renewing the copper domes was a very attractive idea. I agreed to get more details and tried to locate the man and the company I thought could do the job. He had left town, however, and was out of the business of renovating metal.

It was no longer clear what to do next. To raise money we had to know how much the job would cost, and we had no idea who could be found to do the job or give us a price. Wayne Nelson, Griffith Observatory's Technical

* As we go to press I must report with sadness that Harold Griffith died on 8 March 1985.

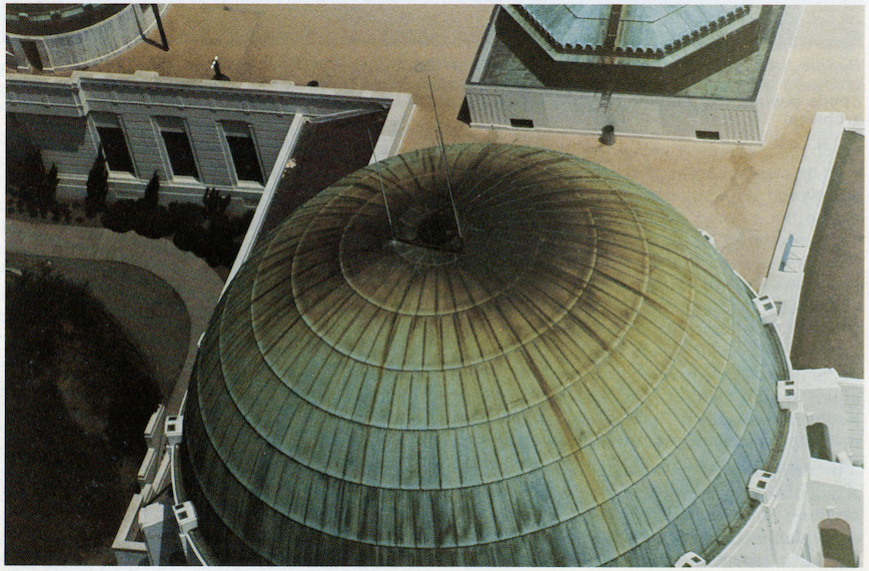


The ribs between these copper panels near the very top of the planetarium dome are green. The panels themselves are rusty brown, discolored by boiler exhaust and iron oxide from the old police antenna platform. (photograph E.C. Krupp, 26 July 1984)

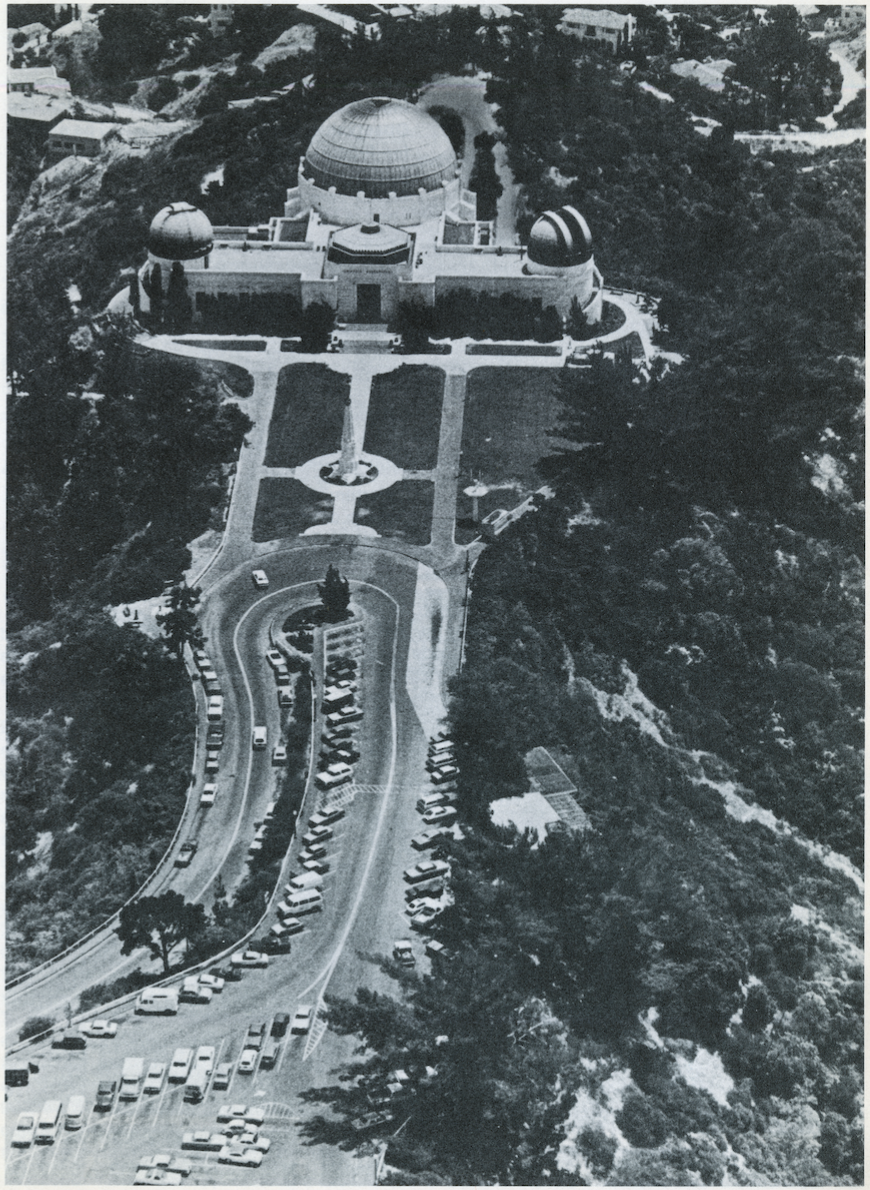
Supervisor, continued to ponder the problem and remembered that the Capitol in Sacramento had a copper dome. So we decided to call Sacramento. Wayne Nelson learned that an expert on the preservation and renewal of historic metals—copper, in particular—lived in Los Angeles. Her name was Myrna Saxe, and we called her right up.

After a preliminary examination of the domes, which involved going right up on top of the large dome (access through the last stretch of the smokestack), Myrna Saxe agreed to prepare a proposal for a detailed study. She would analyze the copper to determine exactly what was wrong and recommend the appropriate procedure for repair.

Her proposal was submitted in May, 1981, to the Griffith Trust Advisory Committee, and they agreed, along with Security Pacific Bank, which acted as Trustee, to pay for the study. By the end of July, 1981, Ms. Saxe had verified the suspected sources of trouble. She recommended careful, controlled chemical cleaning of the entire dome to remove the patina and stains and expressed concern that the visible oxidation and contaminants could signal permanent damage to the copper. There was a real fear that the damaged crust might be chemically active. A series of tests were conducted on a sunken area of the pendulum cupola to help establish costs and methods. The study was completed by the end of September, 1981, and the Griffith Trust Adviso-



Myrna Saxe photographed the top of the planetarium from a helicopter in 1981. The stains looked like a plague spreading slowly but insidiously over the dome. (photograph Myrna Saxe)



In June, 1982, the skin of the large dome was still discolored by rust. The dark triangle at the very top is the second antenna stand, which is now gone. (photograph courtesy *Burbank Daily Review*)

ry Committee—Dr. George Abell, Dr. Maarten Schmidt, and Mr. Harold Griffith—deliberated what to do next. Committed to the importance of cleaning the domes, they arranged to meet with Mayor Tom Bradley and the General Manager of the Department of Recreation and Parks, Mr. James Hadaway. Proposing to dedicate a significant amount of Griffith Trust money to the project, the Advisory Committee asked the Mayor and Mr. Hadaway if the City could provide the rest of the money needed to undertake the work. In the City's mind, however, other priorities at the Observatory loomed larger, and so, for the time at least, the Department of Recreation and Parks declined the offer. For the moment, the issue was dead.

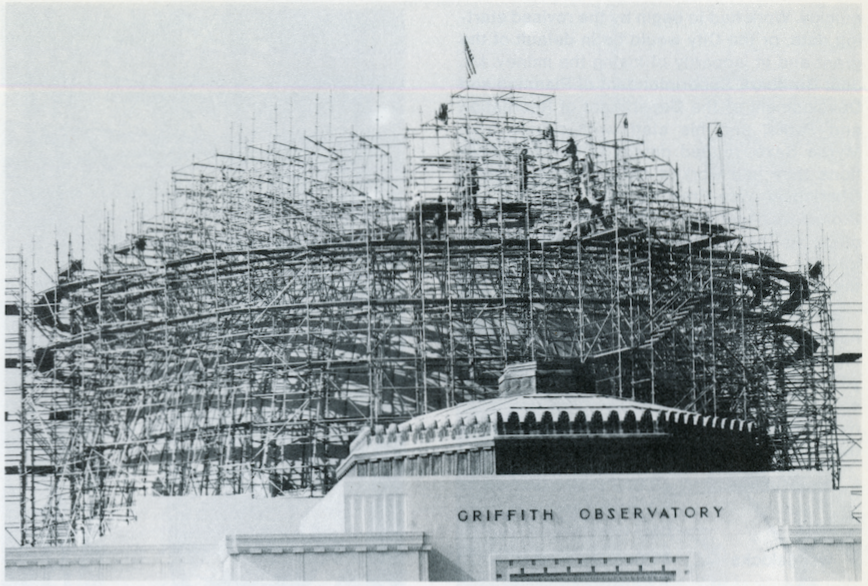
Mrs. Griffith, still very concerned about the domes, initiated a campaign to seek foundation and corporate support through the Friends of the Observatory, but the Friends organization was scarcely two years old. Progress was slow.

Nearly two years passed, and the idea of restoring the great copper dome to its proper glory slipped into hibernation. We were all awakened by a bombshell. The Department of Recreation and Parks and City of Los Angeles had applied for a major grant from the United States Department of Commerce. Under the authority of the Jobs Act Project, administered by the Economic Development Administration, the Observatory dome restoration would be eligible for federal assistance. My supervisor in the Department of Recreation and Parks, Mr. Jerald Lee, telephoned late in the summer in 1983 to ask how quickly we could prepare specifications for the dome work. We had been given the Federal grant. Bids were to be received and reviewed, a contract was to be awarded, and work had to start within 90 days. A moment ago I hadn't even known we had submitted an application for a grant. Now I was required to spend $1,023,000 by Christmas. At that time it took the City nearly a year to buy basic supplies. I was understandably dubious about processing a million-dollar contract in three months.

Fortunately, we knew what we wanted to do. But we didn't really know how much the work would cost in 1983-84. And we were not at all confident that the City's process of competitive



Visitors to Griffith Observatory during the dome renovation were greeted by these signs announcing the principal players in the search for the lost copper. (photographs Robert Webb)



WACO Scaffolding Co. reaches for the sky. (photograph Robert Webb)

bidding would put the work in the hands of a responsible contractor with the skills and experience to carry out such sensitive task.

There was a series of conflicts and crises. By early December, only one contractor had submitted a bid. Just as it looked like the job would go to him and get started, the arrangement fell through. The bid process had to begin again, and the Federal Government granted a short extension. Myrna Saxe, working under contract to the Griffith Trust as an expert consultant, meticulously reviewed the second wave of proposals and endorsed awarding the job to C.P.W., Inc. Theirs was not the lowest bid, but they appeared to be most qualified. If they were to take on the dome, however, it would cost us more than a million dollars. That's a high price to pay for beauty. But it may not be a bad insurance premium to guarantee that it will last. Replacing copper isn't cheap, either. After considerable discussion, the Board of Recreation and Parks Commissioners on 16 February 1984 voted to award the contract to C.P.W., Inc., of South Gate, California.

The Economic Development Administration, U.S. Department of Commerce, had offered $523,000, but it had to be matched. The Griffith Trust made good on its promise and contributed $125,000 as well as money to contract Myrna Saxe to act as an independent expert consultant throughout the job. The other $400,000 were provided by the Department of Recreation and Parks. Was the dome worth it?

Prominent on the south slope of Mount Hollywood, Griffith Observatory is Los Angeles's most visible historic and cultural landmark. The huge planetarium dome, two telescope domes, an elegant pendulum cupola, terraces, walkways, rooftops, and parapets, as well as wall and ceiling murals—all accessible to the public—comprise this preeminent example of 1930s Art Deco architecture designed by Austin and Ashley. Its system of copper domes is one of the few remaining in the country that has not been damaged by improper cleaning or obscured by painting or plating. Griffith Observatory belongs to the world's architectural heritage. And it continues in daily operation to provide information and education on astronomy and related sciences to the public. Of course, the dome was worth it.

Even though the Board of Recreation and Parks Commissioners had acted on the contract, much remained to be done, and done

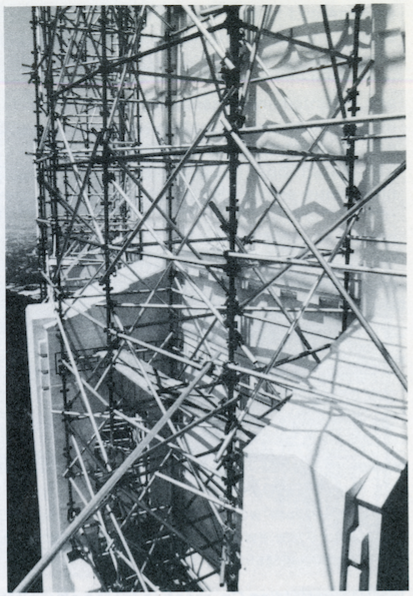
quickly. Work had to begin by the revised starting date, or the City would be in default of the grant and in jeopardy of losing the money. Mr. Joel Breitbart, Superintendent of Planning and Development of the Department of Recreation and Parks, and his staff, with advice from Myrna Saxe, refined details of the specifications they had worked out earlier, and David Charlebois, Vice-President of C.P.W., Inc. and Project Manager for the job, constructed a field office in the Observatory employee parking lot—the same lot which figured prominently in the movie *Rebel Without a Cause.*

Before metal finishers could be trained, they had to be able to get to the dome. The scaffolding that had seemed out of the question a few years ago now turned out to be the only way to provide access. So WACO Scaffolding Company started delivering scaffolding material. They delivered lots of scaffolding:

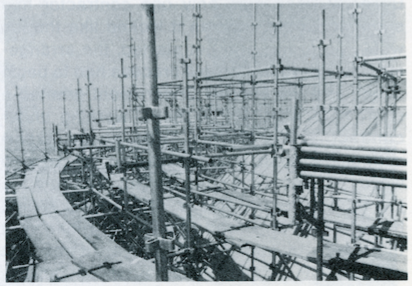
steel tubing	43,028 linear feet, or 8.1 miles, 66.3 tons
wedgelocks	41,861 linear feet, or 7.7 miles 68.9 tons
wooden planks	7,200 linear feet, or 1.3 miles 12 tons
clamps	13,290 of them.

And then WACO built a giant bird cage out of all this stuff. It went right over the top, almost 100 feet from ground level, and took 10 months to complete. On the 4th of July, a United States flag flew from the top of the scaffolding.

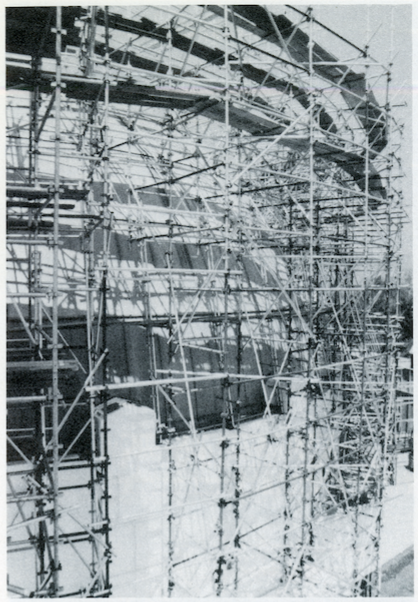
By mid-summer, Griffith Observatory looked like a theme park roller coaster. The design of the massive scaffolding was even more complex than it looked. It had to stand completely free from the dome. The workers who would clean the panels by hand could not rest their feet or hands on the copper at any time. Residues of oil from the skin and other contaminants could not be left on the clean copper. Myrna Saxe had convinced us that after cleaning, the copper should be allowed to repatinate, to reform its protective coating of oxide. Copper is supposed to do this, and a thin, uniform patina is not only pleasing to the eye, it is one of the most durable surfaces known. Natural patination begins as soon as clean copper is exposed to the air. The final patina, which takes years to develop, depends upon the chemicals used to clean the copper, the method by which they are applied, the knowledge and skills of the metal finisher, and contaminants left on the copper. Lack of skill, impatience, harsh chemicals, and sticky fingers may stain, etch, or consume the copper.



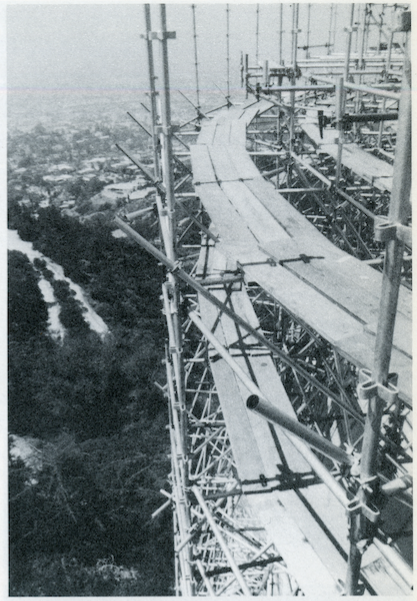
On the south half of the dome, the scaffolding was supported by the parapet. Several exits from the theatre had to be closed, and the theatre, which normally accommodates 630, was allowed to seat only 480 persons per show. (photograph E.C. Krupp, 28 June 1984)



Walkways on the upper levels of the scaffolding looked like Saturn's rings around a planetarium dome planet. (photograph E.C. Krupp 28 June 1984)



Either the work of an advanced erector set enthusiast or the long-lost trellis for the Hanging Gardens of Babylon scales the heights of Griffith Observatory. (photograph E.C. Krupp, 28 June 1984)

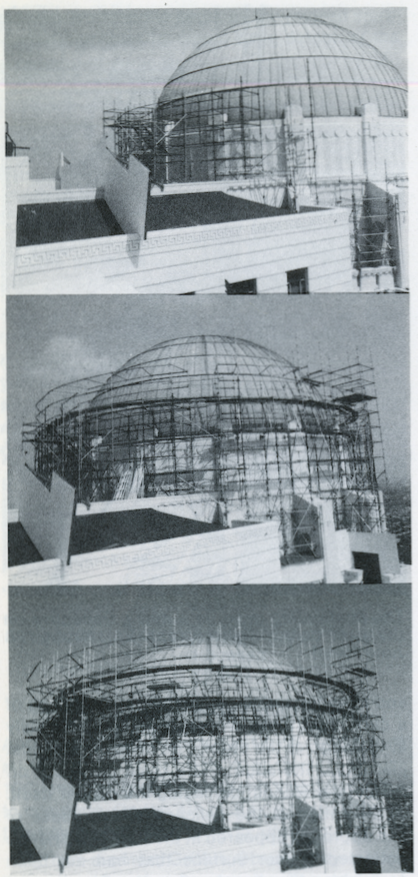


The scaffolding gave us a new perspective on the park below. (photograph E.C. Krupp, 28 June 1984)

Streaks, spotting, or uneven discoloration may appear from an hour to two years after the copper is stripped. Scaffolding the dome for this delicate handwork was considerably more difficult than scaffolding for conventional construction.

By the middle of July, 1984, 11,084 square feet of the copper dome were enveloped by a giant jungle gym and ready for refinishing. Initial tests and Myrna Saxe's basic knowledge of the proper treatment of copper suggested a buffered acid solution should be used to remove the crust on the metal, but the cap of the dome was so thickly coated with hardened residue from the smokestack, normal chemistry wouldn't work. Because the hard crust expanded and contracted at a different rate from the soft copper underneath it, it had to come off. Otherwise it could damage the copper itself. Although the crust at this point obstructed further progress, an unexpected and satisfying technique brought us a pleasant surprise. Walnut shell dust, blown from a nozzle at 30 pounds-per-square-inch pressure and manipulated like a scalpel in the hands of a carefully trained worker, was applied slowly at the edge of the crust. The shock of the dust just under the edge of the crust popped it off the copper without damaging the copper itself. Confirmation of the delicacy and success of this approach appeared in the form of a pristine patinated copper surface that had not been seen since the decade when the Observatory first fired up its boiler.

With the hard, crusty cap removed, the dome was ready for a bath. It turned out to be a sponge bath, starting with a mixture of phosphoric acid and nitric acid (in proportion of 6 to 1) diluted by no less than 50 percent with distilled water to a pH between 1 and 1.5. A thickening agent was added to the acid, both as a buffer and to contain the acid and make its removal and disposal easier. Minimizing problems with the runoff was extremely important. After leaving the acid solution on the copper for one minute, it was lifted off by hand with sponges soaked in a bicarbonate of soda solution. Residual acid was then neutralized by



As the weeks passed, the intricate network of tubes grew higher. The panels on the left formed a temporary wall to keep intrepid but unauthorized dome climbers off the framework. Many more feet of wall height topped with barbed wire had to be added before trespassers were discouraged. The stairway on the left was one of two constructed to provide access to the top. (photographs Robert Webb)

rinsing the cleaned copper panel with fresh water and by treating the copper with a paste of bicarbonate of soda, pH 10, rubbed on with sponges and flushed off with water. A second neutralizer, a commerical product—basically an ammonium oxalate solution—was applied to even out any residues left by the first neutralizer, but because it contained some mild abrasives, it had to be applied by trained personnel working with natural brushes and avoiding any pressure on the copper surface. Sponge-lifting, with a rinse water chaser, washed away the residue. Then the clean surface had to be wiped in vertical, parallel strokes with clean cotton cloth until no color showed on the cloth. More wiping with another cloth, saturated in mineral spirits (with no more than 4 percent aromatics and no less than 96 percent aliphatics), followed, and again the process was continued until no color came off on the cloth. Finally, a thin coat of carnauba wax was applied. The wax protected the pristine surface of the copper from the acidic rain and acidic dew delivered by the Los Angeles atmosphere and provided armor against dripping from the galvanized metal of the scaffolding. The wax will wear off fairly soon, but in the meantime it is giving the copper a chance to start its repatination with a wholesome coat of copper oxide and copper sulfate.

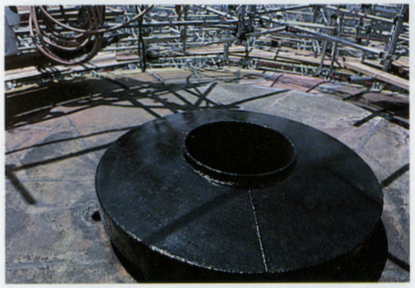
Details of the cleaning procedure were not completely worked out until September. The early tests had been conducted on horizontal panels of the cupola, where the copper was different. Most of the dome panels were vertical, and it took skilled hands to clean them properly. Mr. Kent Hall, a master metal refinisher for McIntyre Metal Maintenance of Los Angeles, under contract to C.P.W., Inc. as a member of the dome restoration team, helped develop the final procedure and trained and supervised the crews who actually put the process into practice on the panels.

Clearly, this was not routine work, no paint-by-number operation. We were pioneering, and it required experienced, skilled people like Kent Hall, David Charlebois, and Myrna Saxe to pull it off. Once the initial obstacles were overcome, including a two-week delay because of an intense summer heat wave, progress on the dome accelerated. Renewal of the copper started moving with a vengeance at the end of September, and by the middle of December the last panel was ceremoniously cleaned.

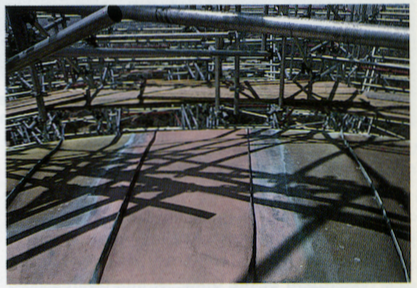
It is a testimony to C.P.W., Inc.—in particular to Project Manager David Charlebois and to Project Foreman Ralph Sellars—that City Inspector Steve Curry was able to approve the work for final payment as completed on time and according to specifications. Over the year Mr. Curry had himself become a knowledgeable and scrupulous judge of an unprecedented undertaking.



Brown stains covered the canopy of the dome. By providing us close views like this, the scaffolding let us discover the damage was worse than we thought. (photograph E.C. Krupp, 28 June 1984)



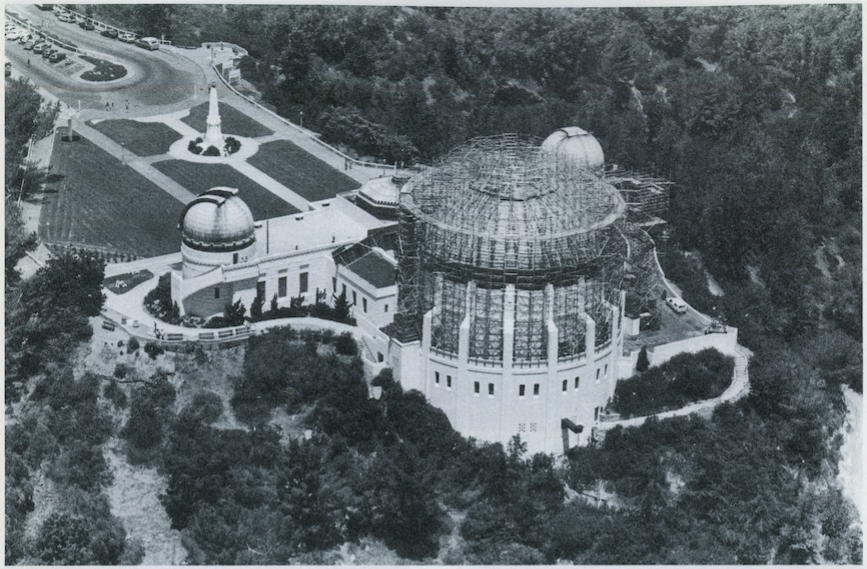
Here is one of the culprits, the smokestack exhaust for the fuel oil boiler that heated the building for 50 years. Residues hardened into a thick crust (just removed) on the surrounding copper panels. (photograph E.C. Krupp, 26 July 1984)



This view down from the top of the dome features a test panel cleaned to its pure copper surface. The panels on either side are still stained. Shadows of the scaffolding cross the dome, but the scaffolding itself doesn't touch it. (photograph E.C. Krupp, 26 July 1984)

WACO started to dismantle the scaffolding in late December, and by early February, 1985, Griffith Observatory was released from its bonds. The two copper telescope domes still have to be cleaned and repaired, and as this article goes to press, contract negotiations for that work continue. At the same time, preliminaries for major modifications to provide handicapped access are underway. These changes are being designed to integrate well with the Observatory's distinctive architecture.

So the big copper dome is clean. How do we keep it that way? The police antennae are long gone from the top, and nothing will be installed there again. As anticipated more than a year and a half ago, when news of the Federal grant first arrived, the boiler exhaust had to be rerouted to prevent recontamination of the clean copper. In fact, the boiler is so antiquated and in such constant need of repair that it must be replaced by an all-new heating system. It was also guessed that the temporary ducts which were fabricated to exhaust directly from the boiler room, low on the southeast side of the building, would not work. This has proved true. Fumes fill the Observatory shops when the boiler is operating, and the same noxious gases enter the intake fans and penetrate the



From the air, Griffith Observatory is transformed into the world's largest jungle gym. (Los Angeles Times photograph, 26 July 1984, Penni Gladstone)

planetarium theater if the wind drives the exhaust around the side of the building. Accordingly we have had to cease operating the boiler altogether. Because it proved impossible to replace the antiquated heating system or to design a workable temporary solution during the renovation of the dome, it has been a cold winter with no building heat. We hope a new heating system will be in place by next winter.

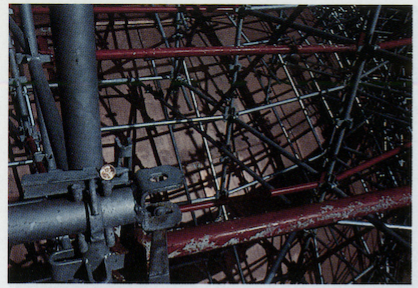
Restoring Griffith Observatory's gigantic copper dome has not been simple or easy. But now that it's done, visitors, in the year of the Observatory's 50th birthday, can catch a glimpse of how the dome looked 50 years ago. The noble blue-green patina will eventually return. In a year or so, the copper will darken considerably; in 20 years all of the elegance of finely patinated copper will be back. If you're going to see the copper dome shine like copper, now is the time to do it.

How closely does the renewed dome resemble the original 1935 appearance? It is similar but not identical, and that is expected. When the Observatory was first built, the virgin copper was fresh from the mill. It really did shine like a new penny. Marion Emmons saw it then and says the present condition of the



Mayor Tom Bradley and Councilwoman Peggy Stevenson, in whose district Griffith Observatory is located, join C.P.W., Inc. President Robert Dugger on top of the scaffolding to acknowledge the successful final inspection of the renovated copper. (photograph E.C. Krupp, 11 December 1984)

dome is similar to its appearance in 1935, but that the surface now "lacks a certain sheen the copper had then." Paul Roques, who retired in January, 1983, after a 40-year career at Griffith Observatory, recalls noticing the Observatory dome in 1934 or '35, as his father was taking him to an event at Hollywood Legion Stadium. It was close to sunset, and the dome was quite



Not quite new-penny bright, the copper panels gleam with new life although still caged by the scaffolding. A new penny poses with panels on the clamp on the left. (photograph E.C. Krupp, 11 December 1984)

shiny, with an obvious spot of brightness created by specular reflection. Both Marion Emmons and Paul Roques say that the copper is redder now than it was then. It now looks more like a clean penny than a mint penny. The specular reflection off the copper is larger and more diffuse. The brightness and highlighting of the metal depend directly on the nature of the copper's surface, and this is certainly less polished and more etched than it was originally.

Paul Roques remembers there was some discussion about painting the domes aluminum when the domes at Mount Wilson were repainted. Eventually it was concluded that the patina might make it difficult for the paint to adhere and that painting the domes would give Griffith Observatory maintenance headaches forever. Relieved that the idea of painting the copper never advanced beyond the stage of



The copper comes clean. Sunlight shines off the south side of a renewed dome. (photograph Robert Webb)

hypothesis, we all now have a chance to celebrate a golden anniversary and see what Marion Emmons, Paul Roques, and many others once saw and never imagined they would see again: copper domes on the hills of Los Angeles gleaming in the sun.

Music of the Sphere

Susan Arminé Injejikian
Griffith Observatory

On 13 December 1984, residents of the area around Los Feliz Boulevard and Edgemont Street in Hollywood heard a mysterious organ fugue coming from the hills of Griffith Park. The eerie tones were heard over each gust of the 60-mile-an-hour wind and grew silent each time the wind died down. Moreover, the multitoned pitch seemed to rise and fall as the intensity of the breeze climbed and dropped.

The ghostly musical instrument turned out to be the massive metal scaffolding covering the main dome of Griffith Observatory. The scaffolding, nearly 16 miles of hollow metal tubing, had been part of the successful effort to restore the central Observatory dome from a rust-damaged green patina to its original copper color.

According to Kirk Palmer, Griffith Observatory Telescope Demonstrator, the organ-like notes were caused not only by the elements blowing through tubes of various lengths at different angles, but also by the sheer force of the gale causing the structure to vibrate, like a giant tuning fork.