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**Mini-Planetarium at Griffith Observatory**

# A Mini-Planetarium for Griffith Observatory

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In January, 2002, the venerable Griffith Observatory on the south slope of Mt. Hollywood closed its doors after 67 years of continuous operation, and the planetarium dome – with its vintage Zeiss IV and multitude of slide projectors – went dark. The original 1935 plaster-on-steel dome has since been demolished to make way for a new perforated aluminum dome as part of the Observatory's major renovation program, with reopening targeted for late 2005.

But the four-year renovation left the Observatory without planetarium shows, which are the major element of its education programs. A year before closure we decided that we should operate a small planetarium in a temporary facility for the duration of the renovation and that we should present public and especially school programs.

> Our test audiences absolutely love the chance to talk to an astronomer and take a tour of the sky, and to actually learn about the stars, the planets, and their motions. There is a real hunger for this sort of experience where visitors can participate, ask questions, and actually learn …

## The Plan

How does one come by a mini-planetarium that would seat at least 35 kids at a time and be in daily use for several years?

We looked at the small portable planetariums that were commercially available at the end of 2001 and decided that none would really suit our needs. Those that would fit under the 12-foot (3.6-meter) ceiling of our temporary quarters were rather small.

An exhibit at the 2001 Siggraph Conference in Los Angeles gave us the idea for creating our own innovative planetarium. The Elumens Corporation of Redmond, Washington (www.elumens.com), displayed a projector with a fish-eye lens that covered the inside of a small 6-foot (1.8-meter) dome (actually a modified satellite receiver dish) that was mounted vertically. It was powered by a personal computer, and visitors sat facing the domed screen and ran simulations with a keyboard and mouse. They ran race-car and flight simulations and saw the sky as displayed by Starry Night (www.starrynight.com). I wondered if we could tilt the projector upward, enlarge the dome and place it horizontally, and project the stars overhead in a small real-time video planetarium.

Once funding for our mini-planetarium was found, Barry Lewine of Elumens Corp. visited us in Los Angeles to determine if the project was feasible. They could furnish us with a 1500-watt Dukane projector, which we concluded was bright enough to cover a dome of the size we had in mind. Their lens focuses from 4 cm to infinity, so dome size was not critical (and, in fact, this enormous depth of focus gave me an idea on how to fit more seats under a low ceiling). The lens resolution of 1024 pixels seemed enough to create a sufficiently realistic sky. We projected a similar-size image in Griffith's large planetarium theater with a projector with similar brightness and resolution and concluded that the images would be acceptable.

We originally had in mind using Starry Night Pro 3 or similar commercially-available software. In conversations with the good folk at Starry Night, which is a subsidiary of Space.com Canada Inc., we learned that they were planning to create a version of their program especially for projection on domes. We offered to be the first to test their product, and we entered into a special relationship to license what soon came to be called Starry Night Dome.

The design of our temporary dome called for a bit of innovation. We wanted people to sit on seats, rather than the floor, as the theater would be used for the public as well as schools. I sat on a folding chair and measured the bottom height of an image that would just clear my head, and in this way we established that the springline should be at 5 feet (1.5 meters). The exhibit building that the dome would fit into has a ceiling height of 12 feet (3.6 meters), so that left 7 feet (2.1 meters) for the height of the dome from springline to top. I placed folding chairs within a circle 7 feet in radius and concluded that too few chairs would fit to make the


**The Griffith Observatory Satellite is the temporary home of the staff during renovation. The front building is open to the public and features exhibits and the mini-planetarium. Buildings housing offices (right) and our production studio (left) are behind. All photographs are by the author.**

project worthwhile. But the great depth of field of the projector gave us an option. We could "flatten" the dome so that it had a greater width than height, fit many more seats under it, and hope that the brightness would remain sufficiently constant over the surface and that distortions would be acceptable. Calculations with Barry Lewine indicated that this would be so, although we had no way to test it in advance.

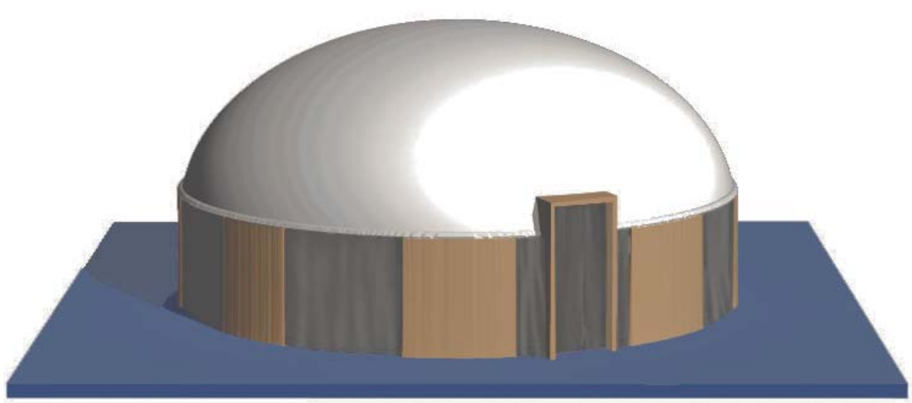
Using Griffith's conference room, which was the room with the most chairs to rearrange, we arrayed chairs to discover an optimum dome width. The greatest clear dimension in the conference room was 21 feet (6.4 meters), which seemed reasonable, so we chose this as the dome's horizontal diameter. This would also fill the space available to it in its home in the new exhibit building. The dome would have a vertical radius of 7 feet and a horizontal radius of 10.5 feet and sit 5 feet off the floor.

Because the dome would sit in a lighted room, it would have to be opaque. We didn't wish to inflate it, so it needed rigidity and to be self-supporting. It would have to be made of Fiberglass or a similar light-weight material. The building's ceiling is not strong enough to suspend the dome, so it needed a rigid base to support the weight. A dozen columns might have done the job, but the theater needed to be light-proof. We were fearful that a solid wall would be harsh acoustically on the inside and stark as seen from the outside, and got the idea that the very heavy black velour curtains from the entrances to Griffith's existing planetarium theater might be reused to form part of the walls. There was just enough curtain material to go around the base, minus the door. We settled on a design that has curved wood panel sections which support the weight of the dome around half of the base, alternating with openings between the sections, with continuous curtains on the outside. The plan was that the curtains could be opened and portable box fans be turned on to vent the small theater between shows. A door is cut into the dome to allow a person to enter without ducking, and it meets American Disabilities Act requirements. The door has new black curtains which fold back when the door is open.

The console at center needed to contain the computer to run Starry Night, a monitor and keyboard for the operator, dome lights, and a small sound system. The Elumens lens comes in either a 180˚ or 160˚ projection configuration (to fill a 180˚ hemisphere). Although the 160˚ cone would have permitted a lower console height, we chose a 180˚ lens so that the flat "cone" of light would everywhere be at a height of 5 feet, rather than the lower 160˚ lens that would have shined up into the eyes of the audience in the front row.

The dome plans went out to bid to "design and construct" to specifications. The successful bidder was Universal Exhibits of South El Monte, California (www.UniveralExhibits.com). Baeri Penn then did an excellent job of turning our simple sketches into construction drawings and ultimately in fabricating the dome and console and furnishing it with computer, monitors, cables, speakers, lights, seats, etc. Universal Exhibits removed Griffith's old planetarium curtains from the soon-to-be-demolished theater, had them cleaned and fire-proofed, and shortened them for new duty in a lower dome.

By late fall of 2002 the classic Observatory on the hill had become a hard-hat construction zone (www.GriffithObs.org/renovation.html) and our temporary exhibit facility, known as the Griffith Observatory Satellite (www.GriffithObs.org/satellite.html) was open for business – minus its planetarium – in the northeast corner of Griffith Park, adjacent to the Los Angeles Zoo. The three-building Satellite houses administrative offices, the production facility where staff is producing the premiere planetarium show for the renovated Griffith Observatory in anticipation of its re-opening in late 2005, and an Exhibit Hall. Exhibits include the Observatory's collection of meteorites, a detailed six-foot (1.8-meter) moon globe, and others; much of the space is a lecture/demonstration area that faces rows of seats.



**This graphic by Observatory artist Chris Butler (which was prepared for the bid package) shows the flattened shape of the dome and the structure of the walls where solid panels alternate with curtains. As constructed, curtains surround the entire exterior.**

## The Mini-Planetarium

In March, 2003, the mini-planetarium was delivered and erected by Universal Exhibits, and we installed a beta-version of Starry Night Dome. We've been training staff and trying it out on lucky test audiences, and we will soon begin presenting regular public demonstrations. We will present daily school shows beginning in the fall.

The dome dominates the 48 x 60 foot (14.6 x 18.3 meter) exhibit building. The dome's top comes within an inch (2 cm) of the ceiling tiles. The curtains around its base are sometimes left open so visitors can look inside when shows are not being presented (and to make it easier for our staff to catch kids who might sneak inside through the back curtains).

The mini-planetarium seats 49 on padded stacking chairs arranged in two concentric rows. Few if any visitors are aware that the flattened dome is not a regulation full hemisphere. The inside surface of the dome is semi-gloss white and is quite seamless.

The console is bulky and sits at center. The Elumens lens pokes out of the top center at springline height. The lens is flanked by flush-mounted white and blue house lights and two small speakers.

The lecturer sits with his back to the curtained door, facing the console and an Apple 17-inch (43-cm) color flat-screen display centered at eye level. He or she runs Starry Night Dome using a keyboard and mouse that slide out on a tray. A dimmable reading light illuminates the keyboard. Inside the console, behind the fold-down display, is the Dukane projector sitting on end with its lens pointing up, flanked by the housings for the dome lights. A baffled fan vents the projector to the outside. It generates a lot of heat but relatively little noise.

Below the monitor and keyboard tray are double doors that open to reveal a Macintosh G4 dual-processor computer, a subwoofer, and a second 15-inch (38.1-cm) monitor that can be used in place of the Elumens/Dukane projector for training and practice. This second monitor attaches to a bracket to the right of the large Apple monitor when needed, and stores below when not in use.

Starry Night Dome is a powerful sky simulation very cleverly programmed by Tom Andersen that allows us to give wonderful live star shows. If you're familiar with the desktop version of Starry Night, you know what it can do. It runs on a fast Macintosh dual-processor computer (or better yet, two computers) and two monitors. One monitor displays the controls and the other the sky (it can be hot-swapped with the Elumens/ Dukane projector).

Our shows are actually demonstrations, without a beginning or end, and they run two hours on weekday evenings, all afternoon and evening on Saturdays, and all afternoon on Sundays. (This schedule will expand come summer and more visitors.) Visitors wander in and out and stay as long as they choose, and are treated to a live scriptless tour of the sky and its motions. Visitors may see the current sky and learn a few constellations (perhaps with outlines and constellation boundaries), may see the planets as they will move in months to come (and perhaps learn why Mars approaches the earth every other year), watch the moon go through its phases, preview an upcoming eclipse, watch the International Space Station pass overhead as it will tonight, see (and magnify) deep-space objects, zoom into the moon to see surface features up close and personal, and zoom into Jupiter and Saturn to watch their moons orbit. We can take visitors to other planets (we can watch Saturn as seen from Titan) and even outside the Milky Way to look back on our home, which from such a distance is impossible to locate, and then zoom back to earth in a stunning fall through space. It's an absolutely wonderful learning tool and our visitors are delighted by the opportunity to learn about the sky in such a casual and informative environment with jaw-dropping visuals. The key, of course, is in having knowledgeable staff, and Griffith's lecturing staff is the best.

A telescope outside is turned towards the moon and planets (about all we can see from Los Angeles!) each evening that the Satellite is open, and the Planetarium Lecturer coordinates with Telescope Demonstrator to add further interpretation to the objects being viewed. We can see the moon as well on our dome as people can see it through our telescope, and we can point out features on the dome that visitors can then try to locate through the telescope; we can show how Jupiter's moons orbit and which is which tonight; we can show precisely where the Ring Nebula and M13 are located in the sky.

School shows will be structured and themed (and short), and they will emphasize comets, asteroids, meteors, and things that can and do strike the earth.

## Production Test Dome

Another motive for purchasing the Elumens fish-eye system is to test visuals for our large new planetarium theater when the classic Observatory reopens in late 2005. That theater will boast a 76-foot (23.2-meter) horizontal powder-coated Spitz aluminum dome, a Zeiss IX fiber-optic star projector, and an all-dome laser-projection system (manufacturer yet to be determined). The theater will seat 300, all facing the same direction. The playback system is SkyVision by Sky-Skan. Although we have produced planetarium shows for decades, and we have produced short video segments for recent shows, we are inexperienced in producing all-dome video, and we feel challenged by the prospect. Getting the camera angles, speeds, and motions correct will take a lot of thought.

The Elumens mini-planetarium gives us a place to test our all-dome videos. By converting the all-dome digital masters we produce with SkyVision to QuickTime movies, we can carry them into the mini-planetarium next door, project them overhead, and critique our productions. Our mini-planetarium will see frequent use after-hours as a test for visuals that will later appear on the big dome in laser light.

When the staff vacates the temporary Satellite facility to move back into the Observatory on the hill in 2005, we will bring the Elumens system with us and install it in our production studio under a much smaller dome and continue to use it to test visuals.

**The Fiberglass-and-wood mini-planetarium seats 49. The black curtains around its base were rescued from the classic planetarium theater before it was demolished**.

## Starry Night Spitz Partnership

Since we made arrangements with Space .com to use Starry Night Dome in our mini-planetarium, Space.com has commenced a close working relationship with Spitz, Inc., of Chadds Ford, Pennsylvania. The parties are working on an agreement for Spitz to be the exclusive distributor of Starry Night Dome as the real-time astronomy component of their SciDome and ElectricSky II full-dome display systems. The companies are also collaborating on touch-screen, manual console-control for Starry Night, which will be part of the Nomad console, manufactured by Spitz. For further information, please see www.spitzinc.com and follow the links through What's New and New Products to SciDome. Also see page 50 in this issue.

## Conclusion

As this is written in late April, our mini-planetarium is a few weeks from its official opening and we have yet to present our first school show, but we are excited by the clever little facility and the possibilities it opens up. Our test audiences absolutely love the chance to talk to an astronomer and take a tour of the sky, and to actually learn about the stars, the planets, and their motions. There is a real hunger for this sort of experience where visitors can participate, ask questions, and actually learn, and we're delighted to be able to offer it. It's a personal, intimate experience that multi-million dollar facilities with million-dollar production budgets, like those in major cities today (and like ours on Mt. Hollywood in a few years), cannot equal. Come visit us if you are in Los Angeles during the next few years, and we'll show you the sun and moon and planets. ☆