

# COSMOS

Carl Sagan takes you on an odyssey through time and space



In the PBS television series premiering this fall, astronomer Carl Sagan uses George Pal's time machine (left) and his own Spaceship of the Imagination (far right) to take you on a wondrous journey. Sagan travels to a planet in space where our own Milky Way galaxy can be seen rising, much like a sunrise on Earth (top right), passes through a quasar (middle right) and makes stops along the way for close observation of phenomena like Saturn's rings (bottom right). The true wonder of the universe turns out to be even more startling than science fiction.

By Jordan R. Fox

Until recently, scientists believed a visitor to Venus would see a stunning vista: the ground distorting and curving upward to the horizon because of the peculiar atmospheric conditions. So when the crew of COSMOS, a new PBS series set to debut this fall, decided to build a model of the Venusian surface, that's what they built.

But before shooting began, information came in from the Pioneer and Venera probes—sent by NASA and the Soviet Union, respectively—that altered theories on what the surface of the planet looked like. The COSMOS crew scrapped their model and started over, adding thick clouds, lightning, volcanos and other details.

But in the middle of building the second model, still *more* information was relayed from Venus, which made the COSMOS crew start over again, changing the colors and brightness of the model to better match the planet surface.

Certainly, the model could have been built easier. Perhaps a handful of people in the world—no more—would have noticed the flaws. But they won't. The changes were made. And that, in a nutshell, is what COSMOS is all about.

"Being so accurate could be a real pain in the ass," admitted series producer Greg Andorfer. "Our changes made the shot less dramatic. But we were making a different point; we're going to the *real* planet."

Such devotion to astronomical detail is unheard of in motion pictures, where style over substance is the general rule. But it's just part of the day to day struggle to bring the universe, the *real* universe onto television screens this fall.

"COSMOS is everything that ever was or ever will be," or at least that's the conceptual framework Cornell astrophysicist and Pulitzer Prize-winning author Dr. Carl Sagan uses to describe the 13-part series he wrote, narrated and helped create. COSMOS is a costly gamble (at \$8 million, the most expensive project ever attempted by the Public Broadcasting System) to combine education and entertainment, and will cover a wide range of topics: from the vastness of the universe to the minutia of a single cell, from the origin of myths to the origin of life here and

elsewhere. And it will all be *science-fact*, not fiction, yet with an ingrained sense of wonder eclipsing most written fiction, and with the promise of a visual scope unmatched by any big-budget space opera.

"Astronomy is a science that has always been at the leading edge of man's knowledge," said Andorfer, explaining how a series covering neutron stars, antimatter and alien worlds can also encompass the life of a cell, talking whales and ancient Hindu beliefs. "If you study a planet, it's made of something, so you need geology. It has a particular atmosphere, so you have to know chemistry. It operates according to certain laws, so you have to understand physics. And the response to the mystery of the heavens has always been an important motivator in man's attempt to figure himself out, and has played a great part in his religion and ritual. We've attempted to go from the grandest scale we know *that way*—the edge of the universe—down to the smallest scale we know in the other direction."

In the course of visualizing this grand journey from the depths of inner space to the farthest reaches of outer space, COSMOS utilizes the Cosmic Zoom and the Cosmic Calendar. The latter compresses the 15 billion years of known time into a single year. On this scale, humanity shows up as a minor footnote in the closing seconds of December 31.

The Cosmic Zoom is a 25-minute, 10 billion light-year ride through the universe that kicks off the first episode, and it represents one of the longest continuous effects sequences ever filmed. The audience travels with Sagan aboard the Spaceship of the Imagination, a glowing, ethereal ship devoid of hardware which looks like a spartan cathedral. But the view on the giant screen is a bit more heavenly, as a plethora of effects techniques simulates the passage through clusters of galaxies, past the heart of the Milky Way and towards Earth itself.

The Cosmic Zoom accounts for just a small slice of the 2½ hours of effects footage in the series, an awesome total that surpasses CLOSE ENCOUNTERS and the two STAR WARS films combined. Just realizing the Cosmic Zoom required motion control, cel animation and multiplane, model animation, process photography, rotoscoping,

models, mattes, tank work, smoke rooms and other special photographic effects. While other films have tried to show such a voyage, COSMOS' Zoom needed a verisimilitude and a sense of dimensionality—a feeling of actually *visiting* stars, planets and the building blocks of life. Since the Zoom is portraying reality, it had to be *believed*.

Andorfer credits a group of eight astronomical artists—John Allison, Jon Lomberg, Adolph Shaller, Rick Sternbach, Don Davis, Susan Brown and Annie and Ernie Norcia—for the astounding visuals that will highlight the series. "They were the core group," said Andorfer. "Their input was crucial because they understood the science."

But the eight not only were scientists and artists, but before long, effects technicians as well. "There was no one person we could have brought in [as an effects designer]. There are very few 'major generalists' around—people like Doug Trumbull and John Dykstra," Andorfer said. "We were dealing with so many different types of effects that it was just a hell of a lot easier to learn it ourselves and integrate things as we went along. The artists came here to paint, and ended up becoming expert model builders, knowledgeable programmers and able to shoot and composite multiple-pass elements."

The production originally contracted STAR WARS alumni Rob Blalack and Jamie Shourt—now with their own firm, Motion Pictures Inc.—to handle the effects chores. MPI set up the COSMOS team with motion control equipment and shot about half of the Zoom, but not without certain problems. "It turned out the only ones who really knew what was going on were the artists themselves," Andorfer said. "The programming didn't work. We ended up figuring it all out ourselves in longhand."

Eventually, motion control work shifted to Universal's Hartland facility, including the part of the Zoom through our solar system, which featured a complicated pass of Jupiter and its moons. With COSMOS' typically painstaking approach, John Allison discarded the stock Hartland starfields, and with another artist made new ones precisely duplicating just what an observer would see on that particular course. "It may not

seem that big a deal," said Andorfer, "but *we* know it's there." The pride is echoed by chief artist Allison discussing another Zoom shot. "This is the only time you've ever seen Saturn the right way, because astronomically, from the back side, the rings are *dark*," he said. "Just another subtle point."

Other work was completed at the Los Angeles PBS affiliate KCET under the direction of Adrian Malone, and several models (including the interior of the brain and five tabletop models of Mars) were built and photographed at the Magicam facility. In each case, the quest—perhaps obsession—for perfection made the task of the effects technicians that much more difficult.

Even many of the effects techniques developed specifically to more faithfully reproduce the look of outer space were scrapped. Starfields were shot on a multiplane camera, but unlike a similar technique in SUPERMAN, stars won't fly off the screen a dozen at a time in parallel lines. Also rejected was Doug Trumbull's method for shooting planets: projecting artwork onto a spherical surface (also used for the moire patterns on the underside of the CE3K Mothership). "It didn't work well for our purposes. We wanted to come up on an object and be able to swing right around it," explained Andorfer. Instead, planet surfaces were painted directly onto large globes.

The distance between imagination and reality will also be touched upon in brief clips from science fiction films. "We have a segment on the Hollywood aliens, basically showing them as a very chauvinistic idea. Though they have long ears or green skin, they're usually humanoid types," Andorfer said. "We use that to establish that life on any other planet would be very, very different from us, because we're the product of a rather long and tortuous evolutionary process."

So what would life on a planet like Jupiter be like? Sagan and artist Adolph Shaller postulated huge, kilometer-wide hot-air balloons floating around on the convection currents, feeding off organic molecules. Predators might be sail-like stingray-like beings. "Any aliens we find," Andorfer said with a smile, "are definitely not going to be like Gumby giving the boy scout sign in CLOSE ENCOUNTERS." □

