THE PLANETARIAN
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The Planetarian
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As a boy growing up in Brooklyn, New York, Carl Sagan gazed in wonder at the night sky. A trip to the library for a book on stars sealed his fate: He would devote his life to astronomy. Sagan recalls his college years in the 1950s as a time of tremendous optimism about science and the future. After earning a Ph.D. in astronomy and astrophysics from the University of Chicago at age 25, he taught at a constellation of prestigious institutions before joining Cornell as David Duncan Professor of Astronomy and Space Science. He also directs the laboratory's Laboratory for Planetary Studies.

Sagan has played a leading role in the Mariner, Viking, Voyager, and Galileo spacecraft expeditions and is noted for research in such areas as the origin of life, the greenhouse effect on Venus, and the long-term consequences of nuclear war on Earth. This year he received the Public Welfare Medal, the highest award of the National Academy of Sciences. He is co-founder and president of The Planetary Society, the world's largest space interest group, and a founding fellow of the Committee for the Scientific Investigation of Claims of the Paranormal, which analyzes and debunks psychics, channelers, astrologers, and reports of UFOs and alien abductions.

"Billions and billions of stars" has been Sagan's signature phrase since his Emmy and Peabody award-winning Cosmos TV series aired in 60 countries and was the most widely watched series in the history of U.S. public television. The accompanying Cosmos book became the best-selling science book ever published in the English language.

A Pulitzer Prize winner, Sagan boldly takes controversial stands. He was an early advocate of multinational cooperation in space exploration, a leader in the scientific community's protest of the Reagan administration's Strategic Defense Initiative (Star Wars), and was twice arrested at demonstrations against continued U.S. nuclear testing when the Soviet Union was abiding by a testing moratorium.

In his crusade to popularize science, Sagan has edited or authored 25 books, including Comet and Shadows of Forgotten Ancestors: A Search for Who We Are, with his writer wife Ann Druyan. His Pale Blue Dot: A Vision of the Human Future in Space will hit bookstores late this year [1994], to be followed by a study of skepticism and the nature of science. Druyan and Sagan are teaming up on a novel, a love story, before penning the sequel to Shadows.

At 59, Sagan is deeply concerned about the future of a world where the Scientific Literacy Index reveals that 94 percent of U.S. citizens are scientifically illiterate.

Astronomy is his passion, but Carl Sagan's interests aren't just out there with the "billions and billions" of stars. He is ardently devoted to popularizing science and tackling some of Earth's most pressing problems.

Q: How does not understanding science cripple people in their daily lives?
A: We live in a society absolutely dependent on science and technology and yet have cleverly arranged things so that almost no one understands science and technology. That's a clear prescription for disaster. Every day there are decisions being made in Washington that will affect our future, things like information superhighways and reduction of nuclear arsenals, research on AIDS, whether drugs that ease the pain of those who are dying should be decriminalized, what is the best way to make sure that America continues as a leader in industrial technology, how to deal with the depleting ozone layer, and global warming. There's hardly an aspect of modern society that doesn't depend on intelligent decision-making in science and technology. We are supposed to be a democracy. The people are supposed to make sure that their representatives vote correctly. How can they do that if they don't know what the issues are and can't understand them?

Q: Why aren't people keeping up with science?
A: There are a lot of reasons. In the short term we can talk about why is the basketball coach teaching chemistry, why do school bond issues repeatedly get voted down, why are teachers relying on textbooks and not labs, why is the teacher just one lesson ahead of the kids, why does the teacher discourage searching questions, when is the last time we heard some discussion of science on the Sunday morning white male pundit shows, when's the last time you heard an intelligible scientific remark by a president of the United States, when was the last television fiction series in which the hero was someone who was devoted to finding out how the world works? But these are all symptoms, not causes. The causes, I think, are in the following: Science is hard, science does not always conform to our wishes, science does not always reassure us, science puts enormous power in the hands of some people who we have every reason to mistrust. Scientists are responsible, in a certain sense, through engineering, for depletion of the ozone layer, global warming, Agent Orange, and all the rest. Now many scientists would say, "Wait a minute. We're just doing our job. All of this is the misapplication of science by government and industry." To some extent, it is. And to some extent scientists have been very courageous in calling attention to the dangers of these technologies. But, nevertheless, if we didn't have science, we wouldn't have these problems. But we also would have life spans of 25 years, infant mortality would be enormous, and many things that make life pleasant or even possible would be gone. There is a kind of tradeoff. All that has happened so fast that many of us are huffing and puffing to keep up.

Q: Nancy Reagan consulted an astrologer, channelers have enormous followings, and the tabloids are rife with reports that sex-crazed space aliens are abducting humans. Does it seem that there's an explosion of ignorance today?
A: No, I think we've always been like that. We had demons from ancient Greece, gods who came down and mated with humans, incubi and succubi in the Middle Ages who sexually abused people while they were sleeping. We had fairies. And now we have aliens. To me, it all seems very similar.

Q: But the difference is now we have much more knowledge and much better communication systems.
A: Well, do we? Look what's on television. How much critical science is there and how much credulous superstition? I think you could argue that television works just the other way, to make people more credulous and less critical.

Q: What can people who are afraid of science do for their children?
A: The most important thing is not be fright-
ened when their children ask them a question to which they do not know the answer. It's all right to confess that you don't know the answer to a question, even if it's a 6-year-old who's asking. The worst thing is to ridicule the child. That convinces the child there's a set of questions that adults get mad at and, after a few experiences, the child doesn't ask the question anymore; we've lost another person who might be comfortable with science. It's self-propagating. Those who are ignorant and fearful of science create a new generation of people ignorant and fearful of science. So if you don't know the answer, you can say, 'Let's look it up. Let's go to the encyclopedia.' If you don't have an encyclopedia, go to the library. If you don't want to do that, you can at least say, 'Maybe nobody knows the answer to that question. Maybe when you grow up, you'll be the first person to know the answer.' That's an encouragement.

Q: What's wrong with teaching both creationism and evolution in the classroom?
A: Creationism is not science—it's mysticism, it's religion. I would have no problem with teaching creationism in mythology courses, in courses on social trends, even in courses on religion, which I think might be a very good thing to have. But not courses in science, because it's not science.

Q: You've been a professor for more than 30 years. How have students changed in that time?
A: The best students haven't changed much at all. They are still terrific. Beyond that, anything I would say would be anecdotal. I thought I saw in the Reagan years kids much less disposed to ask searching questions, especially of those in power. Today I seem to see a greater willingness to ask searching questions, all to the good. In the Reagan years, I thought I saw a lot more kids who chose their careers in order to make money and comparatively few who were ideologically motivated. Today, I see some signs of that turning around. But again, I could be wrong. It's not a statistically significant survey.

Q: It sounds like you think the Clinton administration is providing a better climate for science.
A: Yes, maybe a little. But certainly not enough on the environment; it's nothing like what one might have expected from Al Gore's book. The administration says, 'Look, we've only been in office a year, give us some time.' I'm willing to do that. Certainly in terms of knowledge of scientific and environmental issues there hasn't been a president or vice president as knowledgeable as Al Gore in decades, maybe centuries.

Q: How would you grade the administration on environmental matters?
A: I think they're very cautious, afraid to offend business. But business is precisely part of the problem because if it affects short-term profits, business isn't concerned about environmental consequences, by and large. There are some exceptions. But more typical is the response of the DuPont company when scientists discovered that CFCs (chlorinated fluorocarbons) are dangerous. It took out ads saying, 'No, no, this is only a theory. It's not science. So don't worry about it.' So the idea of cleaning up the environment without putting pressure on industry is naive, I think. Industry can be prodded with carrots and with sticks. Wouldn't a tax that discourages people from driving be more effective in tackling pollution?
A: The way things work is, all used cars pollute a lot. The ones that might be efficient in reducing pollution, that might get more miles to the gallon, are new cars. Poor people cannot afford new cars. So as soon as you say that there's a penalty for driving cars that pollute, the penalty works preferentially against poor people.

Q: If you were the president, how would you allocate the budget?
A: Very hard question. Just think how many lines there are in the federal budget. One thing I would say, though, is to have a so-called defense budget that, including hidden costs, is over $300 billion a year when there are so many other pressing national needs is a serious mistake. The Soviet Union has collapsed. The Cold War is over. Presumably we're not obliged to invade lots of other nations. We can protect ourselves for a fraction of that $300 billion, and the money saved could do an enormous amount to solve many of our other problems. But this administration is not inclined to go in that direction.

Q: Many people fervently believe they have seen UFOs, and some claim they have been kidnapped and sexually assaulted by aliens. Do you think alien spacecraft have visited Earth?
A: Having extraterrestrials visit this planet would be great... even if they were short, sullen, grumpy, and sexually obsessed. Still, if they are the harbingers of advanced civilization and they're here, for heaven's sake, let's find out about them. But the thing is, the evidence is poor. In none of these cases has anyone torn out a page of the captain's log or scraped off a piece of exotic alloy of isotopic composition not known on Earth. In the abduction paradigm there's this very interesting circumstance in which people say the extraterrestrials have implanted a little monitoring device up their nostrils. Great! Let's do that. Certainly our government could make up its mind before we make up our minds.

Also, the women who are said to have been impregnated by alien sperm. Can we take a look at the amniocentesis? How about the sonograms? How about the cases where they are born or miscarried?

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A telescope is turned toward the Orion Nebula, which we know is a spawning ground for stars. Hubble finds that half the stars examined have flat discs of gas and dust surrounding them. This is exactly what the people trying to understand the origin of our solar system predicted: the so-called solar nebula. It was first proposed by Immanuel Kant and by Pierre Simon, back in the 18th and 19th centuries, just from physics. And now we see these things. It now looks as if planets are a frequent if not invariable accompaniment to star formation. There are 400 billion stars in the Milky Way galaxy, and if many or most of them have planetary systems, the chances of extraterrestrial life exist. It's just more support for the plausibility argument. But it's tremendously exciting. And if we start looking at planetary systems, we're bound to understand more about how our own was formed.

Q: After Hubble, what's the next logical step in space exploration?
A: Hubble is an observatory in Earth orbit looking out, and that's only one aspect of space exploration. But in that category, the next obvious mission is called AXAF—the Advanced X-Ray Astronomical Facility. That's a large telescope that does just what Hubble does but within the X-ray part of the spectrum. There are energetic objects all through the universe that are invisible in ordinary light, such as black holes, that we can best understand with something like AXAF. But that's only one part of the space program. Looking at Earth to monitor its environmental health, exploring asteroids, comets, planets, moons, the Sun directly with robot probes—those are some of the other things that are in the future of space exploration.

Q: What's the most serious problem facing the Earth?
A: There are lots of them: ignorance, ethnocentrism and xenophobia, population growth—although it is starting to shallow, but not nearly fast enough. And the absence of an understanding of the virtues of democracy. I would certainly include those on my list. It might be a much longer list, but those are some of the things near the top.

Q: I would have expected you to say global warming.
A: I would put that in the ignorance column.

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David Hoffman
1926 — 1994

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On April 12, 1994, that little black cloud that always followed David Hoffman around finally caught up with him. On that day, Dave succumbed to complications of pneumonia.

Dave for many years directed the Reiser Planetarium at the Godwin Heights High School system in a suburb of Grand Rapids, Michigan. He basically came with the instrument from Viewlex and stayed until budget cutbacks in 1981 forced him to seek employment elsewhere. For a while he directed the Carr-Fles Planetarium at Muskegon Community College (also in Michigan). At this same time, changes were taking place in his personal life. He left Muskegon because, as he told it, “I have been drafted.” He spent the next few years working with the Salvation Army in Wisconsin. Upon retiring from “The Army,” Dave returned to Grand Rapids for his last few years.

Dave was a short, bald headed character from New York who always had a smile, a joke and a short story to share. Although by the time he said, “to make a long story short,” it was already too late. And he sure could tell some good stories—stories about himself, stories about the early days of the profession and lots of stories about Viewlex. At the 1978 Great Lakes Planetarium Association (GLPA) convention in Bloomfield Hills, Michigan, Dave got up in front of the whole delegation and told the following story.

“At the Reiser Planetarium, the students were doing a show about dreams. We wanted to show the effect of going to bed and then the passage of time, so we made up this double bed military style (very and smooth). We carefully placed a camera in the middle of the bed and took a picture every 30 degrees. Then to show the passage of time we crumpled up the bed coverings and took another set of photos. We took the photographs and placed them into our panorama system and when we finished, we had the best looking bed pan you ever saw!” (of course, when Dave told the story, it was much longer).

So at this same GLPA convention, a group of us lead by Eugene Jenneman, went out and purchased a bed pan. We wrapped it up in a box with nice wrapping paper and, in front of the entire delegation, Jenneman called Hoffman up for a special presentation. Of course everyone except Dave knew what was in the box. When Dave was presented with the wrapped box, he very humbly said, “I am deeply moved.” That statement put the entire delegation on the floor laughing. Dave couldn’t understand what was so funny. When he opened the box, he quipped, “I am very, very deeply moved.” No one could beat Hoffman.

He also told the story about his Superintendent, who was also bald, that when they put their heads together, they would make an ass out of themselves.

Dave was a fellow of the International Planetarium Society and served as the Executive Editor of the IPS journal, The Planetarian, from spring of 1978 until spring of 1981. He also served GLPA in many capacities.

Yes, Dave will be sorely missed. He helped launch a lot of planetarium careers. So when a little black cloud comes into your life, think of Dave Hoffman.

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A common concern in some planetariums is that, while housed in a science museum, they seem to operate independently and may have an antagonistic relationship with the rest of the museum. Or, as was recently commented by one observer, "The planetarium appears to be the neglected step-child." While this may never change completely, there are some ways in which the planetarium at the Don Harrington Discovery Center in Amarillo has become involved in the events that the museum hosts.

The Discovery Center has several events throughout the year to bring in families and other special groups. Some are seasonal, such as Mad Scientist Daze (Halloween), Science With Santa (formerly called December Discovery), and Spring Eggstravaganza. Others are related to specific groups: we have workshops for regional Gifted & Talented students, Girl Scouts (Overnight Discovery), and pre-school groups (Week of the Young Child and Week of Discovery). Of course, we also hold special members' events and some fund-raisers.

In the past two years, the planetarium has become a part of most of these events. It has been the location for one of the three workshops for Overnight Discovery and the Gifted and Talented program, with great success. In the past year, it has been the site for programs as a part of each of the seasonal events. And last September, Friday during Week of Discovery was designated "Moon and Stars" day, with one of the four activities conducted in the planetarium.

... there are some ways in which the planetarium at the Don Harrington Discovery Center in Amarillo has become involved in the events that the museum hosts. ... the planetarium is an important part of the museum ... the planetarium is playing an active role in meeting the museum's mission of science education.

Workshops for students, pre-schoolers, and Girl Scouts have been similar to other programs we've done in the planetarium. We've taken trips through space to visit the planets and learned about the constellations. We've also played with toys and seen parts of NASA's "Toys in Space"—making paper grasshoppers was fun but took a significant amount of time for Brownies. We've made space helmets using popcorn buckets and tin foil. We experimented with different aspects of working in space; we dressed up in snowsuits and helmets to demonstrate some of the difficulties of operating in a spacesuit, practiced different exercises that may or may not work in space, discussed orientation and dizziness in space, and ate different foods that wouldn't be too messy in a micro-gravity environment.

Planetarium programs for the seasonal events had to be different. They needed to relate to the theme, they needed to be short (10-15 minutes long), and they needed to be special—something that significantly utilized the planetarium without being identi-
... and entering the planetarium hallway.

Of course, this all means extra responsibility for the planetarium. But the increased exposure and the growing belief that the planetarium is an important part of the museum have been worth it. I’ve enjoyed giving the different programs, and finding ways to fit the planetarium into the events—and feel that the planetarium is playing an active role in meeting the museum’s mission of science education.

The rabbit discusses finding his way to your house at night — using the stars!
A New Star in Instructional Visualization

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The United States Air Force Academy Planetarium, completed in January of 1959, has a proud tradition of writing, producing, and presenting academic and training support presentations for the entire academy community. Early in its history the very nature of the facility hampered its effectiveness in the endeavor. Not because it lacked capability, staff, or professional skill to provide the highest quality educational presentations to cadets, but rather because of the perceived nature of the facility. It housed a star projector! Most instructors and department heads knew this fact and discounted its audio visual capabilities. Today the facility is no longer The Planetarium but the USAF Academy Center for Educational Multimedia. Why it claims this title and how it is fulfilling this lofty goal is outlined below.

When the USAF Academy was being designed, some insightful individual suggested that the Air Force Academy, founded as the space age was beginning, should have an appropriate facility which would represent the space age. Thus the Academy came to possess one of the major planetariums of the world.[1] “The planetarium was acquired by the Air Force to aid in teaching celestial navigation to the cadets. It was also used to supplement introductory courses in astronomy and space travel. Showings were scheduled for the public periodically and to special groups by arrangement.”[2]

From the beginning, the planetarium has been the responsibility of the Commandant of Cadets.[3] In its early years, the Academy graduated cadets qualified as rated navigators and the planetarium was used as a navigation training facility. From 1959 through 1980 an extensive series of presentations were prepared to teach cadets the basics of celestial navigation theory including the location and identification of 50 celestial objects and navigational stars.[4] Other cadet education and training programs were supported as well. Although an exhaustive list of titles would take several pages, typical topics included: Navigation, Astronomy, Physics, Arts and Humanities, Engineering Materials, Astronautics, and Airmanship.[5]

Although the primary mission of the planetarium is to support cadet instruction, an active and free public schedule of programming has continued from March of 1959 through the present.[6] To date, more than 3 million visitors have seen presentations in this facility.[7] Public attendance has varied from a high of 120,000 persons per year to the current 30,000 visitors a year who enjoy a free presentation on some topic of astronomy, space exploration, military art and science, or cadet instruction.[8]

Automation Begins Early

From 1959 to approximately 1978, all planetarium presentations were manual. That is, a lecturer/operator memorized a script and operated a few slide projectors and special effects. Later, during the same period of time, a manual automation system was designed and built by the technical staff. Using it, a technician in a back room followed a script and flipped switches to operate the required special effects.

The system, crude as it was, allowed for more sophisticated programming than was being practiced in European planetaria and many other American institutions. In 1978, an Electrical Engineering cadet designed a new automation system as a project in Engineering 430. This system used touch tone codes from a telephone keypad. These codes were recorded on a program tape. The system’s decoder circuit read the tones in playback mode and converted them into electrical signals which operated selected relays that would turn on effects, activate a dimmer circuit, or advance a slide. Automation control at the Academy was born! This automation system required 3 digit number to be entered on the key pad. The time required for a person to accurately punch in the three numbers while the tape was recording and get them precisely located was about 2 to 3 seconds. On average about 20 codes could be recorded in one minute. However, if you entered the code too quickly the signal didn’t last long enough to be decoded. The entire string of codes was always decoded in groups of three and a single lost digit meant that all subsequent codes appeared as errors. When you consider that three digit codes were required to turn on the projector, another to fade it up, another to fade it down, still another would cause the slide tray to advance, and finally, three more numbers would turn it off. Only about 10 slides or effects could occur per minute. Back in those days, the theater also had circular bench seating, requiring that we project everything in quadruplicate. That way all areas of the audience could see each slide equally well. This also required four times as much code! To solve that problem some functions were ganged so a three digit number might turn on a whole system of projectors or advance their slides or fade them up or down. Nevertheless, it took a technician with nimble fingers and a lot of patience to encode an entire planetarium script for a 40 minute class or public presentation.

This system was used until the early 80s. Due to the success of this automation, course directors began writing more complex presentations and soon no one could punch in error free numbers fast enough to satisfy the needs of the requirements of the instructors.

The touch tone decoders were never very stable and the technician in the back room still had to not only follow the script, but also attempt to correct all misread codes and try to keep the presentation on track. The officer or presenter who failed to mention the assistance of the enlisted technician in the back room during the program introduction seemed to be plagued with more than the usual number of glitches. It paid to acknowledge the hard work of the crew in the back room.

Computer Control

Our first excursion into computer control was made possible through a generous gift from Admiral John Kirkpatrick.[9] Through
his generous financial help we were able to purchase Commodore 64 computers. Staff Sergeant Richard Cheek, then Captain Larry O. Anderson, and I wrote code to enable the Commodore to emulate the touch tone codes used by the old automation system. We could now operate the equipment at mind boggling speed—one 3 digit code every 0.2 seconds, an increase of 1000% over the manual method! For a couple of years, we were able to exceed the requirements of the course directors and script writers of the cadet instruction modules and public presentations. Inevitably, however, the tasking increased. Our next excursion into home built automation was using the Z-100. A Pascal program written for us by an officer in the Computer Sciences Department (DFCS) promised a faster system. It was never fully utilized although tests indicated an improvement of about 50% would have been achieved. We had reached an automation barrier! The problem: data had to come out of the computer serially, controlling one device at a time.

By 1985 most of the large planetariums around the world were buying automation systems. It was an easy thing for them to do because they charged an admission fee to their public customers, but the Air Force Academy Planetarium could not. These automation systems sent data to "smart boxes" attached to individual projectors, then with an appropriate signal all the smart boxes could simultaneously react and either turn on, fade up, advance or fade down a device. Up to 128 devices could be controlled simultaneously. A new command could be sent as often as 1/16 of a second. Through the use of funds that became available at the end of the 1985 fiscal year we were able to purchase such a controller. It is currently still in use at the planetarium.

Today, newer systems allow programming in real time, as opposed to writing code, compiling, recording, then playing back the data. With these faster computers the number of devices that one can control has increased significantly.

For each of the 15,000 presentations given in the planetarium prior to January 1992, the big device in the center of the room was always the main equipment item. That device was the planetarium. It could reproduce the night sky, but only as seen from the center of the Earth. We often fibbed and told people they were seeing the sky from Colorado Springs, Stonehenge, or the Holy Land depending upon the program. Not that it made much difference in the appearance of the sky, but we didn't teach Celestial Navigation using the moon because of the parallax problems of not being on the surface of the earth at a given location.

The planetarium could project the current sky or the sky for some date in the past (like the beginning of the Christian era) or any date in the future. By showing the motion of precession we would tell the audience they were seeing the sky as it would have appeared 15,000 years ago or in the future, another exaggeration! These inherent inaccuracies are caused by the mechanical properties of the planetarium instrument itself and there was nothing to be done about it.[10] Immense amounts of time could seem to pass in moments or the skies could stand still while topics were discussed in detail, but always the "bug-like" planetarium was present. Programs were planned around it's unique capabilities. This was literally true as well for the planetarium towered 3-1/2 meters in the air and was 2-1/2 meters wide. It presented a major problem for our off site graphics department. The artists and photographers had to create and prepare art work and slides that would appear undistorted as we projected our panorama images offset 30 degrees to the side of the instrument on a compound curved projection screen (dome).

 Something New under the Sun

From 1959 to 1984 the Academy planetarium housed an optical-mechanical planetarium and seemed like it always would.[11] However, by 1984 a new technology was on the horizon. This new device, slow to gain acceptance, is called Digistar. It is a 3-dimensional computer graphics projection system. It is no more than 1.2 meters high and it is able to project more than just the stars as
seen from the center of the earth. It can project any object which can be drawn using lines, arcs, points, and alpha-numerics.

When I first saw this device in 1983 I had already come to the conclusion that major changes had to occur at the USAFA Planetarium. In the years since 1979, there had been a slow evolution away from teaching celestial theory and the 50 navigation stars to teaching how to fill out a precomp form, a work sheet that produces azimuth and elevation of a selected navigation star. It was obvious that navigational techniques using Vortacs, Tacans, Loran, Radar and the Inertial Navigation Systems were making celestial navigation less dependent upon the stars and less important as a course of instruction here at the Academy. The work being done on the Global Positioning System (GPS) was viewed as the hand-writing on the wall and the planetarium staff began an active campaign to obtain Digistar.

A Valuable Teaching Asset

The academy planetarium is a room with a 365 square meter screen (larger than the screen at an IMAX theater), it has a superb sound system, more than 90 projection devices, video projection capabilities, computer image projection capabilities, and controlled lighting conditions—infact, everything needed for the ultimate learning environment. All the information coming to the student's senses can be precisely controlled, all extraneous and distracting classroom influences can be eliminated. It is a place where research, training, and teaching can be performed. The challenge of the planetarium staff over the years has been to spread the word that this is a facility that should not be ignored. About nine years ago the staff of the planetarium decided upon a policy to actively seek to increase cadet instruction by the Military Training Faculty and Academic Faculty. This policy was most apparent with the efforts of Major Larry O. Anderson, Major James McBride, Major Thomas Winslow, and Major Daniel Yinger. The USAFA planetarium staff and the Deputy Commandant for Military Instruction required them, as a condition of their training at a major university planetarium, to develop, prepare and produce a specific presentation to support some aspect of airmanship training (we were still part of the 50th Airmanship Training Squadron, SOATS).

In the meantime, our staff, coordinating with Staff Sergeant Hubbard, developed a crude but effective presentation for Survival Evasion Rescue and Escape (SERE). This was a conscious attempt to bring into the planetarium a group which had not used the facility before and design a program using the complete capabilities of the theater. Seeing the potential, the expert SERE staff have since written two improved training units specifically taking advantage of the theater's properties. These SERE programs have improved with each iteration. This is possible because the experts in the subject matter know the material, and can, therefore, plan the training for the entire program. As a result, the experts of SERE and the staff of the planetarium produced a presentation reviewing the use of the compass; map reading; evasion techniques; and direction finding using the stars.

The History department, (DFH) under Colonel Carl W. Ridell, was the first department under the Dean of Faculty (DF) to see the planetarium as a multimedia center. He tasked his staff to develop a major history presentation. Captain Jeffery Griggs and others produced this nationally renowned, audio-visual extravaganza to support their world history curriculum. Their efforts have become a watershed. All future presentations for cadet instruction must consider this presentation as the "model" of cadet multimedia instruction. The history program, "An Overview of World History", was pre-Digistar in that it was designed around the "big insect" in the center of the room. Primarily, the visuals used were 35mm slides—1500 of them are packed into the 40 minute presentation. DFH now has another presentation in development. It can now make use of video, power point, and the 3-D graphics of Digistar.

Inspired Leadership

Digistar was installed in December, 1991. The latest iteration of a SERE presentation was written for Digistar graphics and is also used as a model shown to instructors wanting to use Digistar's 3-D graphics technology for instructional purposes. Shortly after the installation of Digistar the planetarium was transferred to Military Art and Science (CWIS)—an event, in my opinion, of momentous import. Lieutenant Colonel Michael M. Whyte not only shares the same vision as the staff of the CEMM, but has the education, the leadership, the staff of education technologists and instructors eager to make use of their new educational asset. Lieutenant Colonel Whyte's vision is to increase learning opportunities for cadets by use of multimedia experiences, instructional design techniques, careful script writing, and exciting application of these factors in presentations which illuminate course objectives as never before.

A New Thrust Requires a New Name

Digistar means the planetarium is no longer only a place to see the night sky. Digistar can be used to visualize molecules, galaxies, aircraft, or mathematical models in a way never before seen at the Academy. It is now called the Center for Educational Multimedia (CEMM). The division of Military Art and Science has already produced two highly effective airpower case studies designed around the capabilities of the CEMM—Operation Desert Storm and The Battle of Midway. Future presentations, including a Battle of Britain case study, are in development by course directors and staff of CWIS and CEMM.

The History Department and now the Military Art and Science Division are each bringing educators from around the world to see the applications they have made at the CEMM. The CEMM's mission is to make an educational concept more easily comprehensible. Our immediate goal is the quest to provide the highest quality presentations to support cadet instruction. Digistar and the other graphics projection systems give the instructional designers and course directors a third dimension in instructional technology.

The Future

The Center for Educational Multimedia is planning to become a leader in interactive multimedia instructional support. Already several planetaria around the world have begun to use interactive programming. In many of the facilities the audience can be polled to see how a presentation might be guided to some logical conclusion. We want to develop a system here at the Academy which will enable cadets to have input in a presentation as it unfolds. This will allow for the following: 1) A redirection of student attention as required by their input; 2) Allow for cadet/instructor interaction when questions or differences in perception arise; 3) Allow for input in complex war game scenarios played out on the dome of the CEMM; and finally, 4) Allow for individual cadet responses to be saved and scored in informal questioning or more formal quiz or testing situations. These capabilities will further enhance the cadet's educational experience at the CEMM.
Footnotes:

1. Prior to the planning and construction of the Academy Planetarium, very few new planetaria were being built in the US. With the announcement of a planetarium at the Academy having a dome size of 15 meters, the facility and its directors were welcomed into a group known as the Major Planetarium Executives Conference. The other institutions included were the Adler, the Fels, the Hayden, the Morrison and the Morehead Planetariums. Inclusion in this group confirmed the USAFA Planetarium as a major planetarium. Today planetaria are being constructed with domes exceeding 21 meters in diameter.


3. The planetarium has always been under the Commandant of Cadets (CW) and was originally part of the Cadet Wing Instruction Navigation branch (CWIN), (1959 - 1983) then the branch was renamed the 50th Airmanship Training Squadron (1983 - 1992). We were then transferred to the Cadet Wing Instruction in (Military Arts & Science (CWIS) (1992 - 1994). Now with reorganization of the Military Instructional side of the Academy we are part of the 34th Education Squadron (1994 -).


5. A sample of more than 200 scripts on file which have been used in cadet and public performances includes: “The Universe in Motion,” “The History of Aviation,” “First Light: The Hubble Space Telescope,” “An Overview of World History,” “Special Relativity,” “The Dramatic Universe,” and “The Life of Mozart.”

6. Planetarium Attendance Records date 1959 to present.

7. Ibid. As of this writing 3,049,000

8. Ibid.

9. Admiral Kirkpatrick also endowed the Kirkpatrick Planetarium to the City of Oklahoma and has set up generous endowments at each of the Service Academies.

10. The disadvantage of the optical/mechanical planetarium projectors is that they project light through fixed etched metal starplates. These cannot be deformed, which means that all the stars must remain in their fixed positions. Besides, the amount of stellar motion caused by moving around on the surface of the earth could not be measured even by the most accurate instruments. However, the moon is near enough to the earth to be affected by our motion. The change in position of the moon as we move from Colorado Springs to another Air Force base would be measurable but the mechanics of the planetarium were unable to produce this slight shift.

The difficulty with precession is not so much the fact that the celestial coordinates appear to change because the planetarium could accurately portray that motion. The problem is that over such a long period of time as 15 thousand years the individual stars shift position. Those etched metal star plates through which the light shines do not allow individual stars to move. Digitar, the current projection system, can be programmed to do all of these.

11. The original planetarium was a Spitz Model B. Only three were produced. The Air Force Academy, Flint, Michigan and Montevideo, Uruguay were only sites to have this model. The model B projector was unique in that it was suspended from the dome. That unique feature allowed cadets to use sextants in the center of the theater as part of their navigation training. The model B was sold to Flint, Michigan for parts. It was replaced in 1976 with a Minolta Model IV. The Minolta was eventually replaced in 1991 and is now in Midland, Texas at the Museum of the Southwest's Marian Blakemore Planetarium.

12. The last course of Celestial Navigation was offered by the 50 Airmanship Training Squadron in the Spring of 1994. The equivalent course now relies upon the use, theory of operation, and application of the Global Positioning Satellite system.

The planetarium theater now has forward facing seats in a modified chevron pattern. This facilitates briefings by instructors or guest lecturers. The walled pit in the center houses Digitar and many other special effects.
Armand Spitz—Seller of Stars

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I never expected to make any substantial contribution to astronomy or science, but what greater satisfaction can I have than to have one very famous astronomer tell me that he gained his first interest in astronomy through viewing a Spitz planetarium when he was a small boy. I can only hope that in whatever celestial book-keeping there is I will be given indirect credit for helping along the knowledge of the heavens.

Armand Neustadter Spitz was born in Philadelphia, Pennsylvania, on July 7, 1904. His father Louis was a physician and his mother Rose (nee Neustadter) a homemaker. Among the various biographical sources on Armand, only one refers to a brother named Louis who became a physician in West Philadelphia like his father. Armand Spitz had green-gray eyes and dark hair which thinned and grayed prematurely.

Armand attended public schools, graduating from West Philadelphia High School in 1922. He entered the University of Pennsylvania immediately after graduation and spent two years there. Transferring to the University of Cincinnati, Armand attended classes from September of 1924 through April of 1926, when he left without receiving a degree. He then returned to Pennsylvania to work as a journalist.

In Philadelphia, Armand first worked as a district reporter for the Camden Courier. He enjoyed gathering news and later recounted, “I acquired a sneaking desire to have a newspaper of my own.” By 1928, Armand closed in on that goal by joining the Haverford Township News, based in Brookline, Pennsylvania as editor. Within three months, Spitz had saved enough money to purchase the News, found the Spitz Publishing Company, and achieve his goal. In the Township News, Spitz concentrated on community activities, with occasional features on special events in Philadelphia, including notes on the Franklin Institute. Beyond work on his own paper, Armand continued serving as a correspondent for the Philadelphia Bulletin into the mid 1930s.

Bolstered by his work as editor, publisher, and owner of the Township News, Spitz participated actively in his community into the Great Depression. He served as president of the Haverford Township Free Library and founded the Haverford Township Chamber of Commerce. These activities made Armand well known in the township, but not necessarily popular. In the elections of 1932, Armand endorsed several candidates from the “wrong” (losing) party. Some residents disagreed with him so strongly they burned him in effigy.

During the Depression, Spitz and the Township News suffered. Supporting banks and advertisers found themselves unable to pay for their space. Although he accepted scrip as payment and bartered goods for various companies’ advertising space in the paper, Armand could not provide enough financial support to sustain the newspaper so both he and the Township News were forced into bankruptcy in 1932.

Without money or a job, Armand voyaged to France intending to work as a correspondent or writer. Unable to pay for the trip, Spitz took a dishwashing job on a freighter. According to an interview from 1957, this voyage generated Armand’s first deep interest in observational astronomy. A ship’s officer who befriended Armand taught him celestial navigation. To reckon positions, Armand built a sextant out of a water-filled dish pan, a board, and a toothpick. With this apparatus, Spitz launched his lifelong fascination with simplified astronomical instruments that culminated in the Model A portable planetarium. Unsuccessful in starting a career while in Paris, Spitz soon returned to Pennsylvania to resume work as a journalist.

Upon his return, Spitz renewed his acquaintance with and began dating Vera Golden, whom he knew from the Township News. She was one of six children of Mrs. Gertrude Golden, a District Superintendent of the Philadelphia Board of Education and eventual chair of its public relations department. According to a 1954 interview, one night during their courtship, Vera asked Armand to name a particularly bright star. Not knowing the answer, he pored over...
Armand Spitz, TV pioneer and Philadelphia's first TV weatherman.

astronomy books and memorized star names to impress her on future dates. After a brief courtship, they married.

Besides her work with the newspaper, Vera served on the Haverford Township Planning Commission and with the local historical society. Together, the Spitzes had two children—a daughter, Verne Carlin born in 1935 and a son, Armand Lawrence (Larry) born in 1939. Unfortunately, the marriage between Armand and Vera was not happy and they divorced late in 1957, following a publicized suit. Vera died without having remarried at her sister's home in Havertown, Pennsylvania on 21 April 1962.

Astronomy Beckons Armand

Armand Spitz began his path to the stars with an eight year association with Haverford College located in Haverford, Pennsylvania, from 1935. There, he worked as an assistant astronomer and astronomy lecturer, but he never achieved faculty status since he lacked a college degree. Spitz later remarked on the limits of his formal astronomical education:

_I am not a mathematical astronomer. I don't get along with mathematical equations. I am not very much of a scientist. You can call me an interpreter of science if you want to._

Nevertheless, Spitz used the college's ten-inch refractor to study double stars and gave frequent public lectures. James Greene, emeritus professor of astronomy at Haverford, through telephone interview recalls Armand Spitz as an active educator who was constantly trying to spread his passion for astronomy to the public within this highly appropriate setting.

During 1935, Spitz constructed a four-foot tall papier-mache Moon which he then brought to classrooms, auditoriums, and museums to show audiences how our satellite appeared through an average telescope. These lectures spread Spitz's fame nationally and drew large audiences. Illuminated by spotlights, this large hemisphere showed detailed craters, rilles, and maria. Since it only cost $15 to build, this model was widely copied but, as Vera recalled, gluing it together (which Armand did in the kitchen), "made the house smell like a fishery for weeks." Despite such meager origins, the Moon eventually became a permanent display at the Philadelphia Academy of Natural Sciences.

The Spitz home, a two-century-old house in Landsdowne, Pennsylvania, staged several other of Armand's astronomical projects. In the yard, Armand built an equatorial-pier reflecting telescope. When repainting the living room, Spitz covered the ceiling with "an elaborate representation of the planets revolving among the signs of the zodiac." On some walls he painted detailed astronomical instruments including a replica of Tycho Brahe's mural quadrant. After Spitz moved away, these designs were mistakenly classified as early examples of Oriental art in America. Perhaps the most significant pieces of astronomical machinery to come from this home, however, was the Soft Soap origi-
nal and several subsequent prototypes of the Model A planetarium.

**Franklin Institute**

In 1935, Armand Spitz brought his new passion for astronomy to the Franklin Institute, where he tried to volunteer writing publicity. The Institute did not call on him until 1936, when Armand was asked to do three weeks' publicity for special shows as a public relations officer. He proved so suited to this position that he remained on the Institute's staff for nearly twenty years. Spitz eventually resigned to work on his planetarium full-time, but maintained ties with the Institute and Fels Planetarium until 1955.

During his time at the Franklin Institute, Spitz filled a variety of positions ranging from editor of the *Institute News* (1936-1943), founder and director of the Department of Meteorology (1940-1947), Assistant Director of Public Relations (1941-1943), Director of Education (1941-1953), and lecturer in the Fels Planetarium (1942-1955).

Throughout his work at the Franklin Institute, Spitz fostered his interest in astronomy, always seeking to lecture at the Fels Planetarium. Originally denied him for his lack of formal education, Armand's efforts paid off and he eventually delivered nearly one thousand lectures at the Fels by 1955. Topics gleaned from copies of the *Journal of the Franklin Institute* include many designed for school children as well as a holiday programs like "The Christmas Star" and "Easter's Moon."

As an important part of his work at the Franklin Institute, Spitz designed and participated in several broadcast media shows. Appearing over a decade, they ranged from a basic science radio show to an early interactive television program. Some reached only Philadelphia while one of the radio programs and a later television show gained national exposure and popularity.

Beginning in 1935, the radio show "My Stars" represented Spitz's first foray in broadcast journalism. Spitz wrote and starred in this show which told listeners "what's up tonight." Although popular, this program ended with World War II airwaves restrictions.

In the fall of 1944, the Franklin Institute launched "Science Is Fun" after a suggestion by Mrs. Gertrude Golden. Broadcast on radio station WFIL from the Franklin Institute Mondays at 2:15 P.M., it highlighted scientific events, noted anniversaries, and ongoing activities of the Franklin Institute and Fels Planetarium. Spitz contributed regularly; advertising planetarium shows, talking basic astronomy, and explaining sciences like meteorology. Widely acclaimed, the series became part of the public school curriculum in grades three to six. Spitz developed a educators's guide to the series and integrated student and teacher suggestions into newer shows.

Spitz began another program after World War II aimed at high school students. "Great Moments in Science" ran on radio station WIP from Philadelphia Tuesdays at 1:45 P.M. These featured Dr. Roy K. Marshall of the Fels Planetarium, as well as Uncle WIP, and used a format similar to the later television show "Mr. Wizard."

Armand Spitz and the Franklin Institute broke into educational television soon after its introduction. Calling television the "educational medium of the future," Spitz was proud that "Of Shoes and Ships" premiered in 1941 as the nation's first science education show. Curtailed by World War II, the show nevertheless continued until 1946.

A final, but extremely significant accomplishment which Spitz initiated during his service with the Franklin Institute began in 1950. That year, Spitz coordinated and conducted the first National Science Fair in cooperation with the National Science Service. Held at the Franklin Institute, this event featured the best science projects from high school students across the country. Even though he is rarely mentioned in association with the program, this annual gathering provides Spitz's most enduring contribution to American popular science outside of the planetarium community. As he did with so many other activities, Spitz used the National Science Fair to show school children the possibility of combining education and fun through science.

**Armand the Author**

As an outgrowth of his lectures at the Fels Planetarium, Spitz started writing a simplified basic astronomy text designed to teach the most prominent stars and constellations. He wanted this book to be as readable as possible, recalling the difficulty he had experienced while learning the stars. Therefore, he designed it to be comprehended by and appeal to the school-age children who most frequented the Fels Planetarium shows.

In 1940, Spitz convinced Henry Holt and Company to publish his book *The Pinpoint Planetarium*, which he divided into two sections. In the first half, Spitz related basic astronomical facts such as how apparent motions influence stars' visibility and retold some of the mythical stories related to star lore. A series of printed "star domes" comprised the second half of the book. By pricking holes in the printed star patterns, bending the domes into a bowl shape, and holding the proper one in front of a light, those stars and constellations which were visible that night appeared. Since the pages were cut out by many readers to make these domes, intact copies of this book are scarce.

Spitz was raised in the Quaker faith and, as an adult, often lectured at the Newtown Square Friends Meeting of which he was a member. For this group, Spitz penned a pamphlet in 1941 on "The Meaning of the Quaker Meeting" which remained in use through his

Grace Spitz with the original "soap can" prototype.
death in 1971. Spitz did not abandon popular literature during his involvement with the Newtown Friends Meeting, however.

While developing and installing a series of exhibits on meteorology for school children at the Franklin Institute, Spitz decided the public wanted better explanations of how and why weather worked as it did. Mixing this realization with his drive to spread a love of science, he wrote a book to explain the weather. Enlisting the aid of Mrs. Harry Thomas Jordan, Spitz published his second book in 1943. *A Start in Meteorology—An Introduction to the Science of the Weather* was intended for laymen without extensive knowledge of mathematics or physics.

According to a contemporary review of the book, "it provides a clear account of why the weather is what it is, and will enable the careful and observant reader to make predictions of his own." In accord with his personal interest in meteorology, Spitz drew all of the illustrations and wrote the post-chapter questions throughout this volume.

True to his drive to popularize science, Spitz included a gimmick with this book. Built into the cover was a piece of chemically treated paper which changed color according to humidity. Because of this, the book itself was a weather instrument—a perfect example of Spitz's belief that science could be entertaining, easy, and accurate. *A Start in Meteorology* also coordinated nicely with Spitz's work during World War II as a lecturer on meteorology and celestial navigation at the Air-Mar Navigation school in Philadelphia. The popularity of the book and Spitz's exhibits at the Franklin Institute soon led him to set up a Department of Meteorology there, of which he became the director.

Following World War II, Spitz took on several different independent projects. He went to Puerto Rico as an educational consultant for the United States Department of Education, advising on revisions to science education. Spitz co-founded Science Associates in Princeton, New Jersey to produce amateur astronomical and meteorological equipment and, also in the year 1946, started the Amateur Weathermen of America. In 1947, he became president of the Rittenhouse Astronomical Society in Philadelphia and the next year, began a four-year term as President of the Philadelphia Science Council. Around this time Spitz also joined the American Astronomical Society.

**Origins of the Model A**

According to his long-time associate Nigel O'C. Wolff, Armand Spitz held two key opinions throughout his life: "He believed the planetarium was 'the greatest teaching instrument ever invented,' and he felt it a shame a planetarium could be enjoyed only where some philanthropist donated a huge sum to purchase and house a Zeiss instrument.” These twin motives inspired Spitz to begin working on his planetarium as a commercial venture toward the end of 1945. With a target price of $500, Spitz began developing his miniature star sphere. After perfecting this portable planetarium, Armand Spitz spent the next decade consumed with producing and pitching it to amateurs around the country who were interested in the stars.

The history of the Model A planetarium stretches back to the late 1930s, when Armand decided he should be able to give star shows in his home to entertain his young daughter Verne. At the Fels Planetarium, Armand had seen the awe children, and adults, had for the planetarium sky and its stories. Unfortunately, only those fortunate enough to live near major U.S. cities like Philadelphia, New York, and Chicago could enjoy these sky shows. To make this wondrous experience more widely available, Spitz resolved to try and develop a smaller, cheaper planetarium.

The Franklin Institute only offered a moderate salary, but Spitz eventually convinced several friends to help him finance his dream. When Spitz began demonstrations with a hand-made prototype planetarium in 1946, he soon realized that if he hoped to mass produce the instrument he needed an easier shape into which to drill star holes.
Custom tooling to cut pinpoint holes in a sphere was just too expensive and hand-piercing each unit required too much time and effort.

Working through each of the regular solids, Spitz initially chose a regular icosahedron to form his planetarium’s star “ball”. This twenty-sided figure gave many flat surfaces into which star drilling would be easy. A space of intensive work followed as Spitz plotted stars off of his celestial atlases onto the planetarium’s plates. Unfortunately, when he assembled this model, the acute angles required to form this shape were neither easy to cut nor did they produce a three-dimensional shape nearly as spherical as Spitz had intended. He needed a better design. Through his work at the Franklin Institute and recent affiliation with Science Associates in Princeton, Spitz had become acquainted with Albert Einstein. One day, Spitz mentioned his efforts on the planetarium and difficulties with the icosahedron. Einstein suggested the process would be much simpler if Spitz used a dodecahedron to approximate a sphere of stars. This idea proved quite workable and, after another four months of work laying out the new star maps onto plastic dodecahedral plates, Spitz had solved his problem of mass-producing the star panels.

Although the flat pentagons of a dodecahedron made stacking and drilling them easier, it distorted the plotting of stars on the planetarium. Consequently, the early dodecahedral prototypes (which Spitz drilled out by hand at his home and a friend’s garage workshop) needed constant tweaking. Thus, Spitz used a stack of small needles and drill bits to enlarge or make new star holes in the plastic panels. A simple black china marker served to reduce and correct any imperfect or misplaced holes. Such last-minute adjustments preceded most of the trial sales demonstrations of the early Spitz travelling prototype planetarium.

One adjustment session immediately preceded the first official presentation of the Model A made in 1947 at the Harvard Observatory. This combined meeting of the American Association of Variable Star Observers (AAVSO) and the Bond Astronomical Society gave Spitz his first chance to have the Model A critiqued by professional astronomers, so each star had to be perfect. From a ladder moved into the Harvard observatory’s dome, Spitz and Wolff gave a lecture which showed off the possibilities of the Spitz planetarium to the assembled astronomers and guests. The demonstration was a great success, as were several others Spitz made on this trip. When he returned to his home-office in Pennsylvania, Spitz had received orders from across the country.

This success by no means marked the end to Armand’s roving demonstrations, however. Spitz also demonstrated his first commercially built Model A planetarium to military officials at the Pentagon. On the trip, the odd-shaped device was mistaken by one passerby as an atomic bomb. This trip led each of the military training academies to order Spitz planetaria to be used in their astronomical orientation and navigation classes. The first commercial Model A which Spitz had used in his Washington demonstration was placed into service immediately afterwards at Eastern Mennonite College in Harrisonburg, Virginia.

Planetarium Pitchman

With a commercial version built, Spitz began showing off his unit to as many people as possible, often hand carrying his demonstrator model by air, rail, and road to the lectures. Often, as with an American Airlines flight in 1948, he would give impromptu demonstrations to interested passengers if a suitably dark area could be found. Publicity in Sky and Telescope following the Harvard debut demonstration drew rapid national interest for the Model A planetarium. When the first full-page advertisement appeared in the October, 1947 issue, the Spitz Model A was offered at $500 plus freight from Science Associates of Philadelphia. Orders came in for the Model A from schools...

...announcing the

SPITZ PLANETARIUM

for

Schools, Libraries, Museums, Clubs or for the Home

Watch the stars rolling across the sky in classroom, church, living room or bedroom. Set the planets for any date... See the motions of the heavens as viewed from home, North Pole, Equator or Southern Hemisphere.

$500 Planetarium will be shipped within two weeks of receipt of order.

The Spitz Planetarium and other astronomical teaching aids are sold by

SCIENCE ASSOCIATES
401 North Broad Street Philadelphia 8, Pa.
Telephone - Market 7-1372

Original ad for the Spitz Model A: a universe of stars for $500.
and universities throughout the United States as well as internationally. Of the overseas customers, some were educational centers but they also included foreign dignitaries like King Farouk of Egypt.

During the first years of the Model A's production, many sales and most product development occurred in the Spitz home. The massive nature of this project forced Thanksgiving dinners to be buffets since "the dining-room table and almost every other surface in the house was piled high with models, tools, books, correspondence, and parts of several planetariums." Such spartan manufacturing arrangements came out of necessity. Spitz operated his company in these early years from the money he and five friends had pooled. Until museums and schools had been convinced his inexpensive instrument could produce adequate star images, no major partners would back him.

Despite this shoestring environment, in 1949 Spitz Laboratories moved into an abandoned vacuum and carpet cleaner store, then to an old movie theater on Woodland Avenue in southwestern Philadelphia. This building became the factory and production center for the next five years. Here, the Model A, its derivative the A-I, and the Model B, were designed and tested under special domes. The first major design change in Spitz planetaria also occurred here, as the dodecahedron star panels went from plastic to metal.

Spitz Laboratories moved to Elkton, Maryland in 1953, when General Development was called in for financial aid. Early Model A-I planetaria built at this plant included the first bright star/deep sky lens elements inserted into the dodecahedron. When demand for Spitz planetaria required even larger facility, Spitz Laboratories relocated again to Yorklyn, Delaware in 1955. This plant produced the bulk of Model A-1 units and all the Model A-2 planetaria. A final relocation came with a 1969 move to a custom factory in Chadd's Ford, Pennsylvania instigated by the new owner McGraw Hill.

Armand Spitz was called by one associate "a man with an endless stream of ideas." Almost anyone who knew him would confirm the majority of those ideas focused on popularizing astronomy. Although he had done this with his model Moon in the 1930s and his two books in the early 1940s, Spitz's undeniable influence in popular astronomy came through his selling of the Model A.

Armand Spitz took promotion of his planetarium to extremes and heavily publicized unusual installations of his planetaria. As previously noted, one Spitz Model A—the "Little Planetarium" of Boston—was the world's first travelling planetarium. Its director Charles Federer became a life-long friend to Armand and used his position at Sky and...
Armand Spitz and his travelling planetarium in Yearon, Pennsylvania.

Telescope to promote Spitz planetaria with articles such as “Trail Blazing with Spitz Planetariums” which essentially constituted feature-length advertisements.

The notion of a travelling Spitz planetarium was later picked up by St John Terrell with his “Astrotarium.” Using an inflatable planetarium dome and a Spitz Model A-I projector, he departed Wichita, Kansas in 1958, then drove across the Midwest where he set up the planetarium for shows in shopping center parking lots. Coverage of these rolling Spitz star shows included a short photo essay in the New York Times Magazine Sunday supplement.

Other unusual Spitz locations abounded. One was the “unusual planetarium installation,” cited in Popular Astronomy, erected within the Ozark Mountains as a tourist attraction. According to the wishes of Frank C. Thomas, a large cave on the outskirts of Fayetteville, Arkansas housed this Spitz Model A-1 star theater. Certainly, such positive coverage of extraordinary Spitz installations in widely read astronomical and general publications augmented interest in Spitz planetaria.

In a slightly different vein, Herbert N. Williams, convinced of the Model A’s effectiveness during a 1948 demonstration at the Franklin Institute, was hired by Armand in 1952 as a travelling planetarium salesman. With a Spitz Model A and a special collapsible fourteen-foot canvas and aluminum dome in his station wagon, Williams travelled some 40,000 miles over the next two years generating sales for Spitz planetaria.

When the Spitz product line expanded beyond the size of his station wagon, Williams altered his methods but not his enthusiasm for Spitz planetaria.

Armand Spitz himself devised several inventive methods for spreading his Model A planetaria. Perhaps the most enduring was the idea of selling stars to finance the purchase and installation of a Spitz planetarium. By organizing efforts to sell “Astronomical Quitclaim Deeds,” Spitz doled out “parcels of the universe ... that shall remain tax-free until such time as there is habitation of Space beyond the Planet Earth by earthly beings” in proportion to the amount contributed by an individual or organization. Donations of $1 bought common stars, fees from $100 to $250 bought the planets, and $500 each purchased rights to the Sun and Moon. This scheme financed many installations of Spitz planetaria across the country, including those at the Boston Museum of Science (the “Little Planetarium”) and at Roger Williams Park in Providence, Rhode Island.

The furious years of development and relentless salesmanship which Armand put into his Model A made Spitz Laboratories and its planetaria highly profitable by the end of its first decade of existence. Much of the early success stemmed directly from Spitz. Armand’s enthusiasm for popularizing
astronomy was not, however, limited to overseeing full-time production of his planetarium instruments. On the contrary, Armand participated in many other notable projects related to astronomy and science education throughout the Space-Race oriented decade which began in the late 1950s.

**Other Astronomical Activities**

When Sputnik orbited in October of 1957, the Harvard-Smithsonian Astrophysical Laboratory and Observatory asked Armand Spitz to help coordinate its three-year old satellite prediction and tracking program. Spitz took charge of the operation and soon had 5,000 volunteer observers spread across the United States and into other countries. At various times this group operated as "Spitz's Sputnik Spotters," "Project Moonwatch," and "Project See-Saw." Spitz coordinated observations wired in from remote spotters, ordering new watch schedules and passing results on to the government. To tie in this work with his then highly successful Model A-1 planetarium, Spitz developed an auxiliary Artificial Satellite Projector that sold for $50.

Although he often worked from 5 A.M. to 11 P.M. in his office, Armand also travelled the country recruiting observers and speaking about the potential of satellites. In a 1958 speech to the Baltimore Astronomical Society he remarked, "[I]t would be surprising if man reached the Moon during my lifetime." He added, however, "If it were essential for man to reach the Moon, it could be done, although the cost would be fantastic." By the time Spitz died in 1971, six American astronauts had set foot on the Moon and Armand had seen the launch of a Saturn I-B rocket. Spitz headed this highly successful program until 1962, when it was absorbed into the NASA extended tracking network.

Aside from his work as the nation's chief satellite spotter, Spitz found the 1950s an extremely busy decade. Spitz started five years' service as a consultant for the National Science Foundation on educational matters in 1956. The next year, he began eight years of service on the governing committee of the American Association for the Advancement of Science. He had become a fellow of this body back in 1942 and served as a representative of the group's astronomical division between 1943 and 1957. In 1956, Otterbein College of Westerville, Ohio awarded Armand Spitz an honorary Doctorate of Science. This degree was conferred to recognize his "philosophical work in education and science." It was particularly significative to the Spitz family as a recognition of the "philosophical work in education and science." It was particularly significative to the Spitz family as a recognition of the work Armand had done on behalf of his country.

Spitz's rulings on the Moon's potential were based on an understanding of the Moon's orbit. In 1955, Spitz modified his model of the Moon's orbit by adding a fourth axis of rotation and unidirectional motion to it. The Moon's orbit is elliptical, and it takes about 27.3 days to complete one orbit. Spitz's modification of the Moon's orbit was based on the fact that the Moon's orbit is not perfectly circular, but rather elliptical. This elliptical orbit is due to the gravitational pull of the Sun, which causes the Moon to be pulled out of its original orbit. Spitz's modification of the Moon's orbit was designed to take into account the gravitational pull of the Sun and to predict the Moon's position more accurately.

Following his divorce from Vera in 1957, Armand was seen regularly at meetings of the Astronomical League and the National Capital Astronomers with Grace C. Scholz. Grace was born in New York City in 1912, graduated from Hunter College with her A.B. in 1933, and completed graduate work at Columbia and the American University from 1936 to 1940. Although Grace worked with various U.S. government departments as a medical statistician for many years, she harbored an enthusiasm for astronomy that rivaled Armand's.

Grace's astronomical interests had propelled her into five years of service as executive secretary and two as president of the Astronomical League by 1957 plus a year as president and four as trustee of the National Capital Astronomers. During her presidency of the Astronomical League, Grace began working with Armand to coordinate Project Moonwatch stations. Eventually, their relationship blossomed and they were married on 27 September 1958.

After their marriage, Grace and Armand travelled widely to astronomical events promoting their mutual love for the stars by speaking at amateur gatherings and helping raise funds for planetaria. The two also headed several eclipse expeditions in this country and overseas. Following Armand's death in 1971, Grace continued promoting his ideas and planetaria for a few years before retiring to their home in Fairfax, Virginia where she still lives.

Armand also conducted several editing and writing projects in the 1950s. They included *American Weatherman*, a popular magazine begun in 1949; *Weatherwise*, a magazine started in 1950 for the American Meteorological Society; *The Pointer*, a journal of planetarium education begun in 1952; and the *Dictionary of Astronomy and Astronautics*, a reference book issued in 1959 that consolidated information "previously available only to diligent searchers."

In 1958, Spitz revived the *Monthly Evening Sky Map* after the death of its founding editor, a friend who had employed him as an editor from 1937 to 1940. Spitz modified this magazine, turning it into the *Review of Popular Astronomy* and sustaining it as a bimonthly publication until 1969. In June of 1959, the *Griffith Observer* carried a feature article by Spitz on the educational and entertainment obligations of planetaria which defined planetarium directorship thereafter.

**Spitz's Sixties**

The 1960s saw Spitz continuing his work as head of Spitz Laboratories but otherwise working as a consultant and lecturer across the country. From 1961 to 1963, he lectured to various teacher's groups on science education in New York City. In 1962, he helped set up a science center in Hawaii, even serving there as interim planetarium director. Also in 1962, Spitz purchased Astro Murals, a Philadelphia company that distributed copies of astronomical photographs taken by the world's largest observatories. He operated this company, largely from his home, until his death.

In 1963, Spitz wrote the script "Radio Astronomy: New Window to the Universe" for the West Virginia Pavilion at the New York World's Fair. Spitz gained a seat on the Board of Science Education of Washington, D.C. in 1964; the same year he joined the board of directors of Edmund Scientific, a distributor of educational science materials, located in New Jersey. While performing these duties, Spitz also wrote numerous magazine articles on a wide range of subjects. He summed up early Ranger mission photos of the Moon, presented a philosophical essay on the meaning of planetaria, and continued popular writing on historical events in astronomy.

The last major project in which Armand was involved concerned funding and building the first Spitz Space Transit Planetarium (STP) which opened in Miami, Florida in 1966. This revolutionary design introduced fourth axis of rotation and unidirectional seating to planetaria. Active in promoting the project, Armand Spitz was not healthy enough to speak at the dedication of this facility. He did visit it during construction, however, and attended the first Saturn 1-B launch at Cape Kennedy on his return trip to Virginia.

Armand Spitz retired as head of his Laboratories in 1969 when McGraw Hill purchased and moved the facility from Yorklyn, Delaware to Chadds Ford, Pennsylvania, where it remains today. Armand Spitz died of complications from a heart attack on 14 April 1971, in Fairfax Hospital, near his home also in Fairfax, Virginia. Prior to this attack, he had suffered mild strokes over a period of roughly five years, and his health had been declining each time. Despite his degraded condition, Armand taped a final message to the planetarium community which was played at an annual gathering in 1971. Certainly, no words are better than his own to summarize Spitz's life-long contributions to planetaria:

> The fact remains that into a sea of relative placidity, I was privileged to drop the proverbial pebble and the ripples have been moving outward ever since.
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All photographs are courtesy Spitz, Inc., Chadds Ford, Pennsylvania.
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Based on its experience as automation specialist, RS Automation offers an innovating planetarium concept: the SN 88®II. The ease with which the most advanced functions are used will allow you to show existing productions or create your own with minimum difficulty. Amongst other advantages, you shall appreciate in particular:

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RS Automation manufactures planetariums from 9 to 15 meters diameter, horizontal or inclined, and will, following your request, undertake overall implementation of a complete planetarium (including a spherical screen, floor and wall covering, seats, electricity, air conditioning...). Specific developments are also possible, such as planetary device elevating systems associated to a trap-door mechanism allowing use of the room for other purposes.

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"Opening the Dome" addresses strategies and logistics for conducting active, aggressive real sky observation programs as adjuncts to planetarium shows.

Like many of The Planetarian's columnists, I saw last year’s Cocoa conference as an opportunity to talk to a large number of IPS members about what was going on at their facilities. Clever person that I am, I came prepared with a questionnaire that I thought might get a few of you to open up about some of your early experiences in this business. Unfortunately, I didn't reach everyone, so with that in mind, a copy of that survey immediately follows this article. Please send it in to me, and I'll try to use your comments in upcoming columns.

In looking over the questionnaires, I found some common experiences among us:

Four of us related that at least one visitor asked us where we stuck the slide into the telescope to create the image of whatever it was they were looking at;

Probably most of us have had people want to look through telescopes while it was raining;

At least two of us have been presented with the lucky coincidence of conducting a star party and talking about meteors just as a star party was happening; so with that, I found some common experiences among us:

Our wish for an ideal telescope ranged from a 8-20" refractor, to 16-24" reflector, all the way up to a 24-36" Cassegrain.

Our favorite planet to interpret: five votes for Jupiter; six votes for Saturn; five votes for Venus; five votes for Mars; and four votes for earth.

Our favorite deep-sky object: one vote for M1, the Crab Nebula; two votes for M13, and two votes for globular star clusters in general; seven votes for M31, the Andromeda Galaxy; nine votes for M42, the Great Orion Nebula; three votes for M45, the Pleiades; three votes for M57, the Ring Nebula; one vote for M81 (on account of last year's supernova in that galaxy); and one vote for the double star cluster in Perseus (NGC 869 & NGC 884).

Meanwhile, here are some anecdotal samplings from the survey respondents.

Steve Mitch, Benedum Natural Science Theater, recalls his first experience with the sky came when his father took him and his brother out to see a northern lights display. "That night was also the first time that I had seen the Milky Way. The aurora was weak, but I can still remember the faint greenish color."

Steve's first planetarium visit was to the Buhl in Pittsburgh, not far from where he now works in Wheeling. It was in the 6th grade: "My strongest memories of that visit was how impressed I was with the stars and how bored I was with the presenter. At the time, I had no idea what all the lines were that were projected onto the dome. I recall absolutely no other visuals."

Steve adds, "That visit did not influence my career."

Cyndi Zeger of Woodson Planetarium in Salisbury, North Carolina, reports that her first planetarium experience came only a few years ago, in 1986. Her favorite visitor was a young girl, about 9 or 10 years old, who had come for a planetarium camp-in. "It looks so close ... like I could touch it. I'm going to tell my dad I'm spending the night here every weekend!"

Alan Bowden, Director of the Liverpool Planetarium in the United Kingdom, reports on a personal disaster when he was 16, that literally opened his eyes to the skies. He was mixing chemicals, when, "there was a sudden explosion and the mixture covered my face. At the time I didn't know whether I was blinded and I spent several days lying in a hospital bed with my face completely covered with bandages. After a few days I got curious as to whether I would be able to see again, and early one morning I carefully lifted the bandages whilst the night nurse was required elsewhere. My bed was directly opposite a large window and there, shining brightly in the early dawn light, was Jupiter—a magnificent sight above the pine trees. You can imagine my relief at realising that I was not blinded, and how welcome a sight Jupiter was. Ever since then Jupiter has had a special place in my astronomy memories."

Carrie Meyers, Director of the Andrus Planetarium in Yonkers, New York, reports on her worst star party experience: "I recently tried to give a star talk on a windy beach with a microphone and parents with three-year-olds. It was after nine, and people were spread out over the beach. I asked them to look in the direction in which the sun set and people were looking all over the place. They trickled out toward the end."

Paul Trembley, of the John Young Planetarium in Orlando, Florida, reports his best story about operating a telescope when a lady "wanted to know if my BIG telescope could look through the clouds." He also adds that Saturn is a favorite of his for interpretation, especially the rings, "like grooves on a phonograph record, for those who still know what a phonograph record is." (Hey, Paul, I remember playing records that were shaped like cylinders. 'Course, I also remember a time when you could swim across the Atlantic River...)

Alan Gould, Holt Planetarium at the Lawrence Hall of Science in Berkeley, California, first visited a planetarium, Denver's Gates, while on a field trip in the fifth grade. "Then my parents bought me a used 4.25 inch reflector with a German equatorial mount." He reports the planetarium visit wasn’t a deciding factor in his career, but that "the strongest memory was simply the beauty of the simulated sky along with nice music." Alan also reports on a terrific technique once demonstrated to him at a star.
party: “a visiting amateur shot off his camera flash into the eyepiece end of the telescope to show a bright beam to indicate where in the sky the telescope was pointed.”

Jeanne Bishop of Westlake Schools Planetarium in Ohio, reports her earliest recollection of the sky when “my father taught me the ‘bear shape’ when I was about five. I had trouble seeing the figure but I kept trying; and after a few months it “popped” out for me. This experience has helped me appreciate others’ difficulty.” Like Steve Mitch and Dennis Webster, Jeanne’s first large planetarium visit was also to the Buhl, although before that, she had the benefit of the small planetarium her father, Richard Emmons, built and operated for Canton-Kent State University.

Jeanne’s most unusual visitor was a man who, after looking through her telescope, described, in great detail, his view of Saturn. “After he moved away, I discovered the lens cap was [still] on [the telescope].” (Maybe someone took the slide out after he left...)

Peter Smolders of Artis Planetarium in Amsterdam, was profoundly influenced as a teenager, while visiting the Zeiss Planetarium (“the second Zeiss”) in the Hague. “It was just the Zeiss projector, but the director, Dr. J.J. Raimond, Jr., told the story so well! The next year I started writing [about astronomy] in the youth page of a local newspaper.”

Suzanne Chippindale, Hayden Planetarium in New York, grew up in a small, dirt-road, poorly lit mining town in the northern mountains of Mexico. “I can’t remember not being aware of the beauty and mystery of the night sky. My most vivid memory, however, was the passage of Comet Ikeya-Seki. My father got my brother and me up at what seemed the wee hours of the morning, to walk down the alley to the road that ran along an arroyo, to see this long ghostly image stretch across the sky. When I got back in bed, I had nightmares of a “one-eyed, one horned flying purple people eater” type-monster.” (Hey, I remember that song, too!)

Michael Sandras, Curator of the Freeport McMoRan Daily Living Science Center’s Planetarium and Observatory in Kenner, Louisiana, reports on great public response to the Shoemaker-Levy 9 impacts on Jupiter: “It was quite interesting to note here that the views being broadcast by CNN and local networks were much better than the views we could provide. We were told by a large number of our patrons that seeing it on television was just not the same as seeing the event for themselves I think this brings up one of the strongest arguments for using the observatory or a telescope in conjunction with a planetarium. You see, no matter how realistic or impressive a planetarium presents an astronomical event, it still does not capture the imagination of most people the way the actual event does.”

Some of Michael’s more interesting questions from the public: “When will Jupiter blow up?”; “Can we see the Earth through the telescope? I replied no because it’s not the right time of the year (unfortunately, that person didn’t see the humor here and just said, ‘OK?’); “and my favorite is when someone asked me if they should bring in pets and tender vegetation because of the Perseid meteor shower.”

Lorna Waddell-Kremer, University of New Mexico in Albuquerque, recalls seeing the stars in the sky over New York City, of all places. “Somehow, they faded from the overhead sky. But I continued to enjoy them at the Hayden. Lorna reports her greatest sky interpretation challenge was “living in Rochester, New York, where the most predictable sky groups are Cumulus Major and Serious Overcast.”

Mike Ryan of Lake County Schools Planetarium in Florida, also visited the Hayden at an early age. “I bought a postcard of the Zeiss projector which I studied for weeks (to this day I remember the inscription on that card describing the instrument ‘an intricate, multiple, stereopticon, optical projector.’)

Did this visit lead me to a career in astronomy? Heck, no. I taught physics for twelve years with a heavy emphasis on optics (the ‘intricate, multiple, stereopticon’ stuff.) Only after an NSF summer institute in astronomy did I decide what I wanted to do the rest of my life”

Another Floridian, Dave Menke of the Buehler Planetarium in Davie, saw the stars when he was eight years old, from his back yard near St. Louis, Missouri. That was when he decided to become an astronaut. Like a couple of other people surveyed, Dave tells me that some of his best public skywatching stories are “not appropriate for public review”. (Someday I must set about cataloging some of these ‘forbidden’ anecdotes...)

When Dennis Webster, Clearfield Planetarium in Pennsylvania, was very young, the rising full moon, very red in color, alarmed him: “I was sure it was Mars about to crash into the Earth!”

Noreen Grice, Charles Hayden Planetarium in Boston, recalls visiting the place where she now works, “when I was five (you were supposed to be six years old in Boston—but I promised to ‘be good.’ I was extremely excited about the planetarium, but I only thought that ‘very important’ people could work there—I never thought I’d be one”

Noreen also reports on a time when, as a grad student, she drove a hundred miles to bring a telescope for a star party to a Girl Scout camp. “The girls were incredibly thrilled at both looking at the Ring Nebula and learning about this from a woman scientist. A few said they wanted to be an astronomer”

Jon Elvert of the Lane ESD Planetarium out in Eugene, Oregon, like many of us, enjoyed hearing stories about the apparition of Halley’s Comet in 1910 while conducting star parties for “second timers” in 1986. Jon also reports his earliest recollection of the sky was around the age of seven, when someone pointed out to him a partial solar eclipse.

Clint Hatchett of the Science and Space Theater in Pensacola, Florida, remembers when he and a friend used to go out as kids to look at the sky through binoculars. Clint tells us that he most enjoys presenting “preschool shows with an adult/child ratio of about 2:1. Adults learn too and help the kids learn.”

Donna Pierce of Highland Park Planetarium didn’t visit a planetarium until she went as a Jr. League docent to help out at the Dallas Health and Science Museum, though she does recall beautiful night skies out in the Texas panhandle where she grew up.

And Larry Cluplik of the Adler Planetarium in Chicago used to enjoy watching meteorites while lying in the back window well of a 1953 Pontiac. Things were a bit different during his first planetarium visit while in junior high school: “holding the hand of the girl next to me in the dark ... to this day I still call her ‘the girl with the soft hands’.”
Opening the Dome
Skywatching Questionnaire

(photocopy this form and send to: Jon Bell, Indian River Community College,
3209 Virginia Ave., Fort Pierce, FL 34981 USA; use additional sheets if necessary)

Name __________________________________ Phone # __________________________

Planetarium ____________________________________________________________

Address ______________________________________________________________________________________

What's your earliest recollection of the sky or sky phenomena?

______________________________________________________________________________________________

______________________________________________________________________________________________

When was your first planetarium and/or observatory visit, how old were you, was this visit a deciding factor in your career, and what was your strongest memory of the visit?

______________________________________________________________________________________________

______________________________________________________________________________________________

What's your best story about operating a telescope for school or public viewing?

______________________________________________________________________________________________

______________________________________________________________________________________________

What would be your ideal planetarium/observatory setup; what kind of equipment, layout, staff, programming, etc.?

______________________________________________________________________________________________

______________________________________________________________________________________________

What's your favorite planet for interpretation, and why?

______________________________________________________________________________________________

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What's your favorite Messier or deep sky object, or your favorite sequence of objects to display and interpret?

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______________________________________________________________________________________________

What was your greatest sky interpretation success?

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What was your worst sky interpretation disaster?

______________________________________________________________________________________________

______________________________________________________________________________________________
The GSS-Helios (GSX) features 25,000 stars reproducing a sky seen only from space. Digital shutters mean panoramas without stray stars twinkling through the image. Computer-assisted functions give manual mode the ease of auto mode without replacing the lecturer. The list of special GOTO features goes on and on. Contact your nearest representative and find out what your planetarium could be like.
In our last installment, we briefly touched on situations that can make dimmers interactively "misbehave." Since this can be a real problem for planetarians—and a poorly understood one at that—let's take a closer look at this phenomena which is called "dimmer crosstalk", and explore some ways to deal with it.

Many of us have seen dimmer crosstalk—either in our own facilities, or when we visit our planetarium colleagues—even if we haven't realized it at the time. Crosstalk is typically evidenced by dimmer-connected projectors whose lamp-levels "burst" in or out when they're not supposed to, when another projector is intentionally faded up or down. Sometimes when this occurs, planetarians tend point the finger of blame at the dimmers themselves, or at some other components within the control system. However, this is usually not the case at all! True dimmer crosstalk is actually due to the combination of an electronic dimmer's "temperamental personality" (a characteristic more-or-less shared by all modern electronic dimmers) in concert with specific characteristics sometimes found in a planetarium's electrical wiring.

When a Dimmer Isn't a Dimmer

It's important to keep in mind that modern solid-state dimmers don't really "dim" at all, but rather they are high-speed switching devices that rapidly turn AC voltage on and off at precisely determined points along each half-cycle of the AC waveform. Have you ever listened to your planetarium's house lights "sing" as they fade up or down? No, you won't hear them performing Falstaff or Like a Virgin, but at certain points during a fade, you can actually hear the lamp filament(s) emitting an acoustical "buzzing". This sound is generated by the vibration of a lamp filament as a dimmer switches current on and off 120 times every second (100 times per second in many non-U.S. areas). Circuitry in the dimmer determines exactly where along each AC wave that current should be switched in order to make the lamp glow at a desired level.

The semiconductor device in an electronic dimmer that does this switching is the triac. And it is this triac that endows a dimmer with its temperamental character. While triacs do a great job of rapidly switching AC current, they are vulnerable to being "false-triggered" by electrical forces external to the dimmer or control system. This false-triggering, in turn, leads to the unwanted fade-up or fade-down anomalies with which we're concerned. To understand this phenomena, we need to start out with some basic electrical theory (technical gurus please bear with me on the more basic stuff).

Phases

The first factor that enters into the dimmer-crosstalk "equation" is the AC supply's electrical phase—or more to the point—differing AC phases. "AC", of course, stands for "alternating current" and, unlike "direct current", alternates its polarity at a specific frequency (60 cycles per second in the U.S.; 50 cycles per second in Europe, etc.). The plot of this AC waveform is a sine wave, which can actually be demonstrated on an oscilloscope if its probes are connected to the AC line.

Now, if all the supplied AC power followed the exact same sine wave, there would be no crosstalk problem encountered with dimmers. However, it turns out that the power company supplies multiple (usually three) separate electrical circuits into the typical planetarium. Unlike the waveforms shown in Figure 1, the AC sine waves of these separate lines don't peak and trough simultaneously, but instead, are staggered off from each other in time, as in Figure 2. This lack of synchronization means the waveforms are "out of phase" (remember your physics?), so electricians refer to these separate electrical service circuits as separate "phases". They are also referred to as separate "hots" or "mains". Accompanying these separate hot phases into the building is a "neutral", which can sometimes be carried by more than one incoming wire. Once these phases enter the planetarium, they connect to separate large electrical connectors inside the "service box" or "breaker box". And within the box these phases are distributed to multiple electrical breakers—from which they branch out to dimmers and other equipment in the planetarium (Figure 3). The neutral ties in to the "neutral buss bar" (as well as a "grounding bar", which is additionally tied to a local earth-grounding rod). Any
equipment used in the planetarium, like a projector, a stereo amplifier, etc., must eventually connect to both a hot phase and this neutral in a "branch circuit". Otherwise, as they say in the electrical trade you get "no juice". (A few classes of higher-voltage equipment may require connection to two hots and the neutral in a branch, but those won't concern us here).

Wiring Concerns

In the typical branch circuit found in residential dwellings, each branch has its own dedicated hot and neutral (as well as a ground for safety purposes, which branches off the breaker box's grounding bar). However, in large commercial and public buildings (in the U.S., anyway), electrical code allows a single neutral wire to be shared by more than one branch hot, as long as each one of those hots is of a different phase (illustrated by Figure 4, which shows only one representative branch circuit per phase). This is because of the fact that the hots are out of phase, which keeps the "shared neutral" branch wires from being overloaded. This "shared neutral" convention is perfectly safe from an electrical standpoint, and saves on the amount of wire used to create the branch circuits in the facility. Unfortunately, this is precisely where dimmer crosstalk starts to become a problem.

Figure 5 depicts a group of hots—each of a different phase (A, B, and C)—sharing a single neutral. Also depicted are possible dimmer positions, either hard-wired into a central location (such as Spitz's special effects control), or remotely located (often plugged into electrical outlets). Under the right conditions—typically whenever certain dimmer loads are heavier than others—this can be a classic scenario for promoting dimmer crosstalk. Simply put, this is because each dimmer is in the direct "line of fire"—via the shared neutral—of electrical noise induced from either of the other two. And since this noise is generated from a different circuit phase, the affected dimmers receive out-of-phase pulses into their neutral connections. Although the neutral buss bar, and the massive neutral supply wire(s) from the outside electrical line, have the potential to dampen electrical noise by acting as an electrical shunt, they are too far back in the electrical wiring to be of help here.

For example, let's assume for a moment that we have a high-wattage projector connected to the dimmer output on branch A, and low-wattage projectors connected to dimmers on both B and C. When the high-wattage projector on A is faded up, that dimmer's triac induces an electrical noise down the neutral wire. Since the electrical resistance in the neutral wire between A, B, and C is equal to, or less than, the resistance back to neutral buss bar (because of the shorter length), dimmers B and C are highly vulnerable to being false-triggered by the out-of-phase noise pulses of dimmer A.

This problem usually doesn't show up, though, unless there is a significantly larger or smaller load on one circuit than another. That's why a dimmer with a single 300-watt projector won't tend to false-trigger another dimmer-connected 300-watt projector on a different hot phase and shared neutral wire. However, that same 300-watt could very well make a 50-watt lamp spurious burst in and out when the first is faded up. Likewise, a dimmer circuit with three or four 300-watt projectors can false-trigger another different-phase/Common-neutral dimmer with a single 300-watt unit connected.

Crossing Out Crosstalk

Most dimmer-crosstalk problems can be prevented by avoiding this different-phase/Common-neutral wiring scheme. Figure 6 shows the improved wiring layout. Note here that each branch circuit has its own dedicated neutral wire, which isn't shared by any other branches. (To avoid confusion, though, keep in mind that, while only a single duplex outlet per branch is depicted here for the purposes of simplicity, U.S. electrical codes allow as many as ten duplex outlets on a single 20-amp branch.) This is similar in layout to U.S. residential wiring. With this setup, dimmer-induced noise which is sent down the neutral wire for that branch is dumped back into the big incoming service neutral wire(s), via the neutral buss bar, well before it can flow back out to another dimmer by way of its dedicated branch-circuit neutral. In this way, the noise can be shunted into oblivion before affecting dimmers on other phases.

Even this wiring layout isn't an absolute guarantee against all forms of dimmer crosstalk, however. Remember that the incoming service wire(s) must act to dampen the noise from one phase, in order to keep the dimmers on other phases from being affected. However, this can only happen if the neutral service connections are massive enough to act as a sufficient shunt. Sometimes this will mean running in considerably larger neutral wire(s), or more neutral wires, into the service box than is mandated by the local electrical code. Additionally, in the worst case
scenarios, the same number of neutrals as hot phases must be run in, and connected to correspondingly separate and isolated neutral bus bars. In other words, if three phases enter the planetarium service box, then (1) three neutral wires of equal size must also be run in, (2) the neutral bus bar cut into three separate and electrically-isolated parts, and (3) the incoming neutral supplies tied individually to those bars. Care must then be taken to exclusively assign the neutrals for the different phase branches to their corresponding neutral bars to prevent any phase-circuit crossover. Again, this last scheme is only necessary for worst-case dimmer-crosstalk problems.

So what do you do if you’re seeing dimmer misbehavior? After all, the electrical wiring isn’t hanging out there in the open for ready examination (at least, it shouldn’t be). Is it necessary to trace out all the various wiring routes winding their way through your planetarium, hidden inside metal conduit?

Actually, you can start identifying wiring-induced crosstalk problems by merely checking the wiring at its entry-point into the branch-circuit conduits. In planetariums with remotely located dimmers, this means looking for the couplings between the branch conduits and the inside of the planetarium service box. In the case of centrally-located special effects and lighting dimmers—such as with some of the newer Spitz control systems—look for where the conduits for the station outlet wiring connect to the large cabinet containing those dimmers and the subroute hot-patch panel. What you’ll want to look for is the relative balance of hot and neutral branch wires entering the conduits. If the number of neutral wires (white in the U.S.) and hot wires (black in the U.S.) is equal, then you can be pretty confident that your branch circuits don’t share neutrals between different phases—meaning you’re probably in good shape with the branch wiring layout. On the other hand, if you see perhaps only one-half to one-third as many neutrals as hots, then you’ve almost certainly found a major crosstalk culprit.

(Be aware, though, that certain planetarium control systems—namely those produced by East Coast Control Systems and Joe Hopkins Engineering, as well as the old Brevard Community College DORK automation system—have an architecture which places the triac and optotriac driver in projecti

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**Oversights and Blunders**

Why does this sort of wiring problem happen, anyway? It’s primarily due to two factors: ignorance, and lack of communication.

Electricians are well versed in the electrical code—in fact, it is the “bible” in electricians’ circles. If “the code” says it’s okay for different-phase hot branches to share neutrals, the electrician will tend to accept that as the ultimate guideline (especially if it’s easier and will save the electrical contractor money). Sometimes, even if an architect or other subcontractor includes a electrical specification which goes beyond standard electrical code, an electrician may bypass it if he (she) doesn’t understand the reason. Because dimmer crosstalk is really an “electronics” rather than an “electrical” issue, it’s unlikely for an electrician to even be acquainted with the phenomenon.

This situation places an extra burden on the planetarium control system subcontractor to effectively communicate the operational requirements of the control system components in order to insure that no electrical corners are cut. Therefore, planetarium-specific equipment suppliers must monitor the work of the electrical contractor in a new-construction project in order to minimize the potential for major operational problems.

Of course, this describes problems with new planetarium construction only. Many times, planetarium control systems are purchased outside the framework of contracted electrical construction—especially in an existing facility which is upgrading from older control technology. This creates a real dilemma for planetarium personnel, as there may be no good mechanism in place to anticipate or readily deal with wiring-induced equipment problems once they’re encountered and identified. Nonetheless, since the dimmer/wiring incompatibilities will never magically go away, it’s always prudent to investigate the possibilities for future correction. Contact an electrician to get a quote on a rewiring job that will provide separate neutrals for all branch circuits in your facility. Any other solution will be, at best, a “band-aid approach”, and will be a continued source of frustration in the future. A better understanding of how dimmers work—and how and why they can misbehave—will lead to more effective solutions in dealing with this essential class of planetarium equipment.

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**Figure 6**

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**Why does this sort of wiring problem happen, anyway?** It’s primarily due to two factors: ignorance, and lack of communication.
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There's a lot of good information that has come my way recently ... read on!

Portable Planetarium Insurance:

I had requests from several people about what kind of insurance they should carry while running a business with a portable planetarium. I called John and Alison "BB" Meader because I knew they had struggled with this problem and finally found someone to insure them. They put their answer in a letter to be shared with you:

Northern Stars Planetarium (4 Osborne street, Fairfield, ME 04937) carries both general liability and equipment insurance. We are insured by Commercial Union Insurance Company of Boston, Massachusetts. Our equipment is insured on a commercial inland marine policy. All the equipment is grouped together on a floater policy. We have made a list of our major equipment which we keep on file with our insurance company. If we should have to make a claim, this is the equipment which would be covered after a $250 deductible. I have spoken to our insurance representative, Silas Lawry, and he encourages anyone who has any questions about insuring their planetarium to feel free to give him a call. If he cannot insure you himself, he would be more than willing to steer you in the right direction. For more explicit insurance information please contact Silas Lawry, Boothby and Bartlett Company, Burgess and Lawry Division, PO Box 315, Fairfield, ME 04937-0315, phone: 207-453-2516, fax: 207-453-7963.

Thank you very much, John and BB. If anyone else has another suggestion or contact, please let me know so I can pass along this vital information.

Public Domain File:

IPS officers are in the process of making a decision about how these materials will be distributed in the future. The file is expensive to reproduce and mail and the response to its availability (number of requests for copies) is extensive. If you call or write for materials there will be a delay until the proper procedure is defined, but don't let that stop you—I will help in any way I can.

Some wonderful new materials have been donated to the file by some of our well-respected colleagues. Thank you for sharing. I'm sure you will recognize the following names.

Art Klenger (P-11 M Planetarium and Space Museum, 55860 Bittersweet Road, Mishawaka, IN 46545) wrote, "I mentioned to you at IPS'94 that I had written a Kindergarten curriculum (Twinkle, Twinkle, Little Star - 53 pages) ... well here it is. Let me know if anyone is interested. I am now writing a first and second grade curriculum." If you have copies of Art's other materials you know that they are wonderful, and he's done it again.

Wayne Narron (Starlight Traveler, 8436 Colonial Drive, Stockton, CA 95209-2319) uses a GOTO EX-3 mobile planetarium. Wayne sent a game "Planet Hopping" (8 pages) which requires reading, counting, identification with geometric symbols, and is a way for learning about the solar system. Wayne says, "The game has many outcomes. It is a non-threatening way to learn math ... involves groups of children in the classroom, and with slight modification can be used as a team activity (coloring, pasting, cutting). The game form can be pasted on cardboard with the rules pasted on the backside and can be colored if desired along with the spinner and game tokens. I hand out this game when I visit schools. The feedback has been very good. Teachers and parents have found that it's fun to learn and have quality time with the children. ('It can't be learning, it's too much fun!'') Wayne also sent along information about programs he suggests at various grade levels and fourth through ninth grade knowledge objectives-7 pages, ABCs of Astronomy ditto-9 pages, and four information and/or activity booklets (Astronomy & Space Science Activities-20 pages, Star Gazing-16 pages, The Moon-11 pages, and Summer Camp or Classes-4 pages).

Rebecca Elfant (The Ethical Culture School, 33 Central Park West, New York City, NY 10024) sent a copy of "The Dine Astronomy" (78 pages) which was given to her by a teacher from New Mexico (authors: Mike Mitchell, Peggy Francis Scott, and Dave Shindleman). This booklet contains a wealth of information about Navajo constellations and other celestial objects and some information about the Greek constellations.

Dave DeRemer (Charles Horwitz Planetarium, 222 Maple Avenue, Waukesa, WI 53186 USA) sent a script (3 pages) for a Kindergarten/First Grade planetarium program. It is very difficult to acquire written programs for this age student so I am especially grateful to both Dave and Art for their contributions.

Starlab Conference:

The Mid Atlantic Planetarium Society will sponsor a Starlab Conference on May 19, 1995, at Raritan Valley Community College in North Branch, New Jersey. Included will be: advanced lessons for all grade levels, hands-on workshops for classroom activities to support Starlab lessons, workshops demonstrating high-tech and low-tech accessories for Starlab, and a panel discussion on advanced teacher training and developing an astronomy curriculum. The presenters are experienced Starlab teachers from schools, and museums ranging from Maine to Virginia and Indiana to New York.

Date: Friday, May 19, 1995
Time: 8:30 AM to 4:00 PM
Fee: Approx. $50.00, including lunch.
Attendance: limited to the first 60 participants.
Registration deadline: April 1, 1995
For more information contact:
M.A.P.S. '95
Planetarium Dept.
Raritan Valley Community College
PO Box 3300
Somerville, NJ 08876
Phone: 908-231-8805
Fax: 908-231-8810

Solution to Tired Voice:

At the GLPA conference this Fall Jeff Bowen (Bowen Music Productions, 3590 North Meridian Street, Indianapolis, IN 46208 USA, phone 317-923-3838) demonstrated a Mini-Vox hand held P.A. system that works well for some people while teaching in Starlab. It is 5 1/2 lbs, one piece molded case and steel grill, you can plug in a CD or Walkman and playback pre-recorded audio material, and it can be used with a hand-held or wireless microphone system.
Astronomy Day Headquarters Moves

The new address for Astronomy Day information is:

Gary Tomlinson
Astronomy Day Headquarters
Public Museum of Grand Rapids
272 Pearl NW
Grand Rapids MI 49504 USA
Phone: 616-456-3532

1995 Date
This year's Astronomy Day is May 6, 1995.

Handbook
Handbooks to help groups hosting Astronomy Day events are still available from the address above for $2.00 in US funds ($3.00 outside the US) to cover postage and handling. Checks should be made out to: Astronomical League.

Sky and Telescope Astronomy Day Award
Entry forms for this award that recognizes the group that presents the best Astronomy Day event(s) for the year are available from the address above by sending a self-addressed, stamped envelope. Deadline for entry is June 13, 1995.
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Among the very first software offered for personal computers were sky mapping programs—anyone remember Telstar? The earliest offerings were fairly crude graphically, especially by today's standards. Fortunately, the amazing improvements in personal computer capabilities over the last ten years have spurred wonderful advances in the power and quality of these software planetariums.

One of the leaders in this field today is Software Bisque's "The Sky". "The Sky" is available in three different levels distinguished by the total number of objects in the database. Level I presumably isn't offered any longer so the sequence begins with the Level II floppy version which contains 55,000 objects including 45,000 stars. The CD ROM version of Level II has 259,000 stars and 21,000 other objects as does the floppy version of Level III. The CD ROM Level III boasts a million and a half stars and 51,000 non-stellar objects. Level IV is only available as a CD ROM. A good thing too, because it contains 19 million objects from the Hubble Guide Star catalog and 100,000 other objects. The 'other' objects include variable stars, double stars, NGC objects, IC objects, Pk planetaries, the Principal Galaxy Catalog, and GIF images (75 to 700 depending on the level). In addition, all levels include orbital elements for 5,000 asteroids, 2,000 comets, the Sun, the Earth's Moon, the nine planets of the solar system, and Jupiter's Galilean satellites. It took me just under 20 minutes for me to load the operating software for Level IV (CD ROM) into my 486-DX33 using the 'Medium' installation option. "The Sky", Level IV, allows 'Small', 'Medium', and 'Large' installation depending on how much hard disk real estate you have available and wish to devote to the program. Frugal users will choose the 'Small' option which takes up only 3.5 megabytes. 'Medium' grabs 8 megabytes and 'Large' hogs 26 megabytes. Why devote so much space? The more hard disk space, the faster the program will run. As its manual states "The Sky" is 'computation intensive', 'display intensive', and 'disk intensive'. Thus Software Bisque recommends a 486 or better processor with a math co-processor, a local bus/accelerated video card, a processor speed of at least 33 MHz, and, if you use the CD ROM version, a double-speed CD ROM drive. If disk space is a concern, consider Level II or III. Installation was simple and straightforward.

"The Sky" follows the usual Windows conventions with pull down menus and dialog boxes. Anyone who's learned other Windows programs will find "The Sky" a breeze. One surprise is the location of the telescope view function which allows you to display circles representing the fields of view of various telescope eyepieces.
CCD cameras, and Telrad finders. This option is found under the “Lines” pull down menu, rather than the “Telescope” menu.

The manual is clear and well written, yet, at only 146 pages, it's not so thick as to intimidate the user. Unlike some other planetarium programs, it doesn't waste space giving you a basic astronomy course. It assumes, I guess, that if you invest the money and hard disk space that "The Sky" requires, you already know the difference between a star and a planet, or you'll invest in a good text to learn the basics.

The display of "The Sky" is very flexible. Not only can you select the display of limiting star magnitude and whether or not deep sky or solar system objects are displayed but also coordinate grids, constellation borders, star names, constellation names and trails of solar system objects. Field of view angles range from narrow telescopic fields to a wide angle all-sky setting. The latter allows you to create star maps similar to those found in Sky and Telescope and Astronomy magazines. These can be very useful for star parties and classes where you want a simple, all-sky chart designed for your latitude at a specific time that you can print and photocopy on short notice. Most routine display options are available as push button icons on a floating pallet alongside the displayed star field. These icons are designed well enough to be self-explanatory in most cases. Among the many display options are 'mirror image' for telescopes with odd numbers of reflections and 'night vision' which changes the display color to red to preserve your night vision when using "The Sky" at the telescope. Even the contrast and brightness characteristics of the displayed star dots can be varied to suit your star chart aesthetics.

As with many such programs, pointing the cursor at a displayed object and clicking on the mouse will identify the object. "The Sky" also gives you other database information, including magnitude, catalog designations, and rising and setting times. As a test of accuracy, I checked "The Sky's" rise and set times for the Sun on a couple of random dates and the results were identical to those given by the USNO's MICA software which is my touchstone for accuracy in such calculations.

Other features of "The Sky" include a "Moon Phase Calendar" which draws a graphic monthly calendar of daily Moon phases similar to the fancy calendar posters that we've all seen. Solar and Lunar eclipses can be predicted and simulated as well as planetary conjunctions. Planet motions can be animated with or without trails. Planetary positions can also be viewed from a point of view just outside the solar system above the Sun. If you have an observatory or telescope capable of computer control, you can use "The Sky" with optional add-on software to
aim the telescope and even operate a CCD camera.

Faults in "The Sky" are few and minor. Although Jupiter's four Galilean moons are included, no other planetary satellites, except Earth's are included. With the faint limiting magnitude of the software making it ideal for searching out faint objects with larger telescopes, it's a shame that the moons of Saturn, Uranus, Neptune, and Mars of similar magnitude aren't included. When you zoom in on a planet like Jupiter or Saturn, the telescopic image you eventually get is a very grainy representation made of brightly colored pixels. It would have been nice if these images were a little more realistic looking. When you click on an object to identify it you are given the option of calling up a GIF image of the object, but some of the GIF selections are not what I'd have chosen. Saturn, for example, brings up a Voyager contrast-enhanced view of just Saturn's rings. I think I would have at least picked a full planet view. The stick figure constellations seem to closely resemble those of H. A. Rey. Personally I find it hard to teach people constellations with these outlines. They use too many faint stars that can't easily be seen from the city or suburbs. But I know there are many people who love this constellation style.

In spite of these minor drawbacks, I'd say that "The Sky" is about as close to an ideal planetarium program as I have seen. Planetarians will find it particularly useful for making custom star charts for observing sessions, comet path charts, eclipse simulations (especially if you have a video projector capable of VGA input), and checking planet analogs. "The Sky" is flexible, easy to use, and packed with useful features. ♠
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President’s Message

Jim Manning
Taylor Planetarium
Museum of the Rockies
Montana State University
Bozeman, Montana 59717

Greetings!

Last October, the Pacific and Rocky Mountain Planetarium Associations held a joint conference in San Diego, California—not far from Palomar Mountain. This proximity provided a wonderful opportunity for a busload of congresses to make a pilgrimage there for a behind-the-scenes tour of the Hale 200-inch (5-meter) telescope, arranged by our hosts from the Reuben H. Fleet Space Theater.

For me, the trip up the rugged granite hogback (once called “Place of the Dove” by native tribes) to where the observatories waited was a special experience. I grew up in an area with no observatory and no planetarium. In my youth, I skated my astronomical thirst with an old of binoculars, a rickety department-store telescope, the occasional newspaper article or television program—and books. And in those books, I saw pictures of a great, white dome perched on a pine-clad ridge, and inside it, the Hale Telescope, the enormous, metal-framed descendant of Lippershey’s and Galileo’s and Harriot’s spyglasses.

In those days, it was still the greatest light-gathering eye the world had ever trained on the heavens, and it caught my imagination. It revealed an amazing universe of exotic places and activity and mystery of which that the starry sky over my family’s farm only hinted. To me, back then, Palomar represented the epitome of ground-based astronomical observation and discovery. And I’d never had an opportunity to visit—until now.

The summit was cloaked in clouds when we arrived, a cool, misty overcast swirling over the small visitor’s center. Inside, the center was dominated by a full-sized effigy of the big mirror’s shape, surrounded by walls of backlit transparencies from the telescope’s long career. Patrick Moore on videotape told the history of the observatory, and the gift shop offered mementos. Thus fortified, we were led by our guides outside along the short pathway to where the observatory loomed.

And there it was, looking just like its pictures: the massive dome dwarfing the landscape, shutters closed tight against the drifting mist and light rain, the quaint front door seeming ridiculously small set in so large a structure. But this was the cook’s tour, and it was the back door for us, back in the base section where the supplies, machinery and gigantic spare parts were kept, where the old darkrooms and sleeping quarters stood as reminders of a bygone era in observing. From there, our guides led us up onto the floor of the observatory.

And there it was the 200-inch telescope—all girders and glass and history, nestled in its equatorial-mount yoke with the distinctive horseshoe bearing, under the cavernous dome... so well-balanced and lubricated, the guidebooks said, that its 530 tons could be moved with the pressure of a single hand.

The guides gave its vital statistics, its observational triumphs, and fielded questions as our group shot photographs. Later, one of the staff put the leviathan through its paces from an antique console, moving it in right ascension and declination and rotating the dome at the same time as we stood on the dome’s catwalk. So smooth was the ride that it was as easy to imagine that the telescope was rotating on a big turntable as it was to believe that the dome itself was moving.

I imagined what it must have been like for astronomers in the “old” days, before computer control and CCD’s... sitting in the observer’s station at the Cassegrain focus below the mirror, or perched high up in the prime focus cage at three in the morning... bent over the guiding scope, waiting patiently while photons older than humanity, older than the dinosaurs, older than life collected on the glass plates, tripped the photometers, spread into rainbow smears in the spectographs, and whispered their secrets of time and space.

It’s not done that way so much anymore—certainly not at the big telescopes. I’m sure the old-timers would say there was more tedium than romance in the process, and today’s technology and methods for collecting photons is obviously better and more efficient. But I’ll always have that image. It was the way we made our observations when I was in college, and I loved it. And I wonder if today’s increasingly efficient, automated, charge-coupled, and sometimes long-distance professional astronomers ever miss that perhaps more visceral connection with the sky.

The rain was falling harder when we left the observatory and boarded our bus, heading for a box supper and an intriguing slide presentation by visiting astronomer John Gizos on his research with red dwarf stars. By lecture’s end it was dark, the rain was finished, and the sky was clearing—a hopeful sign for our scheduled observation session with the 60-inch (1.5 meter) reflector. But first we visited another of Palomar’s observatories, perhaps only slightly less famous than the Hale itself: the Oschin Telescope—the 48-inch (1.2 meter) Schmidt telescope of Palomar Sky Survey fame, currently completing a new survey of the northern sky while a counterpart in the southern hemisphere photographs the southern sky. We got to stick our heads inside the tube to see the Schmidt’s unique plate-loading mechanism.

Unable to delay any longer, we drove to the 1.5-meter observatory, where the dome was pronounced too wet to open and run the risk of water dripping into the telescope. (I knew I should’ve brought along my Astrobot.) And so we bundled back onto the bus for the journey back to San Diego.

But we passed by the 5-meter observatory one last time, its great white dome gleaming in the moonlight under a hazy sky. And I’ll remember that with a goosebump or two. Oh, today there are bigger telescopes—the 6-meter in the Caucasus, the mighty 10-meter Keck on Mauna Kea, awaiting its twin. And there are some with more innovative techniques, like the New Technology Telescope with its adaptive optics in La Silla. And some have superior locations—the Hubble Space Telescope in particular comes to mind. But Palomar excited me as a boy to the possibilities of the universe, and I’ll always have a soft spot for it.

And that’s rather my point. When the Hale Telescope was dedicated in 1948, there weren’t any more planetariums in the world than there were professional observatories.

Not so today. Planetariums have never been more numerous, more accessible, or better able to serve the function that Palomar—or the Mercury astronauts, the Vostok cosmonauts, the Mariners, the Patrick Moores, the Comet Ikeya-Seki, the “Star Treks”... did for some of us: to inspire, to spark an interest, to engage the imagination. To excite people, especially young people, to the possibilities of the universe.

If you look in the front of the 1995 issue of the “Observers Handbook” of The Royal Astronomical Society of Canada, you’ll find a succinct statement about the importance of the sky in our lives, excerpted from a bulletin of the International Astronomical Union: “The Night Sky with its beautiful stars and its message of our place in the Universe is a precious treasure of all humanity, on which we rely for our knowledge and understanding of our origins and destiny.”
Ed Krupp, in his book Beyond the Blue Horizon, puts it a little differently. He writes that for "thousands of years, the human race has been asking itself the same questions: Who are we? Where do we come from? Where are we going? What is the right thing for us to do? The sky was one place where they found some answers."

When the astronomer seeks answers from the sky, he (or she) goes to the observatory. When the public seeks answers from the sky, like as not, they come to us. That engenders a responsibility, but it also creates a wonderful opportunity—to enlighten, to encourage an interest in science and the world around us, perhaps simply to get someone to look up at the stars with a new perspective ... or to make a difference in somebody's life.

As I wrote more than two years ago when running for office, we need to remind ourselves from time to time of the role we play in society, that we do important work, and that it matters. We keep the cosmic link; we temper the absolute truths of the universe with the warmth of human perspective. We offer people knowledge and understanding and a sense of place on a fragile planet in a universe far bigger than ourselves. That is who we are. That is where we come from. That is where we are going. And that is the right thing for us to do.

Well ...

I just hope this isn't a case of the universe experimenting with the Peter Principle.

Two thoughts occur to me as I undertake the duties of president: first, what a singular honor it is to hold this office in an organization of colleagues for whom I have tremendous respect; and second, what a great responsibility it is. Both thoughts are chastening. But I pledge to do the very best I can to represent, promote, and safeguard the interests of our society, working with the other officers, the Council, and all those who volunteer their time and talents in service to IPS.

Several immediate words of thanks are due—first to Past President Bill Gutsch. Having worked closely with Bill for the last two years, I probably know as well as anyone just how hard he's worked and how much he's done for the society. Under his leadership, our organization has grown by four affiliates and has become more international, the Special Publications arm is reviving, and the IPS Directory has been reestablished; he's begun dialogues with other science and education organizations, has served an important liaison role with our Japanese colleagues in planning for our first Asian conference in Osaka in 1996, and has recruited excellent people for important service roles within IPS.

In short, he's left some mighty big shoes to fill. I hope to continue the initiatives he's begun and to build on them, and to add some along the way where I can. Thanks, Bill, for a first-rate job. We'll look forward to your continued involvement in your role as past president.

On behalf of the membership, I'd also like to thank Katherine Becker, who served with distinction as IPS secretary for several terms before she retired from the post last year. And Joyce Towne, who filled in gamely and effectively as acting IPS secretary prior to the election. It was a delight to work with them, and we owe an enormous debt of gratitude to them both.

To the New Officers ...

... I offer hearty congratulations: to President-Elect Thomas Kraupe, director of the Zeiss-Planetarium Muenchen, Forum Der Technik, in Munich, Germany; to Secretary Lee Ann Hennig, director of the Thomas Jefferson High School Planetarium in Alexandria, Virginia USA; and to repeating Treasurer and Membership Chair Keith Johnson, associate director of the Fleischmann Planetarium at the University of Nevada in Reno, Nevada USA.

I've known each of them for some years, and what a complementary set of experiences and skills they'll bring to the IPS officers corps. They'll make a marvelous team for IPS; I look forward to working and sharing the load with them over the next two years.

Congratulations also to Jon Bell, Dale Smith and Joyce Towne on their nominations and on a race well run. Their participation made for an extraordinary slate of candidates for the membership to consider.

Thanks also to Elections Committee Chair Tom Stec and his committee members for another job well-done.

The 1995 Directory

A few bits of business: at the IPS Council meeting in Oklahoma City in 1993, the directive of the Council concerning the IPS Directory was to move forward with publication in 1994, and then to publish another edition in 1995 to incorporate new members following the 1994 Cocoa conference and to include new information on facilities. In keeping with the Standing Rules, IPS will hereafter publish the directory in odd-numbered years, and will plan to publish a supplement/errata in even-numbered years.

Keith Johnson has created a data base of entries based on the information in the 1994 IPS Directory and on updates and additions gathered since, to serve as the basis for the 1995 edition. The Finance and Publications Committees are presently arranging for the design, printing, and distribution of the document, which, if all goes well, should be delivered in the first half of the year.

The 2000 Conference

With Osaka '96 well along in planning, and London '98 decided upon last year, it's not too early to begin thinking about the year 2000. The Standing Rules call for conference site invitations to be made five years in advance, which effectively means that proposals to host the conference for 2000 should be presented at our off-year meeting on October 13 of this year in San Diego. Council representatives will thus have some time to consult with their affiliate groups prior to the vote at the Council meeting in Osaka in 1996.

If your facility would like to consider making a bid for 2000, please contact me for information on IPS guidelines for making a bid. Thanks!

From Japan

Our hearts and thoughts go out to our Japanese colleagues in the Kobe area, for the personal losses suffered in the devastating earthquake which occurred there just days ago as I write. I understand that there are several planetariums in the Kobe area; at the moment, their status is not known.

As you probably know, Kobe is near Osaka, the site of our upcoming 1996 conference. Kosi Sasaki, the U.S. Minolta representative, tells me that the word from Osaka is that our 1996 host, the Osaka Science Center, came through just fine, and that the city suffered relatively little damage compared to Kobe down the coast. Concerning Kyoto and Nara, the cities to be visited on the pre-conference excursion: Kyoto to the north of Osaka sustained minor damage, and Nara to the east was largely unaffected. So it seems unlikely that the conference, still more than a year away, will be seriously affected by recent events.

Dr. Nakano and his staff and associates in Japan are working diligently on conference planning. Watch for more information about IPS '96 in the coming months.

In the meantime, and on behalf of the membership, I offer our colleagues in Japan our good thoughts and hopes for a speedy recovery as the healing and rebuilding begins.

Until next time ... ki o tsukete kudasai ...

Take care.
This is what the world's toughest audience had to say about America's first Minolta Infinium Planetarium:

"The most dramatic and realistic sky I've ever seen."
"In the future, all planetariums should be built this way."
"There was such detail...like looking at stars from a mountaintop."
"This is easily the most powerful planetarium ever made."
"Wow!"

A sky so real that you will believe.

Background is a photograph of actual Infinium sky

Last July, Florida's Brevard Community College hosted the International Planetarium Society. Pictured above are some of the nearly 500 planetarians from around the world who gathered to exchange ideas and witness America's first Minolta Infinium Planetarium. The result was nothing less than dazzling. For more information about the Infinium and other model projectors, call your nearest Minolta representative today. After all, at Minolta we know that once you have seen our sky, you too will believe.
April S. Whitt
Fernbank Science Center
156 Heaton Park Drive NE
Atlanta, Georgia 30307 USA

Happy Equinox, planetarium readers, and best wishes for a prosperous spring or fall, depending on your hemisphere. This issue’s books include some for children, some for teachers and parents, and some for the interested general public. If you’d like to review a volume for this column, send your name, address and area of interest to me at the address above.

Special thanks to our reviewers this quarter: Francine Jackson, Laura Metlak, Jean Philpott, Mickey Schmidt, John Schroer, Sharon Shanks, Steve Tidey, Richard Williamon, and Wayne Wyrick.


Reviewed by Sharon Shanks, Ward Beecher Planetarium, Youngstown State University, Youngstown, Ohio

Franklyn M. Branley. His name on a child’s book tells you instantly that you can trust it to be sound in its science and an instant hit with your young readers. Eclipse: Darkness in Daytime is no exception. The deán of children’s science literature has captured the essence of total solar eclipses in terms that even 4-year-olds can understand. That’s not an easy job.

His terms are clear: “Sometimes the moon hides the sun,” the opening line, captures the “what” as well as the “how” of eclipses and brings the child directly to the heart of the book. But more valuable is the hands-on experiment that allows children to see for themselves how the mechanics of an eclipse works. After setting up his subject (it gets dark in the daytime) and reviewing some of the interesting history of eclipses (dragons eating the sun), he explains how the moon, 400 times smaller than the sun, can cover the solar disk. Suggesting that children hold a penny in front of one eye and look at a far-away object such as a car across the street, he demonstrates easily how our small moon (the penny) can appear to be about the same size as the sun (the car) and hide it from our sight.

Eclipse paths, the difference between partial, total and annular eclipses, and a safe way of viewing eclipses, are covered just as succinctly and clearly.

Donald Crews’ illustrations are colorful and appropriate. Crews also enjoys a respected position as a children’s author and illustrator (he has two Caldecott Honor Books to his credit). He is able to capture ideas that can be confusing to children and present them in drawings that compliment the text. My co-reviewer (Jessie, age 5) was able to use the penny and car experiment to see for herself how small objects can appear to cover larger ones by following Crews’ illustration and Branley’s words. Eclipse: Darkness in Daytime is certainly a worthwhile addition to a child’s home library or to gift shop shelves and should be the reference of first choice for elementary school educators to prepare their students for studying or viewing eclipses.


Reviewed by Mickey D. Schmidt, USAF Academy Center for Educational Multimedia, USAF Academy, CO 80840

Cosmonautics is a wonderful pictorial of the Russian (Soviet) space program. The story begins with the pioneers in Russian rocketry. As one who entered the space age as an eager teenager I had read of Goddard and the Germans, like von Braun and Wiley Ley, who flew rockets in the German countryside prior to W.W.II. I wondered about the Russian (Soviet) pioneers and never knew until reading this book about their progress. The editor states that there is just too much detail to included everything for everyone so there is a need for additional books covering the Russian space achievements

While the section on the Pioneers is comprehensive in naming people and naming engines and devices the chapter left me wanting more. I wanted the warmth of a little about personalities which seemed to be lacking. I must say, though, the illustrations showing the advances made were plentiful although picture captions could have been improved. Still, I felt as if some pages in the history of rocketry had been uncovered, if only partially.

The chapters dealing with the spacecraft, space stations and boosters are the real meat of this book. If you have ever wanted details on the development of the various launch vehicles, the evolution of the spacecraft and what the Russian space stations were really like, this book is for you! There are excellent views and descriptions of the interiors of the space stations.

Several things about the evolution of Soviet/Russian and Commonwealth of Independent States (CIS) Cosmonautics becomes very evident. Procedures for erecting the launch vehicles are very different from American experience. Fuel combinations in common boosters are different, some very toxic and others, like kerosene, haven’t been used by the US since the Saturn series of launch vehicles. Clustering of rockets is “different,” something we Americans are not used to seeing except in the Delta boosters. The cult of Gagarin is an interesting phenomenon. I found very curious that the use of national heroes still has such an influence in Russia. Not since the 1940’s have I experienced that mindset at an official level in the US. Traditions obviously have a deep meaning for the Russian people.

Testing and assembly of launch vehicles was described in detail. I was impressed by the amount of automation involved in fueling launch vehicles and in making them safe. In case of an aborted launch, Cosmonaut training seems more grueling than for American astronauts, if only because the Russian counterpart has to prepare for landing in blizzards and -40° C. temperatures as well as the desert and sea.

This book fills a badly needed niche in the history of Russian voyages to the Cosmos. As a result of this book I have a much greater respect of Russian Cosmonautics.

I heartily recommend it to anyone who has been curious and as isolated as most American readers are in respect to Russian history. It hints at future cooperation with the Europeans, Japanese and American space programs as it details the training of American “cosmonauts” for the June 1995 docking of the Space Shuttle Atlantis with the Mir Space Station. The plans for the exploration of Mars are also described, with a large number of interplanetary flights planned over the next decade, perhaps culminating with an international team of Mars explorers.

The book comes complete with three posters; The Cosmonauts, Launch Vehicles, and Ships and Stations.
At first glance, A Look into Space reminded me of the kind of science book my Dad brought home from a business trip, but it's more of an upper elementary astronomy text book. The authors present topics from our solar system to cosmology in a colorful, entertaining way. And cartoons and pictures appear on every page! Features include a "Space Lab" project and biographical sketches of real life astronomers and astronauts. Vocabulary words defined in the margins and phonetic pronunciation guides help the reader learn new words.

I found the multicultural approach of the book refreshing. The names of the characters and the people profiled reflect many nationalities and races, and both genders, encouraging the study of astronomy by all. The book is multidisciplinary as well, including history, word puzzles, limericks, newscast spoofs, games, mythology and archaeoastronomy. Measurements are given in both English and metric units.

While some artistic license is taken in the story of an alien space traveler and its human companions, the text does state that they are on an imaginary journey. Overall, A Look into Space is a creative, factual presentation of astronomy for upper elementary age students.


Reviewed by Richard M. Williamson, Fernbank Science Center, Atlanta, Georgia, USA.

Greek mythology is very difficult to present to children. It's not that the stories are necessarily difficult to understand. Nor are the Greek stories hard to visualize. Quite the contrary; the grand adventures and seemingly impossible exploits of the great Greek heroes quickly captivate the young mind as thoroughly as any television show. The difficulty with Greek mythology and children is the explicit and graphic violence that permeates every legend. I am pleased that The Usborne Book of Legends has managed to tell the tales of Ulysses, Hercules, and Jason without compromising the stories and without undue gore. How? With the fabulous illustrations!

As a random example, consider when Ulysses and his crew faced the Cyclops, the one eyed giant who had a nasty habit of snacking on humans. The remaining crew begged Ulysses to kill the Cyclops before more crew members were eaten. Thus they sharpened a pole and put the sharpened end in the fire to heat. The story continues: "Silently they crept forward, careful not to wake the Cyclops. Now shouted Ulysses and they plunged the red hot pole into the eye of the sleeping giant." Typically, an artist trying to illustrate this action would have been tempted to show the pole thrust into the eye at worst or the shaft in mid flight at best. Stephen Cartwright, the illustrator for all the stories in The Usborne Book of Legends, found another way. He chose to focus the action on the crew sneaking up on the Cyclops. The result is that the child's imagination is stirred without resorting to the inappropriate shock of defined violence.

This example is typical. In fact, I did not find any inappropriate illustrations in the book. Planetarium artists and those who illustrate children's literature should all have such foresight. Obviously, I highly recommend this delightful book based on the clever way the authors have retold the ancient myths and on the power of the illustrations.


Reviewed by Wayne Wyrick, Kirkpatrick Planetarium, Oklahoma City, Oklahoma, USA.

Life in the Universe is one of a series of science books for non-specialists introduced by McGraw-Hill under the umbrella Horizons of Science Series. It is a translation of the original French title "La Vie dans l'universe," published in 1989. McGraw-Hill intends the "Horizons" series, currently at eight titles, to be fast-read books. They're all around 100 pages, with few if any illustrations. It seems they were intended to be read in one sitting by pipe-smoking, thoughtful, inquisitive gentlemen scholars in their parlors. The text is fast-paced, but the information presented is necessarily sketchy, as you might expect with only 111 pages.

The book covers most of the important aspects of SETI research, it's just five years behind the times. Project META, for example, is merely a gleam in NASA's eyes, and the strong anthropic principle is still a novel idea. But since none of the projects started in the past five years have found any little green men, not much SETI information is missing.

There are some strange lapses in accuracy. Twice Heidmann (or the translator) states Earth's diameter is 6200 miles. At least he places us 93 million miles from the sun. In discussing phase transitions at the beginning
of the universe he uses the example of freezing water. He (or again the translator) refers to super-cooled water as "supermelted" water. He describes the functioning of an ice box by stating the ice absorbs heat before it gets to the food. Surely even in France people use electric refrigerators, not ice boxes.

Heidmann slips into a kind of Lowellism at one point when he describes how a hypothetical civilization on Proxima Centauri eavesdropping on our television signals could deduce that Earth has distinct political boundaries and various economic systems, (some less successful than others), and vegetation that ebbs and flows as a function of seasons. This is not by translating our signals but by simple deduction from the nature and periodicity of signals!

Life is the Universe is not a bad book. It tries to do too much in too little space. The few but irritating factual errors detract from the book.

But you can read it with only one refill of your pipe.


Reviewed by Steve Tidey, Forum Associate Editor, Southend, Essex, England.

Since the mid-1980's there has been an explosion of comet books, thanks to Comet Halley, and in recent years to some extent people have instinctively shrunk back on sight of another one. But thankfully that cannot be said of this worthy publication, which would benefit those who have already cut their cometary teeth on other more basic, popular-level books.

John Brandt is an academic at the University of Colorado and principal investigator on the Hubble Space Telescope, and Robert Chapman was formerly with NASA. The refreshing aspect of their book for the knowledgeable amateur (for it is not aimed at an absolute beginner) is that they have given us a detailed post-Halley view of cometary science. A basic understanding of physics, chemistry and mathematics will help in digesting the more difficult areas, which include ions, polymers and exponen- tial figures, for example.

There are times when one can almost sense the authors straining at the leash to explain a particular concept by delving into equations, but they restrain themselves well and use accessible language to explain a variety of things, such as the solar wind's interac- tion with a cometary head, mass loss during an apparition, disconnected tails and so on.

The book concentrates on recent data sent back by the probes that encountered Comets Halley and Giacobini-Zinner, but it also gives us a succinct overview of our cometary knowledge. Some fresh areas are covered, such as comets which may have drifted into the solar system from other star systems, the fate of comets once the Sun expands toward the end of its life, and the estimated numbers of comets surrounding other stars close to the Sun.

The authors let themselves go at last in two handy appendices which would benefit undergraduates and anybody else interested in the math behind comets. These give detailed equations covering plasma physics, the laws governing the brightness of a comet, the nature of light, etc. There are also a few pages of graphs showing complex in situ measurements of Comets Giacobini-Zinner and Halley.

Observers are informed about how to verify that the smudge of light they've discovered is in fact a comet and not one of half a dozen other things, and how to report the real discovery of a comet. There is also a complete computer program for calculating cometary orbits. Altogether, a fine book.

Toys in Space does more than describe what the toy does on Earth. It tells why it works and links it to some aspect of science. Toys are grouped by common characteristics with chapters devoted to: space acrobats, spinning space toys, space magnets, and space games. Each chapter also describes how each toy performed (or would perform) in space.

The book's second chapter introduces terms and concepts about physics and toys. This will be especially helpful to the teacher who may not be familiar with any of the principles of physics. Illustrations are useful to help children learn the terms and principles.

I like the book because it did not stop with what the toys did in space. It goes on to describe what life is like in space for the astronauts. From lift-off, through eating and sleeping, to landing, you actually get a feel for what it might be like to be in space. Biographies of each of the astronauts who experimented with toys in space are also included at the end of the book.

This book belongs in the library of anyone who teaches science to children. It can open their eyes to the wonders of science and the mysteries of space.


Reviewed by Laura L. Metlak, Whitworth Ferguson Planetarium, Buffalo, New York, USA.

Reach a child and teach that child on his or her level with toys. Toys are the real world of children. They are interesting to children, and they are easily obtained by parents for children. Toys in Space is just the book to link science in the "adult world" with toys in the "child's world."

This is not a pick-up-and-read-from-cover-to-cover book. It is filled with activities that allow a child of any age to play with a toy, then try to figure out what that toy would do in space. There are also many activities to help the reader make his or her own toy. Most of the directions are very easy to follow. There is one exception: in The Boomerang section on page 50 the reader is instructed to use the pattern on page 48. But the pattern on page 48 is for the Maple Seed. The pattern for the Boomerang is found at the bottom of page 50, below the directions.

(Please see Books on page 48)
OK. Planetarians around the world have caught on big time to the digital audio “buzz” (should I really use this word in connection with first-class audio??!!!). I receive faxes, phone calls, and e-mail literally daily asking how to edit sound tracks in the digital domain. One show producer recently spent a huge amount of time on the phone telling me that they “want to upgrade to digital audio for obvious reasons ... but we want to edit shows in the same way we always have, i.e. razor blades, leader, splicing tape, foil sensors ...” Well friends, there is always “obsolescence” of certain production methods when you upgrade technologically, and moving to digital audio provides no exception. As these “obsolescences” apply to audio editing I see these changes not as having negative impact ... but rather as providing exciting new creative opportunities!

**Once Upon a Time ...**

Let us quickly review some of the basic principles in analog tape audio editing. A typical soundtrack is produced as follows:

- **Step 1:** Record multiple takes of the narration/dialog tracks “cold”.
- **Step 2:** Razor-blade edit the good takes out of tapes from Step #1. Add blank tape (or leader) to create the timing of narration/dialog in the show and to insert spaces for music and visual effects openings.
- **Step 3:** Lay the edited dialog/narrative track onto one track of an analog multitrack machine (this is usually an 8-track machine in a planetarium production studio).
- **Step 4:** Stereo music tracks are then assembled using the narrative/dialog track as the timing reference. If stereo music selections are to crossfade, four tracks will be used for music.
- **Step 5:** Sound effects (SFX) are added on other tracks of the multitrack tape.
- **Step 6:** Audio from the above mentioned tracks is sent to an outboard mixer and mixed to some show master tape format. This mixed format varies greatly from site to site. Some soundtracks are mixed to a stereo mix, some to another multitrack so as to maintain a six or even 8-channel multichannel format. Some presenters actually run the master show tape during show presentations, although I highly recommend dubbing a show presentation tape. Use this tape on a daily basis and store the first generation master to dub additional show presentation tapes if they are damaged or if they wear out.

**Trouble in Edit City ...**

We run into a problem right at Step #2 of the previous procedure when assembling soundtracks using digital audio tape (DAT). DAT cannot be edited by cutting tape. In fact, any tiny flaw or wrinkle in DAT causes DAT machines to discontinue outputting usable audio.

Fortunately, the designers of digital audio systems addressed this scenario from the very beginning. Editing can easily be accomplished using either of two methods. The first uses a computer-based digital audio workstation (DAW) and the second allows audio to be edited exactly in the same fashion as video is edited. This is known as timecode editing.

**Editing with a DAW**

Most DAWs are systems comprised of either a Macintosh or a PC computer with software designed for audio recording/editing/mixing applications. Figure #1 shows a typical screen from one of these software programs.

In the case of the Mac you may or may not need to add any additional hardware. If you only need a stereo final mix, any AV or PowerMac may provide all of the 16-bit CD quality audio you will ever need. Older non-AV Macs will require the addition of a NuBus sound card or in some cases other external hardware. PC format computers always require the use of additional hardware, even if just a simple sound card. A Mac or a PC with a sound card can only provide stereo outputs. A DAW providing stereo outputs will typically run $400 and up. If you need multichannel mixes you will certainly need to use a DAW with external hardware. Prices for a DAW with 4 to 8 separate outputs run $3500 and up.
The DAW solution to the editing "problem" allows for creation of wonderful sound designing opportunities. Audio is digitized and stored on hard disk. DAW software (Figure 1) then provides a visual graph or waveform of this audio. We can cut, copy, paste, delete, drag and otherwise edit these waveforms to create our soundtrack in exactly the same manner as we would use a word processor to edit words and sentences to create a document. And this process is non-destructive, which means we can edit several versions all with different timing or soundbites and then select the one(s) we like best.

Good DAW software also allows graphic automated mixing of all tracks and should even allow you to automate the panning of dialog and SFX between left and right sides of the mix. Figure #2 shows the automated mixing curves we placed in one DAW sound-track.

And what is great is that you can change any part of the mix on any track(s) without affecting the work you have finished on other tracks. This allows you to listen to the mix in your dome and revise easily without a huge time investment. You can experiment with all of those ideas you always wanted to try but didn’t have the time to play around with.

I recommend the following procedure to replace the one I outlined in the "Once Upon a Time ..." segment.

**Step 1:** Use a two-track DAT machine to record multiple takes of the narration/dialog tracks “cold”. DO NOT RECORD DIRECTLY INTO THE DAW! This is some of the best advice I can provide.

**Step 2:** Transfer the good takes out of the DAT tapes from Step #1 into a workstation. Cut, copy, and paste the visual waveforms to create the timing of narration/dialog in the show. Drag the waveforms to insert spaces for music and visual effects openings.

**Step 3:** Record stereo music tracks into the DAW. Cut, copy, and paste the music waveforms to fit with the timing of narration/dialog in the show. Use the DAW software to create automated crossfades of music selections.

**Step 5:** Record sound effects (SFX) on other tracks of the DAW. Use your mouse to drag the sound effects into the proper location relative to the narrative/dialog and music tracks. Most DAW software allows you to place these SFX directly at specific SMPTE time code locations so you can match SFX perfectly to the visual cue locations programmed in your automation software.

**Step 6:** Use the software based DAW mixer to mix the above mentioned tracks to some “master show tape” format. If your final mix is stereo you will not even need an outboard mixer to accomplish this.

**Revise the Show!**

Changes in the timing of show segments is often the norm rather than the exception. In fact most producers who purchase show kits to edit the "canned" shows to fit their specific needs, DAWs make this a super-easy task. Just use the DAW waveform editing to cut out the segments you want to eliminate. Some DAW software even performs the splicing between two sections for you in one simple step!

**DAW Review**

Advantages of editing with a DAW are:
- Non-destructive editing allows experimentation
- Visual user interface
- Random access means no time is wasted winding (shutting) tape
- Software provides an instantaneous track log
- Only a minimum of outboard audio hardware is necessary in many cases

Disadvantages of editing with a DAW are:
- There is very little compatibility between DAWs from different manufacturers.
- You must record the final product to tape at some point.
- Cost of large capacity computer hard drives
- Archiving hard drives
- Some types of edits result in slow processing
- Slow screen updates

**ADAT and DA-88 Editing with Time Code**

Many sites around the planetarium community have converted soundtrack production and playback to ADAT and DA-88 multitrack DAT formats. The audio industry currently refers to these machines as modular digital multitracks (MDMs). The only way to edit any tape-based digital format (unless you transfer MDM audio to a DAW) is to use two machines linked with time code, preferably SMPTE time code. This can sound intimidating at first, but if you realize this is how video has been edited for 25 years it becomes apparent that the method actually must be very simple. Figure #3 illustrates a typical time-code based editing setup.

Time code editing always requires two machines. If your
facility has a backup machine you are pretty much ready to use time code editing. The two machines are controlled by an editor. In my opinion the best editors are the JL Cooper Cuepoint, The Alesis BRK, and the Fostex RMC-8. The Cuepoint will work with almost any MDM on the market.

Here is how the time code editing process proceeds:

Step 1: Use one track of an MDM to encode multiple takes of the narration/dialog tracks “cold”. Locate the first good sound bite you want to use. Park the tape at this point. To make this explanation easy, let’s assume this location is 1:01:00:00. This tape is now called the source tape.

Step 2: Insert a tape into the second MDM. All audio assembly will take place on this second tape. This is now called the master tape. Locate the time code location or address where you want this first sound bite to occur. Let’s assume this address is 1:00:30:00.

Step 3: Refer to Figure #4. The difference between these two addresses is -00:00:30:00. This is called the offset (device between the two machines). An editor allows you to capture the offset as the machines are playing. And, you can experiment with timings by changing the offset so as to slide the sound bites forward and backward before you record them on the master tape. Neat, huh?

Step 4: Recall the address where you want the sound bite to be recorded on the master tape. This is called the in-point of our edit recording. We could also select an out-point where recording would end. The editor will allow you to rehearse or preview the edit before you actually record on the master tape. This lets you experiment freely.

Step 5: By capturing and trimming offsets and record in-out points for each of your edits you can assemble an entire sound track on your master tape.

Time-code Editing Review

Advantages of time-code editing:

☆ Does not require high-capacity computer hard drives; tape is inexpensive
☆ The least expensive way to maintain multichannel inputs and outputs
☆ Editor can store all of your edits to facilitate revision

Disadvantages of time-code editing:

☆ Must have two machines
☆ Should have an editor
☆ Should run all audio through an external mixer Intimidating learning curve
☆ No visual waveform editing

The Perfect Setup

I think the best editing configuration uses both a simple DAW and an MDM with the two synchronized by time-code. The DAW provides the best editing scenario for narrative/dialog and SFX tracks, and for complete short length productions where the show mix is in a stereo format. For the multichannel sound enthusiast, however, the cost of a DAW that will provide forty minutes of 8-track recording with four to eight individual outputs is still relatively steep ... especially when you figure in the cost of large hard drives and the hassles of trying to download and upload soundfiles. Editing tracks on a low cost DAW and transferring them one or two at a time to the MDM allows you to use much smaller (less expensive) DAW hard drives and to keep the multichannel separation in your sound design. This is the method we use at Bowen Productions on a daily basis.

Feel free to e-mail or fax your questions and we’ll try to help you move painlessly into the digital age. Next issue: a “shoot-out” comparison of several digital audio workstations for the Mac and the PC.

(mathematical information on the probability that an object was detected or measured in a particular position. Einstein thought this was complete nonsense, and said that “God does not play dice!” To top it all, the probability of a particle makes a measurement of that particle uncertain at best. The Probable Universe begins with an exploration of those three principles of quantum mechanics, and Dr. Han leads the reader with ease and a steady sense of humor.

The reader is introduced to quantum mechanics through new technology made possible by this field, the scanning tunneling microscope (STM). This microscope can actually image the double helix of a DNA molecule, or the structure of the benzene molecule! Using a tungsten tip only a few atoms in size permits the direct manipulation of individual atoms. IBM scientists created the world’s smallest logo (660 billionths of an inch in length) using the STM. Tunneling technology explains how quantum mechanics could revolutionize electronics, making calculator-sized supercomputers possible.

Dr. Han takes the reader step by step into the reasoning and experiments that have revealed the wave-quality duality, the quantum theory of interaction between matter and radiation, called quantum electrodynamics (QED). Superconductivity and how tunneling also explains radioactivity is also covered, along with a glossary of terms and a bibliography on quantum mechanics, its uses in technology, and quantum electrodynamics for anyone wishing to delve into this fascinating but bizarre foundation of all matter in the universe.)
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?
What’s New

Jim Manning
Taylor Planetarium
Museum of the Rockies
Montana State University
Bozeman, Montana 59717

So—just how old is the universe anyway? Initial results from the Hubble Space Telescope’s identification of Cepheid variables in the galaxy M100 late last year (plus ground-based supporting data from galaxy NGC 4571 Cepheids), with a subsequent reestimating of the Hubble constant, lead some to suggest that the cosmos may be no more than eight to 12 billion years old. Problem is, others find old stars in the same cosmos that seem to be as old as 16 billion years. Hmmmm...

And just the other day, Science News carried a picture and article about Hubble’s discovery of a tiny companion for nearby Gliese 623 that’s just one-tenth the mass of the sun. Funny thing—I’d just seen a Hubble close-up of globular cluster NGC 6397 which revealed a decided lack of little bitty stars, suggesting to some that the universe just didn’t make stars smaller than one-fifth the sun’s mass. So what is little Gliese 623b? An exception? Or at last, one of those elusive brown dwarfs? Hmmmm again.

And as I write, I’ve just finished reading a press release about the apparent discovery of “naked” quasars—quasars that at first glance don’t show the surrounding accouterments of host galaxies. So what powers them? And why do they have close companion galaxies with which they seem about to merge? Hmmmm a third time.

Delightful quandaries; it’s what makes people like us want to get up in the morning. And it also keeps us hopping to keep up-to-date, as the new clear-eyed Hubble looks this way and that, upending our notions of the universe like a bull in a cosmic china shop.

Still, the Space Telescope Science Institute and some of our colleagues are doing their best to keep us informed and to help us keep our audiences informed, as the first several items in this month’s installment attest.

More From Hubble

Rob Landis in the Education Division of the Office of Public Outreach for the Space Telescope Science Institute (STScI) recently sent me another great package of stuff. Included was a new slide set called “Set 5—Expanding the Universe with the Hubble Space Telescope,” manufactured by Finley-Holiday Film Corp., Box 619, Whittier, California 90608, telephone (800) 345-6707, fax (310) 693-4756 for STSCI. Among its 20 slides are a number revisiting the Shoemaker-Levy 9/Jupiter encounter of last summer (most repeats from previous slides sets—but not all). Other images include some great Orion Nebula “proplyd” (“protoplanetary disk”) images (you’ll have seen them in magazines, but they’re nice to have as slides), that “best image yet” of Pluto/Charon, supernova 1987A surrounded by its three rings, a couple images showing the swirling disk of matter around the apparent black hole in the center of galaxy M87, distant galaxies, weird galaxies, and a quasar that is not naked. Very nice images to have; the set had barely arrived before I was raiding it for a luncheon slide presentation.

Rob also included a number of excellent prints, some in black-and-white and some in color, ranging from Jupiter and Uranus and the Iapetus-like “surface” of Titan to kinky planetary nebulae, M100 and one of its Cepheids, the “Cartwheel” galaxy, and assorted galaxies and galaxy clusters from as far away as 12 billion light years (assuming an age of 14 billion years for the universe). Great pictures all. Much of this is available through the Internet, I’m sure, but if you’d like good-quality slide images or prints to work with, you might contact the Office of Public Outreach, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, Maryland 21218 USA, telephone (410) 338-4562 to see what’s possible.

But that ain’t all…

Hubble Shows

Last issue, I made mention that Loch Ness Productions, P.O. Box 3023, Boulder, Colorado 80307 USA, telephone (303) 455-0611, fax (303) 455-1742, was out with its revised Hubble show called “Hubble Vision.” Since then, I’ve had a chance to hear the show tape, and it compares very well to their other shows—a straightforward, almost documentary-style presentation with tight, clear writing, solid narration, and a lovely rippy electronic score behind.

The show tape briefly covers the shuttle’s launch, problems, and repair, and then spends the bulk of its 34 minutes presenting a series of planetary, stellar, and galactic findings, including enough background to explain the significance of the images and data. Both pre- and post-repair discoveries are included, with the Jupiter/comet collision, the Orion Nebula “proplyds,” supernova 1987A, Eta Carinae, M100 images, black holes in galactic cores, and galactic mergers among the two dozen topics/objects presented.

My only quibble with the content is a reference to the Andromeda Galaxy as the “nearest” galaxy to the Milky Way, but it’s a very small point, and the show’s information is solid. The show tape comes with 130 slides, masked, in glass mounts, plus an annotated script, production notes, slide list, bibliography, source list, and background information. The show tape is available in cassette, 7.5 inches-per-second “half-track,” or 7.5 ips “quarter-track.” The cost of the show package is $595 U.S. Narration-less soundtracks for translations, SPICE automation system data files, and duplicate slide sets are all available for additional fees. Nicely done!

I’ve also received a press release and a brochure from the Henry Buhl, Jr. Planetarium at the Carnegie Science Center, One Allegheny Square, Pittsburgh, Pennsylvania 15212 USA, about another Hubble show that will be available to the planetarium community: a collaboration between Buhl and the Space Telescope Science Institute called “Through the Eyes of Hubble.” The program will be premiering at Buhl as you read, where, according to the press release, the 40-minute program narrated by actress Gates McFadden (Dr. Crusher from the “Star Trek” series) will use computer graphics, multiscreened video projections, and special effects to present Hubble findings. It will be available for sale thereafter.

I’ve had a chance to peek at the preliminary script, and it looks like it will be a good show. It includes a bit of historical perspective from Galileo to Edwin Hubble and his confirmation of “island universes” using Cepheid variables, covers the Hubble repair mission, and organizes selected Hubble findings largely along the lines of stellar and cosmic evolution. It gives a generous amount of time to Shoemaker-Levy 9 and Jupiter, and discusses the Orion Nebula and its proplyds, Eta Carinae, the Crab Nebula, the 1987A supernova, M87 and its apparent black hole core, remote galaxies, and M100’s Cepheids and the implications for the size and age of the universe. And there is background aplenty to help explain the significance of Hubble’s findings.

The program is available in a non-video version that will include a slide set, audio tape, annotated script and production notes for $395 U.S., and a video version which includes the above plus a CAV laser disk containing video special effects, footage of the service mission, and Hubble still images, for $595 U.S. Buhl indicates in their brochure that special additions (such as SPICE cue files, Digistar files, additional slide sets or video disks, 8-track versions of the tape, etc.) can be discussed.

It goes without saying that both “Hubble Vision” and “Through the Eyes of Hubble”
are destined to go out-of-date almost immediately given Hubble's current break-neck pace of discovery. Which is why you'll want to keep current on Hubble images so you can add the shows with the latest updates; I suspect that the production notes in both cases will encourage you to do so.

From what I've seen or heard, these are two good shows, each with its own approach to similar material, from two respected sources, on a hot topic. My goodness—how can you go wrong? Check them both out—and enjoy.

But that still ain't all...

**Electronic PictureBooks**

The Space Telescope Science Institute is also making available a series of "Electronic PictureBooks" through its Special Studies Office which present small and neatly organized sets of color images and information on contemporary astronomy and planetary science research—including the discoveries of the Hubble Space Telescope. The products are produced by a non-profit, NASA-supported program called Exploration in Education (ExInEd), whose goal is to create ways to assemble and distribute the results of scientific research and to "relate space science and exploration to basic teaching and learning."

And what a great idea! Last year, I received sample copies of the PictureBook titles currently available, both in diskette form and all together on CD-ROM. The subject matter included Hubble images, results of the Hubble's Goddard High Resolution Spectrometer, Viking Images of Mars, Magellan images of Venus, a set of images on the solar system as a whole, views of earth from the space shuttle Endeavor, an Apollo 11 retrospective, volcanic features in the solar system, a "World Factbook" of information on the nations of the world, and even a speculative program on the supposed Yucatan impact of 65 million years ago and its suggested ramifications illustrated by space artist/scientist Bill Hartmann.

These PictureBooks, authored by space scientists, engineers, and astronauts, are produced as Hypercard stacks and are designed for use with Macintosh computers with 8-bit (256) color displays, and require System 7.0 or later, Hypercard or Hypercard Player version 2.1, at least 2.5 megabytes of free RAM, and sufficient hard disk space to hold the data (up to 12 megabytes for the largest PictureBook—or a CD-ROM drive if you're going for the data in that form).

Each book has a basic data base of color images (most have between 20 and 40) with descriptive text, easily manipulated by a series of screen buttons you can click on with a mouse. The color images look sharp on the computer screen (I presume they are of screen resolution only) and the accompanying text was very good. The PictureBooks ran rather slowly on my computer, especially when it was trying to draw a picture, but then our color Mac is four years old (ancient by computer standards) and quite basic. When we had one of our student assistants run the CD-ROM version on his more capable machine, the programs responded quite promptly.

These programs would be very useful in the classroom, the computer lab, the gift shop, or for a leisurely afternoon of surfing through the cosmos as we know it. (They can also be customized for kiosk touch-screen display.) And you may use, copy, or distribute them for non-commercial purposes as long as you don't change them, says the brochure. The numbers of images are rather small in most cases, but with CD-ROM capability, perhaps that will change. According to the information I received, the CD-ROM versions will soon also be IBM compatible if they aren't already.

The PictureBooks are available through the Astronomical Society of the Pacific and can be found in ASP's current catalog, priced from $9.95 to $39.95 U.S. for the diskettes, and at $99.95 for the CD-ROM. (Discounts are offered for ordering in quantity from STSCI; I presume the same would be true for ASP.) These products can also be obtained from ExInEd's bulletin board, from American Online, or via Internet; for instructions (or more information), contact Dr. Robert Brown, Special Studies Office, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, Maryland 21218 USA, fax (410)516-7450, Internet: rbrown@stsci.edu.

**Planetarium Technology Marches On**

The technology does keep rolling along, as several new developments among planetarium manufacturers last year demonstrated.

Evans & Sutherland announced the development of Digistar II, a faster, more capable, and more user-friendly version of Digistar. The new system employs a computer workstation (the Sun SPARC workstation) and a smaller graphics processor to create and play back programs through their current LEA projector. Among its new features will be a graphical screen interface with on-screen function buttons, on-line documentation, compact design, and fewer electronic components to increase reliability and maintainability. The first copy of the Digistar II is scheduled for installation at the London Planetarium about the time you read this. For more information, contact Jeri Panek at Evans & Sutherland, 600 Komas Drive, Salt Lake City, Utah USA, telephone (801) 582-5847, fax (801) 582-5849.

According to information I picked up at last summer's conference in Cocoa, the first copy of Carl Zeiss Jena GmbH's Universarium Model VIII, designed for domes from 17.5 to 30 meters (57 to 98 feet) in diameter, is scheduled for installation at the "City of Sciences" space science center in Valencia, Spain, about the time you read this. The computer-controlled Universarium has a single starball projecting 9,000+ stars using fiber optics technology to increase brightness, reduce star diameters, create an innovative scintillation effect and offer natural or exaggerated star colors. It also has separate sun/moon/planet projectors among its many features.

Fiber optics technology will also be employed in Zeiss' new Starmaster projector for medium-sized domes. My information says that the new design will be offered in a standard configuration for 10 to 18 meter (33 to 59 foot) domes, but will also be available in versions suitable for both smaller and larger dome sizes. It will feature a very compact starball, many of the control features of the Universarium, and like the Universarium, can be used in horizontal domes or domes tilted up to 30 degrees. The Starmaster is scheduled to debut at the end of 1995.

For more information, contact Carl Zeiss Jena GmbH, Zeiss Gruppe, Astronomische Geräte, D-07740 Jena, Germany, telephone +49-3641-643133, fax +49-3641-642023, or your local Zeiss representative. (In the U.S., that would be Pearl Reilly at Seiler Instrument & Manufacturing Co., 170 E. Kirkham Avenue, St. Louis, MO 63119, telephone (800) 489-2282 or (314) 968-2282, fax (314) 968-2637.)

At the IPS conference in Cocoa last summer, attendees had an opportunity to see Minolta Corporation's Infinium projector, capable of projecting up to 28,000 stars, in operation (along with the Evans & Sutherland Digistar). At that conference, Minolta also announced the development of a new compact planetarium projector called Cosmoleap. Designed for domes of 7.5 to 12 meters (25 to 40 feet) in diameter, Cosmoleap can project between 3,900 and 6,550 stars, can simulate the movement of the starfield as seen from different planets and moons of the solar system, and has manual and automatic control modes among its features. For further information and an availability date, contact your local or regional Minolta representative. (In the U.S., that would be Kosuke Sasaki, Planetarium Division, Minolta Corporation, 101 Williams Drive, Ramsey, New Jersey 07446 USA, telephone (201) 934-5347, fax (201) 818-0498.)
July 24-28. The first emphasizes naked-eye dome was installed last year in Toyama City. The model's features include touch panel screens, computer-assisted operations, separate sun/moon/planet projectors, and 25,000 projected stars. I find GOTO's intelligent functions particularly interesting: "Parameterization" allows several functions to be assigned to a single knob, as in a sun; the "Today" function can calculate and update sun, moon, and planet positions based on time and date; and the "Time Warp" function sets the sky for a chosen date.

For additional information on GOTO products, you may wish to contact Masao Yoshiga, Sales Manager of the International Business Department, GOTO Optical Manufacturing Company, 4-16, Yazaki-cho, Fuchu-shi, Tokyo 183, Japan, telephone 0423-62-5312, fax 0423-61-9571.

With apologies to Spitz, Inc., I'm not aware of new products, but its newsletter indicates that the System S12 system with automation and options is a popular choice both for new facilities (such as the 10-meter (33-foot) planetarium in Safat, Kuwait) and for replacing aging Spitz facilities installed in the 1960s. Also, George Reed is "at it again" in a recent Spitz brochure announcing that he'll conduct two Summer Institutes in Planetarium Education the weeks of July 17-21 and July 24-28. The first emphasizes naked-eye astronomy and the second covers the educational use of the planetarium as a classroom. Cost for each is $290 U.S. For more information, contact Spitz, Inc., P.O. Box 198, Chadds Ford, Pennsylvania 19317 USA, telephone (610) 459-5200, fax (610) 459-3830.

I've also learned recently that Learning Technologies Inc., 59 Walden Street, Cambridge, Massachusetts 02140, telephone (800) 537-8703, fax (617) 547-2686, the manufacturer of the Starlab portable planetarium, has two new projection cylinders out. One shows Chinese constellation figures, the other depicts constellations from African mythology, including ancient Egyptian, Dogon, Masai, Taureg, Bushmen, and other African cultures. These add a nice new dimension to an array of cylinders that project everything from the "standard" starfield, the "urban" starfield, and Greek and Native American constellation figures to celestial coordinates, plate tectonics, ocean currents and the inside of a biological cell—plus a transparent cylinder for making your own projections. All cylinders sell for $470 U.S. except for the $210 transparent one. For more information or to order, contact the company above or your regional Starlab representative.

**Video Dreams of Flight**

Recently I viewed the two latest volumes of Air & Space Smithsonian's "Dreams of Flight" video series chronicling the history of flight, available through SunWest Media Marketing Group, Inc., 1801 Oakland Boulevard, Suite 315, Walnut Creek, California 94596 USA, telephone (510) 906-8118, fax (510) 539-3306. And they're very good.

The original three-volume "Dreams of Flight" series was produced in 1993, and covers aviation history from a mostly American perspective from the earliest attempts through the Wright Brothers, bi-planes, barnstormers, World War ages, the advent of commercial airlines and jets, test pilots, the X-15, and the Space Race, carrying through to Apollo and the space shuttle program. It features wonderful vintage stills and historical footage as well as modern recreations of old-model planes, and lots of short interview snippets with people ranging from aviation historians and pilots to astronauts.

Volumes IV and V were added in 1994 in time for the 25th anniversary of Apollo 11, and are basically an elaboration of the last half of volume III, which covers the manned space effort. Volume IV is titled "To the Moon" and does a very nice job of documenting the Space Race and the Apollo 11 mission. It repeats practically everything in the last half of volume III, but adds a good deal more. There's fine historical footage from both the early American and Soviet manned efforts, as well as plentiful imagery from the Apollo 11 missions. "Talking heads" abound—astronauts, NASA officials, space historians, and lots of Walter Cronkite—but they all provide interesting reminiscences of those early heady days of the Space Age. Even Leonard Nimoy makes a cameo—without the ears. It all works well, with good pacing, a clean look and a nice feel.

Volume V, "Beyond the Moon," picks up where volume IV leaves off, covering the remaining moon missions, the space shuttle era, and speculations about future efforts including the space station, a return to the moon, and a mission to Mars. It's format and style are very similar to the other volumes—and even William Shatner gets a word in here.

I enjoyed the entire series. The production values and editing are good, the interviews add a human touch, and it documents the whole business of doing what the birds do—and more—very well indeed. The video boxes are attractive—the last two volumes sporting beautiful Robert McCall paintings—and would make an excellent item for your gift shop's video shelf. Individually, the videos retail at $19.95 U.S.; the first three volumes as a set sell for $59.95, and the last two volumes as a set sell for $39.95—with a 50% discount for wholesale purchases. It's a deal.

For further information, contact SunWest Media Marketing as given above.

**Music, Music, Music**

Some interesting albums have tumbled into my in-box in recent months, including three from composer Mark Dwane of Westlake, Ohio. His instrument of choice is the MIDI guitar, and his inspiration comes from myths ancient and modern. And it makes for a pleasant mix.

"The Monuments of Mars," which came out in 1988, takes its cues from the face-shaped butte and pyramid-like features on the Red Planet—and the fanciful notion of some that these features are remnants of an ancient Martian civilization. It may be science fiction, but it's fun to revel in the idea with this music as an accompaniment. The album's nine selections (almost 40 minutes of music) are largely atmospheric and moody in tone, sometimes brooding, sometimes rhythmic and relentless, sometimes poignant, conjuring up images of lonely ruins on a dead planet whose glory is past.

"Angels, Aliens, and Archetypes" from 1991 has a more rhythmic character, its nine selections and nearly 45 minutes exploring a variety of themes from "Saucers over Nazca" to "Spirit of the Rainforest."

The most recent album, "The Atlantis Factor" from 1993, returns to a single theme—that of the myth of the water-logged missing continent. This album is also more rhythmic, with a rock feel. There are lots of good melodies and good beats among the nine pieces over another 45 minutes of music, with an ominous ending as Atlantis slides beneath the waves.

I have but a layman's ear, but I enjoyed these. You can find them in Loch Ness Production's latest catalog, selling for $15 U.S. apiece for compact disc, $10 for cassette, plus $2 handling within the U.S., $5 handling outside. Watch for Mark's next album, "Paradigm Shift," coming in September.

Another musical Mark is composer Mark Mercury, who's been around a while composing for movies and cartoons and creating scores for planetarium shows from San Diego to New York. I recently listened to his album "Music of the Domes," produced in 1992, which samples some of the music he's written for planetarium programs. The 45 minutes of musical selections cover a wide range of moods in a lilting, electronic style—good background stuff for planetarium flights of fancy. It's easy, pleasant, and enjoyable listening.
The album is available as a cassette from Blue Chromium Records, P.O. Box 50358, Pasadena, California 91115 USA, telephone (818) 791-1480. No price is listed, but I suspect it's in the neighborhood of $10 U.S. Mark will soon be releasing a compact disc album entitled "Soliloquies," including an hour of new compositions laced with recited poems about space. Watch for it.

I've also recently listened to an 8-minute sampler from Brian Rand of Zodiac Sound Production, Box 148, 3460 Birkerod, Denmark, telephone +45 45-822-772, who writes the musical scores for the Tycho Brahe Planetarium in Copenhagen and has also composed for the Orion Planetarium in Judland. The sampler included a couple of electronic selections and a vocal piece; the music had a pensive, almost bittersweet style that I liked, one with a nice, understated beat. Brian gave no indication of the availability of his music, but if you'd like to have a listen yourself, contact him at the address above.

From JHE

Last issue, I made mention of a new 10-minute program called "Welcome to the Universe," from Joe Hopkins Engineering, P.O. Box 14278, Bradenton, Florida 34280 USA, telephone (800) 543-5960 or (813) 758-6696, fax (813) 753-1482, designed to offer a brief, broad view of the universe for use as an introduction to a live sky show, short planetarium demonstrations, and so on. Since then, I've had an opportunity to hear the soundtrack; it offers a quiet, reflective presentation with low-key narration and scoring—sort of like lying out under the stars on a clear night, contemplating the universe. For a listen, contact Joe Hopkins as given above.

Joe also sent me some examples of another JHE product: a kit of solar system multi-slide panoramas of the sun, nine planets, and the asteroid belt, with a ring overlay for Saturn. From the samples I received, these will be limb views (except for the asteroids), colorful and accurately rendered. The artwork is great, and I assume it's more of Joe Tucciarone's fine work. Check these out; from what I saw, they're excellent.

JHE additionally sent me a few slides showing its new Flex-Track cove lighting system illuminating a dome with a planetarium projector silhouette in front. Joe says the colors are really as deep and rich as they appear on the slides—and the slides have marvelous color. If you're in the market for cove lighting, check this out, too.

In My Backyard

If you're on the lookout for a children's program, consider "In My Backyard," a production of the Alberta Science Center/Centennial Planetarium, Box 2100, Stn. "M," Loc. #73, Calgary, Alberta, Canada T2P 2M5. It's absolutely delightful.

The 35-minute program (whose show tape I've heard) is aimed at youngsters ages 4 to 7 and talks about the adventures you can have in your own back yard—from studying plants, animals, and insects, to watching the change of seasons, to finding things in the sky. The program includes songs, poems, and ways for children to respond. It's skillfully narrated by award-winning children's entertainer Fred Penner (with help from Arnie the Arrow) who has a TV program called "Fred Penner's Place" on the Nickelodeon channel; he has a wonderful, natural conversational style that doesn't talk down.

A great deal of astronomy is covered, from the cause of seasons, night and day, the planets, the moon, meteors, constellations (with a charming story variant about why the sky bears long tails), all with simple and appropriate explanations.

It's well-written, well-crafted, the songs and background music are great—and it comes with an excellent booklet of 25 pages of activities, the moon, meteors, constellations (with a charming story variant about why the sky bears long tails), all with simple and appropriate explanations.

It's well-written, well-crafted, the songs and background music are great—and it comes with an excellent booklet of 25 hands-on activities suitable for the backyard, the kitchen, or the classroom. Included are simple but effective experiments with wind, rain, weather, making rainbows, planting vegetables and terrariums, watching for animal signs, making sundials, watching for meteors, finding constellations and making your own, crafting a solar system mobile, and understanding the cause of day and night. Some good ideas here with a minimum of muss and fuss.

The "In My Backyard" show kit costs $1,200 U.S. and contains the soundtrack (in 8-track half-inch, 4-track quarter-inch, DAT, or cassette formats), 160 plastic-mounted slides and four panoramas (with all-sky format available for some visuals), annotated script, production notes, and the activity booklet. For more information, a preview copy of the show tape, or to order, contact producer Susan Cannon at the above address. Good show!

Following the Drinking Gourd

Another children's program for a slightly older age group (5 to 10) is available from the New Jersey State Museum Planetarium, 205 West State Street, CN-530, Trenton, New Jersey 08625 USA—the show is a coproduction of it and the Raritan Valley Community College Planetarium. It's called "Following the Drinking Gourd," based on the book of the same name by Jeanette Winters, about how American slaves in Alabama and Mississippi in the 1800's used the Big Dipper, or "Drinking Gourd," to help guide them north to freedom. The directions for an escape route were encoded in the song "Follow the Drinking Gourd" and taught to the slaves, who followed the directions northward where members of the "Underground Railroad" helped them escape to the northern United States and Canada. It's been the subject of articles by Gloria Rall in recent issues of both The Planetarian and Sky & Telescope magazine; Gloria is the executive producer of the program.

The show package I've examined is nicely simple and remarkably versatile. First, the entire show has been produced as a 22-minute videotape with full visuals, narration, and music—so you can present it without a planetarium if you wish. The show begins with some basic star identification leading to the Big Dipper pattern and its significance for the slaves. Next, the song is examined one stanza at a time to show how it could be used to follow various rivers and the Big Dipper north to Ohio and then on to Canada. The complete song is then performed with the words on the screen for singing along. And the final section is adapted from the Winters story of a slave family using the song to escape north to Canada, using Winters' colorful and wonderfully distinctive paintings to illustrate the story. (Live actors are faded in dimly at intervals in the story, arranged to roughly match the painting displayed at the moment in a sort of tableau effect. It's clever idea—connecting the story with real people.)

In addition to the videotape, you get a set of 100 slides to adapt the program to your planetarium—with instructions for copying the videotape soundtrack onto another tape for use in your planetarium if you wish. The package also comes with an annotated script, production notes, instructions for creating a rainbow veil for the program, and an educator's guide with background information and activities including the cause of the seasons, how the circumpolar sky moves and changes, the effect of latitude change, and useful worksheets.

So you can run the show as a video presentation (both 1/2-inch and 3/4-inch formats are available), you can present it in a Starlab with a single slide projector and a tape recorder, you can adapt it for your planetarium using a combination of slides and videotape, and you can make it a part live/part taped show (if you want to do the star identification live, for example).

My only real quibble is that the early part of the videotape I received had a few rough spots in transitions (the sunset scene, for example), and the video starfield is a little crowded and too uniform in star brightness.
to easily pick out patterns until the patterns are highlighted and the stars made brighter as they're discussed. But you'd use your planetarium to handle these sections anyway, and the rest is very nicely done.

The show concept is first-rate, the treatment is good, the show length and presentation of concepts seems appropriate, and the Winters artwork is wonderful. And the cost of the package is just $150 U.S. I liked it. Do check it out; it could fill a niche for you.

Treasures of Deep Space

Look at the stars! look, look up at the skies! O look at all the fire-folk sitting in the air! The bright boroughs, the circle-citadels there! Down in the dim woods the diamond delves! the elves'-eyes!
The grey lawns cold where gold, where quick-gold lies...

So wrote Gerard Manley Hopkins in 1877 in the poem "The Starlight Night." And so are these words appropriately emblazoned across the top of a lovely new poster entitled "Treasures of Deep Space."

This 24- by 36-inch (61 cm by 86 cm) wall poster comes from MindMatter Publishing, 9685 Genesee Avenue, Suite G-2, San Diego, California 92121, telephone (619) 558-9233, fax (619) 558-8490. The company is about a year old and is run by Stephen Peters, who served as director of the Books and Products Division at Sky Publishing Corporation for three years. MindMatter is "dedicated to producing thought-provoking science books and products for the consumer market," according to my information. If such is the case, they're on the right track with this poster.

Featured are 20 color images in assorted sizes representing the three main classes of deep-sky objects: nebulae, star clusters and galaxies. Each image is accompanied by an explanatory caption. It's a feast for the eye, and perfect for the classroom, the gift shop, and anyone who likes to look at the cosmic menagerie that exists beyond the solar system. The poster sells for $9.95 (a steal), with a wholesale price of $4.90. Contact as given above for further details.

Assorted Bits

Speaking of feasts for the eyes, take a look at the 1994-95 catalog of the Astronomical Society of the Pacific, which arrived too late for a mention in the last issue but is definitely worth a mention now. It's chock-full of all sorts of astronomically-related delights, including books, videos, computer software, posters, slides, audio tapes, games and novelty items, and always something new. If you don't have a copy, contact the Astronomical Society of the Pacific, 390 Ashton Avenue, San Francisco, California 94112 USA, telephone (800) 335-2624, fax, (415) 337-5205.

And if you want to see deep-sky objects directly, you may be interested in a CCD camera from Integrated Scientific Imaging Systems Inc., (formerly Compuscope), 3463 State Street, Suite 431, Santa Barbara, California 93105 USA, telephone (805) 966-7179, fax (805) 966-6693, E-mail: info@compuscope.com. Their CCD 800 line, including an eight-position filter wheel and 32-bit image processing software, starts at $3,895 U.S. For details, contact the company.

If your taste runs to older instruments, you may wish to consider a product offered by Thomas and Celina Pederson, 1879 Marshall Avenue, St. Paul, Minnesota 55104 USA, telephone (612) 645-1782, fax (612) 426-3012. According to information I've received, for $995 U.S., they'll make you a recreation of a 12th century Moorish astrolabe like the one they were commissioned to make by the Royal Museum in Saudi Arabia. It's a beautiful piece, made of solid brass, with a translation of the Arabic, operating instructions, manufacturing story, history, and presentation case included. Contact for more details.

Finally, Hansen Planetarium is offering a new poster called "Europe at Night," a mosaic of satellite images of the full continent outlined and punctuated in city lights. It's a dramatic view, with a reference guide included, and is available in laminated as well as regular style. I don't have the price, but you can get that information and other details from Hansen Planetarium Publications, 1845 South 300 West, #A, Salt Lake City, Utah 84115, telephone (800) 321-2369 or (801) 483-5400, fax (801) 483-5484.

Congratulations ...

... to IPS's new and renewed officers, elected in the end-of-year balloting: President-Elect Thomas Kraupe, Secretary Lee Ann Hennig, and Treasurer Keith Johnson. Good people for a good organization; all best wishes and Goodspeed.

Finally ...

I'm out of time and space to delve into the burgeoning world of laser technology this issue; I'll have a go at it next time.

Until then ... what's new?

Everybody is born curious. Everybody wants to see this universe. Everybody wants to understand this universe. They're just waiting for someone to present it to them.

—John Dobson

Those who honestly mean to be true contradict themselves more rarely than those who try to be consistent.

—O. W. Holmes
Regional Roundup

Steven Mitch
Benedum Natural Science Theater
Oglebay Resort and Conference Center
Wheeling, WV 26003
(304) 243-4034
(304) 243-4110 fax
CompuServe 72467,2051

Kudos to all who sent in material for this issue of Regional Roundup! I can only pass on to your colleagues what you send to me. Please mark your calendars for Monday April 10th which is the deadline for articles to be included in the next issue. Thanks!

Association of Mexican Planetariums (AMPAC)

After many months of preparation, AMPAC held its first international meeting outside Mexico. The meeting was held in conjunction with the Iberoamerican Planetarium Organization (OIP) meeting last October 31st, and was hosted by Ormis Durval, Director of the Rio de Janeiro Planetarium in Brazil. A total of 33 participants from 22 planetariums represented 3 Iberoamerican countries: Brazil, Mexico and Columbia.

By-laws of the organization were reviewed for corrections and additions. The current General Secretary of the organization, Ing. Jose de la Herran will produce the final draft of the by-laws within six months and the organization will finally become official. Other business included the election of other officers and representatives from various Iberoamerican regions.

Several papers were presented during the conference that stressed the responsibility of planetariums to forward vital messages concerning conservation and the environment of Planet Earth to the public. Other papers considered the planetarium as an important tool for teaching science, to look into ways to update planetarium programs and equipment, and to fulfill the educational objectives of the Iberoamerican planetariums.

A post conference tour was arranged for the group to visit Foz de Iguazu and its incredible waterfalls. On November 3rd, the group visited Wanda, Argentina, a small mining town about 60 miles from Iguazu to observe what turned out to be a spectacular solar eclipse. The post conference trip concluded in Buenos Aires, Argentina, with a visit to the Galileo Galilei Planetarium where host Ing. Antonio Cornejo hosted the group and presented a special program to the group.

The next OIP meeting will take place in either Valencia, Spain or Campinas, Brazil in 1996. The 1998 OIP meeting will be in Medellin, Colombia and will be hosted by Gabriel Gomez, Director of the Medellin Planetarium. The meeting will coincide with the February 23rd total eclipse which will be visible in northern Columbia.

The next AMPAC meeting will take place in May 1995 at the Pachuca Planetarium, Pachuca, Hidalgo, Mexico.

Council of German Planetariums (CGP)

The Council of German Planetariums was founded in Mannheim on May 3, 1987 to integrate the common interests of several planetariums in the region.

During the Fall 1994 meeting at the Zeiss Planetarium der Carl-Zeiss-Stiftung AM in Jena, two new members were added, bringing the total CGP membership to 19 institutions.

The host for the conference was Dr. Hans Meinl, Planetarium Director. Dr. Meinl also serves as the Speaker for the Council of German Planetariums.

The Spring session of the CGP will be April 30 and May 1 at the Kieler Planetarium in Kiel, Germany and will be hosted by Mr. Eduard Thomas. For additional information, contact Mr. Thomas at: Planetarium Kiel, Alte Chaussee 32, D-24107 Kiel, Germany.

Before the unification of the Federal Republic of Germany and the German Democratic Republic, there were about 80 planetariums, 41 in the in the GDR. The destiny of a number of planetariums in the former GDR is uncertain. Some were closed due to financial reasons and others for unknown reasons.

The technical capabilities of the 19 CGP members runs the gauntlet ranging from homemade equipment to the ultramodern Zeiss MK-7 projector. Ancillary equipment ranges from single-slide projector, manual operations to sophisticated, computer-controlled multimedia systems.

Prior to World War II, there were 12 large planetariums in Germany, the first of which opened on May 7, 1925 at the German Museum in Munich. Only the planetariums in Hamburg and Jena survived the war.

Great Lakes Planetarium Association (GLPA)

The Great Lakes Planetarium Association held their 30th Anniversary Conference at the Benedum Natural Science Theater located at the Oglebay Resort and Conference Center in Wheeling, WV, October 26-29th. One hundred and fifteen delegates from 19 states attended the conference hosted by Steven Mitch and his staff.

Conference highlights included an assortment of excellent papers. Workshops included a Make-it, Take-it workshop conducted by Dayle Brown of Pegasus Productions; a Starlab workshop conducted by Dayle Brown, Sue Reynolds of the OCM, B.O.C.E.S. Planetarium and Georgia Neff of the Lakeview Museum of Arts and Sciences; a workshop entitled "Equal Opportunity Planetariums-Meeting the ADA Challenge", conducted by Rick Pirko of the Youngstown State University Planetarium and David Hurd of the Edinboro University of Pennsylvania; and an audio workshop conducted by Jeff Bowen of Bowen Music Productions entitled "The Smart of Noise-Using Low-cost Computer Based Recording and Editing to Assemble and Mix Planetarium Soundtracks."

Four excellent speakers were in attendance for the 3-day event. Dr. William Cassidy, Professor of Geology and Planetary Sciences at the University of Pittsburgh, opened the conference with a talk entitled "The Frozen Meteorites of Antarctica"; Dr. James B. Kaler, Professor of Astronomy at the University of Illinois, Urbana/Champaign gave his annual "Astronomy Update" lecture which covered all of the wonderful new discoveries and developments during the past year; Dr. Derrel Hoff, Adjunct Professor of Physics and Science Education at Luther College, Decorah, Iowa, gave the Armand Spitz Lecture following the GLPA banquet. Dr. Hoff's speech was entitled "The Planetarium's Role in Educational Reform," and it included an interactive session in which all the people at the banquet participated; and Mr. Ray Villard, Head of Educational and Public Affairs for the Space Telescope Science Institute at Johns Hopkins University in Baltimore, MD. Mr. Villard's talk was entitled "Hubble Space Telescope: New Worlds of Discovery," and it included a lot of new Hubble images, including the spectacular photos of Comet Shoemaker-Levy 9 impacts with Jupiter.

Other highlights included a Vendors Showcase, a visit to the new Challenger Learning Center at Wheeling Jesuit College, two spectacular nights of sky observing which utilized the Cleveland Regional Planetarium Association's Mobile Astronomy Observatory which was brought to the con-
ference by Wes Orloff of the Euclid City Schools, Cleveland, Ohio, and the World Premier of the new Loch Ness Productions planetarium program "Hubble Vision," presented by Mark C. and Carolyn Collins Petersen. And of course, a conference such as this would not have been complete without the gracious hospitality of Joe Hopkins of Joe Hopkins Engineering. Much was shared, discussed, and argued in the suite after hours to the benefit of all who shared the experience.

And finally, the success of the conference must be shared with the tremendous support of the numerous vendors and corporate sponsors.

The 1995 GLPA conference will be held at the new Roger B. Chaffee Planetarium in Grand Rapids, Michigan, October 25-28th. Hosts for the conference will be David DeBruyn and Gary Tomlinson. Additional information about the upcoming conference will appear in future articles.

The Illinois State Meeting will be held at the Strickler Planetarium of Olivet Nazarene University in Kankakee on Saturday, April 8, 1995. The host for the meeting will be Troy Stoneking.

Carl Wenning, Director of the Illinois State University Planetarium announces that his facility recently received a $300,000 grant from the Illinois State Board of Education to be used for the enhancement of science teacher training at ISU and the improvement of science literacy in high school classrooms. Some 40 teachers will be involved in the two-year process.

The Indiana State Meeting will be held at the P-H-M Planetarium in Mishawaka on Saturday May 6, 1995. The meeting will be hosted by Art Klinger.

Dayle Brown of Pegasus Productions in South Bend, Indiana has begun a new leasing program whereby teachers are taught to use the Starlab equipment for one week intervals.

Dan Smith has retired after a long an successful career as the planetarium director of the Kennedy Middle School in South Bend.

The Michigan State Meeting will be held at the Abrams Planetarium in East Lansing on Saturday, May 13, 1995. David Batch will be the meeting host.

The Chaffee Planetarium in Grand Rapids, Michigan has unveiled its new 50-foot Digital Planetarium and is showing off its new video capabilities with Sky Dance, an original production.

The Kalamazoo Planetarium in Kalamazoo, Michigan will close at the end of June 1995. Their new 50-foot facility is undergoing construction and is scheduled for opening in November of 1995.

The Ohio State Meeting will be held at the Sidney Frohman Planetarium in Sandusky, Ohio on Saturday April 8, 1995. Dick Speir will be the host for the meeting.

The Wisconsin-Iowa-Minnesota State Meeting will be held at the University of Northern Iowa in Cedar Falls and the Grout Planetarium in Waterloo, Iowa on Friday and Saturday, April 28th and 29th, 1995.

Last August, the Elgin, Illinois Planetarium (officially known as the Elgin National Watch Company) was entered into the National Register of Historic Places. According to Director Gary Kutina, the observatory was built in 1910 by the Elgin National Watch Company for the sole purpose of telling time from the stars. This observatory is the only time observatory in the world that was owned and maintained by a watch manufacturer. It contains a transit telescope, a chronograph, a shortwave radio transmitter, and three German-made clocks known as Reiflers. From 1910 to 1958, the observatory was part of several historic events, the most noteworthy of which was the turning of the outside lights at the 1933-34 Chicago World's Fair. In 1960, the watch company deeded the observatory over to School District U-46. Three years later, a 24-foot diameter planetarium was added to the facility. Approximately 14,00 student from the district will visit the planetarium and observatory this year. To celebrate this achievement, the city of Elgin will feature the observatory on its vehicle sticker in 1995.

Italian Planetaria's Friends Association

The 9th National Meeting of Italian Planetaria was held at the Planetarium/Observatory of Crespano del Grappa, near Treviso, Italy. During the meeting, it was decided that the "Day of Planetaria" will be held on March 19, 1995 in Italy, France and the Eastern European countries of Poland, Slovakia, Ukraine and the Czech republic. The formula for arriving at the "Day" for each year is determined by the Sunday just before or just after the vernal equinox. The "Day" for 1996 will be March 24th.

The meeting in Crespano was also devoted to the presentation of the prototype of a small and inexpensive planetarium instrument built and distributed by Giampaolo Gambato. This new model will be presented during the European meeting of portable planetaria that will be held in Brescia and Lumezzane on October 13-15, 1995. The meeting, organized in collaboration with the IP.S Mobile Planetarium Committee, will present workshops conducted by American, French and Italian planetarium operators.

The 1994 national meeting of the Italian Planetaria, a proposal was developed for the opening of the National Archive of Planetaria. The site will be the Serafino Zani Study and Research Center, located in the small industrial town of Lumezzane, 15 kilometers from Brescia. The archive will include foreign publications about planetaria and will be managed by the Italian Planetaria's Friends Association. It is important that each country have a center where publications and information about the planetaria be located.

The Italian National Archive will contain:

- a) publications and information about Italian Planetaria,
- b) publications edited by Italian Planetaria's Friends Association,
- c) Bibliography about planetaria,
- d) Documents about planetarium management,
- e) Publications of the International Planetarium Society and publications of regional planetarium associations throughout the world,
- f) Catalogues of planetarium manufacturers and suppliers,
- g) Collection of publications, plans, photos and slides about the buildings, the projection rooms, exhibits of planetaria and science centers,
- h) Audio collections of show recordings, lectures and shows for the sight impaired.

Each year, the Archive will publish the list of the publications that are available. The Archive will be open in time for the European Meeting of Portable Planetaria.

Middle Atlantic Planetarium Society (MAPS)

The 1995 Middle Atlantic Planetarium Society Conference will be held May 17-20 at the Raritan Valley Community College Planetarium in Somerville, New Jersey and will be hosted by Planetarium Director Jerry Vinski, Lonny Buinis, and the Garden State Planetarium Association (GASPRA).

One of the primary aspects of the conference will be a "Starlab Conference" on May 19th. The mini-conference is designed for classroom teachers who use the Starlab and will focus on advanced lessons for all grade levels, hands-on workshops for classroom activities, workshops demonstrating high and low-tech accessories for Starlab, and developing an astronomy curriculum. Experienced Starlab teachers will serve as presenters. Approximately 60 classroom teachers from MAPS region will be invited and will be a wonderful opportunity for them to network with other users and planetarians and to share lesson ideas.

For additional information, contact Jerry Vinski or Lonny Buinis at: Planetarium Department, Raritan Valley Community College, P.O. Box 3300, Somerville, New Jersey 08876 or call (908) 231-8805.
Pacific Planetarium Association (PPA)
The Pacific Planetarium Association recently held its 1994 conference jointly with the Rocky Mountain Planetarium Association at the Reuben H. Fleet Space/Science Center in San Diego, California, October 13-15th. The conference was hosted by John Young and Dennis Mammana and the staff at the science center.

The conference included paper sessions and a Starlab display. Friday afternoon was spent exploring the science center and experiencing the Omni Theater, planetarium, the Omniscan Laser program, “Laserific,” presented by Audio Visual Imagineering, and a behind the scenes tour of the facility.

Dr. Young of the San Diego State University gave the banquet speech entitled “Finding Your Way to the Exit Ramp of the Information Superhighway”. On Saturday, the group visited the Mt. Palomar Observatory for a tour of the 5-meter Hale telescope, the 48-inch Schmidt and the 1.5 meter telescopes.

The 1996 PPA spring meeting will be held March 30 - April 1 at Yosemite National Park, California. The host for the meeting will be Gail Chaid of the Independence Planetarium in San Jose, California. For additional information contact Gail at: Independence Planetarium, 1776 Educational Park Drive, San Jose, CA 95133; (408)729-3911 ext. 2469; e-mail: chaidg@aol.com

Southeast Planetarium Association (SEPA)
Patrick McQuillen, formerly of the Peninsula Planetarium, Newport News, Virginia, assumed the position of Planetarium Director at the Brest Planetarium in Tyler, Texas, as of April 1, 1994. Dr. Ben Zeinor has assumed the position as Planetarium Director at Georgia Southern University in Statesboro. Ben was previously with the Space Telescope Science Institute. The planetarium in Albany, Georgia, sustained major damage as a result of Hurricane Gordon. The ensuing closure offered an opportunity to address a number of planetarium needs as well as the repairs necessary to reopen just after the first of the year.

The Lafayette, Louisiana, Natural History Museum Planetarium remains closed pending long-delayed action from the city government concerning its future. In the meantime, Director Dave Hostetter has been using a portable planetarium.

The city of Kenner, Louisiana (a suburb of New Orleans), has accepted a tentative design for a 50-foot planetarium/large format film theater.

Forty-four Florida planetarians attended the semi-annual FlorPlan meeting hosted at the Bishop Planetarium in Bradenton, FL on October 21, 1994. A full day and evening of activities including several star shows, an educational laser show, several rock music laser shows, various demonstrations, and the usual networking/shop-talk sessions. The 1996 spring Flor Plan meeting will be hosted by the E.G. Owens Planetarium in Pensacola, Florida.

Several SEPA members journeyed to the far reaches of Bolivia for the November 3rd total solar eclipse. Jane and George Hastings of Richmond, Virginia, and John and Linda Hare of Bradenton, Florida, joined six other brave enthusiasts for an unforgettable adventure. The trek included a visit to Bolivia’s only planetarium, a Spitz Nova in La Paz. Rumor has it that Butch and Sundance were in the audience.

Southwest Association of Planetariums (SWAP)
Planning continues for the 1995 SWAP conference to be held at the Burke Baker Planetarium of the Houston Museum of Natural Science. Some of the conference highlights will include Digistar demonstrations, Laser Fantasy laser shows, science museum tours, IMAX shows, a visit to the Cockerell Butterfly Center, the Challenger Learning Center, an Earth Forum, Internet workshop, Toys in Space II by Dr. Carolyn Sumners, Archeo-Astronomy projects and curriculum, a visit to the George Observatory, a visit to the Johnson Space Center for a VIP tour, a visit to the Lunar and Planetary Institute, a Rice University space physics and astronomy tour, a brief stop at Astro-World amusement park, and a visit to Galveston’s Moody Gardens for a 3D IMAX film presentation.

Wayne Wyrick reports that the Kirkpatrick Planetarium in Oklahoma City, Oklahoma, is going to replace its old planetarium dome with a new aluminum dome.

Bowl Walker of the Hudnall Planetarium in Tyler, Texas, has a different phone number than the one listed in the IPS Directory. The correct number is (903) 510-2312.

Day of the Planetaria
On March 19, 1995, will take place the next issue of the Day of Planetaria, that has been organised in Italy since 1990, in France since 1994, and from the next year also in Poland, Czech Republic, Slovakia and Ukraine. Therefore in 1995 the Day of Planetaria will be held in six European countries. The aim of this initiative is to promote the knowledge and the diffusion of planetaria. During this Day planetaria organize lessons, shows, exhibitions, and practical sky viewing. During the Day in some planetaria the entrance is free. For the occasion, exchange and twinning between planetaria of Eastern and Western European countries will be promoted.

The annual Day of planetaria always take place on the Sunday before or after the spring equinox. Also in the previous years the initiative involved planetaria of different countries (London-Great Britain, Genk-Belgium, Pamplona-Spain, Armagh-Northern Ireland, Aschersleben, Herzberg, Osnabruck and Schkeuditz-Germany), but 1995 will be the first year with the official collaboration of the national planetarium committees of many countries. Probably in future also other countries will collaborate in this Initiative (In 1996 the Day of Planetaria will be held on March 24).

The initiative provides a good chance to diffuse knowledge of planetaria to the public. The simultaneity of this event in various cities promotes its advertising through mass media.

For more information contact the following planetaria in each country:

- Hvezdarna a Planetarium, Kravolska obora 233, 170 00 Praha 7, Czech Republic;
- Planetarium du Tregor, Rue de Noterlou, Pleumeur-Bodou, 22560 France;
- Associazione amici del planetari/Archivio Nazionale Planetari, c/o Centro studi e ricerche Serafino Zani, via Bosca 24, 25066 Lumezzane (BS), Italy;
- Olsztyn Planetarium, Al. J. Piaskudzkiego 38, 10-450 Olsztyn, Poland;
- Hvezdaren a Planetarium, Dilongova 17, 080 01 Presov, Slovakia;
- Republican Planetarium, 57/3 Krasnoarmejska Street, Kiev 252005, Ukraine.
Much of the justification for the existence of planetariums comes from the claim that they can be excellent learning laboratories for students. While that is certainly true, it has been my experience that most of the students benefiting from the planetarium experiences are the youngest students of the elementary school grades. The reasons for this are many and varied, but its roots to the fact that more rigid in the secondary schools, preventing or discouraging some of the out-of-the-classroom learning experiences students are likely to benefit from during the elementary school years. Therefore, most of us—especially those of us involved with the schools—are more likely to have a larger base of elementary students to work with in our planetarium offerings than secondary. Therein lies a major dilemma. Nearly all research indicates that the understanding of astronomical content for students in grades 1-4 should be limited to observations, descriptions, and finding patterns. Any attempt to use models or otherwise to extend these observations into explanations will be limited by students inability to understand these concepts at this early age. As school districts across the country become more and more familiar with current research in elementary science education, they will come to expect that the planetariums which serve them to utilize the results of this research into the planning of their planetarium offerings. In many cases, the planetarium will be used as a learning laboratory for the social studies and language arts areas as well as that in science.

To address some of the concerns expressed above, my colleague Dave Duchon, also of the Harford County Public Schools, devised a two part planetarium lesson which is teamed with the elementary school classroom teachers he serves. First, he has chosen a discipline from the social studies area (map skills) which is likely to already be part of the curriculum at any grade level. Then, he utilizes some of the recommendations for planning the core of elementary science content found in the current issue of Benchmarks for Science Literacy as the vehicle for attaining those content goals. Specifically the benchmarks that this planetarium lesson aims to attain are (a) most things are made of parts, (b) something may not work if some of its parts are missing, (c) when parts are put together, they can do things they couldn’t do by themselves, and (d) something may not work as well (or at all) if a part of it is missing, broken, worn out, mismatched, or disconnected.

This is a unique lesson on mapping the sky, in which each cooperative group, and in turn each student has a part in the final project—a whole sky map! We would certainly like to encourage other planetarians to try the lesson below with some of their school groups and to share their results with Dave or me.

I would also like to encourage other planetarians who work with school groups to consider sharing some of their favorites with this column for publication here. Planetarium lessons are welcomed and encouraged for all grade levels. Please send your submissions electronically (WordPerfect S1 binary file, or ASCII text) or on an IBM formatted floppy disk (save as DOS text or WordPerfect) file. You can reach me on E-mail at schapman@umd5.umd.edu.

How Can We Map the Sky

a planetarium lesson by

Dave Duchon
Harford County Public Schools
Edgewood Middle School Planetarium
Willoughby Beach Rd.
Edgewood, MD 21040
dduchon@umd5.umd.edu

Outcome: Students will demonstrate the ability to work in cooperative groups to:

1. Identify and copy onto paper star patterns which they identify in the sky.
2. Create imaginary pictures, constellations, from the stars on their paper (map).
3. Assemble their individual group maps together back in the classroom to create a “sky map” for the Southern Hemisphere.

Materials: Each group of students will receive a clipboard with paper and pencil attached at the proper time during the planetarium lesson. Neither students nor teachers need bring any materials to the planetarium for this lesson.

Advanced Preparation: Before attending the planetarium lesson, classroom teachers should review with their classes the basics of maps and globes. Key points pertaining to Earth maps that will be used during the planetarium lesson will be as follows: latitude, longitude, equator, north and south Pole, and Cardinal directions (N,E,W,S). As part of the lesson, it will be emphasized to students how all of the objects in our solar system that have been photographed extensively have also been mapped by the same techniques as the Earth.

Students should be placed into cooperative groups of threes before arriving at the planetarium. Groups of four are too cumbersome, but if necessary, one group of four or of two may be created during the lesson. Please have the students lined up in their groups as they exit the bus to facilitate quick seating in the planetarium.

Class Time: The planetarium phase of the lesson will last approximately fifty to fifty-five minutes. At least one full class period will be required as follow up in the classroom on the day after the planetarium visit. This time will be required for the students to complete their individual maps and assemble them into a large map of the southern hemisphere sky.

Classroom teachers are expected to take whatever time is necessary to prepare their class prior to the visit also.

Cross-Curricular Activities:
Social Studies, Science, Art

Science Thinking Skills:
Observing, defining, discussing, decision making, visualizing

Introduction: This lesson and activity are designed to incorporate past information learned in the planetarium and the material being done currently on maps, globes, and mapping skills. The social studies will also be involved in this lesson as it depends on the method used by the ancient Greeks to map
the sky. It is also the intention to help students understand that the concepts used in their classroom for maps and mapping the Earth are applied to mapping the other objects in our solar system. An opportunity to work in cooperative groups is presented as a part of this lesson, allowing the students to apply work habits and skills used in their classroom in a new environment.

The lesson was planned and implemented utilizing a Spitz A3P under a 24 foot dome with concentric seating. This seating arrangement aids in the lesson’s implementation as it allows each cooperative group to face a different direction toward a specific area of the dome. A series of art desk lights with red lamps were added around the dome to allow the students to be able to see their progress on paper while still being able to observe star patterns. To aid in the presentation of some of the topics involving coordinate systems, the Spitz geocentric earth projector was used in conjunction with the coordinate system of right ascension and declination. Where additional coordinates were needed, various projections of the lines available with the astronomical triangle projectors were used.

Pre-Planetarium Visit Activity:

Before the visit to the planetarium, the classroom teacher should review with the class some major concepts from mapping skills. A quick review of latitude, longitude, the equator, north and south pole and the four cardinal directions would greatly facilitate assimilation of the material to be presented in the planetarium.

Students would also benefit from a quick review of the concept of constellations. In previous years in the planetarium, students are taught that constellations are nothing more than imaginary pictures made of stars in the night sky. A general discussion of constellations and what students have learned in the past about constellations should be sufficient. Once in the planetarium, a very brief review of these topics will be done as part of the lesson. Keeping this portion of the lesson short will allow more time for the students’ participatory segment of the day’s work.

The Planetarium Lesson

Students will enter the planetarium in their cooperative groups and be seated by threes. Part way through our work, the students may be moved to allow more work room and a better view of the sky.

Correlations will be made for the students about the maps and globes that they have seen of the Earth and the maps and globes of planets and the moon, for example. A photograph of the Earth taken from space will be displayed. This photograph will be the basis for a discussion on imaginary lines such as parallels, meridians, and political boundaries. The imaginary nature of the north and south pole will also be part of this.

Switching to the planetarium machine, the class will then travel to the center of the Earth and look out through the Earth’s surface to outer space. A system of lines and the North pole will also be displayed on the dome at this time. The Earth projection will then be turned off and the stars turned on. This will show the students that the sky also has latitude and longitude lines, a North Pole, and an equator.

From here, we will enter a brief look at one or two constellations. Ursa Major (the Big Dipper), and Ursa Minor (the Little Dipper) will probably be the two constellations used at this time. It is from the North Star in the end of the little dipper’s handle that we determine the four cardinal Directions of the “sky map.” A short explanation on how to find the North Star will be given. This will conclude the portion of the lesson intended to show students how the sky can be looked at in the same manner as any other mapped object, be it our planet, moon, or Harford County.

The lights will be brought up about halfway while the star ball is being moved. Students will receive their instructions about what is to follow. Each group is going to be assigned a portion of the planetarium sky to map.

Groups will be spread out and a clipboard will be given to each group by the attending teacher or planetarium teacher. Specific duties will be required of the various members of each cooperative group. The attending teacher will assign these duties in the planetarium since he or she knows the students best. One member of the group will become a recorder, who will record star patterns observed on a piece of paper. Each group will also have two people who will act as spotters for the recorder. The spotters job will be to help the recorder accurately locate and place the stars from the sky onto the paper on the clipboard.

When all is in readiness, the sky will darken again. The sky as seen now will not be the same one viewed at the beginning. Our new sky will that of the Southern Hemisphere as viewed from the South Pole. A system of lines (triangle and meridian) will divide the sky into eight equal-sized pieces. Each group will be assigned one portion of the sky by number to copy onto their paper. It is not important for the groups to be absolutely accurate, but rather to be careful. Groups should also be told not to invent stars. Only those stars which are actually in the sky will be copied on their papers. Ample time will be allowed for the groups to accomplish copying their stars.

The amount of sky to be mapped will depend on the configuration of each individual planetarium, in particular the seating arrangement. Concentric versus unidirectional seating makes for modification on the director’s part.

Closure: If time permits, the students may enter stage two of the sky mapping activity. There will only be a scattering of dots (stars) on their maps at this time. The next step is to turn these stars into constellations. Five to six constellations may be invented. What constellations are invented (imagined) are entirely up to each group. They will be encouraged to allow their imaginations to run wild. Anything is possible! Should some group invent an eight-legged three-headed giraffe with ten eyes and three noses, it is perfectly acceptable! After making the constellations, groups must then name their constellations.

Post Planetarium Lesson: If the above constellation making was not done in the planetarium, it can be done back in the classroom. To finish this activity, the maps may be joined together to form a complete map of the southern sky as seen from the South Pole. The final map can then be posted in the hall outside of the classroom for all visitors to see and enjoy!

Education Notes: Science education reform is a continuing and ongoing process in many school districts across the United States and other countries. Planetarians who are interested in including in their planetarium offerings specific to address these reforms are encouraged to consult the influential documents listed below. Although each is independent of the other, most readers will find that they are each basically recommending the same kinds of strategies for science teaching in the future.


60
From the creators of
"LifeStyles of the Stars"
and
"Sandy, Pepper & the Eclipse"

"MoonWitch"

Ideal for grades 2nd through 5th, and super as a family Halloween program, this planetarium production examines the nature of the moon and its changing appearance in the sky. On Halloween we meet Billy and Diana, a brother and sister who are trick-or-treating. Diana notices that no matter where she goes the moon seems to follow. Back home, Mom and Dad explain moon appearance and motion. At school Diana continues to share her new knowledge of the moon with teachers and classmates and demonstrates why the moon goes through phases. The program ends with Diana’s discovery of the “dark side of the moon” and “earths-hine.” Here, she tells her father that she sometimes dreams of being the first woman to land on the moon and describes the wonderful world she will discover. Her lunar lander is named “The Moonwitch.”

"MoonWitch" is authored by Phil Groce and has a running time of about 15:00. The program includes 50 pin-registered Wes-mounted slides featuring the original art of Jim Chapman of Sudekum Planetarium. The digitally mastered soundtrack features rich sound effects and an original music score by award winning composer Jeff Bowen. "MoonWitch" has been carefully reviewed by: Steve Mitch, Christine Brunello, George Reed, and Sharon Parker.

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Some school-affiliated planetarians wouldn't hesitate for an instant! It would not
take them more than an eyelink to leave scheduled classes during the school year
to go chasing after a good eclipse.

Not me. The first question I always ask when an upcoming event is presented to me is
"When is it?" I don't care how wonderful it is, I won't even consider it if it's during
the school year, my contractual period of employment. I have a good job, with sort of
decent pay, and wonderful people to work with. They pay me; I put in my hours with
them. That's all there is to that.

So, when John Hare, Planetarian from Bradenton, Florida, presented the idea to me in
1992, I dismissed it immediately. "No thanks," I said. "Not during the school year."
"Off limits." "A no-no."

He did not insist, realizing that he was dealing with a completely scrupulous EDU-
CATOR of the PLANETARIAN PERSUASION. It really sounded good, though: TOTAL
ECLIPSE OF THE SUN, in Bolivia, South America (somewhere I've never been but
always kind of wanted to go), mild latitudes, near some interesting archaeological sites,
and, best of all, with a small group of planetarium-related folk. (Some think that last
item would be a detractor from the invitation; I've found planetarium types to be,
shall we say, ... interesting.)

But when those late October-early November, 1994 eclipse dates were presented,
that "school year" flag ran up my flagpole, and that was the end of that!

It's December, 1994 and guess what? I went. To Bolivia. To see the total eclipse of the
sun. This is not me. Why did I do it?

Am I turning into an eclipse "geek" who follows the sun twice a year to exotic and
isolated locations laden with cameras and mylar filters? Is it a need to feel the primal
fascination as the sun "gets gobbled up by the puma," as the Bolivians believe?

Maybe it was a disappointment with past
eclipses. I was in Helsinki in 1990 with other IPSers for a total eclipse of the sun which
was, after all, just a glistening sunrise with some interesting cloud effects. Let's not kid
ourselves. We may PRETEND that it doesn't matter whether we see the eclipse or
not; that it's the trip, the camaraderie, the new places that we visit that really make the
excursion worthwhile. But we really want to see the eclipse. So the next time, on the big
island of Hawaii in July of 1991, my group did a little more to guarantee our success at
eclipse watching. We investigated sites all over the Big Island to come up with a good
one. Wrong! We were clouded out.

Was it “third time is always different”
mythology that led me to go to Bolivia?
Why did I cave in to become just another
unsavory eclipse-chaser with no
thought to my school groups?

Well, actually it was because of my school
groups that I decided to go to the eclipse.
When I saw that the dates for the eclipse trip
included the dates each year that I dread
facing school groups the most, I began to
think differently about the proposal. I never
want to be a planetarian on these dates. I
always hope for snow on these dates, but it's
too early. What are these dates? The days
immediately following Halloween! Hordes of
sugar-crazed fourth graders, leaving a
trail of miniature candy wrappers in their wake,
have to be scraped off the dome each year on
these days. The neighbors who give the kids
all that candy should have to be "planetari-
an-for-a-day" to see what havoc they have
wrought!

That did that. Noticing that the dates of the
eclipse included my dreaded "Monster Days"
convinced me that we were all better off if I
were out of the country.

P.S. We saw it this time!

Overheard and Seen at IPS '94:
- Jon Elvert, Planetarian from Eugene,
Oregon, during his presentation, "It took 20
years for the overhead projector to get out of
the bowling alley to the classroom."
- 2nd place in the Best T-shirt at IPS
Contest in 1994: Carolyn Petersen of Loch
Ness Productions, with artsy looking uni-
verse painting with a fake zipper drawn open
to show real universe objects.
- Bess Amaral, of Goddard Planetarium in
Roswell, NM, to Carolyn Petersen, while
looking at Carolyn's Loch Ness slide display:
"Do you have a Cassiopeia with clothes on?"
- John Mosley, having been given a
Special Service Award for a fantastic job as
Editor of The Planetarian for 8 years: "I don't
get very many awards. This one is really
special. I like it.
- Rob Landis, guest speaker from Space
Telescope Science Institute, who, on his lap-
top computer, had a Hubble Space Telescope
screen saver.
- WINNER of the Best T-shirt contest: Tom
Callen, Planetarian at Cosmonova in Stock-
holm, Sweden, with his 4-panel comic strip
(in Swedish). 1st panel: a man standing and
talking to an unseen (by us) being sitting in
a big chair. Man: "So you're responsible for
everything in the universe?" UB (unseen
being): "Yes." 2nd panel: "Even black holes
which will eventually gobble up everything?" UB: "Yes." 3rd panel: Man: "Won't
black holes also gobble you up?" UB: pause...
pause. 4th panel UB: "I'm working on that."
- Lonny Baker, on her move from Morris-
on Planetarium in San Francisco to
Astronomical Society of the Pacific. "I gave
up the stars for a window; very strange."
- Mike Reynolds, Planetarian at Chabot
Observatory and Science Center in Oakland,
Calif., when slides didn't advance during his
presentation: "This is like an automation sys-
tem in a planetarium; it kind of does its own
thing."
- A delayed presentation in the planetari-
um at IPS kept everyone waiting, but not for
long: first one laser dot appeared on the
dome, then another. Soon the impromptu
"dueling laser pointers" routine entertained
everyone until the show started!
- Speaking of laser pointers, Cory Stone,
Planetarian in El Paso, Texas, warns against
using it outside of the planetarium. He hid
and aimed it at a tree in the yard of a neigh-
bor, as a joke. The neighbor, a policeman,
was in the yard and dove into yucca and rocks
next to him—he thought he was the target of
someone using a laser sight on a gun! 

The stars are only accessible to us by a dis-tant
visual exploration. This inevitable restric-
tion not only prevents us from speculating
about life on all these great bodies, but also for-
bids the superior inorganic speculations relative
to their chemical or even their physical natures.
- August Comte, 1844, quoted in
Sun and Earth, Friedman, p.7

For all the wonder of everlasting stars, eter-
nal spheres, and what not, they are not everlasting.
they are not eternal; they burn out like candel.
... Imagine them all extinguished, and your
mind feeling its way through a heavens of total
darkness, occasionally striking against the
black, invisible cinders of those stars. If you are
cheerful, and wish to remain so, leave the study
of astronomy alone.
- Thomas Hardy, Tower, chap. 4, pp. 35-6,
on hearing about a nova in Scorpius.

We are all ignorant. We are just ignorant of
different things.
- Will Rogers
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