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Produced at the Griffith Observatory, Los Angeles, California
George W. Bunton, Jr.
November 16, 1910 - February 21, 1995

Roland W. Force
Honolulu, Hawaii

George Bunton spent his life among the stars. Perhaps because of their preoccupation with the vastness of the universe, astronomers possess a special perspective on the heavens, on the earth, and on human life. They are concerned with both space and time of stunning scope, far beyond the comprehension of most of us who are awed by cosmic events, light years, planetary atmospheres, celestial bodies, and so much more.

George Bunton spent much of his life explaining the stars and all the related phenomena to those whose exposure to the science of astronomy was limited. And he was good at it. He was a teacher, and the planetarium was his classroom.

Born in Covington, Kentucky, the only child of George W. Bunton, Sr., a Methodist minister, and Ina Case Bunton, he moved with his family to Dayton, Ohio when he was five, and started school. Five years later the Buntons moved again this time to southern California.

From the time he was in junior high school, George was fascinated with science. After he graduated from Hollywood High School in 1929, he enrolled briefly at the University of Southern California, but the depression cut his studies short.

Despite the economic distress of the time, he and his childhood sweetheart, Marie Jardine, were married in 1930. A daughter was born to them in 1932. George resumed his education in 1937, earning a bachelor's degree in physics with a minor in astronomy from UCLA in 1940. The same year he enrolled at USC again, this time as a graduate student in physics, aiming for a Ph.D. The war interrupted his plan, and in 1942, he left school to work in an aircraft plant. At the same time, he taught astronomy and other scientific subjects at USC and worked part time as a technician and guide at the Griffith Observatory. This became a full-time job in 1944, and he ultimately became Head Guide and Chief Technician. He continued there until 1951. He then became a technical consultant during the construction of the California Academy of Science's Morrison Planetarium in San Francisco's Golden Gate Park. A year later he was named Curator of the Academy's Department of Astronomy and Manager of Morrison Planetarium.

Without doubt, the happiest years of George's life were from 1962 until his retirement in 1980, when he served as Astronomer and Manager of Kilolani Planetarium and Observatory at Bishop Museum. The planetarium was opened to the public in December of 1961. Dr. Earle G. Linsley, Astronomer on the Museum staff, had seen the planetarium through the planning and construction stages and he wished to return to the mainland. Dr. Armand Spitz, designer of the planetarium projector, was a consultant, and during February of 1962, visited the Museum. He highly recommended Bunton to succeed Dr. Linsley. As director of Bishop Museum, George was my first staff appointment, and one of my best. He began work on April 1, 1962. I told him I wanted him to run the place so I wouldn't have to worry about it. He did and I never did.

There were many Bunton virtues. Besides astronomy, George was knowledgeable in the fields of physics, optics, electronics, and meteorology. He was a facile and articulate planetarium lecturer; he knew his subject. He worked well with others and had a marvelous sense of humor. He once said, poking fun at himself, that he was 40% scientist and 60% ham. His community outreach included writing a regular astronomy column in the Star Bulletin, making radio and television presentations, giving talks to service clubs, and playing an active role in the Hawaii Astronomical Society. Somehow over the years, he found time to write more than 40 popular articles on astronomy. No one will ever forget his planetarium program and booklet on The Star of Bethlehem.

Perhaps George's greatest virtue was his absolute mechanical genius and his engineering skills. He could and did produce remarkable devices to assist him and the other lecturers in the planetarium put on their shows. If no piece of equipment was available to produce a particular effect, George designed and manufactured it in the planetarium workshop. Sometimes he did so, even if a piece of equipment did exist.

There were high points in his career. One of these was his 1958 trip to Pukapuka to observe an eclipse of the sun. On the trip he also visited Tahiti where the transit of Venus was observed by Captain Cook in 1769. In 1974, he and several other astronomers and his wife, Marie, saw another solar eclipse, this one from Australia. Our Apollo flights to the moon were especially exciting to George. He was asked by the Smithsonian tracking station on Maui to keep a close watch on the moon during the Apollo 8 flight in 1968. He also served as a commentator on television for the Apollo 11 and 12 shots in 1969. Another high point was the 1970 exhibition at the planetarium and on Kauai and the Big Island, too, of a moon rock that was retrieved by our astronauts. On another occasion a laser-light show lit the heavens over Kalihi and hundreds of cars converged on the Museum to see the excitement.

Most people are unaware that Hawaii does not adjust its clocks as the mainland does for Daylight Saving Time because of George. He pointed out that because of Hawaii's location there was really no need to do so, and that we were better off remaining on Standard Time throughout the year. For years he alerted the community to upcoming eclipses and comets—once mistakenly announcing that a meteor display would be visible at 5:30 a.m. When it didn't happen, he apologized in the newspapers to everyone. He received letters from many people who, far from being annoyed, thanked him for getting them up early to see the dawn, a thing they hadn't done in years.

Something else. George wrote poetry, some of it inspired by his love of astronomy. Here are a few lines from a poem he called Universe.

From a hollow of darkness light was let forth.
From a stark vacuum all matter was born.
From a point within emptiness a universe grew ...
For thus it is written in the book of the gods ...

The way of the gods is seemingly strange.
Man bred for life had bred to his death.
His stay on this world seems futile and vain.
But the gods had a plan that included his time.

From the ashes of death sprang a figure superb.
Man full adorned with glories unheard.
Man knowing love and none of the hate.
Man with wisdom, in tune with the gods.
Man who came near to being like gods.

George Bunton still lives among the stars.
Pluto Express: Big Mission, Small Spacecraft

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Originally designated the Pluto Fast Flyby, the Pluto Express mission is planned to launch two spacecraft on fast trajectories to study Pluto and its moon Charon. Last year prototype instruments were delivered to JPL. The spacecraft may be launched on either an American Delta or a Russian Proton rocket. Under a collaborative American-Russian approach, the twin Pluto-bound spacecraft would be launched in 2001 on a Proton launch vehicle and would carry two small Russian-built atmospheric probes, called “Drop Zonds.” Spacecraft would arrive at Pluto/Charon system between 2008 - 2011. This paper briefly describes the Pluto Express mission design, cost, schedule, and performance.

Planetarians may play a role in educating and exciting the public on the “Mt. Everest” of solar system exploration. Such a show, “Pluto Express” is being presented at the Griffith Observatory in Los Angeles; similar shows may be performed elsewhere. Pluto Express gives planetarians the opportunity to discuss a future mission to a major solar system body while it is still being planned, rather than reporting on what has already been discovered.

Pluto Background

Although 18 February marked the 65th anniversary of Pluto’s discovery, the ninth planet has guarded its secrets well. This cold world is so small and distant that even the best Earth-based instruments show it as a featureless blob. More recently, the Hubble Space Telescope has confirmed the existence of Plutonian polar caps and a darkly mottled band girdling the planet’s equator. Pluto/Charon is the solar system’s only example of a double planet and may be the key to understanding conditions in the outer solar nebula in the region of planet formation. The only means to better understand this far away world is to send spacecraft to complete the reconnaissance of the solar system.

Shortly after the dawn of the space age, people began sending spacecraft to the planets. All known planets in our solar system have been explored by robotic emissaries of the Earth save one, the Pluto/Charon system. In the early 1970s, when space scientists and mission planners began considering the epic Voyager odyssey, investigators considered sending Voyager 1 on to Pluto. At that time, it was generally assumed that Titan, Triton, and Pluto were very similar bodies. Mission planners decided to send Voyager 1 on a trajectory to take it close to Titan as Earth-bound telescopic studies indicated the presence of a thick methane (CH₄) atmosphere. Voyager 2 would fly on to Triton. Meanwhile, Pluto would have to await another generation of scientist explorers and spacecraft.

Since the twin Voyager spacecraft were launched, knowledge regarding Pluto has changed appreciably. Pluto’s moon, Charon, had not been discovered; the mutual event occultations (between Pluto and Charon) in the mid-to-late-1980s hinted at Pluto’s polar caps and mottled surface; a stellar occultation in 1988 revealed the presence of a tenuous atmosphere; and, the latest Hubble images of Pluto/Charon seem to confirm the existence of polar caps and a mottled equatorial band. The Plutonian system is distinctive in its own right and has a unique tale to tell. It beckons for a planetary explorer.

This paper briefly describes the Pluto Express mission design, cost, schedule, and performance.

Table 1: Pluto Science Highlights

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>Discovery of Pluto</td>
</tr>
<tr>
<td>1965</td>
<td>3/2 orbit resonance with Neptune discovered</td>
</tr>
<tr>
<td>1976</td>
<td>Methane (CH₄) ice discovered of Pluto</td>
</tr>
<tr>
<td>1978</td>
<td>Discovery of Charon, mass of Pluto + Charon determined</td>
</tr>
<tr>
<td>1980</td>
<td>Stellar occultation reveals Charon radius ~600 km</td>
</tr>
<tr>
<td>1985</td>
<td>Onset of Pluto/Charon mutual events</td>
</tr>
<tr>
<td>1986</td>
<td>Determination of separate albedos and colors for Pluto and Charon</td>
</tr>
<tr>
<td>1987</td>
<td>Water (H₂O) ice discovered on Charon</td>
</tr>
<tr>
<td>1988</td>
<td>Discovery that Pluto’s orbit is chaotic</td>
</tr>
<tr>
<td>1989</td>
<td>Stellar occultation reveals Pluto’s atmosphere</td>
</tr>
<tr>
<td>1992</td>
<td>Multiple events hint at the presence of polar caps</td>
</tr>
<tr>
<td>1993</td>
<td>Nitrogen (N₂) and carbon monoxide (CO) discovered on Pluto</td>
</tr>
<tr>
<td>1995</td>
<td>Discovery of significantly different densities of Pluto and Charon</td>
</tr>
<tr>
<td>2001</td>
<td>HST observations confirm the existence of Plutonian polar caps and mottled equatorial band</td>
</tr>
</tbody>
</table>

Mission Background

There have been a few other attempts to describe possible Voyager-like followup missions to visit the outer planets, including Pluto/Charon. Pluto is the most difficult planet to reach. Until recently, the conventional wisdom was that the end-to-end mission (in light of today’s economic environment) would take too long and cost too much to be successful. Several in the planetary science community have been pushing for a Pluto mission since 1989.

Following the successful Voyager 2 Neptune flyby, a few engineers at JPL collaborated on an idea to send a 39 kg “microspacecraft” on a five- to six-year direct trajectory to Pluto.

In 1990, a plan circulated amongst NASA...
would have a daughter probe to investigate both sides of Pluto, a much larger science payload, and a flight time of 16 years. This behemoth would require launch on a Titan 4/Centaur and would have flown the same flight path as the 350 kg class vehicle.

The Outer Planets Science Working Group (OPSWG), a NASA chartered group of leading planetary astronomers, examined small and large missions to Pluto and reported their findings to NASA in May, 1991. In subsequent meetings with NASA, OPSWG and NASA's Solar System Exploration Subcommittee formally endorsed the JPL concept of a dual Pluto flyby with very small spacecraft in 1993.

**Faster, Cheaper, Better, Smaller**

During the current era of economic austerity, NASA has been directed to find faster, better, cheaper ways of doing space science. In order to “stay in business,” the space agency needs to find new ways of doing quality science with less money. Upon learning of the proposed Pluto mission, the NASA Administrator gave his enthusiastic support of the mission provided the spacecraft did not exceed the 164 kg mass class. This directive, to reduce spacecraft mass, has become the driver for adopting and developing new technologies that would enable a 100 kg-class vehicle to do the same science as a more massive one. Some of the new technologies might then spin off into other space missions and into the private sector providing broader benefits. Deliveries of prototype hardware began in late 1993 for key spacecraft components to achieve mass reduction goals. Depending on the launch vehicle (Titan IV, Proton, or shuttle) and upper stage combinations, Pluto cruise time would be 7 to 10 years.

Currently, plans are to launch two Pluto Express spacecraft on separate vehicles in 1999 and/or 2000 on direct trajectories to pass within ~15,000 km of Pluto/Charon in 2007-2010, obtain scientific data and transmit that data to Earth following the encounter.

Life cycle cost for fiscal year 1993 was estimated at $1.1 billion dollars. (Life cycle cost is defined from project genesis, development, spacecraft assembly, launch, launch vehicle, crew operations, cruise, and encounter.) This compares quite favorably with Voyager, Galileo, and Cassini costs. Still, in light of anticipated U.S. Federal budget cuts to assist in deficit reduction, the challenge is now to keep life cycle costs below FY'93's $1.1 billion dollars, while retaining the same science payload, increasing data return, and maintaining mission reliability in order to achieve a successful decade-long mission.

To come to fruition, the mission must maintain an exciting science content, early launch, and an attractive life cycle cost and cost profile in a fiscally austere budget environment. This presents quite a challenge to mission development activity. Meanwhile, preproject funding remains constant to permit substantial prototype hardware and software development, reducing cost and schedule risk when a final budgetary commitment must be made. If costs exceed the amount which the Congress initially approves, the entire effort can be expected to be canceled. NASA tentatively plans to submit the Pluto Express mission for a new start for FY'97, when it will be included as a line item in the Federal budget.

**Science Instruments**

In April, 1992, the OPSWG defined the science goals for the mission, arranging and prioritizing them into three classes (see Table 2). Category 1A represents the “must do” science objectives. These include the characterization of Pluto/Charon's global geology, morphology, surface compositional mapping, and characterization of Pluto's tenuous atmosphere. Categories 1B and 1C will be attempted if still within the project constraints.

**Spacecraft Drivers**

The Pluto Express mission is primarily driven by (1) cost, (2) schedule, and (3) performance. The first driver is the most important. If at any time during the course of mission development it becomes apparent to NASA that the $1.1 billion life cycle cost cap will be exceeded, the Pluto mission team can expect the project to be canceled.

The second driver is the need to get to Pluto as quickly as possible before it's atmosphere collapses back down onto the planet's surface. Getting to Pluto quickly meets OPSWG's science objectives and requires both short timescales in development and cruise to Pluto (which, in turn, contribute to lower cost). The reduced development schedule limits the use of advanced technology; but, advanced lightweight technology could help reduce the spacecraft mass and shorten the flight time. A balance must be struck between development cost and schedule, and operations cost and flight time.

The third driver—performance—defines the primary function of the

<table>
<thead>
<tr>
<th>Table 2: Pluto Mission Core Science Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category 1A:</strong> Characterize global geology and morphology</td>
</tr>
<tr>
<td>Surface compositional mapping</td>
</tr>
<tr>
<td>Characterize of Pluto's neutral atmosphere (scale height, structure, composition)</td>
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<tr>
<td><strong>Category 1B:</strong> Surface and temperature time variability</td>
</tr>
<tr>
<td>Surface imaging</td>
</tr>
<tr>
<td>High resolution terminator mapping</td>
</tr>
<tr>
<td>Surface composition mapping</td>
</tr>
<tr>
<td>Characterization of Pluto's ionospheric/solar wind interaction</td>
</tr>
<tr>
<td>- Search for neutral species including: H, H$_2$, HCN, C$_x$H$_y$, and other hydrocarbons/nitriles in Pluto's upper atmosphere</td>
</tr>
<tr>
<td>Obtain isotope discrimination where possible</td>
</tr>
<tr>
<td>Search for Charon’s atmosphere</td>
</tr>
<tr>
<td>Determination of bolometric bond albedos</td>
</tr>
<tr>
<td>Surface temperature mapping</td>
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<tr>
<td><strong>Category 1C:</strong> Characterization of the energetic particle environment</td>
</tr>
<tr>
<td>Refinement of bulk parameters (radii, masses, densities)</td>
</tr>
<tr>
<td>Magnetic field search</td>
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<tr>
<td>Additional satellite and ring search</td>
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</tbody>
</table>

In Table 2, the most critical science objectives are described within each category. The first category, (1A) includes the most critical science objectives that must be achieved. The science objectives in categories (1B) and (1C) are less critical, but still important for mission success. The mission team must prioritize their efforts to ensure the highest return on investment for the limited resources available.
spaceship: to obtain (at a minimum) the Category 1A objectives. The scientific objectives of the mission define what the Pluto Express spacecraft must be capable of doing. Performance requirements on the spacecraft are derived from the scientific objectives. Performance requirements include: electrical power generation, data storage, communications capability, propulsive capability, thermal control, pointing control, and numerous other resources which the spacecraft must provide to the instruments.

Cost, schedule, and performance are not independent variables. Given this prioritization, the design approach must be very sensitive to cost and allow capability within cost and schedule to define the performance (i.e., science return).

**The Russian Connection**

As recently as 1993, NASA was not permitted to consider joint missions with the former Soviet Union. However, the Planetary Society—not constrained by governments nor bureaucratic restrictions—approached several Russian space organizations regarding a possible joint effort with the United States for a Pluto mission.

The Space Research Institute of the Russian Academy of Sciences headed the study of a possible joint mission. In early 1994, the Russian study team presented recommendations to the JPL Pluto Express team. The Russian group shared several options using the Proton rocket (and different upper stage combinations to send the spacecraft on direct interplanetary trajectories), use of ion thrusters, and an ultralight Drop Zond to make *in situ* measurements of the Plutonian atmosphere.

**Summary**

In the years since discovery in 1930, Pluto has retained its secrets well. Pluto and its moon Charon have a tale to tell. Pluto’s atmosphere is much thinner than Titan’s and is being replenished by a primordial reservoir. Unlike Triton, which is currently about Pluto’s distance from the Sun, Pluto has simpler seasonal changes which are driven by an elliptical orbit and very high obliquity, has polar caps which are probably temporary, and was evidently formed in the solar nebula instead of in a planetary nebula. The scientific imperative to visit Pluto before its atmosphere collapses (which is predicted to occur between 2010 and 2020), inspired early Pluto mission designs and has evolved into the current PE design. Pluto/Charon symbolize the “Mt. Everest” of planetary exploration. It is the farthest, coldest, and hardest planet to get to. A scientifically exciting initial reconnaissance of Pluto and Charon is possible.

Creative planetarians with the drive, desire, and the interest in mysterious Pluto have the capability share with (and educate) their patrons in the fascinating history and interplay of human ego which led to the discovery of the ninth planet, to the recent and current science discoveries surrounding Pluto/Charon, and to the future quest of sending two small spacecraft to this enigmatic double-world.

This paper was originally presented at the Great Lakes Planetarium Association Conference, Wheeling, West Virginia, 26-29 October 1994.


Dear Editor:

I warmly congratulate Thomas Kraupe on his election as IPS President-elect. As another candidate, I was very impressed with his statement of goals and with the talents he brings to IPS. I also thank the many people who offered kind words of support to me during the weeks of the election, and now look forward to the excellent leadership Thomas will bring to IPS in the years ahead.

Dale W. Smith
Bowling Green State University Planetarium
Bowling Green, Ohio

Dear Editor:

For a planetarium show now being developed, we seek to learn about legal cases with significant astronomical evidence, including cases with astronomers as expert witnesses. If you know of any (other than Lincoln), please write the undersigned, or phone at 510-530-3480. Thank you very much.

Norman Sperling
Planetarium Coordinator
Chabot Observatory & Science Center
4917 Mountain Blvd.
Oakland, CA 94619

**Letters**

Dear Editor:

First of all I would like to thank those (very few) who have responded to my request for information about Sources and about Special Effects. Unfortunately, those keen people are very few in number and the committee would much appreciate a little more input to our task of trying to expand the number and relevance of IPS Publications.

Just to remind everybody, we are planning to reprint the Resources Directory—this time making it an international list. That is planned for possible publication at the end of this year. The next task is to revise, update and expand the Special Effects Book. There have been some useful new contributions for this but many more would be appreciated,

The IPS Membership leaflet has been translated into Russian, courtesy of Oleg Sizutchin, and is available from him at the Moscow Planetarium.

Publications are for your benefit. Please contribute.

Undine Concannon
London Planetarium

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**Classified Advertisement**

*The Planetarian* welcomes non-commercial advertisements for planetarium equipment and related materials at no charge. Send copy to the Executive Editor. Ads may be edited for brevity.

**FOR SALE: GOTO M-1 planetarium projector** and control console to highest bidder ($1,000 minimum bid). Purchaser responsible for dismantling, crating, transportation, and all other charges. Must be removed by December 31, 1995. Deadline for written bids is September 30, 1995. For information contact: Dave DeBruyn, Public Museum of Grand Rapids, 272 Pearl NW, Grand Rapids, MI 49504; 616-456-3977.
Lessons from Museum and Leisure Research

Sharon K. Parker
Buehler Planetarium
3501 SW Davie Rd.
Davie, Florida 33314

The information that is included in this article came about as a result of extensive literature research that I conducted on visitor behavior, motivation, and expectations in leisure and informal education settings such as museums and theme parks.

I believe my findings can be generally applied to planetariums because 1) planetariums are places where visitors spend leisure time, 2) planetariums are informal education settings that share a similar educational and cultural function to museums— and, in fact, are often located in museums or cultural complexes, and 3) people are likely to have similar motivations for attending these facilities even though they may have different expectations of each.

Now, for a rhetorical question... what motivates people to visit your planetarium? Do they visit because it’s something to do when the weather is lousy? Are they there to entertain themselves or perhaps a child? Are they wrapping up a museum visit and simply want a place to sit down or dark place to catch some sleep before heading home with the family? Are they there to make out with a date in the back row? Or, are they there because they have a burning desire to learn something about our wonderful universe?

Since I could not find any published visitor studies for planetaria, and since such studies are tightly guarded secrets among theme parks, I investigated museum visitor studies. Given the socio-economic and demographic similarity of planetarium and museum visitors, it seems reasonable to assume that such research can shed light on visitor attitudes toward learning in cultural facilities in general. The studies I found suggest that many museums, (and probably planetariums, too) are seriously out of touch with visitor motivations and interests. There appears to be a significant difference between what visitors want (as indicated by their behavior), and what museum professionals continue to provide.

Today’s museums and planetariums are faced with challenging trends that are affecting their ability to survive as mainstream cultural institutions. Fundamentally, these trends are connected to their ability to attract, maintain, and increase visitation among economically and ethno-culturally diverse populations.

In consumer oriented societies, businesses must be sensitive to customer perceptions, motivations, and expectations in order to succeed. Cultural institutions, like museums and planetaria, are no different—they cannot afford to ignore market realities. If planetaria and museums fail to understand and address visitor needs, they will lose visitors to competing leisure attractions, will become less successful in attracting corporate and grant funding, and may be considered less valuable by their parent institutions.

Recent museum and leisure research sheds light on visitors’ leisure motivations. Research documents that behavior in museums is inconsistent with a learning agenda, and that program/exhibit objectives and strategies are often out of touch with visitor desires. Research suggests that planetaria and museums will be better equipped to face the challenging trends of the future if they avoid stagnation; diversify programming; develop innovative, effective, and entertaining approaches to science education that are more active and less passive; facilitate positive social discourse within visitor groups; and if their parent institutions commit to investing in technologies that will allow them to compete successfully with increasingly sophisticated information delivery systems and "edutainment" opportunities that are available elsewhere.

Fundamentally, museum visitor behavior is incompatible with a learning agenda. Museum visitors typically spend 90-120 minutes in a museum, during which time they skip 60% of the exhibits and spend 3/4 of their time in non-learning related activities. The exhibits they do visit are attended to for no more than a couple of minutes at most and label copy is frequently ignored. A typical exhibit visit lasts about 30 seconds. By comparison, visitors spend 8 hours or more (often over several days) in theme parks which are increasingly adopting educational agendas. Consider Epcot Center. It is strongly educational in nature, costs about $30 for a single admission, yet still manages to be one of the nation’s premiere tourist attractions. As for Disneyland, three out of four visitors are adults. One comprehensive museum study revealed that parent/child groups with children age 6-11 years are least likely to be interested in learning and most likely to be interested in active participation and social engagement. But isn’t this the group we spend the most time trying to educate?

If museums, planetaria, and theme parks are places where people choose to spend their leisure time, and if education is a goal of each of these leisure venues, then why is there such a big difference between visitor behavior in theme parks and museums? I believe the differences are caused by two things. 1) theme parks recognize that people are there to have a fun, social experience with members of their group, and they design experiences that foster social engagement, and 2) theme parks recognize that, as far as visitors are concerned, learning is secondary to having a good time. Consequently, they market themselves as being places to have fun and rarely mention “the E word” (education). Research tells us that learning in a museum context occurs most often via social mechanisms. So, encouraging the social aspect of a museum visit may actually be the most effective way to get people to learn.

The social element of a museum, planetarium, or theme park visit is not only critical to learning, but also influences the meaning visitors assign to their experience.
One poll found that 60% of regular museum visitors had their interest in museums shaped by a family member, while only 36% of visitors stated that their interest was shaped by a school field trip. This may be related to the fact that children found unstructured (self guided) experiences more enjoyable than those which were structured and overtly educational (guided). This finding has powerful implications for repeat visitation and suggests that an overt, educational agenda may be self defeating in the long run. It also suggests that it may be possible to increase economic, ethnic, and cultural diversity among visitors simply by appealing to a universal value—the social experience. After all, theme parks, unlike museums, have little trouble attracting a culturally diverse audience.

Now, for a few more rhetorical questions ... what are you doing to design innovative planetarium experiences that provide opportunities for social interaction within visitor groups or, for that matter, between visitor groups? What are you doing to create programs that allow visitors to participate actively in your programs? By active participation, I am not talking about directed question and answer sessions with a presenter or talking about real mental engagement—role playing, problem solving, experimenting, questioning, fantasizing, and discovering unknown capabilities. I'm also talking about real physical engagement—handling objects, exploring visual perception, moving around the theater, playing games, and sensory stimulation.

Active participation is just one of the criteria that people use to define leisure experiences. Other factors include lack of self or external evaluation, physical and/or mental effortlessness and comfort, emotional relaxation, opportunity for personal growth or creativity, degree of social interaction possible, "worth" of the activity, opportunity to learn, and whether there might be a challenge of new experiences. Personal relevancy and meaning, control, and feedback are also important. How may of these factors do you consider when designing new programs?

In consumer-oriented societies, businesses must be sensitive to customer perceptions, motivations, expectations, and needs in order to succeed and survive. Museums and planetaria are no different. If we fail to understand and address visitor needs (including the ones they don't know how to articulate), then we will lose visitors to competing "leisure attractions", we will become less successful in attracting corporate and grant funding, and we run the risk of being considered less valuable to our parent institutions.

Developing new, innovative programs that address visitor's leisure needs should increase repeat visitation, increase minority and lower socio-economic participation, and position our facilities to compete with the myriad of new leisure/learning venues that have cropped up in recent years—theme parks, nature centers, and virtual reality clubs.

... what are you doing to design innovative planetarium experiences that provide opportunities for social interaction within visitor groups or, for that matter, between visitor groups? What are you doing to create programs that allow visitors to participate actively in your programs?

Bibliography


"Jay" Gunter
1911 - 1994

Born Sanford, NC, January 15, 1911, son of Junius Utley Gunter and Kate Ledbetter Gunter.
Dr. Gunter graduated from the University of North Carolina at Chapel Hill in 1931. While an undergraduate at UNC, he was a member of Sigma Phi Epsilon, and was elected to Phi Beta Kappa. He attended Medical School at University of North Carolina for two years, serving as President of his class, followed by a two-year teaching fellowship in Histology. He then attended Jefferson Medical College in Philadelphia, receiving his MD in 1936.
Dr. Gunter served in intern and resident capacities at Cooper Hospital, Camden, NJ, Pennsylvania Hospital, Philadelphia, and Duke Hospital. He then worked at Jefferson Hospital, Roanoke, VA, as a pathologist. He served in the Medical Corps, USN, during World War II.
Dr. Gunter served as Pathologist and Director of Laboratories, Watts Hospital, Durham, NC, from 1947 until his retirement in 1976. He was Visiting Assistant Professor of Pathology at UNC School of Medicine during this period. He authored many papers published in regional and national medical journals.
Dr. Gunter was a Diplomate of the American Board of Pathology. He was a Life Member of the Durham-Orange County Medical Society, the North Carolina Medical Society, and the American Medical Association. He was Emeritus Fellow of the College of American Pathologists and the American Society of Clinical Pathologists, and an Emeritus Member and Past President of the North Carolina Society of Pathologists.
Dr. Gunter was a member and director of the Durham County Chapter of the American Red Cross, and played a key role in establishing the Central North Carolina Blood Bank.
Following his retirement, Dr. Gunter became an amateur astronomer of international reputation. He had a special interest in asteroids, and published regular articles and columns on asteroids in several astronomy journals. For over 15 years, he published *Tonight's Asteroids*, a bimonthly newsletter. This newsletter was distributed to amateur astronomers in many countries, enabling hundreds of readers to view asteroids by using the tracking charts published therein. In 1980, the International Astronomical Union named Asteroid No. 2136 JUGTA in his honor, the name being derived from his initials and the name of the newsletter. He received the Amateur Achievement Award of the Astronomical Society of the Pacific in 1983. He received the Caroline Henschel Award from the Western Amateur Astronomer Society in 1989 for his work on *Tonight's Asteroids*.
Dr. Gunter was a member of the Cofounders Club of the Medical Foundation of NC, the President's Club of Jefferson Medical College, and the Davison Club of Duke University Medical Center.
Dr. Gunter was a member and deacon of the First Presbyterian Church of Durham, NC.
He is survived by his wife, Elizabeth Kerr Gunter, daughter Elizabeth Johnson of Wilson, sons John of Rochester, NY and Stephen of Raleigh, and three grandsons.

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The Planetarian
Introduction

Japan, a small country with the land mass of California, has over 300 planetaria. If awards were given to the countries with the most planetarium facilities, Japan would win second place, just behind the United States. Yet very little is known about what goes on under all those domes in the East. In preparation for your trip to IPS in 1996 we would like to enrich your knowledge about the history of the planetarium in Japan, the people who run the facilities, the kind of shows given, and the present trends in the field.

History

Osaka built the first planetarium theater in Japan in 1937. Soon after, in 1938, Tokyo followed suit. At this time Zeiss still held its monopoly on the world planetarium market. Then World War II put further planetarium growth on hold for 13 years. Things slowly started up again in 1951 with the first Spitz projector installed in Ikoma. Minolta Camera entered the market with its first machine in 1958 followed closely by GOTO's planetarium debut with its installation at Bridgeport Museum in the U.S.A. After the two local players entered the market, outsiders such as Zeiss and Spitz were seldom ever heard of again.

In Japan, there was no late 60s early 70s planetarium construction boom like that of the United States; rather planetarium growth has been fairly steady since the mid-60s. In fact, the growth curve is so smooth that a member of our marketing department (actually a frustrated Jupiter researcher) found that the curve can be described by the equation:

\[ N = 0.540414 + 355.942 t - 0.365624 t^2 + 0.0000938886 t^4 \]

Equation Describing Planetarium Growth in Japan

where \( N \) = number of planetariums, \( t \) = time in years

I knew some of you wanted to know that! The entire market is split between GOTO and Minolta in an nearly perfect 60/40 ratio which has remained fairly constant over the past 25 years.

In the early 1980s Yokohama wanted to build a science center unlike any in Japan. The exhibit designers spent much time studying the Exploratorium in San Francisco. Living in the space age, an earth-based view of the heavens seemed too ordinary. The Yokohama planners originally thought to create a sphere with views of the stars below as well as above, giving the feeling of floating in space. The problem of where to put the audience kept this particular idea from ever getting beyond the earliest stages. Then, rumors that a Space Theater combining a planetarium and OMNIMAX theater was just being completed in San Diego reached the attention of the designers. A study group left immediately to meet with the staff of the Reuben H. Fleet Space Theater. The result: the world's second Space Theater, the Yokohama Science Center, opened in 1984. Thus began Japan's love affair with the tilted dome. Over 40 have been built in the last 10 years.

The last 15 years has seen a burst in the growth of larger domes of 14m and over in public facilities such as museums, science centers, public halls and children's centers. Cities and prefectural governments experiencing “dome envy” compete to build the world's largest planetarium dome. The Ehime Science Center now holds this distinction with a 30 meter or approximately 100 foot diameter tilted dome. Even so, smaller domes of the 8 to 13m range are still the most common type of theater. While almost every Japanese school has a portable planetarium,
fewer have the fully equipped facilities found in many U.S. schools. Most astronomy education is carried out at the local museum planetarium.

Museums and Science Centers often combine large format motion picture projectors with planetariums are extremely popular. Nagoya Parco and Machida Star Hall or private companies such as the Sunshine Planetarium and soon to be opened Kenji World. Of the government funded facilities 40% are managed directly by the government while 60% are managed by non-profit corporations. Both types of organizations receive financial support from the local government towards yearly running costs. Imagine having the city pay all your bills, provide an incredible budget for show production and film leasing and, on top of that, provide you with staff to run the facility as well. Ready to pack up you bags and look for a job in Japan? Wait! Not everything is as idyllic as it seems. A typical planetarium staff consists of 2 to 3 people and a few part time ushers. 90% of the people managing the planetarium are non-professional and are unable to do much more than push the “on” button to start a pre-made, pre-programmed show. The 10% of professionals are often very dedicated amateur astronomers with only some, if any, formal astronomy background. These people have learned about planetariums just by being incredibly devoted and involved for 10 years or more. Another 10% had a particular desire to be involved in astronomy education when starting their jobs, but after holding the post for over 10 years are considered by colleagues to be semi-professionals. The majority, a sizable 77%, are government employees assigned to planetarium duty for 3 to 6 years before moving on to some other bureaucratic position. Finally, 3% are contracted from companies such as Tokyo Community and Owen which specialize in supplying support staff, such as building maintenance, janitors and ushers, for museums.

Shows

The majority of theaters purchase ready-made or custom shows from show production companies such as Potofu, Idea Science Art, Japan Planetarium Laboratory or the planetarium equipment manufacturer. Both Minolta and GOTO have show production divisions to meet this demand. GOTO supplies 200 shows a year to theaters throughout Japan, 50 of which are new titles, offering full programming and installation at site. A few theaters write and produce their own shows or, even rarer, a planetarium will write a scenario and contract a show production

Management

Local governments, i.e. a city, county or prefecture, provide funding for the construction of over 98% of the planetarium theaters in Japan. The remaining 2% are commercial theaters owned by department stores such as

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with 35 such facilities in operation. Film clips, short one- to two-minute sequences of a shuttle launch, the formation of the galaxy, the rings of Saturn, etc., are often used in the planetarium show, greatly enhancing the impact of the material. Theaters typically alternate between the planetarium show and film presentation but the planetarium show inevitably sells out first with the stragglers opting for the movie. Only the Ikomayama Space Science Center Museum (11m, Minolta MS-10 in 11m dome and Tsugamirama 35mm Sp film in tilted 17m dome) maintains separate planetarium and film theaters, although there was one other example in Miyaki City (GOTO GM-1ST in 15m dome and Astrovision 35mm Sp in 15m semi-tilted dome) which is no longer in operation.
company to produce it.

Animation slide frames provide the bulk of any show with little emphasis on special effect projectors. Sheer volume of the number of shows which must be installed by the show production companies severely limits the amount of creative time available to think of unique ways of presenting concepts and, perhaps an even bigger factor, no theater maintains a technical staff capable of building special effects for a particular show. Video is still relatively new and is used sparingly; however, many new theaters include at least one Sony or Barco projector among the auxiliary projector systems.

On the other hand, the use of short films on large format (70mm 10p is most common) surpasses any other place on Earth. GOTO has an extensive library of 70 clips covering 36 different topics designed specifically for planetarium shows. A typical show with large format capability will use 2 or 3 clips in a 20 minute planetarium show.

Almost all shows in Japan use a standard format of 15 to 20 minutes of the stars tonight lecture, often done live, followed by a 20 to 25 minute thematic program, almost always presented using full automation.

Sources of Astronomy Information

Lack of contact with professional astronomers create a less than ideal environment for up to date astronomy education. While this might be true everywhere, Japanese professional astronomers do little to assist the popularization of astronomy. The main astronomical research institutions in Japan are:

1. National Astronomical Observatory
2. ISAS (Institute of Space and Aeronautical Science)
3. NASA (National Space Development Agency of Japan)
4. Tokyo University
5. Kyoto University
6. Tohoku University

Amateurs, on the other hand, actively participate in educating the public by helping planetariums and museums hold star parties and by assisting school clubs. Three monthly astronomy magazines aimed at non-professionals keep serious sky watchers attuned to the latest events, both cosmic and local.

Very recently the word Internet entered the Japanese language, but finding anyone who actually uses it rare. A few universities and research institutes are on line but only one planetarium site has access at this time. Even computer communication via services, such as NiftyServe and CompuServe, are few. The slow transition to electronic communication is most likely an after effect of the proliferation of dedicated word-processing machines, rather than computers, in the office and home. But the promising possibilities have been recognized and it is only a matter of time before Japan adds its own ramps to the information superhighway. Work is already underway to connect major observatories and planetariums via PAONET (Public Astronomy Observatory Network), giving them instant access to the latest images.

Planetarium Societies

Three societies exchange information and ideas among planetarians. The national group is the Japan Planetarium Society which is affiliated with IPS. Two smaller groups are the Planetarium Society of Japan, which is essentially a GOTO User's Group (but all are welcome), and the All Japan Planetarium Association, which is a Minolta User's Group. All three groups together with the Society for Teaching and Popularization of Astronomy will assist the Osaka Science Museum, the host of IPS'96, to make everyone's trip to Japan in '96 an enriching and rewarding experience both technically and culturally.

Conclusion

Like many industries in Japan closed to outside influences, the planetarium field in Japan is in some ways like a Jurassic Park. Many theaters suffer from stagnant presentation methods and inefficient management methods while pouring money into the latest and greatest high tech goodies, such as 8 track CD sound systems and touch panel control consoles. It would not take much for these facilities to evolve to their true potential but a serious push is needed. IPS '96 will bring enlightenment to many Japanese the-

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Forum

IPS: Value for Money to International Members?

Steve Tidey
58 Prince Avenue
Southend-on-Sea, Essex
SS2 6NN
England

Hello again. First of all, may I apologise for the absence of the Forum column in the last issue of The Planetarian. This was the result of being let down by a third party, who was supposed to have sent the column to John Mosley via the Internet. I was assured it had been sent, but the copy deadline had passed by the time I learned that John had not received anything. This won’t happen again, as by the time my next column is ready I shall be the proud owner of a modem which will bring the joys of the Internet direct to my workstation. For this issue’s column, I decided to choose a topic which would gauge the feelings of the membership about the degree to which the IPS has undoubtedly already moved towards meeting the needs of its international contingent. I was thinking in terms of the non-American members, and the value they feel they get from belonging to an organisation with such a strong American flavour. But as it turned out, the correspondents widened the scope for discussion by looking at whether all members, regardless of their country of origin, get value for money from the IPS. The topic was worded:

Does the IPS give value for money to its international membership?

When Steve Tidey asked me to offer my opinion on the question of whether IPS gives value for money to its international (that is to say, non-American) members, several thoughts struck me: that the opinions of other members might be more interesting to read than mine; that my answer wasn’t going to surprise anybody, and that the question is really a subset of the larger question of whether IPS membership has value for all dues-payers, regardless of nationality. Yes, I do believe that IPS offers value for its membership dues, and that certainly includes international colleagues. Let me count the ways...

IPS has never been more international than it is right now, with non-American membership up and 11 non-American organisations among the 18 IPS affiliates, four of them having joined in the last two years. (Past President Bill Gutsh and 1994 host Mike Hutton and his staff have worked with particular vigor in the past two years to encourage international participation in the organisation.) Everyone benefits from this diversity in the communication and exchange of ideas, information and experience.

This exchange occurs in person at our biennial conferences through workshops, paper sessions, informal discussions and product exhibitions. Our next two conferences will convene in Asia and Europe, which I hope will encourage increased international participation and benefit.

Exchange continues between conferences through the IPS journal The Planetarian, received by all members—excellently done and published like clockwork under John Mosley’s editorship. And anecdotal experience suggests that it’s having the desired result: just recently I received a communication from a French planetarium (a new institutional member of IPS) asking for the best way to contact a vendor mentioned in my “What’s New” column. Clearly, this planetarium got the journal and found something useful in it.

Another benefit of membership is the IPS Directory, published by Loch Ness Productions for IPS in 1994 after a four-year absence, and for my money one of the best values of membership along with the journal and conferences. It’s a wonderful tool for aiding communication among colleagues throughout the world planetarium community. There will be another Directory published this year to incorporate new members following the conference in Cocoa and to include new information on facilities, much of it international. Thereafter, the Directory will be published in odd-numbered years with possible addenda in the even-numbered years.

The Special Publications arm of IPS is reviving under the capable direction of the London Planetarium’s Undine Concannon and her Publications Committee. The fine booklet So You Want To Build A Planetarium, developed by Ken Wilson and his Planetarium Development Group, is IPS’s first special publishing effort in some years. Other ideas are in development, including an international version of the Great Lakes Planetarium Association’s excellent resource book; the IPS publication will include American and non-American sources of goods and services relevant to our work. (The Great Lakes affiliate also worked with the United Nations for Outer Space Affairs to produce the book, Planetarium: A Challenge for Educators, edited by Dale Smith and Hans Haubold, with assistance from Jeanne Bishop. It is available to planetariums and government education ministries worldwide and is published in English, Japanese, and Spanish at the present time, I believe.)

IPS is working in many other ways to provide value for membership, ranging from working with Space Telescope Institute officials on the best way to apprise IPS members of the latest Hubble materials and how to get them, to trying to facilitate the transfer of information and materials to planetariums with limited resources such as those in the Eastern Bloc.

Of course, not all benefits of IPS membership are passive ones, nor should they be. As with so many things in life, what you get out of IPS membership depends a lot on what you put into it. So let me encourage you to participate. Attend a conference. Present a paper. Write an article. Volunteer for committee. Suggest a new idea. Share your experience. Become active in your affiliate. Contribute. It not only benefits others, it will benefit you.

For our part, the IPS officers and increasingly international Council editors, conference hosts and committees will continue our efforts to provide the best value we can for membership, for all our members, within our means to do so as a volunteer organisation. In the meantime, please don’t be shy about telling us how we’re doing, and what you’d like to see IPS doing in the future. After all, IPS belongs to you.

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

One of the advantages of our membership in the IPS is that you are linked with fellow professionals from around the world. Working both in a school facility and museum facility, I see that we become so involved in show production, lecturing, budgeting, transportation, curriculum development and justifying our own existence that we have little time to interact with others in the museums or schools that we work in. Although we become isolated by the nature of our jobs, The Planetarian is sometimes the
only bridge between us as professionals. Where else can you read comparative reviews of video projectors in star theatres or gain valuable lesson plan ideas for the presentation of new or unusual topics just for planetariums? What better source of lesson plans and worksheets than from others who have tried the ideas already?

The advantages of attending the IPS Conferences is icing on the cake. Although too numerous to list here, anyone who has attended can tell you of the feeling of being connected to a team of outstanding individuals. We face the same problems, share some of our best achievements, and relate to outstanding events that could only be appreciated by others in our field. Please get that next issue of The Planetarian to me as soon as possible.

Japan, here I come.

Ted Williams
Planetarium Director
Arcola Intermediate School
Eagleville Road
Norristown, PA 19403 USA

* * * * *

Without a doubt, planetaria are among the Hubble Space Telescope's greatest cheerleaders. Only recently has the Space Telescope Science Institute (STScI) become increasingly aware of the pre-existing planetarium network. In my short tenure at STScI, we have learned that the planetarium community is not merely receptive to input from HST, it is wildly enthusiastic!

Although details are being worked out as of this writing, STScI hopes to be proactive in its involvement with planetaria. I cannot think of a more efficacious means to share the wonders of HST discoveries than via the planetarium community.

STScI is working closely with Jim Manning in formulating a survey to IPS members on the level of support that would be appropriate, affordable and useful.

To date, we've done our best to fulfill requests on an individual basis. Of course, we'll continue to do our best to support that activity, but we'd like to make it more "automatic". I'd like to canvass the membership to begin thinking of what would be most useful for you, and your planetarium.

In the next issue of The Planetarian, STScI—along with IPS—will present a questionnaire to this effect. On the basis of the result of that questionnaire, we will proceed further and will make your IPS membership more valuable.

Rob Landis
Space Telescope Science Institute
3700 San Martin Drive
Baltimore, MD 21218 USA

* * * * *

The first point I would like to raise is that of what great value an IPS membership truly is. Typical national or international membership fees for other professional associations commonly run to $150, $350, $650 and more per year. This is even true of associations related to the planetarium community. And I find the use of the fees collected by IPS to be managed responsibly. The sponsorship of the Membership Directory produced so well by Mark and Carolyn Peterson is a very wise financial investment, and alone would justify my membership fees. But a member also receives a quarterly copy of the IPS journal, The Planetarian. A member may approach use of this publication in two ways: to glance through the current issue and throw it into the corner magazine pile, or to read the issue cover to cover and use the information to enhance their level of development as a planetarium professional. As with many opportunities in life, the true value of an IPS membership lies in what you yourself make of the opportunity.

Jeffrey H. Bowen
Bowen Productions
3590 N. Meridian
Indianapolis, IN 46208 USA

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This is a tough question to ask. And I don't think it's a completely fair one, because when you start questioning the value of something, you usually have a couple of options to consider. For example, if you question the value of the automobile you own your decision could result in either hanging on to the car you've got, or buying a new car. Very seldom do you opt to get rid of your old car and walk everywhere.

When you ask "Does IPS membership provide good membership?", you simply don't have these options. There is no other multinational planetarium society that you can choose as an alternative, nor should there be one.

So, what is the question really boils down to is, "Should I or should I not be a member of IPS?"

The community of planetarium professionals, worldwide in scope, is still a very small community. Many of us know a lot of our colleagues, which means that communication within the IPS organisation can be incredibly swift and thorough. I can think of no other global profession, where an individual can make such a great impact on his peers or his discipline. Can you imagine trying to advance your theory on the best way to cook home-fried potatoes to a huge, international convention of short-order cooks? (Incidentally, I have come up with a terrific recipe for home-fried potatoes).

The money we pay for dues is not much, certainly much less than that for most other museum or science professional organisations. If you don't feel you're getting your money's worth, then maybe you should consider ways in which more value can be gotten for your dues. In other words, contribute your ideas, your skills, and your time to those things in IPS that you would like to see enhanced. If you've got a great idea for a book or publication, then submit it. If there's something that the organisation isn't doing that you think ought to be done, volunteer for heaven's sake! No sense griping about things that can be changed, and even less than no sense to drop out of IPS because you don't feel you're getting fair value for your dues. Get involved!

Jon U. Bell
Planetarium Director
Indian River Community College
Fort Pierce, Florida 34981 USA

* * * *

My own opinion on this topic is that Jim Manning hit the nail on the head. Members of any organisation can't sit back and expect things to be dished up to them on a plate. I like to be an active member (hence my responsibilities for this column) and the new contacts I make because of it increase my value for money in joining the IPS. The tide of thought in the upper echelons of the IPS is turning inexcorably towards meeting the concerns of the international contingent, and is it up to those very members to contribute to this long-overdue change by becoming active participants in change. The fact that I did not receive any contributions from non-American members would indicate that, on the whole, this section of IPS feels they are getting value for money.

* * * *

The subject for discussion in the next Forum will be...

The world is beginning to be gripped by Millennium fever. Should planetarians start to think about organising long term projects, which will celebrate the coming of the 21st century in our own unique way? These projects could perhaps equally remind people of the astronomical discoveries of the 20th century, or they could look forward to the promise of discovery over the next 100 years. Or perhaps you have your own ideas?

Please send contributions to me by July 10 at the latest.
**SPACE CREATORS**

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The Australian Outback,  
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In my 'B.C.' (Before Computers) period in the planetarium profession, I used to dread the occasional phone call that started, "I'm going on vacation to Bermuda and I want to know exactly what time the moon will rise on July 16..." or some variation. What I dreaded was the tedious interpolation of tables in The American Ephemeris and Nautical Almanac (now The Astronomical Almanac) and button pushing on the calculator. In those day of yore, that was the way to go if you wanted a precise and reliable answer. When the first personal computers appeared, some of the earliest astronomical software developed for them calculated sun and moon rises and sets. Unfortunately, some of these early efforts left a lot to be desired in the accuracy department. Now, thanks to the good folks at the U.S. Naval Observatory, we have the Multiyear Interactive Computer Almanac - MICA, for short.

With MICA you can compute much of the information found in the tables of The Astronomical Almanac but tailored of any location on earth whose latitude and longitude you know and for any date or span of dates within the 1990 - 1999 decade. In addition to sun and moon rises and sets, MICA will also calculate astronomical, nautical and civil twilights. In fact, it will calculate rises, sets and transits of any major body in the solar system as well as any object in the MICA database. This database includes the 1535 stars of the FK5 fundamental star catalog, the 108 Messier objects (cross referenced with NGC numbers), the 233 member compact extragalactic radio source catalog of The Astronomical Almanac and a 1482 star subset of the Yale Bright Star Catalog. There are also provisions for creating your own catalogs of objects.

MICA can also calculate the positions of any object in its database. These positions can be determined as apparent, astrometric or geometric and for barycentric, heliocentric, geocentric or topocentric origins. These positions can be tabulated for any one of five reference frames: equator of J2000, ecliptic of J2000, equator of date, ecliptic of date, or local horizon.

If you're a solar or planetary observer, MICA will give you the apparent magnitude, phase angle, and angular dimensions of the planetary disks along with the sub-solar and sub-earth positions and the position angles of the axis of rotation for planets and sun. Quantities in the output tables are corrected for light travel times to give observed values.

Low precision topocentric information on the sun, moon and major planets at any given time can be listed in a single table using the 'configuration' option. This provides, R.A., Dec., Distance, Azimuth, Zenith Distance, Elongation, Diameter, and Magnitude.

MICA will calculate in either TDT or UT1 time scales. For UT1 it uses measured values for delta T in 1990 - 1992. For subsequent years it makes an estimate of delta T with an estimated accuracy of 1 to 4 seconds.

The user interface for MICA is very primitive by today's flashy, resource hogging, GUI standards. All selections and commands are accessed by simple drop down menus. Nonetheless, the menus are very straightforward and intuitive. This elemental interface no doubt has a lot to do with its wide usability. MICA will run on any IBM PC or clone with an Intel 8086 processor running PC- or MS-DOS (version 2.0 or higher), 512 K bytes of RAM, a clock speed of 8 MHz or greater, and a hard disk with 1.8 Mega-bytes of available space. A math coprocessor is highly recommended.

Some of you may have heard of MICA's antecedent ICE (the Interactive Computer Ephemeris). ICE wasn't restricted to 1990-1999, but its interface was cruder and guess you could find ICE on some of the computer bulletin boards if you want to look at other decades.

In sum, MICA is an excellent utility program that no planetarium should be without. It may not be pretty, but it is the final word in accuracy. So, get a copy of MICA and stop dreading those phone calls asking, "What times does the moon rise from..." Remember to dust off your copy of The Astronomical Almanac every now and then, in order to remember the good old 'B.C.' days!
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!"

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.
Zooming and slewing projectors have been used commonly in planetariums for at least a couple of decades now. These devices make it possible to visualize dynamic scenes of moving planets and spacecraft using our old friend, the slide projector. In fact, motorized zooms and mirror slews are among the most popular moving-visual devices operating in planetariums today. But while their use has been enhanced in some facilities by integration with computer automation, this trend has not been universal. Indeed, most zooms and slews are still operated manually—which is a problem for those of us who try to incorporate them into our presentations. In this installment, we'll explore a relatively inexpensive way to make this equipment more versatile and user-friendly in shows.

The Problem

For the zoom or slew which is coupled together with a single-shot slide or filmstrip-type projector, there really is no problem with operation—either manual or automated. Since such devices are generally designed to be used only once within a presentation, they can be set up positionally before the program, and simply motion-controlled when called for later in the show. However, many zooms and slews can now be found coupled together with Ektographic-style multiple-slide projectors, making it possible to use this equipment many times for many different images within the same presentation—at least in theory. While a couple of planetarium equipment manufacturers have incorporated position-repeatable automated controllers for zooms and slews, the unfortunate reality is that the cost of such interfaces is prohibitive for most low-budget facilities. And some automation systems have no provision at all for utilizing such refined and specialized controls.

The alternative in such circumstances is to control zooms and slews manually. But unless a show is constructed in such a way that the ending position of one motion is essentially the same as the starting position for the next one, the show giver is left to blindly grope about with the zoom and slew controls in a feeble attempt to reposition those devices between the moving-image sequences. This can be particularly problematic when controlling a zoom as well as both X and Y slew axes. Because of the production design constraints of the typical planetarium program, it is seldom desirable or even possible to start every zoom-slew motion from the ending position of the previous moving image.

At least one vendor has attempted to address this problem. In their design, there is an alternate "positional" or "servo" mode in which the operator—instead of controlling slew rate—can use the controls to drive the unseen image to a desired position on the dome. However, trying to use the joystick and range/sensitivity knob in this mode is, at best, inexact. Furthermore, some folks find it quite cumbersome, mentally, to switch between the rate and servo modes—especially in tight sequences, or while other manual planetarium operations are required.

Seeing the Invisible

While working at Gibbes Planetarium in Columbia, SC, back in the mid-1980s, I came up with a cheap, relatively low-tech solution to this problem. It involved using simple "position feedback" circuits for the motion mechanisms. On each zoom and slew axis a "feedback" potentiometer was mounted and geared into the motion mechanism, and wired to a corresponding panel-mounted DC voltmeter back at the console. A regulated DC power supply was used to power all the zoom and slew feedback circuits. Figure 1 is a schematic diagram of this design as used to monitor a zoom and an accompanying X-Y slew mechanism.

The operational premise behind this system is straightforward. As the slew mechanisms are panned and tilted, and the zoom is driven large or small, the potentiometer for each mechanism has its shaft and wiper position moved via the inter-meshed gearing. As
a result, the pot—which is connected to the output of the DC supply—itself outputs a changing voltage to a DC voltmeter back at the console. The show operator, therefore, by watching the needles on the “X”, “Y”, and “Z” voltmeters, can infer “see” where or how large the invisible slide projector image is before it is used in the program. (This is particularly helpful if the “Y” an “Z” meters are turned on their sides, and if the meters have appropriate labels affixed to their faces inside their clear bezels, as depicted in Figure 2). This allows the operator to repeatably and accurately position the mechanisms “blind” prior to each sequence in which those images actually appear in the show.

**The Electronics**

The DC voltmeters we used are Radio Shack #270-1754. This model comes with a 15K-ohm dropping resistor—which is supposed to be wired in-series with the meter’s (+) lead. However, we chucked the 15K unit and opted, instead, for a 10K resistor and a 10K trim pot, which allows for a “gain” adjustment on the meter. Each trim pot and resistor are wired in-series as shown in Figure 1. In turn, the trim pot on each is connected to the wiper of a 10K feedback pot which is mechanically coupled to the corresponding slew or zoom mechanism out in the theater. The side terminals of each feedback pot are wired to the power supply back at the console. Specifically, one side-terminal of each pot is connected to “ground”, and the other to the supply’s (+) output. Each meter’s (-) lead is connected to the power supply ground terminal as well. A small-gauge multi-conductor cable is then used to interconnect the console and zoom-slew components, with two conductors needed for the power supply feed lines, and one additional conductor for each feedback-pot wiper.

The DC power supply (Figure 3) is a regulated version, which guarantees that the meter readings should be consistently accurate, regardless of line-voltage fluctuations or current draw from the other feedback pots as they voltage-follow their mechanism motions. The following is a component list of the main power supply parts:

- **S1** - SPST mini toggle switch
- **F1** - 1/4-amp slow-blow fuse
- **T1** - 25.2-volt, 450 mA center-tap transformer
- **L1** - 12-volt, 75 mA panel lamp, E-5 base
- **BR1** - Bridge rectifier, LS A, 100 PIV
- **R1** - 100-ohm, 1-watt resistor
- **R2** - 220-ohm resistor
- **R3** - 10K trim pot
- **C1** - 1000 MFD, 50 WVDC electrolytic capacitor
- **C2** - 100 MFD, 50 WVDC electrolytic capacitor
- **U1** - LM317T Positive adjustable DC voltage regulator

All of these power supply components are available through Radio Shack. (A few other components—such as a project case, circuit board, fuse holder, etcetera—may be needed, depending upon the specifics employed in the final layout.) For clarification, the trim pot R3 sets the output voltage of the regulator U1 (1.2 to 37 volts), and thereby provides a rough “master gain” setting for the feedback system. L1 is simply a lamp scavenging low-voltage AC from one side of the transformer’s center-tapped secondary—that can be overboarded from the supply and used to illuminate the voltmeters for visibility in the dark. The 100-ohm, 1-watt resistor (R1) is used to limit current to L1, making the lamp a good, subtle intensity for use in a darkened planetarium. Radio Shack also has panel-mount lamp holders (#272-340) to fit the E-5 base of L1, and these units have red lenses, making them particularly applicable for use in the dome. (We mounted one of these on a small aluminum hanger attached to the console, which suspended it—facing down—above the meters. In addition, we attached a tiny light shield—cut from a cylindrical black plastic Kodak film cassette storage cartridge—around the lamp holder to minimize unwanted light spray.)

The feedback pots are 10K-ohm units, and are of the panel-mount variety. While the exact selection isn’t critical, it is important to use pots which are relatively decent quality, and have a linear taper—not an audio taper. Also, the selection should have a shaft diameter compatible with a standard gear bore. In the US, this generally points toward a pot shaft of 1/4 inch. (Unfortunately, the linear-taper panel-mount pots available at Radio Shack have a shaft diameter which is slightly smaller than 1/4 inch. This means that a 1/4-inch-bore gear will mount onto it rather lopsided, creating severe problems when meshing it to the zoom or slew mechanism. In addition, the Radio Shack pots are optimized for use with a ganged switch, which can be mounted onto the backside of the control. As a result, these units are designed so that roughly 30 to 40 degrees of their counterclockwisemost region of rotation provides no resistance change whatsoever, further making these units unsuitable for this application.) Try either a local electronic parts store, or an electronic parts mail order warehouse for these pots.

**Mechanical Considerations**

The mechanical aspect of this project is perhaps the most problematic, because it requires that care be taken to smoothly integrate the feedback pots and their mountings into the existing zoom and slew mechanisms. Sloppy work or poor retrofit design can result in a failure to successfully mate the feedback system to the mechanism, or worse, to damage the slew or zoom assembly itself. Do plenty of research and planning before diving into this aspect of the project. (Remember the old carpenter’s adage, “Measure twice, cut once.”) If you don’t feel mechanically adept, or don’t have the ready facilities to do simple mechanical design and construction, try to find a friend who can provide the needed expertise and assistance. Always work hard to keep metal filings out of delicate pre-existing mechanisms during drilling and tapping. Meticulously taping-off those areas will go a long way toward protecting them. Keeping a vacuum hose close to work-in-progress will also provide insurance against a fleck of aluminum lodging itself inside an unsealed ball-bearing or other part.

The major tasks in the mechanical retrofitting are anchoring the body of the pot to some fixed point on the device, and smoothly integrating the pot shaft into movements of the mechanism. Whatever design and
construction strategies are used, the end result should provide consistent, repeatable position readings, while not adversely affecting the zoom's or slew's speed-range or smoothness characteristics.

On some X-Y slews, the motion axes are already driven via exposed gears, providing a ready way to link-in the feedback pots. In the case of mechanisms having no exposed or accessible gearing, gears will have to be mounted onto the main axes as well as to the feedback pots themselves. Spur gears (having teeth cut into the circumference at right angles to the gear faces) are the most common type used on geared slew and zoom assemblies, and are by far the simplest to retrofit to. It is important to find gears with the same pitch (size and spacing of teeth), and pressure angle (slope or cut-angle of the teeth), to insure proper meshing—though most spur gears you will encounter will probably be machined with a 20-degree pressure angle. Gear pitch, as measured in the US, can be ascertained by simply counting the number of teeth on the gear, measuring—in inches—the gear's pitch diameter (from the mid-height point of a tooth on one side of the gear, to mid-tooth on the opposite side), and dividing the total tooth-count by the pitch diameter. For example, suppose the axis-gears on an X-Y slew assembly have a total of 80 teeth and a 2.5-inch pitch diameter. By dividing 80 by 2.5, you can ascertain that the gear pitch in this case is 32. To properly mesh one spur gear to another—regardless of the final gear diameter selections—you must match the interfacing gears' pitches.

In addition, it is important to have the pots mounted so that their shafts are kept parallel to the rotational axes of their respective mechanisms. Interfacing the pots in an out-of-kilter orientation can cause the mechanical motion to become jerky or uneven. And the feedback pots must be mounted in such a way that their gears have enough, but not too much "backlash," or "gear slop." Too much backlash, or loose meshing, can create excessive positional inaccuracy between one motion and its opposite direction. Too little backlash, or overly-tight meshing—with the gear teeth pressed together—can lead to rough motions and binding of the mechanism. To combat this, the pot should be mounted in such a way that its final position—relative to the other gear—can be adjusted. This can be accomplished in two different ways. The first is to accurately calculate, measure and drill a slightly oversized pot-mounting hole, and use that hole to provide the needed "play" for the pot-position adjustment when mounting it with its bushing nut. The second method is to mount the pot on an adjustable arm (Figure 4), which, in turn, is mounted to the existing mechanism with machine screws. If the screw holes in the arm are drilled slightly oversized, then the arm can be pivoted into a desired gear-mesh position before the screws are tightened (into drilled and tapped holes in the fixed mechanism). The best way to determine proper gear backlash is to check that the teeth are fully meshed together, but that the pot gear can also be rotated ever-so-slightly against a totally stationary axis gear. Try this at several different mechanism positions in case the gear's circumference isn't perfectly concentric with the pot shaft.

Another important consideration deals with the relative diameter or ratio of the pot gear to the gear on the zoom ring or slew axis. Since most single-turn pots have a rotational range of around 300 degrees, the gear ratio should not lead to an excess of this rotational angle. To be safe, I recommend selecting a gear that, when mounted, utilizes no more than about 80 percent of the pot's rotational range when driving the slew or zoom from one end of its motion range to the other. Much more than 80 percent and you run the risk of damaging the pot as the wiper is driven hard against its end stop. On the other hand, using too little of the pot rotation—say, less than 40 percent—will reduce the resolution, or accuracy, of the meter indicator. The best way to find this "magic number"—after determining gear pitch—is to start by simply counting the number of teeth on the zoom ring or slew-axis gear that passes a fixed point as it is run from one end of its motion to the other. From there, it's a relatively straightforward matter to calculate the size of the pot gear that's needed.

When it comes to zoom assemblies, adding position-feedback can be a real problem, particularly to those designed to be driven via a friction belt, or O-ring. Because of the potential for belt stretch and slippage, there is no effective way to positively "lock" the zoom ring to either the motor or the pot. The only way to deal with such an assembly is to rebuild the drive mechanism itself by adding gears or chain and sprockets to the motor and zoom-ring interface—probably not a job for the mechanical novice. There are, however, a number of zoom assemblies out there that already use just this sort of mechanical linkage, and they are well suited for adaptation.

Sometimes space constraints on an existing motion mechanism will not allow for the addition of "standard-size" components. Such is the case with the Sky-Skan SS 244 X-Y slew. The DC motors and servo-pots fill near-

![Figure 3](image-url)
ly all of the available space inside their axis-drive boxes. When retrofitting the SS 244 at Schiele Planetarium in Gastonia, NC, we had to select miniature panel pots (Clarostat 308N series) whose bodies were only 1/2 inch (13mm) square. This allowed us to mount the X-axis pot inside the X, or base box, and mount the Y-axis unit just outside the Y-drive box via a metal bracket, but close enough to interface with the axis-gear. However, the pot selection forced us to machine small adapter sleeves to mate the miniature pot's 1/8-inch shafts to the pot gears' 1/4-inch bores that we used.

Final Setup

After mechanical and electronic assembly, you'll want to adjust the feedback system to achieve maximum range and resolution on the meters. The first order of business is to mechanically “center” the feedback pots to the zoom and slew mechanisms. First, run each so that it is exactly in the center of its motion range, and using the set screws on the pot gears, adjust them on the pot shafts to place the pots at their range-centers as well. This can be done by simply “eyeballing” them, though use of a volt-ohmmeter will make this adjustment more accurate.

Next using a volt-ohmmeter, adjust the power supply output to about 20 volts, and then connect the supply, meters, and feedback pots together as shown in Figure 1. Powered up, roughly center the meter needles (with the zoom and slew mechanisms still centered) using the individual 10K trims for each meter. Now run the motions. You should see the needles track along with the slew and zoom motions. You'll probably find that one or more of the meters moves “backwards,” or disagrees with the logical motion direction of the slew or zoom. In that case, you can simply reverse the two side leads on the corresponding pots, which will immediately correct the problem.

As you operate the zoom and slew, you'll probably notice that the meter needles don't cover their entire ranges. You can expand the upper ends of the ranges by readjusting the meters' trim pots. Unfortunately, the circuitry doesn't incorporate a "bottom end" or “threshold” adjustment. While this could be added to the electronics via the addition of some op-amps, doing so would add complexity to the project. The same result can be accomplished through a slightly unorthodox approach, though. The mechanical “zero” adjustment of the meter—usually used to set the meter with no voltage present—can be changed to place the bottom end of the range at zero for that corresponding part of the zoom or slew range. (Actually, when used in this way, the meter will fall to below zero when the feedback system is powered down, but this phenomenon is of no practical consequence.) Even then—depending upon how much of the feedback pots' ranges are utilized, given the gear ratios selected, you still may not be able to get the needles all the way down to zero. If this is the case, you can be even more sneaky. Simply remove the clear-plastic bezels from the front of the meters, and adjust the needles' low-ends further downward by swinging it with a small screwdriver the small slotted metal adjustment lever inside the meter. By alternately tweaking the high ends of the range with the trim pots, and the low ends with the meters' mechanical adjustments, you should be able to achieve a full swing on the meters. Finally, ship the tiny plastic tabs off the bezel adjuster screws (since they're useless at this point anyway) and replace the bezels.

Getting Some Feedback

As you operate the zoom and slew controls, you'll quickly notice how certain meter-position combinations correlate to image sizes and positions on the dome. You'll soon find that it's easy to use these readouts to accurately position images without them even being visible. In fact, it is even possible to jot down "position index numbers" from the meters onto your show script and achieve very accurate and repeatable "blind" slew and zooms during shows. However, in the case of slew mechanisms, it is very important to bear in mind that positional repeatability can only be maintained if the slew head and projector are kept in a fixed orientation with respect to each other and to the dome. Developing a strategy for either anchoring, or otherwise referencing these devices will enhance your ability to move your zooming, slewing images with accuracy.

As far as parts sources for this project, most of the electronic items (except for the recommended feedback pots) can be purchased at Radio Shack. On the mechanical side, a good source for spur gears is:

Winfred M. Berg, Inc.
499 Ocean Avenue
East Rockaway, NY 11518
(516) 596-1700

This outfit has a voluminous catalog available with all sorts of neat mechanical parts, and they have oodles of gears in lots of different pitches and diameters, with a variety of hub styles and bore sizes. They can even do some custom assembly for specialized parts-combinations for an additional charge.

By incorporating position indicators into your manually-operated zooms and slews, you'll suddenly be able to add a whole new dimension to the shows that you run. You may even adopt a whole new and positive outlook on these motion devices, finding lots of visual tricks to incorporate in your programs, and adding polish and professionalism that was impossible to achieve before.

Dimmer Postscript

I'd like to make a clarification in my discussion of dimmer crosstalk from the last installment of Planetrchnica. In that article I mentioned that "hot" wires in US electrical systems are black in color. Actually, hot conductors can also be colored red and blue, in addition to black—which is sometimes how different branch hots are differentiated away from the service box, or distribution panel.

In addition, I should thank Jim Horn, here at Morehead, for providing me with some valuable insights into the dimmer crosstalk phenomenon. It was Jim's years of experience with such equipment that helped elucidate some of the more esoteric aspects of this insidious planetarium problem.

Donald S. Hall Retirement Party

What: A party to roast and toast Don's retirement after 27 years at the RMSC Strasenburgh Planetarium

When: Tentatively scheduled for Saturday, Sept. 30, 1995, 6 p.m.

Where: RMSC Strasenburgh Planetarium
657 East Avenue
Rochester, NY 14607

For further information: contact Charlene Oukes, Strasenburgh Planetarium, PO Box 1480, Rochester, NY 14603. Telephone: 716-271-4552 ext. 401; FAX: 716-271-5935

Vol. 24, No. 2, June 1995

The Planetarian 25
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? 

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?

KEEP LOOKING UP!

JACK HORKHEIMER: STAR HUSTLER

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American Museum/Hayden Planetarium

"...I never miss it. As someone totally involved in science fiction, I'm enthralled with Jack Horkheimer's science fact." 
John Nathan Turner, Executive Producer, 'Dr. Who'

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Book Reviews

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Summer (or winter, depending on your hemisphere) is always a good time for new books. The star party that's clouded out, the meteor shower blocked by a full moon, the planetarium program for that special group that doesn't show up (not to mention that hammock in the shade...), all are opportunities to sample some stellar stuff from the publishers.

Thank you to our loyal reviewers for this issue: James Brown, Robert D. Hicks, Francine Jackson, Gary Lazich, Dennis Mammana, David Maness, Jose Olivarez and Sue Reynolds.

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Reviewed by Robert D. Hicks, Richmond, Virginia, USA.

Science teacher Robert L. Bonnet and computer consultant G. Daniel Keen have written another volume in the Tab Books series on science fair projects. The authors' goal is to provide complete project ideas using valid scientific processes and procedures. The book's introduction discusses the virtues and benefits of science fair projects, accompanied by a good, concise background which defines science and describes how science fairs operate. The introduction—and the suggested projects themselves—place great emphasis on safety and adult supervision where appropriate.

The suggested projects are divided into broad categories including basic sky observing techniques, time reckoning, solar system and stellar astronomy, a separate section on meteors and meteorites, and comparatively unusual applications of astronomy such as examining superstitions and astrological predictions. Some projects are rather traditional but instructive, such as "Focus In," in which the student determines the relationship between the field of vision and increasing magnification through a telescope. Other projects are unusual and might involve research and experimental skills found among older students, such as "Booking Your Flight," which examines the correspondence between bird migration and seasonal changes in the length of daylight. The authors suggest studying the swallows of San Juan Capistrano, data perhaps not easy to obtain.

I am partial to projects which focus attention on the "basics" of astronomy: measurements of time, motion, and mass. This book's collection does address some—such as the construction of a simple sundial (although, curiously, no appropriate illustration accompanies the description)—but does provide some fun twists. For example, one project requires students to superimpose a metric clock face on a standard one. On the other hand, the project for determining the direction of north ("Which is North?") seems limiting in focusing on magnetic deviation. Exercises which are based on Renaissance-era techniques for determining latitude or finding true north (relying on observations of the sun or polestar) are absent from this collection, one of my few criticisms of this book.

All experiments are written in language understandable to junior high students. Most experiments carry clear illustrations, but a few require specialized equipment such as photography with Tri-X film or use of a video camera. At least two require computer skills (programming in Basic). Each project is succinctly framed within a common format: an overview; a list of requisite materials; a statement of the hypothesis; a description of the procedure; and a list of other related questions worth exploring. Frequently, the related questions are more interesting and provocative than the hypotheses.

Although the book features both traditional and new and imaginative projects suitable for junior-high and high-school students, the authors could have included a short bibliography with each project. A few resources are in fact listed in the book (mostly supply companies), but none are linked to specific projects. I would have preferred to see some additional "hard" projects involving, say, latitude and longitude measurement, as opposed to a few projects of questionable scientific value, such as "Heavenly Hobgoblins," which asks students to deliberately circulate made-up superstitions about astronomy and try to fool people into believing them. Overall, however, this book should well serve science teachers and their students.

I was a bit wary of this book when I first opened the package. It looked like it would be dry and technical. But I was pleasantly surprised by the time I reached the third page and realized it was somewhat readable. Most of us in the astronomy "biz" are predisposed to do most of our looking up at night. This book is a reminder of the value of daytime sky observing as well.

There were a few minor annoyances that bothered me upon first reading. Some definitions of terms were very brief and required further clarification. In chapter 2 there was the first mention of the term "singly oriented columns" that were described as "column crystals falling with their axes nearly horizontal." I don't like assuming things, but I had to assume the author meant the long axis. He might have meant the short axis, an axis of rotation, or something completely different. A glossary would have been helpful.

The photographs in the book are generally spectacular. I frequently wondered if the author would make any suggestions or give any hints about techniques he discovered. While these could have been referred to in the text, I did find the information in Appendix A. There are many photos or diagrams in which it is just not clear what was supposed to be visible (page 14 is one example). It took several minutes of cross-referencing between pages to discover what was referred to in many of the illustrations. Arrows and labels would have been a great help.

Insofar as the science goes, it is well thought-out. The procedures were there and they made sense. The book itself, however, is a bit disorganized. It wasn't until long after stating that the crystals caught in petri dishes were responsible for the display that he explains his reasons for thinking so (page 39). For a strictly scientific work, I think the procedures and rationale should have been dealt with at the beginning. The author himself admits (on page 50) to some minor problems with organization.

Atmospheric Halos has certainly made me more conscious of rings around the sun and moon. But the most frequent note I made to myself for this review was the need for more labels. In short, this is a good brief reference.
black holes as the cause of cosmic expansion. The resulting universe oscillates in 40-bilion-year cycles with a Milky Way galaxy at least 300 billion years old. In the face of disagreement verging on ridicule, Hoyle and his supporters propose alternative explanations for most verified "big-bang" discoveries. (See "A Catalog of Quasars Far and Near" in December, 1994's *Sky and Telescope* and the Newswire section of the January, 1995 issue for examples.)

The "exquisite complexity" of physical laws and the "incredible chain of subtlety" behind biochemistry leads Hoyle to "doubt the nineteenth century denial of a purposive universe" as well as "the crude breaking of physical laws that occurs in big-bang cosmology." He sees the Universe of physics as "a set of restrictions on mathematical quantities ... optimized for their consequences" with God as "the chap who thought up the restrictions." Rejecting prayer as too prone to self-deception, Hoyle suggests consciousness itself as a means to "extra-Universal" communication with God.

Despite his uncertainties, Hoyle maintains his optimism. "After a lifetime of crabwise thinking, I have gradually become aware of the towering intellectual structure of the world ... [W]hat the end may be for each of us, it cannot be a bad one." I enjoyed this book on several levels: as the story of an interesting character; as a glimpse into the workings of twentieth-century astrophysics; as a stubborn defense of an apparently dis-proved theory of cosmology; and as the retrospective of an individual who has spent his life attempting to make sense of the universe, of human existence, and, ultimately, of himself.

Planetarium educators, who contemplate the universe with their audiences, should find this book especially thought-provoking. At over 400 pages, Hoyle's story is not a quick read, but those with the time and patience to accompany him on his sometimes "crabwise" excursions will find the effort amply rewarded.


Reviewed by James Brown, Stanback Planetarium, Orangeburg, South Carolina, USA.

Everyone, it seems, has a slant on gravity. Sir Isaac Newton, of course, gave us the foundations in mathematics for our current understanding of gravity. Albert Einstein furthered that knowledge with his work. Scientists have searched for years to discover an understanding of what gravity is, to identify it in non-mathematical terms. A former astrophysics professor of mine spent time at the radio observatory in Green Bank, West Virginia, searching for clues to gravity waves. Some theories have merit, others seem as wild as the fantasy world of science fiction. I'd like to be able to report that this book falls the former category, but unfortunately, it falls in the latter.

First, the author holds a medical degree. While the book jacket describes his medical career in glowing terms, there is no mention of any background in physics, astrophysics or mathematics. It describes his background with gravitational theory as "an intense curiosity about how the universe works—especially gravity."

Quinn's concept of gravity involves a theory first postulated in 1694 by Nicolas Fatio. This theory is based on *corpuscles ultramondains,* minute particles moving rapidly in all directions in space. Quinn later quantifies these particles as photons and says that gravity is "photon pressure" on objects. I quote: "In areas of space remote from solid matter, electromagnetic waves (EMW) would be coming from random directions and the flux of energy would be equal in all directions—or isotopic. However, in the presence of matter, the energy flow would not be isotopic. An object or mass would absorb or reflect some of the EMW and distort the flux of energy in the space around the object. A shadow would be created about any material object because of its interference of the flow of EMW energy. The shadow would be spherical about the mass and the intensity of the shadow would decrease according to the distance of the object."

"This disturbance of the isotropic flow of energy would result in a gradient of space pressure about an object. This shadow or distortion of radiation pressure could be called a field about a mass. If this shadow field acts like gravity, then we can suggest that gravity is merely a mechanical effect caused when an object's shadow distorts the isotropy of space pressure."

He describes the formation of stars to be not what is conventionally thought of as an ever-increasing mass/gravitational center the creates the protostar, but rather the result of photon pressure pushing the gases together to form the protostar from surrounding space. He further describes the formation of galaxies as "...formed from the explosion of a massive star." He discounts the Hubble constant and claims that Doppler effect red shift is caused by "gravitational drag."

I've heard and read quite a few wild and unorthodox theories in my professional career, including one Chicago man's theory...
that the Sun was a living, breathing organic creature. But up until now, nothing to top Robert Quinn's "theories" on the nature of gravity. It bothers me that this book could be read and accepted by laymen as a viable alternative to accepted physical laws. It doesn't take much to show that Quinn's "photon" theory doesn't hold up. For example, if I take a ball into a closed room in which there is no light and let it drop, it will still fall toward the Earth.

Our understanding of gravity today is based on the work of scientists, work that has been proven time and time again. I have no doubt that in time a fuller understanding of the nature of gravity will be uncovered and I would recommend this book for reading only if the reader is familiar with the work of Newton and Einstein and is looking for some recreational humor.

Reviewed by Jose Olivarez, Wichita Ominisphere and Science Center, Wichita, Kansas, USA.

Today, beginning telescope buyers and budding amateur astronomers must wade through an ocean of literature and propaganda before they are able to select a telescope intelligently. Some seek help from other amateur astronomers, but for many their first impulse is to call their local planetarium for some quick and authoritative advice. What is a planetarian to do? This is where this wonderful book comes in!

After opening with a chapter that explains telescope history and jargon, Star Ware discounts and explores today's astronomical marketplace. Where is the best place to buy a telescope? Is there a telescope that does everything well? How should one care for a telescope? What accessories are needed? Although there is no single answer to these questions, Star Ware provides intelligent options so that a potential equipment buyer can make an educated decision.

Chapter 3 (So You Want To Buy A Telescope) and Chapter 4 (Attention Shoppers) clearly detail what a buyer must know before purchasing a telescope. Chapter 3 will help readers get a pretty good idea of the kind of telescope they want, and Chapter 4 guides them through 37 reputable retailers of astronomical equipment. One line of good advice in Chapter 4 states, "Do not buy a telescope from a department store, toy store, hobby shop, or any other mass-market retail outlet that advertises a 600 power X 60mm telescope."

The selection and purchase of eyepieces is covered in Chapter 5 (The Eyes Have It), and Chapter 6 (The Right Stuff) discusses filters, finders and photographic equipment.

Interestingly, not all of the best astronomical equipment is for sale—some of it can be made! Ten homemade projects are outlined in Chapter 7 (The Homemade Astronomer) where plans are also provided for the construction of an observing chair, an illuminated clipboard, a binocular mount, a simple camera tracking device, a solar theater, and even a complete backyard observatory.

Star Ware concludes with an important chapter on the care and cleaning of a telescope and a couple of chapters on how to do...
sky observing with a telescope (A Few Tricks Of The Trade and It’s Time to Solo).

Star Ware is truly an “ultimate guide to choosing, buying and using telescopes and accessories.” Mr. Herrington has done a fabulous job of presenting the material. The book is a gold mine of information and sensible guidance for those who want to purchase the right telescope without the fear of ever regretting their choice. Star Ware should also be kept in a handy place in every planetarium’s library for ready use when the phone call comes in from a bewildered telescope buyer. With Star Ware on hand, you will be able to advise shoppers with authority and confidence!


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

The surprising feature of this book is the target audience: families. How the Universe Works was made, not as a regular “lab” book, but as a set of projects the whole family could do together. Each section begins with a paragraph or two about the subject. An average of three experiments per topic completes each two-page spread.

Although some of the projects can be adapted for class use, I noticed that the words “simple” or “easy” do not appear in the title. Some of them are, of course. I’ve performed the Radar Mapping of Venus using rocks instead of building blocks, and the Floating Saturn and Why Stars Explode experiments can be done within thirty seconds. But many others are so elaborate, I worry the child will go back to his/her video game before the setups are finished. For example: The Streetlight Pollution segment involves constructing a box with three partitions of foamcore, making three separate “streetlights” from coat hanger, wooden skewers, flashlight bulbs, clay, tape and a toilet paper roll, then hooking them all up with a 4.5 volt battery. Also, the end photo in the book is too perfect. I’m afraid the child would be disappointed with the Rube Goldbergesque product with which many parents would end up.

Very disappointing is the fact that several patterns, such as the zodiac, the planetarium, and especially the Galileo model are not to scale. They are beautiful works of art in the book, but nowhere near true size. Photocopying these pages won’t help get these models made. And the star charts for the planispheres (this book was written for both hemispheres) are in the seams and won’t copy flat.

All in all, the book is good. If a parent were looking for science-related activities to do with a child, then this is a good choice. The topics are relatively clear, many of the experiments are easy to follow, and anything that can get a kid away from a TV screen (especially an educational activity) sounds great to me.


Reviewed by Dennis Mammana, Reuben H. Fleet Space Theater, San Diego, California, USA.

If you’re looking for an astronomy book that’s easy to read, informative and entertaining all at the same time, look no further. The Wrong-Way Comet is just the ticket for you.

The book captures Evans’ long-time fascination with the solar system in a multitude of engaging essays, lists of astronomical trivia, and exercises that help backyard stargazers feel part of this seemingly awesome universe. Each of his essays stands alone—no previous knowledge or background is required to understand and appreciate his subject material.

What I particularly like is that one may open the book at any point and begin reading. There’s only a loose connection among the essays. In other words, the book is ideal for short-attention-span readers.

The Wrong Way Comet is written on two levels, one for the “raw beginner” who has little scientific background, yet possesses a fascination with the cosmos and our place in it, and one for the more advanced reader who can pick out dozens of new facts, perceptions and quotations.

As an author of four books, I often read others’ work with an eye toward how I
might have done the work better myself. I must admit in this case, however, that couldn’t possibly improve on Evans’ effort. This seems remarkable in that The Wrong-Way Comet is Evans’ first book. That’s not to say that he’s new to popularizing astronomy—he’s been producing a syndicated monthly sky column since 1987. He expresses himself with the easy-going style of a veteran author, and skillfully leads readers along a wonderfully enchanting path of discovery.

His enthusiasm and fascination for the material show in every word, and his style—light and friendly to even the most novice among us—reminds me of that of the late Isaac Asimov. Granted, that’s a pretty lofty compliment, but as I read the book, I was reminded time and again of the way Asimov awakened me to the universe in the early 1960s. If my guess is correct, The Wrong-Way Comet is destined to inspire countless youngsters of the 1990s in much the same way.

In the introduction, Evans explains the goal for the book: "...it’s an attempt to evoke in people with little or no scientific background some of the same spirit of wonder that I see in even the most serious of astronomers. After all, astronomers are scientists, and what are scientists but adult-looking girls and boys who have never been able to stop playing?" In that regard he succeeds beautifully.

For those like me who’ve never completely grown up and still love to “play” among the stars, I heartily recommend The Wrong-Way Comet.

The Complete title of the book will give you a clue about information contained in it and the writing style of the author! The Moon Book: The Meaning of the Methodical Movements of the Mysterious Moon and Other Interesting Facts About the Earth’s Nearest Neighbor contains a million and one bits of information about the moon. Probably every factual detail you could possibly want to know about the moon and its movements are at your fingertips, with this book as a resource. Although the author goes into great detail, his explanations and illustrations are very easily understood. They’re useful as another tool for developing strategies to teach students concepts related to Earth’s natural satellite.

Some of the topics included: vital statistics of the moon, actual and apparent motion, phases (see illustration below), moondogs, moonbows, eclipses, tides methods for observing and photographing the moon, maps, “geological” history, history of lunar exploration, and a discussion of moon calendars.


Reviewed by Susan Reynolds, OCM BOCES Planetarium, Syracuse, New York, USA.

The Moon Calendar
New Moon
One lunar cycle has been completed.

Old Crescent Moon
The moon is ahead of the earth, but beginning to move toward the trailing edge of the orbit.

Last Quarter Moon
The moon is 90 degrees (1/4) around its orbit, on the leading edge of the earth’s orbit.

Waning Gibbous Moon
The moon is moving into the leading side of the earth’s orbit.

Full Moon
The moon is opposite from the sun, on the far side of the earth.

Waxing Gibbous Moon
The moon is moving into the far side of the earth’s orbit, away from the sun.

First Quarter Moon
The moon is 90 degrees (1/4) around the earth, still on the trailing side.

Young Crescent Moon
The moon is trailing behind the earth in its orbit.

New Moon
The moon is between the sun and the earth.
Readers of this book will not only be able to use it as a source of basic lunar mytholo-
gy, but will also gain new perspective in reading mythology with imagination. Luna
could well prove to be a valuable resource for those wishing to develop multi-cultural
programs. Ms. Cain states, "The original pur-
pose of writing Luna: Myth and Mystery was
to provide a Mythological handmaiden for
The Moon Book (see review above) written by
Kim Long." Luna concentrates on the way people in
different cultures all over the world have
viewed the moon, though their myths, leg-
ends, stories, folk traditions, poems, songs
and customs; and how those cultural ele-
ments may have been continued in present
practice." The materials presented are inter-
esting and varied, and some of the illus-
trations and quotes are wonderful.
The author does not claim this book to be
a scholarly work. The reader must therefore
screen for technical errors. One scientific
error, and one of my pet peeves, is the pic-
ture on page 104, where the moon's orbit is
labeled, "The moon's rotation around the
earth."

Private Lives of the Stars, by Roy
A. Gallant; MacMillan Publishing
Company, New York, NY.

Reviewed by: David Leake,
William M. Staerkel Planetarium, Parkland
College, Champaign, IL

At some time in his life, every stargazer
will remember one book that made the uni-
verse a bit more knowable; a book where
everything just seemed to "click." I can recall
reading Herbert Friedman's Amazing Universe
many years ago, and the sequence of stellar
evolution just seem to make sense. Reading
Roy Gallant's Private Lives of the Stars gave
me flashbacks to a time when "the light bulb
turned on."

In his unique, fatherly style, Roy Gallant
takes the reader through stellar evolution at
about the middle school level. Major topics
include where stars come from, why they
shine, why they come in different colors,
and their eventual fate. All the bases are cov-
ered and it doesn't read like the Astrophysical
Journal.

Mr. Gallant begins with an ancient view of
the universe, through the gods and goddesses
of our ancestors and the rise of the constella-
tions and the lore that accompanies them. I
particularly appreciate that the author chal-
genled the reader's beliefs in a rotating and
revolving Earth. We often take for granted
what is printed in our textbooks and fail to
ask for proof. Throughout Private Lives of the
Stars, the proof is given in layman's terms.

Chapters two and three focus on the Sun
and our struggles to determine its distance
and size. The reader is taken on an imaginary
journey to the center of the Sun, on the way
passing the corona, chromosphere, and pho-
tosphere, to the core. The discussion of the
Sun's fusion powerhouse is excellent!

My favorite sections of the book are chap-
ters five through nine. They introduce the
reader to the different types of stars that
inhabit our galaxy. Gallant does not speak in
general terms, however. He acquaints us by
discussing specific stars we can easily see in
the sky. We learn about Rigel, Deneb, and
Sirius as examples of blue and white giant
stars. Then come the red giants in the form
of Betelgeuse, Antares and Aldebaran. Each
star comes with a "portrait" displaying some
of the star's vital characteristics and full-page
charts are included to show where to find
these stars in the sky.

White dwarfs are introduced as the proba-
ble end state of our Sun, followed by a dis-
cussion of planetary nebulae and novae. The
book concludes with chapters on variable
stars that "can't make up their mind," and
the anomalies of the galaxy, namely super-
novae, neutron stars, pulsars, black holes, and
"goblins," or mini-black holes.

My only criticism of the book is Chapter
four on the "big bang" and galaxy formation,
which could probably be omitted and not
 disrupt the flow of the manuscript. The short
section on star formation could have been
situated elsewhere.

I would recommend this book to any high
school, middle school, or planetarium that
has a library. It would be the perfect gift for
that young astronomer who has learned a
few constellations and now desires further
knowledge of how the universe works. It is
full of black & white photographs and a gloss-
ary at the end. The real treasure of this book,
however, is Roy Gallant's writing style. It is
as if he is talking to you as you read.
PARTNER * SHIP * EARTH
Our planet provides everything needed to support a large variety of life. Earth seems alive itself, caring for and nurturing its occupants. In this 25 minute program you will explore our fantastic planet from its violent birth to today and see how its composition, structure and wealth of resources make life possible. Find out what we can do to better enjoy and preserve the future of our world.
- 250 slides

LIFE BEYOND EARTH
This 31 minute program investigates the possibility of extraterrestrial life. The show explores the number of stars in our galaxy, the places where planets may have evolved, the chances of life on other worlds and our search for intelligent life in the Universe. A science fiction story about future contact with an alien civilization weaves through the program.
- 368 slides

DESTINATION: UNIVERSE, OUR FUTURE IN SPACE
We dream of flight among the stars, but a trip to the nearest star will require a mastery of technologies we can barely imagine today. This 38 minute program takes you on a journey of the imagination from America's Space Station Freedom, to planetary engineering projects ten thousand years hence.
- 321 slides

WORLDS OF WONDER
"Worlds of Wonder" explores exciting discoveries about the planets, moons and other worlds in our Solar System made during the last two decades with spacecraft like Viking and Voyager and other probes. Beyond the familiar nine planets, at least sixty moons, thousands of asteroids and billions of comets add mystery and adventure to our continuing investigation. Explore these fascinating "Worlds of Wonder" in this 25 minute program.
- 314 slides

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Programs funded by the Westinghouse Electric Corporation
President's Message

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

Greetings!
Last fall, I was part of the general astronomical exodus to South America to watch the sun go dark in the Andean morning sky. My task was to help shepherd a diverse, international group of people across the equator for the big event. We were Americans, Canadians, British, Germans. We ranged in age from 16 to 98. (That's not a typographical error.) We were eclipse veterans and novices. And we were intent upon witnessing the unique rendezvous of sun and moon that creates, to my mind, the most exquisite of all celestial events.

Our destination was Bolivia and the mountainous terrain bordering the eastern edge of the altiplano—the great high plain of the Andes. Our quest took us first to the capital, La Paz, for a few days of acclimatization to the altitude, then on to the old white-washed capital of Sucre, then on a spectacular climb by bus up to Potosí—at more than 13,000 feet (more than 4,000 meters), the highest city in the world. We arrived at nightfall on November 2nd—the eve of eclipse day.

We roused out of bed at 2 a.m. the next morning to cocoa tea and buses waiting to transport us 30 miles south on a winding mountain road to our observing site. Guided by the Southern Cross and the Clouds of Magellan rising in the south, we reached our site near the hamlet of La Lava an hour before sunrise, with dawn just graying the eastern sky.

We tumbled out of our buses onto a cold, rocky plain dotted with prickly pear and scrub, curling up into rugged ridges on nearly every side. As our Bolivian hosts set up bathroom facilities and a tent for breakfast, the group began staking claims to observing spots and erecting a forest of tripods on the otherwise treeless expanse.

The sun peeped over the eastern ridge about a quarter to six, illuminating a sky ribbed with thin cirrus. Clouds north and south thickened, made a feint toward the sun, and then dissolved—taking with them a good deal of our apprehension. The cirrus remained; the sky would not be perfectly clear, but we would have a view.

In the tradition of Bolivia's Aymara Indians, solar eclipses occur when a sky puma eats the sun. On this day, the puma took its first nibble at 7:20 a.m.—and the show was on.

Over the next hour, the sun shrank to a sliver crescent as the puma-moon slid precisely into place over the solar disk. Preparations were made, equipment was checked and rechecked, filtered peeks at the sun were offered to local residents who gathered and regarded us with bemused looks.

Fifteen minutes before second contact, the landscape took on an eerie, whiskey-colored cast in the weakening sunlight. Hearts beat faster as Venus was located above the ailing sun in the deepening sky. With two minutes to go, a blue darkness gathered and grew in the northwest; 90 seconds later, shadow bands rippled across the ground. At 8:24, the moon's shadow descended on us like a falling curtain; the last blazing bead of the sun's disk faded away, and the solar corona blossomed gloriously into view to the primal whoops and shouts of all who watched below.

For three minutes, we reveled in the rare, twilight world of totality. Forty degrees up in the east, the moon was a black disk surrounded by the gauzy streamers of the sun's crown. Equatorial plumes swept outward for several solar diameters; delicate brushes curled over the sun's poles. Venus blazed brightly just above, Jupiter below, and a few bright stars peeked through the cirrus—all against the dark, blue-shadowed sky edged with pale saffrony light around the horizon.

Camera shutters clicked, heads bent over eyepieces, people tried to look everywhere at once, trying to burn a hundred fleeting impressions into their minds, emotions rising in their throats. Aside from the technology, how different, really, from eclipse-watchers of long ago?

After three minutes, a small, ruby prominence popped out on the moon's trailing edge, followed moments later by a bead of laser light that grew into a diamond ring around the moon. The corona was extinguished, the blue shadow gathered itself up and hurtled southeast toward Paraguay. Totality was over, leaving us jubilant and blinking in the new sunlight.

Over the next hour, the puma slowly digorged the sun—a time for high spirits and lowering blood pressures and reliving those glorious minutes of total eclipse. As we waited for fourth contact, the whole experience seemed to call out for some final act of acknowledgement. I joked idly to our Bolivian escort, Luis Carlos, that perhaps we could fashion a Nazca-like line across the rocky ground. And that's when he suggested that there was, actually, something we might do. We might build a huaca.

At 9:39, the puma-moon at last released its grip on the sun. After we broke down our equipment and had packed up for departure, Luis Carlos called us together for that final act of acknowledgement. He explained that the gods of the ancient Andeans were represented in the forces of nature—sun, moon, thunder, rainbow, and other natural phenomena. When the people wished to thank these local gods for a gift received, they built a huaca, an altar of stones on which they placed sweets, spirits, tobacco—things that the gods might use. Did we wish to make such a construction? He hadn't finished his words before we were hunting for stones.

First Luis Carlos set up the core of the huaca—a small, phallic boulder planted upright in deference to the seemingly universal principle of a male/female balance in nature. Around it we piled our chosen rocks, weathered smooth in the harsh climate of the Andes, until a small cairn stood on the plain.

I handed Luis Carlos a chocolate bar I'd been saving, and he carefully broke it into pieces and placed it on the stones. Soon everyone was digging into their packs for an offering: now another chocolate bar, now a package of crackers, an apple, a lollipop, a
couple of cigarettes carefully shredded and sprinkled over the stones.

Someone kicked over a rock next to our cairn, revealing a small, swarming ant hill. The ants will consume our offerings, a voice said. Luis Carlos calmly observed that they were a part of nature too—and perhaps a way for the gods to receive our gift. The native Bolivianos of La Lava clustered around us, watching intently. The chocolate began to melt in the sun and drip down the stones—as if the gods were accepting and transmuting our gifts before our very eyes.

There was something as visceral and moving about this scene as there had been for totality: 20th century travelers respecting the old traditions of this land, trying—however fleetingly—to make an emotional connection with the culture and people, just as they had sought to make an emotional connection with the universe barely an hour before. It seemed the perfect punctuation to a singular experience.

When our efforts were completed, we boarded our buses for the dusty trip back to Potosí. Later that evening, one of our group noted the interest that the local residents had taken in our huaca-building project, and asked Luis Carlos what they might have felt about it. His answer seemed to reflect those ancient Andean traditions, mindful of what had been lost or taken through centuries of colonial intervention. He said that what the people probably saw was a group of foreigners who came and extracted an experience from the land—and took the time to leave something behind in gratitude. He said that they were probably impressed.

I have many memorable images of that trip to Bolivia—of the people, the culture, the harsh beauty of the altiplano. But most vivid of all remain two images from La Lava: the streaming corona of the eclipsed sun, and a simple cairn of stones in the middle of a desolate plain. The universe manifesting itself overhead, and below, a token of our human reaction to it.

I guess that delicate counterpoise of images remains so vivid because for me, it distills the essence of the work that we are about. Ours is not so much the astronomy of research and discovery as it is the astronomy of interpretation and enlightenment. We deal as much with people as we do the universe—perhaps more. And like that contention of quantum theory that says at some level the observer alters reality by the mere act of observation, we cannot consider the universe in our work without also considering the human response to it.

A few years ago, our museum was developing a grant proposal for the National Endowment for the Humanities. My administrators turned to me and asked if we did anything in the planetarium that could possibly relate. I promptly responded that nearly everything we did had an aspect of the humanities. Because if you removed human context and perspective and culture from our programs, you might as well remove the audience, too—for our efforts would be as sterile as the moon.

I think that’s true for all of us, whatever the size and scope of our planetarium, whether our mission is aimed at school or public, whether we do interactive programs, present the current sky, or craft automated multimedia extravaganzas. To enlighten, we must first engage. To engage, we must make relevant. And relevance comes with personal perspective.

Our business is to forge connections to the universe, to channel human reaction into understanding. But how best to do this? I’m reminded of something storyteller Lynn Moroney said to me a few years back, affecting her best Oklahoma drawl: “Ain’t nobody don’t like a good story—and ain’t nobody don’t like the stars.”

I’ve never heard a better, simpler recipe for success in the planetarium. First, give your audience the stars—whether it’s the backyard sky, the view from Pluto, or a simulated cosmic environment ten billion light years from home. Then give them a good story—whether it’s a tale of Coyote scattering the
stars or how the atoms of our bodies were forged inside them.

Give them the stars—and give them a good story. Make relevant, engage, enlighten. Whether it's building a *huaca* in the Bolivian highlands, operating a telescope on Mauna Kea, or snuggling into a comfortable seat in a big-city planetarium to see what a dark sky really looks like, we all seek to make a connection with the terrors and wonders of the universe. Opportunities and experiences abound—let's not waste a single one of them!

**Astronomy Education Standards**

There are several important movements currently afoot to offer new standards and guidelines for the teaching of astronomy—in which all of us should be interested.

Last November, a "Declaration on the Teaching of Astronomy in Europe's Secondary Schools" was adopted by more than 100 secondary school teachers from 17 European countries attending a workshop sponsored by the European Union (EU) and the European Southern Observatory (ESO) at ESO Headquarters in Garching, Germany. The central statement of the document declares that "astronomy should contribute towards the consciousness that, in a complex society abounding in science and technology, a scientific education is essential for the choices that every citizen has to make in the democratic life. Moreover, students should feel that the Earth is a wonderful place in the Universe, and to be cared for and defended."

The declaration outlines basic recommendations on astronomy teaching aims, curriculum development, teacher in-service training, and special activities for students. One of the long-term goals is the establishment of a unified European curriculum in astronomy—one that "would illuminate astronomy as a human endeavor, with associated doubts and lack of answers, the interplay between experiment, observation and theory, the philosophy of science, the scientific method as well as the interaction between science, technology and society."

Another important act of the workshop was the creation of the European Association for Astronomy Education (EAAE), whose provisional Executive Committee is chaired by our colleague Dionysios (Dennis) Simopoulos of the Eugenides Planetarium in Athens, Greece. The committee is setting up a European newsletter on astronomy teaching and is planning a constitutional conference within the next year.

To receive details about this important work, you may wish to contact Dennis in Athens. Congratulations, Dennis, on your selection for this post. We wish you very good luck in your and the committee's efforts.

Complementing the European effort is an ongoing effort in the United States, represented by the National Academy of Sciences' draft proposal for National Science Education Standards. The objectives of these standards are much the same as for the European goals—among them to advance the goal of achieving scientific literacy for all students and to encourage enlightened public decisions on science and technology, to develop universal curriculum goals, to promote activity-based science teaching with emphasis on scientific inquiry, to improve teacher preparation and teaching resources, and to provide equitable access to good science teaching for all students. In this document, astronomy is included mainly under the aegis of the "Earth and Space Sciences" category.

The draft document has been circulating for some months, and many of our American colleagues have been involved in reviewing and offering comments on these standards. I'm most familiar with the efforts of planetarians in my region of the U.S.—Mickey Schmidt at the Air Force Academy in Colorado Springs has been particularly active in encouranging planetarians to participate in the review process. Bess Amaral at the Goddard Planetarium in Roswell, New Mexico, Bob Stoller at the Fiske Planetarium in Boulder, Colorado, Carolyn Collins Petersen of Loch Ness Productions, Lonny Baker at the Astronomical Society of the Pacific, and Alan Gould at the Lawrence Hall of Science in Berkeley, California are among those who've also been involved. If you'd like more details, I'm sure that they and others would be happy to steer you in the right direction.

Again, these are important standardization efforts in which American and European planetarians have an important stake. Let your voice be heard.

In the meantime, it would be very helpful to learn what standards or standardization efforts our colleagues in other parts of the world may be dealing with; please let me know, and I'll pass that information along.

**Connecting with Other Organizations**

Several valuable initiatives are currently underway in our profession's efforts to build bridges and develop relationships with other organizations involved in science or astronomy education.

One of these efforts is being organized by Martin Ratcliffe of the Buhl Planetarium at the Carnegie Science Center in Pittsburgh, Pennsylvania. The American Astronomical Society (AAS) will be meeting in Pittsburgh from June 11-16, and Martin has put together a half-day session on addressing the "apparent gap in communication between research groups and the planetarium community by asking what better ways can be found to make the communication between current research and the mediums of communication of science and astronomy to the wider public more productive," according to his abstract.

The session is divided into paper presentations and a general discussion session; presenters as of this writing include Martin, Anne Kinney of the Space Telescope Science Institute in Baltimore, Dale Smith from Bowling Green State University in Ohio, Carolyn Collins Petersen of Loch Ness and the University of Colorado in Boulder, Doug Duncan, Astronomy Department Head at the Adler Planetarium in Chicago, and Ryan Wyatt of the Burke-Baker Planetarium at the Houston Museum of Natural Science.

Martin's effort is beautifully timed, considering that AAS president Frank Shu has recently called for the creation of an AAS astronomy and science education committee to explore ways in which the AAS and its largely research-oriented membership can better communicate an educational message to the public. This is becoming ever more important as grants for scientific research increasingly require an outreach effort.

I wish Martin all good luck, and I will look forward to his assessment of the session's results.

 Barely a week after the AAS meeting, the Astronomical Society of the Pacific will be convening its Astronomy Education Symposium in College Park, Maryland on June 24-26. IPS is one of the co-sponsors of this event, and we're looking forward to active participation in the session by colleagues including Past-Presidents Bill Gutsch and Jeanne Bishop, Gary Sampson from Wauwatosa West High School Planetarium In Wauwatosa, Wisconsin, and others. Bill will be giving a plenary talk on the role of planetariums, and Jeanne will make a presentation in the K-12 small group session on her research on students' learning processes.

The symposium is gathering some 200 astronomy educators from North America to review major topics, issues and projects in astronomy education; to address problems, solutions, and future plans in group discussions; to create an astronomy education resource network of people and materials; and to produce a proceedings document to disseminate the results of the symposium.

This is another important effort, and for those unable to attend, we will attempt to make the proceedings available in some fashion to apprise you of the symposium's accomplishments.

Incidentally, Jeanne Bishop will be receiving the ASP's 1995 Brennan Award for excel-
lence in secondary astronomy teaching at the ASP awards banquet on June 27. Congratulations, Jeanne, on this well-deserved recognition!

Yet a third effort to reach out to other organizations will occur this fall at the Association of Science and Technology Centers (ASTC) Conference in San Diego, California, October 14-17. Dennis Mammana of the hosting Reuben H. Fleet Space Theater and Science Center is organizing a showcase session entitled “A Universe for Everyone.” In keeping with the conference theme of “Science Centers and Communities,” the session will focus on how planetariums and educational organizations around the world are reaching a variety of communities through the creative use of astronomy.

An international group of planetarians will be participating in this session, including Dennis, Bill Gutsch, Derrick Pitts from the Fels Planetarium in Philadelphia, April Whitten from the Kountze Planetarium in Omaha, Nebraska, IPS President-Elect Thomas Kraupe from Munich, Germany, Undine Concannon from the London Planetarium, Dennis Simopoulos from Athens, Greece, and myself. Since the IPS Council will be convening its off-year meeting in San Diego on October 13, there should be additional opportunities for participation in the ASTC meeting by Council meeting attendees. Perhaps we’ll see you there!

We also need to make connections with similar sorts of organizations outside of the U.S. I hope that our international colleagues will assist us in identifying these groups, so that we can begin to build bridges of communication around the world.

The 1995 Directory

As I write, work on the 1995 Directory is proceeding, and appears to be on schedule for delivery probably by the middle of July. Keith Johnson especially deserves a special thank you for his work in creating the new data base and formatting the master copy for printing.

Thanks also to Publications Chair Undine Concannon and her committee for their guiding hand, and to John Mosley for his help.

The comprehensive directories of recent years had their beginnings with Norm Petersen, Bill Lazarus and Tom Fleming followed in 1979 our new designation, the International Planetarium Society. John Cotton produced the third edition in 1983.

Beginning with the 1986 edition, Mark Petersen brought computer power to bear with a vengeance, producing a series of directories through 1990 that dramatically expanded the number of entries and indices, striving to list every planetarium known to exist on the planet. When the publication faltered through the early 1990’s, his company plugged the gap with The LNP Planetarium Compendium, and he came to our aid last year by producing the 1994 IPS Directory.

Norm, Bill, Tom, John—Mark through the whole of the last decade—and now Keith deserve our great thanks for their dedication in compiling and producing a publication which, along with The Planetarian, are two of the most important and useful benefits of membership we have to offer.

On behalf of the membership, I offer my sincere thanks.

The 2000 Conference

The time for considering proposals to host the 2000 IPS conference approaches; Council will be doing so at its October 13th meeting in San Diego.

If your facility would like to consider hosting our eclectic group, there’s still plenty of time. Please contact me for the IPS guidelines for making a bid.

From Japan

Past-President Bill Gutsch and I have received a most gracious invitation from Dr. Tadao Nakano, president of the Organizing Committee for the IPS 1996 Conference, to visit Osaka to confer with the committee on plans for next year’s conference hosted by the Science Museum of Osaka. The trip is also sponsored by Minolta Planetarium Company and Goto Optical Manufacturing Company. Bill and I will also have an opportunity to address our colleagues at the meeting of the Japan Planetarium Society in Chiba, and to visit conference and tour sites.

The trip is scheduled for late May; look for a report from us on conference preparations in the next issue. Until then ... sayonara ...
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Donna Pierce has asked me to take over Gibbous Gazette, so here I am. Please bear with me—no one could possibly fill Donna's shoes, but my feet are pretty big so I'll try! Please send me information about your affiliations, your planetariums, and your lives! (And ask Donna how her golf game is going the next time you see her!)

Congratulations

(and maybe condolences!) to our new IPS Officers: Jim Manning (Taylor Planetarium) moved into the President's slot; Thomas Kraupe (Forum Der Technik) as President-Elect; Lee Ann Hennig (Thomas Jefferson High School Planetarium) as Secretary; and continuing Treasurer and Membership Chair Keith Johnson (Fleischmann Planetarium)—some people are gluttons for punishment! A special thanks goes to Joyce Towne (Fels Planetarium) for acting as Provisional Secretary to bridge the gap between Katherine Becker and Lee Ann.

Other congratulations are in order to: Jeanie Bishop (Westlake Schools Planetarium) for earning the Brennan Award for "contributions to the teaching of Astronomy in high schools" this June from the Astronomical Society of the Pacific; to David Dundee (Fernbank Science Center) for receiving the 1995 Museum Professional of the Year award by the Georgia Association of Museums and Galleries; and to Dionysios P. Simopoulos (Eugenides Planetarium) for being named Chairman for the European Association for Astronomy Education.

Did You Know...

Barbara Baber (Abilene ISD) started something—writing about past SWAP members whereabouts and whatshadoings: H. Rich Calvird from El Paso ISD Planetarium is fishing and farming in East Texas; John Pogue (formerly of Grand Prairie Planetarium) is one of the top people in the Grand Prairie Federation of Teachers Union and is on the School Board; and Mark Wallace from Andrews ISD Planetarium is now the Assistant Superintendent of Operations at Andrews ISD.

Belated condolences to Mark Petersen (Loch Ness Productions) on the loss of his father, and to Donna Pierce (Highland Park Ind. Sch. Dist. Planetarium) who lost a younger brother in February.

Population explosion? Tony Butterfield (Saunders Planetarium) has a baby daughter; Martin Ratcliff (Buhi Planetarium) had a baby last fall; Kris McCall (Sudekum Planetarium) had daughter last year, Art Klinger (P-H-M Planetarium) is a new daddy, and Donna Favour (Richardson I.S.D. Planetarium) now has a new granddaughter—Rachel Elizabeth.

Schenectady Museum & Planetarium held a "Mars Party" last winter to celebrate the return of Mars into the evening sky; included were Mars Bars, Red Planet Punch, Celestial Cookies, visitor Marty the Martian, and of course The Mars Show, according to Director Richard Monda. Schenectady Planetarium is also searching for a planetarium intern, beginning October 1, 1995—for more information, contact Richard at Schenectady, New York.

Speaking of The Mars Show, it was playing on Valentine's Day in Robert Wollman's planetarium (Richard King High School Planetarium) when a young man asked Robert to project a full moon on the dome with the stars while he proposed to his date. The gentleman apparently is considering holding the wedding in the planetarium as well. Other stories of romance under the stars: Art Gos (Phillips Space Theater) was married last year in his planetarium, and Dale Smith (Bowling Green State University) reports that a proposal was made last spring to one of his students during a show. With the programs that they've been holding in Dale's planetarium ("Twilight Readings" of poetry and a String Quartet performance) is it any wonder that romance is in the air?

London Planetarium is proceeding with its renovations—it will be a real treat to visit in 1998! Undine Concannon undoubtedly has her hands full already—there will be a dedication ceremony this summer for their new Digistar III.

Bown Productions (formerly Bowen Music Productions) has been awarded the design consulting contract for Kerry Magruder's new planetarium at the Oklahoma Baptist University in Shawnee. I guess Jeff Bowen finally had more work than even he could handle—Jeff has added additional two new staff members, Mark Kindred and Jennifer Piekarski.

We've added a new staff member here at the Discovery Center; Aaron Guzman (formerly from San Diego State) will be developing our outreach program, including (we hope) a portable planetarium. Aaron will also occasionally be acting as my backup—imagine being able to take a day off and yet the shows will go on!

There's a new intern at Taylor Planetarium—Kevin Scott (a Goldwater Award Winner) is producing a show to examine how the development of technology has guided us to a clearer understanding of the Universe. Perceptions is being narrated by Star Trek Voyager's Jennifer Lien (who plays Kes) and the score is being done by Mark Petersen (Loch Ness Productions).

Bill Gutsch (Hayden Planetarium) and Jim Manning (Taylor Planetarium) have been invited to visit Osaka by Dr. Tadao Nakano to confer on the upcoming 1996 IPS conference, and to address the Japanese Planetarium Society. We know that they'll represent IPS well, but can they hold their sake? Loris Ramponi (Unione Astrofilo Planetarium) and the Associazione Amici dei Planetari are exchanging information and publications with the IPS affiliate representatives, and are creating a National Archive of Planetaria in Italy. Send them your publications and catalogs. It sounds like a daunting enterprise!

Ron Johnston (previously of the Lubbock Moody Planetarium) is now the Director of the Planetarium at Fayetteville State University; Suzanne Chippendale (formerly at the Hayden Planetarium) is the new Director at the Santa Fe Community College Planetarium; and Cheryl Bauer is new at the Albert Einstein Planetarium.

Seven European countries participated in the "Day of Planetaria" back in March, including Italy, France, the Czech Republic, Poland, Russia, Slovakia, and Ukraine. How did it go? The Portable Planetarium Committee and the Italian Planetaria Friend's Association are planning a European meeting of itinerant and small planetaria in October at Brescia—sounds like a great reason to visit Italy (as if anyone needs one!)

Mark and Carolyn Petersen were featured in a set of interviews on Denver's KUSA Channel 9 and CNN's Showbiz Today, after Mark was contacted by CNN to be one of a group of ambient space music composers.

Martin Ratcliffe (Buhi Planetarium) organized a special half-day session for the American Astronomical Society's meeting in Pittsburgh this June, attempting to address the gap in communication between current astronomical research and the means of dispersing astronomical information to the (Please see Gibbous on page 43)

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The Planetarian

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Despite this seeming era of retrenchment in space exploration, there's still much that's new and news going on over our heads.

Around the time you read this—and assuming all has gone well and on schedule—space shuttle Atlantis should be engaged in its mission to retrieve a mixed Russian-American crew from space station Mir after a three-month stint aboard the orbiting craft. This unprecedented mission of international cooperation begins Phase I of the plan to build space station Alpha, scheduled to start in 1997.

And in a matter of months, spacecraft Galileo, crippled main antenna notwithstanding, will begin dribbling back to earth in earnest its approach pictures and data of the Jupiter system.

And of course, the Hubble Space Telescope continues to ply its clear-eyed trade above the atmosphere.

Hubble especially points out how we can serve as channels to keep our various publics informed on all things astronomical. A few immediate examples follow ...

Hubble Rolls On

These days we're all making liberal use of the results from Hubble put out by the Space Telescope Science Institute (STScI) and others. A notable example comes from Philadelphia, where the Fels Planetarium at the Franklin Institute Science Museum, Benjamin Franklin Parkway at 20th Street, Philadelphia, Pennsylvania 19103 USA is running a 30-program called “The Other Side of the Universe” narrated by actor Avery Brooks (Commander Sisko of “Star Trek: Deep Space Nine”).

Producer Joyce Towne relates that the show includes a four-minute live section during which staff presents the latest news on Hubble; the segment changes every few weeks. She also credits STScI with being most helpful in briefing staff and providing information.

Another STScI collaboration is “Through the Eyes of Hubble,” the program from the other side of Pennsylvania produced by the Buhl Planetarium of the Carnegie Science Center, One Allegheny Square, Pittsburgh, Pennsylvania 15212 USA, and narrated by another “Star Trek” alumnus: actress Gates McFadden—Dr. Crusher from “The Next Generation.” I mentioned it last issue, but since then I've seen the final script and heard the soundtrack.

The program begins with a deft historical section focusing especially on Edwin Hubble's work, and cleverly works in the Hubble repair mission and organizes selected Space Telescope results throughout the ever-broadening topics of solar system, stellar, galactic and finally cosmic evolution. One of the things I really like about the show is that its focus is the great questions of astronomy—and how Hubble is helping us to investigate them.

My only quibbles are a few small grammatical ones with the narrative. “Through the Eyes of Hubble” has a nice, professional feel—well-written, well-narrated, with a good balance of astronomy and Hubble results and a perfectly-matched musical score. Good show!

Buhl is currently offering “Through the Eyes of Hubble” as a show kit in two forms. The non-video version includes slide set, audio tape, annotated script and production notes for $395 U.S.; the video version includes all of this plus a CAV laser disk containing special effects, Hubble footage, and stills for $595 U.S. Contact Martin Ratcliffe and his staff for more information.

Another good show is Loch Ness Production's “Hubble Vision,” also mentioned last issue. This crisp, documentary-style presentation, loaded with Hubble results, is available for $595 U.S. including 130 masked, glass-mounted slides, show tape, script, production notes, bibliography and background information. Author Carolyn Collins Petersen reports that the program will be the subject of a paper at the meeting of the American Astronomical Society—also in Pittsburgh and occurring in mid-June as you read—and will include a presentation of the video adapted from the program. For additional information on the program or video, contact Loch Ness Productions, P.O. Box 3023, Boulder, Colorado 80307 USA, telephone 303-455-0611, fax 303-455-1742.

Finally, just as fast as Hubble churns out new images, STScI turns them into slide sets; I recently received set #6 from Rob Landis which includes such goodies as the Catseye (Planetary) Nebula, the Cartwheel Galaxy, Quasar PKS 2349 seemingly merging with a companion galaxy, galaxy clusters, Galaxy M100, the star Gliese 623 and its diminutive companion, pulsing Cepheids, and solar system views including Uranus, the gross surface of Titan, that second storm in Saturn's atmosphere, and the evolution of the G-site on Jupiter. Good stuff to have. Contact the Office of Public Outreach, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, Maryland 21218 USA, telephone 410-338-4562 for more information.

Laser Technology Marches On

Laser light shows have become a programming staple for many planetarium facilities as we increasingly view our theaters as multimedia environments capable of feats in addition to astronomy education. And like the mythical hydra, you can't chop off a head but two more grow back in the expanding universe of laser technology and production.

Last summer's IPS conference in Cocoa and last fall's International Laser Display Association (ILDA) conference hosted by Jack Dunn's Mueller Planetarium in Lincoln, Nebraska, both illustrated the great diversity of laser-related equipment and programs available. With the information I brought back from Cocoa and what my assistant director Mike Murray brought back from Lincoln (took me three days to wipe the drool off his chin), here's an hors d'oeuvre's worth of the latest goings-on, in no particular order, from the world of stimulated light ...

Laser Images, Inc., 6911 Hayvenhurst Ave, Van Nuys, California 91406 USA, telephone 818-997-6611, fax 818-787-7952; at Cocoa and Lincoln, this long-time laser company displayed its new Laserium CSL projection system, advertised as a smaller, cheaper, and better version of its Model 68. It's capable of full automation using Laser Images' MIDI control interface and ADAT digital tape decks, and it's loaded with features.

Available with the new system are white-light lasers; the company's software system called choreoGRAPHICS, a Macintosh-based computer workstation for program development including real-time manipulation and recording; the newly-developed MILLENIUM "Display Engine" for graphics generation; and an equipment-leasing program called LEASURUS currently under development.

Laser Images also has a menu of two dozen programs to choose from (my favorite title is "Lollapalaser") featuring a variety of mostly rock artists and music with some classical and new age themes in addition. And the company has International listings among its clientele. For more information and pricing on what's new at Laser Images, contact Ivan Dryer, President, or Mitch Hartmann, Vice President.

Pangolin Laser Software, 10114 Lavender Flower Court, Manassas, Virginia 22110, telephone 703-335-6328, fax 703-335-6329; one of this company's newest products is the latest
As the story was developed from manufacturers, and offers an excellent brief "Laser Resource Guide" listing a number of them along with Pangolin dealers. I've also heard that its worldwide client list has the capability of functioning much like a users group. For more information and prices, contact president Patrick Murphy.

Laser Fantasy International, 1408 W. Hume Street, Portland, Oregon 97219 USA, telephone 503-244-1123, fax 503-244-3911: here's another company with an international clientele and which can supply both hardware and software products. One of its strong suits is its impressive program catalog: the 1994-95 edition contains about 30 shows covering almost every musical taste and includes educational programs. IPS '92 attendees may remember "Laser 101"—in which an animated electron demonstrates how a laser works; it's a good example of the detailed animation work for which the company is known.

The company offers its programs through a Programming Network in which clients can license shows according to a cost formula incorporating market size, theater capacity, and the number of shows desired. Contact Mike Lutz, Director of Theater Operations, at the address and numbers given above for more details and costs.

LOBO Electronic GmbH, Hofackerstrasse 13, D-73430, Aalen, Germany, telephone 49-7361/6095, fax 49-7361/68810: this full-service laser company recently sent me a color brochure and press releases announcing some of its latest products. LOBO offers an "economy line" of hardware products including the ELGP-3 laser graphics projector and the EPU-3T player unit, designed to be turn-key systems requiring a minimum of maintenance. The systems work with a variety of lasers, can accept laser light via fiber optics, and can run a library of some 150 shows produced for the company's LACON-3 line of products.

Some of the company's other products include a new grating box that can swivel into the laser beam to produce holographic effects, a setup incorporating four projectors that receive light through fiber optics and project anything from zodiacal figures to animations, and a "waterscreen" which uses a film of falling water as a projection screen for laser and multimedia display (the last perhaps not ideally suited for planetariums, but it sounds fascinating).

Most intriguing of all is LOBO's "laser-glove," a control system which creates a kind of virtual reality laser program by allowing the controller to change up to 13 arbitrarily definable show parameters (such as color, position, and rotation angle) through simple movements of the hand and fingers. The possibilities rather boggle the mind!

For more details and prices on these and other LOBO products, contact Lothar Bopp at the address given above.

AudioVisual Imagining, 10801 Cosmonaut Boulevard, Orlando, Florida 32824 USA, telephone 407-859-8166, fax 407-859-8254: this is the company that developed Omniscan—the full-dome computer graphics laser projection system demonstrated at IPS '92. According to a recent press release, the system was demonstrated in March in combination with Carl Zeiss Jena's new fiber optics planetarium projectors, the Starmaster and the Model VIII, with pleasing results. The release stated that the combination of technologies produces full-color vector displays without fading star brightness.

AVI has also recently announced the development of a new educational laser program called "Laserwarp." The program employs "classical-style" and 3-D computer animation, Kodaklith slides, and AVI's trademark "ChromaDepth 3-D" technology (in which special glasses show the four primary laser colors at different apparent distances for an unmistakable sense of depth) to tell the story of two children who are plunged into a laser "virtual reality" by a holographic guide who takes them—and the audience—on a journey from the beginning of time through the age of the dinosaurs.

The story was developed with the assistance of our profession's own Jon Bell at the Indian River Community College Planetarium in Fort Pierce, Florida, and was designed, according the producer Derek Mackey and AVI General Manager Joanne McCullough, to respond to requests from planetarium and science center directors for more educational laser programming.

"Laserwarp" is scheduled to run this summer at the McLaughlin Planetarium in Toronto, Canada, and at the St. Louis Science Center, the Hansen Planetarium in Salt Lake City, and the Discovery Place in Charlotte, North Carolina in the United States. For more information, contact the folks at AVI.

Lighting Systems Design, Inc., 4625 Winter Garden Road, B-6, Orlando, Florida 32811 USA, telephone 407-299-9504, fax 407-299-3965: one of this company's latest products is the Excalibur Vector Scanning Engine, a compact laser graphics projector of the sort that moves a laser beam around very quickly to create an image. The device comes in single-channel and dual-channel versions (that is, containing one or two X-Y scan heads), and is designed to work with any laser graphics computer that outputs X-Y and color information, and all major brands of laser projector.

Mike Murray was impressed when he saw it in operation at the ILDA conference, saying that it had "the highest input-output ratio of brightness" he'd ever seen. The device includes LSDI's new and improved "Turbotrack 2" scanner amplifier, which can run both General Scanning and Cambridge Technology scanners.

Another new LSDI product is "Beam­brush," a dynamic focus mechanism which allows one to vary the width of the laser beam, and thus the lines it creates—allowing for soft images, fill patterns, and variable line width. The brochure indicates that it works well with any part of the visible spectrum—and could add considerable variety to laser imagery, I would think.

For more information on LSDI products, contact president Greg Makhov at the address given above.

Laser Production Network, 7000 Northeast 4th Court, Miami, Florida 33138 USA, telephone 305-754-6885, fax 305-751-7574: this is a newer company started in 1988, and one of its major products is the PC-based LASERMAX system for creating and displaying laser graphics. The company offers a variety of projectors, software and computers, scanning systems, and special effects—including "Smartscan," a laser simulator that employs a 300 Watt Xenon lamp and programmable equipment to create laser-like effects.

Of particular note is the company's LASERMAX ARTGROUP service: fee-paying members of the group receive a library of ready-made graphics and animations, with regular updates and custom production services available. Again, for more data, contact as given above.

Creative Laser Production, Max-Weber­P10, D-81675 Muenchen, Germany, telephone 49-89-4705611: this company also offer holographic gratings, referred to as Lightworld Gratings, for laser effects; contact Peter Mayer.

Laser Spectacles, Inc., 1700 RR12, San Marcos, Texas 78666 USA, telephone 512-392-4600, fax 512-392-4601: this company is a distributor for the above-mentioned gratings in...
the U.S. and Canada. The company also offers a device called the Horizon-Scan 360-degree Laser Scanner, which uses a rotating mirror at an angle of 45 degrees to rotate scanning laser graphics all around the horizon. For details, contact Tim Walsh.

- Laser Physics, Inc., 3573 West 1987 South, Salt Lake City, Utah 84104 USA, telephone 800-527-2778, fax 801-975-7011: this company makes the Reliant Series Laser—"the first air-cooled argon laser with the power supply and laser head integrated into one small compact package," according to the literature. For prices and more information, give Laser Physics a ring.

Well ... perhaps this can serve to give a sense of some of what's happening in the wide world of laser technology, but of course, it just scratches the surface. I hear that there are additional innovative things afoot in Europe, for example. So let me know if you hear about something interesting, and I'll pass it along.

**Sky Songs**

Recently I came across a little gem called **Sky Songs**, an audio cassette of five astronomical songs by Marjorie Prager sold by the Museum of Science, Science Park, Boston, Massachusetts 02114 USA. From the simple, colorful decoration of the package, you might think as I did that these songs were for little kids. Don't be fooled.

These are not cute little-kid songs; they're really quite sophisticated compositions with a contemporary sound ranging from a sort of calypso style and folk to rhythm-and-bluesy with a little bit of rap thrown in for good measure. These are songs for older kids, presenting solid information in the lyrics about earth, sun, moon, planets, stars—how we're made of chemicals cooked in stars—and of the importance of caring for the earth. Good messages wrapped in an appealing, contemporary musical package. Check it out!

**Sky Songs** retails for $7.00 U.S., with wholesale rates available for orders of 24 copies or more; contact Sally Ellison of the museum's product development office. My information says that tape is limited to classroom and home use and can't be used for planetarium and public programming.

The tape would make a dandy addition to your gift shop music shelf, I think—but have a listen first. If you agree that the style of the songs is best-suited for older children, you may want to indicate that in your advertising so that buyers for young children aren't fooled by the packaging.

**Becoming a Computer Musician**


This is an interactive publication aimed at beginning and intermediate-level users—either for computer users wanting to get into composing or composers wanting to get into computers. The book introduces and explains the principles of employing computers to make music, with chapters for both Macintosh and PC users. Jeff offers a step-by-step hands-on approach through the use of tutorials which access an enclosed CD-ROM containing Mac and PC software. The CD includes evaluation versions of musical software, working versions of tutorial programs, demonstration versions of popular music programs, clips from instructional videos by Peter Gabriel and Kenny Aronoff, and examples of the author's own compositions.

The book has instructions on setting up your own MIDI (Musical Instrument Digital Interface) studio, ideas for musical composition and arrangement, professional techniques, source lists of equipment manufacturers, a glossary—even tips on career opportunities in the music profession. All in all, it sounds like a great deal of fun.


Sams Publishing has also recently released Jeff's follow-up effort entitled **The Computer Music Starter Kit**, which my information tells me is an interactive training system that teaches entry-level users how to "design and operate computer-based music systems for fun, educational, and professional use."

In other Bowen news, note that the company has changed its name from Bowen Music Productions to Bowen Productions to reflect its expanded services—including audio and video systems design, installation and service, and video and multimedia program design and production. Along these lines, the company's latest news release announces projects ranging from sound system installations and consulting contracts to sound design of a CD-ROM space game. And that "Moonwitch," the latest in its series of "AstroNotes" educational short programs, is available for shipping.

Busy group! Contact Jennifer Gundlach at 317-923-3838 for details.

**Cleaning with Snow**

A notice from R & D Corporation, 3255 E. Lincoln Street, Tucson, Arizona 85714 USA crossed my desk recently, advertising their Snow Clean Machine. The device creates a spray of carbon dioxide "snow" that can be used to clean a variety of optics and equipment without water stains and without polluting the environment. The ad says it's good for cleaning cameras, electronics, laser optics, laboratory optics, photographic film, microscopes, telescopes, and of course, satellites and rocket gyroscopic guidance systems among other applications.

Personally, my rocket guidance systems rarely need cleaning, but we all use a lot of the other sorts of stuff that this system can freshly scour. The system comes in six different models producing various flake sizes and using various attachments and gauges, ranging in price from $500 to $1,100 U.S. Model 4 at $1,000 is the one recommended for professional observatory applications. For more technical information, contact Richard Zito as given above.

And that's it for now. Have a pleasant summer/winter (depending on your hemisphere bias), and until the fall/spring issue ... what's new?

(Gibbous, continued from page 39)

public (namely, planetariums). Let us know what the results are! **Rob Landis** (Space Telescope Science Institute) has worked with Martin to create a new show featuring the Hubble Space Telescope's latest discoveries: *Through the Eyes of Hubble.*

**Thomas Kraupe** (Forum Der Technik) has been working many late nights producing a Pink Floyd Laser Show—how do you say "Another brick in the wall" in German? Thinking about a trip to Cambodia for the October Solar Eclipse? **Dennis Mammman** (Reuben Fleet Space Theater) has organized a tour of the Angkor temples, the cities of Phnom Penh, and a night in Hong Kong—they will be at the renowned temple Angkor Wat during the eclipse. Talk about your religious experiences!

Rumor has it that **Gary Tomlinson** (Roger B. Chaffee Planetarium) is a real party animal, going so far as to model astronomical bathrobes. Gary and **David DeBruyn** are preparing to hold GLPA's 30th Anniversary (or is it Annual?) Conference in October in their new Chaffee Planetarium at Grand Rapids, Michigan—the founding site of GLPA.

If anyone has any news (or something interesting that isn't really news but we'd like to hear about anyway) please don't hesitate to call or write! Have a great summer!
SN 88® II PLANETARIUM, AN INFINITY OF POSSIBILITIES PLUS ...YOUR SKILL!

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:

Centralised piloting: all production tools (planetary device, diascopes, video projectors, surround effect sound and lighting...) are operated by one powerful calculator, using a specific program: the Integral software. All can thus be controlled, automatically or manually, from the console.

Speed and flexibility: in only a few seconds, you can pass from an observation point and an observation date, to other coordinates, even to those located in totally different periods or regions, and this even from another planet. You just enter the coordinates and the calculator repositions itself immediately, silently and with maximum precision.

User-friendliness: no need to be a computer specialist to operate this system which uses a PC compatible computer as interface between the user and the calculator, associated to the Integral software developed on Windows.

You can therefore develop your own productions, simply using the trackball, the action menus and configuring the timing for each tool. You may also purchase existing productions, which are easy to implement, develop or modify.

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.
**Focus on Education**

**A Problem-Solving Activity for Middle School Students**

A planetarium lesson by

Stu Chapman
Harford County Public Schools Planetariums
Southampton Middle
Moores Mill Rd.
Bel Air MD 21014
schapman@umd5.umd.edu

**What Can we Learn from the Classification of Stars?**

A great deal of information presented in the planetarium requires students to understand how certain facts are arranged and how they are related to other facts. Students in the middle grades of 5-7, who are asked to classify objects by a single trait, begin by perceiving similarities and differences. Then, they may be able to separate these objects into several groups according to shape, color, or some other single trait. As additional classification skills develop throughout the middle school years, students gain the ability to arrange objects along a continuum (hot to cold, big to small, etc.) and to recognize that an object may belong to more than one class (e.g. realizing that the sun is in the solar system and in the galaxy at the same time). The focus of this planetarium activity is to address students' acquisition of some of the classification skills described above by classifying stars found in the planetarium sky according to several traits.

**Outcomes:** The student will demonstrate the ability to:

1. Identify several stars and constellations on a provided star chart and to point to the location of the same stars and constellations in the planetarium sky with the pointer flashlight.
2. Relate the color of a star to its surface temperature.
3. Solve comparison problems involving the brightness, distances, and temperatures of stars.

**Materials:** For each student, a pencil, a star chart entitled "Sidereal Time 3 Hours," and the worksheet entitled, "What can we Learn from the Classification of Stars?". Clipboards to hold student worksheets will be provided by the planetarium.

**Advance Preparation:** Prior to the date of the planetarium visit, the classroom teacher should have duplicated both the map and the worksheet. Students will need their maps for an assignment on the day prior to the planetarium visit. The worksheet may be distributed on the planetarium day.

**Class Time:** Two or three class periods. In the first class period, students complete the warm-up activity with their regular classroom teacher. The second day is a fifty-minute lesson in the planetarium with the planetarium teacher and the classroom teacher. A third day may be needed for the completion of some post-planetarium activities in the students' home school with their regular classroom teacher.

**Cross Curriculum Activities:** Science, Social Studies, Math.

**Science Thinking Skills:** Identifying, categorizing, classifying, comparing, contrasting, visualizing, decision making, sequencing, explaining, distinguishing, organizing.

**Pre-Planetarium Warm-Up**

1. Display this outcome: (#1 part 1) The student will demonstrate the ability to identify several stars and constellations on the provided star chart.
2. Distribute copies of the star chart, "Sidereal Time 3 Hours," to the class on the day prior to the planetarium visit. The teacher should work with the class using an overhead projection transparency of the same star chart to perform the following tasks:
   a) Identify the "numbered" stars. They are found in a "clockwise" order from the lower left. They are:
      - Procyon: 0
      - Pollux: +1
      - Castor: +2
      - Mu Geminorum: +3
      - Nu Geminorum: +4
   Make no marks next to them. Students will discover the meaning of the numbers on the day of the planetarium visit.
   b) Identify the following constellations on the map: a) Orion, b) Taurus, c) Gemini, d) Canis minor, e) Canis major, f) Auriga (Aur-EYE-ga). Make no marks next to them.
   c) Identify a star of each surface temperature on the star chart. With a pencil, place the name of the star in the proper position in the table at the bottom part of the star chart. On the date of the planetarium visit the student should have found and recorded the following information on his/her star chart:
   - Alnitak: 30,000 deg
   - Rigel: 20,000 deg
   - Sirius: 10,000 deg
   - Procyon: 8,000 deg
   - Capella: 6,000 deg
   - Aldebaran: 5,000 deg
   - Betelgeuse: 4,000 deg
   (temperatures are given in degrees Kelvin (K) where Kelvin = °Celsius + 273)

**Planetarium Day Procedure**

1. The outcomes (above) shall be displayed and explained to the class.
2. The planetarium teacher will identify the stars numbered as 0,+1,+2,+3, and +4 for the class. Students will discover that these numbers (apparent magnitudes) describe the brightness of a star as seen from earth such that the smaller the number, the brighter the star.
3. The planetarium teacher will then ask for student volunteers to point out each of the seven stars located on the star chart in class the day before on the planetarium sky with the flashlight pointer. While this is being done, students will be encouraged to observe the color and magnitude of each of the stars and to record that information on their star charts.
4. The planetarium teacher will now bring up the lights enough for a short discussion. The planetarium teacher will explain the difference between a star's apparent brightness and its true brightness. He will ask what two factors could determine how bright a star appears to us here on earth (the distance to the star and its "true" brightness). He will ask what factors could determine the color of a star? (the surface temperature). The planetarium teacher will now discuss the color-temperature relationship for stars and the relationship between distance and apparent brightness of observed stars. When students seem to be comfortable with these concepts, the lights will be lowered and the students will be presented with several problems which relate to the concepts just discussed and the stars on their star charts. Students will fill in their responses on the worksheet.

**Closure:** The planetarium teacher shall provide some additional problems similar to the ones above using the stars in the sky as
they will appear during the week of the students' planetarium visit.

ENRICHMENT: Students may be encouraged to visit an observatory open house with his or her family where he or she can make some of his or her own observations and where members of the Harford County Astronomical Society will be happy to explain on the student's level just how we are able to determine the distances and sizes of stars based on relatively simple observations.

REFERENCES: Teachers might wish to consult some of the references upon which this laboratory activity is based. They are:


**OUTCOME:** The student will demonstrate the ability to solve comparison problems involving the color, distances, and temperatures of stars.

**DIRECTIONS:** The following problems are to be solved during the planetarium session. Circle the best answers.

1. WHICH STAR OF THE "WINTER TRIANGLE" IS PROBABLY THE LARGEST IN SIZE?  
   A) BETELGEUSE  
   B) SIRIUS  
   C) PROCYON

2. WHICH OF THE TWO STARS BELOW PROBABLY HAS THE GREATEST "TRUE BRIGHTNESS"?  
   A) BETELGEUSE  
   B) RIGEL

3. WHICH OF THE TWO STARS BELOW IS PROBABLY THE MOST DISTANT FROM THE EARTH?  
   A) BETELGEUSE  
   B) RIGEL

4. WHICH OF THE THREE STARS BELOW HAS THE COOLEST SURFACE TEMPERATURE?  
   A) E33 ORIONIS  
   B) MIRA  
   C) ALDEBARAN

COMPARE TWO OF THE CLOSEST STARS TO EARTH TO EACH OTHER:

STAR 1: SIRIUS (9 LY)  
STAR 2: EPSILON ERIDANI (8 LY)

WHY ISN'T EPSILON ERIDANI BRIGHTER THAN SIRIUS?

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Harford County Planetariums  
Sidereal Time 3 Hours

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**Planetarium**  
What can we Learn from the Classification of Stars?

**OUTCOME:** The student will demonstrate the ability to solve comparison problems involving the color, distances, and temperatures of stars.

**DIRECTIONS:** The following problems are to be solved during the planetarium session. Circle the best answers.

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COMPARE TWO OF THE CLOSEST STARS TO EARTH TO EACH OTHER:

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WHY ISN'T EPSILON ERIDANI BRIGHTER THAN SIRIUS?

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**Harford County Planetariums**

**Sidereal Time 3 Hours**

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**The Planetarian**

Vol. 24, No.2, June 1995
It is really difficult to believe that summer (winter for those south of the equator) is already here again! Hopefully your experiments with new techniques and ingenious methods are meeting with success. We are continuously challenged to effectively guide students in their attempts to comprehend basic concepts. Connecting with colleagues at various conferences and get-togethers really helps to get the creative juices flowing. It will be wonderful when all the regional organizations are promoting area PIS meetings for portable and small planetaria as suggested at IPS '94. I have not received any news of that happening yet, nor have I received news of new columns of interest to mobile planetaria included in regional newsletters. Loris Ramponi, however, continues to expand his contacts throughout Europe (see information below pertaining to the first European meeting for portable planetaria).

Expanded Networking:

The e-mail system has proven to be a neat new way for me to network with fellow users around to globe. Several people from various locations around the world have contacted me in this way.

Ray Worthy (The Stargazer Planetarium, 15 Queensberry Avenue, Hatlepool, Cleveland. TS26 9NW, U.K. - email: raymond@stargazr.demon.co.uk) contacted me to ask about the October meeting in Italy and to tell me about his business. After retiring, he build his own planetarium (to the 6th magnitude/about 5000 stars) with which he travels throughout North England giving lessons approximately three days a week. He sent, through the regular mail, several pictures which give a partial history of the first dome he built in 1986 of PVC plastic. This dome had found to be extremely durable but very heavy and not easily made opaque. After much experimentation this dome was eventually closed by the Fire Brigade due to concerns about evaporation time in case of fire. This unfortunate happening led to further experimentation and the discovery of a lighter-weight material that works better for him. He has designed a door that is conveniently a tall zippered opening so you can walk into the dome. Anyway, it is a long and wonderful story and Ray is now interested in building planetariums (dome and projector) for others—and at a very reasonable price. Ray also sent an audio tape sample of his programs. It is delightful to hear the accents and another teacher's style. I am preparing to send him a tape in return (another wonderful way to network). Most of us do not write out our lessons as we prefer to remain responsive and interactive with each unique audience; however, tapes of this kind would certainly have helped me in the beginning and now give me new ideas! THANK YOU RAY! Ray also sent me a few pictures of a colleague who owns and operates the inflatable "Cosmodysee II"—the dome, although beautiful with a walk-in door, appears quite a bit smaller than Starlab.

Two more items of interest from Ray: there is a new news group on the "net" devoted to planetarium matters: discussions, advertisements, and one or two items for sale (this is on newsciastoplanetarium) There is also in existence an astronomical net magazine which is changed twice monthly. (This is available at ftp://ftp.rahul.net/pub/resource/ASTRONET.TXT)

Torbjørn Urke (Starlab Planetarium, Starevegen 5, N-6150 Orsta, Norway—email: Torbjørn.Urke@hivolddano) contacted me to ask about the October meeting in Italy and wrote that he remembered speaking with me in Salt Lake City 1992. He says that the Norwegian Government has once more given economic support to their Starlab activity at Volda Laerhogskole—Volda Teacher Training College 80 there is a lot to do. Congratulations—I like to hear good news! I hope to see Torbjørn in Brescia!

Suzy Chippindale (Santa Fe Community College Planetarium, PO Box 4187, Santa Fe, NM 87502-4187 USA—email: schippi@santafe.cc.nm.us) wrote, "Your name was passed on to me as a resource for activities. I recently became the director of a new planetarium at Santa Fe Community College and am starting from scratch. It is a nice Spitz S12 system, but we are just one step above the complexity of a Starlab with just 4 slide projectors." (She doesn't know that some of us have much more technology than that in our Starlabs!) "I am scratching my head trying to figure out what kind of presentations would work in such a theater since I came from the Hayden in New York and Fiske in Boulder before that." I'll bet she'd love to hear from others that could help her out too. Maybe she should listen to some of our taped lessons!

Juan Carlos Zabalgoitia (Director, Astronomia Educativa S.R.L., C.C. 100, Suc. 25-1425 Buenos Aires, Argentina) wrote to tell me that as an IPS member he reads "Mobile News Network" every time (smile). He writes, "I'm running a business with portable planetariums called "Astronomia Educativa" and we have three portable planetariums: one Starlab and recently we have acquired a GOTO EX-3 - both with inflatable domes. I am sending you a photograph that I took inside the dome. I think that we, the planetarians, may develop a new hobby that could be called 'planetarium astrophotography'. This differs from the traditional astrophotography that must follow the sky rotation permanently, but we have the ability 'to freeze' the sky and we don't need clock systems or similar apparatus because we can put the cameras on a tripod and take a shot with the exposure time necessary: 1 second, 5 seconds, 2 minutes, etc. The star will not move—never! Also we do not have to wait for winter (summer there) to take a photo of Scorpius or for summer (winter there) to take a photo of Orion. We can simply put in the dome the sky we want to photograph. The photo I am sending you was taken with a Voigtlander SLR camera with a 35mm lens mounted on a tripod and with an exposure of 3 minutes. The film is Kodak PJC 1600 ASA and it was processed in a 'one hour lab.' The photo was taken in the inside of the inflatable dome of a GOTO EX-3. You can see in the photo the EX-3 projector. Antares is red because I colored it with a red cellophane. Originally the stars are not colored in the EX-3 projector. The yellowish tone of the stars is due as this photo was taken with film for daylight (6000 K) and the light source of the picture (the bulb of the projector) is a filament lamp that has a temperature light of 3400 K. It might be easily corrected using a blue filter 80B, that turns the yellowish color white."

I was really interested to receive this letter and the photo is really good. I had heard of others photographing star trails with Starlab but not still photos—it makes perfect sense as another neat thing to experiment with and share. Thank you for taking the time to write Juan. Please stay in touch and continue to tell us what you are doing.

Daphne McLeod (Coordinator of Math/Science Training, Ouachita Parish School Board, 100 Bry Street; PO Box 1642, Monroe, LA 71210-1642 USA) writes, "Thanks so much for the use of all the space science..."
materials that you sent us. Enclosed is a copy of our "Starlab Curriculum." It's not perfect by any means, but we've had great success with it as a resource tool in the schools." The curriculum Daphne sent is a very complete set of lessons and activities for K-6 teachers to use before, during, and after trips to the Starlab and are correlated with the Louisiana State Curriculum Guide, the Scott-Foresman science textbook, and with Project 2061. What a lot of work—it is 290 pages long! Thank you so much for sharing!

**Tinka Ross** (STAR*DATA, 89 Dominic Drive, San Rafael, CA 94901337 USA—email: tinka@marin.cc.ca.us) owns her own Starlab and also works as a lecturer at Morrison Planetarium, California Academy of Sciences. For insurance purposes she is sponsored by a non-profit organization, Sierra Pacific Educational Adventures, whenever she goes to schools. She takes her planetarium to schools and also is developing a teacher training/rental program.

Tinka also sent me some information, a brochure, about Larry Harrison who is the California representative for Learning Technologies, Inc. He runs a business called SCOPE (Science Can Open Peoples Eyes), a hands-on educational program for the advancement of Astronomy. Thanks Tinka, it is good to know what is going on with you and others in our field.

**Current Decision Made With Regards to the Public Domain File:**

At this time you, may continue to request the entire box of printed activities in my file that have been cataloged for $55 printing charge plus a shipping charge which varies according to where it is shipped. You can order single activities from the list at cost of printing and shipping also. At present the catalog is not complete or pretty. I hope to get it better organized this summer when I have some breathing time. I am also working on a proposal, at Jim Manning’s request, for a special IPS publication (free to the membership) with some of the best materials from my file included as well as an index of added information and a detailed catalog. GLPA has also requested that a TIPS booklet for portable users be produced and I am in the middle of doing that now. If you have tips and or suggestions for this kind of publication or you would be willing to work on it with me please contact me ASAP, I could really use some help.

**European Conference: October 13 - 15, 1995**

I would like to remind you to consider attending the first European Conference for itinerant and small planetaria which will be held in Brescia, Italy. This meeting has been organized by the Italian Friends’ Association and by the IPS Portable Planetarium Committee. There will be workshops and papers pertaining to maximum utilization of Cosmodysee II, GOTO EX-3, and Starlab planetariums. We expect there will be representatives from a large variety of countries all over Europe as well as some from the USA. This promises to be an exceptional experience for all of us and will really strengthen and enrich our network around the globe.

For more information and registration: Loris Ramponi, Associazione Amici dei Planetari, c/o Cicivi Musei di Scienze, Via Ozanam 4, 25128 Brescia, Italy (Fax 30 87 25 45) or Susan Reynolds, OCM BOCES Planetarium, PO Box 4774, Syracuse, NY 13221 USA (Fax 315-4331530).

**Signing Off:**

That's all for now, have a great summer (or winter as Juan reminded me)!
Many thanks to those who sent material for this issue of Regional Roundup. The deadline for the next issue of Regional Roundup is Monday, July 10, 1995. Please mark your calendars accordingly.

British Planetarium Association (BAP)

The Armagh Planetarium has installed their Digistar projector and are currently enhancing the Armagh experience to many delighted visitors.

The Mills Observatory in Dundee celebrates its 60th anniversary this year. An increase in attendance over last year's total of 17,000 visitors is expected. As well as school visits, public lectures and planetarium shows, a summer exhibition will show the advances in astronomy over the past 60 years. A public lecture, done in 1935-style, will use the collection of glass lantern slides from the early 1900's. The observatory was featured in the first of the recent BBC series "Heavenly Bodies." Brian Kelly has been appointed City Astronomer, in succession to Fiona Vincent.

There are plans for a planetarium to be incorporated in a new Scottish National Science Center in Glasgow. Prof. Archie Roy is one of the members of the Foundation Committee, which will be visiting the state-of-the-art planetarium in Munich, Germany.

The Greenwich Planetarium in London has experienced an increase in the demand for shows, especially school shows, since the London Planetarium has been under renovations the past several months. The refurbishment and upgrade in equipment at the planetarium is now complete. The computerization was made possible by a grant through the generous support of the National Grid Co. Plc. Patrick Moore officiated the reopening of the planetarium on March 31st when he introduced and started the show "More than Meets the Eye."

Work is now underway on a project to reconstruct William Lassell's 24" reflector in Liverpool. Lassell used the wealth he acquired from the brewing industry to fund his passion for astronomy. His telescope was the first large reflector to be mounted equatorially. With this telescope, Lassell discovered Triton in 1846, and Ariel and Umbriel in 1857. Collaborating on the project are the two Liverpool Universities and the Museum, and the sponsor is the Royal Insurance Company.

The London Planetarium closed on January 2nd after many years of service to the public. The closing was celebrated with a party where the guests were allowed to play with the Mark IV Zeiss on its last heavenly journey. The final program was coupled with a mad array of slides; video; jazz, pop, classical music; and serendipitous use of a laser pointer. The final whirl around the sky was universally agreed to be the best show ever done! It was also agreed that the wine helped! In its place, a new planetarium is being constructed. To date, the skeleton of a new 4-level cylindrical entrance, an extra floor inside the copper dome, and framework of a new projection dome have been erected. Production of the opening show, "Comic Perceptions," is currently being done.

The new, larger dome for the GOTO planetarium of the Norman Lockyer Observatory in Sidmouth, along with a new entrance hall, exhibit area and other facilities, is now complete. The new planetarium will be named the Norman Lockyer Planetarium, after Sir Norman Lockyer. The old planetarium dome will be reconverted into an observatory which will house Lockyer's original refractor. Any surplus exhibit items would be greatly appreciated by Dr. George Wilkins.

The next meeting of the BAP, AGM will be on Saturday, May 20, 1995 at the Liverpool Planetarium, hosted by Paul Dearden.

A "Rising Star" appeared in Cardiff, Wales on May 1st. The interactive science center contains over 170 exhibits and is the largest of its kind in the UK. The new science center houses a 6 meter dome and seats 40 people for a variety of presentations.

Great Lakes Planetarium Association (GLPA)

The Illinois State Meeting was held at the Strickler Planetarium of Olivet Nazarene University in Kankakee on Saturday, April 8th and was hosted by Troy Stoneking.

The Illinois State University Planetarium in Normal, IL announced that Troy Ringler, an ISU physics major, has recently joined the staff.

The Indiana State Meeting will be held at the PHM Planetarium and Space Museum in Mishawaka and the Kennedy Planetarium in South Bend on Saturday, May 6, 1995. Art Klinger will be the meeting host.

Peggy Gebhart is the new director of the Muncie Community Schools Planetarium. The planetarium is located at Muncie High School.

Dan Goins, of the Martinsville High School Planetarium, is now a monthly guest lecturer at the Space Quest Planetarium in Indianapolis, Indiana.

Dayle Brown from Pegasus Productions and the Olive Township Elementary School is taking her Young Astronauts to Space Camp in Huntsville, Alabama this spring.

The Michigan State Meeting will be held at the Abrams Planetarium in East Lansing on Saturday, May 5, 1995 and will be hosted by David Batch.

The new Michigan State Chairperson is Lisa Daly from the Upton Middle School Planetarium in St. Joseph. Jeff Bass has stepped down to devote more time to his role as GLPA Development Chairman.

Eric Schreur of the Kalamazoo Public Museum Planetarium reports that the new planetarium facility is coming along nicely. The outer shell of the facility is up and the dome is currently at Spitz, Inc. awaiting shipment.

The new Chaffee Planetarium in Grand Rapids has welcomed over 40,000 visitors in the two months since their Grand Opening.

The Ohio State Meeting was held at the Sidney Frohman Planetarium in Sandusky on Saturday April 8th, 1995 and was hosted by Dick Speir.

Mary Schindewolf is the new planetarian at Lourdes College in Sylvania for the spring semester.

The Wisconsin 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. Hosts for the meeting will be Tom Hickey and Aaron Spurr.

The annual spring meeting of the GLPA Executive Committee was held on Saturday, April 22, 1995 at the Public Museum of Grand Rapids, Grand Rapids, Michigan.

There is a new address for Astronomy Day information which is: Gary Tomlinson, Astronomy Day Headquarters, Public Museum of Grand Rapids, 272 Pearl NW, Grand Rapids, Michigan 49504. His new phone number is (616) 456-3532.
The 1995 GLPA Conference will be held October 25-28 at the new Chaffee Planetarium in Grand Rapids, Michigan. Hosts for the conference will be David DeBruyn. Additional information about this conference will appear in the next issue of Regional Round-up.

Italian Planetaria’s Friends Association

The Italian Planetaria’s Friends Association has a new address which is: The National Archive of Planetaria, c/o Centro studi e ricerche Serafino Zani, via Bosca 24, C.P. 104, 25066 Lumezzane.

The municipality of Bologna has organized many teaching laboratories for schools. One of the latest is the teaching room “Planetario” that serves all the schools in the city. The lessons are taught in a 4-meter dome by Prof. Angela Turricchia. Over 2100 children have attended the lab since the beginning of the year.

The 10th meeting of the Italian Planetaria will be held in Brescia and Lumezzane October 13-15, 1995 in conjunction with the European meeting of Itinerant (portable) and Small Planetaria. Three different types of portables will be demonstrated during the meeting. They are: Starlab, Comsodisse II and Goto Ex-3. Presentations will be given by Michel Dumas, Head of the Itinerant Planetaria Commission of the Association of French-Speaking Planetariums; Giovanni Paistrini and Dieter Vornholz of the Obers-Planetarium in Bremen, Germany.

The III Day on the Problem of Light Pollution will be held on October 21, 1995, and the 1996 Day of Planetaria will be held March 24th.

The exchange of publications and information between the Italian Friends Planetaria’s Association and other organizations has been very successful. The other organizations include: The Japan Planetarium Society, Southeast Planetarium Association (Southern Skies), Middle Atlantic Planetarium Society (The Constellation), Great Lakes Planetarium Association (GLPA Newsletter) and Pacific Planetarium Association (Panorama).

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 Jerry Vinski, Director and Lonny Buinis, with assistance from GASPR (Garden State Planetarium Resource Association). The theme for this year’s conference is “Advancing with Technology.” Along with the usual assortment of papers and workshops, this year’s MAPS conference will also contain a one-day mini-conference for portable planetaria. This conference will be held on Friday May 19th and approximately 60 portable planetarium users will be in attendance. The MAPS banquet will be held at the Newark Museum Planetarium in Newark, NJ and the Margaret Nobel Address will be given by Don Hall of the Strasenburgh Planetarium in Rochester, NY. Optional post-conference activities include hot air ballooning, an Atlantic City trip, a visit to the US Golf Association Headquarters, or visits to other GASPRA facilities.

Joyce Towne’s reign as MAPS President will conclude at the end of the conference. The new in-coming MAPS President is Fred Stutz of the Howard B. Owens Science Center Planetarium, Searbrook, Maryland. The President-Elect of MAPS is Laura Deines of the Southworth Planetarium, University of Southern Maine, Portland, Maine. Congratulations Laura!

The Henry Buhl, Jr. Planetarium and Observatory in Pittsburgh, Pennsylvania just recently presented the world premiere of “Through the Eyes of Hubble” on March 17th. The 40-minute program was produced in collaboration with the Hubble Space Telescope Science Institute. The program will be released for international distribution to other planetariums in the near future. For additional details, contact Martin Ratcliffe at (412) 237-3399.

The Pittsburgh Area Planetarium Association (PAPA) met on April 4th at the Pine-Richland High School Planetarium in Gibsonia, PA. Several new CD-ROM astronomy programs were demonstrated as well as a demonstration of the new Zeiss Jena ZKP III by director Robert Pilat. Rick Pirko of the Youngstown State University Planetarium presented a workshop on baby food jar special effects techniques.

Pacific Planetarium Association (PPA)

The Third “Half a Dome” PPA Conference took place at Yosemite National Park, March 30 - 1 April, 1995. Organized by Gail Chaid, the time was well spent between paper sessions, stargazing the "real" sky and feasting at the Ahwahnee Hotel banquet. The Banquet speaker was Seth Shostak, SETI Institute, who spoke about the Phoenix Project, a privately funded radio survey of the southern sky which is currently searching for intelligent signals.

Nominations for officers: Gail Chaid (President) and John Young (Secretary/Treasurer). The election will take place in the Fall.

The Griffith Observatory developed its new public show “Pluto Express” with the assistance of the Pluto Express preproject team at the Jet Propulsion Laboratory in Pasadena. The mission team and their families were guests at a special grand opening.

The Fall 1995 PPA meeting will be held in San Jose, CA, in conjunction with the California Science Teachers Association (CSTA), September 28-October 1. In addition to our own sessions, members will attend workshops, sessions, and keynote speaker sessions for CSTA. We would welcome members from other regions to join us. Contact person: Gail Chaid, Independence Planetarium, San Jose, (408) 729-3911, chaids@aol.com.

Southeastern Planetarium Association (SEPA)

The Mark Smith Planetarium at the Museum of Arts and Sciences in Macon, Georgia will host the 1995 SEPA Conference June 20-24. The conference theme is “Networking” and will include a variety of activities with paper sessions, planetarium shows, workshops, vendor displays, visits to nearby sites of interests, and lots of good southern hospitality. Additional information is available from hosts Carole Helper and Jim Greenhouse at (912) 477-3323, Fax: (912) 477-3251 or email: CHelper@Comet.Ibl.gov.

Southwest Association of Planetariums (SWAP)

Congratulations to Donna Favour of the Richardson Planetarium in Dallas, Texas, the winner of the 1994 H. Rich Calvird Award. This award is named in honor of retired planetarian, Rich Calvird, and is the most prestigious service award given by SWAP.

The 1995 Annual SWAP Conference will be held at the Burke Baker Planetarium in Houston, Texas, September 21-23 and will be hosted by Carolyn Sumners. For additional information, contact Dr. Sumners at (713) 639-4632.

Astronomy is useful because it raises us above ourselves, it is useful because it is grand. It shows us that however small man's body may be, his mind is great, since while his body is only an obscure particle, his intelligence is capable of grasping the whole of the dazzling immensity and enjoying its silent majority.

Henri Poincaré

Heaven and earth were created all together in the same instant, on October 23, 4004 BC, at nine o'clock in the morning.

John Lightfoot, Vice-Chancellor of Cambridge University.
Secretary’s Report

Minutes of the IPS Council Meeting
Cocoa Florida, July 10, 1994
4/20/95

In attendance:
President: Bill Gutsch
President Elect: Jim Manning
Treasurer: Keith Johnson
Secretary: Katherine Becker

Affiliation representatives:
Association of French-Speaking Planetariums (APL) - Marc Moutin
Association of Mexican Planetariums (AMP) - Ignacio Castro Pinal
British Association of Planetariums (BAP) - Undine Concannon
European/Mediterranean Planetarium Association (EMPA) - Dionysios Simopoulos
Great Lakes Planetarium Association (GLPA) - Dale Smith
Great Plains Planetarium Association (GPPA) - April Whitten
Italian Planetaria Friends Association (AADP) - Loris Ramponi
Japan Planetarium Society (JPS) - Shingo Kawakami
Middle Atlantic Planetarium Society (MAPS) - Joyce Towne
Nordic Planetarium Association (NPA) - Franck Petersen
Pacific Planetarium Association (PPA) - Lonny Baker
Rocky Mountain Planetarium Association (RMPA) - Bess Amaral
Southeastern Planetarium Association (SEPA) - John Hare
Southwestern Association of Planetariums (SWAP) - Donna Pierce

Also present: Phyllis Pitluga, Awards Committee; Gabriel Munoz, IPDC; Martin Ratcliffe, IPDC; Mike Hutton, Conference Chair ’94; John Mosley, Editor, The Planetarian; Zinarda Sitkova, Russian Planetarium Association; Alexander Lenjin, Ukrainian Planetarium Association; Zina Sviderskiene, Lithuania

The meeting was called to order at 9:30 a.m. by President Bill Gutsch with the best attendance in many years.

Application for affiliation was received in good order from Hans Meidl of the Council of German Planetariums (CGP). Council voted and approved the CGP as a new Affiliate to IPS.

IPS has received requests for affiliation from the President of the Russian Planetarium Association, Georgi Grechko, and from Alexander Lenjin of the Ukraine. Each of their organizations may not have enough IPS members to affiliate according to Standing Rules. Discussion ensued. The matter was delayed until Friday after the regional meetings.

Slovakian planetarians have made contact through Undine Concannon, and wish to host a meeting for all planetariums in the former Eastern Bloc from October 4 - 6, 1994. We are also in contact with planetariums in India, China, and other areas. The number of future affiliation requests is unknown. Denis Simopoulos is contacting many facilities and will work with them for memberships, since some money is available through the EEC for former Soviet Union members. TACIS program funds can be used to help bring them to Council Meetings.

Discussion continued on the proper ways to encourage and sponsor new members, perhaps through our vendors and business partners or regional affiliate organizations’ sponsorships. Bess Amaral offered to sponsor a member on behalf of the Goddard Planetarium. A motion was passed to create a committee to deal with these issues.

The International Planetarium Director’s Conference (IPDC) will meet in 1996 at three sites in Eastern Europe. The relationship between IPDC and IPS was discussed, including the potential for IPDC affiliation with IPS, depending on whether it is of interest to their informal organization.

The Secretary’s Report had been mailed to all at an earlier date. It was accepted.

The Treasurer’s Report was presented and discussion followed. Keith Johnson indicated that the organization is on track for meeting its annual budget. Directories should have gone out to everyone joining the organization or renewing membership; anyone who was missed or who joins late receives a publication order form to receive back issues of publications. Denis Simopoulos noted that currently, 25% of IPS membership is non-US, up from 5% in 1974. The Report was unanimously received.

The Elections Committee Report was read on behalf of Tom Stc. Secretary Katherine Becker and Treasurer Keith Johnson have agreed to run for office again. Candidates for President-Elect are Jon Bell and Dale Smith. Nominations will also be taken from the floor at the general Business Meeting.

Members of the Russian and Ukrainian planetarium organizations joined the meeting at this time along with a representative from Vilnius, Lithuania. They were welcomed to the meeting along with their conference translator.

The Awards Committee Report was given by Phyllis Pitluga. The President Plaque will be given to Bill Gutsch, the Service Award to John Mosley and new Fellow Certificates will be presented at this conference. The group discussed membership status for Fellows.

Council reaffirmed the decision made at the 1992 meeting in Salt Lake City that Fellowship was a permanently bestowed honor and not a category of membership, and that Fellows whose membership lapsed would not be removed from the list of Fellows. Concerning membership, Phyllis also asked about Institutional Memberships; it was clarified that only one person can be designated as the official representative of each institution.

The request was made for a larger curriculum vita for nominees of the Service Award Plaque and a new slate of nominees. These will be dealt with at the 1995 Council Meeting.

The Publications Committee report was presented by Undine Concannon. The Planetarium Development Group has completed the new publication called So You Want to Build a Planetarium. It represents a tremendous amount of work and will cost about $700 to print for members.

The group discussed costs and distribution possibilities for the booklet. A motion was made and passed to make the publication free with membership, and that others wishing to obtain a copy could join the organization in order to receive it. Once the booklet is printed, the Planetarium Development Group will begin work on larger, more detailed document on planetarium design and development.

According to a survey, the two IPS publications most in demand are the Special Effects Manual, which is in short supply and which Undine will update, and the Educator’s Workshop Guide which was superseded by the PASS volumes produced by the Lawrence Hall of Science. Resource Guides were also requested. Lawrence Hall prints one that is extremely comprehensive for the USA, as does GLPA, but there is no document for Europe or other locales. Other requests included materials for portable planetaria, which Lawrence Hall has also created. The President instructed the Committee to use the GLPA document as a base and to internationalize it and create a Special Publication Resource Guide.

There was discussion about hard copy publications vs. publications on disk; there is not yet a consensus or decision on this point.
Discussion turned to the IPS Directory. The IPS files for the Directory are still text files, not a data base. Mickey Schmidt has offered to scan and edit the Directory. The group discussed the ramifications of creating or acquiring a data base for the Directory. The group voted in favor of seeking bids for producing the data base through a commercial firm. Keith will investigate and report back by October 1. Directories will now come out every other year beginning in 1995, with addenda in between.

The President suggested including another member’s survey with every renewal since the information has been very helpful.

A special publication on the history of our profession was also suggested by Dennis Simopoulos. It was reported that Paul Engle had an organizational scrapbook which has not been updated for some twelve years. At the Richmond meeting the Historian was charged with creating a history committee that would investigate the history of IPS and our profession. Historian John Hare is in favor of reviving that committee for those purposes and to extend the archives.

Discussion ensued on ways to solicit articles for The Planetarian and on Internet communication.

John Mosley then joined the group. Discussion continued about The Planetarian and its columns, including current vacancies. Articles could be borrowed from other journals such as the JPS Journal, NSTA, regional newsletters, etc. John Mosley reported that advertising revenues are healthy thanks to Advertising Coordinator Sherry Trivobich.

Expanding on the question of language, Council discussed and concluded that microphones and simultaneous translation for Council meetings was at present not feasible. At the 1996 conference in Japan, however, there will be simultaneous translation of IPS sessions.

A motion was made and following discussion, was passed, to create a Dan Zirpoli Award to honor those who are most innovative in our field.

The group continued discussing the action necessary for accepting the Russian and Ukrainian applications for affiliation within the requirements of the Standing Rules. It was proposed that sponsorships are needed for additional IPS members; one more for the Russian Association and two more for the Ukrainian. Goddard Planetarium, Dennis Simopoulos and SWAP each offered to sponsor a member so that affiliation would be possible now. A unanimous vote made the affiliates official. GLPA offered to sponsor another membership is need be.

The Conference Report was then presented by Mike Hutton. Pre-registration exceeded 400 and the final count will be nearly 500. Seven people were funded through grants. The conference budget is solid with some overage anticipated. Conversation continued about the trade show and vendors, looking ahead to the Japan conference. Mike recommended that IPS create a guidelines publication for conference hosts. Council sincerely thanked Mike and his staff for the work they had done.

Membership Committee reported that IPS will top 600 members this year. Today there are 595 members.

All Committee Reports were approved through a vote.

The existing Ad Hoc and Subcommittees currently include IPS Packets for New Planetariums, Language, Planetarium Development Group, Astrology, Portables, and History.

Under Old Business, the Eugenides Foundation has once again funded the Script Contest. The cycle is now off but can be restored and announced in the fall Planetarian. It will be made clear that all scripts must be publishable.

The Astronomical Society of the Pacific’s newsletter was discussed. IPS had provided funds for all members to receive the newsletter, but some names have been purged. The problem is timely delivery of the overseas mailing. Lonny Baker will be our go-between and ASP has proposed that its newsletter be printed in The Planetarian to solve the problem.

The Learning Technologies’ Gerald Mallon Award will be presented by that company during this conference.

The group discussed additional script contests or contests for other show production/creativity areas for the future which could be sponsored possibly by foundations.

Under New Business, Jim Manning announced that the off-year Council Meeting will be held in San Diego, California prior to the Association of Science and Technology Center’s Meeting which is held from Saturday October 14 through Tuesday, October 17. He proposes our meeting for Friday, October 13, with arrival on Thursday night. The hotel will be chosen with proximity to both the Reuben Fleet Space Theater and ASTC. ASTC is a very expensive conference but is very worthwhile. Bill Gutsch will see that ASTC registration materials are sent to Council Members in June. Regional representatives receive one-third of their airfare, two nights’ lodging, and lunch during the Council Meeting from IPS. Officers receive two-thirds of their airfare, two nights’ lodging and lunch. A motion was passed to reimburse Council Members’ expenses for one night’s lodging during on-year meetings, since this is an expense that would not normally be incurred. It was suggested that if some Council Members can choose not to accept the reimbursement, the funds be used to sponsor conference attendees in need of assistance.

Newsletters on the Osaka Conference were provided by Shingo Kawakami, including a tentative schedule. In Japan, the Council will meet the day prior to the Pre-Conference Tour. The entire meeting may move three days earlier to give people the opportunity to fly on mid-week rates.

The Treasurer fielded questions about the budget. A revised budget will be presented later this week.

A motion to adjourn was passed.

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The IPS Council Meeting continued on Friday and was called to order at 12:00 noon.

In attendance:
President: Bill Gutsch
President Elect: Jim Manning
Treasurer: Keith Johnson
Secretary: Katherine Becker

Affiliation representatives:
Association of French-Speaking Planetariums (APLF) - Marc Moutin
Association of Mexican Planetariums (AMP) - Ignacio Castro Pinal
British Association of Planetariums (BAP) - Undine Concannon
European/Mediterranean Planetarium Association (EMPA) - Dionysios Simopoulos
Council of German Planetariums (CPG) - Hans Meinl
Great Lakes Planetarium Association (GLPA) - Dale Smith
Great Plains Planetarium Association (GPPA) - April Whitten
Italian Planetaria Friends Association (AADP) - Loris Ramponi
Japan Planetarium Society (JPS) - Shingo Kawakami
Middle Atlantic Planetarium Society (MAPS) - Joyce Towne
Nordic Planetarium Association (NPA) - Franck Petersen
Pacific Planetarium Association (PPA) - Lonny Baker
Planetarium Association of Canada (PAC) - Tom Clarke
Rocky Mountain Planetarium Association (RMPA) - Bess Amaral
Russian Planetarium Association - Zinarda Sitkova
Southeastern Planetarium Association (SEPA) - John Hare
Southwestern Association of Planetariums (SWAP) - Donna Pierce
Ukrainian Planetariums Association - Alexander Lenin
The meeting was called to order by President Bill Gutsch at 12:00 noon.

The proposed 1995-96 budget was presented on behalf of the Finance Committee, was discussed and approved through a vote.

The group discussed the selection process for the conference site for 1998 following the surprise announcement, at the General Business Meeting, of a London-Paris joint meeting instead of two separate site bids. The change to a joint conference proposal at this date is not possible according to the proposal deadline requirements of the By-Laws. The situation and potential ramifications and solutions were discussed at length by Council. The President asked if we might be back to the situation of having the original three bids from London, Paris, and Pittsburgh as they existed prior to the General Business Meeting. Undine Concannon and Marc Moutin requested time to confer with their institutions and consider their position on this matter. The meeting was adjourned until 6:00 p.m.

At 6:00 Council re-convened with Lee Ann Hennig representing MAPS.

The President reported that Phase Two of meeting planning for 1996 in Japan had begun. He will be polling vendors for their questions regarding trade show exhibiting in Japan. The International House is the Conference Center where most of the papers and functions will take place. Costs of the conference were also discussed.

Turning again to the matter of the 1998 Conference, Bill Gutsch asked if all three of the original bid proposals were back on the table for consideration by Council. all three site representatives indicated in the affirmative. After discussion and determination that a Council vote at this time was in compliance with the By-Laws and Standing Rules, a motion was made to vote immediately.

In subsequent discussion, Undine Concannon from London, Marc Moutin from Paris, and Martin Ratcliffe from Pittsburgh were asked to review their Institutions' proposals, including a review of costs. Council then voted on the motion to vote now; motion passed with one opposed.

Council then voted, by customary secret ballot, on the choice of site for the 1998 conference. the result of the vote was: London, 14; Pittsburgh, 6; Paris, 1. the announcement of the London Planetarium as the site of the 1998 IPS Conference will be made at the evening beach party at 8:00 p.m.

Jim Manning commented on the excellence of all three bids, urged Paris and Pittsburgh to consider resubmitting in the future, and thanked all sites for their efforts.

The meeting adjourned.

Recorded by Katherine Becker
Edited and Submitted by Joyce Towne
4/20/95

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A small group of my high school astronomy students is working independently with an activity in class. They are projecting a series of slides, one at a time, onto a piece of white poster paper.

Student: "Mrs. Hastings, there are no stars on this slide."

JGH: "Stars have to be in that slide. It shows planets against a background of reference stars."

Student: "But there are no stars in this slide!"

JGH: "Well, do you see the planets?"

Student: "Yes, but there are no stars!"

JGH: "Let me see... oh... what are those big fuzzy circles in your picture?"

Student: "I don't know; they're not stars!"

JGH: "Let's try focusing the slide."

Student: "Oh, there they are!"

Never a dull moment with this bunch. I try to mix it up: activities, planetarium demonstrations, computer simulations, videos, lecture, reading assignments, keeping a sky journal, tests, quizzes. I try to guess what of this mix will work; I never guess right.

I predicted to myself before the course began that they would like activities best. I was wrong. They don't "enjoy" doing the activities. They rush through them, anxious to put down some sort of answer, and go on with their lives.

It's too bad, really, that they don't like doing activities. It's too bad because "... students must elucidate their own preconceptions and then test them. Only by realizing that their own ideas cannot explain the outcomes of experiments or natural phenomena do people realize a need for a different theory. Educators can then present the scientifically accurate concept as a powerful idea that can predict and explain events."

Dr. Phil Sadler said the above, at IPS in Cocoa Beach. Phil is with the Harvard-Smithsonian Center of Astrophysics, Harvard Graduate School of Education, and he invented the "Starlab" portable planetarium. I found his quote easily because I keep a copy of Phil's presentation handy. I need some help in figuring out where my astronomy students are, conceptually.

From the research he did for his doctoral dissertation, Phil developed a profile of a high school student entering an astronomy class. His composite: "He has chosen to take an astronomy course because he is curious about the subject, but he does not consider it a hobby."

More: (the student) tends to think of the astronomical world as fixed, or, at least, as constant. He can state that the Earth turns on its axis, but he is not quite sure of the ramifications of this motion. The length of daylight, the path of the Sun in the sky, and the movement of the Sun against a background of stars are all misconceived. In his view, the sun moves in a uniform, unchanging way, rising in the east, being overhead at noon, and setting in the west. Its path is independent of geographic location or season. He knows that the Earth orbits the Sun in a year, but thinks its path is highly elliptical.

Amazing! He has ideas about the size of and relative distance between astronomical objects that are vastly out of proportion. Both the Earth and Sun are thought to be about ten times their actual diameter. Solar system objects are thought to be much closer to each other than they actually are. This supports his view that the seasons are caused by the Earth's changing distance from the Sun and the Moon's phases are caused by the Earth's shadow. The Moon circles the Earth in a day while the stars appear fixed in the sky.

More? (The composite student believes) that the entire universe is compressed. Stars can be found between the planets. Since the stars are fixed, traveling to another star would not change the appearance of constellations. Galaxies are much farther away than the visible stars. The universe itself is static, neither expanding or contracting. Gravity does not play a major role in the structure of the universe since it is not dependent on mass and distance, but only on air pressure.

Go, on Phil! "Misconceptions in mathematics limit the usefulness of graphs and calculations in helping to understand astronomical concepts. He can extrapolate graphic data, but has difficulty reading graphs and extracting useful information or patterns. His understanding of scientific notation is poor. Order-of-magnitude calculations are difficult for him and are often performed incorrectly. He understand angles only when they are concrete and small. More abstract arguments using angular measure are not effective with him. He thinks a circle has only 180 degrees of internal angle. Size-to-distance ratios are a foreign idea to him. He solves simple algebraic equations, but cannot apply proportional reasoning to real-world or word problems. He sees math as a separate subject with little relevance to or utility in learning science."

I've kept his paper on top of one of the piles on my desk all year now. I turn to it frequently with the thought "Well, what did he find out about this... or that... (insert current day's frustration realized by student responses for that day)." Phil's paper is reproduced in pp. 183-192 of the IPS Proceedings along with a sample of some of the pre-test questions he used to determine his composite student entering an astronomy course.

I knew Phil was right after I gave my astronomy students a "pre-test" on the first day of class. There were 25 questions. This is a "bright" group of kids; they got a good percentage of the questions right. But every single one of them thought that the sun rises in the east every day, is overhead at noon every day, and sets in the west every day.

Take heart, fellow Planetarians! There's a lot of work out there for us to do!

Overheard in Starlab:

- George Hastings, of the Mathematics and Science Center of Richmond, Virginia, was presenting a night sky show in Starlab to 3rd graders.

George: "Now look over here in the South. If you use your imagination, you can see that stars make letters of the alphabet. Here is the letter "A" [Sagittarius], below that you can see the letter "O" [Corona Australis], and just to the right of that is a big letter "J" [Scorpius].

Student: "Oh. There's OJ.' In the sky!

- GDK [Sorry, I don't know who this is... read it in Starlab newsletter] was sharing the school auditorium with a drama class. The drama class had their props stored on shelves in the same location as the electrical outlet where the Starlab blower was plugged in. When one of the drama students removed a box full of glitter from the shelf, the bottom busted out and fell to the floor directly in front of the blower! The constellation lesson inside the planetarium was suddenly enhanced by a "storm of stars" lit up by reflections from the starfield cylinder!

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One cannot teach without first knowing what it is that others believe to be true.

Gore Vidal

It's better to know nothing than to know what ain't so.

Josh Billings

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