

# PLANETARIAN

*Journal of the International Planetarium Society*

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# Buzz Aldrin Promotes Mars Exploration in Your Planetarium Show

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Former astronaut Dr. Buzz Aldrin went to the moon almost thirty years ago, but since then he's been thinking about how to get us to Mars. Through his work as chair of the National Space Society, his private company Starcraft Enterprises, his recent novel *Encounter with Tiber*, and innumerable lectures, interviews, and television appearances, he has spent the last few decades promoting the continued manned exploration of space. He strongly believes that our future is in space and that an ambitious program of exploring the solar system will give our society the goals and focus we need to accomplish great things. Our achievements in space will be our legacy.

Dr. Aldrin has thought about how to go from one planet to another for a long time. Shortly after the first Americans touched the edge of space in the Mercury program, he realized that true space travel would require the ability for one spacecraft to rendezvous and dock with another. He selected for his doctoral thesis at MIT in 1963 the task of finding a solution to the problem of manned orbital rendezvous with another spacecraft. Three years later Dr. Aldrin put the routines he developed for his thesis into practice when he steered and docked his Gemini spacecraft to an Agena target. He later extended the exercise while in orbit around the moon. It's ironic and little appreciated today that it was Dr. Aldrin who developed the orbital procedures that made it possible to travel to the moon.

Taking that successful idea to the next level, Dr. Aldrin has spent more almost two decades thinking about orbital solutions to the problem of getting to Mars and back again. He designed a system of recycling spacecraft that would use the gravity of the earth and Mars to orbit endlessly between the two planets. The spacecraft would land on neither, but would remain in space continuously and be resupplied by shuttle craft

that would rendezvous with them. A pair of these spacecraft would open Mars to permanent exploration and colonization.

We at Griffith worked with Dr. Aldrin on a planetarium show some years ago. In 1979 he graciously recorded an 11-minute audio tape of his recollections of what it was like to walk on the moon. That tape was used in Griffith Observatory's public planetarium show "We Came in Peace," which was presented that year.

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*Buzz Aldrin recorded a short video statement promoting the exploration of Mars that he would like to share with the planetarium community. It was written and produced to make it easy to incorporate it into your next planetarium show on Mars or on space exploration.*

---

In 1989 we presented a revised version of the show that accommodated new information about the moon, and we reused the audio tape. It occurred to me that other planetariums might like to incorporate Dr. Aldrin's narrations into their shows too, so we made it available to others in 1988 as a service to the planetarium community (see *Planetarian*, Vol. 17, #4, December 1988). For a nominal fee that covered expenses, we distributed copies of it to planetariums around the world, and Dr. Aldrin's comments were heard by planetarium audiences as part of local shows on the moon and space exploration.

Now Dr. Aldrin is looking to the future. When he learned that we were producing a new planetarium show on the exploration of Mars, he offered to participate. After several discussions, we agreed that an effective way to incorporate his presence into the show would be for him to tell the audience, via videotape, his proposals for a recyclable system of spacecraft that will open Mars to long-term exploration and colonization, fol-

lowed by an eloquent personal statement on the importance of a human presence in space. A script was developed that runs under seven minutes. It was written so that it could be incorporated into any planetarium show on Mars exploration — or space exploration in general — as a stand-alone section.

The Television Production Department at Saddleback College, near where Dr. Aldrin lives, offered to donate studio time as a public service. On April 15 we recorded Buzz seated in front of a blue-screen. He also recorded a short promotional piece for the video.

The Observatory art staff, lead by Art Director Don Dixon and Recording Engineer Jennifer Barak, created video that illustrates the points in Dr. Aldrin's narration. Where he talks about 15th century sailing ships, we see sailing ships; where he talks about the Cyclers, we see sketches of them. This background video was done in-house and is modest in scale, but we believe it is effective. The video we use in our Mars show begins with a close-up shot of Buzz and then alternates between Buzz and other visuals several times, ending with Buzz making his concluding statement.

As a service to the planetarium community, the Griffith Observatory will distribute

copies of this tape for a nominal charge to any planetarium that requests it. The tape contains two segments: (1) Buzz seated and speaking into the camera and with cut-aways to other visuals and then back again, and (2) Buzz speaking the short promotional piece against a black background. Planetariums are free to add their own video backgrounds to the narration and to make other reasonable modifications to present it in their theaters.

The cost for a copy of the tape is US \$20 by check or money order, made out to "Griffith Observatory MRP-860." To keep costs down the Observatory cannot accept purchase orders. The tape is available in VHS, U-Matic, or Hi-8 formats. Please specify format (if none is specified we will send VHS). The \$20 cost includes the video tape, duplication, and postage. The video may be used for in-house presentations by planetariums but may not be broadcast, repackaged, or resold.

It is Dr. Aldrin's hope that planetariums will find the video useful and will find a way to present it to their audiences.

The text of Dr. Aldrin's narration, followed by the short promotional, is:

Hi, I'm Buzz Aldrin. In 1969 Neil Armstrong and I landed on the moon, but since then I've been thinking about how to get to Mars.

At present we're sending automatic orbiters, surveyors and rovers. This is a good way to start, but ultimately we're going to want to send people.

The shortest path may not be the best. In the 15th century, European mariners learned to take advantage of the tropic winds that blow steadily westward to move their caravels across the vast, trackless ocean. They relied on another system of easterly winds to return them to their home ports. These looping, curving routes did not follow direct courses, but using the wind saved energy. These trade winds became bridges between continents, making possible the great age of discovery.

I've developed a relatively inexpensive and dependable transportation system that uses *gravity* to open Mars to long-term exploration. It involves reusable spacecraft which I call "Cyclers." Cyclers take advantage of the way the earth, traveling faster on an inside orbit around the sun, catches Mars about every two earth years. A cycling spacecraft in an elliptical orbit would go from the earth to Mars and back again, permanently cycling between the orbits of the two planets. Like a ship sailing the trade winds, a cycling spacecraft does not follow a linear route to Mars. When the planets are aligned, it accelerates away from earth and loops outward, swinging close to Mars five months later. But instead of stopping, it releases smaller ships that ferry people and supplies to the surface. The Cycler itself acquires some of the planet's momentum in a process called "gravity assist," and it glides majestically on, curving away and eventually back to earth. It returns home 21 months after departure, but it doesn't stop. With another boost from earth's gravity it sails on — back to Mars. In a sense the vehicle becomes a permanent, man-made companion of the earth and Mars, using the free and inexhaustible fuel supply of gravity to maintain its orbit.

I've designed Cyclers that consist of a central docking hub, a habitation module shielded from solar flares, and the power plant. These three components are connected by long, multi-cable tethers and spun around the center to generate artificial gravity.

In practice, the Cycler system means we no longer have to repeatedly accelerate and decelerate — or discard — the most massive components. Like an ocean liner on a regular trade route, the Cycler would glide perpetually along its beautifully predictable orbit. Regular planetary flybys would create an entirely new economic and philosophic approach to exploration, carrying mankind on the next great age of exploration — and eventually to colonization and interplanetary trade.

Why is it important to send humans to Mars?

There is the scientific interest in searching for life on another planet. It is extraordinarily difficult to find truly ancient fossils here on earth, and no robotic Mars craft can make the kind of thorough search which requires trained scientists. We will never know the history of Mars until we go there in person.

But, more importantly, exploration followed by the settling of new frontiers has always been an integral part of our national, historical character. Our history of consistently taking the challenge of exploring the frontier has imbued our society with many of its distinguishing characteristics.

Many years after Apollo 11's historic landing, I'm struck by how many times people come up to me, who seem compelled to tell me where they were while Neil and I walked on the moon. I can see that event has great significance for them personally. It somehow enriched their lives to be vicarious participants and witnesses — to have been alive when it happened.

There's nothing like that today. We're consumed by short-term objectives, absorbed in our own individual concerns. This attitude, ultimately, shortchanges our children and our future. We need another great goal, another great endeavor, that will once again inspire us to bring out our best.

Our age is not going to accomplish this by building cathedrals ... or pyramids ... or bigger skyscrapers. The exploring spirit is an affirmation of faith in our society and in our future. If we don't grow, if we don't keep moving dynamically into the future, we stagnate, and then slowly we decline.

Mars beckons. We have a plan. It's time to go.

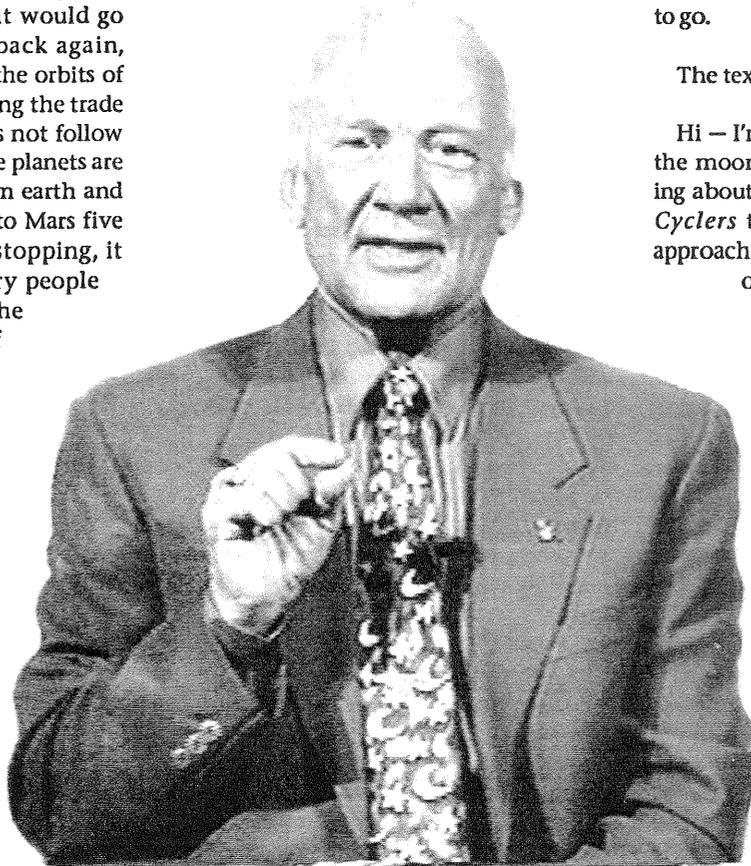
The text of the promotional piece is:

Hi — I'm Buzz Aldrin. Years ago I went to the moon, but since then I've been thinking about how to get to Mars. I've designed *Cyclers* that will create a whole new approach to space exploration and that will open Mars to colonization and interplanetary trade. I'll tell you about it in the planetarium show.

\*\*\*\*\*

Additional information on this video is posted at the Observatory's World Wide Web site at <http://www.GriffithObs.org> on the "Planetarium" page.

I would like to thank Dr. Buzz Aldrin and the Television Production Department at Saddleback College, Mission Viejo, California. ☆



*Buzz Aldrin in the recording studio of the Television Production Department at Saddleback College, California, April 15, 1997.*

# What Really Killed the Dinosaurs?

Jim Manning  
Taylor Planetarium  
Museum of the Rockies  
Bozeman, Montana USA

"Something has survived ..."

So rumbles the movie trailer for "The Lost World," the sequel to the blockbuster film "Jurassic Park," which hits American theaters this summer—setting off, no doubt, a whole new round of dino mania. It may also spawn a flurry of new or dusted-off dinosaur shows in planetariums taking advantage of the public interest. But the catch phrase in our science education theaters is more likely to be "Nothing has survived ..."

There's no denying the celebrity of dinosaurs; they're big (mostly), scary, mysterious—and they get great press. With Godzilla-like cachet, they have thundered across the popular imagination ever since 19th-century bone-collectors realized what they had. They are also safely dead, and that fact forms a principle part of their mystique; they have virtually become poster children for that most dinosaurian of all denouements: extinction. And therein, largely, is where planetarians find their stake in the franchise.

Since 1980, when the cosmic impact theory of dinosaur demise made its serious debut, planetarians have joyfully embraced it as an opportunity to legitimately link astronomy to those icons from the Age of Reptiles. "Death of the Dinosaurs" presentations have become planetarium staples as a result. Everybody does them, and in their simplest form, they go something like this ...

The show is about dinosaurs, or maybe comets and asteroids, or cosmic threats to earth. Somewhere around the middle, or nearer the end, the dinosaurs are (literally) set up: big, successful, rulers of earth for 160 million years, the very flower of the Mesozoic Age (well, once flowers had been invented). *But then*, intones the narrator ominously, *something happened, for almost overnight, they all vanished from the earth.*

*Why?* the narrator asks. *Scientists now think they know ...* And so the iridium anomaly at the Cretaceous-Tertiary boundary is invoked, its extraterrestrial nature is surmised, asteroids and comets as earth-bangers are introduced (if not already done),

and a good sized earth-banger is sent on its way toward the dinosaur-infested late Cretaceous earth.

The chilling scenario is played out: dinosaurs minding their own business, then the massive bolide streaking out of nowhere, and then WHAM!—destruction, chaos, and a good Ylem effect. A vast cloud of dust blankets the earth, and an extended winter of darkness and cold sets in. First the plants go, then the herbivores, then the carnivores, along with half to three-quarters of all species of life (percentages vary, even among

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*I like the impact theory. It's dramatic. It's sexy. It's full of astronomy. It plays well in the theater. A plausible case can be built for it. And of course, it may be right. There's just one little thing. It may also be wrong.*

---

scientists). And when the dust clears and the sun comes out at last, so do little milquetoast mammals projected against the mighty saurian skeletons, who have survived the disaster by burrowing and eating carrion. Well-fed and rested and ready to roll, they now proceed to evolve, diversify and rule in the dinosaurs' stead.

Additional points may be emphasized: the similar scenario of nuclear winter, the need to find earth-crossing asteroids because it can happen again, the human species as the world's current biggest disaster threat. And so the sudden disappearance of the dinosaurs is solved, with lessons for us today.

I like the impact theory. It's dramatic. It's sexy. It's full of astronomy. It plays well in the theater. A plausible case can be built for it. And of course, it may be right.

There's just one little thing. It may also be wrong.

Do we include any such equivocation in our presentations? Some planetarians do. Some do not, and back in 1986, Mick Hager, the Museum of the Rockies' former director, raised eyebrows at several planetarium conferences when he took us to task for playing the theory more as a given than as the

hypothesis it was. But that was then; after more than ten years of additional studies, isn't the evidence overwhelming? Do we really need to qualify our demonstrations today?

Perhaps, with computer-animated carnosaurs on the big screen shrieking in our dolby-surrounded ears, this is a good time to review that question. For it has implications beyond merely spinning a good yarn about dinosaurs; it also says something about how we present science to the public. Here's one person's perspective ...

## Seeking Perspective

The Museum of the Rockies where I work is a multifaceted museum, but no facet shines brighter than its dinosaurs. And there's nothing like being around dinosaurs and their handlers—the paleontologists—to gain some perspective on the Really Big Questions that surround them.

The museum is known for the work of paleontologist Jack Horner, famous for the discovery of dinosaur nesting sites in Montana and his subsequent theories about dinosaur social behavior. Our dinosaur

exhibits illustrate what life may have been like back then, but you don't have to take the exhibits' word for it. In a way, you can go see for yourself.

In the summer, the museum conducts daily tours and week-long field schools at "Egg Mountain," the site excavated by Jack and his associates since the late 1970's. The scrubby knoll and surrounding badlands west of Choteau, Montana have yielded the remains of eggs and nests and babies and adults of several Cretaceous dinosaurs species, including the duckbill *Maiasaura* (the "Good Mother Lizard"), the smaller hypsilophodont *Orodromeus*, and the small carnivore *Troodon*.

By day, field schoolers work with paleontology graduate students who lead sorties into the badlands, hunting and exhuming 80 million year-old fossils that no human has ever laid eyes on before. You might go prospecting for new finds, picking up bits of black eggshell weathering out of *Maiasaura* nest sites along the way. Or chip at the hard matrix of Egg Mountain itself, seeking new hypsilophodont nests, eggs or bits of bone. Or hunt for ornithomimid remains, or *Daspletosaurus* teeth, or "coprolites"—fossilized

dino dung. Or dig into the bone bed underlying the site which contains the jumbled remains of an estimated 10,000 Maiasaurs presumed to have succumbed during a gigantic volcanic eruption, their bones later mingled and washed downstream in a great flood.

And by night, you gawk at a stunningly black and starry sky, sometimes laced with auroral streamers or bright Perseid meteors, seeking finds of another kind with one of the museum's small portable telescopes. Or sit by the campfire in the night chill, listening to the coyotes howl at the rising moon before you bed down in Blackfoot tipis to the call of nighthawks and the scritch-scratch of black-eyed mice playing on the tipi liners.

Egg Mountain is a wonderful place, with the panoply of dinosaur life and death laid out in the synclines and anticlines and eroding gullies around you, the universe arching above at night. It's a place where the museum combines in a singular experience the elements of paleontology, geology, and astronomy—the same subjects we planetarians try to combine in our dinosaur shows. It's a good place to contemplate links between the cosmos and the dinosaurs, and to ask the Really Big Questions.

If you ask Jack Horner those questions, and I have—specifically the one about how the dinosaurs died out—he'll tell you first that dinosaurs were among the most successful large animals ever to walk the earth, and that he's much more interested in how they lived. Next, he might tell you that dinosaurs *didn't* die out, not completely; that they survive in their descendants, the birds. But if you press him, he'll probably also tell you that he favors the more traditional climate- and habitat-change theories of dinosaur extinction.

Why? It's not that he disputes that something big crashed into the earth 65 million years ago and wreaked havoc with the end of the Cretaceous period; he has no quibble with notion of an impact itself. What he'll tell you is that there is as yet no definitive proof that there were any dinosaurs still alive when the thing hit; in other words, no dinosaur skeletons have yet been found as high in the geological strata as the Cretaceous-Tertiary boundary layer where the excess iridium lies. And until that changes, he considers the impact theory academic for dinosaurs,

and is content to go on puzzling out how they lived rather than when, exactly, the last one died.

Paleontologists, I've found, expect corroboration in the fossil record for sexy theories. And in the "Choose Your Poison" dinosaur sweepstakes, Jack Horner is not alone.

### A Dinosaur's Pandora's Box

Extinction is a natural part of life on earth. But we didn't know it until the early 1800's, when French naturalist Georges Cuvier looked at all the old bones people were digging up and declared that they belonged to fabulous creatures that had long since cashed in all of their chips. And from the carnage he found in some of the some rock layers, he further declared that the cashing-in must have been catastrophic, caused by floods, glaciers, and earthly upheavals of a most unpleasant sort.

In 1841, Englishman Richard Owen grouped those with reptile-like skeletons into a new class he called "Dinosauria"—"terrible lizards", and people began to wonder what kind of catastrophe could have befallen so

large and impressive a race. Owen himself suggested that God had placed dinosaurs on the earth during a past period of low oxygen content in the air—it was something he (Owen) figured cold-blooded and low-energy reptiles didn't need much of. When the atmosphere later became more oxygenated, the world became unsuitable for them and they turned into fossils.

Death by oxygen may not be the spectacular end the catastrophist Cuvier had envisioned, but by this time, the "uniformitarianism" of James Hutton and Charles Lyell had taken hold as the geological paradigm that would rule subsequent views of earth history. "The present is the key to the past," the paradigm says; "the earth processes at work today are a continuation of those at work in the past"—and those processes seemed to operate mostly at a gradual rate. In fact, Darwin was heavily influenced by this paradigm, so it's not surprising that his "natural selection" theory of evolution involved the gradual accumulation of small changes that led species to invigoration, doom, and altered forms. Abrupt changes simply meant gaps in the record.

But catastrophic or gradual, there had to be a reason—a culprit—in the demise of the saurians, who even then had an appeal that no deceased trilobite or horsetail could match. Cuvier and Owen had gotten the ball rolling, and things have been going like a game of Clue ever since. Was it Colonel Mustard in the parlor with a pistol? A mosquito in the rump with a killer virus? Or the cosmos in the Yucatan with a big rock?

There's never been a lack of imaginative scenarios for killing dinosaurs, and they read like a veritable Pandora's Box of miseries. "Racial senility" was an early favorite; this was the notion that dinosaurs simply reached the end of their genetic rope. The fossil record shows that dinosaurs changed and adapted, new species replacing old, through most of the Mesozoic Period; they finally just ran out of new ideas and body styles. Or as humorist Will Cuppy put it in 1941: "The Age of Reptiles ended because it had gone on long enough and it was all a mistake in the first place."

Some said that the upstart mammals did it by eating the dinosaurs' eggs. Some said the dinosaurs did it to themselves by eating things that were bad for them and making their eggshells too thin to be viable, or putting on so much weight that they had a problem with slipped discs, or



Uncovering the past at Egg Mountain. Museum of the Rockies photo.

letting their brains shrink so that they became stupid (the first object lesson in “use it or lose it”).

Some said that the plants did it, evolving into toxic forms that either poisoned the dinosaurs or gave them terminal—and mind-boggling—cases of constipation. Some said that it was insects injecting them with plagues (presumably as the insects in turn sucked up their DNA for later recovery by Michael Crichton). And some said it was volcanoes that did it, disrupting their environment. Or lack of standing room on Noah’s ark.

Occasionally, celestial retribution was cited: cosmic rays or radiation from a nearby supernova, sterilizing the hapless beasts or killing them outright. Or (this will sound familiar) big meteorites or comets knocking them off from space. Or even aliens from Alpha Centauri on a hunting safari.

But it was always the climate change theories that seemed most plausible; who can forget the famous Walt Disney Dinosaur Death March in *Fantasia*, the world gone to desert to the strains of Stravinsky’s “Rite of Spring”? The main question was did the dinosaurs’ world become too hot or too cold, too wet or too dry? There were scenarios for each. Whichever, loss of suitable habitat seemed the likely winner, especially when plate tectonics came into vogue, telling us that the dinosaurs and all the rest of earth’s land life were constantly riding around on continents that acted like slow-motion bumper cars. As the land masses ground together and pulled apart, as mountains rose and volcanoes spewed forth climate-altering gases, as the seas advanced and retreated, it got hard for big, specialized animals to cope. When the weather turned and their habitats “went south”—so did they.

And so things went—until around 1980, when a rare metallic element concentrated in a clay layer in sediments north of Rome turned earth science on its ear.

## The Impact Hypothesis

In 1980 in the journal *Science*, a quartet of scientists made a modest proposal. Their paper suggested that a rare metallic element found in a clay layer 65 million years old was the signature of a global catastrophe that utterly altered the world, wiping out many of earth’s life forms including the dinosaurs. They said an asteroid did it. I think the catastrophist Cuvier might have been pleased.

They weren’t the first to suggest the possibility; that honor may go as far back as 1742, when a gentleman named Pieerer de Maupertuis opined that comets whacked earth regularly and destroyed its life. Others revived the notion periodically in the years

to follow, including the French astronomer Laplace. Most recently, Canadian geologist Digby McLaren in 1970, American chemist Harold Urey in 1973, and Irish comet expert E. J. Opik some years earlier had all suggested meteoritic or cometary impacts as a good way to kill the dinosaurs. The difference with the Alvarez group was that they brought serious evidence to the table.

According to accounts, in the late 1970’s, geologist Walter Alvarez was seeking a way to determine an accurate time scale for, among other things, the laying down of sediments in the narrow clay layer that marked the end of the Cretaceous Period of geological history. It was a time known for the extinction of many species, from the massive dinosaurs to the tiny marine foraminifera whose calcium carbonate shells made up the limestone sediments that stopped at the clay layer, were absent during the years the clay was put down, and then resumed in newly-evolved forms in the dawning Tertiary Period above it.

Walter’s father, Nobel-laureate experimental physicist Luis Alvarez, suggested an ingenious method of timing. Iridium, a member of the platinum group of metals, was rare in earth’s crust but relatively abundant in meteorites; since a constant slow rain of meteoritic ash settled on the earth from space, why not test the concentration of iridium to surmise the time frame over which it was deposited? With the help of nuclear chemists Frank Asaro and Helen Michel, the Alvarez’s analyzed samples of the clay layer near Gubbio, Italy. And they found an “iridium spike”—an unexpected and sizeable enrichment of the metal that made it useless as a timekeeper but suggested that for some reason, an awfully lot of presumably meteoritic dust was deposited just around the time that many species of life were dying out in what scientists termed a “mass extinction.” Two other sites in Denmark and New Zealand yielded similar iridium spikes at the Cretaceous-Tertiary (K-T) boundary.

The Alvarez group put two-and-two together and postulated that an asteroid (about 10 km or six miles wide, from the estimated amount of iridium deposited) smashed into the earth 65 million years ago at a speed of thousands of miles per hour, making a crater 200 km (120 miles) wide and blasting debris 60 times its own volume into the air. The dust shrouded the earth in constant night for several years, halting photosynthesis. On land, plants died, then the plant-eating dinosaurs, then the meat-eaters who preyed on them. There was a similar food chain calamity in the oceans.

When the dust finally settled, the dinosaurs and a lot of other things were

dead. But small animals including our ancestral mammals survived, perhaps by feeding on insects and decaying vegetation; plants recovered via seeds, spores, and roots, and life went on. Not only that, but there were other mass extinctions in the past; perhaps they might have been caused by impacts, too.

Well. Needless to say, geologists and paleontologists took notice, igniting a flurry of scientific investigation and a lively debate about causes and effects and the fossil record that continues to this day. The media, knowing what the public likes and prone to giving it to them, jumped on the bandwagon almost immediately. As Australian journalist Ian Warden wrote (quoted from the book *The Great Dinosaur Extinction Controversy* by Officer and Page), “To connect the dinosaurs, creatures of interest to but the veriest dullard, with a spectacular event like a deluge of meteors ... seems a bit like one of those plots that a clever publisher might concoct to guarantee enormous sales. All (the theories) lack is some sex and the involvement of the Royal Family and the whole world would be paying attention.”

The dinosaurs were already resurgent in the public mind; by the end of the 70’s, a decade of discoveries, debates, and controversies were remaking the dinosaurs’ old public image as reptilian, stupid, and slow. Increasingly, they were being regarded as active and agile creatures, potentially warm-blooded (this remains controversial), some perhaps exhibiting bird-like social behavior, with the lineage perhaps surviving in the form of descendant birds today. And now, to have them perish in what would have made a top-notch disaster movie ... The whole world seemed to be paying attention even without the additional wrinkles suggested by Warden.

Within a few years, planetariums were debuting the first “Death of the Dinosaurs” shows, finding the astronomical connection that made dinosaurs a hot topic under our domes. Also within a few years, scientists inspired by the hypothesis (Carl Sagan among them) were developing a similar model for the effects of nuclear war called “nuclear winter,” adding a new chill to that ghastly cold-war prospect. And people found increasing reason to search the sky for earth-crossing asteroids that might wreak such havoc again at some future time. Very quickly, the notion of dinosaur death-by-impact seemed to pass into the popular culture.

Meanwhile, what was the scientific community doing? Scientists were doing what scientists do: arguing among themselves.

Challenging new ideas is a time-honored scientific tradition; it’s the “fail-safe” part of the scientific method. It’s not sufficient

merely to observe and hypothesize; you have to test, and you have to submit your theory to the most rigorous kind of scrutiny as your colleagues either search for supporting evidence or try to blow it out of the water. It's Darwinian science, "survival of the fittest theory," and it keeps us from drowning in a morass of unsupported fads and claims of "cold fusion." If the theory survives, it can become part of the scientific paradigms that characterize our view of how the world works. But it's not easy to get in. And it takes time.

In the case of the impact hypothesis, the resulting debate is sometimes characterized as a fight between the "old" uniformitarianism and the "new" catastrophism. Cuvier's concept of change-by-catastrophe had enjoyed a revival in the 1970's when geologists Stephen Jay Gould and Niles Eldredge proposed a modification to Darwinian theory called "punctuated equilibrium." They suggested that the fossil record revealed not gradual evolution over time, but rather, long periods of equilibrium punctuated by episodes of rapid evolutionary change. The impact hypothesis fitted neatly into this concept, and it was used to assail the uniformitarian view which had held sway for more than a century—and whose proponents resisted the abandonment of more gradualist theories of extinction for a *deus ex machina* in the form of a big rock from space.

Was resistance to the new hypothesis simply the old guard hanging on to their beloved paradigm? Or resentment that the leading lobbyist for the theory—Luis Alvarez—was a physicist dabbling in another science's realm? In some cases, perhaps. But it's too pat an answer and far too broad a brush with which to paint the whole of the opposition.

The burden of proof for a new scientific theory inevitably falls on its proponents, and opposing scientists, whatever their motives, were doing their job. To the Alvarez group and their supporters, they said "prove it"—and the game was afoot.

### Dante's Inferno, Periodicity, and the Crater

The ensuing rough-and-tumble years of the Great Extinction

Debate (and it was always about more than just the dinosaurs) have shed a good bit of heat and some fascinating snatches of light on the history of the earth, extinctions, and the process of science. As scientists scurried to look for supporting or conflicting evidence, they began to peek under the veil of the past in ways they hadn't before.

One needed only to look at the moon, count earth-crossing asteroids and fossil earth craters, and think of Tunguska to realize that the threat of impact was genuine. But did it really happen, big-time, 65 million years earlier? Could additional evidence be found?

Scientists continued to root around in the K-T clay layer, ultimately turning up iridium spikes at more than 100 sites world-wide; whatever happened, it appeared to have sprinkled the element liberally. Investigators reported tiny metallic spherules (now found at more than 30 sites), and the presence of shocked quartz grains as well (noted at more than 60 sites). Both were contended to be

telltale signs of a monster impact that rained down the debris along with the iridium.

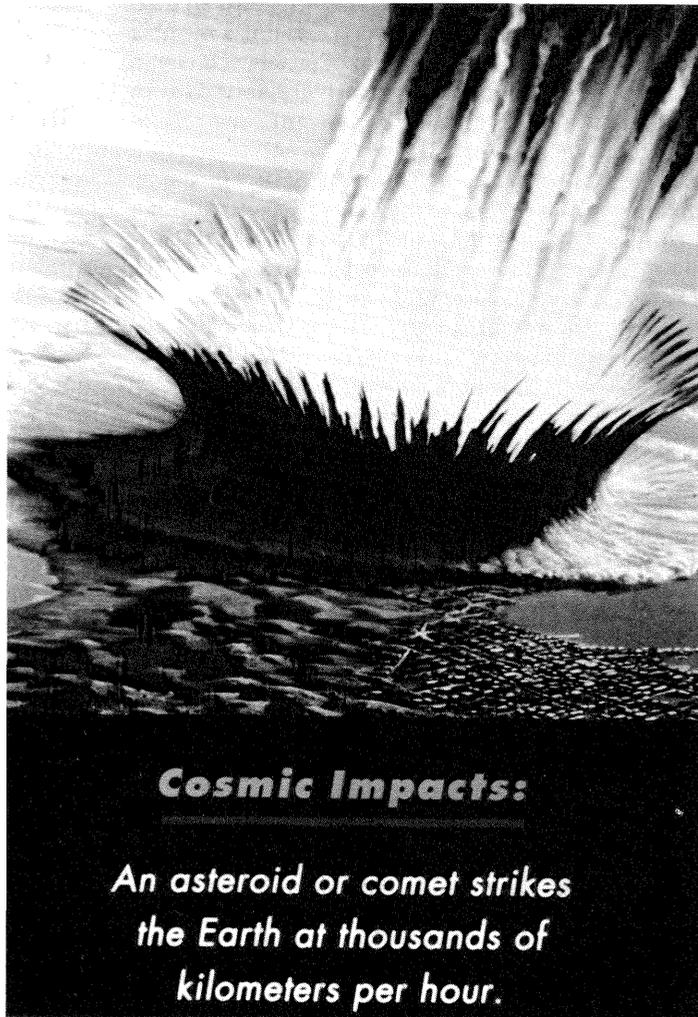
Now geologists may not deal much with iridium anomalies, but they know their quartz, and the tiny fractures in the grains were of the sort associated with nuclear test sites—and impacts. And many were impressed. But not all. Some contended that the pressures of explosive volcanism could shock and scatter the quartz and spherules as well.

While scientists quibbled over quartz, the dino disaster train was building up a head of steam, and impact supporters (sometimes called "impactors") were suggesting corollary effects that would only have increased the woes of late Cretaceous earth-dwellers. Some said it got more than dark; it also got cold, the atmospheric dust blocking solar heating and plunging the temperature to below freezing for time periods now characterized in months rather than years. (Scientist's theories couldn't keep the dust aloft for three years as originally suggested, but they felt

they could keep it up for three to six months and still do the trick.) Others said that injected greenhouse gases like water vapor would have made things hot; some suggested first it got really cold, and *then* really hot. Opinion still doesn't seem quite settled on this, but either way was bad.

And there was more. Some scientists said that the energy of the impact would have created nitrogen oxides in the atmosphere, falling to earth as a global acid rain; others later added sulfuric acid from vaporized rock to the nasty cocktail. Still others in 1990 reported soot at several boundary sites, and postulated global wildfires (set by flaming blast fragments or lightning strikes on dried vegetation) that consumed up to half of the world's biomass. Impact supporters were painting a gruesome picture of aftermath; Walter Alvarez termed the proposed mix of conditions a "Dante's Inferno."

While the dino disaster movie was adding some gonzo new special effects, scientists were still quibbling over the constituents of the pesky K-T layer, and it was causing the impact hypothesis to evolve. Critics pointed out that while shocked quartz in the boundary layer suggested a land hit, arsenic and antimony levels suggested the presence of ocean-



Was it an impact that killed the dinosaurs? Courtesy Hansen Planetarium.

floor basalt; so the impactors hypothesized several near-simultaneous hits, both by land and sea. And when others claimed the fossil record showed staggered or “stepwise” extinctions over a three-million year period, some of the impact crowd—including Walter Alvarez—countered with a shower of comets instead of a single asteroid hit.

Some impactors didn’t like their elegant single-hit theory turning into a hydra, but the comet shower idea fitted in nicely with an expansion of the impact debate that had begun a little earlier. For many years, paleontologists recognized five great dyings in the fossil record of the Phanerozoic Eon (the eon of “visible life,” encompassing the last 550 million years), when the level of ongoing “background” extinctions climbed to unusually high rates. These were the “mass extinctions.” The K-T event was the most recent; there was a smaller peak at the end of the Triassic Period (which obviously didn’t do in the dinosaur gene pool), and a really big one at the end of the Permian, when up to 95% of earth’s species died out—the closest we ever came (so far as we know) to the total extinction of life.

But in 1984, extinction peaks started popping up all over. A statistical analysis of the last 250 million years by paleontologists David Raup and Jack Sepkoski revealed, they said, a number of smaller extinction peaks as well—12 in all since the Permian, which occurred periodically at a mean interval of about 26 million years. They suggested that the cause might be extraterrestrial; it was all some astronomers needed to get into the game.

In a matter of months, three theories had been manufactured to account for the cyclic rains of death. The first proposed a tiny companion star for the sun (dubbed Nemesis) which, every 26 million years, dipped into the Oort cloud and dislodged a hail of comets to smack the earth. The second theory substituted Planet X, precessing regularly into the comet swarm to produce a similar effect. The third cited the solar system’s habit of bobbing up and down through the galactic plane; when it did so, it was the gravity of interstellar clouds that did the comet-nudging. Nemesis especially was appealing to the media, as the “Death Star”; once again there was flaming retribution from the

sky in the popular press.

And again there were spoilsports. The extra extinction peaks were small—some not much above the background noise; were they real? Some said they were a statistical artifact. And others suggested any periodicity merely reflected the time it took surviving species to rediversify sufficiently to be vulnerable once again to large-scale die-offs.

As for the “Death Star,” some astronomers pointed out that a red dwarf in so huge and tenuous an orbit would have been lost to the sun long ago. No Planet X was forthcoming, and the solar system was crossing the galactic plane right now—where was the mass extinction?

And so it went.

Back at the K-T, before the impact hypothesis starting growing multiple heads, one nagging question had always been “Where’s the beef?”—namely, the crater. Of course, it might have been subducted, but if not, where do you hide a 200 km fossil crater?

In 1990, after several smaller candidates

had been investigated and rejected, scientists sniffing around suspicious K-T deposits in the Caribbean learned of a large, circular structure under the north coast of the Yucatan Peninsula, centered under the town of Chicxulub (in sanitized Mayan, “the devil’s tail”). It had been noted as early as the 1950’s during oil explorations by Pemex, the Mexican oil company, and had actually been suggested as a possible impact site in 1981, to surprisingly little attention. Now it got some attention.

Scientists analyzed samples of rock taken from Pemex drill cores of the site and reported in 1992 that they found what appeared to be glassy melt rock that they dated to 65 million years old and closely matched material in nearby K-T deposits. The crater appeared to be the right age and the right size (180 km wide—recent reports say maybe bigger), with apparent late-Cretaceous breccia identified above it that was dismissed as “fallback” and “infilling” material. Soon scientists were buzzing around Chicxulub and its environs

like honeybees around a flower patch, analyzing geophysical data, well logs, drill cores, alleged ejecta blankets and tidal wave deposits, declaring that they had found the “smoking gun.”

So—you had dead dinosaurs and other expired species, a geologically sharp boundary riddled with chemical and mineral evidence of impact, and at last, a fossil crater that filled the bill. Surely, opposition would now dry up and blow away.

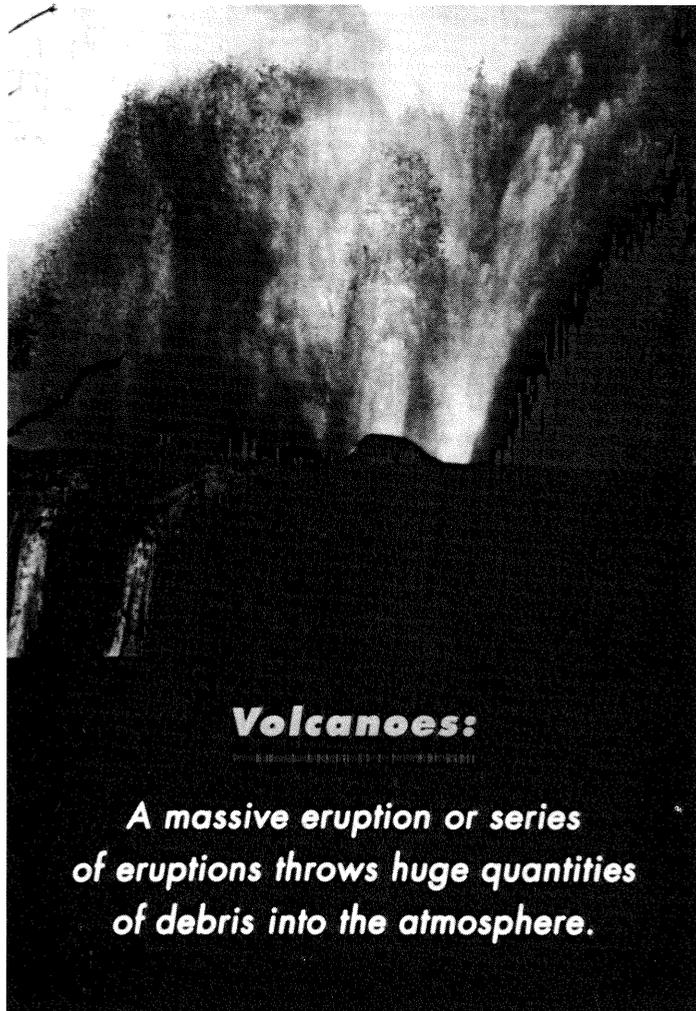
It didn’t.

### Impact as Anticlimax

As any forensic pathologist is likely to tell you, a smoking gun is a very useful thing to find—assuming the victim died of a bullet wound. And that’s the crux, I think, of where the Great Extinction Debate sits today.

From the beginning, the impact hypothesis had two main tenets: first, that a big impact occurred at the K-T boundary, and second, that it caused the sudden and massive extinctions that are noted there. And acceptance of the first does not automatically imply acceptance of the second.

An anecdote will illustrate. In 1985, Malcolm Browne of *The New York Times* took an informal poll at a meeting of the Society of Vertebrate Paleon-



Were volcanic eruptions involved in the dinosaurs’ demise?  
Courtesy Hansen Planetarium.

tologists concerning the impact hypothesis; he found 90% of the paleontologists willing to accept the possibility that an asteroid hit the earth around the end of the Cretaceous, but he found only 4% who thought that a cosmic impact was what wiped out the dinosaurs. Why the disparity? I think it's because while physicists and geochemists and planetary scientists were pursuing one line of evidence, paleontologists were looking at another: the fossil record. The two lines of evidence weren't jibing, and paleontologists believed the fossils.

The difficulty of corroborating the impact hypothesis in the fossil record has always been the tricky part of the whole impact business. Paleontologists had traditionally recognized the great changes in life at the K-T boundary; it was in fact the abrupt disappearance of the calcareous plankton (the limestone-makers) and the sharp demarcation line it made in the strata that had caused scientists to peg it for the boundary between the Mesozoic and Cenozoic in the first place. But to a geologist, "abrupt" can mean a million years, and estimating time periods of less than 100,000 years in the strata is doing very well. Six months? It was one thing to say late Cretaceous dinos and others died out quickly—over thousands or maybe a million years. It was breathtaking to say they were offed literally overnight, in less than a year—and expect the fossil record to tell you it happened in June. (Remember that it was Walter Alvarez's desire to find a way to get a handle on the elapsed time of the K-T transition that led to the discovery of the iridium anomaly and the formulation of the impact hypothesis to begin with.)

As in so many things in life, timing is everything in the extinction game, and the geological record offers only a gross recording.

The state of the fossil record is another problem. The reason those little limestone foraminifera are used so much for dating and deciphering things is because they and the marine deposits in which they're found are relatively plentiful. Dinosaur bones, on the other hand, are not. Deposition and erosion regimes are very different on land than on the sea bottom, and it's hard

to preserve a dinosaur—and thus to be sure when they're all gone. (Even the Alvarez group appreciated the problem in their original iridium paper as did the authors of the later comet-shower treatise. In the former in 1980, the Alvarez's acknowledged that a problem with their hypothesis was that best evidence at that time suggested that the K-T foraminifera and the dinosaurs didn't die out at the same time. In the latter published in 1987, the authors simply stated that the relevant fossil record was complex, and "Dinosaur fossils are too rare to determine whether their extinction was abrupt or gradual.")

Perhaps it's not so surprising, then, that many paleontologists—especially vertebrate paleontologists—still don't buy the impact hypothesis as the dinosaur-killer.

Jack Horner, as I mentioned earlier, is one of those vertebrate paleontologists. Frankly, he doesn't feel all that strongly about the issue in the first place; he'd much rather talk

about his theories of dinosaur behavior. But if you insist, he'll take a position that I think a lot of his colleagues do as well: fine—an asteroid or a big comet hit the earth 65 million years ago and raised some dust. But there's no solid evidence that there were any dinosaurs still alive then. Fossil data clearly suggest that the dinosaurs had been in decline for some time, operating on an ever-shrinking number of species. At best, the rock fell on the heads of the stragglers who were already on their way out.

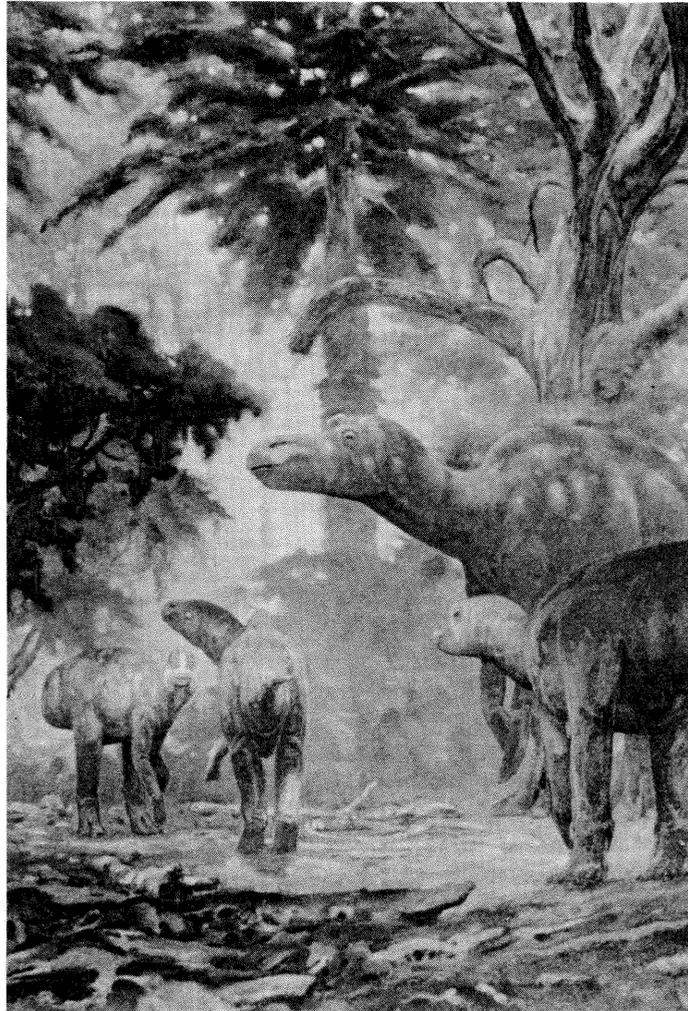
In short, the asteroid was anticlimactic, at least as far as the dinosaurs were concerned.

It's important to remember that only so much can be inferred globally, on either side of the issue, from the existing fossil record—as biologist David Archibald points out in his book *Dinosaur Extinction and the End of an Era*. According to Archibald, there are many late Cretaceous sites around the world, but very few identified end Cretaceous sites—strata that encompass, on land, the time up

to the K-T boundary. Virtually all of these are in western North America running along the Canadian and U.S. Rockies, where the late Cretaceous inland seaway divided the continent and provided excellent conditions for fossil deposition. And only one of these sites—the Hell Creek Formation in Montana—provides a really good record of vertebrate fossils across the K-T boundary into the Tertiary.

This rather limits the view backward, or at least requires some large assumptions. For example, some people claim that North America was the dinosaurs' last stand, the creatures having already disappeared from the fossil record on the other continents. It may be true, but it also may just be an artifact of the rarity of end-Cretaceous fossil records elsewhere. Paleontologists make the most of what they have. And what they have so far, many of them they say, gives no solid evidence that dinosaurs were still around, in North America at least, when the Big One hit. And there's little evidence of any sort from any place else.

A few paleontologists who find dino bits in early Paleocene strata above the K-T boundary contend that dinosaurs may have survived the end of the Cretaceous, but most of their colleagues consider the bits to have been "reworked"



Sometimes extinction is a very personal thing. Albertosaurus and Maiasaurus encounter. Doug Henderson; courtesy Museum of the Rockies.

from older ground into younger ground by erosive processes. In fact, Archibald reports that the highest "in-place" (not reworked) dinosaur bones at sites along the Rockies are some three meters (10 feet) below the K-T boundary as defined by the iridium signature. And while some paleontologists believe that dinosaurs flourished right up until the end of the Cretaceous, most find decreasing diversity of species as the K-T boundary is approached, and they believe the data to be real.

But if the asteroid didn't do in the dinosaurs, then what did? Scientists cite long-accepted evidence of environmental changes during the end times of the Cretaceous, even if it isn't as spectacular as flaming death from the sky. Pangea was pulling apart then and the continents were going their separate ways; mountains were building and the weather was changing. There was intense volcanism creating the Deccan Traps in India and spouting off elsewhere, and the climate was cooling. The ocean levels were falling, the shallow epicontinental seas were being lost, and especially critical in North America, the inland seaway was going away. Dinosaur habitats were changing for the worse, there may have been added competition from ascendant animal species who were doing better in the new conditions, and they couldn't cope. Except, of course, for the birds!

Interestingly, a similar set of conditions is believed to have occurred at the end of the Permian, when Pangea was coming together and the earth experienced the granddaddy of all extinction events. And there isn't much evidence of meteoritic involvement then. Some think it's a good model for the K-T.

And so the debate goes. Some scientists have used statistical methods to claim that Archibald's "three-meter gap" isn't significant, and is within "sampling error," and therefore dinosaurs romped right up to the K-T cutoff. But while statistics allow you to argue the point, it doesn't *prove* the point; only bones or other tangible evidence can do that.

In the meantime, Jack Horner is going back to his preferred studies. If you want to impress him with the impact theory, you're just going to have to come up with an in-place dinosaur skeleton at the K-T boundary. If it's sprinkled with iridium, so much the better!

## The Earth Did It

Despite the apparent pervasiveness of the impact hypothesis, alternative viewpoints still flourish in the nooks and crannies of the scientific world, like mammals waiting for

the skies to clear. And if the impactors have trouble convincing some paleontologists that there were dinosaurs left for the asteroid (or comet swarm) to hit, they also still have trouble convincing at least a few geologists that there was any impact at all. Geologist Charles Officer and Jake Page, in their book *The Great Dinosaur Extinction Controversy*, say the earth did it without any help from space.

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*But what, finally, of the suspicious crater in the Yucatan? Officer/Page go so far as to say that it's volcanic also.*

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Officer and Page are proponents of the rival volcanic theory which still nips at the heels of the impact hypothesis, claiming that all of the effects described at the K-T boundary, and the extinctions, can be accomplished by the work of volcanoes. (They also derive some help from sea-level regression.) In fact, the creation of the Deccan Traps of India—extensive lava deposits that represent the biggest volcanic episode since the end of the Permian—have been dated to about 65 million years ago, coinciding with the K-T boundary. But how could volcanism explain what we find there?

The iridium? No problem, say the volcanists. There's little iridium in the earth's crust because of earth's early differentiation, but there's plenty in the interior, and it gets out via "hot-spot" volcanoes (volcanoes created by upwellings of heat from the deep mantle). The Deccan Trap volcanoes were created by a hot spot, and so is Hawaii's Kilauea, from which considerable iridium-spewing has been detected. Because the Deccan volcanism lasted for several hundred thousand years, it can account for not only the iridium anomaly, but the smaller enrichments and peaks which have been noted on either side of the main spike. (Impactors explain this feature as a diffusion of the iridium after deposition.) And the quartz and spherules? They're volcanic features created and distributed by explosive volcanism at the start of the Deccan period. (It's safe to say that the impactors are not convinced.)

This is the Officer/Page scenario: first, sea-level regression takes away the North American inland seaway, the habitat changes and the dinosaurs are history. Next, as the waters continue to recede, the shallow continental-shelf oceans are lost, and so are the shallow-water shellfish. Finally, the emissions of the Deccan volcanoes create an acid rain that poisons the ocean for the plankton, and they

kick off as well. All the other doomed species follow along.

Volcanism and sea-level regression also occurred around the time of the great end-Permian extinction, and Officer/Page suggest the two effects may be connected in some way. Geologist Vincent Courtillot has proposed that the connection may be energetic mantle convection which may also add magnetic field reversal to the mix.

But what, finally, of the suspicious crater in the Yucatan? Officer/Page go so far as to say that it's volcanic also. Citing a Pemex log of a drill core from the site, they find the late Cretaceous "ground" layer in place above it (hence no impact to gouge it out), find no characteristic "melt sheet" (which is rock liquified into homogeneity by impact and then solidified), and claim that the melt layers noted in the drill core are volcanic in origin. But other geologists who contend it's an impact crater, looking at the same drill core and others, say overlying Cretaceous breccia is material that fell back and filled in. They also claim no melt sheet, but suggest that it may be lower down or that the site may not have an extensive one (apparently not all impact structures do). Finally, they say that the melt rocks they've seen and analyzed are impact-melted.

Of course, the two analyses are quite irreconcilable. Perhaps it shows what differences of perspective can do!

## The Kitchen Sink Theory

When no one theory quite seems to satisfy, maybe all of them together will; that's the approach of biologist Archibald, who in his own analysis, throws everything at the dinosaurs but the kitchen sink.

He finds that no single theory seems able to account for the pattern of evidence, extinctions, and survivors that he sees, and so he suggests that it may require an unlucky convergence of factors to produce the sorts of massive yet selective extinctions perpetrated at the end of the Cretaceous. He offers a hybrid scenario; parts will sound familiar by now, but he has an interesting wrinkle at the end.

Archibald opens his tale of doom several million years before the end of the Cretaceous with that old devil sea-level regression. The continental shelves are being exposed, and the inland seaway of North America is shrinking; shallow-ocean dwellers and the dinosaurs and some of their terrestrial compatriots are stressed. The sea lowers and land bridges form, and new immigrants jostle for living space.

As the Cretaceous Period wanes, the Deccan Traps are erupting regularly, tossing particulates into the atmosphere that cool

and dry the climate in many areas. The old habitat just isn't what it used to be and the dinosaurs and others are in decline.

Then, at just the wrong moment, as if they weren't in enough trouble already, a big asteroid screams in from the stars and pocks into what will become the Yucatan Peninsula. It's the last straw. Debris blasts into the air, darkness descends and interrupts photosynthesis for a while, and the species already not doing well call it an era. Those that had been doing all right muddle through and inherit the earth.

Furthermore, Archibald postulates, mid-latitude environments and places near the crash site, like North America, fared worse than higher latitudes. Fossil plant studies from Rocky Mountain sites suggest rather abrupt plant die-offs followed by a brief enrichment of ferns (ferns are known to opportunistically settle areas where the vegetation has been devastated). But higher latitudes don't show the same pattern. He cites recent research on marine strata from the Arctic and Antarctic, as well as fossil plant studies from Russia, which seem to indicate that plant and animal life at higher latitudes show lower and more gradual rates of extinction across the K-T boundary. He infers from this that the effects of an asteroid hit were less toward the poles, and that impact effects were perhaps more regional than previously allowed.

Archibald is willing to include the impact hypothesis as part of his scenario, but he makes it clear that he thinks the primacy of impacts in causing mass extinctions has been overstated, demonstrated by the lack of evidence for one during the big end-Permian die-off. They contribute in some cases, he implies, but they don't work alone.

Scientist Antoni Hoffman stated a concordant view in 1989: "Perhaps . . . mass extinctions are not the biotic consequences of any single phenomenon of one or another sort, but rather rare incidences of more than one major change in the physical environment accidentally clumped together within relatively short intervals of geologic time, say 2-4 million years in

duration."

So the reason we see so-called mass extinctions, it is suggested, is because sometimes several causal agents (impacts included) coincide to boost the level of extinction well above the normal background.

As David Raup has written: "Extinction is evidently a combination of bad genes and bad luck." And he favors bad luck.

### The Biological Approach

In the ongoing extinction debates, some impact theory critics remain unrepentant—including paleontologist Robert Bakker. He rejected an asteroidal end to the dinosaurs in his 1986 book *The Dinosaur Heresies*, and in a recent telephone conversation, he indicated his opinion is even stronger today.

All of the important primary data is being "swept under the rug," he contends, and the only way to really understand what happened during the complex events of the late Cretaceous is to pay more attention to not only who died, but who survived—and why. For example, with all acid rain allegedly ravaging the landscape, he asks, how is it that the frogs (currently under stress from man-made pollution) could have survived? He advocates that scientists need to start constructing "victim profiles" to help sort out the damage and its direct causes.

In fact, biologist Archibald is aiming much of his analysis of the fossil record in that direction. In his recent book, he organized the fossil vertebrate fauna of the end-Cretaceous (as represented in the Hell Creek

Formation) in terms of extinct and surviving groups, and analyzed how well corollary effects of the impact and marine regression hypotheses jibed with the pattern of survivals and extinctions. He concluded that sudden cooling, acid rain, and global wildfire didn't match the pattern very well, but that habitat fragmentation and competition from land bridge invasions of foreign species (presumed effects of sea-level drops) seemed to match the pattern better.

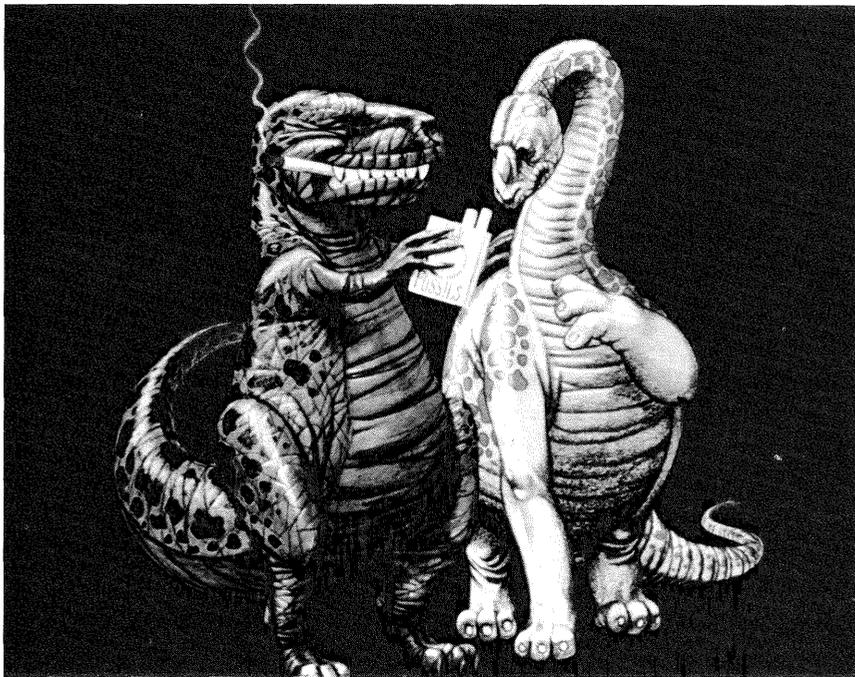
Bakker thinks analysis needs to take a distinctly biological bent if we are ever to divine the answers. He suggests scientists give the problem for a while to wildlife managers and zookeepers, who know the sorts of problems living animals face—things like competition from invaders, disease, and other problems—and who can offer insight into what devastates animal populations today.

Why not? Everyone else has certainly taken their shot. It reminds one of the Sidney Harris cartoon (as related in Richard Monastersky's 1992 piece in *Science News*) of the solitary man standing in front of the dinosaur exhibit at a museum. The caption: "T. Radfield Burke, chemist, is the only person in all of science who does not have a theory about the extinction of the dinosaurs."

### Mixing it Up

Paleontologist David Raup has written "science is basically an adversarial process." I think the Great Extinction Debate is a good example.

Both Raup (in *The Nemesis Affair*, 1986) and Officer/Page (in *The Great Dinosaur Extinction Controversy*, 1996) offer some interesting perspectives on the process of science from opposite sides of the impact controversy. Officer/Page especially weave a juicy tale of rancor, politics, bias, and creeping political correctness that they claim has pervaded the issue. The scientific method (observe, hypothesize, test, reject/revise/accept) sounds objective and civilized in theory, and most of the time, it probably is. But ultimately, science is a human endeavor—and it shows. I think the extinction controversy is as fascinating for what it reveals about science and scientists as



The "Dissolute Living" Theory of extinction. Courtesy Hansen Planetarium.

for the light it may ultimately shed on the bumptious history of life on earth.

For example, consider the “pecking order” among the sciences that some say clearly exists. At the top are the theoreticians and experimentalists: mathematicians and physicists. Next come astronomers and chemists. Farther down are the geologists and paleontologists, with biologists at the bottom. It can be a status thing (some say a spectrum from “big money and flashy machines” to the trench workers), and it can come into play when the disciplines meet.

Museum of the Rockies geologist Christopher Hill agrees with the general rankings, and he believes that it can be deciphered in terms of how the disciplines work. The theoreticians deal with fewer variables which they can control. Geologists and biologists, on the other hand, deal with a very large number of variables in their work which they cannot control. Officer/Page characterize it similarly: the physicist can build a machine or devise an experiment to test a hypothesis, and the experiment can be repeated by others to verify the result. The geologist, on the other hand, works with incomplete data from an experiment which cannot be repeated, for which a consensus of interpretation must be reached. And geological consensus bears little resemblance to a proof in physics.

William Glen, in his report in *Special Paper 307: The Cretaceous-Tertiary Event and Other Catastrophes in Earth History (1996)*, who has studied the extinction debates for some years, also seems to agree. He points out that the varied science disciplines involved in extinction theory bring very different training, mindsets, and paradigms to the discussion, and that this accounts for much of the character of the debate. This makes it a little easier to understand perhaps, the physicist who says “Iridium, shocked quartz, mass extinction—cosmic impact; next problem,” while the geologist replies “Hey—have you seen how complex the fossil record is?”

As an anecdotal (and non-scientific) experiment, I talked to some of the geologists, paleontologists, and physicists on my university campus to get their views. Even though some (not all) of the geologists felt that a majority of the people in their discipline now supported the impact hypothesis, not one of them did personally; they “didn’t buy it” or felt the evidence wasn’t yet sufficient to convince them. Not unexpectedly, the physicists all supported the theory.

Glen says it’s the subdisciplines where the really interesting indicators are. For example, his studies show that vertebrate paleontologists are nearly unanimous in their opposition to impact as the extinction mechanism,

but virtually all specialists in impacts and earth-crossing objects support it—and that everybody chose sides at the start and almost no one has switched sides during the course of the debate.

It seems that in the clash of sciences, differing mindsets, methods of appraisal, and ways of doing science have had as much to do with the Great Extinction Debate as the evidence presented on both sides. And it has been a clash—of the physics of impact versus the interpretation of the fossil record, of the new catastrophism versus the established uniformitarianism, of what gets published in journals, and what gets reported in the press.

The clash of ideas continues, as scientists still mix it up on the extinction question, struggling toward ultimate truth. Geologists continue to quantify the Chicxulub structure as an impact site, while colleagues keep them honest with studies of their own contending that some of the supposed tsunami and ejecta deposits claimed for it are sediments laid down over longer periods of time.

Some of the volcanists are conceding that evidence for a monster K-T impact (crater, iridium, shocked minerals) has become compelling, and are willing to give the asteroid its due. But they also cite one of the original impact authors (Asaro) as declaring that the K-T signature is unique in the Phanerozoic record, and if the Chicxulub crater does turn out to be 300 km (180 miles) in diameter, it may represent a once-in-a-billion year event. This leaves them free to consider volcanic causes for other extinction events in the past, for which there are interesting correlations. And the Deccan Traps were still erupting 65 million years ago, they remind us; the asteroid simply horned in on an extinction event already underway.

But scientist David Rampino is not so quick to give up the possibility of other impact-caused extinction events, claiming evidence (albeit sketchy) for small iridium

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anomalies, shocked minerals, and possibly associated craters coinciding with some other extinctions. Respondents acknowledge

that space rocks have certainly hit the earth many times in the past, but they were smaller and show no evidence of causing real extinctions. And some add that the granddaddy end-Permian extinction event appears to have no sharp boundary at all, but consists of several stages of extinction over several million years.

A recent *Sky & Telescope* article reported on a new statistical study which claims a correlation between cratering peaks and mass extinctions of the past. But the problem is coming up with a mechanism. The Nemesis hypothesis has suffered from more than a decade of non-discovery; astronomers find less and less reason to invoke a Planet X to account for vanishingly small anomalies in the orbitings of Uranus and Neptune; and we’re still in the middle of the galactic plane with no hail of comets hurled by interstellar clouds.

As for dinosaur fossils, David Archibald cites recent reports from New Mexico claiming a hadrosaur footprint within half a meter (15 inches) of the K-T boundary; the significance depends on the time period represented by that 15 inches, but it suggests that dinosaurs are creeping closer to the iridium. However, Archibald also mentions reports from a new end-Cretaceous site being excavated in China that claims dinosaur finds above the K-T boundary; the claims remain to be substantiated, but what will it do to dinosaur and impact theories if they should prove out?

Meanwhile, a recent statistical study contends that 100% mortality of an inferred population density of end-Cretaceous dinosaurs wouldn’t yield enough bones to produce widespread bone beds. So an absence of K-T bone beds doesn’t mean the dinosaurs weren’t there. So show us *one* dead dinosaur, say the vertebrate paleontologists; without some physical evidence, it’s all just smoke and mirrors. And so it goes, struggling toward the light ...

## To Qualify or Not To Qualify

Timing—as in life and mass extinctions—is everything, and this summer, our museum hit it on the nose. While movie crowds are thrilling to the grisly habits of 20th century dinosaurs, we’ll be opening a brand new exhibit called “T-rex on Trial.” People will be able to come and see a full-sized cast of the skeleton of a *Tyrannosaurus rex* (nobody uses the real bones any more—too valuable) that was dug up in central Montana where it fell. They’ll also be able to see a skeletal cast of a Jurassic *Allosaurus* retrieved from the strata of Wyoming, and a *Deinonychus*—cousin to those nightmarish Velociraptors that will be on view in theaters and perhaps afterwards

in our dreams.

People will also be able to consider evidence for Jack Horner's latest controversial idea: that T-rex, fierce and beloved icon of all the Calvins of the world, may have been more scavenger than predator. Positively scandalous. But like many new hypotheses (including the impact theory), it may also just be true. We don't know yet, because the process of science hasn't yet run its course. We'll see if consensus will ultimately emerge, either relegating the notion to a footnote, or placing it into the paleontological paradigm that helps us to understand those glorious beasts of another age. The same is true of the impact hypothesis.

We in the Taylor Planetarium will also be hopping on the dinosaur bandwagon this summer. We'll be dusting off and running one of our most popular programs, "The Dinosaur Chronicles," which does something that Jack asked us to do when we produced it several years ago: show how dinosaurs fit into the scheme of life on an evolving earth.

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The impact hypothesis asks two questions. Did a major impact occur at the end of the Cretaceous? And did it kill, among other things, the dinosaurs? There is overwhelming evidence that the answer to the first question is yes. The answer to the second is not so clear.

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As I've said, he's more interested in how they lived than how they died.

Do we blow them up at the end in a big asteroid impact? You bet; we blow 'em up good. Do we qualify the theory when we present it? Yup. And when we're done, we note that there are other opinions, and that the debate continues.

Why? Because it's the truth.

Should we still qualify our presentations of the impact hypothesis? I think so. As I discovered in my own investigations (and as I hope I've illustrated), there's a lot more discussion and debate going on than one might realize. And I don't think it can all be dismissed as a few old fogies clinging stubbornly to a dying precept. Consider Horner and Bakker, for example, and their proclivity for voicing controversial theories—Horner on dinosaur social behavior, warm-bloodedness, and T-rex's dining habits, Bakker on warm-bloodedness, birds as dinosaurs, and other "heresies." Neither ascribes to the impact hypothesis, but I don't think a convincing argument can be made that either is unresponsive to new ideas. As Bakker has written, "I champion heresies only if they fit the facts better than orthodoxy."

The impact hypothesis asks two questions. Did a major impact occur at the end of the Cretaceous? And did it kill, among other

things, the dinosaurs? There is overwhelming evidence that the answer to the first question is yes. The answer to the second is not so clear. I don't think it's sufficient for the physicist to calculate effects of impact and then assume the consequences; it's fair to expect that the consequences must be confirmed in the geological record, and we must give geologists and paleontologists time to puzzle it all out.

There are legitimate questions still to be asked. Where the dinosaurs still alive for an impact? Did all affected species die together or in stages? Who died and who survived—and why? What effects actually occurred and were they global? Does the North American end-Cretaceous record represent the global situation? Was more than one causal agent involved? Is the extinction record really periodic, and if so, what is the cause? In a culture of pop science where a suspicious rock turns overnight into life on Mars, we have an opportunity to delve a little deeper, to offer a little more: a peek at the

way science works.

Our paradigms are shifting, too—from product to process. It's not enough just to offer answers anymore; we need to present the information and to encourage more critical analysis. I think it's good science education to at least acknowledge that we still have things to learn.

To me, the Great Extinction Debate resembles a classic dialectic process. We began with *thesis*: the proposition in the form of the impact hypothesis. Presently, we have *antithesis*: using conflict and opposition to explore the proposition. With luck, we're heading for *synthesis*, where conflicts will be reconciled into a higher stage of truth. That truth will be a more profound perspective and understanding of the history of life on earth.

What *really* killed the dinosaurs? I think we're still finding out. And that's the joy—and the process—of science.

Now go enjoy those Spielbergosaurus...

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# Eugenides Foundation 1997 Script Contest

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The International Planetarium Society Council is pleased to announce a script-writing contest (outlined below) for 1997 with awards, funded by the Eugenides Foundation, to be given at the 1998 IPS conference. Winners need not be present to accept awards. This competition is open to all members of I.P.S., and limited to one entry per member. I have been appointed the coordinator of the contest for which three judges will be selected to evaluate each submission

in accordance with the criteria listed in the rules below.

All submissions are welcome, beginning immediately, and must be received by me (five copies of each entry) by December 31, 1997. Four scripts will be selected to receive award distinction in this competition for the "Most Creative Public Show Script". Four prizes, made possible by the generous support of the Eugenides Foundation in Athens, Greece, will be awarded for First Place

through Fourth Place as checks in US dollars for \$500, \$250, \$150, and \$100 respectively. Only scripts that have not been previously submitted, and have not been published elsewhere, may be submitted. Each entry must be accompanied by a release form (copy below) assigning the script to the I.P.S. for publication in the *Planetarian* and inclusion in the I.P.S. Script Bank.

The Eugenides contest was last conducted in 1989. The First and Second Place entries, that year, were submitted by Jim Manning at the Taylor Planetarium, and Kris McCall at the Sudekum Planetarium. I am pleased to see the return of the competition and wish to thank the I.P.S. council, Dionysios Simopoulos of the Eugenides Planetarium, and Mr. Nicos Vernicos-Eugenides, for again bringing this opportunity to the I.P.S. membership.

Read the rules carefully, select your best work, complete one release form, and send your finest work to IPS Eugenides Script Contest, C/O Alan Davenport, Jordan Planetarium, 5781 Wingate Hall, University of Maine, Orono, ME 04469-5781.

*(Script contest rules begin on the next page)*

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## IPS'98 UPDATE

Undine Concannon, London Planetarium, UK

Full details about this conference will be included in the September issue, which will have a pull-out page section for you to register your preliminary booking. I know it's still a long way off, but there are certain difficulties which will be much easier to solve if we have an early indication of how many people to expect.

Meanwhile, if you have read of the vast acres of space which we have apparently booked at the Connaught Rooms, don't believe all of it! They can run three big conferences at once, but we have only booked a third of the total space, which is quite adequate for our purposes! Space for vendors WILL be limited, and the total number of delegates will also be limited to 500. We shall take bookings in strict rotation, so it's in your interest to register your intention to come as soon as possible after September!

We are still planning to visit Greenwich, by boat down the Thames, to see the Old Royal Observatory; in addition the National Maritime Museum and 19th century tea clipper, Cutty Sark, are also options for you during the afternoon. A whole-day trip to the ancient stone circle of Avebury, a delightful 18th century house, and perhaps Salisbury Cathedral as well, will end in an evening at Stonehenge, with refreshments. Our involvement with Stonehenge has taken an interesting twist. Its owners, English Heritage, have applied to the Millenium Fund for a large grant to improve access, build a replica and extend the visitor centre. This won't happen before 1998, but if their grant application is successful it will be our parent company, Mme. Tussaud's who will design the new areas. They are already planning to build a planetarium there (well, a sort-of planetarium) so as to demonstrate the importance of midsummer solstice to the site. This won't, however, mean we can all get in free!

The Post Conference tour is now taking its final shape. The first day will be a visit to Jodrell Bank Radio Observatory and Science Centre, with accommodation and dinner at Manchester University. We will then fly direct to Dublin which will be our base for the following four days. Hotel accommodation there is more expensive than London (Dublin is such a popular tourist destination now!) so we are planning for most people to stay at Trinity College, which, apart from being my old university is a delightful place, and cheap! The rooms are small, but adequate, and most have their own shower. For those who want the comfort of a hotel, we will arrange 3\* accommodation - anything above this will take the cost over the moon! But it will be essential to book our accommodation before the end of the year, in order to secure enough rooms at the right price. We can't do this unless we know what the numbers will be. If there is any chance that you want to come on this tour please let us know by mid-December.

# THE EUGENIDES FOUNDATION SCRIPT CONTEST AWARDS

## Outline

### I. General

- A. In recognition of individual excellence in public planetarium show production, the Society shall hold a continuous biennial contest sponsored by the Eugenides Foundation, Athens, Greece, under the category of Most Creative Public Show Script.
- B. Any currently-enrolled IPS member may participate by following the rules and procedures below.
- C. Winners shall be recognized in *The Planetarian* and at the IPS conference, where they shall be awarded a certificate indicating their selection.
- D. The Society retains the right to publish copies of any and or all entries in the IPS journal, *The Planetarian*, and/or include any and all scripts in an archive of scripts for the benefit of all Society members.

### II. Contest Rules and Procedures

- A. Any IPS member may submit up to three different entries in the contest, which have not been previously submitted or published elsewhere.
- B. Each contestant shall submit five copies of each entry to the Script Section Editor: one copy for the Eugenides Foundation's files, one copy for the IPS files, and one copy for each of the three referees.
- C. The Script Section Editor shall choose, from the list of IPS Fellows, three independent referees to consider each coded entry, based on a set of general and specific criteria (below). The names and institutions of the authors will be kept anonymous from the referees, until all final decisions have been made and announced.
- D. The opinions of the three referees shall be quantified and averaged by the Script Section Editor, who shall then make his/her recommendation to Council, submitting along the referees' opinions.
- E. Entries are to be submitted between July 1 and December 31 of the non-conference (odd-numbered) years. Winners of that contest shall then be recognized during the awards ceremonies at the following IPS conference.
- F. All scripts submitted shall conform to the following generalized format:
  - 1. Title, Author, Institution, Address, Telephone at the top of the first page, or on a separate title page.
  - 2. Text in English, typed, doubled-spaced, pages numbered (computer printout acceptable).
  - 3. Text on right hand side of pages; corresponding visuals appear on the left side. Line numbers optional.
  - 4. Recommended visuals shall include slides, panoramas, special effects, plus appropriate star instrument functions/motions.

5. Suggested length not more than 20-30 pages; shorter scripts acceptable.
6. A completed release form must accompany each submitted script.

### III. Evaluative Criteria

- A. For each of the 20 criteria listed below, each referee shall assign a numeric value as follows:
  1. Five for superior (or strongly agree)
  2. Four for above average (or agree)
  3. Three for average (or neutral)
  4. Two for below average (or disagree)
  5. One for Inferior (or strongly disagree)
  
- B. Each referee shall respond to the following:
  1. General Evaluative Criteria
    - a) The program's purpose/goals are clear.
    - b) The overall program achieves the perceived purpose and goals.
    - c) The program's structure enhances the purpose/goals
    - d) The style and technique of the program enhances its Purpose/goals.
    - f) Overall originality and creativity are
  
  2. Specific Evaluation Criteria:
    - a) Information (Cognitive) Criteria
      1. Contents are clear.
      2. Repetition is used for clarity or Previous recall.
      3. Perceptual capacity of the viewer is respected.  
(Example: no "Information overload" occurs.)
      4. Potential "noise" or confusion is overcome by emphasis, clarity, or carefully-chosen examples.
      5. The continuity of ideas expressed is readily apparent.
  
    - b) Entertainment Functions (Predictable Structure and Conclusions)
      1. Program features an attention-grabbing, or contemplative beginning.
      2. Program properly uses dramatic tension/sense of impending change/surprise elements to maintain interest.
      3. Perceived tone of address is positive (leading, not "talking down to" the audience).
      4. Examples/amount of humor used are carefully chosen (not employing clichés, stereotypes, or negative prejudices).
      5. Mood/feeling created by the show is such that audience members may wish to explore topic(s) further on their own.
  
    - c) Persuasion Functions (Arguments and Explicit/Implicit Conclusions) Criteria
      1. Program indicates that the writer is competent.
      2. Style of the argument puts the audience into a receptive mood.
      3. Organization of the argument is clear, logical, and conclusive.
      4. Argument is appropriate to the intended audience.

### IV. Awards Categories/Values

- A. First Place - \$500.00 (USD)
- B. Second Place - \$250.00 (USD)
- C. Third Place - \$150.00 (USD)
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[Complete one form and include with each script submitted. Deadline: December 31, 1997]

Submission date: \_\_\_\_\_

The undersigned does hereby assign and release unto the International Planetarium Society (IPS), the script entitled \_\_\_\_\_, and permits the use of content of script in whole or in part in connection with planetarium programs of all kinds.

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# Tony Jenzano In Memorium

Lee Shapiro  
Morehead Planetarium Director  
CB #3480 Morehead Bldg.  
University of North Carolina  
Chapel Hill, North Carolina 27599-3480

Anthony (Tony) F. Jenzano, long time director of the Morehead Planetarium at the University of North Carolina at Chapel Hill, passed away Saturday, March 22, 1997.

Tony trained as an electrician in the armed forces and was hired as a technician at the Fels Planetarium in Philadelphia. In 1949, when Dr. Roy K. Marshall came to Chapel Hill to be Morehead's first Director, he brought Tony, described as a mechanical genius by Marshall, with him. Marshall left less than two years later and Tony became manager of the Planetarium, with the title changed a decade later to Director.

In addition to overseeing the Morehead Planetarium's growth into a mature and prominent facility, Tony laid claim to a number of special achievements. Morehead Planetarium was the first planetarium to produce an annual star theater presentation about possible astronomical explanations for the Star of Bethlehem. Tony also had the foresight to convince NASA in its early days, that Morehead would be an ideal place to train astronauts in celestial navigation. Every Mercury, Gemini, and all but one Apollo astronaut received celestial navigation training at the Morehead Planetarium, in addition to the Skylab, Apollo-Soyuz (American), and a number of the early Space Shuttle astronauts. Indeed, Neil Armstrong spent more

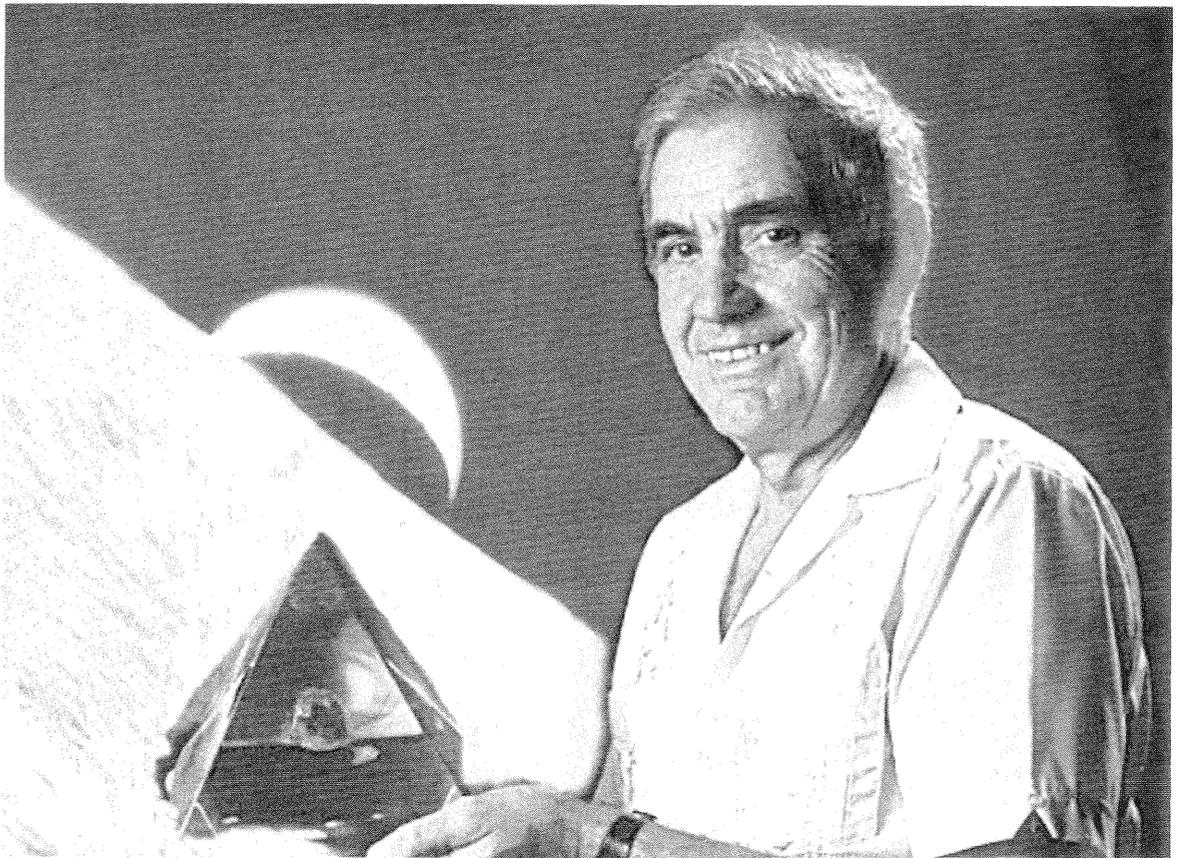
time at Morehead than any other astronaut. The first astronauts would usually come in twos or threes with security and anonymity the word of the day. Often, those astronauts, when in town, would go rest and relax out of the limelight at Tony's home. When Morehead celebrated its 40th birthday in 1989, the six remaining Mercury astronauts (now down to five) came to help celebrate. Clearly one of the highlights to them was the opportunity to meet with Tony again and to thank him not only for the training they received, but the very special accommodations Tony and his wife, Jay, gave them in their home and in their hearts.

Tony also led the battle to gain American

Association Museum accreditation for Morehead as a non-collecting facility and pioneered the accreditation program for many other non-collecting museums including planetariums and science centers. He was instrumental in the acquisition of two major gifts from the Morehead Foundation — a Zeiss Model VI Planetarium projector and star theater automation equipment.

As a new planetarium director at Abrams Planetarium, I met Tony in 1974 at the Planetarium Directors Conference in Boston. He made me feel right at home among the Big Dome group and was an easy person to with whom to talk. He did take pride in the fact that he was the senior planetarium director in the United States, but it was not an "I am above you" pride. Tony was outgoing and interested in the planetarium profession as a whole. Five years later, as two of the directors of major planetariums on university campuses, he and I worked together as consultants in Boulder, Colorado.

Tony retired from Morehead Planetarium and the University of North Carolina in 1981. He had set a high standard to follow. I was told when I came to Chapel Hill in 1982, that UNC only hired planetarium directors every thirty years. Tony continued to live in Chapel Hill and stayed involved with planetarium for a number of years afterwards in connection with the Zeiss company. ☆



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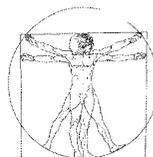
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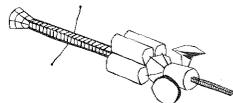
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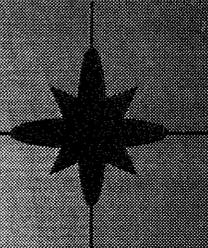


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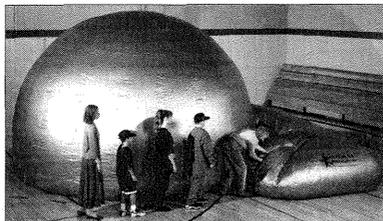
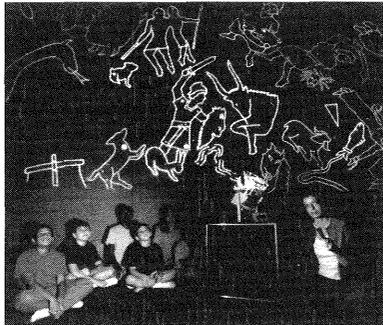
Penn State is offering a one-week, graduate-level workshop titled "Stars and Planets for Science Teachers" in the summer of 1997 for middle-school and high-school teachers who want to bring modern astronomy into their classrooms. "Students' understanding of the physical laws governing the world around us is nourished by studies of intriguing topics such as new planets, exploding stars, and the search for alien life," says Eric Feigelson, professor of astronomy and astrophysics at Penn State and organizer of the workshop

The workshop will use basic concepts of physics to explain the current understanding of stars and planets. Daily activities include lectures and discussions accompanied by examination of multimedia and World Wide Web materials, classroom and computer-based hands-on laboratories, nighttime and planetarium observing, and guest presentations by research astronomers, science-education faculty, and master teachers. Participants will receive Penn State graduate credit.

The one-week workshop will take place from **June 23 to June 27, 1997**, at Penn State's University Park campus. Residence on campus is expected from Sunday evening to Friday.

The workshop is intended for middle-school and high-school teachers of Earth science, physics, or astronomy from Pennsylvania or other states. Financial aid for text books, travel, and local costs is available.

For more information, contact Penn State Inservice Workshops in Astronomy, Department of Astronomy and Astrophysics, 525 Davey Laboratory, University Park, PA 16802, or contact the program director, Dr. Eric Feigelson, at 814-865-0162 edf@astro.psu.edu (e-mail), or <http://www.astro.psu.edu/outreach/psiwa> (World Wide Web).



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# Book Reviews

April S. Whitt

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Whether you're welcoming winter or celebrating summer this solstice, take some time to escape into a book. Here are some of the publisher's latest offerings. The one comet book entry I received in response to last column's request is here (thank you, John), and you'll also find something for just about every reader out there: young or old, beginner or expert.

Thank you also to our reviewers for this issue: Robert Ballou, Kevin R. Grazier, Robert Hicks, Francine Jackson, John Mosley, Mike D. Reynolds, Alberto Sadun and April Whitt.



*Gravity's Fatal Attraction: Black Holes in the Universe*, by Mitchell Begelman and Martin Rees, Scientific American Library, W. H. Freeman and Company, 41 Madison Avenue, New York, NY, 1996, ISBN 0-7187-5074-0, \$32.95

Reviewed by Alberto Sadun, Agnes Scott College, Atlanta, Georgia, USA.

This book, a popular text on the role of gravity throughout the universe, is an excellent introduction to some of the most interesting and important scientific issues in astrophysics today. These two authors, both of them well renowned and highly respected, offer an overview of how gravity influences the evolution and dynamics of astronomical phenomena on all scales, from stars to galaxies, and even to the evolution of the universe itself. It is a book written with humor as well as insight, and it gives an excellent historical treatment of the subject, but then continues with present issues in the field, as well as future, more speculative possibilities.

It begins as a general introduction to our galaxy and then moves to cosmology. It starts with the astrophysics of ordinary stars, and proceeds with the development of stellar black holes. Then, the subject expands to galactic nuclei and the supermassive black holes purported to be contained in active galactic nuclei such as quasars. It moves on

to extragalactic jets, and finally deals with cosmology and the role dark matter plays in the evolution of the universe. This book is written for anyone interested in astrophysics, and the authors are faithful to what astrophysics is really about, a marriage between astronomy and physics.

The authors manage to keep the reader engaged by describing the various astronomical phenomena that exist, and at the same time, they introduce the reader to the important physics (explained with a minimum of mathematical equations) without which one could not understand the astronomy. The theme here, of course, is how the law of gravity underlies all the astrophysics being explained in this review. More specifically, it seeks to explain the implications of black hole theory as fundamental physics where classical gravitation breaks down and notions of space and time are tested.

It is a book of concepts, and although it covers many phenomena, from stellar to galactic evolution, the central idea is the same, namely that a single physical law, gravity, is responsible for a remarkable array of structure throughout the universe, and will be the determinant of its future dynamics.

The authors are unafraid of discussing some of the more exotic phenomena and theories in this field. For example, they tell us that mini-black holes may have once existed and that hibernating stellar black holes may currently be lurking throughout our galaxy. They also discuss efforts to discover the latter. They describe the mounting evidence of hibernating supermassive black holes that reside in the centers of otherwise normal and nearby galaxies and even within our very own Milky Way.

They do an excellent job of bridging the gap of enormous scales, such as making the plausible connection between stellar black holes and their jets and their counterparts, active galactic nuclei and their jets. Through their historical presentation, they open up the universe for us by showing it to us at other wavelengths, particularly in X-rays.

Their balance between theory and observation is excellent. Each is needed to describe the phenomena under discussion. The descriptions of various objects and processes encountered depend both on how they are observed as well as the physics behind those processes.

*Gravity's Fatal Attraction* is a thoroughly rigorous introduction to gravitational astrophysics, aimed at the college level for the non-major in astronomy. In its 246 pages there are excellent plates and illustrations to guide the reader, and pink pages as math panels for optional use, similar to what one

would expect from a text book. One would be remiss if one did not mention the fantastically useful and profound appendix included in the back of this book. It is a summary, at the most conceptual yet graphical level of the very basic nature of gravitation and its influence at many scales, and of the great complexity which results.



*Impact! the Threat of Comets & Asteroids*, by Gerrit L. Verschuur, Oxford University Press, New York; 1996; ISBN 0-19-510105-7; 237 pages hardbound, \$25.

Reviewed by John Mosley, Griffith Observatory, Los Angeles, California, USA.

We all do planetarium shows with titles such as "Cosmic Impact," "When Worlds Collide," "The Death of the Dinosaurs," and so on. This is where the sky meets the earth - often with a bang. It's a natural topic for a public planetarium show, so a good new book that summarizes the latest information on cosmic impacts is always a welcome addition to our library.

Dr. Verschuur reviews what is known today (or when it was written in 1995) about comet and asteroid impacts. The book was inspired in part by a collaborative effort to produce a show on impacts at the Hansen Planetarium in 1991. Dr. Verschuur is a former planetarium director and he has a flair for the dramatic. You could pull everything you need to write a successful planetarium show from this one source (but a little fact checking would not hurt).

The book begins with a review of the K/T "event" and the evidence that convinces us of what happened to the earth and to living things. Especially interesting is his recounting of the long story of the recognition of the Chicxulub impact site. I hadn't realized that the crater was identified as an impact structure and mapped well before Alvarez' famous discovery of Iridium in Gubbio, but that it took decades for the news to filter into the collective consciousness of the astronomical community. A later chapter dramatically describes, blow-by-blow, the environmental horrors produced by the K/T event.

I especially enjoyed Dr. Verschuur's history of the idea that large objects impact the earth. He begins at a time when such arguments were theologically based (would God permit such a disaster to happen?) through Velikovsky (who thoroughly soured the entire astronomical community on even the possibility of cosmic impacts) and to the present (where the only hold-outs are deeply

entrenched paleontologists; see pages 7-16 of this issue). However, I believe Verschuur is far too sympathetic to the strange ideas of Victor Clube and William Napier, who try to connect disappearances of ancient civilizations with cosmic disasters. They have a long "disastrous" history. Apparently the range of thought that has overly conservative astronomers at one end and Velikovsky at another is really a continuum, and Clube and Napier are somewhere along it. I learned (page 102) that "Much of the zodiacal dust that is present now may be the leftovers from the breakup of a large comet around 3000 BC" - something I will want to verify before accepting!

Another chapter provides a good description of the work done by Spacewatch and an account of recent near misses by near-earth asteroids. They seem to be in the news regularly these days.

Verschuur spends substantial time discussing the threat posed by tsunamis, which I especially enjoyed because I believe they are the greatest threat posed by asteroid impacts. Perhaps this interest is partially personal - I live in the coastal community of Los Angeles (although I've arranged to put a low mountain range between the sea and my home in the San Fernando Valley and to work on a mountaintop). According to Verschuur's sources, a rather small NEA only 200 meters (600 feet) in diameter that hit in the middle of the Atlantic Ocean would generate a wall of water 200 meters (600 feet) high as it washed over the East Coast and Western Europe. Closer to home for me, an iron meteorite 100 meters (300 feet) in diameter impacting 1000 km (600 miles) offshore would create a wave 280 meters (900 feet) high as it breaks over the Santa Monica beach, and such an impact might be expected somewhere on earth roughly once every thousand years. Sobering stuff!

Verschuur offers a concise and very useful summary of what happened during the very familiar story of the impact of Comet Shoemaker Levy 9 onto Jupiter. Enough time has now passed since the event to be able to put it in fuller perspective

Next he assesses the risk of dying by impact and compares such risk with more conventional fates such as electrocution or auto accidents. This section will be of great interest to anyone who wants to sort out the relative risks and to know how to express them.

Finally: what to do? Do we maintain an arsenal of powerful weapons to blast incoming rocks out of the sky? Verschuur maintains that at the minimum, we ought to be making more determined efforts to find and catalog them. He does not minimize the work involved in keeping track of the hundreds of thousands of objects that would be

discovered were we to implement a serious search.

I did not read critically for numerical errors, but two caught my eye. The meteorite that hit Mrs. Hodges in 1954 weighed 4 kg, not 19 kg - which probably would have killed her (p. 39), and my sources place the energy of the explosion that produced Meteor Crater at closer to 5-10 megatons than "50 megatons" and "in 100 megaton range" quoted on pages 41 and 42. My fear is that other such errors exist. Also, the name and subject indices are completely inadequate.

The proverbial bottom line? This book is essential reading for planetarians and all popularizers of astronomy. If you don't have a copy, go get one now. Not only is it well-written and fun to read, you will find it an extremely useful reference on a topic important to all of us.



*Cosmology*, 3rd ed. by Michael Rowan-Robinson. Oxford University Press, 198 Madison Avenue, New York, NY 10016, 1996, ISBN 0-19-851884-6, \$65.00.

Reviewed by Kevin R. Grazier, Griffith Observatory, Los Angeles, CA and Jet Propulsion Laboratory, Pasadena, CA.

This is a wonderful introductory book on cosmology, and is the third edition of a book which was originally published in 1977. It makes a great starting place for anybody interested in the study of cosmology. Written at the intermediate undergraduate level, there are short problem sets at the end of each chapter, and the book could reasonably be covered in a one-semester course.

The first three chapters are dedicated to introductory concepts ranging from electromagnetic radiation, to the H-R diagram, to the cosmic distance scale. This material would be equally at home in an astronomy text as in one devoted to cosmology. Throughout the book, equations are included only when they shed real insight into a concept, and the math is, at most, at the introductory calculus level.

After the introductory material, the author touches on such topics as the big bang, general and special relativity, the cosmic background radiation, and different cosmological models. Particularly appealing, was the inclusion of several recent images from the HST, IRAS, and COBE missions—in addition to several images taken from various observatories. In doing this, the author does a commendable job of tying theory into observation. This is especially helpful

when speaking to the public, or to students not majoring in science, when we, as science educators, must answer the ubiquitous question, "What evidence do we have that ANY of this stuff is true?"

Finally, leaving us with an excellent starting place for further study, the author concludes with, "Twenty controversies in cosmology today." Since, over time, these controversies are revised or resolved, they change in every edition. Those included in this text are important problems being debated in the scientific world presently (as of March 1997). I would recommend this book as a valuable addition to the library of any planetarium or astronomy educator.



*Black Holes: Gravitational Interactions*, by P.D. D'Eath, Oxford University Press, 198 Madison Avenue, New York, NY 10016, 1996, ISBN 0-19-851479-4, \$80.00.

Reviewed by Kevin R. Grazier, Griffith Observatory, Los Angeles, CA and Jet Propulsion Laboratory, Pasadena, CA.

"Not for the timid," is perhaps the best way to describe this book. *Black Holes: Gravitational Interactions* is an advanced graduate-level astrophysics/general relativity text, which assumes the reader has mastery of math at least at the level of multivariate calculus and partial differential equations. A background in classical mechanics is also helpful.

As the author points out, the primary difference between this book and others on the subject is that most make the assumption that the black hole is an isolated body. This book tackles topics such as how a black hole interacts with the background universe, and with other black holes.

We start with an introduction to black holes, and move onto the dynamics of black hole/background universe interaction. The next two chapters are devoted to slow- and high-speed black hole interactions. Finally, the last three chapters are devoted to black hole collisions.

As a graduate text, or to academician studying black holes, this is a modern, cutting-edge, treatment of the subject and is a valuable reference. To someone in the planetarium community, however, there are other books on the topic of black holes which are much more pertinent. The level of the material in this text is well beyond that which one could ever reasonably expect to present in a planetarium show or lecture, and even beyond level of questions one could expect to field from even the most knowledgeable of patrons.



*Electronic and Computer-Aided Astronomy*, by Ian S. McLean, Praxis Publishing Ltd., West Sussex, England, and John Wiley & Sons, West Sussex, England, 1994, ISBN 0-13-248246-0.

Reviewed by Mike D. Reynolds, Chabot Observatory and Science Center, Oakland, California, USA.

Astronomical imaging is rapidly changing from the use of photographic emulsion to electronic imaging, the basis for Ian McLean's *Electronic and Computer-Aided Astronomy*. The book also covers a variety of computer and other electronic devices, representing today's technology, that have become the norm in astronomy. McLean's book provides the reader not only with an excellent overview but with an in-depth look at some of the specifics. Each chapter concludes with a list of references that directs the reader to solid additional references.

The reader is treated to an overview of the history of the technology as it applies to astronomy. A solid overview of CCD astronomy and overall principles, including sample schematics for design, will provide the reader ample introduction and even a beginning point for astronomical imaging. Operations of CCDs, as well as control systems, computers, and image displays, is covered.

McLean also discusses other detectors, such as infrared detectors, ultraviolet detectors and X-ray detectors. He concludes by examining overall detector development, very large telescopes, and the Hubble Space Telescope; some of which appears to be somewhat a deviation from the topic at hand.

The table of contents is very detailed, and allows the reader to quickly find sections that interests him or her. There are many photographs, graphs, and illustrations to guide the reader through the various subjects as discussed. Many of these are useful, though I felt that some of the photographs were not of good quality or were poorly reproduced. A color center plate section illustrates as many types of imaging possible as detailed in the book. A useful appendix, glossary, and index complete this hard bound edition.

Depending on the background of the reader, one might find some sections quite technical, whereas another might consider it not detailed enough. This is where the reference section comes in handy. As a CCD-user, I am not certain that I would recommend this

book to the general planetarian or amateur astronomer, or even as a first text on the subject to someone considering getting into CCD imaging; for example many explore the field of low light level video imaging before getting into CCD imaging. But I would recommend McLean's *Electronic and Computer-Aided Astronomy* for those who have gotten into the exciting area of CCD imaging, and to anyone interested in the history of astronomical imaging.



*Black Stars in Orbit*, by Kephra Burns and William Miles, Gulliver Books, Harcourt Brace and Company, 6277 Sea Harbor Drive, Orlando, Florida, 32887-6777, 1995, ISBN 0-15-200276-6, \$8.95.

Reviewed by Francine Jackson, University of Rhode Island Press, Providence, Rhode Island, USA.

On August 30, 1983, Colonel Guion S. Bluford, Jr. became the first African American to travel into space. As a mission specialist for STS-8, Bluford's responsibilities included deploying an Indian communications satellite and performing medical experiments in weightless conditions. As an Air Force pilot and aerospace engineer, Bluford is a fine example of the American dream. But Burns and Miles explain his success as a response to a "hidden message" from a high school guidance counselor to go to trade school rather than to college.

*Black Stars in Orbit* is a fascinating and informative book. From it I learned the history of the Tuskegee Airmen, and the career paths of many top black pilots and astronauts. As a children's history book, this is excellent. But there's another aspect of this work that concerns me.

The message this book should convey to the young reader - "Set your mind to a goal and follow your dream" - is overshadowed by the negativism that exudes from virtually every page. When speaking of the training for the Tuskegee Airmen, "... The pilots knew ... if they failed (it would prove) blacks could not compete in a white man's world." When they excelled in flight training, "Reluctantly they were organized into several squadrons ..." Another example: Captain Ed Dwight's meteoric career through the ranks is shadowed by page after page of negative comments about his abilities, including alleged inference that his astronaut career was bolstered solely by John Kennedy's aim to have a black land on the Moon.

This is a children's book. Children need

positive role models, and those models are present in this book. But to infer that the only way a minority can succeed in this world is by fighting the injustice all around, rather than earning a place by merit, is very disconcerting. I would not burden a child with the belief that his or her dreams are conditional.



*Moon Handbook: A 21st Century Travel Guide*, by Carl Koppeschaar, Moon Publications, Inc., P. O. Box 3040, Chico, California, 95927-3040, ISBN 1-56691-066-8, \$10.00.

Reviewed by Francine Jackson, University of Rhode Island Press, Providence, Rhode Island, USA.

More than once, I had to step back and remember that, just because author Koppeschaar had apparently written the book's preface at Moon City, June 2020, this is a work of fiction. It is so skillfully put together that the reader must often remind him- or herself, "Hey! That hasn't happened yet!" The ESA didn't crash-land its first orbiter in January 2000. There is no joint US-Japanese Company producing food and air next to Mount Schneckenberg."

At least not yet. Carl Koppeschaar has given us a handy reference guide to what might be. He has already laid out the best tourist sites (start at the Moon museum), giving hiking and walking tour layouts - cautioning us not to walk on the designated protected areas - and chartering lunar modules for extended trips. All aspects of the voyage are covered: when best to go (between new and first quarter), where to stay (Mont Blanc Resort is highly recommended), how to solar sail, and using the go-carts for rent at Plato.

Interspersed in this *Handbook* are myths and legends galore, from Jack and Jill to the Moon illusion (ignore the backward Moon on page 125), Johannes Kepler to Jules Verne. Also, there is a good history of spaceflight, listing every Moon mission, manned and unmanned, all the way up through Clementine ... and beyond.

This book is one of a series from Moon Travel Handbooks. Apparently, the progression from Earth to Moon seemed obvious, and Koppeschaar has made a terrific preparation for future travel to our nearest neighbor. Utilizing Tirion maps, beautiful photographs of the lunar surface and exquisite artwork (future photographs?) of resort and manufacturing areas, this handbook is a visual delight. Too bad we can't pack it in our suitcases for use right now.



*History of Astronomy, An Encyclopedia*, edited by John Lankford, Garland Publishing, Inc., 1000A Sherman Avenue, Hamden, CT 06514, 1997, ISBN 0-8153-0322-X, \$95.

Reviewed by Robert D. Hicks, Richmond, Virginia

The first volume in Garland Publishing's Encyclopedia on the History of Science, *History of Astronomy* splendidly lives up to the editor's goal of presenting to both the general reader and the specialist a compendium of current scholarship on the history of astronomy. *History of Astronomy* declares the history of science to be "a mature and independent discipline," arguing that within its essays the reader will clearly discern that our understanding of the past involves a changing interpretation which borrows from myriad sources. In this philosophy, *History of Astronomy* departs from most other one-volume histories of the subject which give linear chronologies of instruments and great men in that this book's entries are informed by current social history and the sociology of scientific inquiry.

Entries are organized alphabetically, each accompanied by a current bibliography. One finds the expected capsule biographies of the great and notable (although portrayed more within the context of contemporary ideas, not as a series of Great White Male Astronomers) as well as entries on major observatories and concepts, but one also finds entries on women in astronomy and the literature of astronomy, plus essays on astronomical research by specific countries. One topic, "Reward System in Modern Astronomy," elucidates the value, hierarchy, and influence of awards and honors bestowed upon astronomers. The reward system essay emphasizes how social history infuses this volume.

The author states that the "comparative social history of modern science is an inviting research frontier, and the reward system provides a challenging starting point." What other encyclopedia of astronomy mentions this topic?

Many of the longer entries essays are just plain fun as well as enlightening. The stimulating essay "Literature and Astronomy" will send readers to the library to read John Donne's "Good Friday 1613" or Thomas Hardy's "At a Lunar Eclipse." "Amateurs in Astronomy" will foster resolve in any neophyte because amateurs here receive respectful and respectable treatment. One learns, for instance, that William Henry Stanley Monck, a bankruptcy judge, recognized a relationship between stellar characteristics and radial velocities, while South African

teacher William Roberts demonstrated that eclipsing binary stars are prolate spheroids that sometimes touch one another.

While the historical emphasis of the book concerns the scientific revolution and its consequences, the ancient and medieval periods are adequately covered, all informed by current social history emphasizing multidisciplinary perspectives. Joann Palmeri's essay on contemporary cosmology advances the need to reckon "nonscientific factors" such as philosophy, religion, and metaphysics in trying to understand that "the criteria for scientific explanation" have changed over time. Similarly, Liba Taub's essay makes clear that the proper analysis of ancient astronomy must conflate calendar making, navigation, agriculture, politics, and religion, beyond the traditional concern with chronicling mathematical astronomy: "Any consideration of astronomy in the ancient world must include those ideas and practices that were important to the ancients themselves. The modern concept of astronomy as a scientific discipline cannot be anachronistically applied to antiquity; the modern understanding of how the ancients regarded the celestial phenomena should be informed by the examination of texts and sources that may not be considered scientific but that indicate widely held views or areas of controversial opinion."

This philosophy guides all essays in this volume. Readers familiar with Galileo and Copernicus will find surprises, too, as their achievements are examined against contemporary ideas from many sources—particularly ecclesiastical ones—with the result that the heroic roles hitherto assigned them diffuse somewhat as their allies, enemies, competitors, and predecessors emerge as intellectuals in their own right, their arguments assuming force and logic. In this sense, this book treats astrology as a domain worthy of serious scholarly interest. The entry "Catholic Church and Astronomy" debunks popular myths about Galileo's showdown with clerics, arguing that Catholic doctrine "provided .... Western Christendom with crucial insights for the fortunes of physical science."

John Lankford, the editor, must be congratulated on managing to incorporate such diverse, timely, important essays in one volume, and with such apparent unity in historiographical thinking. This volume is an important landmark as it will serve many uses for years. My only criticism is that the illustrations are poor: the black-and-white photographs of standard subjects are poorly reproduced, and many of the computer-generated diagrams are very crude. At the unconscionable price of \$95, this volume is likely to reach public libraries only, which is a pity.



*Impact Jupiter: The Crash of Comet Shoemaker-Levy 9*, by David H. Levy, Plenum Press, 233 Spring Street, New York, New York 10013-1578; 1995; ISBN 0-306-45088-7; 290 pages hardbound, \$25.95.

Reviewed by April Whitt, Fernbank Science Center, Atlanta, Georgia, USA.

This book reminded me of wonderful travelogues I've enjoyed in the past. It's a first person account, a "behind-the-scenes tour" of the discovery and subsequent crash of Comet Shoemaker-Levy 9. And the reader is right there.

Levy describes the observing sessions that led to the comet's discovery, the frustration of clouded out sky, the first inklings of something strange. He provides some background information on comets and on Jupiter, and he quotes the many people that contributed to the efforts to predict the impact sites and time. Once again, I was struck with how different this comet's path-tracing was compared, say to Halley's 1985-86 apparition. The Internet allowed virtually instantaneous communication among a wide group of observers and researchers all over the world.

The "human interest" stories were among my favorites. Heidi Hammel's exuberant arrival at a press conference, champagne bottle waving; Clark Chapman's reaction to seeing the impact sites through his old childhood telescope, Gene Shoemaker's sartorial difficulties before a formal dinner - each brings out the "people" side of astronomy.

*Impact Jupiter* would be a good reference work for students working on comet projects, a source for images and ideas for planetarium programs about comets, or just a fun read some clouded-out weekend.



*Time and Space* (a volume in the Eyewitness Science series), by John and Mary Gribbin, Dorling Kindersley, 64 pp, 1994. \$15.95

Reviewed by Robert Ballou, Atlanta, GA 30307.

Schrodinger's cat, wormholes, black holes, ultimate length, special and general relativity, quantum oddity — it's all here, along with other strange and plain features of space and time, in this fine volume in the Dorling Kindersley series Eyewitness Science. Written by popular science writer and scientist John Gribbin (*In Search of Schrodinger's Cat* and *In*

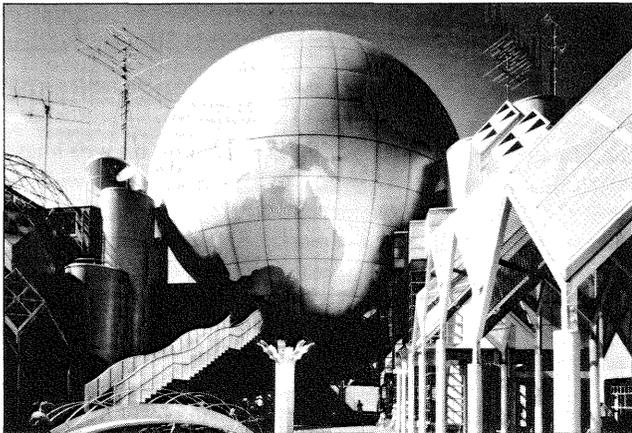
(See Book Reviews, continued on page 30)

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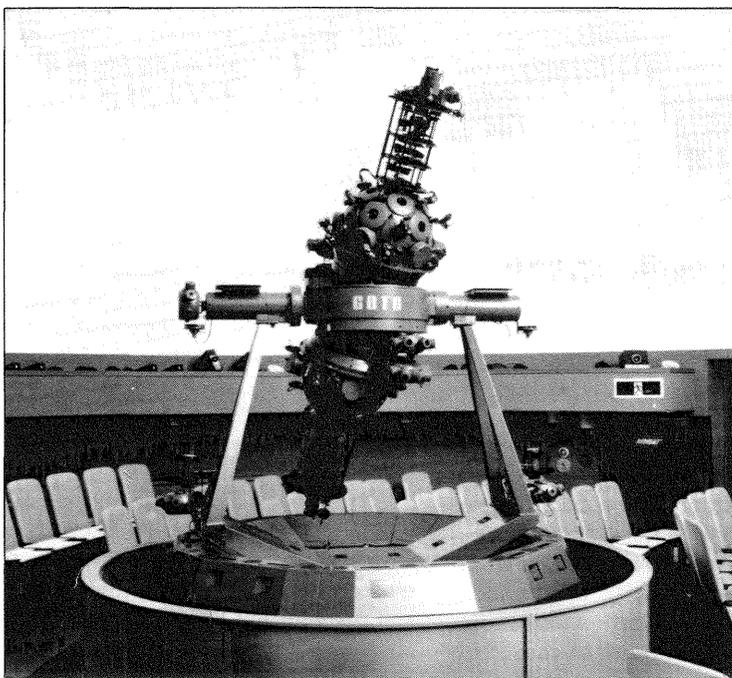
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# Planetarium Memories

Kenneth E. Perkins  
6624 12th Avenue North  
St. Petersburg Florida 33710

## Stars of Truth and Knowledge

As planetarium director (lecturer), it was my joy and delight to work with youngsters as they came by groups on field trips to see the star shows. My usual introduction in the hallway was to introduce them to the word "constellation" and to my favorite constellation, Orion, the Hunter, using a chalkboard and a rubber ball. As I drew round stars in the chalkboard, I explained that stars are round like a ball and not five pointed design stars like those on a flag or ... or ...

A group visiting the planetarium at the junior college was a group of older Boy Scouts, many with Downs Syndrome. I saw them coming up the hallway with their rag-tag uniforms ... some with a scout shirt, some with scout pants, and some with caps and neckerchiefs.

I told them about the two stars on the Tenderfoot badge that stand for the ideals of truth and knowledge, like the three points stand for the three points of the Scout Law.

To further illustrate, I raised my hand with my three middle fingers extended as I held my pinky finger with my thumb gesturing the Scout Sign, and as I did so did my big-little boy audience saying ...

"On my honor I will do my best  
To do my duty to God and my country  
and to obey the Scout Law;  
To help other people at all times ..."

I was choked up and a tear was running down one of my cheeks as the boys marched into the planetarium chamber. I get goose-bumps just thinking about it.

Those big-little boys were an ideal audience. They laughed at the right time, they ooo-ed at the right time, aahh-ed at the right time, and at the end of the show they applauded at the right time.

As they walked out the door they pumped my hand vigorously as they thanked me. Some of them gave me hugs. They were warm and I cried as they waved good-bye going down the hallway.

I sniffed, thinking, "It's time for Taps."

## Big Cypress Swamp Star Gaze, April 1982

Soon after I started as Planetarium Director at St. Petersburg Junior College, St. Petersburg/Gibbs Campus, I heard of the Botany Class Field Trip to the Fakahatchee Strand in Big Cypress Swamp of the Everglades. It was an extensive trip lasting over several days with an overnight camp at an abandoned field packing station on an even more abandoned railroad line.

Knowing that biology classes didn't schedule visits to the planetarium, I inquired about the possibility that members of the botany class might enjoy looking at real stars from the latitude of their campsite with hopefully a clear and dark sky. Later, I was invited by the instructors, Frank Bushnell and Claude Hilliard, to visit their overnight camp and conduct a stargaze.

The trip from St. Petersburg to Copeland down the newly opened Interstate 75 highway was faster but without the benefits of rest areas and roadside food shops. I did stop in Fort Myers to visit an aunt and cousin and had a meager lunch that was to be supplanted by a fried chicken carry-out. Not realizing the delay that it would cause, I went off the highway looking for the chicken.

Making a wrong turn onto Alligator Alley caused further delay at the toll booth when the toll collector wouldn't let me make a U-turn so I could go south and east on the Tamiami Trail that was the hypotenuse of a large triangle. Instead, I had to continue on Alligator Alley that was one leg of triangle and south past the Copeland Farm on the other leg of the triangle.

The directions that had been given to me were: "Go to Copeland, take the gravel road until you reach a group of five tall palm trees with the college van parked underneath. Go through a hole in the fence and follow a trail that was the former railroad bed. It's about a two mile walk."

My arrival time at the palms was just at sunset and as I walked along the trail it became darker and darker. Fortunately, the trail was open and rough only in a couple of spots.

Finally, I saw a light at the end of the tunnel of the overhanging canopy of trees. The light was the brightly blazing campfire at the campout and soon, as others said, "Ken emerged from the forest."

Following a dessert of cookies and coffee, the stargaze began with only one problem: with campsite surrounded by the canopy of trees, there was only a small patch of clear dark sky with one or two constellations, Leo and Virgo, and one or two bright stars, Regulus and Spica. The last quarter moon that would rise after midnight caused no

problem.

The lecture on celestial mechanics, a few stars, and a not-risen-yet moon lasted about an hour and was well received.

After the stargaze, I unrolled my sleeping bag on set of squeaky top bunk springs and slept soundly until breakfast time.

After breakfast, I hiked back through the swamp to the hole in the fence under the five tall palm trees.

I knew that there were alligators in the area but it wasn't until later that I learned that the Fakahatchee Strand at the west edge of the Everglades is the site of the Copeland Prison Farm and the home habitat of the Florida panther.

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(Book Reviews, continued from page 28)

*Search of the Big Bang*) and his wife Mary, *Time and Space* provides a wonderful, wide, though not deep, survey of its subject in the rich graphic display for which the publisher is so well known and regarded.

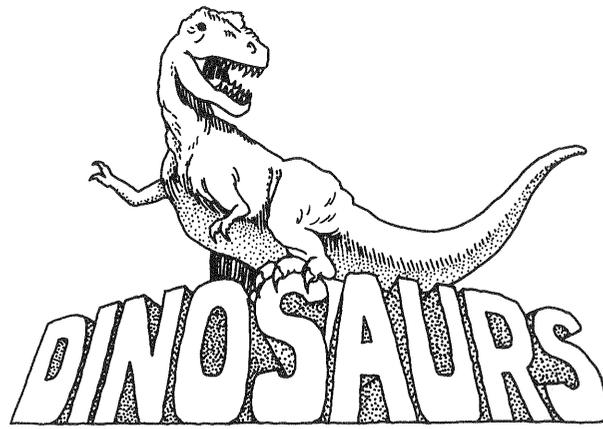
With winning headings such "The Philosophy of Time," "God's Dice," and "How to Build a Time Machine," each two-page chapter (there are 29 in all) includes a short expository passage; sharp, well-captioned photographs, schematics and illustrations; a brief biography of the scientist of the moment; and lots of things to look at. The candy store effect isn't lacking here.

Though the heady concepts presented in *Time and Space* often require suspension of common sense, readers will find the writing thoughtful and engaging. From "Timescales of History," the Gribbins write, "How long is the history of time? In the 17th century Archbishop James Ussher calculated from clues that he found in the *Bible* that the creation of the Universe had occurred in 4004 BC. If he was right, by now the history of the earth has lasted only 6000 years, but evidence from astronomy, biology, and geology shows that the Archbishop was wrong." The chapter "Black holes and Beyond" begins "A black hole is an object that has such a strong gravitational pull that nothing, not even light, can escape from it. In the 1780s the British physicist John Mitchell pointed out that a star 500 times bigger than the Sun but with the same density would trap light in the same way. Nobody took the idea seriously ..."

A note on the copyright page from the publisher to parents and teachers states that the Eyewitness Science series "encourages children to observe and question the world around them." Judging from *Time and Space*, I suspect that young adults, middle schoolers and up, will find this excellent series more rewarding than children will. ☆

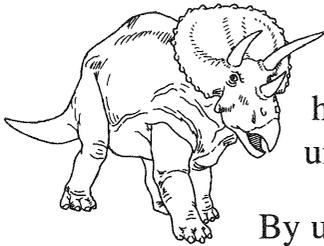
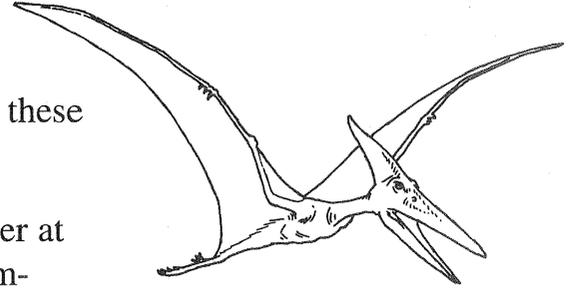
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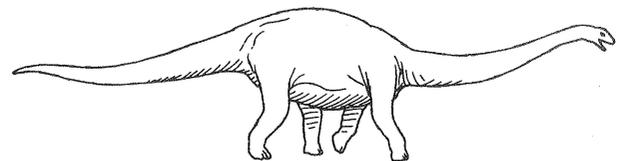
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## Low-Tech Slide Alignment

Richard McColman  
Morehead Planetarium  
CB #3480 Morehead Bldg.  
University of North Carolina  
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Making slide images line up on the dome is easy if you have a pin-registered camera setup. But few of us can afford such equipment, which typically runs into the thousands of dollars. This is a dilemma for planetarians wanting to create professional-looking presentations, because positioning tiny chips of film in small plastic frames requires a keen eye, micro-precise manual dexterity, and gobs of time and patience — at least it's always seemed so. Well, actually there are some cheap alternatives and techniques available to the "pin-registeredless" planetarian that can make life easier when aligning slides, and we'll explore some of those in this installment.

### Dissolvable Slides

The first problem in slide alignments involves the treatment of dissolve sequences. (For the uninitiated, a dissolve sequence contains two or more slides which are designed with some similar elements but some dissimilar ones, too — such as a series first depicting a comet nucleus, then the same comet nucleus with gas jets, and then the nucleus with the jets expanded, and so on. When the slides in a sequence are placed in two or more projectors — all aimed at the same location on the dome — each slide can be shown in succession, creating a crude "movie" or animation in which — in the case of our comet example — the nucleus appears to have gas jets dynamically erupting from its surface.)

To create the illusion of continuous, unchanging elements along with the evolving elements within a dissolve sequence, the projectors in a "dissolve set" must first be able to *register*, or precisely position, their slides when they drop into the gates. (In the case of Kodak projectors, the Ektagraphic and Ektapro models have this registration

feature, while the Carousel projectors do not.) Secondly, all the projectors in dissolve set must be aimed so that their projection-positions are registered relative to each other on the dome. This is accomplished using special registration-grid slides that can be commercially purchased, dropped into the pro-

jectors, and their projectors re-aimed until the grid-lines of the projected slides overlay each other on the dome. The third requirement for smooth dissolve sequences is the registration of the film bits in their slide mounts — each against the others. This is where we start to run into trouble putting shows together.

---

... there are some cheap alternatives and techniques available to the "pin-registeredless" planetarian that can make life easier when aligning slides ...

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A pin-registered camera can expose each image frame on the film in an exact position relative to the film's eight pairs of closest sprocket holes (Figure 1) — and do this consis-

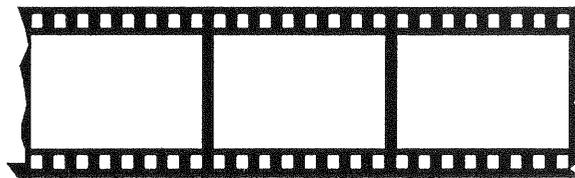


Figure 1

tently from one shot to the next. On the other hand, a non-pin-registered camera simply places the film with its edge perforations in an *approximated* position, and is much less consistent in doing so. The positions of the images against their adjacent sprocket-holes — as exposed in a non-pin-registered camera — could be a little left, or little right, and also a bit up or down compared with each other, or with an absolute standard. This means

tered camera will let them — which it won't, really. This leads to dissolve sequences in which the common elements in multiple slides aren't stationary on the dome, but instead appear to jump about during the sequence.

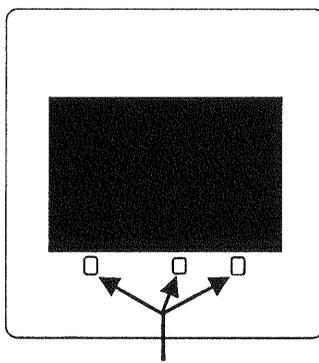
Enter Wess plastics — perhaps the foremost manufacturer of professional slide mounts — with a solution, called the VR (or Variable Registration) mounting system. In the VR system, the slide mounts do not have the traditional set of three rectangular pins,

but instead, have two tiny round pins, designed to position between the bottom row of film perforations and the nearby film edge (Figure 3). To complete the system is the VR punch, which lets the user hand-align two chips of film — sandwiched together — onto a clear window (back-illuminated with a light table), and punch the necessary tiny holes in the film

pieces. If done correctly, the VR system can take care of a number of slide-registration needs, without using an expensive pin-registered camera. It's particularly well-suited to registering slides in dissolve sequences where horizontal, or left-right, image-skewing is needed to align images.

But the VR system has its limits. Because it's designed to actually punch holes in the film, you really only get one chance to "get it right". If one of the film chips slips out of position during the punching procedure, then you've essentially locked-in an inaccurate registration. The tight tolerances in registration leave little room for error, and a second punch-attempt will merely serve to elongate the otherwise round holes punched in the film, making the special VR holes unusable.

In addition, the VR system doesn't work too well for anything beyond the most minor vertical or rotational skewing, due to the limited space available between the factory-punched rectangular perforations and the film edge. While dissolve-sequence fixes can help the planetarian significantly, there's another class of image positioning that the



registration pins

Figure 2

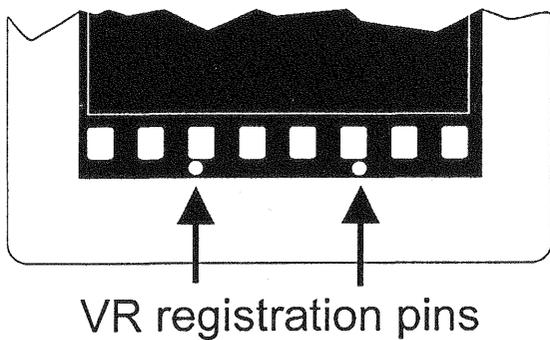


Figure 3

VR system is poorly-equipped to deal with — the alignment of adjacent and overlapping images of the dome, such as multi-section panoramas.

### Hand-aligned Pans

Panoramas which are “done right” can be some of the most impressive images created with slides in the planetarium. Well-executed pans aren’t just slides on the dome — they can create new environments for the audience. But to do this, all the individual slides in a panorama — be they six, twelve, or some other number — must be closely aligned and blended with their adjacent component images. Though well-aligned pans create impressive visuals, a haphazardly-composed multi-section horizon scene can destroy the intended illusion quicker than most any visual element in the dome. And this problem is compounded by a phenomena found in the slide-projection schemes of many domes — parallax error.

The computer-generated Digistar; some of the more recent star machines incorporating “uniball” technology; and domes with hypospheric layouts, present little, if any, obstruction to projecting slides straight across the dome — the only way to minimize projec-

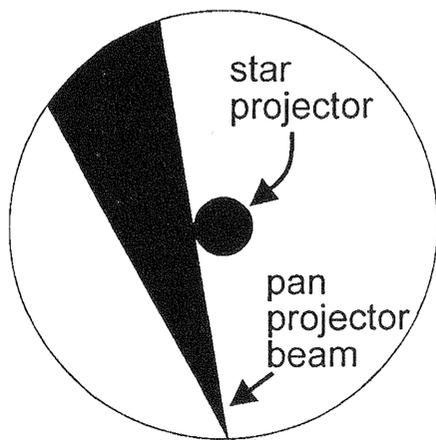


Figure 4

tion-distortion. But the majority of planetariums have instruments that “stick up” in the centers of their theaters. This forces planetarium pan-projection-system designers to “shoot around” one side (usually the left) of the star machine when projecting pan slides (Figure 4). The off-kilter projection leads to parallax error and “keystoned” images resulting from light beams hitting the dome in a non-perpendicular orientation. (Figure 5 shows the familiar effect of several rectangular, non-masked and non-opaqued slides projected this way.)

The best way to deal with this distortion is to rephotograph the slide with *counter-distor-*

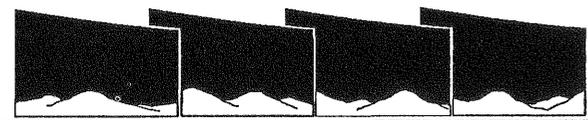


Figure 5

tion added. In the past, planetarians have done this by concocting elaborate jigs to hold the original artwork at contortionistic angles and curves, or — in the case of slides from a show kit — by performing similar trickery with intricately-manipulated projection rephotography. Recently, Sky-Skan’s *DigiDome* software has been employed to do the same thing with incredible accuracy in the digital computer-imaging environment, with final slide-image output to a precision film recorder. While effective, all of these techniques are way too expensive and probably too complex for the tight-budgeted and less-apt audiovisual producers among us.

As a result, some planetarians have tried aligning pans and other slides by hand-manipulating the film rectangles in their slide mounts. By skewing and tilting the film chips and then anchoring them in place with adhesive tape, it’s possible to re-align panoramas. Precisely tilting each film chip to compensate for the effect of projected parallax error can do an amazingly effective job of creating seamless panoramic

imagery on the dome. But there is a “down side” to this approach. Successful hand-alignment requires the steady hand of a brain surgeon, along with gobs of time and patience. (Would you prefer a root canal?)

However, there is a strategy that helps facilitate the process.

### Using One’s (Pin)-head

Many of us without pin-registered cameras don’t buy pin-registered mounts. Instead these folks gravitate toward non-pin mounts — or in the case of Wess customers, VR mounts. Since, at first glance, the registration pins in regular pin-registered mounts appear to be of no use when hand-aligning pans, they seem to be wasted in this application. But closer examination reveals that those pins can actually be a blessing. When hand-

aligning — totally free-hand — in a non-pin-registered mount, there are really no “benchmarks” against which to guide the position of the film. If, for example, you need to raise the right-hand side of a slide to get its image’s “horizon line” to match that of the slide projected

immediately to the right — which is often the case in facilities where pans are projected past the left side of the star machine — it’s difficult to establish and maintain a good position for the left-hand side of the film during the procedure. The total free-float of the hand-aligned film chip in a non-pin mount makes alignment exceedingly difficult. Whenever one side of the film is repositioned, the other end is almost invariably moved, too.

This is where pin-registered mounts come in. In this case, the registration pins — rather than establishing absolute positional references — can be used as “benchmarks” for *relative position*. For example, by cutting out the “bottom” edges of the sprocket holes in the center and right sides of the film chip, but maintaining the entire film perforation corresponding with the left pin in the

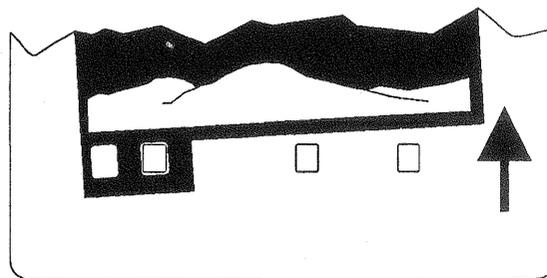


Figure 6

mount, the right side can be raised while the left side remains anchored (Figure 6). In addition, the right-side pin now serves as a "benchmark" against which to judge the vertical offset of the film on the right-hand side. The film's right side can then be affixed with a piece of adhesive tape to anchor it in the mount. Of course, precise positioning in this system still carries with it a bit of trial and error, but the presence of the registration pins makes the process much more manageable. In this case, raising the right side of the film is sometimes possible — within limits — because the actual 35mm image-frame size is typically a bit larger than the slide-mount opening.

But sometimes, raising the right-hand sides of panorama sections enough to match their image-horizon lines brings the black-film area below the pan images above the spring-line of the dome. This creates a series of narrow black wedges visible at the base of the panorama. Because of this, it may be a better strategy to *lower the left side* of pan sections instead. To do this, make a horizontal cut just *along the bottom edge of the pan-section image*, so you can cut away all the sprocket holes to the left of the rightmost pin in the mount (Figure 7). Cutting above the sprocket

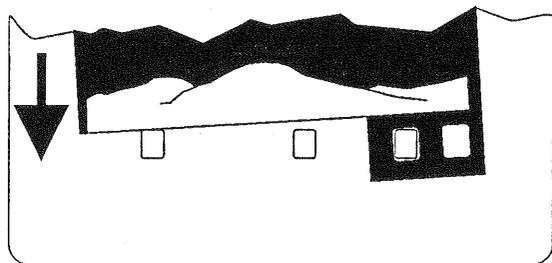


Figure 7

holes themselves and removing everything below the image area provides enough "breathing room" to tilt the left-hand side of the slide down in the mount for alignment, without worry of having a narrow wedge of black Ektachrome visible below areas of your panorama.

But what if the image requires moving to the left or right — as well as tilting — to become aligned? In the case of sliding to the left and lifting the right side, you'll need to start by cutting away the sprocket holes right up to the very tops of the holes from the right side over toward the left registration pin. This is actually pretty easy with a sharp pair of scissors and some patience. (Try it a couple of times on some scrap film chips for practice. In fact, it's rather surprising how closely you can align this

cut along the perf-tops.) In addition, you'll also need to continue this horizontal cut leftward to penetrate into — but not beyond — the hole that would normally fit over the left pin. Then snip off this strip with a small vertical cut from the lower film-chip edge up to the bottom of that pin-perforation. This leaves you with just one intact sprocket hole at the bottom of the film, on the left-hand side, and the left-most margins of the second perf from the left (Figure 8). Doing this makes it easy to visually gauge any horizontal repositioning, by checking the space between the left pin and the left edge of the truncated sprocket hole. And any tilting of the film can also be visually gauged against the top(s) of the pins. On the other hand, *lowering the left side* will require cutting away not only the sprocket holes, but also up to the bottom of the image — except for the partial sprocket hole remaining for positional-reference against the right registration pin (Figure 9). Perhaps a bit confusing at first, but you'll get the hang of it.

Similarly, repositioning the image towards the right can be facilitated by mirroring either of the cutting-patterns described in the above paragraph. Either way, the film chip can be anchored into position with tape. But because there's no sprocket hole fully intact to help hold the film chip's position in this procedure, a couple of pieces of tape — in different locations on the film chip's edges — will prevent image-

shift within the mount at a later time. With experience, you'll create other variations of cutting patterns to shift and tilt the film to re-align pans and other slide images.

The registration-pin / hand-alignment strategy still requires a certain amount of trial-and-error to get slides aligned — by re-

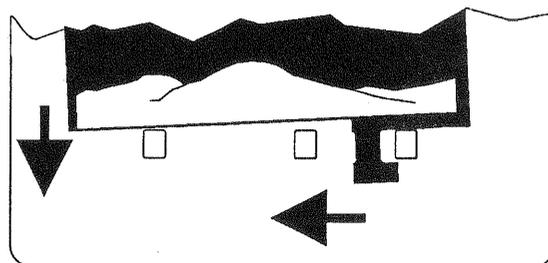


Figure 9

sitioning the film, closing the mount and dropping it into the projector, visually checking it against the adjacent projection, and trying again — as many times as needed

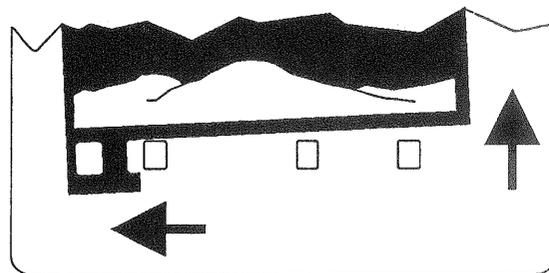


Figure 8

to get the alignment right. But with a bit of experience — along with the positional references provided by the registration pins — the show producer can "get a system going" fairly quickly. Before long, gauging the horizontal and vertical spacing between film and pins starts to become a more intuitive and quicker process. It's not as "quick and clean" as with a photographic counter-distortion method and a pin-registered camera, but it helps to make hand-alignment a good bit less painful.

Of course, you'll want to get rid of those pesky BFRs (Big Fat Rectangles) on your slides, too, before running your show. If you do this via contact-print masking (described in "Slide Masking Revisited", September, 1991, *Planetarian*), be sure to sandwich, register, and attach the film original and mask together in a pin-registered mount using a couple of pieces of Scotch Double Stick Tape #136 in the black areas of the slide. After doing so, you can lift the attached films from the mount, cut the lower row of sprocket holes away from the mask with scissors, and then continue with your alignment procedure in the mount. And after finishing that, sandwich-in the soft-edge panorama mask of your choice to blend the pan sections together nicely.

While aligning panoramas in this manner isn't totally painless and automatic, it does provide the low-tech planetarian with an effective method for making pans look much more seamless and professional — with less exasperation and hair-pulling — than when re-aligning totally-freehand. So remember, even in you don't have a pin-registered camera, buy pin-registered mounts. They'll still provide you with lots of help in mounting and aligning slides.

And, as always, remember to use glass mounts to keep your images in focus!

## Most Frequently Asked Questions:

**QUESTION:** What is the most frequently asked question about 'STAR HUSTLER'?

**ANSWER:** That's easy. Everybody asks about our theme song which is the classic 'Arabesque #1' by Claude Debussy performed by Tomita on the still available "Snowflakes Are Dancing" album (RCA)

**QUESTION:** At what times and days of the week can I see 'STAR HUSTLER'?

**ANSWER:** Most TV stations air 'STAR HUSTLER' just before nightly sign-off. However, due to 'STAR HUSTLER's' enormous popularity a number of stations find the show's 5-minute format can fit anywhere during the broadcast day and air the show more frequently. Local TV listings seldom include 5-minute shows, so it's best to call the station for the broadcast schedule.

**QUESTION:** If I can't find 'STAR HUSTLER' on my hometown PBS station, how can I see it where I live?

**ANSWER:** 'STAR HUSTLER' is provided free of charge by WPBT, Miami to all PBS stations. If you can't find it, write or call your local PBS station and ask if they will air it and remind them that it is available free of charge.

**QUESTION:** Is it necessary to get special permission to use 'STAR HUSTLER' for astronomy club meetings, teaching in the classroom, science museum or planetarium use?

**ANSWER:** No. In fact, many astronomy clubs, teachers, science museums and planetariums have been taping 'STAR HUSTLER' off the air and using it regularly as a way to reach their public.

**QUESTION:** Is there any way I can get 'STAR HUSTLER' other than my local PBS station?

**ANSWER:** Yes. A month's worth of 'STAR HUSTLER' episodes are fed monthly to a satellite from which all PBS stations take it for their local programming. Anyone with a satellite dish is welcome to the satellite feed. Again, no permission is required. For satellite feed dates and times call Monday through Friday (Eastern time) 305-854-4242. Ask for Mrs. Harper or Mr. Dishong.

**QUESTION:** I am a teacher planning my curriculum and would like several 'STAR HUSTLER' episodes in advance, but I do not have access to a satellite dish. Is there any other way I can obtain 'STAR HUSTLER'?

**ANSWER:** Any teacher anywhere around the world can obtain 'STAR HUSTLER' episodes in advance through their NASA C.O.R.E. Teachers' Resource Center. For details write: NASA C.O.R.E.; Lorain County Joint Vocational School; 15181 Route 58 South; Oberlin, OH. 44074.

**QUESTION:** Why does 'STAR HUSTLER' always say "Keep Looking Up!" at the end of each show?

**ANSWER:** Have you ever tried star gazing looking down?



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# Mobile News Network

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315-432-4523 fax  
sreynold@ocmvm.cnyric.org

Please note the new PO Box and fax numbers above.

## GLPA Conference 1997

Plans are underway for an extraordinary Starlab workshop at the October Great Lakes Planetarium Association conference. Four

Starlabs, possibly one of them super-sized, will be set up, and poster papers dealing with topics of interest to small and portable planetaria will run concurrent to presentations in the domes. The idea is to get as many new and interesting ideas as possible in the framework of the workshop time slotted.

## New e-mail

Ray Worthy (15 Queensberry Avenue, Hartlepool, Cleveland TS26 9NW, United Kingdom; e-mail: raymond@stargazr.demon.co.uk) is conducting a huge survey to find locations of portable users around the world. His inquiries seem to be producing some interesting results. I look forward to reading his report. A preliminary report will be given at the MAPS May 1997 meeting.

## Transparent Cylinder Contest

A last reminder: Win big in the LTI Contest! Learning Technologies Inc. is sponsoring a contest to inspire creative uses of the Starlab Transparent Cylinder. A collection of quality drawings and curriculum materials gathered from entries will be published in a manual and made available to worldwide users. Prizes include \$250, \$600, and \$1000

gift certificates which can be applied toward the purchase of any LTI products. Transparent cylinders will be provided to contestants at an extremely reduced cost or, if materials are chosen to be included in the manual, charges will be refunded. Deadline for applications is July 31, 1997. Contact LTI for contest rules and further details. (Learning Technologies Inc., Transparent Cylinder Contest, 40 Cameron Avenue, Somerville, Massachusetts 02144 USA; Fax 617-628-8606; e-mail: STARLABLTI@aol.com)

## PIPS Meet in June

The next meeting of Powerful Interactive Planetarium Systems (PIPS) will be hosted by Gary Burgess at Oswego College in New York State on Friday, June 20th. Gary has booked three rooms plus the 20-foot planetarium, Spitz A-3P. There will be plenty of room to set up portables and any other materials you wish to demonstrate.

I am still waiting to hear that other IPS Regions are also holding PIPS meetings. Sharon Mendonsa, Southeastern Planetarium Association, has expressed an interest in conducting such a meeting. It will be great to hear the results of her efforts. ☆

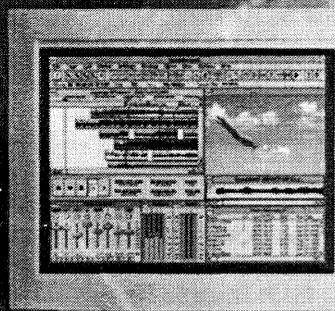
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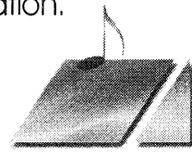


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# Regional Roundup

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[www.dalnet.se/~stella](http://www.dalnet.se/~stella)

The Regional Roundup column depends entirely on contributions that I receive from IPS Affiliate Associations all over the world. Please continue to contribute as you have done before. In order to be sure that your text will make it into the column, please send it so I have it at the first day of the *Planetarian* deadline month, preferably by e-mail. The deadlines for contributions to No. 3/97 is thus 1 July, and for No. 4/97 1 October.

Thanks to Bart Benjamin, Ignacio Castro, Tom Clarke, Undine Concannon, Jon Elvert, John Hare and Zinaida Sitkova for contributing to the Regional Roundup Column this time. You are welcome back with new reports, and I look forward to reports from other Associations as well.

**Important notice:** Unfortunately, there might be problems with my regular e-mail connection in the summer. Therefore I ask you to send your contribution to **both** the addresses given above. Please remember that a short note is also appreciated!

## Association of French-Speaking Planetariums

Planetarium Strasbourg with Director Agnes Acker hosts this year's IPS Council Meeting 23 June. The delegates who chose to stay in Strasbourg can attend the TILE Conference 24-26 June.

## Association of Mexican Planetariums

The 1997 AMPAC Meeting took place at the Veracruz Merchant Maritime School Planetarium 22-24 May. Hubble Space Telescope slides were shown to interested AMPAC members wishing to incorporate them in their sky shows. The distribution process of the slides has been initiated. Comet Hale-Bopp has brought new audi-

ences into Mexican planetariums, awakening interest in astronomy basics.

The Hidalgo Planetarium inaugurated early this year a new Science Center, *Rehilete*, with many interactive facilities. The Luis E. Erro Planetarium has broken grounds to become part of a new Science Center adjacent to its facility. The Planetario de Ciudad Victoria was advertised by Goto Optical Mfg. Co. In the April issue of *Sky & Telescope* magazine, revealing its impressive architecture.

## British Associations of Planetariums

*Armagh Planetarium.* With the appearance of one of the biggest comets in recent times, so comes a new production, *Comet: From Ice to Fire*, which answers questions about these fleeting visitors. It features comets old and new, from Halley to Hale-Bopp, and a futuristic manned landing on a cometary nucleus in 2060.

*Greenwich Planetarium.* Domeless planetarian Alex Lovell hijacked the planetarium for two very successful shows for the deaf during a special day of signed events at the Old Royal Observatory. Further shows are planned.

*London Planetarium.* For the national week of science engineering and technology, *Galileo* appeared before schoolchildren to talk about his life and how he explained the universe by his observations. Using a variety of entertaining props, he demonstrated the force of gravity with great gusto. The week also marked with an exhibition of paintings by Joe Tucciarone, which was well received by visitors and staff alike. The planetarium dome is now red, in aid of charity - to learn why you will have to come to IPS'98.

*BAP Meeting 1997* was held 17-18 May at the Planetarium in Fort Victoria, Isle of Wight, where Paul England had nobly stepped in as host at short notice.

## Canadian Council of Science Centers

At its Annual Meeting of 18 June 1996, the Canadian Council of Science Centres agreed to take over the function of the Planetarium Association of Canada (PAC) in providing a means of support, communication, representation, etc. of the Canadian Planetarium community. CCSC immediately applied to the international Planetarium Society (IPS) to replace PAC as the recognized IPS affiliate for Canadian planetariums. This was approved by IPS Council in July 1996.

*Manitoba Planetarium, Manitoba Museum of Man and Nature* has lately been offering what seems as everything *but* planetarium shows. Over the last few months they have done everything from product launches to

film festivals. As an example, The Winnipeg Symphony Orchestra used the theater as a venue for a *Murder Mystery* fundraising event. This particular event holds the record for the greatest number of people through the theater in a two hour period at 1600. The touring show of the Banff Festival of Mountain Films has been presented in the star theater using our four video projectors.

The planetarium has however also been running the Adler Planetarium's *Comets are Coming* show, supplemented heavily with video and SFX. *Make A Wish* with Sharon, Lois and Bram, is the current family show. The planetarium is developing a Mars public show, and for the family audience, a children's show starring local musician and recent Juno award nominee Jake Chenier. Ryan Diduck, has replaced Scott Young as Mobile Planetarium Astronomer.

The museum is going through a five phase redevelopment project. The remaining phases include a planetarium refit. This year they hope to have a first-hand look at all the new digital technology (Virtuarium, Electric Sky and Star Rider) that could transform the theater into a multi-purpose, virtual reality theater. Plans are to open the new theatre in the year 2000.

*Planetarium de Montreal.* The annual attendance of the Planetarium for 1996 was about 150,000 visitors based on preliminary results. Of these, about 145 000 people saw the programs in the star theater and about 5000 participated in special activities. Astronomers at the Planetarium continued to write monthly articles for two important newspapers, *La Presse* in Montreal and *Le Soleil* in Quebec. They are also pleased to announce that Planetarium de Montreal will be the host of the International Planetarium Society Conference in 2000.

Two new public services were in full operation at the end of 1996: a special phone line for information about the night sky (861-CIEL, in French only) and an Internet address for the Planetarium (<http://www.planetarium.montreal.qc.ca>)

They are in full production for the next program and temporary exhibition on comets. Even their biggest exhibition of the year, *An Island in Space*, is on the drawing board. A live presentation of the current night sky and on the most recent astronomical discoveries will be presented on Monday evenings (*The Sky Tonight*). A new activity offering popular talks by astronomy experts, presentations of the seasonal sky, and outdoor observing sessions, begun in February with Thomas Bopp and David H. Levy (*Moonlit Nights at the Planetarium*)

*H. R. MacMillan Planetarium, Pacific Space Centre, Vancouver.* The star theater was closed from 9 September to 1 November 19

for a major refit. While the upgrade was not as radical as the one performed at the Calgary Science Centre, it was a significant step forward toward the goal of becoming a true *space centre* within the next 9 to 12 months. Components of the planetarium upgrade included a new automation system and a new laser programming and playback system, plus a stage complete with lighting and audio systems and controls. The capacity was also reduced to 230 seats.

The theater reopened on time, and programs were installed at a rate of roughly one a week for the first five weeks. Opening show was *The Sky Tonight: A Walk in Heaven's Garden*.

The final phases of work are now underway for the opening of the Pacific Space Centre itself. At this point, the new facility is scheduled to open in October 1997. As part of the final phase, the star theater will be closed again to paint the dome, recover the seats, and install video projection systems.

*The Atlantic Space Sciences Foundation (TASSF)*, Halifax, Nova Scotia, is a group of volunteers who own and operate a Starlab. For the most part, Starlab operates out of Discovery Centre. As of this writing, the Starlab is booked into May 1997. Some 7000

students have enjoyed the Starlab experience, four Starlab teacher workshops have been held, and three more are scheduled.

*McLaughlin Planetarium, Royal Ontario Museum*. Since May 1996 Tom Clarke has been involved in a public call for *expressions of interest* from potential business partners in the renewal of the planetarium site. That call generated thirteen proposals which were short-listed by December 1996 to the one judged best to meet the Museums objectives for the site. The Board of the Royal Ontario Museum has been dealing with management's recommendation to begin serious negotiations with that potential partner. If they are successful and timely in negotiations and decision making, the cinema portion could open by March 1988. The planetarium portion would be dependent on the timing of the necessary fund raising.

The proposal contemplates three components to the renewed facility: building renovations and an Omnimax theater, funded and operated by the partner; a planetarium housed in the same theater with equipment and programming provided by the Royal Ontario Museum; revenue generating commercial activities or, possibly, high-tech interactive exhibitions and experiences in

the other levels of the building.

In the meantime, a Starlab program allows the Royal Ontario Museum to continue astronomy programming for schools. The Museum has purchased two Starlabs, the first for use in the museum building as part of the ROM's education programs, and a second one for use outside the ROM as part of its outreach programs. Under the direction of Ian McGregor, programs have been developed and six part-time instructors trained to use the equipment and present the programs. The outreach Starlab has already serviced over 1,000 people in three months.

### Great Lakes Planetarium Association

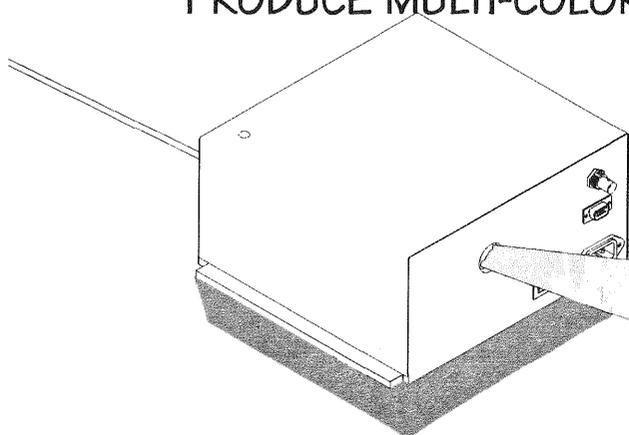
*Illinois*: The Illinois State Meeting was held on Saturday, 12 April 1997. Mary Schindewolf from the Waubonsie Valley High School Planetarium in Aurora hosted the meeting.

The Cernan Earth and Space Center of Triton College welcomed Alan Hale for its annual *Big Event* for members. Plans are underway for the Cernan Center to invite astronaut Eugene Cernan to a series of events in November to commemorate the 25th anniversary of his final footsteps on the moon. The Cernan Center is currently show-

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ing *The Space Shuttle: An American Adventure* along with its own production *Comet Hale-Bopp: An Observer's Guide*. It is also showing its children's show *Zip! Zoom! Whiz!*, the *Monthly Skywatch*, and *Floydfest*, two different laser shows featuring the rock band Pink Floyd.

The Illinois State University Planetarium in Normal welcomes Kevin Emery to its staff of student workers. Kevin is majoring in physics teacher education.

The Lakeview Museum Planetarium in Peoria is currently showing *Through the Eyes of Hubble* as their feature show. The Saturday morning series of family shows highlights comet Hale Bopp. It is a recorded/live comet show culminating in a trip to the comet's nucleus; students are then able to pass around synthetic comet material produced in Sheldon Schafer's freezer. Preparations are being made for the visit of dinosaurs to the museum and the planetarium. The dinosaurs will remain through 10 August. Plans are also being formulated for the annual solar system bicycle ride in July and motorcycle ride in August.

The Strickler Planetarium in Kankakee debuted *Rusty Rocket* during their homecoming weekend in November. A new

phone system has been installed on campus, which means that the planetarium has a new information line with a menu of options for program information.

The William M. Staerkel Planetarium at Parkland College in Champaign welcomes Mary Nicholas back to the operations position. The planetarium is working on a state grant project with seven county museums to link with 25 classrooms across the state in addition to collaborating on a similar grant with the Adler Planetarium. Dr. Jeff Hunt, after receiving his Ed.D., moved into administration at Waubonsie Valley High School. Mary Schindewolf, formerly from Lourdes College in Sylvania, Ohio, has assumed the duties as Planetarium Director.

**Indiana:** The Indiana State Meeting was held on Saturday, 12 April 1997 in Muncie. Peggy Gebhart from the Muncie Community Schools Planetarium and Ron Kaitechuck from the Ball State Planetarium co-hosted the event.

Kudos to Gregg and Barb Williams for their ongoing efforts and success involving high school students in GLPA. This year, the Merrillville contingent numbered nine students and three adult leaders. Alan Pareis is now the Interim Pastor of the Federated

Church of Sandwich, Illinois for about a year. Alan reports that the Russian Slide Project Team is hard at work. Slide duplication is in progress and the technical annotations and greetings are also in the process of being translated.

**Michigan:** The Michigan State Meeting was held on Saturday, 10 May in Kalamazoo. Eric Schreur from the Kalamazoo Public Planetarium hosted the meeting.

The Longway Planetarium in Flint welcomes Carrie Meyers to the planetarium staff. The Longway Planetarium has a brand new Web Page. Its URL is <<http://www.flint.org/longway>>.

The Shiras Planetarium in Marquette showed *Comet Hale-Bopp is Here!*, written and produced by a couple of local astronomy club members. It used some laser disk images from *Through the Eyes of Hubble*. In April and May, *Earth: The Blue Planet* was presented. Their June show is *The Loneliness Factor*. The Shiras Planetarium has a new Internet web site at <<http://www.mich.com/~michaelb/shiras.html>>.

The Abrams Planetarium in East Lansing has continued showing *Larry, Cat in Space* as the family show. *From Stardust to Life: A Cosmic Journey* returned as the feature show

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in May. For the fall, Abrams is working on a Milky Way show. The script was written by Ken Crosswell, author of *Alchemy of the Heavens*, a recent popular book on the Milky Way. They're planning to make the show available to other planetariums.

The Hurst Planetarium has presented a number of shows targeted to specific grade levels, including *The Little Star that Could*, *Worlds of Wonder*, and *Comets and Eclipses*.

The McMath Planetarium at the Cranbrook Institute of Science in Bloomfield Hills created an event around Comet Hale-Bopp involving three solid weeks of nightly observing sessions in late March and early April. The Cranbrook Museum is currently under renovation and construction. Work continues on plans to upgrade the planetarium.

At the Chaffee Planetarium in Grand Rapids, evening star shows have been replaced by laser light shows. However, to give people a real planetarium show, they have started a Wednesday night double feature: the comet show and a 45-minute live sky show on the current night sky, which included how to find Comet Hale-Bopp. Pink Floyd's *The Wall* is their featured laser light show. They also give a school show called *Surfing the Solar System*, which is about a family who learns about the solar system while surfing the Web. It is designed for grades 2 to 5.

The Longway Planetarium in Flint will show *The Wizard of Oz* this summer. You are welcome to visit Longway's webpage at <<http://www.flint.org/longway>>. Garry Beckstrom of the all new Delta College

Planetarium reported that several hundred people came to their opening on 5 February. They ran preview shows every half hour from noon to 7 p.m. for two days! Now they are running *Planet Quest*, an interactive, live/canned program from Sky-Skan, that takes the viewers on a flight through the solar system. Their shows have all been sold out so far!

The Kalamazoo Valley Museum has been showing their own production *Secrets In the Sky*, about the underground railroad, and *Winter Stargazing*. Plans are underway for their hosting the Michigan state meeting on May 10, which will showcase the museum's Universe Theater and Planetarium.

*Ohio:* The Ohio State Meeting was held on Saturday, 12 April 1997 at the Wilderness Center Planetarium in Wilmot (southwest of Canton) with David and Robin Gill as hosts.

The Ward Beecher Planetarium at Youngstown State University is celebrating its 30th anniversary season this year with a diverse series of programs revealing the wonders of the cosmos and the joys of skywatching. For all thirty of its seasons, the planetarium has been guided by the able hands of Warren Young and has twice hosted GLPA Conferences, first in 1972 and again in 1991. Rick Pirko, Mike DiMuzio and Warren continue to bring the joys of astronomy to their classes and audiences.

The Cleveland Natural History Museum and Mueller Planetarium continues an annual series of astronomical lectures, with joint sponsorship by the Cleveland Astronomical Society and Case Western Reserve University. Comet shows lighted up the domes of

Ohio's planetariums while Comet Hale-Bopp lighted the real sky. At Youngstown's Ward Beecher Planetarium, *The Comet Show* told the story of comets past and present in a show running from February through early May.

*Adler's Comets Are Coming!* was run at both the Bowling Green Planetarium and the University of Toledo's Ritter Planetarium. Ritter also gave Saturday matinees featuring *Follow the Drinking Gourd* and *Lifestyles of the Stars*. BGP runs a double feature in which Edgelight Production's short program *Explorer* precedes the comet show. Both of these northwest Ohio university facilities have web sites you can browse at <<http://www.physics.utoledo.edu/~rpbo>> and <<http://chandra.bgsu.edu/~gcd/planetarium.html>>.

*Wisconsin and Minnesota:* The Wisconsin/Minnesota State Meeting was held on Friday and Saturday, April 25-26, 1997 in Madison with Geoff Holt as host. The University of Wisconsin La Crosse Planetarium featured *Journey To The Stars* (Horwitz Planetarium; Waukesha, WI) in March. They have completed installation of East Coast Controls equipment after water damaged the old control system last summer.

The Minneapolis Planetarium was very pleased to host the 1996 gathering of GLPA members. The final count totaled 118 delegates. Alan Hale, co-founder of Comet Hale-Bopp, signed over 60 copies of his new book after the conference closed on Saturday. Anyone wishing to purchase his book can contact High-Lonesome Books in Silver City, New Mexico at (505) 388-3763. If there is any-

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## PUBLICATIONS UPDATE

Undine Concannon, London Planetarium, UK

Those of you with Internet connections will, no doubt, have seen the IPS Web page, put together by Tom Hocking, Thomas Kraupe and Alan Gould. All information to be included should be sent to Tom Hocking, the Sub-Committee Chair. A word of warning, however, if you submit information about institutions or conferences run by someone else, please make sure you check with that person first, so that we can avoid inaccurate and misleading information appearing all over the world, as happened in the case of IPS'98. (The information which now appears on this should now be correct!)

The *Special Effects Book* is at the printers as I write, so your copies should be with you very soon, if they haven't already arrived. Hope the wait was worth it!

The *Resources* book (a relatively international "Yellow" or "White" pages for those who have them) is well on the way to production now. Alan Gould, Dale Smith and Gregg Williams are doing sterling work in pulling it all together - well done, gentlemen.

Susan Reynolds is working on a proposal for a book specially for Planetarians with portables; if approved, the IPS would publish this as a special publication, which means it would be free to all members.

Our next ventures may include a book of Astronomical Quotes, and a "perpetual" calendar of astronomical dates. If you would like to contribute anything to either of these, please send your ideas to me, or to Jon Bell at Hallstrom Planetarium, Indian River Community College, 3209 Virginia Avenue, Fort Pierce, Florida. 34981-5599.

one who is interested in purchasing the Minneapolis Planetarium's two new shows, *Honey, I Shrunk the Universe* or *Amazing Stargazing*, please call Bob or Rod at (612) 372-6543.

The annual spring meeting of the GLPA Executive Committee was conducted near South Bend, Indiana on Saturday, 3 May 1997. On 1 January, Dale Smith became President-Elect of IPS after winning last fall's election. Dale is the second active member of GLPA (and of CRAP) and the second Ohioan to serve as IPS President, preceded by the inimitable Jeanne Bishop, whose term was 1983-1984.

Dr. Walter E. Mitchell, Jr., who retired from the Planetarium and Astronomy Department at Ohio State University, passed away on 26 July 1996 after a lingering illness. Lisa Harmon, Project Coordinator of the Spacequest Planetarium at The Children's Museum in Indianapolis, passed away 7 January 1997 of natural causes.

### Middle Atlantic Planetarium Society

The annual MAPS conference, MAPS'97, was held 7-10 May and hosted by Spitz, Chadds Ford, Pennsylvania. This year's Margaret Noble address was given by Jim Sharp. The title of the talk was *Planetariums: Entering the Third Millennium*.

### Nordic Planetarium Association

The 14th annual Nordic Planetarium Conference takes place at Sigrid Rudebeck's Junior College in Göteborg 22-24 August. Pleanery speakers are Curt Roslund, who will talk on Nordic archaeoastronomy, and Torbjorn Urke, who will talk on constellations of the Nordic Laps. Also planetarians from other parts of the world are invited to attend this English-speaking meeting. Contact conference host Per Broman at per.broman@planetarium.se or fax +46 3125 6477 for information and registration.

Kosmorama Space Theater in Borlänge opened a new show 26 April, called Kronos. The theme of the show, written by Hans Lundstrom, is time. The same day, The Futures' Museum opened a new Science Fiction exhibition.

A new large NPA poster has been produced by Cosmonova in Stockholm and was distributed to NPA members in May.

Comet Hale-Bopp was a great success at high latitudes, easily seen from mid-March to mid-May (when the evening skies became too bright). At the peak of its performance, many planetariums gave it special attention. Erik Andersson at Goteborg's Public Observatory reported the biggest crowds in the Observatory's history. Hans Carlson and Lars

Broman at Stella Nova Planetarium in Falun let people watch Hale-Bopp through a specially equipped 10 inch Meade telescope in broad daylight. The comet was clearly seen, even through passing clouds. This extraordinary event took place on 1 April.

### Pacific Planetarium Association

Mark your calendars now for the next two PPA conferences: 24-27 September 1997 at the Kansas Cosmosphere and Space Center in Hutchinson, Kansas. Kim Arnold is hosting this conference which will obviously be a joint conference with GPPA and other regional associations. PPA members will receive specific information on registration, hotel and call for papers in the upcoming *Panorama* issue. Flights from the West Coast should be around \$200.

David Falk is hosting our fall 1998 meeting at the Los Angeles Valley College Planetarium in Van Nuys, California, on 14-18 October. The College is located in the San Fernando Valley on the north side of Los Angeles. The conference hotel will be the Airtel Plaza Hotel at the Van Nuys Airport. A conference theme has not yet been decided, but will combine technology with astronomy. Agenda will include trips to local area points of astronomical interest such as the Jet Propulsion Laboratory, Mt. Wilson Observatory and Disneyland. David is inviting the Rocky Mountain, Southwestern, Great Plains and Mexican Associations which will make this another multi-regional conference.

The Hubble Space Telescope slide distribution list continues to grow. We are hoping to receive post HST repair/upgrade mission slides soon. Contact Jon Elvert at the Lane ESD Planetarium, 2300 Leo Harris Pkwy., Eugene, OR 97401 for details.

### Russian Planetariums Association

The Russian Planetariums Association Conference, devoted to the 40th anniversary of the 1st Sputnik, will be held 15-16 September this year in Kaluga. After the conference, the participants will take part in XXXII Annual Tziolkovskii Conference.

All Russian planetariums took part in the International Day of Planetaria. More than 1000 people visited Nizhny Novgorod planetarium (projector Skymaster with 8 meter dome) and enjoyed the shows *Salut-Mir-Alpha*, *Cassini Project*, *On Jupiter's Moons*, and *Through the Eyes of Hubble* (courtesy by Rob Landis from the Institute of Space Telescope). When the darkness came, thousands of people watched the Comet Hale-Bopp.

### Southeastern Planetarium Association

Anthony "Tony" Jenzano, longtime director of the Morehead Planetarium in Chapel Hill, North Carolina, passed away on March 22. Jenzano began working at the Morehead when it opened in 1949. He became director in 1951, leading the institution until his retirement in 1981. Among his greatest accomplishments were the astronaut training programs conducted for the Mercury, Gemini, and Apollo astronauts.

Britt Rosse resigned as director of the Hopkins Planetarium in Roanoke, Virginia. Roanoke had been selected as site of the 1998 SEPA Conference. Gary Close, acting director, was concerned that he would not be able to follow through with the commitment. However after much deliberation, it was decided to move forward the conference as originally planned. Other planetariums in Virginia as well as volunteers from throughout the SEPA region have offered their assistance. The conference is scheduled for early June of 1998.

Kris Swanson's planetarium is a hit with the Palm Beach County, Florida schools. The facility includes a refurbished Spitz A3P, formerly at Pensacola Junior College and now located in Poinciana Elementary School in Boynton Beach, a magnet school serving the entire county. Kris has the good fortune to have extensive production facilities at his disposal and has involved his students in producing several shows for the planetarium. Their first production was *Follow the Drinking Gourd*. Based on his initial successes, Kris has plans to continue to involve students, as it has proved not only to be an incentive for them to be enthusiastically interested in the planetarium, but is also a source of welcome assistance.

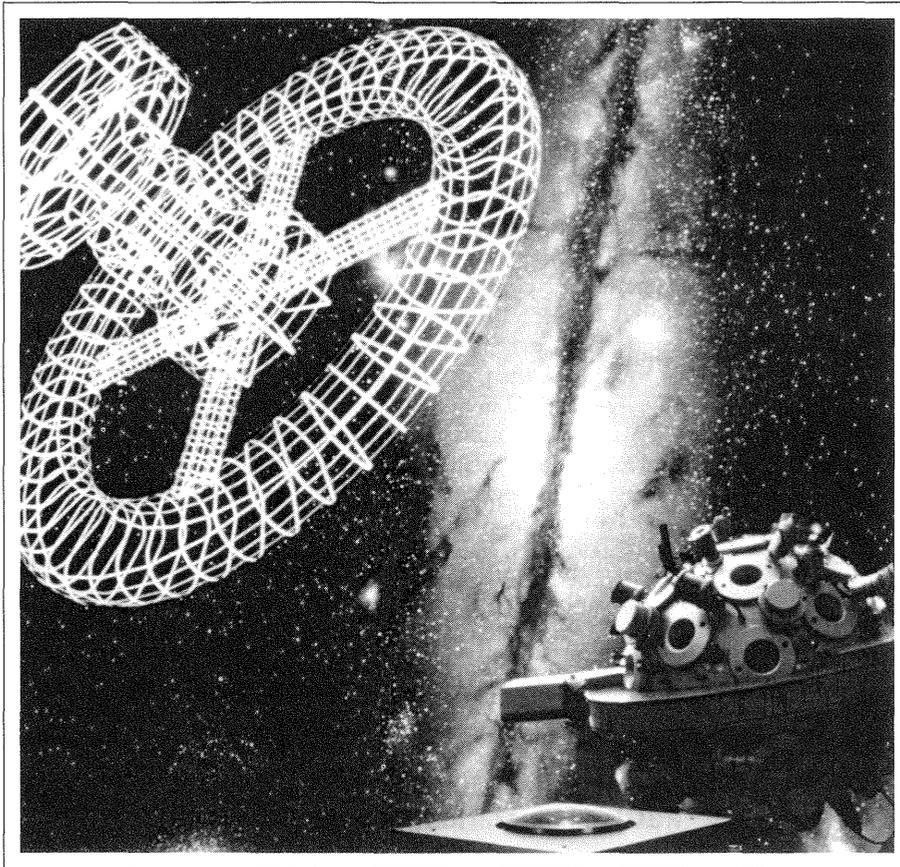
Steve Rider has joined the staff of the Astronaut Memorial Planetarium in Cocoa, Florida. Steve started with the John Young Planetarium in Orlando, and most recently he was with the Zeiss Planetarium in Munchen, Germany.

Within the past year, a number of South-eastern planetariums have undergone or are planning refurbishment and several new facilities have come on-line. These include Columbus and Albany, Georgia; Boynton Beach, Jacksonville, Orlando, Tampa, and West Palm Beach, Florida; Muscle Shoals, Alabama; and Nashville, Tennessee. The Ethyl Universe Planetarium in Richmond, Virginia, site of the first Digistar, recently upgraded to a Digistar II. They will close later in the year for the installation of a new dome and other major refurbishment.

Hale-Bopp has been the "star" of most planetariums in the region as well as everywhere. Alan Hale ... please find another one for us soon! ☆



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Mars related CD-ROMs seem to be the latest fad in astronomy related software. This may have something to do with the possible life traces found last year in a Martian meteorite. Or, it could be the latest batch of robotic probes that have been sent to Mars. I'd like to think that it reflects an ageless fascination humans have had with the Red Planet.

"Mars Rover" is a two CD-ROM package that provides a multi-media interface to three dimensional topography data from NASA's Viking orbiters. Most planetarians have seen the impressive 3-D fly-overs of Venus, Mars, and the Earth created by NASA. "Mars Rover" is an attempt to give you the same sort of experience on your desktop computer. A stylized futuristic/alien spaceship control panel acts as an interface to text, still pictures, and Apple QuickTime VR movies. You start out presumably in orbit above Mars looking at a rectangular map of the planet from 0 to 50 degrees of latitude (one disk has the 'northern hemisphere' and the other one has the 'southern hemisphere'). If you click on any one of six longitude regions, you get that section on the main screen with markers for the available regions to land your spacecraft on. These map-like images of Mars are more artistic than they are cartographically useful. There are no place names, contour lines, or other useful symbols. You can select your landing site by clicking on one of 20 landing 'spots' indicated on these global surface maps, or select a place name from a text panel on the right. Once selected for landing a stoic

female computer voice announces "One moment please", while the screen changes to the initial ground view of the site you've selected.

Up until this point the user interface of "Mars Rover" is pretty simple and intuitive. But once you're on the surface the controls are not at all obvious. To fly over the landing site you must click on a fuzzy white spot that may be visible in the viewing window. If you have speakers make sure they're connected and turned up because the only clue you get is the computer voice that says, "Select the light source for transport." Since the images of the landing sites are 360 degree panoramas, this 'light source' could be in any direction, not necessarily the part of the scene that you are viewing. If it's not visible you'll need to figure out how to move your view direction. The interface for this task is not at all obvious. If you place your mouse pointer inside the viewer window and hold down the mouse button and drag it outside the window the view point will change in the direction you've moved the mouse. It would be a lot less confusing if this procedure were explained on screen, in a manual, or via the under-used computer voice.

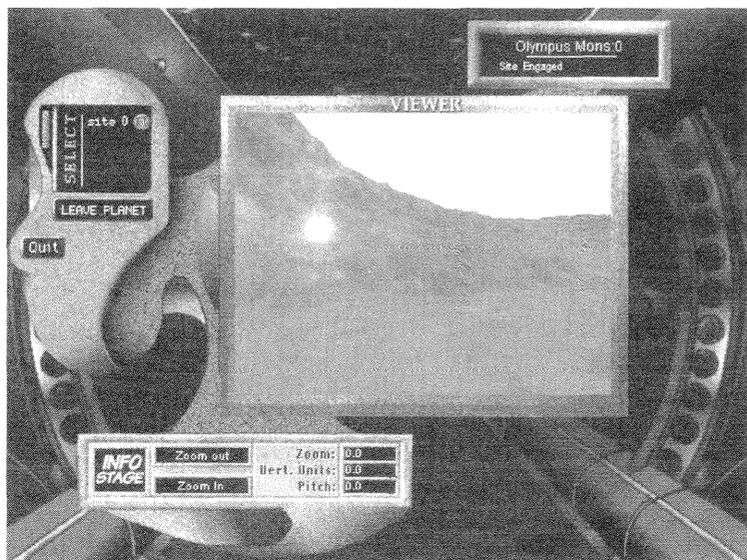
Once you start a fly-over, an electronic music soundtrack, often sounding like disco music, kicks in as background. Unfortunately, there is no voice or text to describe what you are flying over. Also you have no control of the speed or view direction during the fly-overs. The QuickTime movies run smoothly and are as dramatic as they can be considering that they are viewed in a 'viewer' frame that's less than half as wide as your full computer screen. And, as you might expect, the resolution is not very high. It's high enough to make the fly-over effect work, but not good enough to go looking for subtle planetary features.

If you want more information about the spot you've landed on you can click on a hot spot labeled "Info Stage". That takes you to a screen which the computer voice announces as, "the Central Data Bank". Here you will have

the option of viewing three Viking orbiter stills of the area, labeled "16X", "32X", and "64X" - although it's not explained what the "X" means in this context. The central data bank also contains a scrollable window with text information about the site. This information varies from informative to irrelevant. For example, the text about Nilokerus Scopulus tells us nothing about that region. Instead, it launches into a rudimentary discussion of future Mars exploration; terraforming; and the ethical implications of Mars exploration if life is ever found there. While these topics are legitimate for a Mars CD-ROM, they should not be taking the place of landform information that belongs in this section. Furthermore, the alternative information provided in this case has so little detail that it's hardly enlightening.

On the positive side, "Mars Rover" installed quickly and easily on my PC. The software comes with the required QuickTime VR viewer which also installed quickly and easily. RomTech say that you'll need Windows 3.1 or Windows 95, a 486 or better processor, SVGA, 8 MB of RAM, and a 2X or better CD-ROM drive on the PC platform to get behind the wheel of "Mars Rover". Mac users will need a Power Mac or 68000 machine, 10 MB of disk space, 16 MB of RAM and a 16-bit display.

Although "Mars Rover" has nicely-done graphics and runs smoothly, its primary feature, the multimedia fly-overs of the Martian surface, are little more than a gimmick. They don't have enough resolution or interactivity to make them engaging nor enough background information to make them really educational. Planetarians might find the fly-overs useful as a special effect when projected with a data projector, but the weak interface and content most likely rules this out as



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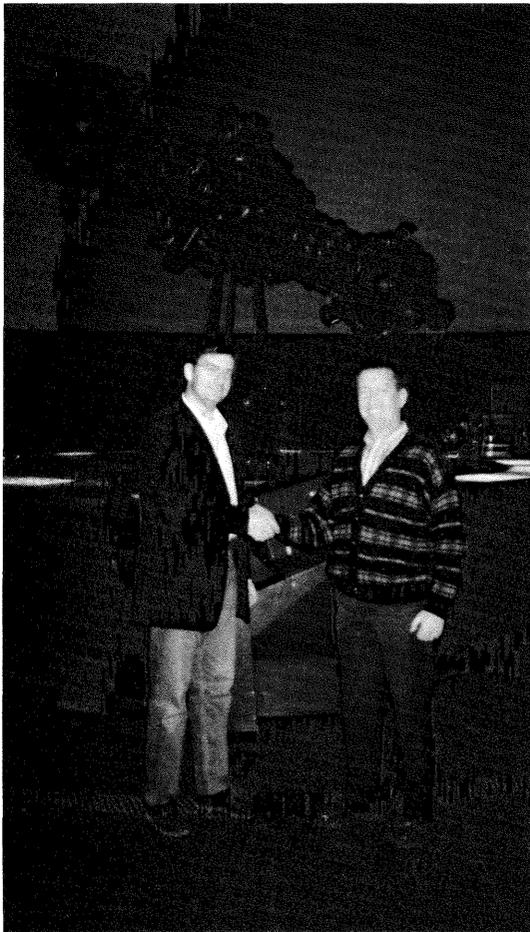


# President's Message

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## Greetings.

Just a few days from now, on July 4th, ID 4, we are the aliens to land a robot on another planet. NASA's Mars Pathfinder mission will come to a climax and planetary scientists and enthusiasts will party on in a gigantic celebration of planetary exploration in



Antonio H.M. Rocha de Freitas, marine officer and Planetarium Director (right) with the author at the Lisbon Planetarium.

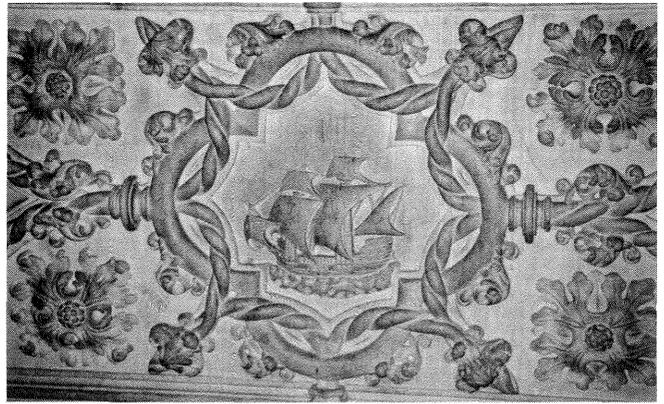
the streets of Pasadena and elsewhere.

This will be yet another date, which will be noted in our history books, where mankind bridges the cosmic ocean. It is not only the fruit of advanced technology, but also the result of our predecessors work - and it is not just an American triumph. Speaking with the words of Frank Borman when he recalled the first trip around the moon: "We leaned on the shoulders of giants and on the knowledge of generations. Much of this knowledge was Portuguese". Indeed, Portugal, Spain along with England, were the homelands from which the "astronauts" of the 15th and 16th century set sail to distant shores. I think we as planetarians should have a special interest in drawing lines to connect current events to historical and cultural backgrounds.

## 1998 - Year of the Oceans

Next year will not only be the year of the IPS conference happening in one of the great seafaring nations - England - but in fact 1998 will also be the "International Year of the Oceans" as declared by the United Nations.

Doesn't that offer us a lot of themes to link our planetariums on this "Waterworld" with aquariums, oceanographers, ecologists and his-



Detail of sarcophagus of Vasco da Gama.

torians? A great chance especially for planetariums close to the seashores!

Lisbon in Portugal is an especially rewarding place for establishing such connections.

The "Planetario Calouste Gulbekian" is part of the Maritime Museum in Belem, a suburb of this cosmopolitan city. It is only a mere 100 meters away from the sarcophagus of Vasco da Gama. In 1498, this Portuguese navigator opened up the sea route to India, bringing a century old dream to fruition.

In 1998, five hundred years after that great voyage, Lisbon is once more at the centre of the world's attention, concentrating people and political will on "The oceans - A Heritage for the Future" - the theme of the last world exposition of the 20th century. The Lisbon World Exhibition - EXPO'98 - which is intended to be a great celebration of the Oceans, will also mark the first meeting of formerly distant worlds by means of the sea. The event will run from May 22nd to September 30th, 1998.



EXPO'98 construction site early this year. It will be the most international Expo ever!

EXPO'98 stretches 2 kilometers along the Tagus river bank, only a few minutes from the centre of Lisbon. With more than 120 participating countries, this exposition will be the most international ever. It will approach the theme from various different perspectives - science, entertainment, arts and ecology: It will be a global reflection on the future of the oceans and the total expected number of visitors is 15 million!

Will there be Indian planetariums connecting with Portuguese speaking planetariums among them ...? It seems to me that it is not only worth thinking about planetarium activities related to the theme of EXPO'98 - it is certainly worth going there and experiencing not only EXPO'98 and the Maritime Museum, but also an enormous cultural heritage and one of the most beautiful cities in the world!

I encourage all distant "planetarium navigators" to travel across the oceans to Europe in summer 1998 - plan early for extra time in Lisbon and at IPS'98 in London. You can be sure to find the theme of navigation - and of space and time - beautifully enchanted in both places: Our hosts at IPS'98 will take us to London's famous centre of time and space - to the Old Royal Greenwich Observatory. This is where time begins: since 1884 the whole world has set its clocks to the time of day on the Meridian of Greenwich. And as for navigation, if it weren't for that Observatory, we wouldn't know where in the world we were (many of us who have read Dava Sobel's bestseller *Longitude* will finally have a chance to see Harrison's first chronometer, which allowed ships to know their exact position).

## IPS'98 - It's about time

Yes, it's about time to speak about IPS'98. Just before writing this I had the chance meeting with Undine Concannon, our host for IPS'98, in London. I can tell you that I was very impressed to see what is being prepared for us at the conference site.

And you will love this city with it's bandwidth stretching from old traditions at Buckingham Palace to the virtual extravaganzas at the Trocadero! Besides the trip to Greenwich and Stonehenge (as part of the conference) and the many astronomical sites you don't want to miss in the Post-Conference Tour (Jodrell Bank, Lord Ross' Telescope), there are many sites within the city limits which are worth visiting for a planetarian, among them one of my favourites: the splendid Natural History Museum with its "Life" and "Earth" Galleries.

Watch out for the next issue of the *Planetarian*: In the September issue our host will have a major article about the conference, giving you all the background info - plus giving you the chance for your input to the conference program. IPS'98 will be designed to offer not only paper sessions - it will put a special emphasis on thematic discussions and workshops with hands-on material.

Working closely with the IPS officers, our host is ensuring that you will get the most for your money and your creative contributions and I am pretty sure IPS'98 will be a splendid conference not to miss!

## New Associations - New Affiliations?

I already mentioned the link between India and Portugal - it strikes me again!

Despite these historic links, we do not yet have any planetarium organisations in these countries which are so rich in history and culture. In fact, to this date there are no planetarium associations even in the whole Iberian Peninsula nor for the Portuguese or Spanish speaking planetariums in South America. With more such planetariums under construction, e.g. in Rio de Janeiro and Sao Paulo plus some marvelous new institutions on the Iberian Peninsula (Valencia and Porto) plus several world-class planetariums like Madrid and Pamplona, we certainly will continue to encourage everybody in the Spanish and Portuguese speaking world - and in India - to continue with their cooperation within IPS and to also think about hosting future IPS conferences beyond the year 2002.

It is my great joy to report that our members "down-under" are continuing their work to form the first association for planetariums in the Southern Hemisphere. I would be especially pleased, if I could report to you next year that IPS council received the request for the first affiliation of an association with members on the southern hemisphere!

## IPS Publications

It is a pleasure to see some more fruits of the enormous volunteer work of our Publications Committee and of many IPS members who contributed! As a benefit of your IPS membership, you just received (or will receive shortly) three completely revised and updated publications. Sample pages of all three of these new publications can be found on the IPS web site <http://sun-site.unc.edu/ips>. Many thanks to our Publications Chair, Undine Concannon, who had the burden of coordinating these projects!

1. The new version of the *IPS Special Effects Handbook*.

Thanks to all members who shared their ideas on how to build a special effects projector using rather simple tools. With many planetariums fighting budgetary problems and still a lot of effects which can't be done with video or laser in a cost-effective way, this publication is still very important (the number of German planetariums who asked me about that publication at the recent conference in Stuttgart seems to prove that).

As a next step we are planning to scan the drawings of that book in order to make future publications easier to handle.

2. *IPS Resource Directory*

Similar to what is called "Yellow Pages" in most countries, the *IPS Resource Directory* lists companies and organisations whose products/services are of interest to planetariums. It lists the type of service and products and



Natural History Museum London - The New Earth Galleries

includes also web sites plus email-addresses.

The IPS Web subcommittee is also installing these web addresses as links on our IPS web site under "Resources". To enhance our communication lines we also encouraged all companies and organisations to install links to the IPS web site on their home pages.

Many thanks to the *Resource Directory* Coordinators - Alan Gould, Dale Smith and Gregg Williams - with special thanks to Gregg. His expertise and volunteer work with the data on his computer made this project work!

If you have updates please send them to Dale, our IPS President Elect, who for now will be the keeper of that database. Extra copies of the *Resource Directory* can be purchased for \$20 each - a valuable tool for anybody working in that field!

### 3. *IPS 1997 Directory of World Planetariums*

You probably wonder where we are with the *IPS 1997 Directory of World Planetariums*. This enterprise proved to be a very complex one because we first wanted to integrate the two databases which were so far separated - the membership database and the directory database - into one database on FileMaker 3.0, the same platform on which we now also keep our Resource Database.

An enormous amount of updates, many new web sites and email-addresses, plus formatting issues have turned this into quite a project.

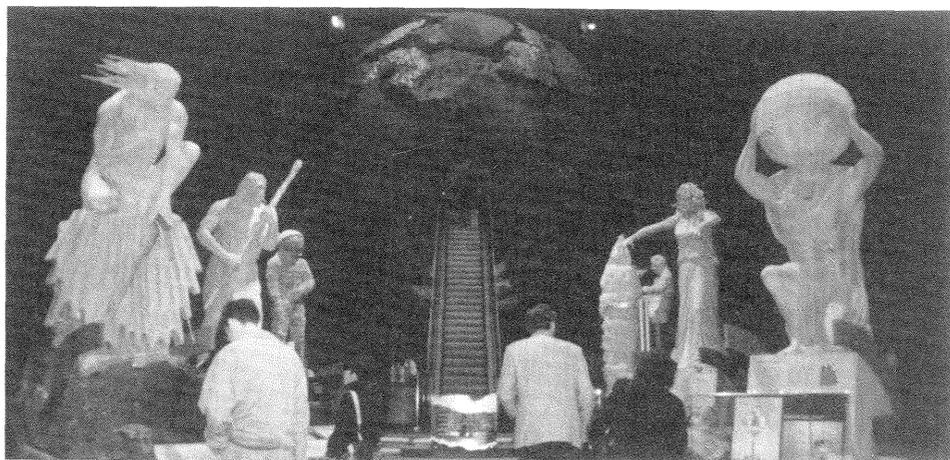
Thanks to our Treasurer and Membership Chairman Shawn Laatsch's hard work, you are likely to hold the new and improved *IPS Directory* in your hands pretty soon.

Please check our web site <http://sunsite.unc.edu/ips> for the latest news on this publication. In the future, for your convenience, you will be able to update your entry for the *IPS Directory* using a form posted for you on our web site. Remember, your entry in the directory can only be accurate if you keep Shawn informed of any changes!

With the support of Johan Gijsenberg at Europlanetarium in Genk (Belgium), an IPS European Repository is currently being set up. But this is likely to become operational no earlier than late this year. I will report about this in more detail in a later message - also about the suggestions for new publications we are considering for the future (as discussed at the council meeting in June).

## Visuals for IPS Affiliates

The slide distribution service arranged with the Space Telescope Science Institute in Baltimore is becoming both a model and an encouragement for other institutions to support IPS members in a similar fashion. On behalf of all IPS members I want to especially thank Prue Campbell at the Office of Public



Outreach. She is doing a fabulous job and she was instrumental in that process. Each regional planetarium organisation affiliated with IPS is treated like the big newspapers and receives copies of the latest Hubble slides along with the press release. Duplication and distribution for the IPS members in each association is handled within that organisation.

As of this writing, agreements for similar services with JPL (for Galileo, Pathfinder and Cassini missions) are in the making and are also intended to include video-sequences. Thank you Anita Sohus at JPL for supporting us in this!

These new benefits for IPS members have quite a long history. I remember very well when we started talking to the wonderful folks from JPL who were present at ASTC'95 in San Diego. Thank you Bill Gutsch and Jim Manning - your elaborate work behind the scenes got this started!

Regarding European sources, I can also give you some first signs of progress: the Max-Planck-Institute for Extraterrestrial Physics in Garching near Munich is willing to supply us also with their visuals - slides and videos. Arrangements on how the existing and the future images of the X-Ray satellite ROSAT, the COMPTON Gamma-Ray Observatory and the IR-Astronomy projects will be distributed to us are currently being made.

Further talks with both ESO, the European Southern Observatory (HQ also in Garching) and ESA, the European Space Agency (Paris) will be next. I hope to be able to have some more good news later this year.

## IPS Committee News

Welcome to Marie Radbo at Goteborg, who is the new chair of the revived IPS Language Committee. The committee she is currently putting together will explore the possibilities of translation at conferences and publishing relevant articles in languages in addition to English, and consider other lan-

guage-related issues.

I encourage especially our new Japanese members, who represent the second largest language group and the second largest population of planetariums in the world to work with Marie's team. We would all like to find out how we can improve the exchange of important planetarium related information and publications to and from Japan and look for volunteers from Japan to help with translations at the IPS conferences.

Rick Greenawald of Twin Falls, Idaho, will monitor and investigate existing and emerging technologies that have or may have an impact on planetariums. He will communicate on these matters to the IPS membership - watch out for related discussions on Dome-1. He will introduce his committee on the IPS web site and is interested in receiving reports about your technological dreams and nightmares.

In this issue of the *Planetarian* you will also find the announcement for the Eugenides Script Contest, administered by Alan Davenport from Maine. Alan and his team of judges look forward to receiving many good scripts from our talented members! Thanks to the Eugenides Foundation for keeping this important contest alive! My hope for the future is that there will be more organisations like the Eugenides Foundation who understand how to encourage and honour creativity.

Well, dear IPS members and readers of the *Planetarian* - that's about all for now. Thank you for your attention. In fact, while you are reading this, the IPS council is holding its off-year meeting at the Palais de Congress in Strasbourg, France. There will be a whole lot of new developments and decisions for me to inform you about in the next issue of our journal. Those of you on the Northern Hemisphere - have a great summer! Those of you on the Southern Hemisphere - have a not too unpleasant winter. I'll meet you again at the equinox!

☆

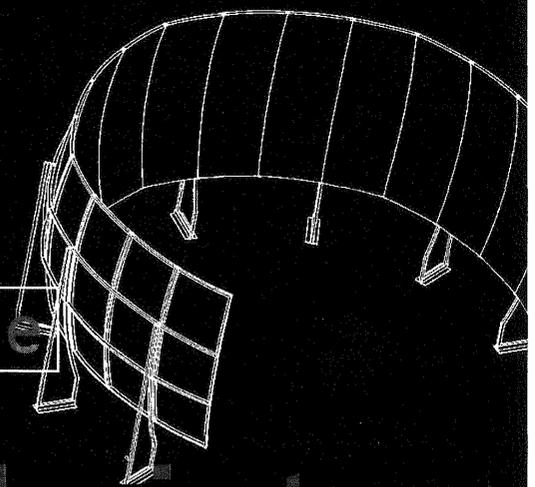


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# What's New

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Well—have you all survived the comet? As it recedes from the sun under the watchful eyes of our Southern Hemisphere colleagues, it's time to turn to other cosmic matters. Mars Pathfinder, for instance. If all has gone well and continues to do so—if it doesn't pull a Mars Observer, if its airbags deploy, and if it doesn't hit a really sharp, pointy rock or otherwise have problems, we should have in just a few weeks another toehold on the planet Mars.

With luck, Pathfinder and Sojourner and Mars Global Surveyor still en route may provide us with insights on the Red Planet, sending us scurrying to review and revise and maybe rewrite our Mars show scripts. If so, I have just the tool for you to consider in this

column's first item.

## The ScriptRiter

You know the trouble we have finding computer software that can actually and easily allow you to write the script on one side of the page and the visual and audio cues on the other, in a way that can easily be manipulated and changed? "The ScriptRiter" may just be the answer.

"The ScriptRiter" is a word processor software package available from MBC Images, 6009 West Leonard Road, Coopersville, Michigan 49404, telephone 616-837-9441. It's a user-friendly way to write scripts as pairs of paragraphs (one for script and one for AV cues) which can then be formatted into fairly conventional script pages or in other clever ways.

I had an opportunity recently to play with a demo version of the package, and it has a lot of advantages to the old way of writing scripts. After starting with a color console screen, you bounce into the "Editor" which takes you to the basic screen format for writing: two equal columns for writing copy, one to serve as the "audio" side (for writing the words the narrator will say) and the other to serve as the "visual" side (for writing descriptions or cues for visuals—or

anything else, for that matter, including music cues, sound effects, etc.) One screen represents one paragraph; you write the copy, key to the other column, and write the cues (or vice versa), then hit enter to bounce to the next empty screen format for the second set of paragraphs. Each set of paragraphs is numbered as you hit return, so when you're done, you end up with a series of consecutive screens containing the paragraphs in order.

There are a number of nice editing features which make the program great for the angst of scriptwriting. Using various simple functions, you can bounce almost instantaneously to any paragraph par you like, you can swap paragraph positions, delete sections, insert sections, import sections from other scripts, export scripts or script elements, and so on. There's a clock in the corner that will keep track of the total time you've spent writing—which is not something I'm sure I want to know, since I spend a great deal of time staring at the screen. But there's also another time-keeper which will keep track of the total estimated time for someone to *read* the script, based on an estimate of reading pace which you can designate. And *that* is one of my favorite features, since it can give you a good sense of how

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you're doing in terms of show length. You can choose to not show either or both.

Once you have your basic script, or if you want to print out what you have, or see how long it is in terms of pages, you can go into the "Formatter" section of the program, which allows you to format the paragraphs in pages based on format elements that you can set on the spot, or set in advance and save as "templates" for regular use based on what your needs or tastes are. There are lots of choices: you can format in the script/cue columns like a "normal planetarium script, or format to print out just the narration, or just the visual cues. You can create a storyboard format which provides the visuals paragraphs next to little boxes, and so on. You have choices of font, how to title, how to number pages, whether the narration will go on the right side or left side, etc. The paragraph pairs are formatted with the numbers assigned at the time of writing, but they can be eliminated if you like. There are also assorted advanced techniques and tips for using the program and even for writing audiovisual scripts.

I must admit that writing in paragraphs instead of pages, which is what I'm used to doing, seems a bit odd at first. I'm used to seeing what's written above as I write the next sentence. But the manual/tutorial makes some excellent points—namely, that you can scroll up to access the previous paragraph about as fast as you can look up at it in a page format, and you can bounce around among the script's paragraphs with ease—as quickly and perhaps quicker than you can scroll to a paragraph three pages away. And you can always see the script formatted as pages any time you like by popping into the formatter. Once you get used to it, I think it would work quite well.

This is a nice program, very easy to use, with some great features, and well worth checking out for the script writers among us. It's available in Mac and IBM-compatible formats. The requirements for the Mac version are a Macintosh with 68000/20/30/40 CPU or Power Mac in emulation mode (a special Power Mac version is available; I ran the demo copy on a Power Mac 7200/90 and it ran quite nicely), System 7.1 to 7.5, color monitor with 600x400 minimum resolution, and 2 megabytes RAM. The program will have a file size of up to 999 pairs of paragraphs in memory, can print to disk in standard or non-standard ASCII, and is compatible with laser or ink jet printers.

The IBM-compatible version requires Windows 3.1 or greater, a color monitor with 640x480 minimum resolution, and 2 megabytes RAM. The program will have a file size of up to 254 paragraph pairs in memory (but will print scripts of unlimited

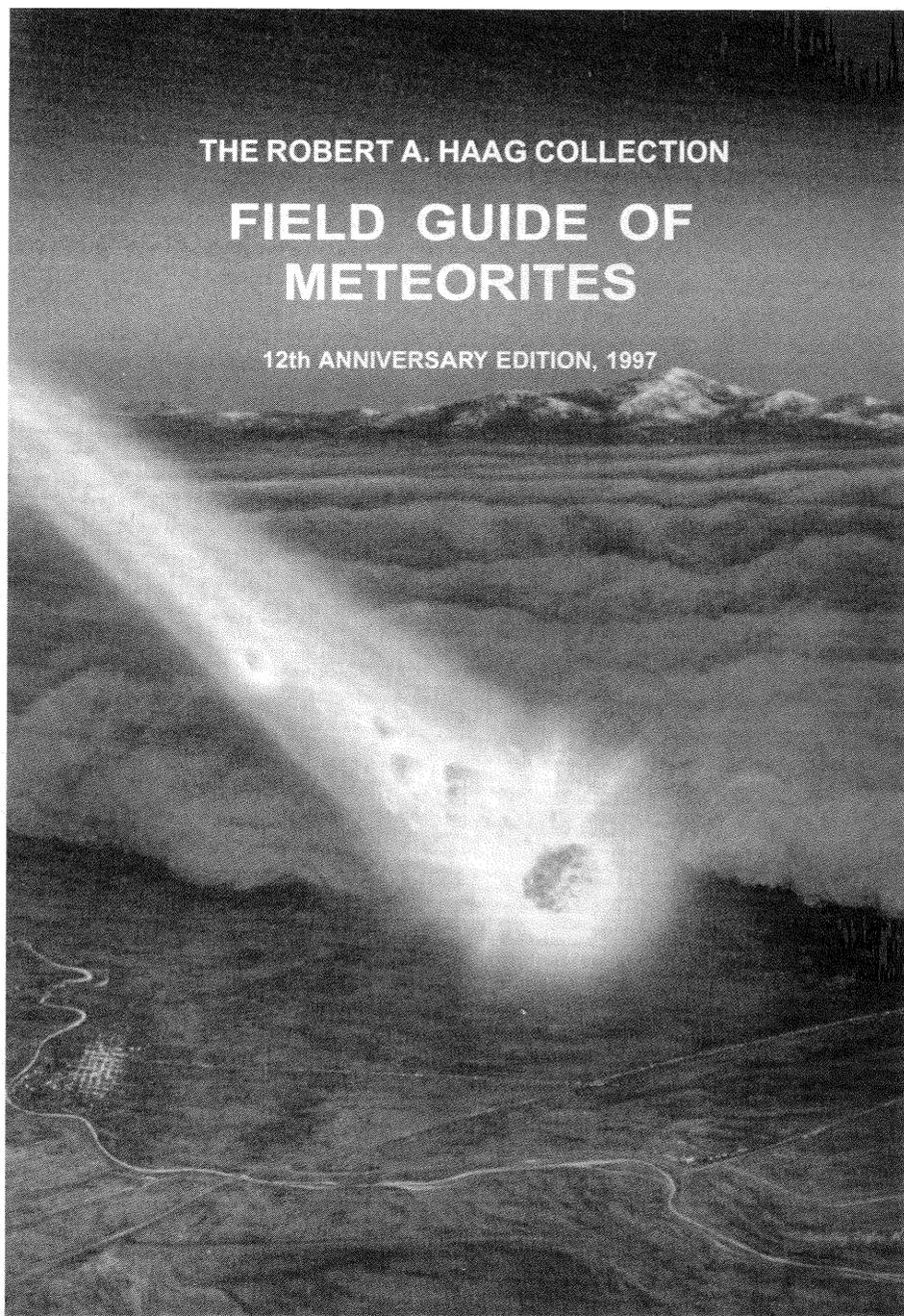
length using "the method of linked files," can print to disk in standard or non-standard ASCII, and is compatible with laser or ink jet printers (dot matrix printers will print very slowly in graphics mode).

The program is also available in Mac Classic (for older Macs) and IBM MS-DOS versions. The purchase price for the Macintosh and Windows versions is \$145 U.S. The price for Mac Classic and MS-DOS versions is \$125 U.S., I believe. Add \$5.20 U.S. for shipping and handling.

Scriptwriters, check out "The ScriptRiter!" Contact as given above for more information or a demo disk. Special thanks to Bill Gutsch for alerting me about this package.

## Meteorites

Robert Haag is out with a new 12th anniversary edition of his meteorite catalog called "Field Guide of Meteorites," a glossy full-color catalog that is more than just a catalog. Haag has examples of most every type of meteorite class (including a few tantalizing bits of the Zagami, one of the SNC meteorites believed by some to be Martian in origin and which have no doubt gone up mightily in price since last August), presented in lovely color presentation shots with specific descriptions. The publication is also loaded with tales of Haag's meteorite-hunting exploits around the globe with accompa-



nying photos, and useful bits of information on meteorite types in general, tektites, the process of etching for iron-nickel varieties, meteorite ages, Tunguska, a glossary of terms, and so on. There's lots here to see and learn and lust after.

In addition to meteorite specimens, Hag also sells novelty items including medallions made of iron meteorite scrap, watches with faces made of etched iron slices, and "asteroid belt" which is a belt with conchos made of Gibeon meteorite material, and gem-like faceted peridot crystals derived from pallasites,

Meteorites ain't cheap, but Haag's prices are competitive, I think. Prices range from about \$2 U.S. per gram for common and plentiful types up to about \$150 per gram for rare or special types, with the Zagami fragments in a stratospheric class of their own at \$2,000 U.S. per gram. Based on weight, specimens themselves run from as little as \$20-\$40 for little pieces of Odessa meteorites up to thousands for the big chunks, for good-sized pieces of pallasite, or for rare specimens. The medallions are \$250 apiece and the asteroid belts will cost you \$500. The pallasite gemstones run about \$1,000 per carat. Quantities vary, and are sold on a first-come, first-served basis.

I've had occasion to order meteorites from Haag for our museum on several occasions (and even bought one myself), and I've found him very easy to work with and the specimens top-notch. We even got a bullion-cube-sized piece of Zagami about nine years ago at a great price and are thinking of displaying it rather like the Hope Diamond next year—which it now may approximate in value! From our experience, I can certainly recommend him as an excellent source to meet your meteorite needs.

To get a copy of the guide or for more information, contact Robert A. Haag, P.O. Box 27527, Tucson, Arizona 85726 USA, telephone 520-882-8804, fax 520-743-7225, e-mail: <bobhaag@primenet.com>. You can visit his web site at <www.meteoriteman.com>.

## Asteroids

Going from the chips off the old blocks to the old blocks themselves: a little while back, I received a press release from The Planetary Society announcing a new project called the "Near-Earth Object Grant Program," designed to provide grant awards to promote the discovery of asteroids which may one day threaten to give earth a really bad afternoon. The desire is to increase the rate of discovery, permit wider participation in the endeavor by amateurs and observers in developing countries, and to provide seed funding to

professionals to help increase the potential of their programs to make significant contributions to the search.

Considering that the Society suggests that only about 10% of larger near-earth objects and even fewer of the small ones have been discovered, it seems a noble goal. The Society hopes to speed up the process in light of modest government funding.

Adriana Ocampo of the Jet Propulsion Laboratory will coordinate the program, with a selection advisory committee including near-earth object scientists Richard Binzel, Clark Chapman, Andrea Carusi, and Brian Marsden. The project is being conducted in cooperation with the Spaceguard Foundation, a European-based organization which promotes the discovery of these objects.

For more information or for application guidelines, contact the Society at 818-793-5100 or by e-mail at <tps@mars.planetary.org>.

## Film Projectors

Not long ago, I received an e-mail message from Alex Lavin of the Westrex company describing "state-of-the-art" 35mm/70mm film projectors that his company makes for applications in large-format theaters and planetariums. He says the projectors can hold more than 50 minutes of 8 perf/70mm film (24 frames per second) without needing loop bins or platter systems; that a single projector can show 4/35, 5/70, 8/70, or 10/70 film at speeds of 0-60 frames per second; that 180 frames per second forward or rewind can be achieved through the gate; that they include a special Westrex constant Tension film handling system that gives high print life; that the projector footprint is only 2 feet by 1.5 feet ( m by m) with the projector just 5 feet ( m) tall; that the projectors can be operated automatically and require minimal maintenance,

I didn't see any planetariums listed among companies ordering film systems in the past year, but there were a wide variety of theme parks and similar sorts of entertainment and leisure-time sites. You can check out the Westrex web site at <Westrex.net>, or contact Mr. Lavin at Westrx@aol.com for more information.

## Planetarium in a Castle

Here, a guest piece ... Tony Fairall from South Africa supplies the follow-

ing account of his visit to a planetarium-in-a-castle while touring Japan following the IPS conference in Osaka last summer. It shows that planetariums can come in most any shape or size—at least on the outside! Tony's account follows ...

"Those of us who were fortunate enough to attend IPS 96 are still enchanted by the warm hospitality and impeccable manners of our Japanese hosts. We were warmly received at many planetariums, but I happened to visit one very special planetarium, that nobody else with the IPS got to see!

"I was unable to join the post-conference tour, but immediately after the conference boarded the Shinkansen bullet train for Gifu where I spent two pleasant days visiting Dr. Ken Wakamatsu—a fellow researcher who like me chases redshifts of galaxies half hidden by the southern Milky Way. Ken and I are in fact good neighbors; we have been working adjacent regions of sky. My visit to Japan was an ideal opportunity to see the scanning equipment he has set up at the university in Gifu, and to compare notes.

"By the second day, as our discussions continued, Ken was driving me around the countryside. We visited the peaceful atmosphere of a Buddhist temple, had lunch, then continued into mountainous terrain. Ken then announced that we were to visit a small planetarium. It seemed an unlikely setting; we were following deep valleys through lush forested slopes. We drove over a large concrete dam wall then round its reservoir, before following further up the valley.

"Quite suddenly as we came round a corner, there in the valley above the river was a stunning and immaculate Japanese castle. Above its slanting masonry base, symmetrical terraced structures rose skywards—an absolutely beautiful piece of architecture. "That's the planetarium" said Ken. I could hardly believe it.

"In fact the building was not ancient, but almost brand new - the housing for a plane-



tarium and science museum. The Fujihashi science center is an ideal place for astronomy. At night, the mountains hide much of the light from nearby cities, making the sky relatively dark. A large reflecting telescope, available for hire, was just then being installed in an observatory building a short distance from the castle. The observatory is complemented by the planetarium and museum.

"The square base and tapering structure of a Japanese castle is, of course, a sensible shape to accommodate a planetarium dome. At ground level, there is little space to spare between the planetarium chamber and the outer walls, but stairs lead upward to where some three levels of the museum fill in the remaining volume of the castle.

"We were warmly received by the director and staff who demonstrated the planetarium and conducted us on a tour of the museum and observatory. The planetarium is a Minolta, working in what I think was a 12 metre dome—a slightly smaller version of the facility than the one I am used to, but with just as a good quality, if not better, in its sky projection. The science museum was impressive, in that most of the exhibits have been designed and built in house, on relatively modest budgets—yet they are very effective.

"For example, a dramatic field of stars in a darkened section proved to be nothing more than a cardboard panel, drilled with many holes, fitted in a window so that the daylight provided back illumination. Elsewhere were exhibits to show the different designs of small telescopes; models were made up with clear plastic tubes, so their optical components were apparent, but which you could also look through. There was also an exhibit to demonstrate the appearance of the night sky with and without light pollution.

"As always in Japan, one was almost embarrassed by the hospitality. I was presented with small gifts, having been caught totally unprepared to reciprocate. I hope however that this short account of my delightful visit to Fujihashi

will serve to bring its attention to my fellow planetarians, and thereby I can say thank you to its director, Mr. Akitaka Oguri and his staff."

Finally ...

That's it for this time. As we wait for news from Mars, enjoy the season (depending on your hemisphere). And as always, until next time ... what's new? ☆

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# Gibbous Gazette

Christine Shupla  
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Arizona Science Center  
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Phoenix, Arizona 85004  
(602) 716-2078  
(602) 716-2099 fax

Hopefully, everyone survived the big spring rush of events; between Astronomy Day, Comet Hale-Bopp, and the usual tide of students in April, I'm certain that everyone has had a busy time. **Ryan Wyatt** (Planetarium Manager here at the Arizona Science Center) and I have also been preoccupied with opening events at the new center and developing and presenting our new shows. So if this column seems a little shorter than usual, fear not ... things will return to normal some month soon. I would also like to apologize to the members of SWAP for not turning in anything to *Regional Roundup*.

## Congratulations

to **Rick Greenawald** (Faulkner Planetarium in Twin Falls, Idaho) and wife Lori, who have announced the birth of their twin daughters Kylie Rose and Hannah Jo. Kylie and Hannah arrived on January 16th at 9:10 and 9:11 am respectively. They were born premature at 32 weeks, but both are doing exceptionally well. They join big sister Mackenzie who is 3½ years old.

to **Alan Friedman** (Director of the New York Hall of Science), who was honored by the American Association for the Advancement of Science (AAAS) with the AAAS Award for Public Understanding of Science and Technology. Dr. Friedman was recently named as the 1996 recipient of the award, which recognizes leading scientists for their outstanding contributions to the popularization of science.

to **Steve Tidey** (formerly of The Planetarium, Central Museum, Southend-On-Sea, Essex, England), who won the \$250 third prize in the Griffith Observatory's annual science writing competition, sponsored by Rockwell (now Boeing). He wrote a piece about the asteroid impact that probably helped to kill off the dinosaurs, and brought

the event to life for the reader by making them feel they are there watching it happen.

to **York Clamann** (Abilene Christian University, Abilene, Texas) and wife Andrea who should have their second grandchild by the time you read this.

## People on the Move:

After 27 years in the planetarium/astronomy field, **Larry Toy** (formerly at the Chabot Observatory and Science Center in Oakland, CA) has taken a new position in a new field. He has been appointed to a senior position in the California Community Colleges statewide system, as Director of System Advancement and Resource Development. Larry will be responsible for developing new resources (money, equipment, personnel) for the 106 community colleges and the statewide system office in California, developing the overall technology plan for the system, representing the community colleges on several statewide and national boards and commissions, including California's Virtual University, developing a method of disseminating best practices through the Internet, and discovering new planets and comets. His office is in Sacramento and he can be reached at 916-322-0882, email: ltoy@cc1.cccco.edu. Larry will continue to serve on the Board of the Chabot Observatory and Science Center, but has stepped down as Chair of the Architecture Committee.

I have taken a position at the Arizona Science Center as Assistant Planetarium Manager. **Aaron Guzman** is now filling in at the planetarium at the Don Harrington Discovery Center in Amarillo, Texas.

**John French** (formerly Planetarium Production Assistant at Buhl Planetarium in Pittsburgh, PA) has accepted a position at the new planetarium in Corsicana, Texas!

## Did you know

Some of you may have wondered what has become of **Jim Mullaney**, formerly and Editor with *Sky & Telescope* magazine, and more recently of South Carolina. Jim is alive and well, and living in Pennsylvania, and runs (among other things) a business selling celestial and Earth globes for Spherical Concepts, Inc. Jim Mullaney, P.O. Box 1146, Exton, PA 19341-1146 or call him at (610) 2890-7183.

**Steve Fentress** (Director, Strassenburgh Planetarium, Rochester New York) has announced that after a two-year hiatus in the program, the Strassenburgh Planetarium will once again offer a one-year planetarium internship, beginning September 1997 and running through August 1998. The Strassenburgh Planetarium is a department of the

Rochester (New York) Museum and Science Center. Restoration of the internship was made possible by the moral support of the RMSC's new President, Kate Bennett, and our VP of Finance and Administration, Lyle Beach; and continuing financial support from the Rochester community.

Those of you who subscribe to the New York State *Conservationist* Magazine might have noticed an article in the February issue by fellow planetarium director **Richard Monda** (Schenectady Museum & Planetarium, Schenectady, New York). "Wonders of the Winter Night Sky" has a variety of descriptions and anecdotes on the names of the stars.

**Steve Savage** (Sky-Skan) has been out in Utah this spring, filming the comet. Video for a new laser-disk, maybe?

SWAP President **Donna Favour** (Richardson ISD, Dallas Texas) penned a new verse to "Home on the Range," in lament of cloudy skies for Comet Hale-Bopp:

*Oh give me a home  
Where the comets do roam  
And make a celestial display!  
Where never is heard  
A discouraging word  
And the skies ARE NOT CLOUDY ALL  
DAY!*

Please, if you have any information you would like to see in the next Gibbous, send it to me by July 1st. ☆

---

*For the first time in the history of our species,  
we have devised the tools — unmanned space  
vehicles and large radio telescopes — to search  
for extraterrestrial life. I would be very  
ashamed of my civilization if, with these tools  
at hand, we turned away from the cosmos.*

— Carl Sagan

*To consider the earth the only populated world  
in infinite space is as absurd as to assert that in  
an entire field sown with millet only one grain  
will grow.*

— Metrodoros

*Upon one tree there are many fruits, and in one  
kingdom many people. How unreasonable it  
would be to suppose that, beside the heavens  
and the earth which we can see, there are no  
other heavens and no other earths?*

— Teng Mu

*There are more things in heaven and earth,  
Horatio, than are dreamt of in your philosophy.*

— Hamlet (Shakespeare)

# Jane's Corner

Jane Hastings  
Thomas Jefferson  
Planetarium  
4100 West Grace Street  
Richmond, Virginia 23230  
jhasting@pen.k12.va.us

## Mom and Pop see Comet Hale-Bopp

"Hey, honey, better get a move on. It's getting late. I'll be in the car." "OK; do you have the keys to the front door?"

"Yep."

"Then I'm going to lock and shut it."

[In car, going down road: "Look outside. You're right. We had better hurry. Do you think we'll get there in time?"

"Oh, sure."

"How far have we come?"

"I don't know; it surely is getting dark."

"Well, it's not only getting dark, but we're getting farther away from town."

"(In child's voice): 'Are we there yet?' Ha. Ha!"

"H-m-m-m. I think we're getting close. Do you have the instructions with you?"

"Yes. Believe it or not, I remembered to bring the information they gave us."

"Well, what does it say to help us find the place?"

"Well, let me hit the highlights here. Where is that map light switch? I can never remember. Now ... this brochure from the planetarium at the Science Museum of Virginia says, 'get as far away as you can from the lights of civilization' and '... a clear west and northwestern horizon ...'"

"Well, it's certainly dark here. Let's just pull off on the shoulder of the road. Not much traffic; it'll be OK."

"Look at the stars! There are so many of them here, and, well, it's D-A-R-K. Yes, this will do fine!"

"I wonder which way is west? I forgot to bring a compass! I thought about it when I read these instructions at home, but I forgot. Darn!"

"You're right. We should have brought one. Let's just get out and look around. Oops, a little chillier than I thought it would be ... well, let's just see if ... hey! I think I see it! What does the brochure say? It says, 'the comet will look like a fuzzy spot of light with a fainter, fuzzy tail extending upward from the horizon.'"

"Honey, do you think that's it? Look at that. Whew! That's gotta be it! You're right!"

"Oh, my, it's definitely not a star. Look at the tail. Is that what they call that wispy stuff coming off the bright spot ... the tail?"

"It stretches quite a ways across the sky. You know, it's beautiful. I don't remember seeing anything like this before, at least not for awhile."

"What's its name again, Comet Halley-Bopp? Isn't that the one that came around about ten years ago?"

"H-m-m. ... Oh, you mean Halley's Comet? Sure sounds sort of like that same one. To be honest, I don't know. You know they come back again and again; comets go around the sun."

"The sun? I don't see the sun. Don't tell me too many facts about comets; let me just look at this comet with you ... I like looking at pretty stuff with you."

"Me too. And aren't those stars something? Too bad we don't know what we're looking at ... I wonder if the Big Dipper is up there somewhere. Hey, see that bright sort of pink star right on the opposite side of the sky from the comet? I'll bet that's the north star, it's so bright!"

"Darling, I wish we could stay here longer, but I really didn't bring the right jacket. We're going to have to go now; I'm getting cold."

"(Sigh) ... wish I knew more. One more look at the comet ..."

[On the way home] "I wonder if we'll ever see that comet again. Oh wait; I remember now. I read somewhere that it'll be back in 2400 years. Oops. Ha Ha! Guess we won't see it again!"

"Here we are, back home. Look up; I can hardly see any stars, just a few here and there. Wait! I think I see the comet. Look! Isn't that it?"

"Oh my gosh, yes. I think that's it. What? We didn't have to go out to the country after all; we could have just looked up and seen it in our own yard!"

"Ha! Ha! I guess the joke's on us. We can see

it right here! I wonder if anyone else in our neighborhood has seen it. There's Bob, taking out the garbage. (Calling loudly) 'Hey Bob! Have you seen the comet yet?'"

## Overheard:

—at planetarium conference (from Patsy Wilson of Woodson Planetarium in Salisbury, N.C.): "I'm an elementary school science teacher who turned into a planetarian about a year ago. I believed my new boss when I was told that all you have to do is 'push the button'! I should have known better! Needless to say, it's been a long year!"

—classroom teacher, talking about the moon to his class, using hand in sweeping back-and-forth motion in front of his body: "You see, the moon moves back and forth in the shadow of the earth [demonstrates] and that's what causes the phases of the moon to change!"

—Unidentified planetarian at planetarium conference: "(in voice of frustration) My definition of a museum association board is a group of people who have never worked in a museum or planetarium and don't have to live with the decisions they make!"

—at planetarium conference: John Hare, of ASH Enterprises, announced that his company was setting up the first planetarium in the Bahamas. Voice from the audience: "Need any help with that?"

—6th grader, at Jane Hastings' planetarium in Richmond, Virginia: "Mrs. Hastings, we took those tests [statewide standardized tests] today before coming here. There was one question on it that I wasn't sure of. It asked to list three things in size, from large to small: comet, planet, star. I knew that a star is smaller than a planet, but I couldn't figure out the comet. Is it bigger or smaller than a planet?"

—attributed to Isaac Asimov, science fiction writer: "The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka' [I found it], but ... 'that's funny' ..."

## Second Annual Boeing Writing Contest

The Griffith Observatory, in the interest of stimulating the flow of information between scientists, science writers, and the public, proudly announces the sponsorship by Boeing of an annual offering of awards for the best articles in astronomy, astrophysics, and space science. First prize is \$750. Award-winning articles will be published in the *Griffith Observer*. Articles must be postmarked no later than December 1, 1997.

For contest rules and information, contact:

Awards Committee  
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2800 East Observatory Road  
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or visit the web site at <http://www.GriffithObs.org/Observer.html>.

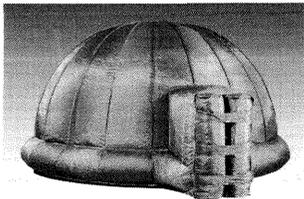


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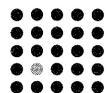


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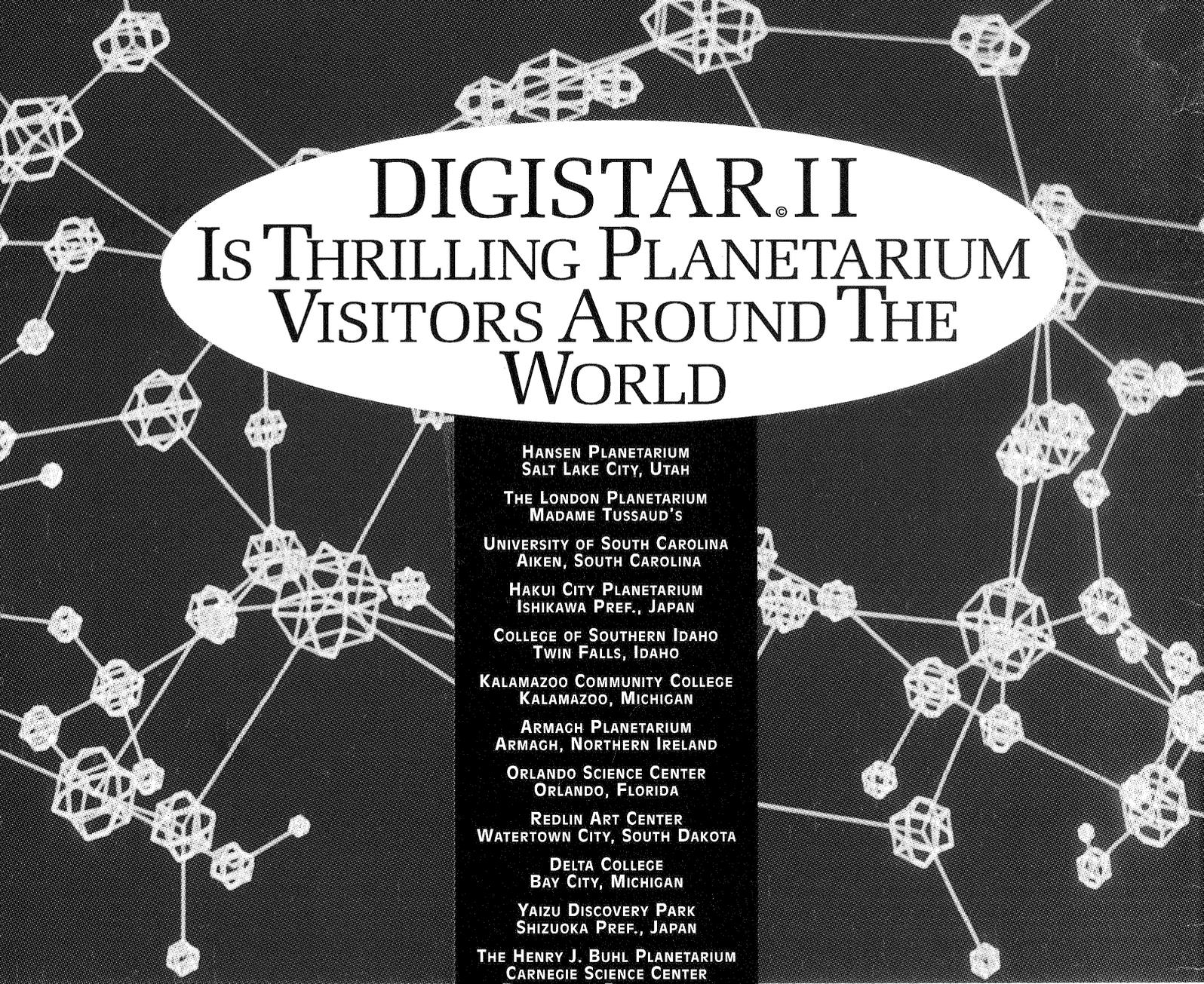
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