THE PLANETARIAN

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Letters to the Editor

'94 Conference Dates

I have a strong personal conviction that the coming IPS Conference, hosted by Mike Hutton in Cocoa, Florida in 1994, will better serve IPS members and be a much better conference if it is held in October instead of the planned time in July. I sought and received the approval of then-IPS President Terence Murtagh to survey the membership on the idea of moving the conference dates to the Columbus Day weekend. Mike helped to write the opinion poll question.

Your opinion please. Should we have IPS '94 in Cocoa, Florida during Space Week and the 25th anniversary of the moon landing (July 20) or should it be moved to Columbus Day (second Monday) weekend in October?

If we have our Conference during Space Week (July), we have the advantage of being part of the celebration and may have access to big name speakers.

If we have our Conference around Columbus Day (October) we will have better weather (cooler and dryer), the hotels will be less crowded (we can obtain a better room rate), we will have much easier access to the nearby Space Camp and the Kennedy Space Center (both of which will be running at capacity during July), the host planetarium’s new building will be more complete and operating more smoothly, we can negotiate a better rate for a pre/post conference visit to Disney World, including a behind-the-scenes tour, and we may be able to charter the cruise ship Oceanic for part of our conference.

Realizing that many IPS members are public school employees, we hope that if the conference is staged in October, that you will be able to obtain the needed two additional days away from school for your professional, biennial conference in 1994.

— Let’s move the Conference to October, 1994.

— Let’s leave the Conference at the originally proposed time in July, 1994.

About half the IPS membership responded to the poll, giving it 99% validity for the entire membership, and 61% voted for moving the dates to October.

This percentage is not in the minutes of the Council meeting, where the poll was considered, and the Council vote was unanimous against moving the dates. Council has, of course, the total responsibility for this decision, but I am amazed that it ignored the wishes of a clear majority of its members and I want the membership of IPS to know what has happened.

Don Hall
Strasenburgh Planetarium
Rochester, New York

Astronomists?

I think that Katherine Becker and Dave Hostetter (Jane’s Corner, December 1991) have missed a plausible definition of the word “astronomers.” Could this be a combination of an astronomer and an optimist? Thus it would mean those who gaze skywards hopefully and would apply to a whole range of astronomers from those who go out night after night to those who travel half way round the globe to see an eclipse.

Incidentally, the “check spelling” facility on my computer queries the word “astronomist.” Should I now add it to its dictionary?

Ian Giddings
Gallowgate, Aberdeen, UK

Christmas Star Shows

Should I be pleased or upset with your references to my letter to the editor about my concern with Christmas Star shows in your article “In Defense of Christmas Star Shows” (December 1991)?

I take great issue with you when you categorize me as being a part of a small vocal group of creationists. I agree that my referenced letter was ambiguous about presenting all the facts. Yes, you printed what I wrote, but I am sorry that I did not put my complete thoughts in that letter. You have a record of attacking the intentions of other people who disagree with your conjunction hypothesis.

I respect Carl Wenning’s work and his dedication to the planetarium profession. We have had repeated and lively conversations about the star. He has done the research. I’ve asked a few probing questions and he has supplied answers to his satisfaction. Are we conspiring creationists? No. Do I believe his glory hypothesis? No. I added his glory hypothesis to Christmas Star presentations along with the meteor, comet, and conjunction. Then I offered reasons why all of them are unsatisfactory. The glory hypothesis is unscientific. Unlike the conjunction hypothesis, the glory cannot be tested. When I said “offer all the ideas …” that is what I meant. In my humble opinion, there are no current explanations that fit the observations, regardless of the names of prestigious astronomers you invoke!

Furthermore, after you wrote your editorial comment in vol 12, #2, I sent you another letter and some position papers I wrote against teaching creation-science in the schools. I’ve been an outspoken critic of the cries for equal time and balanced treatment in the local media for over a decade. I wrote letters, against a balanced treatment law, to my state legislators when the topic came before the Illinois
legislature several years ago. Apparently, those documents were lost in the mail as you said you never received them. At a later date when I asked you to print the letter you said that my response was no longer timely and that it would not be printed.

I have an alternative to the Christmas Star show. I've called it Rites of the Season. Carl and I cannibalized part of an Abrams script that we initially used for a Christmas star show. Over time I realized that I needed another December show, because of my ethical concerns about how to present the show without giving support to astrology and religion. I developed Rites of the Season from parts of the joint script by relating the many holidays of the year with astronomy. Dave Linton of Parkland College revised Rites for his theater and even presented it to the GLPA conference when we met there in 1989. I am sure that the conference who heard my reasons for working with Rites of the Season would say that I'm not a creationist, but quite the contrary. Carl made a major rewrite of it for his 1990 production.

If you or anybody wants to use the Christmas Star as promotion to raise revenues, at least be honest and say that you need the money. I readily accept that as a reason. Make it part of your statement of mission in a similar fashion that light shows are used: Raise revenue, expose another group to the planetarium, etc. Present the Christmas show because a segment of your population demands it, it fills your theater, and boosts revenue. I will never argue against multipurpose uses for anybody's dome, especially when I see many colleagues trying to make it through difficult economic times.

You exploited my incomplete letter, especially when you had personal knowledge of my anti-creationist opinions. If I were in your position (and I'm not after it) of writing and editing a feature article for a major publication in our field, I would refrain from insulting colleagues who disagree with my opinions. I will remain active on this issue, when appropriate, and other difficult questions that affect our profession. I won't ask for a retraction because of your history in The Planetarian is to personally attack anybody who disagrees with your conjunction hypothesis and then get the last word because you are the editor.

Jeffrey Hunt
Aurora, Illinois

Congratulations on a truly outstanding summary article—information and position—on Christmas Star programs. I think you've done a great service for our profession. By detailing dissenting points of view, your position seems the only one to accept, in conclusion. Bravo!

Jeanne Bishop
Westlake, Ohio

Your long summary of the Christmas-show controversy is very interesting, but I don't think that your conclusions follow from the facts and discussions you marshal. The disclaimer you suggest (p. 27) is so weak, and so quick, that it seems to me to be mere semantics. Though the show about the role of religion and myth in civilization suggested by Mickey Schmidt (p. 30) sounds interesting and suitable, it is so far from the Christmas shows that are given or are likely to be given on a widespread basis that I doubt its relevance to the discussion of "Star of Bethlehem" shows.

The notion that even you think that it is better than 50-50 that no actual astronomical event occurred (p. 23: "Personally, I feel there is a slightly more than even chance that ['popular poetry' invented later to improve the story] is the correct explanation for the star) only emphasizes, in my view, the misleading nature of the "Christmas show" to most visitors.

I think you underestimate how bothersome it is to non-Christians to have a "Christmas show," and therefore how important it is to stay clear of seeming to endorse or to emphasize the majority religion. The Letter to the Editor in the same [December] issue replying to someone who didn't understand the importance of the distinction between Jesus, a person, and Christ, an ecclesiastical title, shows further how narrow the proper path is and illustrates to me that planetarians should just stay away from it.

I think that attendance will increase during the December school vacations no matter what you show. A show entitled "winter solstice" should do well, as would ones on many other astronomical topics. Why not try a "winter solstice" show one year!

Jay Pasachoff
Williams College
Williamstown, Massachusetts

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Just two weeks before I.P.S. President-Elect Gerald Mallon died on November 5, 1991 at age 39, he told family members that one of his fears was that he would be forgotten. I am writing this so that we will all have a record of some of the accomplishments of Jerry’s life and work, in addition to letting you know how Jerry is being remembered.

A service celebrating his life was held by his family, friends and colleagues at St. Luke’s Church in center city Philadelphia on December 5, 1991. On February 25, 1992, the Methacton Schools in Norristown, Pennsylvania named the planetarium, which Jerry directed for 17 years, in his honor. Students donated money for a plaque outside the planetarium entrance proclaiming it The Gerald L. Mallon Planetarium. Inside is an artist’s portrait of Jerry. During the planetarium rededication service, Jerry’s fellow teachers, members of the school board, school administrators and students spoke about Jerry and his work at the Arcola Intermediate School.

Jerry graduated from college in 1974 and his first job was in the brand new Arcola school planetarium. Jerry was honored for his work in science education by the National Science Teachers Association just six years after starting work. During the following years, he made his planetarium famous, world-wide.

Jerry set an example for all planetarians, not only by his dedication to science education but also through his imaginative uses of the planetarium across the school curriculum. Jerry was also a master of wringing the most effective use of every moment of time, obtaining his advanced degrees while teaching. He was rightfully proud of his Doctor of Education degree (1980) from Temple University in Philadelphia. His dissertation compared student achievement and attitudes in astronomy for traditional planetarium star shows versus participatory programs.

Had it not been for AIDS, Jerry would have served his term as President during 1993-94. He was diagnosed as HIV positive (HIV is the virus that causes AIDS) in October, 1989. Although he knew this when he accepted the nomination, he fully expected to live through his term of office. According to AIDS experts, some people who are HIV positive still not symptomatic 10 to 13 years after infection.

Jerry had already set in place the foundations for projects that would be carried out two years later during his anticipated term as President. His health took a turn for the worse with the onset of pneumonia, the first of several opportunistic diseases that would plague him in the months that followed. It was this pneumonia which caused him to miss the IPS Conference in Borlänge, Sweden during July of 1990. Again, according to AIDS experts, there are many people who live with AIDS, after becoming sick for the first time, for eight years or more.

Many of us last saw Jerry at this year’s MAPS meeting in Philadelphia where he gave a paper on celestial objects in the paintings of Vincent Van Gogh and how the planetarium could be used to establish dates when these works were painted. His presentation was an audio-visual masterpiece, complete with a “Starry Night” necktie.

During the four years that he served on the council of IPS as Executive Secretary, he took the time to go back through years of meeting minutes to come up with a set of “Standing Rules” of all the things the council had decided for the organization, but that were not part of the official by-laws. Jerry was the person we turned to when something needed to be done and it had to be right the first time and on time. If he were the first to see a need, he would be the first to take action.

In 1988, Jerry was the recipient of the first Challenger Seven Fellowship, a memorial to the astronauts who lost their lives in the Challenger Space Shuttle disaster. For his Fellowship, he designed and implemented a project that was multi-cultural and involved middle school students in a simulated mission to one of the planets. This project was a wonderful combination of Jerry’s interests in education, astronomy and many of the principles of Black and White Men Together—an interracial, gay group whose Philadelphia chapter Jerry helped to found. Jerry wrote a substantial amount of and edited all of Resisting Racism: An Action Guide which was first published nationally by B.W.M.T. in 1985. Jerry updated and revised a second edition which was released just last year.

Four years ago he was selected to serve as one of two people representing the U.S. in India for a workshop on planetarium education. Jerry loved India and, at his request, his brother has made arrangements for his ashes to be scattered there.

Jerry is the author of dozens of articles and papers on science education generally and the use of the planetarium in the schools specifically. Last year he completed two books on planetarium activities for students that have been jointly published by the Lawrence Hall of Science in California and the New York Hall of Science. His books in the P.A.S.S. series are: Activities for the School Planetarium and A Manual for Utilizing Portable Planetariums.

It is my hope that the Council of I.P.S. will start a fund from dues and donations from our members that will carry Jerry’s name. The income generated by such a fund could be used, for example, to give recognition at the biennial conference for outstanding achievement in the use...
of the planetarium with students, or to encourage more people-of-color to enter the planetarium field. From having been Jerry’s friend and colleague for 11 years I know that either of these projects in his name would please him.

Jerry was a teacher of both his students and his colleagues, an organizer and a leader. His planetarium colleagues will miss his smile, red hair, dedication and leadership.
Entertainment and Education: Are They Compatible?

Christine Brunello
Morehead Planetarium
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One of the major issues in the planetarium field today is priorities: is the goal to entertain or to educate? A number of planetarians consider themselves primarily educators and believe that their goal is to teach. By making shows entertaining, these planetarians hope to retain the audience’s attention and to make shows more palatable. “Our primary goal has been, and always will remain, education. Entertainment is merely a tool toward this goal ... a means of capturing and maintaining the audience’s attention.” (Walker, 1986). But this incorporates an assumption—that making a show more entertaining will not interfere with its educational effectiveness. Perhaps an entertaining show will be more efficient at communicating the points of the show, but it is also conceivable that the entertainment will distract the audience and prevent them from learning as much as they would otherwise. Does the entertainment value of a planetarium show affect the audience’s learning?

Does the entertainment value of a planetarium show affect the audience’s learning? ... Does the personality and delivery of the presenter, or visual or audio stimulation affect the ability of the planetarium audience to understand the concepts, or their interest in the scientific topic presented?

Now that some definitions have been established, the question can be restated. Does the personality and delivery of the presenter, or visual or audio stimulation affect the ability of the planetarium audience to understand the concepts, or their interest in the scientific topic presented? Perhaps the immediate reaction is “Yes—of course these things will help the audience to understand the material, and will make the subject much more appealing.” But the possibility remains that some of these elements could distract the audience and prevent them from understanding the concepts, or from gaining an appreciation of the material that might not be so well understood.

Several different research papers will be examined to help answer the question presented. Some of the papers will relate directly to education in the planetarium, while others are related to the effectiveness of audio, audio-visual, and visual communication, and the possibilities of audio or visual interference with learning.

What effect does the presenter have on the educational value of a planetarium program?
What effect does the presenter have on the educational value of a planetarium program? This is probably less important for recorded shows, but it may have a strong effect on the audience's learning for any live programs, such as interactive shows where the audience participates, or shows where the main narrator is the console operator.

In one study, research was done on two different approaches to planetarium programs to see if there was a significant difference in the retention of cognitive knowledge—how much do students remember from a live show in which the console operator demonstrates phenomena compared to when the students themselves take data and perform the experiment? (Fletcher, 1980). The study used eight different directors as instructors, and 32 Earth Science classes, for a total of 686 subjects. Half of the classes were given a program using the traditional method, and the other half were given a program covering the same material, but using the participatory method. The students were then given a test immediately, and were tested again two weeks after the planetarium program. No significant differences were found for the method of instruction used; however, there was a significant difference for the application (scores improved with practice for the traditional method but diminished for the participatory method), and for instructors, and for the time of testing. The part of this study relevant to this paper is that significant differences were found for the instructors. It is possible that the style of the instructor made a difference in the cognitive learning of the students, even when the same material was presented, as specified, for the program.

In the second study, the traditional method and the participatory method of instruction in a planetarium were again compared, in five different states (Mallon & Bruce, 1982). However, in this case the students were tested on astronomy content and on "astronomy attitude"—what their interest in astronomy was before and after the planetarium presentation. Five different planetariums in five states participated, including Pennsylvania, Texas, California, Minnesota, and Nevada. In Pennsylvania, 324 third grade students were used as subjects; in Texas, 76 third grade students were used; California had 52 third and fifth grade students; and Nevada and Minnesota each used 52 fourth grade students. Existing scripts were used to keep the programs consistent from state to state. In this study, the participatory method had a significant difference from the traditional method for the astronomy content; students who took data were more likely to learn more about astronomy than students who simply watched and listened. But for the results of the pretest to post-test attitude scores, there was a significant difference for the participatory method only in Pennsylvania, and there was a significant difference for the traditional method only in Texas. The participatory method had a significant difference over the traditional method in the attitude test in Pennsylvania and Minnesota. In other words, the students' attitudes towards astronomy had only been improved in some of the testing regions. (Different instructors were used for each region.)

Perhaps the different instructors in these two studies made a difference in how much the students actually learned. The material covered was the same, but the students did not all learn the same amount. Style and humor of the show presenter may have an effect on what the audience learns, both in terms of astronomy content and in attitude.

What effect do [sound, vivid images, and unusual special effects] have on learning?

Many shows in planetariums are filled with sound, vivid images, and unusual special effects. What effect do these have on learning? Many studies have been done to compare learning from video tapes, sound tapes, and written material. Although these may not seem to relate directly to the planetarium field, the results might be able to suggest which types of planetarium shows are best. Also, the best shows might be different depending on whether we wish to teach astronomy content or to arouse curiosity and improve the audience's attitude towards astronomy and science in general. Finally, the results may differ for different age groups.

Two experiments were done on groups of adults comparing learning from print, audio, and audio-visual material. One study tested for cued recall as a function of the medium of communication (Furnham, Benson, & Gunter, 1987). Three different advertisements were each prepared in three media: print, audio, and audio-visual (television) for the experiment. The subjects were all undergraduate students at the University of London, ranging between 18 and 27 years. Each subject saw one advertisement, heard another, and read the third. (Each advertisement was prepared for the three media; a television commercial, the sound track to the commercial, and the script for the commercial. Those who read the script had the same amount of time as the length of the recorded commercial.) After this, each subject was given a test of five questions on the content of each of the three advertisements. Those subjects who had read the ads tested better than the others, and those who had seen the television commercials tested better than those who had only heard the ad.

A second study is similar to the previous one; however, instead of three advertisements, the subjects studied a single party political broadcast (Gunter, Furnham, & Leese, 1986). There were 65 subjects ranging from 18 to 40 in age; these were separated into three groups. The first group viewed the broadcast on a color television. The second group heard the soundtrack, and the third group had written transcripts of the broadcast. The broadcast was 4 minutes and 53 seconds long; all subjects had that amount of time to complete their observations. The subjects were tested on three variables: free recall (in which they had five minutes to write down everything they could remember about the broadcast), cued recall (in which they answered
were then asked 5 questions—four were recognition of portion was one cartoon. View a two minute television segment, in which the video between visual and audio stimuli. Audio learning (recognition), and with interference 12 conducted (Hayes study, the experiments in this study dealt with video and audio-only presentations for children. An additional factor is considered in some of these studies: do the visuals support the audio? What effect does this have on the children’s understanding?

In the first experiment, 18 preschoolers were chosen to segments of Sesame Street (Pezdek & Stevens, 1984). Some of the children saw a regular segment of Sesame Street with the correct soundtrack (audiovisual match), some saw a video with the wrong audio soundtrack (audiovisual mismatch), some saw the video without any audio, and some heard the audio without seeing the video. The children were tested on three dependent variables: the percentage of total time that each child visually attended to the television, the child’s comprehension of the audio and of the video, and the child’s accuracy in recognizing portions of the audio and visual segments. (The audio-only group was not tested on the visual portions, and the video-only group was not tested on the audio portions.) The results suggested that young children pay more attention to visuals than to audio stimulation, and that visuals that don’t match the audio portions of a show may well distract the children from listening: children in the audiovisual mismatch group tested similarly to the children in the video-only group, as if they had only seen and not heard the presentation. In the second study, four related experiments were conducted (Hayes & Birnbaum, 1980). As in the previous study, the experiments in this study dealt with video and audio learning (recognition), and with interference between visual and audio stimuli.

• In the first experiment, 18 preschoolers were chosen to view a two minute television segment, in which the video portion was one cartoon (“Superfriends”) but the audio was from another cartoon (“Scooby Doo”). The subjects were then asked 5 questions—four were recognition of information that was presented in only one of the show’s two modalities, and the fifth was a probe to see if they noticed something unusual about the cartoon. (“What was wrong?”) The children recognized visual portions more easily than audio portions. None of the subjects knew what was wrong with the show. This experiment backs up the first study that suggested that young children don’t learn as well from hearing as watching;

• In the second experiment, a different set of 18 preschoolers were used. This time a six-minute segment was prepared using a cartoon with matched video and audio, and 15 questions were asked. Five of the questions could only be answered using the visual portions of the show, five of the questions were related to the audio, and five were integrated (demonstrated both visually and aurally). Again, the visual questions were more often answered correctly than the audio questions, but there was no significant difference in scores between the visual and the audiovisual questions. Apparently, in some cases the audio isn’t necessary to help communicate information that is already presented visually.

• In the third experiment, the previous experiment was conducted with 27 college students. No significant differences were found for any of the question types. Adults seem to pay more attention to the audio portion of a show than young children.

• In the fourth experiment, 36 preschool children were chosen and divided into three groups. Each group watched a six-minute segment of cartoons, but while one segment had a match between the visual and audio, the other two had an audiovisual mismatch. Four sets of five questions were created, and each subject was asked two sets of questions (one set corresponding to the video they saw and one set corresponding to the audio that they heard). Visual questions were more likely to be answered correctly by the audiovisual mismatch groups, while the control group (audiovisual match) showed no significant differences in the two types of questions. [This is an interesting result, as it clearly contradicts the results of the second experiment.] Only one child out of the 24 shown audiovisual mismatches showed an awareness of what was wrong with the show.

In the third study, audio and visual comprehension were again tested on young subjects (Ginsburg et al., 1989). 80 subjects, ranging from 3-4 years in age, were chosen to watch a videotape on prevention of child victimization. Two videotapes were produced with different visuals but the same audio; in one, the narrator is shown speaking, while in the other, the narrator’s story is acted out in sequences. The subjects were divided into five groups to match five conditions: the first only heard the audio, the second saw and heard the video with the on-screen narrator, the third saw the action video but had no sound, the fourth saw and heard the action video, and the fifth did not see or hear any videotape. The children were then given Fisher-Price figures and asked to act out the sequence demonstrated by the video tape on what to do if a stranger approaches (the “No—Go—Tell” sequence) and
received a point for each correct step. The audiovisual-with-action group tested much better than the audio only group and the last group (which neither saw nor heard the videotape), but did not test significantly higher than the group that saw and heard the narrator or the group that only saw the action demonstrated without audio. This suggests that while visual action may be helpful in communicating a point, it isn’t necessary.

In the fourth study, the impact of audio and visual features on young children’s preferential selection of, and memory for, verbally presented materials was examined (Calvert et al., 1989). Forty preschoolers were chosen to interact with a computer lesson teaching names of objects. On the computer were 24 objects which, correctly identified by typing in the name, would either move in an action meaningful to the object, or create a nonmeaningful but distinctive sound, or both or neither. For four days (at 15-20 minutes per day) the subject would hear a story that incorporated all the objects; some of which would be associated with action and/or sound, which would be performed when the object’s name was typed in. The child would then select one object from each set (for a total of six)—this choice was recorded as the child’s preferential selection. On the fifth day, each subject completed a 30 minute post-test, in which all names of the objects were listed as free recall. In the results of the test, words with action were more likely to be recalled, and words without sound were more likely to be recalled. In the preferential selection, boys were more likely to pick words with action while girls did not do so significantly; and there was a sound by day interaction—by the third and fourth day, more words with sound were selected. These results are interesting; nonmeaningful sounds (while perhaps are entertaining—the children were more likely to select them) are not useful for helping children retain information and, in fact, may be detrimental to learning. Meaningful action, on the other hand, may be useful.

In the final analysis of these various experiments, nothing has been established with certainty, but some conclusions are suggested. For instance, in the first two studies, it was found that instructors do make a significant difference in planetarium programs, in both the cognitive and affective domain. Presumably, some styles of delivery enhance the learning of the audience in the planetarium, while others may negatively affect the audience. This can be true of any teaching situation, but especially true of planetariums, where the instructor does not have a large amount of time to get to know the audience before the lesson or show begins.

... young children are very influenced by what they see and either do not pay as much attention to what they hear or are confused or distracted by it ...

The studies on audio and video learning suggest that young children are very influenced by what they see and either do not pay as much attention to what they hear or are confused or distracted by it (as in the last study, where scores actually dropped for those objects associated with sounds). Clearly, for these groups, a show should have constant visualization of the points being made by the narrator, whether the show is live or taped. Relevant actions also seem to help, but it is unclear whether non-relevant actions help, hinder, or affect learning. But all effects, whether visual or audio, should clearly be meaningful or directly related to the points being made in the show; otherwise, the young audience will be lost.

Similarly, adults are visually-oriented, and will learn more from simply reading the material than having it demonstrated. Older children were not included in any of the studies, but it may be assumed that people in general tend to be visually-oriented. [In the past, research has shown that some classes will learn as much or more in a classroom than in a planetarium; perhaps it is because of this superiori ty of written materials in teaching content (Sunal, 1976; Reed & Campbell, 1972).] However, the drama of music and visuals in a planetarium theater may be more likely to influence the affective domain. Presenting visuals to support the audio is very important for assisting in learning of adults (and presumably older children) as well as young children. However, adults are more likely to assimilate audio and video without significant interference in the content of either.

... entertainment does have a significant effect on learning in a planetarium show. However, that effect can be either negative or positive ...

So, in conclusion, the answer is yes; entertainment does have a significant effect on learning in a planetarium show. However, that effect can be either negative or positive—the actions and visuals can be used to make the point more clear, or they can distract the audience if they are not directly related to the content of the show. Similarly, nonmeaningful sounds (music, special effects) are likely to distract a younger audience and interfere with learning. The style of the presenter will also have a significant effect on learning; hopefully, a lively and humorous presentation will have a positive effect.

It would be interesting to see more research on the cognitive and affective learning in a variety of modern shows, to see how automation, live delivery, video, lasers, and music independently affect the audience’s learning, relative to the age of the audience. With new technology and innovations in the planetarium field, planetarium shows are constantly being changed; more research needs to be done to insure that these changes are for the better.
References


Under Roof, Dome & Sky

MAPS Education Committee is considering reprinting Under Roof, Dome & Sky, a highly successful collection of astronomy projects and programs for both the planetarium and the classroom. This book has been in constant demand since its 1973 printing.

In order to determine whether a new printing is viable, the Committee would like your feedback. Please fill in and return the coupon below ASAP.

1. Have you ever seen/read Under Roof, Dome & Sky? _____ _____

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Send to:

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Planetarium Visuals: Research Questions and Proposals

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Introduction

The planetarium is a visually sophisticated arena. A star projector alone projects thousands of stars on the domed ceiling to simulate the night sky. Supplementary projectors present slides and special effects, while video projectors show laser disc, video, and computer graphics. Other domed theaters have all-sky film projectors. Planetarians, as a group, are visually sophisticated, as many can identify all the objects in a photographic Messier catalog without delay. They can see faint, nebulous objects through telescopes that even the most frequent planetarium visitor cannot discern. Their museum galleries, slide libraries, and office walls are filled with marvelous color photographs of the visual universe beyond. Daily they see hundreds or even thousands of images of celestial objects as they present shows to their own patrons and design new ones. Planetarium visitors are not necessarily visually sophisticated. Most probably cannot tell the difference between planets.

When presented with a photograph of Messier 1 (Crab Nebula), many planetarians can identify it by name, describe it as the remnant of the supernova of 1054 A.D., and may be able to identify the pulsar at its heart. The planetarium visitor would probably identify M1 as little more than a smear of light. S/he does not have the repertoire of visual experiences of most planetarians. Because of the vast gulf of visual experiences, planetarians drive visual Ferraris and most of their visitors clunk along in visual Yugos. Planetarians must accommodate this gap in visualization performance.

This writer's comprehension comes from many years of experience working with groups of all ages. Planetarium patrons appear to be visually unsophisticated. When children react in a positive fashion when seeing a beautiful color photograph of Saturn, to what are they reacting? The color of Saturn's clouds? The size of the image? The shape of the planet? The color and texture of the ring system? There is no research to explain their reactions.

The intent of this article is to review learning research of visuals from education, summarize it, and extrapolate this foundation into the planetarium.

Do planetarium visitors learn better by showing fewer visuals and showing them longer?

The size of the image? The shape of the planet? The color and texture of the ring system? There is no research to explain their reactions.

I include some participation and questions with appropriate wait times, but like other planetarians, I base my feature presentations and lessons on intuition, experience, and personal preference without much regard for research. Riordan (1991) reviewed the various planetarium research projects ranging from classroom versus planetarium lessons, participatory lessons, and focused research. That review showed the many efforts to test the significance of learning in the planetarium, but major gaps remain in our knowledge of how visitors learn.

The intent of this article is to review learning research of visuals from education, summarize it, and extrapolate this foundation into the planetarium. Certainly, extending any research is a dangerous maneuver, but I will propose research projects that planetarians can perform in their own theaters. I hope these ideas will facilitate discussions among my peers, additional articles from interested writers, and research projects to test these proposals. With thousands of data points passing through their domes each year, all planetarians can help construct a framework of understanding on the use of effective visuals in the planetarium.

Visual Literacy

This recently coined term has entered the education literature. Many readers can probably remember striking
and lasting images from movies or music videos. American political campaigns are full of neatly designed images that portray political events in a particular manner. Nearly all commercially-made images have intention. Visual literacy is the ability to understand the content and purpose of any image. A visually literate person can perceive, understand, and interpret visual messages and can actively analyze and evaluate the visual communications they observe (Robinson, 1984). The study of visual literacy has elements of visual design: color shape, line, texture, pattern, perspective, point of view, size, framing, motion, sequence, and composition, among many others. With other techniques from cinematography, designers create images for print, film, and electronic media to convey desired messages.

**Visual literacy is the ability to understand the content and purpose of any image.**

Visual literacy is important to planetarians. For example, Friedman (1980) made a case for visualizing how objects appear from different frames of reference in the planetarium. He used Piagetian theory to describe how planetarians can develop lessons for visitors of varying cognitive abilities: egocentric, concrete, and formal levels. He found that visitors’ many learning styles and cognitive abilities should be accounted for during a planetarium experience, including the visual elements.

Instructional designers rely on several building blocks for foundation when selecting media for their courses of instruction. One of these, Dale’s Cone of Experience (Dale, 1969), figure 1 at right, categorizes methods for instruction. Does a field trip meet the instructional objectives or will a video tape delivered on television do a better job? A planetarium starfield provides experiences near the cone’s base, while a mediated lecture (show) is more abstract and is higher on the cone. Experiences near the bottom of the cone build a foundation of knowledge that helps the learner understand the abstract ideas presented at the top.

### Visual Literacy Research

To get a broad background of the study of visual literacy, one should look to educational fields where visuals have been studied. Francis Dwyer, Dwyer (1978) and Dwyer (1987), of Pennsylvania State University has devoted many years to researching the effectiveness of diagrams of the human heart. In a long-running project known as the Program of Systematic Evaluation (PSE), he has evaluated over 35,000 high school and college student subjects with his heart diagrams and a 2,000-word script (Dwyer, 1987). He uses sets of eight types of diagrams to test his hypotheses. They vary in complexity: simple black and white line drawings; simple color line drawings; detailed black and white shaded drawings; detailed color shaded drawings; black and white photos of a heart model; color photos of a heart model; black and white photos of a real heart; and a color photos of a real heart.

He developed eight mediated sequences of 37 slides each and one presentation with no graphics based on the same learning objectives. Some of the variables he studied:

1. Method of presentation (television, slide tape, self-paced).
2. Effect of amounts of detail in images.
3. Color versus black and white.
4. Cueing techniques (arrows, animation).

![Dale's Cone of Experience](image)

After the treatment subjects participated in five tests: terminology, identification, drawing, comprehension, and total criterion (Dwyer, 1978).

In testing method of presentation, Dwyer found that programmed instruction (self-paced) dominated as the best with nearly every set of heart diagrams. He concluded that this method was more effective because the subjects had more time to interact with the visuals than in the externally paced (television and slide/tape) treatments. In astronomy education research, McLellan (1987) showed the importance of self-pacing and interactivity with a microcomputer and software called *Sky Travel*. Since the planetarium is not a self-paced environment and hardly interactive — especially for students having complete control as they would with a computer — planetarians need to...
look at ways to increase learning to approach self-paced achievement.

Dwyer (1978) demonstrated that time is a factor. In the slide/tape version, the presentation was 40 minutes in length. When the same presentation was delivered on television, for only 17 minutes, the slide/tape version was superior. This is not good news for the planetarian who uses hundreds of slides in a one-hour feature presentation. By showing visitors too many slides, too fast, they don’t remember what they saw. He stated, When it is found that visualization used to complement instruction does not improve achievement it may be a worthwhile strategy to increase the amount of time students are permitted to interact with the instructional unit. Specifically, show fewer visuals and show them longer.

In the slide/tape mode, Dwyer discovered that simple black and white line drawings were better than realistic photographs. In this externally-paced mode, there may be too much information in a realistic photograph for a learner to look for the desired information. Edit out the unimportant information by offering a line drawing or a simplified photograph. The type of diagram is determined by the type of objective.

Single color images at slow pace with ample rest time are better than black and white and false color photos.

In a study performed with realistic photographs, Berry (1991) found that realistic color photographs were more effective than black and white or non-realistic color photos. In his study, he showed his test subjects a slide for 20 seconds. Then the subjects were allowed four minutes to write down everything they saw, and they remembered more when they viewed the color photographs. After a five-minute rest period, the process was repeated. Subjects were exposed only to three photographs. This study does not conflict with Dwyer’s work, but possibly can be applied to the planetarium exhibit galleries. Single color images at slow pace with ample rest time are better than black and white and false color photos.

Cueing Techniques

A cue is a technique to attract attention to important details in a visual. For a student to learn optimally from a visualized presentation, he must be able to locate, attend to and interact with the relevant instructional stimuli (Dwyer, 1978). Various methods of assisting (cueing) the learner to interact with a visual can be employed. He listed nearly thirty techniques, including arrows, lines, labeling, size, animation, encircling, bordering, color, and advance organizers.

Cueing is a common technique in the planetarium. The console pointer is the most common. Planetarians cannot imagine showing starfields, describing the color and position of individual stars without designating their places with their pointers. Cueing a learner with other visuals is just as important.

From informal discussions, I learned that many planetarians do not use cueing as part of their shows. They feel that arrows and labels (words) destroy the mood that the planetarium environment creates and the illusion of infinite size of space. Planetarians would not be without their console pointer to designate (cue) stars, constellations, planets, and deep sky objects. The pointer demonstrates that the night sky created in the domed theater is an audiovisual illusion because it designates the position of the projection screen. With the illusion already modified by the use of the pointer, why not use cueing with other visuals to assist in learner retention, if cueing is proven to be effective?

Animation (motion) is another cue that Dwyer suggests. Several studies have been performed by various researchers using a microcomputer. Many planetariums shows are computer-controlled so planetarians should take note of this research. Computer control of a planetarium show and computer-based instruction insures that the message is delivered the same each time.

In a review article, Lloyd Rieber (1989a) of Texas A&M University looked at the years of research involving animation. His review showed there was little research on animation, and the research that had been accomplished, at the time, showed that animation is not a powerful influence on learning. Furthermore he stated, when learners are novices in a content area, they may not know how to attend to relevant cues or details provided by animation.

Rieber (1989b, 1990, 1991) made important contributions to the study of animation with computers and Newton’s laws of motion. His research showed that animation may be useful for some age groups but not others, and that his subjects learned better when they knew the content they needed to look for in the animated sequence. When his animated sequence was used with elementary students (fourth graders), the animation yielded better learning when students had further practice. He concluded that animated graphics may be significant, but that experiment did not show it. When the sequence was used with a group of college students, animation had no effect. Students benefitted more from the review than the treatment. Perhaps this was academic acculturation of learning that caused students to want a review so they knew what to study for the test.

... animated graphics may be significant, but that experiment did not show it.

Gary Mayton (1991) attempted to put Dwyer’s PSE into a computer based instruction module. He created still frames and animation with screen text. Although his work was incomplete, it yielded slightly better learning for animated graphics.

Is animation significant in the planetarium? Is the
expense of video projectors and motion picture projectors justified in learning gains? Research does not, yet, supply the answer.

Dwyer (1978) and Dwyer (1987) showed that color was an important cue in his simple line drawings and the fewer the color cues, the better. Start (1989) showed that color was significant, but since he tested the colors of an abstract shape it would be unwise to extend his research to learning in a regular classroom or the planetarium. Is color effective as a cueing agent in the planetarium? If so, how should color be used? Research offers no answer.

In significant cueing research (advance organizers) for the planetarium, Walter Bissard (1979) studied four treatments of introducing terminology of The Last Question with public program audiences. In his treatment he introduced energy terms used in the show by subjecting visitors at Abrams Planetarium at East Lansing, Michigan, to a slide-tape introduction, a written text introduction, a live introduction or a null (no) introduction. He found that subjects learned more about the contents of the show with an introduction than subjects who had none, and that a slide-tape version, when properly designed, appeared best. Furthermore, he showed that different programs should be used for different audience demographics in public shows, especially when different show times can be demographically identified. This cueing medium should be offered to all public program groups for taped programs. The research is clear on this point.

Is Bissard's work the extent of cueing that is appropriate in the domed theater? Are there other ways to enhance learning? Again, research does not supply an answer.

Facility Goals and Objectives

How visuals are used in the planetarium depends on the facility's goals, mission, and objectives. Distinguished correspondents to a discussion question in the Forum column of the December 1991 issue of this publication seemed to agree that their planetariums serve as a resource of astronomy information — education: where to find selected objects in the night sky, teacher workshops, astronomy shows, etc. If education is the planetarium's primary mission, shows should reflect this goal.

William Peters of the Alberta Science Centre of Calgary, Alberta, Canada, hoped for more technology: Install Digistars, Ominaxes, Cinema 360s, fish eye slides, big screen video. Go for the big picture. Is a multimedia blitz compatible with an institution that is gloriously alone in its basic role — the topic of discussion — or is it a contradiction? There is no research in the planetarium field to suggest big screen improves instruction. Every planetarian has an opinion based on experience and intuition. Actually, Dwyer's (1978) research showed that an increased size of the heart image did not improve its effectiveness.

To be fair to Mr. Peters, large images are fun, exciting, interesting, and entertaining; perhaps they increase the aesthetic value of the planetarium experience. Large scale projection may increase attendance and revenues, but the visually literate planetarian must put a turbocharger on the visual Yugo to make the technology-driven planetarium show educational.

For many years an informal topic of discussion centered on the question, What if you gave a planetarium show and nobody attended? The question has a corollary: What if you gave a planetarium show and nobody understood?

I (Hunt, 1991) entered the debate of the role of the planetarium from a management perspective. My statements were intended to give perspective of what planetarians do in their domes. Largely, the function of the local planetarium depends on the philosophy of the parent organization. The institutions range from formal education setting to those for entertainment only, but the correspondents from major planetariums across the globe responding to the Forum question insisted that their mission is education. What plays in Chicago and New York will not necessarily fill the dome or fit the philosophy in Peoria. Certainly, there is a blend of entertainment and education in every facility. The mix depends on institutional goals and function. Feature shows need not be clones from facility to facility, but the same basic elements of a show should be similar, especially if they are based on research.

Because of the rate at which images are presented in a domed theater, every beautiful image in the planetarium's library may not be appropriate. Just because planetariums have sophisticated modern audio visual technology does not mean that it should be used in every instance. Use the technology that fits the learners' needs and cognitive abilities, learning objectives, learning style, and the institutional goals.

Planetarians, as a group, do not give the visual element of the planetarium experience enough consideration and planning. Obviously, they recognize the visualized aspects of astronomy, but, perhaps, they do not plan the visualized messages as they design other elements of a planetarium show.

Planetarians, as a group, do not give the visual element of the planetarium experience enough consideration and planning.

McColman (1990) reported on his evaluation of good planetarium shows. In his writing, the soundtrack, musical content, and aesthetic quality were most important. Without them all of the other elements are little more than a loose jumble of pretty pictures. This statement needs research.

The September 1991 issue of the profession's global publication, The Planetarian, had several regular feature sections, including Mobile News Network, Opening the Dome, Gibbous Gazette, Planetechnica, Forum, Scriptorium, Regional Roundup, President's Message, Kodalith Corner, and Jane's Corner. There is no mention of the production or use of effective visuals in those feature columns or in the major articles.
The consideration of the aforementioned published work is not an indictment of Messrs. Peters or McColman, of John Mosley, The Planetarian’s editor, or the planetarium community. It is a statement of how planetarians take for granted the visual aspect of the domed theater. Without visual elements planetarians might as well create audio tapes and send them to their patrons.

Proposed Research

A major intent of this article is to invite planetarians to test some of the ideas presented here. Following are nine proposed research questions for planetarians to consider:

1) Do planetarium visitors learn better by showing fewer visuals and showing them longer?

2) Under which format do planetarium visitors learn best, simple black and white line drawings, color photographs or false color photos when using the same instructional objectives.

3) Do planetarium visitors learn better with cues such as labels (words), color coding of line drawings, arrows, and lines or without cues? There is a research project for each cue type.

4) Is animation significant for the planetarium visitor? If animation is significant, does it need cues?

5) Is animation better than a dissolve sequence showing the same dynamic process? If dissolve sequences are more significant, do they need cues?

6) McColman’s statement (music, soundtrack, and aesthetics are most important) should be tested. Planetarians can create a show in the regular fashion with music, sound effects, and spoken script. Compare the learning in a regular show with one that has music and sound effects in its soundtrack and cued visuals and small amounts of text projected on the dome. Use a regular show without visuals. This writer believes many patrons will reject the second type of show on cultural purposes. They expect to hear a voice in the planetarium experience and not see photographs with words. They may accept the third type, without visuals, but they probably expect visuals with their shows.

7) In an all-sky movie (Omnimax, Cinema 360, etc.) experience, do visitors learn more if visual cues are projected with slide projectors over the movie to distinguish important points in the soundtrack or without cues?

8) Does the image size make a significant difference in learning in the planetarium?

9) How do these factors work with visitors of various Piagetian frames of reference?

Summary

Before the planetarium becomes too technological, planetarians should consider the appropriateness of the technology with the goals and mission of the institution. When sophisticated audio-visual technology is used, the planetarian must help the planetarium visitor make the technological step by giving the visual Yugo a boost. Bissard showed that visitors can learn more if they are told about the important terms and concepts in a show by showing a short, well-designed slide-tape presentation before the show. Researchers from educational fields have shown ways to increase learning through well-designed visuals. Does that research apply to the planetarium?

References


(Please see Visuals on page 21)
How many of you wish you could improve the quality of sound in your theater? Contrary to popular belief, you don’t have to have all new equipment to have good sound. With tight budgets, new audio equipment is really pretty low on the priority list when compared to star lamps and your salary.

However, all hope is not lost. There is a way to improve overall quality of audio that doesn’t cost an arm and a leg. The solution could be as simple as replacing the existing wiring between audio components with high quality (but not high cost) cable.

When I came to work at the Sudekum Planetarium, the sound system was seriously ill and showing a variety of symptoms including dropouts, buzzing, humming, and strident high frequencies. All these seemingly insurmountable problems often made me want to scream or gnash my teeth to nubs.

Looking at the components in the rack, the source of the problems was not there. None of the gear is new. In fact, most of it was bought used. But every piece is an excellent performer. But, when I looked behind the rack, my jaw dropped. The cables that connected all those expensive boxes were cheap or poor quality, and as I soon found, many had bad solder connections. There was little or no identification on any of the wiring and it looked like an Italian restaurant after an explosion. Then, when there was a problem in the system, it was difficult, if not impossible, to trace.

If I was going to give programs, I wanted the task of rewiring the entire sound system. After all, audio is really half the audio-visual experience we provide. If it doesn’t sound good, who’s gonna care what the show looks like or what it’s about. It’s like a beautiful woman with the voice of the Godfather.

There is a way to improve overall quality of audio that doesn’t cost an arm and a leg. The solution could be as simple as replacing the existing wiring between audio components with high quality (but not high cost) cable.

The criteria used for selecting replacement cables were:

1. Good shielding - Blocks stray electromagnetic fields from entering the audio signal through the cables.
2. Copper conductors - prevent high frequencies from taking on that “gritty” quality. Steel conductors may be acceptable for some uses but not audio.
3. Reasonable cost.

In the April 1982 issue of *The Audio Amateur*, I came across an article entitled “Current Thoughts On Wire” by Bill Ruck. In his article, Mr. Ruck recommends Mogami Neglex 2534 microphone cable as a high quality, low cost cable that met all three of my criteria.

The Mogami Neglex 2534 cable has:
1. Four OFHC (Oxygen Free High Conductivity) copper conductors).
2. A spiral OFHC copper shield.
3. Polyethylene insulation that doesn’t shrink when making solder connections.

It’s available in a variety of colors making cable identification much easier. Constructing the cables is pretty straightforward. Our audio gear uses standard RCA and 1/4 inch mono phone plugs. Audio professionals call these unbalanced inputs and outputs. Start by stripping the insulation off the blue insulated wires and twist the two bare copper conductors together. Repeat the same procedure with the clear insulated conductors, twisting them together as well. Trim the spiral copper shield as far back as the outer wire insulation and insulate it using a small piece of heat shrink tubing. This end of the cable will be used for the output from an audio component. What you have now is the blue insulation conductors twisted together, the clear insulated conductors twisted together, and the outer spiral copper shield trimmed and insulated so it doesn’t come in contact with any wires on the plug once the solder work is done.

Before doing any soldering, be sure to slip the plug cover on the cable or you’ll have to unsolder the connec-

Richard H. Shores was the Assistant Planetarium Director for the Sudekum Planetarium in Nashville, Tennessee. While awaiting placement at another facility, he continues to write about the planetarium field and to assist with the promotion of astronomy education in Nashville as a member of the Barnard-Seyfert Astronomical Society.
tions and start over! On either an RCA or 1/4 inch mono phone plug, solder the twisted clear insulated conductors to the center pin. Then solder the twisted blue conductors to the ground tab on your plug. Now place the plug cover on the plug and this end is complete. You’re ready to work on the input end of the cable.

Now is also a good time to slip the other plug cover onto the wire. Repeat the stripping and twisting procedure of like colored insulated conductors, but do not trim away the outer spiral copper shield. Twist all the fine copper strands of the outer shield, and then twist them and the blue insulated conductors together.

As before, solder the clear insulated conductors to the center pin and the blue insulated and spiral copper shield combination to the ground tab. Check to be sure that the wires soldered to the ground tab do not touch the center pin. Place the plug cover over the completed plug, and mark the outer insulation on the end with a black permanent marker. One cable is done. You can make as many cables as you need, but after each of the cables are constructed, check to be sure that you have no shorts or opens at either end on the cable. The success of this depends on being able to make reliable solder connections. After all the cables are finished and testing is completed, turn off all audio gear and disconnect the old cables.

Plug the output end of a cable in to the output of an audio component such as a preamp, CD player, or tape machine. Then plug the input end (the one with the black mark) into an audio component that needs an input such as a preamp, power amp or tape machine. Repeat this with all those new cables and then turn on the audio gear.

Now listen to the music!

You should be able to notice an improvement in the quality in your audio. If all your equipment is working well, the sound should be more even and high frequencies will be less “gritty” and strident. Some of you may not be able to detect any change in quality, most should see a little improvement, and others may not see the difference between night and day, but if you don’t hear any change, those finely constructed cables of outstanding quality will serve you well for years to come. Mogami Neglex 2534 cable isn’t too esoteric and available from most good electronics supply houses or from Marshall Electronics, Inc. Their phone number is (213) 390-6608. Call them to request a catalog. Even after all this although the planetarium audio still needs a little work, but the investment of time and cable was well worth the effort. In fact, I rewired the entire sound studio using the same cable and the sound is much improved. I hope that these new cables improve your audio quality too.

(P.S. Special thanks goes to Kris McCall, Director of the Sudekum Planetarium for her editing skills and for the encouragement to share my information with fellow planetarians.)

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(Visuals, continued from page 19)


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The Planetarian
Family Shows: A Fourth Alternative

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Producing a planetarium program is often the core activity of a planetarian. Basically, three alternatives exist in presenting public shows—child shows, adult shows, or an offering of both types of shows. In this article, I will suggest looking at a fourth alternative—a family oriented planetarium show. Family shows are being done today. However, not much has been explored as to what a family show is all about—or why they should receive our attention in the first place.

I often think planetariums and astronomy can sell themselves. The stars are magical, romantic. They shine. They intrigue. Build a planetarium and they will come. For this reason, Rodney Nerdahl and I at the Minneapolis Planetarium do a live sky for every school and public show. M. Leon Knott’s excellent Focal Point “Bring Back The Planetarium” in Sky and Telescope captures this sentiment:

> We need to see more of the simple planetarium star show. Bells and whistles aren’t needed to attract people to the majesty and grandeur of a silent and starlit night. So let’s get the public excited about the real thing. (Knott, 1991)

This works for us. An in-house survey showed our audiences’ favorite part of the show was split 50/50 between the program and the live sky. But a live sky is only half of our show. The program sits like a huge lump of clay on the other side of the fence. How am I going to mold this clay into something people will like?

Two factors determine the success of a planetarium program. First, what is to be presented—the content. And second—how the content is presented. Both factors are of equal importance. Both parts have to be effective for a show to succeed, i.e., patrons walking out satisfied—and somewhat better educated. However, there is only so much you can do in an hour. And it gets hard not to want to cram too much “space” into that hour.

Like the stars themselves, a hot astronomical topic can sell a show by itself. You can do a timely show on Halley’s Comet and draw record numbers, but if it’s not a “good show”, they won’t come back (but in another 76 years, they might forget). It’s hard to imagine a show on dinosaurs becoming unfashionable, but those dinosaurs did die, didn’t they? “How to do a show” is often more challenging to the planetarian than selecting a topic. Our egos demand we do it well. We do not want to merely present a topic and then let the folks go home. We want it to be entertaining as well as educational. We want them to come back. We want them to like us. Our salaries (some of us at least) depend on it.

Giving people what they want is a simple marketing concept. So, you ask, what do people want? Do they want these family shows mentioned earlier? And just what is a family show anyway?

Families Start Knocking on Planetarium Doors

Some planetariums have recognized that audiences are becoming increasingly family oriented. Donald Hall, Strasenburgh Planetarium, noted:

> Changing attendance problems indicate the need for family programs on weekends and during the school holidays. I suspect this is true for many planetariums. (Hall, 1990)

To see what other people thought about family programming, the Minneapolis Planetarium (1991) sent out 75 space probes to regional and major planetariums who present public shows. Almost 60 percent responded to our signal.

The data received showed almost 40 percent have family audiences of 70 percent or more. Nearly, 75 percent said they have family audiences of 50 percent or more.

Robert Bonadurer is the Program Associate at the Minneapolis Planetarium, where, since 1989, he has helped write, produce, and present planetarium star shows. He was a student assistant at the University of Wisconsin-La Crosse Planetarium where he performed similar duties. Bob also worked as an educator at the Space Studies Institute in Princeton, New Jersey.
Collectively, planetarium public audiences surveyed are 57 percent families. However, when asked who their public programs were presently targeted for? Families (52%) and children (52%) took a back seat to adults (81%). In other words, most surveyed institutions provide adult shows that are largely composed of families with children.

One respondent added:

I believe visiting a museum or a planetarium is so often a family activity, so shows should be for families.

At the Minneapolis Planetarium, we recognized that our public show audiences are approximately 80 percent families. This has just been confirmed by an in-house survey. Second, our audiences prefer shows designed for families over adults and children by a five to one ratio.

... our audiences prefer shows designed for families over adults and children by a five to one ratio.

I don't know if the wave of families is here to stay or temporary. I've surmised the increase could be a result of the baby boomers turning middle age, having children, and then taking them to planetariums, zoos, museums, etc. And when the baby boomers age, will we see a decrease in family attendance? Who knows? Regardless of the reason for more family attendance, I think there will always be families coming to planetariums.

Responding to Increased Family Attendance

At first, planetarium shows were fairly simple. Most shows were live talks with a handful of slides. Most lecturers tailored their talk to the level of the audience. If the crowd was a young school group, then all the show topics were presented on a very basic level to accommodate the kids. They were introductory shows exploring all the wonders and mysteries of the cosmos.

Soon after, multimedia shows were developed. Basically, these are the adult and child shows we see today. The adult shows served the upper elementary through adult. Since most adults have a limited working knowledge of astronomy, they were written at a basic level, I would say anywhere from the 6th to 8th grade. Thus, these adult shows could work as children in these grades.

The child shows needed to be developed to better serve the younger kids in the lower elementary grades. Shows like "The Sky Tonight", "Our Sky Family", "Max's Flying Saucer", "The Little Star That Could," and "Larry Cat in Space" are all excellent examples of children shows.

But what of the increasing number families coming to the planetarium? Do you show them an adult show that might not be exciting enough or undigestible for a little kid? Or do you show a children's show that might be too cutsey for an adult?

Four alternatives exist if your planetarium has witnessed increased numbers of families—or if you feel you can start attracting more families with your public planetarium programs.

Three of the Four Alternatives

The first alternative is to offer both types of shows. Indeed, many planetariums utilize this option. One planetarian from our survey notes:

I don't see the need for family programming as that great. We have different shows on different schedules.

Another person saw a similar picture:

We offer both adult and child shows, although we call child “family shows.” We've noticed the increase in families attending shows. We are always on the lookout for good quality family oriented shows.

This option seems logical. You can offer child shows on Saturday mornings or in the early afternoon on weekends. And then you can offer an adult show in the late afternoon or on weekday or weekend nights. A patron could not complain about the “level” audience the show was targeted—unless, of course, they did not know about your different schedules.

The second alternative is simply to do adult shows. Since adult shows need to appeal to the lowest common denominator of understanding—that of a child’s—adult shows will work for young and old alike. My experience is that many planetariums are still using this format. I've visited various large planetariums around the country over the years. While I've always enjoyed the shows, I wonder if the many kids in the audience got much out of the show besides the nice special effects.

My sentiments were echoed by another in our survey:

Children are overlooked. High tech shows need to give way to more direct star talks. Special effects are great but should not wag the dog.

Though another saw it differently:

I am not a big fan of targeting children. If the audience targeted is too young, the planetarium falls short of its potential, and becomes amusement with little educational value.

The third alternative is to use child shows as family shows. Many folks are already doing this. We have done it...
here in Minneapolis. It generally works. “Max’s Flying Saucer” drew great crowds for us. I often think planetariums that have child shows for their school groups could use them for expanding their public shows—if the situation works out for them. Offering a new Saturday morning show could bring in many new customers.

Child shows do appeal to families. So, I would not disagree with anyone who calls these shows “family shows.” Although our audiences are 80 percent families, they were split 50/50 between adult and children. We simply felt the child shows might not serve our adult population very well, including parents. Further, it might keep some “knowledgeable” adults from coming to the planetarium. However, I would agree with the argument that most adults could learn much from any child’s show. I guess we had image on our minds. We wanted a product that appeals to people of all ages—a family show.

I must admit this dilemma may not be a problem for many planetariums, especially if public shows are not a major part of their operations. But here in Minneapolis, this was precisely the issue.

The Fourth Alternative

Do a family show.

What is a family show? Good question. I think most child shows are close to the mark. Basically, child shows are stories that are creative and imaginative. They have characters and personalities. The kids can identify with these characters and imagine being there among the stars and planets. A family show would also tell a story. But instead of a story centered on kids, it would have kids and adults in approximately equal roles. The age level targeted would also be raised a notch to better attract adults. Most child shows are for grades 1-3. A family show would be targeted for grades 4th through adult. Another planetarian echoed our thoughts:

Our public shows are for persons from third or fourth grade through adult. We have presented young children’s shows during the summer months. Believe visiting a museum or planetarium is so often a family activity, so shows should be for families.

I see family planetarium shows adding a new dimension to the planetarium universe. Some say that to keep up with the times, you have to keep up with technology. Technology has woven its way into the planetarium field. New star projectors continually improve our “real” skies. Planetariums have made use of laser discs and video to better serve its customers (that slide bank mountain was just getting too high anyway). But I don’t think technology alone attracts the masses. People have quietly demanded more for their educational and entertainment dollar. Technology alone can not keep “bringing them in.”

A family show may help. As stated, family shows tell a story. The interaction of characters with different voices can keep an audience from a favorite planetarium pastime—sleeping! Have you ever noticed how the local news usually cast two anchors to break up the monotone of a single lecturer.

Support for the Fourth Alternative

When we sent out our survey, we had no idea of what kind of response to expect. Were others thinking like us? Or were we out in left field? Or the bleachers? Maybe we weren’t even in the ball park? We found our seats must be pretty good as evidenced by the following comments:

Family shows are needed. We need “Bullwinkle” shows that can be smart and fun for kids; too.

More of a need for this type of programming than any other ... And it’s not readily available.

Family oriented shows are just what we need. I think the big problem is planetarians do not know their audience make up nor why their audience attends planetariums.

I could attract whole families in great numbers by advertising a “family” presentation.

We’ve gone from one child show a week to four. Convinced family programs can get the audience excited, but must be very skillfully done.

I heartily agree, “family” audience is of prime importance these days. It is that “middle ground” where a skillfully prepared program can have maximum impact on the widest possible age and background range.

Your planetarium seems to be a leader in this area. Keep up the good work.

At our facility there is a need, but also a gap in service. We don’t have the manpower to produce them right now.

Many planetariums do not give enough attention to family programming. It is a vital aspect of our goals and objectives that should take on increasing importance.

There is a need for family programming, with quality slides, shorter lengths (35 minutes), and at affordable costs.

All these comments strengthen my resolve to push family shows. While definitions and concepts of a family show may vary, people are definitely thinking in the direction of
serving families.

Challenges to Trying the Fourth Alternative

I admit a family show is trying to combine the best of both worlds. Many folks picked up on this in our survey:

Sometimes trying to please all, pleases none.

A need exists, but can’t please all the people all the time.

We call our children shows—family shows. Generally agree with your findings, but the compromise (combining adult & child) is tough to carry off.

Many “school” shows written for older elementary can be used as a family show.

A good “family” show may not work for an audience of 100 percent children.

What is a family show? Most of our public shows have a general family appeal. Even though audiences are adults, they have a very limited knowledge of astronomy. This means that our shows must play to an early common denominator.

The comment about “trying to please all, pleases none” is crucial. We struggle with it constantly, but still feel family shows are needed. Families are our market. They need to be served as best we can.

Searching for the Fourth Alternative

When we started looking outside for a family show, few were to be found. Adult type shows were plentiful. While some were easy to understand and well written, we felt they lacked much appeal to families. As mentioned, child shows were used such as “Max’s Flying Saucer.” These type of shows can and do work as family shows. Still, we felt they might be “too” child oriented and leave little for adults. We face this dilemma now in deciding to run “The Little Star That Could” this spring (though we think it will do well).

“Planet Trek” and “Dinosaurs in the Dark of Night” are two family shows the Minneapolis Planetarium produced to serve our audiences. They tell a story. “Planet Trek” is about a family of aliens who visit our solar system. The show is basically a “planets” show but contains some interesting twists—the kids secretly plan to visit an Earth “alien,” so they need to get mom and dad out of their way.

“Dinosaurs in the Dark of Night” is about a father (who is into astronomy) and his daughter (who loves dinosaurs). At the end the father realizes there are “dinosaur” constellations because his daughter shows him dinosaurs are descended from birds.

We feel these programs contain something for both adults and children. They are home produced shows, but we have limited production capabilities and cannot do this for every show. We do not have the facilities to market the shows. Someday soon, perhaps.

Others have picked up on the need for more family shows to chose from:

A good pre-level/family show kit is sorely needed.

Don’t have resources to produce (family) shows now. There is a need.

We’d be fools not to use family shows. The bulk of our audiences are families.

Definitely a need for family planetarium programming.

I find very few good family shows presently exist.

I have witnessed some family shows elsewhere. I felt the London Planetarium presented an excellent show in “Solar Swoop.” This show had two laser eagles come alive. One was Aquila, an old crotchety grandfather-type personality who knew his way around the universe. The other was the Eagle Nebula, a young, eager-to-learn-type personality. The dialogue was educational and clever. Another show I heard about from the Kirkpatrick Planetarium in Oklahoma City is about a family looking to take a spring vacation on another planet, but first they have to get the “weather” forecasts.

I’m sure there are many more examples of family shows. I wish more could be listed. One respondent from our survey had shows about a family trip to watch meteors, a young girl getting a telescope for her birthday, and a boy who daydreams about places his model rocket will take him.

I hope these shows become more and more available to planetariums everywhere. The more to pick and chose from the more a family show may work for your planetarium.

Conclusions

The definitions and parameters of family shows are vague at best. Different people have different ideas at what the lowest grade level to target (1st, 2nd, 3rd, 4th, 5th, 6th, 7th, or 8th). Some may debate the format of storytelling. Some may like using different characters while stories take away from the educational content. People will always question the amount and form of humor in a planetarium show.

I think lacking an exact definition of a family show is a good thing. I would hate to get bogged down on exact con-
to astronomy for beginners; seminars and talks on projects and activities in amateur astronomy

Cosponsored by a number of astronomy organizations and institutions from around the mid-west and the country (including the Adler Planetarium), the weekend program will bring together professional astronomers, educators, amateurs, and "armchair astronomers" and give participants an opportunity to show and learn what's new in their areas of astronomy.

To receive more information and a registration packet about the meeting, send your name and mailing address to:

Wisconsin Meeting Dept.
A.S.P.
390 Ashton Ave.
San Francisco, California 94112
fax: 415-337-5205
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Please allow me to introduce myself. I am John Flynn, and for my sins I am the Education Officer at the Planetarium in Armagh, Northern Ireland. John Mosley has asked me to run a column on educational matters and I have taken the liberty of re-using the title from past issues. I have begun with an article about education at Armagh but I do hope that many of you will send me further material on anything related to educational astronomy.

Material can be sent to me at the address above, or by fax to 0861 526187. My phone number is 0861 524725.

If there appear to be mis-spellings please make allowances for the difference between American and English spellings. I do look forward to hearing from some of you.

Thank you.

Education at Armagh Planetarium

John Flynn Education Officer

Over the last two years the Armagh Planetarium has developed an extensive outreach programme designed to service the needs of both pupils and teachers in the province of Northern Ireland. The programme began in 1989 when the then director Terence Murtagh (I.P.S. Past President) obtained sponsorship to purchase a van to tour the schools with a Planetarium Lecturer and audio visual teaching aids. Under the acting directorship of Martin Ratcliffe (now of the Buhl Planetarium in Pittsburgh) the programme expanded and became a regular part of planetarium activities. The support of the current director, Dr. Ian Griffin, coupled with a massive increase in demand has seen it reach a level that not even the most optimistic could have imagined.

The Astrovan with a lecturer and often a volunteer helper visits a school free of charge for a full day. If the school is a small one then all the pupils can be taken for a full day session, or if the school is larger then talks and demonstrations can be repeated until perhaps an entire 'year' of pupils has been covered. The content of a visit can be varied to suit the needs and requests of teachers and pupils but would often take the form of telescope demonstrations followed by a talk illustrated with slides and video.

The youngest children in the primary schools usually receive a fairly short and general introduction to 'space' presented in the form of a slide show. It includes images of the earth taken from space to give the idea of the earth as a planet. Children are capable of holding two mutually contradictory ideas in their head and often recognise a globe as 'the earth' or 'the world' but when asked if the earth really looks like this can often reply 'no it does not'. This has been observed by the author on many occasions when dealing with four to six year old children.

The child seems to consider that many ideas can have two explanations, the one that satisfies the teacher and then the 'real' answer. When a globe is shown to the children and then followed by a slide of the earth from space it is very satisfying to hear the gasps of amazement. The earth really is a globe. Perhaps the poor old teacher might know something after all!

One excellent image (I think) shows an astronaut engaged in a spacewalk from an orbiting spacecraft. The earth's atmosphere is clearly visible as a thin blue band between the earth and the blackness of space. By discussing the astronaut's spacesuit, and why he needs it, even the very young children are introduced to the idea that there is no air in space and the air/atmosphere is a thin blanket surrounding our own earth. This is reinforced by another slide of an Apollo astronaut on the lunar surface that shows a clear footprint. This can be used to stimulate discussion about conditions on the surface of the moon and to illustrate the fact that there is no wind or rain on the moon to disturb the footprint. Slides of rockets introduce at a very basic level the idea of forces and what makes the rocket move.

For the upper primary or lower secondary school children an illustrated talk on the solar system is often presented that covers the formation of first the sun and then the planets. It is stressed that rather than simply memorising a host of statistics about the solar system it is much more useful to get a general overview. The differences between small solid rocky planets and large gas giants is stressed and a rough guide to conditions on each planet outlined. Depending on the length of the session and attention span of the children the 'assorted debris' of the solar system, comets, asteroids etc. can also be covered.

It is not surprising to find that in many, or indeed most, cases the knowledge of the children about this subject is greater than their teacher realises. Very often the children will be able to name all of the planets, perhaps even in order, to the amazement of the teacher who has not yet covered this in class. Perhaps this is one of the clearest illustrations of the great interest children display in astronomy.
How many other subjects will children have investigated on their own initiative? I suspect they will be very few in number. Many teachers express concern at the length of the sessions considering anything over an hour a bit too long for their pupils. Yet not only can the attention of a class be held for an hour and a half (sometimes two) but this can often be done with ease.

Another short talk looks at space travel and the uses of space showing (hopefully) that it is one of the most beneficial and cost effective endeavours the human race has ever indulged in. Many teachers have approached the author after this and admitted to being converted away from the 'we waste money on space' idea to a much more rational view of our achievements.

Due to curriculum requirements the upper end of the secondary schools will not be teaching astronomy for two to four years so very few Astrovan visits are given to these groups, but that is a situation that we are confident will change in the not too distant future.

Much of the demand for Astrovan visits has arisen because astronomy has finally been introduced into the new National Curriculum so that it must, by law, be taught. Planetaria in the United Kingdom have been fighting to achieve this for over a decade, so we naturally see this as a very great victory and you must must forgive us if we gloat a little. More and more schools now see a visit to the Planetarium as a major visit of their school year and are keen to have either a preparatory visit or follow up visit from the Astrovan.

Another consequence of astronomy in the National Curriculum is that many teachers feel unsure of teaching such a subject and have requested the education authorities of this province for 'In Service Training Courses' (INSET Courses) on this subject. Naturally the Planetarium was approached and asked to organise these courses.

So far quite a number of one-day courses have been organised at several venues around the province, but even better have been the two and three day courses organised in the planetarium itself. The courses concentrate on several vital aspects of teaching astronomy:

1) Why bother with astronomy? We show it is an excellent cross-curricular vehicle for teaching a wide range of subjects. It develops skills that are useful in all the sciences. It removes many silly and potentially dangerous misconceptions and finally is a subject worthy in itself of being taught.

2) What are the problem areas? These are often not what the teacher initially expects and we identify many misconceptions that not only children but many adults hold.

3) Some of the background theory is covered to make the teacher more familiar and thus more confident.

4) Practical work is covered on ideas such as how to teach about eclipses, phases of the moon, seasons etc. This is done using a light source and globes of the earth and moon. It is most important to illustrate that by giving demonstrations in three dimensions a much clearer understanding of all of the previous mentioned phenomena can be obtained rather than by resorting to diagrams, the old two dimensional approach.

5) Available resources are detailed and evaluated including what we believe (naturally) to be the single most important resource for astronomy teaching in the province, the Planetarium itself.

The INSET teacher training that has been done, together with that planned up until May '92, should mean that about 60% of the secondary schools in the province will have had at least one teacher attend one of our courses and often two or more will have come. A beginning will also have been made on the primary schools but with three times as many primary as secondary schools it will take a little longer to achieve the same results.

Again in response to the National Curriculum a new video show 'Journey to Earth' has been produced by our director Ian Griffin. This looks at the earth from the point of view of a visiting alien. Why would he (she, it?) choose to visit our solar system and what would they think of planet earth and more importantly what mankind is doing to it. Naturally the show is cross curricular in content and has been very well received by pupils, teachers and general public alike.

In our exhibition hall a section has been devoted to the theme of 'The Earth In Space'. Now this may come as somewhat of a surprise, but that is also the title of the astronomy section in the National Curriculum. I leave the reader to guess at the content of this exhibit but if it just happened to be rather similar to the astronomy section on the curriculum would you be very surprised?

A very interesting project we are beginning, involves two teachers coming to the Planetarium on secondment for a three month period. They will develop project material for visiting schools which can be sent out with the booking confirmation form. The teacher can then use these materials with the children on the visit.

A classroom is attached to our Hall of Astronomy so that pupils can be taught in a more formal manner, if appropriate, and has already been used as a venue for our INSET courses. The classroom facility will be expanded in early '92 with the addition of further equipment.

Naturally the introduction of an Outreach programme has placed an extra strain on staff but it is one that we welcome and we do feel that this is an important role for the Planetarium. We would also be very interested to hear what all the other planetaria are doing in this field and look forward to hearing directly from them or reading about their activities in this column.

A Useful Scale

The width of a penny held at arm's length (unless the length of your arm is quite different from the average) is 9 arcminutes.

—Keith Johnson
State-of-the-art systems for education, entertainment and training. Spitz, Inc., a full-service company providing hardware, software, solutions and support to the planetarium and Space Theatre community since 1945.
It's time to start planning for the Biennial Conference of the International Planetarium Society to be held in Salt Lake City this coming June. Judging from the materials received for this column, it is obvious that you possess a wealth of experience and ideas that can be passed on to other portable and small planetarium instructors. Please plan to attend this international gathering. It is guaranteed that you will learn as well as share. The hosts of this conference proclaim, "... this conference is designed to excite each delegate's inner spirit of exploration."

Last time mention was made of the need for developing evaluative tools for our programs. In response to new state directives, our planetarium staff designed the tool shown on the next page. We hope it will measure our effectiveness as astronomy educators. Comments and suggestions for improvement are welcome.

Great New Ideas:

Gary Kratzer (43 Eucalyptus, Sulphur, Louisiana 70663 USA) would like to pass on another great addition to his Starlab. Thank you Gary! He writes:

"I have found glow-in-the-dark paint to be quite useful in creating special effects for the dome. The neatest one is my glow-in-the-dark horizons. The horizons consist of two-inch tall strips cut from poster board. The design for a horizon should include things that are present in the student's environment: Louisiana would be a flat strip (just joking). Luminescent paint is available from Edmund Scientific or just about any craft store. I have even found the paint in a variety of colors. After you have drawn landscape strips and then cut them out, paint them with about three coats of the luminescent paint. You will have to decide if a full circumference horizon is needed, or just strips about four feet long under each direction. After the paint has dried, laminate the strips twice so as to greatly strengthen them and prevent them from tearing. To determine where the strips go on the dome, turn on your projector's projection lamp with no cylinder on. Make sure the side lamps are set low. The dome will then be illuminated to about thirty inches above the floor. Tape or velcro the strips to the dome where the illumination from the projector ends. You might want to create a set of glow-in-the-dark direction finders too. Just cut two- or three-inch letters and paint them with luminescent paint. Go to a baseball card shop and purchase four clear, rigid plastic card holders for about 50 cents or so. Place the letters in the card holders and tape or velcro to the dome. I have found these markers to glow continuously through a normal class time. Have students run a flashlight (white) over them to "charge" them up periodically. Even better, leave a bright light on (sun simulator) between classes and the horizon and markers will be charged when you re-enter the dome with the next class.

Since we are on the subject of glow-in-the-dark stuff, I can't help think of your last Planetarian tip on cheap light pointers (we have ordered the ones for $10.95 and have made a few modifications as well as gluing on different color acetates over the head of the point for different color pointers and reducing the voltage using dummy batteries available from Radio Shack). I have effectively used an inexpensive telescoping (antenna) pointer available at office supply stores. The head is large enough to cover with masking tape and then paint with luminescent paint. These $2.36 pointers will work well for a pair of students working together to point out constellations. The pointer extends out to 27.5 inches and collapses to about the size of an ink pen. For someone on a tight budget, these devices work well. I have painted them a variety of colors. I have named them "The Fireflies" due to the fact that the dome suddenly seems to be filled with the summertime creatures. **Caution** I always remind the students not to poke at each other with these pointers! It is possible to poke someone in the eye, however, the same is true of any other pointer if a kid really wants to. I think the teacher should issue a stern warning about horseplay each time they would be used.

Another idea for luminescent paint might be to have each student write or print, with stencils, his/her name on an index card in luminescent paint. The students could bring his/her name card each time a lesson is conducted in the dome and could respond to questions by holding up
OCM BOCES PLANETARIUM PRESENTATION EVALUATION

TEACHER ________________________________ SCHOOL ________________________________

DATE(S) ________________________________ Grade ________________________________

PROGRAM SELECTION(S) __________________________________________________________

Please spend a few minutes to react to the questions below by marking an "x" at the place that most closely reflects your feelings. Return this form to your BUILDING PRINCIPAL.

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Not age appropriate at all | Completely age appropriate

2. In general, the content and skills presented in the program should be:

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Completely changed | Continued as is

3. Following their planetarium visit student behaviors pertaining to learning more about astronomy and space science (asking questions, visiting the library, writing, or drawing, etc.) indicated:

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No increased interest in the topic(s) | A new fascination with the topic(s)

4. Following the planetarium lesson student behaviors (discussions, test scores, work on projects) indicated:

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No retention of concepts or facts | Topic mastery

5. The teacher guides are:

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Poor quality, of little use | High quality, very useful

THANK YOU FOR YOUR TIME
(COMMENTS MAY BE CONTINUED ON THE BACK)
their “glow-in-the-dark name card” and not by shouting! Boy, what a motivator!”

New Users Heard From:

Welcome to the fold Miram Buckland (5 Irvine Road, Old Greenwich, Connecticut USA) and Brad Vietje (19 B West Street, Winooski, Vermont 05404 USA). Both people were very interested in what’s going on with the rest of us. I sent a list of the lessons in our files and some people to contact as well as some sample lesson plans.

Follow-up activities:

George Hastings (Mathematics & Science Center, 2401 Hartman Street, Richmond, Virginia 23221 USA or via CompuServe #72407,22) Writes:

“I try to provide some follow-up activities for each group that visits Starlab. Here (below and next page) is an example of the worksheets I send back with the groups who come for a program on the constellations.”

**Front View**
String lengths are shown in cm. Use black string to suspend beads.
Starlab Follow-up
Mathematics & Science Center
Richmond, Virginia

Build a three dimensional model of the Big Dipper

Top View
Distances from front edge to string attachment hole are shown in cm.

A
7 cm

B
10.4 cm

C
8 cm

D
8.2 cm

E
6.5 cm

F
7.4 cm

G
13.8 cm

Front Edge
Mark and punch holes in top of box as shown above. The distance between holes is the same as in this sample. Attach beads to length of string, make sure string is longer than noted length. Mark string A for proper length, as shown in front view. Put string through hole A and tape to top so that the length mark is at the top surface. Repeat the same operation with all other strings, B through G.

George Hastings
September 1991
Special Effects:

Here's an article pertaining to a single slide projector that can be used in Starlab and other small planetariums. Thanks Scott!

Single Slide Projector for Starlab

Scott A. Niskach
Hanes Planetarium
Nature Science Center
Museum Drive
Winston-Salem, North Carolina 27105
919-767-6730

One of the largest problems inside a portable planetarium is the lack of special effects. For the longest time, I had wanted a simple way of doing constellation overlays. The Starlab system offers various, interchangeable cylinders that show Greek, Native American Indian or H. A. Rey figures. The only drawback is there are too many figures at once. All those figures tend to overwhelm students. I knew there must be a better way.

On a whim, I telephoned Joe Hopkins of Joe Hopkins Engineering (800-543-5960) for some advice. Joe recommended that I contact Radmar Corporation (708-298-7980) and that I look into their single slide, hand held model. Upon speaking with Radmar, the salesman suggested the Radmar 2204 illustrator slide/filmsstrip projector. He described the three pound unit as being compact, easy to handle, and equipped with a slide exchanger. All this for $125.00.

The Radmar 2204 measures 7.4” high, 4.0” wide, and 11.3” long. It has two slots that slides can fit into. The forward slot is intended for filmstrips. The rear slot accepts single slides. Since I was only going to be using the rear slot, I used duct tape to cover the forward slot (less chance of foul ups in the dark). To make loading of slides easier, I pre-mark each slide to determine proper orientation. A small piece of slide tape to tag the top and rear works well. After all there are eight ways to load a slide and only one is correct.

The projector also comes with a single slide exchanger. You load one slide and then push the next into its place. Past slides slide neatly into a collection area below. Only one small problem: this slide exchanger does not work with glass mounted slides.

The Radmar 2204 uses a single on/off switch so the image tends to be real bright. To solve this problem, I installed an inline dimmer switch (Radio Shack 61-2682, $12.95) so I can control the intensity. With this, I can bring the image on just enough to be seen by me. Then I move it into place and turn up the intensity. Bingo, a constellation outline. To move to the next constellation simply dim the image out and load another slide.

To protect the Radmar 2204 during travel, the company offers a hardened plastic carrying case (#1531, $25.00). It is sturdy and has ample room for slide storage.

It seems like one more portable limitation has been solved. Now does anyone know of a good meteor projector?

Signing off:

That's all for now, folks. Hope to see all of you at IPS '92 in Salt Lake City. While you are there please introduce yourself to me so that I can learn who all of you are and pick your brain for some more innovative methods of teaching in our small universe!

---

Planetarium Internship

Buehler Planetarium, Florida

Date Internship Starts: July 1, 1992
Requirements: Bachelor's degree in astronomy or related field; some experience at a planetarium or public observatory.
Stipend: $16,000 for 40-hour week for 12 months.
Topics: Intern will learn a variety of skills needed to become a professional in the planetarium field.

To apply, contact:
Dr. David Menke, Director
Buehler Planetarium
Broward Community College
3501 SW Davie Rd.
Davie, Florida 33314

Deadline: April 16, 1992

---

V. M. Slipher Committee

The V. M. Slipher Committee of the National Academy of Sciences will have a modest amount of funds ($4,500) to award for projects that enhance the public's understanding of astronomy. Applications must be postmarked by May 18, 1992. Preferences will be given to projects requiring seed money for programs that will continue beyond the funding period. Past grants have included support for radio programs on astronomy, refurbishment of an historical telescope for use in a public observatory, and partial support of teacher workshops and park interpretive workshops.

For further information please contact:
Dennis Schatz, Chairman
V. M. Slipher Committee
Pacific Science Center
200 Second Avenue North
Seattle, Washington 98109

Vol. 21, No. 1, March 1991

The Planetarian

35
Opening the Dome

conducted by
Jon U. Bell
Astronomy Director
Virginia Living Museum
Newport News, Virginia 23601

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

It was four o'clock according to my guess, Since eleven feet, a little more or less, My shadow at the time did fall, Considering that I myself am six feet tall. - Geoffrey Chaucer, Canterbury Tales (Parson's Prologue); AD 1390.

The Giant Portable Human Sundial and You

There's something magical about sundials. They're so simple, yet I can't get over how well they work, once you've messed around with longitude corrections and factored in the equation of time. Recently I created a portable version of the giant human sundial that I'd designed for the Virginia Living Museum a couple of years back (see "A Living Sundial", The Planetarian, Vol. 18, No. 3, September 1989).

I made the portable version because I was tired of having to recreate lots of chalk-on-sidewalk versions of the sundial at various places and festivals. Not only was I using a lot of time and chalk, I was also giving myself backaches and leg stress from bending down and scampering around all over the place (although, toward the end there, I wised up and chose some lucky young volunteers for the privilege of drawing the lines.)

I also had an event coming up where our museum's display area was on grass, not concrete. I could have used ballfield lime or something, but that seemed a lot messier than even I like. So all I did was take a large, roughly 20 foot square piece of plastic tarpaulin or groundcloth, and lay out the basic pattern on it with canvas/cloth spiking tape (fig. 1).

Then as long as you stay at roughly the same latitude, you've got a fairly portable sundial; just fold it up and carry it under your arm wherever you go. Then when someone asks you the time, just unroll it, orient it, stand on it and say "Oh, it's about ... ")

Here are some of the things I've learned about our audience and giant human sundials, portable or otherwise:

* Once folks figure out how it works, they're pretty impressed.
* Whenever our museum participates in a festival by setting up tent displays and demonstrations, I always feel a little shortchanged: here our education department is trotting out live animal shows, rocks and fossils, skeletons, Chesapeake Bay critters touch tanks, fish painting; and all I've got is some astronomy slides, a celestial globe and a solar telescope. The addition of a hands on (or feet on) activity like the human sundial, coupled with small sundial handouts (fig. 2) is a welcome addition to a science that's difficult to touch.
* The human sundial is great for attracting the media, particularly TV weather people and newspaper "lifestyle" editors.
* The portable version is much more of a magnet for kids, particularly when the tarp's a bright color; although they usually think it's either some kind of hopscotch or twister game, or a standing broad jump activity ("OK, Billy, let's see if you can jump all the way up to the number 6") Once, because I was afraid the tarp might get ripped, I found myself saying to a bunch of kids and adults, "Please stop jumping on the clock!" Stanchions and cordons are helpful here.
* People invariably stand at the intersection of the meridian and the base line and try to read the time from there (putting people footprints along the meridian line helps alleviate this problem).
* The dial works a lot better when someone is there to explain it. The permanent dial at the museum has a "boiled-down" instructions sign (fig. 3), which nobody ever looks at.
* People will try to use the dial when it's cloudy, raining, or nighttime (although this is usually a good time to get out a bright flashlight and show them how it's supposed to work).
* Some folks will complain when clouds, rain, night, etcetera, prevent the dial from working (these are the same people who gripe about our telescope not being used for the same reason).

I didn't make the hour lines long enough - shadows can get really long, especially in the winter! And what happens is that people usually won't extrapolate the lines out to where their head shadows fall, but will think the time is where their body sha-

---

**Instructions**

Stand on the red line, placing your feet in the correct spot for your height (including shoes!).
Stand up straight and look for your shadow on the ground.
Where the shadow from the very top of your head crosses a white line tells the correct time.
Solar Powered Time

SUNDIAL INSTRUCTIONS

Cut along solid lines. Shape Time Dial into a smooth semi-circle. Match notches and inserts. Assemble as shown in the small diagram.

Gnomon should point toward Polaris, which is due North.

Your sundial can be used as is or as a template for reproducing the sundial on heavier material such as cardboard or aluminum.

Optional: Spray with plastic waterproofing compound to make your sundial more weather resistant.

by Jon Bell
Director of Astronomy
VIRGINIA LIVING MUSEUM
(804) 595-1900
How does this Sundial Work?

That sundials can tell time at all is thanks to the fact that the earth rotates, causing the sun to change its place in the sky throughout the day.

A sundial measures the position of the sun in the sky by using an object, called a gnomon, to cast a shadow on the ground. In this sundial, you are the gnomon—it is your shadow that tells the time.

Most sundial gnomons are triangular wedges that make an angle equal to your latitude; it rises up out of the south end of the dial, which is aligned with the earth's axis of rotation. Instead of putting the entire gnomon on this dial, we marked its place with a red line that runs south to north.

When you stand on this line in the right spot for your height, the top of your head becomes even with the gnomon angle, which for this spot is equal to 37° (the same as our latitude, 37° north of the earth's equator).

The time that your shadow reads is probably not exactly what your watch reads. For one thing, sundials tell you solar time, which doesn't take civil time standards into account. There are two corrections that need to be made to get to your watch's time: first add 6 minutes to your shadow time, (since our longitude causes us to be 6 minutes behind Eastern Time); and then factor in a mysterious-sounding formula called "The Equation of Time." Confused? Ask at the front desk for a sundial interpreter!

The Equation of Time

Because the earth does not revolve around the sun at a constant speed, and because the angle of the earth's path around the sun, the ecliptic, changes in relation to the horizon as well, the sun sometimes moves more quickly across our sky than at other times. In order to correct for this variable, we use a formula called "the equation of time," which is really just a table noting the differences between solar time and civil time.

After you have added six minutes to your shadow time, consult the table below and add or subtract the number of minutes indicated for today's date:

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<td>Jun 15</td>
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<td>Jun 30</td>
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What's making your shadow? What does that tell you about the sun if your shadow is moving around like that? Is the sun moving, or are we?

* I made up a mnemonic rhyme to help me remember the change in the equation of time: "Slow 'til the Ides of April (4/16), Fast 'til the Ides of June (6/16); Slow again 'til Labor's done (9/2), and Fast once more 'til Christmas has begun (12/25)."

* Getting enough people of different heights together to form "the living gnomon" is a lot of fun!

And thou, O Sun, thou seest all things and hearest all things in thy daily round. - Homer, The Iliad

All cannot live on the piazza, but everyone may enjoy the Sun. - Italian proverb.

The Planetarian Vol. 21 No. 1, March 1992
Attacking Slide Advance Problems in the Ektagraphic III

In the early 1980's, Eastman Kodak decided to shelve its long-revered line of slide projectors. The old "tried and true" Carousel and Ektagraphic models (which had for years served as the mainstay in both amateur and professional A-V circles) were deemed obsolete by the marketing and engineering experts at Kodak. The old line had undergone several changes and additions of features over time. But it was, alas, seen by Rochester as too outmoded in basic design layout to accommodate the growing demands of A-V specialists for new product features.

The successors to the old Kodak slide projectors were soon introduced and sported a stylish external appearance as well as a number of new design updates including: powered-down tray removal, a built-in 'homing switch' for pro A-V applications, and improved cooling. One of the most significant changes in these projectors came in the form of a rear-accessed 'lamp module'. This last feature made it possible for A-V professionals to change a lamp without disturbing projector alignment, and do so almost instantly during the actual run of a show. These new features (or variants of them in other projector lines) soon became industry standards. Despite the diehard Ektagraphic II devotees, Ektagraphic model III's rapidly began to replace the older units in the projection areas of many auditoriums and planetariums.

But as time passed, and operational hours began to pile up on the new projectors, repair technicians got the opportunity to assess the real guts of these audiovisual wonders. The reviews were mixed. While the new models did evidence certain internal design improvements, many technicians bemoaned what they saw as a 'flimsy quality' in the updated units. Many pointed to the extensive use of plastics in the projectors, particularly in the projector case. Some argued that screw holes in the thermo-plastic case would simply wear out with repeated disassembly and reassembly. The new projectors were also seen as more difficult to repair, as the replacement of many small parts in the units required extensive projector disassembly. Nonetheless, the new projector line, because of its enhanced features, has generally been viewed as an overall improvement in slide projector technology, and the author, for one, has enjoyed using the Ektagraphic III's.

Because of certain design peculiarities, the new Ektagraphics can, over time, develop an annoying tendency to project the wrong slide at the wrong time. In fact, these problems can become so acute as to render the offending units virtually useless for show presentations. Some time ago, while at Gibbes Planetarium, we began to experience slide-advance difficulties with our Ektagraphic III's. The first evidence of this came in the form of one particular projector that, on occasion, would fail to cycle when issued an advance command by our Spice Automation system. Because this cycle-failure at first seemed to occur around the same point in certain shows, we initially suspected an automation failure. Eventually, this assumption proved to be erroneous. While the technical staff at Sky-Skan suggested that we look for loose wiring in the projector, our troubleshooting led us to reject this as a candidate for the problem.

As sometimes happens when technical bugs arise, this gremlin was only intermittent in frequency, making it extremely difficult to track down. It seemed that every time we pulled the projector after an advance-failure, we were unable to duplicate the anomaly on the work bench. Frustration mounted as the projector would foul up once in half-a-dozen shows or so, but would hum along very nicely when opened up for inspection. The dilemma went on for days without satisfactory resolution.

The Cruddy Contacts

After haggling with the projector for a week or so, we were determined to fix the blasted thing. It was nerve-wracking to face an audience, unsure whether their show would run properly or not. Although we had a spare projector to insert in the offending unit's place, it was imperative that we establish reliability in the primary projector to free-up the backup in the event of any failure(s) in our other units.

During close scrutiny inside our problem projector,
“What is easy is seldom excellent.”

-Samuel Johnson
When we inaugurated SPICE Automation six years ago, we purposely chose the hard road.

Instead of easy, but slow, BASIC, we wrote in challenging, but lightning-quick, C.

Instead of easy, but unreliable, circuitry, we designed noise- and phase-insensitive controllers.

Instead of easy, but wearisome, cues that work only when executed, we came up with powerful status output that tracks as you move.

And instead of resting on our laurels, we’ve kept working.

The result?

Video control, audio control, and new independent flicker/flash routines that make each projector respond like it has its own dedicated computer.

Ironically, all this work on our part means easy programming for you.

So if you want excellent shows, but haven’t got six years to spare, get SPICE.
‘What is easy is seldom excellent.’

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So if you want excellent shows, but haven’t got six years to spare, get SPICE.

Sky-Skan, Inc.
51 Lake Street, Nashua, NH 03060. Tel. (603) 888-8500. FAX (603) 882-6522
500 Chesham House, 150 Regent Street, London W1R 5FA. Tel. 071-629 0558. FAX 071-734 4166
though, a suspicious phenomenon began to catch our attention—a 'green crud' covering some electrical contacts crucial to the operation of the cycling mechanism.

For those experiencing the intrigue, or misfortune (depending on your point of view), of probing the internal guts of a Carousel or Ektographic slide projector, there are three large moving parts that will immediately catch your attention: the motor, the fan, and the camstack assembly. Probably anyone, including a mechanical idiot, can easily identify these first two items of interest. Of prime concern here, though, is the camstack assembly, which can be recognized as the large part in the projector that rotates once for each advance of a slide. (If unsure about this, plug-in a projector with the bottom case removed, switch it to 'fan' and press either the 'forward' or 'reverse' buttons.) The camstack assembly looks like a series of thin metal and plastic disks on a rotating steel shaft, with thin spaces between the disks. Within these spaces are molded plastic 'cams' with high and low areas which lift and lower the metal levers that change slides and index the slide tray. A cursory inspection will reveal that this assembly possesses what we'll refer to as a striker pad, a tiny metal rectangle designed to stop the rotation of the camstack each time it hits a small steel L-wire (so named here because it is shaped like a letter "L"). This wire is part of what Kodak calls the 'cycle lever assembly'. With the fan running in an opened projector (the bottom case portion of a model-III can be lifted away after removing six Philips or Torx screws), the interaction of the camstack and cycle lever assemblies can be studied. When depressing the 'forward' or 'reverse' buttons, the cycle solenoid (that fiberglass-tape-wrapped cylinder inside a U-shaped steel bracket with a plunger sticking out one end) lifts the cycle lever and its L-wire away from the camstack's striker pad—allowing the camstack to begin its rotation. Once the 'forward' or 'reverse' button is let go, the cycle lever drops back into its spring-loaded position. Then, as the camstack finishes one complete rotation, the striker pad hits the cycle lever's L-wire, stopping rotation and the cycle action. Therefore, the striker pad and L-wire combination constitute a sort of "mechanical stop," determining the 'start-point' and 'end-point' of the slide-cycling action.

Along with performing this purely mechanical function, though, the striker pad and L-wire also serve as electrical contacts. They are hooked up in such a way as to pass electrical current for the very same cycle solenoid which starts the camstack rotation in the first place! Therefore, these two parts must offer a relatively low resistance to electrical current in order to operate the solenoid.

The 'green crud' mentioned earlier was all over the L-wire and striker pad. It seemed unlikely that this coating would make for a low-resistance electrical pathway. Checking the circuit with a volt-ohmmeter confirmed this hypothesis—we were getting resistance readings varying from about 10 to 200 ohms.

Calls to Kodak revealed that the company had recently been plagued with numerous complaints identical with ours. The technical representative we spoke with explained that follow-up research had discovered that the so-called 'conductive grease' used to lubricate the striker pad and L-wire would over time, degrade into a tough non-conductive green coating. This, in turn, would drop the current available to the cycle solenoid. The recommended solution was to clean the striker pad and L-wire, and lubricate them with a thin film of 'Super Lube,' a milky-clear Teflon-based lubricant in a gray tube manufactured by an outfit located in Bohemia, New York. It turns out that this same lubricant is currently available at Radio Shack stores where it is sold under the name 'Lube Gel' (catalogue # 64-2326). Although the use of such a lubricant initially concerned us (since Teflon is generally used in other applications as an electrical insulator), the Kodak rep assured us that a thin film of 'Super Lube' would provide little or no electrical resistance in this particular application.

The Problem Returns

After placing the troublesome projector back into service, we monitored its performance closely. Days, weeks, and months went by without incident. It appeared that our failure-to-cycle problem finally had been found and fixed. Nearly a year went by without a slide-advance malfunction in our Ektographics. Then suddenly, the problem began to occur in another of our Ektographic III's, and the unit was summarily pulled, serviced, and replaced. But much to our dismay, the Kodak-recommended service procedure had little or no effect on the malfunctioning unit. At best, the projector might merely make a loud buzzing sound (a chattering cycle solenoid) when given an advance or reverse command. At worst, it would simply sit there silently (except for the fan noise), refusing to cycle.

But much to our dismay, the Kodak-recommended service procedure had little or no effect on the malfunctioning unit.

Accordingly, we again re-cleaned and relubed the striker pad and L-wire in the offending projector, and watched its performance closely. To our utter amazement and frustration, the unit showed absolutely no sign of improvement! Suspecting that the problem was with the solenoid itself, we again opened up the malfunctioning projector, and this time adjusted the mechanical link between the solenoid and the cycle lever (a procedure that will often clear up solenoid-buzzing). But repeated adjustments didn't abate the problem. Next, we tested the rectifier diodes that feed DC-voltage to the solenoid, and they checked out fine. Finally, we changed out the solenoid altogether—but still no change. Frustration was now leading to near-panic, since a recent change in our projector layout in the planetarium had temporarily left us without a spare projector at all! We had to find a solution to the problem—and fast!
make matters even worse, more and more units were experiencing the same problem. Within days, nearly half the Ektagraphic projectors in the planetarium were exhibiting intermittent failure-to-cycle problems. Oddly, experiencing the same problem. Within days, nearly half another Sky-Skan customer, Novins Planetarium in Toms mised, never once evidenced such a cycling problem. man.

"Certainly someone else has had similar problems," we thought.

Accordingly, we called Ty Bloomquist at Sky-Skan. Ty had always been more than helpful in the past, and though the problem wasn't with Sky-Skan's equipment, we felt it possible that, through the grapevine, he had heard a similar story. After describing our dilemma, Ty recalled that another Sky-Skan customer, Novins Planetarium in Toms River, New Jersey, had experienced some Ektagraphic troubles.

We phoned Novins Planetarium Director Eric Zimmerman. It turned out that his description of their Ektagraphic troubles was identical with ours—and he too hadn't yet found a fix. As the conversation progressed, we realized that his frustration closely paralleled our own. Several of his projectors had even been sent out to Kodak for repair, but, in the end, came back with the same insidious goblins. At one point in the discussion, Eric mentioned a fact that we hadn't thought about—that the old Ektagraphic II's had never experienced such a difficulty. While they might rarely require solenoid or camstack-timing adjustments, the model II's were much more reliable cyclers than their Ektagraphic III counterparts seemed to be, at least for now.

We mulled over this very salient point. Our own experience at Gibbes had borne out Eric's assertion. Before switching over to the Ektagraphic III's, our old projectors—despite their otherwise dilapidated conditions—had never once evidenced such a cycling problem.

"Something in the basic model III design ... must be causing the problem ... something that isn't in the Ektagraphic II!" The point was so obvious that it had previously escaped us altogether. With that we sprinted over and retrieved one of our old Kodak projectors, and opened it up. With old and new units side-by-side we studied them to compare their inner workings.

**The Revelation**

Although the mechanical guts of the old and new Ektagraphics are different in specific layout, they do have many functional similarities. After a few moments, though, one thing started to become obvious—the electrical pathway for the cycle mechanism on the new model was more complex than on the older unit. Instead of possessing a fixed camstack striker contact like on the Ektagraphic II, the new model had a sort of 'floating point' design. The Ektagraphic III's steel striker pad was really just the bent end of a pivoting lever that extends further down into the camstack assembly. Whereas the steel-wire striker contact on the model-II connects directly to the electrically-grounded center shaft of its camstack assembly, electrical current in the model-III has a more convoluted path. Just beneath the opposite end of the striker pad's integral pivot lever (which is attached to the camstack via a loose rivet) resides a small gold-colored contact plate measuring roughly 2 x 5 mm. It is this secondary contact that is connected electrically to the camstack shaft in the model-III. Because the pivot lever is spring-loaded, it does not touch this secondary contact when a slide advance or reverse is in progress (the camstack is rotating). However, when a slide-cycle ends, caused by the striker pad hitting the L-wire, the resulting force knocks the striker pad/pivot lever back. This makes the opposite end of the pivot lever press against the secondary contact inside the camstack assembly. Therefore, to initiate the next slide advance or reverse, the current to the cycle solenoid must negotiate, not one, but two sets of moving electrical contacts. While we had cleaned and lubricated the striker pad and L-wire, up to this moment we had paid no attention to this second set of contacts.

What was the condition of the second set of contacts? First, the geometry of the camstack assembly makes it difficult to examine this area when the camstack is in its 'at rest' or non-cycling position. By running the projector fan and then turning it off immediately upon pressing the 'forward' button, the camstack can be parked at another position. (The secondary contacts can be accessed by running the camstack about 1/3 of a full rotation.)

After running the camstack around for inspection, we immediately spotted something—tiny blackened areas on the small secondary contact plate and on the underside of the pivot lever, exactly where the two parts make electrical contact. Using the tip of a straight-blade precision screwdriver and a solvent-soaked cotton swab, we cleaned these deposits from both parts.

"Could these tiny blemishes really have been the culprit," we wondered?
Over the next day or so we pulled every Ektagraphic projector out of the planetarium for inspection. Besides cleaning and relubricating the striker pads and L-wires in the units, we checked the condition of their secondary contacts. It turned out that, without exception, each projector with cycling problems exhibited the tiny sooty spots on its secondary contacts. Additionally, every properly operating unit showed little or no evidence of secondary-contact blackening.

Now came the acid test. After cleaning up the contacts in all projectors and reinstalling them, we waited to discover whether our new remedy had worked. Although it seemed likely that the culprit finally had been found, we already had been frustrated too often to assume success. Days passed with no missed cycles. Still, it was difficult to assume anything. But with each show presented it became more and more obvious that the problem was fixed.

Understanding the Problem

As we discussed in our earlier installment on corrosion and its effects on electrical flow, any non-conductive impurities or deposits between contacts in an electrical circuit will essentially act like a resistor, reducing the current flow to the component(s) drawing that current—in this case, the cycle solenoid. As more resistance is placed in the circuit, the less current is available for the solenoid to lift the cycle lever assembly. One can actually create a test of such a failure-mode by wiring a rheostat in series with the solenoid. As more resistance is dialed-in on the rheostat, the pulling-action of the solenoid against the mechanism's return springs becomes progressively diminished until the solenoid makes a clattering noise and fails to pull in. If the resistance is increased further, the current drops until there isn't even enough energy available to make the solenoid buzz.

This is exactly what happens when either or both sets of the aforementioned electrical contacts become too dirty. The problem gets aggravated even further when the
cycling mechanism is being controlled by the typical automation system. Although some of the cheaper control systems switch the ‘forward’ and ‘reverse’ current using conventional electrical relays, the more advanced systems use solid-state devices for this application. As the electrical current passes through one of these, the circuit potential drops by a couple of volts. This explains why, in such cases, is may be possible to cycle a malfunctioning projector with the ‘forward’ or ‘reverse’ switches on the projector itself, while the automation system can make the unit do nothing more than buzz.

Ektagraphic III’s generally begin to experience such problems when they’re about 4 to 5 years old, depending upon how much they’re used. (It’s interesting that they come with a three-year warrantees!) By that time, the ‘conductive grease’ will have fully deteriorated inside the hot environment of the projector, and the oxides will have sufficiently accumulated on the secondary contacts inside the camstack.

Since the conductive grease deteriorates into a rather tough film, it is best to use a sharp knife to lightly scrape the deposits from the striker pad and L-wire, as well as intermittently scrubbing the parts with a cotton swab soaked with contact cleaner or denatured alcohol. Once clean and shiny, the contact surfaces of these parts should be coated with a thin film of Super Lube (or Lube Gel). The secondary contacts inside the camstack should be lightly scraped with the point of a precision screwdriver or other suitable instrument, and finished off with a soaked cotton swab. It is very important to note, however, that no lubricant whatsoever should be placed on these secondary contacts, as they touch each other with relatively light pressure. A coating of lubricant could, in this application, serve as a source of resistance to electrical current. Besides, the secondary contacts are not subject to the kind of mechanical stresses and friction that are present at the striker pad and L-wire.

Over-Anxious Cyclers

Another strange problem that occasionally plagues the Ektagraphic III is a tendency of the projector to advance erroneously one tray position when the fan is turned on. This phenomenon can pose a problem, especially in those systems that turn off a projector fan when that unit isn’t projecting a slide. The cause of this problem is a misaligned L-wire which is positioned so that the striker pad is contacted too close to its edge. Since the striker pad is tilted back a bit when contacting the L-wire, the latter has a slight tendency to ride up the slope of the striker pad when the fan turns on (the motion is precipitated by a slight lurch in the camstack’s slip-clutch). If the L-wire contacted the striker pad too close its ‘trailing edge’ at the end of the previous cycle, the camstack could have just enough mechanical energy at the next fan turn-on to push the L-wire out of the way—leading to an unwanted advance.

By periodically venturing into your projectors to tackle these rather exotic, but simply-corrected gremlins, you too can get the most out of their updated features without having to suffer from their design pitfalls.

Although Kodak recommends replacing the entire cycle lever assembly (which includes the L-wire) to correct this problem, such a task can be avoided most of the time by simply bending the L-wire. However, in such a situation, it is very important to keep from bending or otherwise placing stress on the remainder of the cycle lever assembly. We achieve this by using two sets of long-nose pliers. (Don’t use those spindle-jawed “needle-nose” pliers, though, as they are not strong enough to bend the steel wire.) By clamping down with one pair of pliers on the L-wire close to its riveted attachment point on the cycle lever, one can relieve the lever from any bending stresses applied to the L-wire with the second pair which is clamped on the free end. When the adjustment is successfully completed, the L-wire should contact the striker plate at dead center.

On occasion, though, you may encounter a cycle lever assembly with “too much play.” In such a case, the wire won’t contact the striker plate consistently in the same position. Although you can fix the problem by replacing the cycle lever assembly, this is definitely not a task for the faint of heart. Going this route requires almost complete disassembly of what Kodak calls the ‘mechanism assembly’ (that rectangular metal box which contains the cycle lever, camstack, solenoid, slide gate, and all the other levers, springs, etcetera that cycle the slides). You’ll soon find yourself hurling a mass of expletives at the confounded thing. In such a scenario, we recommend that, instead, you replace the entire mechanism assembly. Although this part runs around $70, you’ll find it more than worth the investment in preserving your sanity. Besides, the mechanism assembly is hard enough to replace by itself.

After solving the Ektagraphic III’s cycling problems, we have once again fallen in love with these opto-electro-mechanical beasties, despite their increased tendencies toward chronic mis-cycling. By periodically venturing into your projectors to tackle these rather exotic, but simply-corrected gremlins, you too can get the most out of their updated features without having to suffer from their design pitfalls.
Lonny Baker  
Morrison Planetarium  
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Last fall, at the joint PPA/RMPA conference at the Museum of the Rockies, I moderated a panel discussion on a topic suggested by conference host Jim Manning. The topic, “Do We Have A Legacy Worth Passing On?” was so meaty I decided to use it for this issue of FORUM.

The question I asked the panelists and other colleagues was:

“As astronomy educators, can we create a legacy worth preserving and passing on?”

While contemplating the following responses, take a moment to review the things you’ve done recently that enhance public awareness and appreciation of the universe. Then congratulate yourself on a job well done.

Last October, during a visit to my native Wisconsin, I stopped in at my undergraduate alma mater, the University of Wisconsin at Oshkosh. It was Saturday, and by a stroke of luck, I happened to find my old astronomy teacher, Professor John Evans, in his office. I hadn’t seen him in years, and while his adult astronomy class watched a videotaped episode of “Cosmos” and the voice of Carl Sagan drifted out of the classroom down the hall, we had a pleasant chat. We talked of old times, caught up on each other’s lives, and reviewed the current state of the universe and high school graduates. And I took the rare opportunity to thank him for the influence he’s been on my life and my career.

Two decades ago, I was a green kid off the farm with a strong interest in astronomy and little previous opportunity to focus it. John Evans listened, encouraged, and advised throughout my undergraduate years. He dusted off the university’s little-used astronomy minor and helped me meet its requirements. When I expressed an interest, he arranged for me to give my first presentations in the Buckstaff Planetarium. He served as a reference for my first planetarium job, and his philosophy of astronomy education, which I much admired, became the basis on which I built my own.

In short, John Evans was (and still is) creating a legacy in his students, and I was one of the beneficiaries.

Most of us can probably point to a John Evans somewhere in our lives or careers—someone who inspired us or encouraged us or helped us along the way. What we must realize is that we’re doing the same thing today.

To know many people did you show Halley’s Comet who weren’t disappointed? How many saw the rings of Saturn for the first time—for real—through your telescope? How many times have you patiently answered the questions of the bespectacled kid who lingered at the console after a show? Or gave one a chance to work under your dome? Or helped a parent choose a proper telescope for a child? Or made the extra effort to help a student understand? How many scientists and educators have you started on their way in some small fashion? How many people can look up and see a star and know its name and know what it is because of you? That’s a legacy you’re making. And you’re making it every day. And it makes a difference.

How many scientists and educators have you started on their way in some small fashion? … That’s a legacy you’re making.

Thomas Carlyle once lamented: “Why did not somebody teach me the constellations, and make me at home in the starry heavens, which are always overhead, and which I don’t know half to this day?” Our role is to be those somebodies, to be purveyors of one of the few truly permanent artifacts of human existence: knowledge. In our case, knowledge of the universe of which we are inextricably a part. Not everyone hears. Not everyone appreciates. But the work has always been one of small steps—one Carlyle at a time.

Can we create a legacy worth preserving and passing on? Yes, emphatically! So long as the sky has sights to stir the soul and stimulate the mind, so long as we strive to pass on our wonder and knowledge of it, we continue the legacy of the skywatchers and storytellers and teachers of old—and the John Evanses of our youth—who sought to make people at home in the starry heavens. It’s a worthy task. And it’s a legacy of which we can be proud.

James Manning  
Taylor Planetarium  
Museum of the Rockies  
Bozeman, Montana

Do astronomy educators have a legacy worth preserving and passing on? Considering what a lot of us are paid, there’d better be. It seems to me that if it’s agreed astronomy is worthwhile and worth learning, then what we do is important.

I don’t think there is much doubt that people find the universe fascinating on many levels. Aside from institutes
of higher learning, there are probably few institutions, other than a planetarium, whose routine programming can better prepare a person to consider both the universe and his or her place in it. Once this type of personal thought begins, there's no telling where it will go or how that perspective will affect a person's personal philosophy. Most planetarians probably went through such a process. Some patrons may come to beliefs or philosophies with which we disagree, but simply inspiring people to think more deeply about their role in the cosmos is an important part of our profession's legacy.

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In much the same way, space age images and information about Earth and the other planets have surely had an effect on the way people view the environment, and planetariums are an important outlet for the information that leads to that cosmic perspective.

Planetariums can also play an activist role in issues such as science illiteracy and light pollution. We have the opportunity to present the public with exciting information about the universe, about the way scientists find out what they know, and about choices that need to be considered; there's also an important role for us as an information resource for teachers, science fair planners and government bodies.

On a more personal level, as our facilities age we may find ourselves playing a new part in parent/child relationships as parents bring their children to visit a planetarium they themselves enjoyed in their youth.

These are just a few of the things planetaria can do for society. Yes—we do have a worthwhile legacy.

David Hostetter
Natural History Museum Planetarium
Lafayette, Louisiana

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You know, I really miss the good old days, when a sky interpreter was respected and obscenely well paid: The occasional human sacrifice to propitiate the deities, the presiding over great agricultural festivities, the straightforward task of observing sunrise and sunset points, scratching a few cryptic lines in the dirt and saying, "Ok, boys, put that stone monolith over here—a little more to the left, that's it; no, no, no, too far, take it to the right a little; ok, now back it up, back it up, back it—it—stop! Perfect—drop it!" And nobody gave you any backtalk either. Hey, would you risk ticking off some powerful astronomer-priest who could invoke the wrath of the sky gods?

Oh sure, there was a down-side. Just ask Hsi and Hso, court astrologers of ancient China, who blew a big eclipse prediction—history records that after everyone got over their initial panic, and made enough noise to scare off the eclipse dragon, the Emperor went out of his way to send Hsi and Hso to visit their ancestors. But for the most part, a sky interpreter had a pretty firm lock on the power in society back then.

I'm certainly not advocating the return of those days. After all, back then astronomy was an occult activity, clearly against the modern ethos of science, which through publication and debate makes the astronomer's observations of the sky available to everybody—and that is how it should be. We sure don't need to be spreading around any more fuzzy thinking, and in fact, it's planetarians who are among the most alarmed about the prevalence of belief in modern astrology, numerology, pseudoscience and other cosmic claptrap.

But the funny thing is, astronomy is even more important to society than it ever was. Read through Ed Krupp's In Search of Ancient Astronomies. Dr. Krupp (Griffith Observatory) makes a telling point early on when he says "Without the practical benefits that astronomy supplied, it might not have been possible to have civilizations at all" (italics mine). He further relates how "our economy is stitched to the sky," because even though we are not always aware of it, astronomers are the ones who determine the calendar—a vital tool for not just establishing seasons, festivals and holidays, but also the work week, the business of the marketplace, all the timekeeping that rules our daily lives. With a burgeoning and increasingly complex society, the stakes become all that much higher, and our dependence on the calendar that much more necessary: Prevent a major city from receiving its outside food supply for more than a week and the importance of the astronomer's calendar becomes apparent. So I find the characterization of astronomy as "a useless science" to be extremely offensive.

There will always be a place for us; we are astronomy's storytellers, the keepers of ancient skylure and of modern science.

There will always be a place for us; we are astronomy's storytellers, the keepers of ancient skylure and of modern science. And I don't think our job is really all that difficult. We certainly don't have to go about creating any legacy to pass on. All we've got to do is report on the existing legacy in an interesting fashion. Whether that be as a caretaker of some ancient culture's mythology, or as modern storytellers who enchant first-time listeners with a tale of the voracious black hole and the elusive gravity wave, our
I believe that as planetarians we are in a unique position to promote a global perspective in our audiences. I would like to see more program elements that portray our planet as a grand and complex symphony of interwoven systems, both physical and cultural. This can come from discoveries by remote sensing of Earth by satellites, studies of vegetation, ecosystems, atmospheric, weather and climate patterns, plate tectonics, examination of human history, sociology and economics. As our awareness of these systems increases, we recognize ways in which humans fit into and influence all Earth systems.

It is easy to become discouraged when we realize the destruction humans have either deliberately or inadvertently wrought. A computer image of the hole in the ozone layer, when coupled with our knowledge of the increased risks of melanoma associated with exposure to ultraviolet light, provides a depressing picture of the negative effect human activity can have on life on Earth. Cranking out greenhouse gases by our energy and industrial systems makes warming the whole Earth and altering climate systems a possibility. These and other “bummers” such as pollution and war, are examples of legacies that are probably not worth preserving and passing on.

A legacy that definitely is worth passing on is the human ability to recognize such “bummers” and correct them. There are many efforts in the world today, in science and other disciplines, to analyze and understand our place in the grand scheme of things and to live more in harmony with each other and our world. For example, the first international agreements are taking steps to end production of ozone-depleting chemicals. The first step was the recognition to promote a global perspective in our audiences. I would like to see more program elements that portray our planet as a grand and complex symphony of interwoven systems, both physical and cultural. This can come from discoveries by remote sensing of Earth by satellites, studies of vegetation, ecosystems, atmospheric, weather and climate patterns, plate tectonics, examination of human history, sociology and economics. As our awareness of these systems increases, we recognize ways in which humans fit into and influence all Earth systems.

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... while many human cultures and nationalities are radically different in many ways, ... We are all looking at the same sky and seeing the same things.

Another concept to convey in planetarium shows is that, while many human cultures and nationalities are radically different in many ways, there are certain fundamental similarities that we all have by virtue of being human and living together on this planet. We are all looking at the same sky and seeing the same things. Many cultures have relied on calendar systems based on lunar cycles and/or annual cycles of movements of the sun. Similarities are evident in these calendar systems because ... we’re all looking at the same cycles! Native American cultures have based their timekeeping on the moon cycles, just as Jews have for centuries. It is exciting to learn about cultures that are very foreign to us and still find out that they do many things in ways familiar to us.

Surely, increasing global awareness is a legacy worth passing on. A planetarium is a good place to do it.

Creating the Legacy: A new buzzword in education is multicultural education, an approach to teaching and learning that is based upon democratic values and beliefs, and seeks to foster cultural pluralism within culturally diverse societies. The movement is toward achieving equality of educational opportunity and equity among all identifiable groups, particularly ethnic minorities.

Other than the sun, moon, planets and stars, there are no universally observed objects in human experience. People basically observe the same objects in the heavens, but at different altitudes above the horizon. How past and present people interpret these objects depends on their environment as well as their cultural values. Studying the astronomical mythology of others can help us learn more about ourselves and gain a broader perspective of other peoples of the Earth.

For example, how we orient the sky when we draw it tells us much about ourselves. Because of our Western heritage, based on Mesopotamian roots, most of us picture a sky chart having the celestial equator and ecliptic in the middle of the star map. This is because, to the ancient astrologers of the Middle East, the changes in the positions of the moon and planets were used in an attempt to try to find order in their unpredictable universe. The changes were interpreted as representing the activities of the gods in their preparation for the events to take place on Earth. But to the Chinese, the North Star was the most important point in the sky, the Emperor of Heaven and the divine prototype of the emperors who ruled China as “Sons of Heaven.” Thus the Chinese star maps are north polar centered.

The constellation divisions now familiar to us in the West are only one way to interpret the random placement of stars. How we interpret what we see within those star maps also tells us something about our culture. Upon seeing a projection of Ursa Major, an astronomer might explain that the stars are part of the Ursa Major moving cluster. However, planetarians might single out the Big Dipper and relate a myth concerning the asterism.

Passing on the Legacy: Why not pass on the mythology of other cultures with some information about that culture while using a tone of voice that encourages acceptance and...
Book Reviews

Laura L. Kyro, Production Specialist
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The first two reviews are by James Rusk, Russell Planetarium, Mesquite Texas.


In 1889 the Russian writer Anton Chekhov was asked about the conflict between religion and science. Trained as a medical doctor, Chekhov wrote that human ignorance was the reason for the conflict between science and religion, not the disciplines themselves.

"When a man does not understand," wrote Chekhov, "he senses a discord within himself; he seeks the reasons for this discord not in his own self, as he should, but outside himself, whence comes the war against what he does not understand."

A different point of view is taken by Tad S. Clements, an Emeritus Professor of Philosophy. According to Professor Clements, the idea that religion and science can be safely relegated to their own separate spheres is wrong. He makes a case for what he calls "scientific secular humanism" as opposed to "prescientific frameworks."

Although Clements targets all religions, he emphasizes American Protestant sects who insist on a literal reading of the Bible. Clements takes the literalists to task by pointing out in great detail the scientific inaccuracies and logical inconsistencies within the Bible. Students of the Bible will find nothing new in the list.

Clements writes well and logically, but he tries to avoid the fact that many men and women of science have been and are deeply religious. Many scientists would agree with Chekhov that any apparent conflict between science and religion is due to human ignorance.

This book might be of some use to planetarians involved in the creationism controversy, but I found it too philosophical and abstract.


Clear Thinking is a revision of a book originally published in 1962, and teachers should rejoice that Prometheus Books has reissued this classic. I know of few other books for young people that so clearly explain logic while providing interesting everyday examples of the power of sound thinking.

Clear Thinking is enlivened by many line drawings that young people will find amusing and thought-provoking. In fact, this book is a natural choice for "talented" and "gifted" programs. Under the guidance of a good teacher, every secondary school student could benefit from the book. Planetarians will be pleased to know that Mr. Ruchlis' case study in defective reasoning involves astrology.


Reviewed by Jay M. Pasachoff, Williams College-Hopkins University, Williamstown, Massachusetts

Cosmology has been so transformed and legitimized over the last decade or so that the number of its practitioners has grown greatly. Public interest has long been high in questions about the origin and evolution of our universe. Only recently, though, have new, sensitive electronic detectors been able to take data about faint galaxies in minutes instead of hours, and the physicists' giant atom smashers been able to recreate hints of the hot, dense conditions in the first moments of the universe.

Alan Lightman and Roberta Brawer have interviewed two dozen cosmologists, ranging from the traditional heroes, like Allan Sandage, to the newcomers now shaking up the field, like Margaret Geller. The questions they ask range from introductory ones, such as "I wanted to start..."
with your childhood and ask you a little bit about your parents," to technical ones, like "What is your view of the horizon problem today?" to philosophical ones, such as "If you could design the universe any way that you wanted to, how would you do it?" We learn about childhood influences, with Allan Sandage—the heir to the great Edwin Hubble at the 200" telescope at Palomar Mountain (not, as is incorrectly stated in the caption to its picture, Mt. Palomar, which doesn’t exist)—answering, "Every weekend, I would go down to the Franklin Institute and to the planetarium. James Stokley, who was head of the Fels planetarium, was my early hero. That and a childhood friend were the beginning of my interest in science."

We learn about the books that influenced these cosmologists in their early years. Many of these books remain available for the current generation. Hoyle cites Eddington’s books, as does Sandage, though the latter was earlier influenced by now forgotten books like The Romance of Astronomy, by F. A. Grondal (1937) and The Stars for Sam, by R. W. Maxwell (1931). Vera Rubin said, "I read a lot of books, such as James Jeans’s book, The Universe Around Us, and Eddington’s early books. But I was already hooked. It really came from the sky. In the late 1930s, I remember, there was an alignment of planets. That impressed me." James Gunn, now himself a senior astronomer, remembers Frontiers of Astronomy, by Fred Hoyle, one of the other interviewees. John Huchra said that his interest was sparked by "Books like George Gamow’s One Two Three ... Infinity, and a book by Fred Hoyle. There was also Gamow’s The Birth and Death of the Sun."

If I had designed [the universe] differently, it wouldn’t have produced me. ... I’m prepared to make do with the universe we have, and try to find out what it is like.
—Stephen Hawking

It is interesting to learn about the childhood and early influences on these cosmologists, and to extrapolate to how we can make our own teaching and lecturing influential to today’s young. The technical parts of Origins, including the middle of most of the interviews, is much more technical and therefore rewarding to people already knowledgeable about the field. Lightman has written a 49-page introduction to the book, going over many aspects of cosmology. It is nicely written, but is fairly dense reading for those otherwise unacquainted with the field. A 21-page glossary at the end helps the nontechnical reader. End notes and references make it possible to look things up, though an index would have been helpful. Even in the technical parts, there is much to learn about the approaches to science that the astronomers take. I especially liked Wallace Sargent’s comment, “Because just as the history of actual discovery has been far more surprising than expected, it seems to me one ought to treat wild theories with more seriousness than one would have done.”

It is fun to read about the philosophical and religious views of these scientists, or about how they avoid these subjects. Margaret Geller chose to answer a question about her philosophical views with a statement of how she approaches scientific problems, and segued into the question of gender and science. John Huchra, who works with her, said that his design for the “universe would be exceedingly simple, with galaxies that were all the same shape, size, mass, luminosity. It would consist of only baryons that emit light. These dark things are bloody hard to detect, a real pain in the tootsies.” Stephen Hawking, in his brief interview, answered the question of how he would design the universe by “It is like the anthropic argument: If I had designed it differently, it wouldn’t have produced me. So that is a meaningless question. I’m prepared to make do with the universe we have, and try to find out what it is like.”

Origins is a book that is fun to pick up and read a bit from time to time. Planetarians, teachers, and others interested not only in the universe but also in the people who study it can gain much from reading this set of interviews. It is fun to find out how people started in their careers, and fun to hope that we can influence some of the young students with whom we now deal.

Jay M. Pasachoff is Director of the Hopkins Observatory at Williams College and of its Milham Planetarium. His latest text is Journey Through the Universe (Saunders College Publishing, 1992).


Reviewed by Kevin D. Conod, Dreyfuss Planetarium, Newark, New Jersey

This is the latest volume in the Webb Society’s series of handbooks for amateur astronomers. The study of variable stars is an area in which amateur astronomers can still make an important contribution to science. Over 30,000 have been cataloged since 1638, when Omicron Ceti (“Mira”) was discovered to vary its brightness in an eleven-month cycle. Considering how few professional astronomers there are, and that most stars go through a variable stage in their lifetime, it’s not surprising the professionals need the help of amateurs. Oddly enough, amateurs have some distinct advantages over the professionals—telescope time is only one example. The amateur can decide what to do with his/her telescope, when, and where. The professional has to share with other astronomers and is on a fixed schedule.

The book begins with a short history of variable star
their ages at the time of the mission. Section 3, "Techniques of Observation," was a bit disappointing. I think a beginner might be mislead into believing that estimation of star brightness by eye is a waste of time. Isles seems to imply that the only way to fly is by photoelectric photometry. Not so! Few have the financial means to purchase this type of equipment. The majority of variable star light curves are still "eyeballed.

Section 4, "Analysis of Variable Stars Observations," was also disappointing. It's not basic enough for beginners, yet not in-depth enough for the advanced. Also, alternate sources for this material are not included in the bibliography.

At section 5, "Variable Stars and the Amateur Astronomer," the book picks up. It contains practical information on variable star observation and a neat chart listing variable stars which are visible to the unaided eye (there are more than you think!).

Part 2, "The Field Guide," is the real meat of this volume. It provides detailed maps (with reference stars), descriptions, and explanations of 110 variables suitable for visual observation. The information contained therein is indispensable and not readily available elsewhere.

Were my fellow planetarians asked to recommend a book on variable stars to a beginner, this one is not it! There are more appropriate books on the subject out there. Probably the best, and the most widely available, is David Levy's Observing Variable Stars. Although Volume 8: Variable Stars has some disappointments, its field guide is excellent and is a must for the advanced amateur astronomer interested in variable stars.


Reviewed by Hal Donovan, McDonnell Planetarium, St. Louis, Missouri

Rodolfo Neri, former shuttle Atlantis crewmember, has written a children's book in which he attempts to explain the basics of astronomy and to look toward the future while telling the story of three children rescuing a colony full of scientists on Mars. Once you've read the title and know it is written for children, you can fill in the rest yourself.

2035: Emergency Mission to Mars traces the exploits of Brian, Jimmy, Debbie, and their intrepid dog Waldo as they brave the rigors of space for eight months (one way) to deliver and install an important piece of the oxygen distribution system of a Mars colony.

Although the book begins with descriptions of the primary characters' early childhood, it's difficult to assess their ages at the time of the mission. If they are old enough to receive training for a flight to Mars, why are they still referred to as "children?" (I guess all that emphasis on space education back in the 1990s must have paid off!) The astronomical information is clumsily interspersed instead of being smoothly integrated into the story. However, the looks into the future, which include traveling aboard a "space plane"-like vehicle, and life in a space colony, are interesting.

This book seems to be an awkward combination of children's book, basic astronomy lesson, and look into the future.

This book seems to be an awkward combination of children's book, basic astronomy lesson, and look into the future. Unfortunately, it doesn't contain enough of any one element to determine its true target audience. I'm afraid those interested in either the astronomy or the look ahead will find the story line too immature, and those who would swallow the story wouldn't be interested in the other two elements.

The next two reviews are by Sharon K. Parker


UFO Abductions is the third UFO book written by avowed UFO skeptic, Philip Klass. In this book, he tackles the controversial subject of UFO abductions head-on by presenting interesting and little known information relating to famous abduction cases of the past (such as the Betty and Barney Hill incident, and the Charles Hickson and Travis Walton cases) as well as those cases which have been brought to light in recent years by authors such as Whitley Strieber (Communion), Bud Hopkins (Intruders), and others.

In UFO Abductions, Klass presents information that he claims was intentionally suppressed or overlooked by UFO proponents (because it didn't support their views), along with information that he obtained through his own investigations and interviews. Throughout this book, the author examines several possible psychological and monetary motivations of UFO "abductees" and he enthusiastically points out inconsistencies and contradictions in their stories at every opportunity, often with a touch of sarcastic humor. While Klass' book is logically presented, straightforward in its style, and appears to be fairly thorough, it is far from being a balanced presentation. It must be remembered that Klass is a skeptic, and UFO Abductions is as biased against UFOs as Hopkins' book, Intruders, is biased in favor of them.

Throughout the book, it was apparent that there is no love lost between Klass and UFO proponents Hopkins and Strieber. Klass constantly questions the qualifications of...
these men specifically, and those who do UFO research in general, citing sloppy investigative procedures, their willingness to believe abductee stories too quickly, their tendency to influence the stories that abductees tell, and their acceptance of polygraph tests and hypnosis sessions conducted by untrained people under uncontrolled conditions. For example, he points out that UFO occupants are described as being either benevolent or malevolent depending on who is conducting the investigation. Further, he cites several instances where people identified as abductees have flatly denied or recanted their initial UFO stories, yet the investigators persisted in the belief that an abduction took place. He also comments on the remarkable "coincidence" that the number and substance of UFO reports tend to coincide with the releases of UFO related movies and books.

In one of the more fascinating aspects of this book, the author explores the role that psychology plays in UFO cases. During his investigations, Klass sought explanations and evaluation from several psychologists. He shares these findings with the reader along with revealing and little known facts about several prominent UFOlogists and purported "abductees." It’s information that works effectively to shape the reader's opinion of these people's credibility. Although Klass tried to be very matter of fact about his accusations, I frankly, felt that the tone became a little bit too personal at times.

I found UFO Abductions to be an "easy read" filled with all manner of interesting tidbits and useful information. It's also an interesting and revealing expose of the motives, methods, and personalities of contemporary UFOlogy. Suffice it to say that this book would be a worthy addition to any planetarian's bookshelf, and is a must for all UFO skeptics or people who want anti-UFO "ammunition" to share with the public.


The author of Science in a Nanosecond, a journalist by trade, developed this book after having been asked various science questions by his children as they were growing up. It consists of 110 pages of black and white illustrations, accompanied by brief, explanatory text. The questions cover basic subjects within the fields of astronomy, physics, geology, meteorology, and chemistry. The idea behind the book is that good pictures can teach science in a nanosecond.

Does the idea work? Well, that depends. When I first picked up this book I put on my "science educator's hat" and tried to look at it from the standpoint of a person who had some basic science questions and wanted satisfying answers. What I found were answers that were overly simplified to fit the format of the book. I saw my imaginary reader becoming intellectually dissatisfied with each new (and often incomplete) explanation because it led to new questions that were not be addressed, or because the illustration just didn't work well to explain the phenomenon. I also saw my reader occasionally falling prey to common misconceptions because this book sometimes sacrificed scientific accuracy and thoroughness for the sake of providing a streamlined explanation and/or a simple illustration.

"OK," I thought, still wearing my educator's hat, "who could benefit from this book?" If you have little science background, this book probably wouldn't be too helpful. This is because the answers and sometimes, even the questions themselves, assume a degree of scientific understanding that novices just don't have. However, if you’re a reader with some science background, you’re in dangerous territory. You know enough for the book to be useful, but may not know enough to avoid the pitfalls of misconception or the seductions of superficial science. You could
read this book and feel perfectly satisfied that you understood a phenomenon, when in reality, you understood very little. If, on the other hand, you are a reader with a basic grasp of high school science concepts, and could use a quick and painless refresher, then this could be just the book you need.

Basically, I found Science in a Nanosecond to be an interesting book. And, although many of the illustrations were throwaways (they really weren't needed to explain certain questions), some were quite inventive and came with fun analogies. On more than one occasion, I caught myself "borrowing" ideas!


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

John Dobson (and his editor/publisher, Norman Sperling) march to their own tunes, and it would be a surprise (and disappointment) if their collaboration had produced a conventional, predictable, book on how to build telescopes. The reader is not disappointed.

The major portion of the book is how-to instructions designed to "... enable a person with reasonable ability, and very moderate education and finances, to complete a sizeable and useable astronomical telescope." Perhaps no one has taught more people to grind mirrors and build telescopes than John Dobson, so these are instructions from the master. He is very patient and very clear, and although I've personally not ground a mirror and made a telescope, I almost think I could just by following the book. The text takes you through the steps slowly, giving friendly advice, reasons for doing the things the recommended way, and the tolerances before running into trouble. There are 154 clear illustrations.

Of greatest interest to planetarians who do not plan to build a telescope is the section "Under the Sky," where we learn how Dobson interprets the sky. He is a master, and we can all learn from him. One of his more important principles is to use people in his analogies, to personalize them. The audience identifies with the people, as in: "... through this particular telescope at 93X they saw the Sun as it through a #14 welder's glass at 1,000,000 miles, but that at that distance the welder's glass would evaporate in about a minute, and shortly after so would they." For sky interpreters, this chapter alone is worth the price of the book.

There is also a short but very interesting biography of this unusual man.

There are two good reasons to buy this book. You will have a copy to read and enjoy, and you will encourage the work of two individuals who deserve our support.


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

I suspect that most, if not all, of us who work in astronomy institutions have been visited by people who bring us suspected meteorites for identification. I'm fortunate to have access to a decent meteorite collection, and that makes my job considerably easier, but it's still not a simple task. This is the sort of book that will help.

This handbook is oriented towards the serious collector. The subtitle is "A Practical Guide to Their Acquisition, Preservation, and Display," and that about sums it up. The largest portion of the book is devoted to the mineralogy of meteorites and to their classification. Other sections describe in detail how to polish and etch your specimens, how to display them, and—planetarians who deal with the public, take note—how to recognize them.

The book is about studying and collecting meteorites, and it focuses on this with a will. It is not about meteors, meteor showers, asteroids, comets, meteorite craters, what happens when meteorites strike, or what killed the dinosaurs. You get what is advertised—a handbook for serious collectors undiluted by distractions, and this truth to itself is the book's main strength. That and the obvious authority of the author, who packs a very high density of experience into 160 pages. Recommended as a basic reference work.


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

I've always had an odd sort of fascination for planetary nebulae, largely because they're relatively neglected targets for amateur telescopes, and partly because they are still poorly understood and lack glamour. This neglect shows up in the "literature" for amateurs—planetaries generally fall in the category of "miscellaneous other" objects. Planetary aficionados can rejoice in this book, which is truly a user's guide.

The bulk of the book is a catalog of all of the planetaries known (or suspected) up to May of 1990—1340 objects—with finding charts (the "atlas") for the 253 most interesting. The catalog gives 40 pages of essential information in fine print (good material to be made available on computer disk), including probably as much descriptive information as exists for the fainter objects. The charts are printed with one to four objects per page and consume 80 pages, so they are not large. The charts were prepared from a variety of
If planetarians relate the mythology of other cultures to our audiences and interpret the possible meanings behind these stories, maybe we can make a contribution in furthering global understanding and prepare our young people for citizenship in a world filled with pluralism, interdependence and change. We can build on the legacies of other cultures by presenting multicultural education. In so doing, we are passing on our legacy and contributing to world peace and understanding.

Eileen Starr
Gonzaga University
Spokane, Washington

And speaking of Legacies, this issue concludes my tenure as Editor of FORUM. The column and I have been together for over four years. It’s been an enriching experience for me, and I hope for our readers as well. My thanks to all who have contributed so generously to the success of the column by taking the time to respond so thoughtfully to the questions. I hope that others have been motivated to contemplate the issues raised, have gained new insight into our commonly shared problems and have applied some solutions to their own situations. And now it’s with some sadness that I bid adieu to FORUM. The column will live on and prosper under the guidance of Richard Shores. I know he’ll appreciate your continued support.
THE BALANCE SHEET

Keith Johnson, IPS Treasurer
Fleischmann Planetarium
University of Nevada
Reno, Nevada 89557-0010

This column will provide information about IPS finances to members.

1. Banking. I keep IPS funds in two different accounts. One is a normal checking account, the other is an interest-bearing money-market account. In 1991 I kept these accounts at Security Pacific Bank of Nevada. But I eventually grew dissatisfied with the service there, and in December I opened new accounts at Valley Bank of Nevada. If that doesn't work, I'm considering a plastic bag in my backyard garden. By the time you read this, I will have closed out the Security Pacific accounts.

The treasurer and the current president are authorized to sign checks. But I won't let John have the checkbook unless he buys me dinner in Salt Lake.

2. IPS is a non-profit corporation, but not a charitable organization. We are in the IRS category 501(c)(6), which covers things like professional associations and business leagues. This means we don't pay taxes on income related to our purpose for existence; but anyone who gives us a donation cannot claim a deduction on their income tax. But we will appreciate it just an awful lot. The foregoing is the current view of the treasurer, who is not a lawyer or accountant, but has watched most of the Perry Mason reruns, and collected the milk money for his teacher in 3rd grade.

3. Note the "related to our purpose" phrase above. The interest earned in our money-market account(s) is not related to our purpose, which is "the coordination, motivation, and improvement of all aspects of planetarium operations," according to our By-Laws. Collection of interest may motivate the treasurer, and improve the treasury, but does not really fit the definition. Therefore, we pay a small tax on this part of our income each year.

4. Quite a few people sent money to Mark C. Petersen over the past 15 months for IPS purposes. While I'm sure he could use it as well as any of us, he's not the IPS treasurer any more. Next time you pay IPS dues, please check with your Purchasing Department. You may have the right address in your Rolodex, but they may still have him listed. And if you see the IPS contact address listed in any of your journals as being in Boulder or Denver, let me know, so I can chastise them severely.

5. IPS maintains MasterCard/Visa and American Express merchant accounts, to make it easier for some of you to pay dues. A small percentage of such income goes to service fees. Also, MC/V requires a minimum amount deposited each month. This is no problem in January and February, but during the rest of the year we will be paying $20 a month minimum fee just to keep the account open. To save some money, I plan to deactivate that account in April, and reactivate it some time in the summer after the conference, probably for just a month. Therefore, if you charge IPS dues after March, I may wait for some time to charge your account, though I'll enter you in our hallowed list immediately. Of course, if you're reading this, you most likely already sent in your dues... Oh, well.


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Of the members (not library subscriptions), 74 were new members.

7. IPS memberships are on a calendar year basis. I sent out invoices in late November, and they were due back by the end of January. This year, I actually did get more than half of them back by then. But I know further checks will be trickling in all year.

There's a slight penalty for late dues. You are entitled to all the issues of The Planetarian for the year, but we won't automatically send them to you. I will include a Publications Order Form in the envelope with your receipt. You must send this to Rochester, New York, and Charlene Oukes will light her carbon lamp and descend into the rank depths of the IPS Repository to retrieve your mold-encrusted copies. We all want Charlene to stay healthy, so please try to get your dues in on time each year.

8. Membership dues were increased for 1992 by order of IPS Council at the Atlanta meeting in 1991. Institutional dues were raised the most, because these had not been changed for quite a few years. Institutional members have several privileges, including the right to display "IPS
# INTERNATIONAL PLANETARIUM SOCIETY
## TREASURER'S REPORT
### End of year 1991
Prepared by Keith H. Johnson, Treasurer

## INCOME

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## BALANCE SHEET. 12/31/91

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---Prepared 14 January 1992
Keith H. Johnson, Treasurer
Institutional Member" on letterhead and programs, the ability to bring non-IPS-member staff persons to conferences (but only one vote is granted), back issues of IPS publications, and one set of IPS membership mailing labels per year. They also get a rather nice-looking plaque to hang on their wall.

9. The books and membership lists are, of course, kept on computer. Currently I still use, in spite of the opinions of a number of friendly detractors, a version of AppleWorks souped up with a number of TimeOut and JEM enhancements. It seems to work fine. I realize everyone on the cutting edge uses Windows or the Mac graphic interface, but I got started with computers back in the dark ages when you still had to be able to read.

10. I welcome suggestions, praise, and constructive complaints. I'm not an expert at this; if I were, I'd be getting paid for it! There were some bumps last year, but I think I've ironed most things out. Thanks for your patience in 1991, and I hope you agree things are going smoother this year. If you have any questions about IPS finances, please send them to me.

Notes for Treasurer's Report:

1. The item listed under “Special Publications” is the 1990 Conference Proceedings. It was originally budgeted in 1990, but was actually paid in 1991.

2. The item "Retained MCP" refers to cash kept by the former treasurer to cover postage and phone expenses involved in the transfer. People write and call him, thinking he's still the treasurer; this will probably continue until roughly the next ice age.

3. Some of the dues income shown above is for 1992 memberships. I sent out invoices early enough that I received a significant amount in December. But I didn't want to leave undeposited checks lying around, and saw no reason to delay depositing them. I can still determine how much dues income was received for each year.

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The Association of Astronomy Educators is the only U.S. group exclusively dedicated to improving astronomy education at all levels, from kindergarten to college. Founded in 1977 as an outgrowth of a National Science Teachers Association task force, the Association's goal is to help our members by disseminating activities in order to promote a quality of astronomy education which will enhance the scientific literacy of our students. We encourage the development and exchange of information about effective curricula, materials, facilities, and groups as a means to enhancing the teaching of astronomy. The AAE seeks to bring together resources and knowledge from a number of diverse groups for the benefit of the teacher involved in astronomy education. Affiliation with NSTA has continued, and the Association's annual meeting takes place in conjunction with the spring NSTA meeting, at which AAE sponsors several workshops and sharing sessions. AAE is a co-sponsor of Astronomy Day, and encourages other similar activities which promote astronomy education at both the national and international level. Members receive the AAE newsletter, periodic special publications, and announcements of regional and local astronomy activities. As of September, 1991, dues are $12.00 per year, payable to Chaz Hafey, Universe Planetarium, Science Museum of Virginia, 2500 West Broad Street, Richmond, VA 23220.

If you teach Astronomy, whether as a full course or part of a general science curriculum, AAE is for you. To join, please return the attached form. Feel free to duplicate this form as needed. Astronomy is looking up!

Please print clearly!

Yes! Sign me up for the Association of Astronomy Educators.

Name ________________________________

School address ________________________________

Home address ________________________________

I prefer my mailings be sent to my school ______ my home ______

Membership runs September through August. Yearly dues are U.S. $12.00. Canada, add $1.50 for postage, elsewhere add $2.50 postage. Make checks payable to Association for Astronomy Educators. Membership includes subscription to our journal, ASTRONOMY EDUCATION.

Send to: Chaz Hafey, AAE Membership, Science Museum of Virginia, 2500 West Broad Street, Richmond, VA 23220, U.S.A.
Gibbous Gazette

Donna C. Pierce
Highland Park Planetarium
4220 Emerson
Dallas, Texas 75205
214-526-4800 work
214-692-9662 home
214-520-6967 fax

Society exists for the benefit of the members; not the members for the benefit of society. Herbert Spencer, Principles of Ethics, 1879.

Take heart; someone reads Gibbous Gazette! My sincerest thanks to Ole J. Knudsen (The Danish Museum for Science History Planetarium Group) for answering the S.O.S. from the December, '91, column. Ole wrote several suggestions that I have passed on to the appropriate people. He also reports the building phase of an 11-meter planetarium in a new museum building in Aarhus. The museum will cover the history of the exact sciences and the history of medicine. Opening is scheduled for early September 1993! Plans for two more small planetaria in Jels and Aalborg and a larger one in Odense are also planned! Ole reminded me that Odense is the home of a favorite author of mine—Hans Christian Andersen!

Wayne Wyrick (Kirkpatrick Planetarium) reports over 5,000 junior and high school students attended planetarium presentations on Engineering Day last month. The Oklahoma Engineering Society co-sponsors this event with local science firms. Vision of the Universe's annual art contest is currently keeping the Kirkpatrick staff busy.

Eloise Koonce (Richardson I.S.D. Planetarium), chairperson for IPS Textbook Task Force, thanks Barbara Baber (Abilene I.S.D.) and Mark Sonntag (Angelo State University) for their school textbook reviews. The committee has been working overtime!

What an excuse for down time: Richardson I.S.D. Planetarium had a bad transformer blow out so much equipment that the facilities were down for several days. Bet that excuse will be good for SWAP's Bent Cage Award at their next conference!

I enjoyed the Christmas laser light photo taken by Jack Dunn (Ralph Mueller Planetarium) and his son Mike on their Christmas card! Did any of you catch ABC World News Tonight with Peter Jennings when the feature story was about SCOLA? Jack Dunn was elated, and rightfully so!

Is there enough room for all the IPS members, Lars? On the west coast of Sweden the Bromans have erected two cabins and have done most of the work themselves!

Congratulations to the new Falun Science Center due to open this month!

I'm looking forward to viewing Voyages by C-360, Inc., aren't you? Just wish it was coming out at the beginning of 1992 instead of at the end.

I heard that Jim Chapman continues to crank out fantastic art work for the upcoming Sudekum Planetarium production The Planet Patrol...Solar System Stakeout. Check with director Kris McCall for all the details!

Thanks to Larry Toy (Chabot College) for his thank-you note. As Planetarian-of-the-Year Larry is our shining star!

Gunvor and Jan-Erik Solheim (Northern Lights Planetarium) write from Tromsø with another war story. Seems the planetarium went bankrupt, but hopefully the University will take it over. The good news is that they were grandparents the first of the year!

SpaceQuest Planetarium in Indianapolis lost Sharon Parker to the Buehler Planetarium in Florida.

Another portable (Sue Reynolds, can you keep up with all of this??) planetarium is now operating in Mustang, Oklahoma! Kathy Marquis is looking for help. Send information on school shows to Kathy at 906 S. Heights, Mustang, Oklahoma 73064.

Richard Shores had some great ideas on promoting IPS to non-member institutions. There is so much creativity and resources that are just bottled up. I would vote to have a mass mailing to non-member facilities once a year or once every two years to facilities in our database who aren't IPS member and don't have IPS members on their staff. Just a brief description of the society would go far in possibly getting more planetariums and planetarians involved in IPS. New blood in IPS sure wouldn't hurt.

I'm curious to how many IPS members wrote Mary Post with information after my S.O.S. in Gibbous last issue? I agree with Richard but would add that we need to keep IPS members more informed of the services available. Some IPS Task Forces are more active than others. It's time for another list of committees and task forces with contact people made known. It's time for action. 'E'nuff said.

A new IPS Task Force? In scuba diving, Steven Zavalsky (Don Harrington Discovery Center) is now an instructor after having to spend some time in California to get certification!

Great hearing from John Tate (Armagh Planetarium). We've got to figure out a way to get John to IPS'92.

Did the Smithsonian hire a planetarium production manager?

And where oh where is my IPS Special Election ballot?? Congratulations to newlyweds Robin Fields (Sudekum Planetarium) and Louis Levine (Cumberland Science Museum). The wedding and reception were at the Museum with lots of great food, drink and dancing!

It was wonderful seeing the photographs taken by Paul Engle (retired, UALR Planetarium) in dARK Sky! Congratulations are in order to UALR on the opening of their STAR (Science Teacher Academic Resource) Center! Supervisor Polly Davis says STAR Center and the Planetarium staff are looking forward to the opportunity to provide this new NASA Teacher Resource Center for the science teachers of Arkansas.

Now is the time for you to get your act in gear for IPS'92 in Utah. IPS needs you and the ideas only you can bring to this international conference. So, pack up and head for Snowbird. See you there.
I would like to once again thank all of you who have contributed to Regional Roundup in 1991. Your contributions not only make my job easier, but they allow your fellow colleagues to keep up with what is happening in the various regions that comprise IPS.

If you are an IPS member, you may contribute anything of a newsworthy value that you would like to pass on to other colleagues. I welcome your input because after all, IPS is your organization. My function is to edit and pass on your news to others. Just send your material to me at any of the addresses listed above before the next deadline, and I will get it the next issue of The Planetarian. The deadline for the next issue is Friday April 10th. Please mark your calendars accordingly.

ASSOCIATION OF FRENCH-SPEAKING PLANETARIUMS (APLF)

No report. Agnes Acker, representative.

ASSOCIATION OF MEXICAN PLANETARIUMS

No report. Ignacio Castro Pinal, representative.

BRITISH ASSOCIATION OF PLANETARIUMS (BAP)

The Aberdeen Technical College Planetarium will be the host of the next meeting of the British Association of Planetariums. The hosts for the conference will be Mr. Jardin Giddings and Mr. David Finlayson. The meeting dates are February 28th and 29th, 1992.

The Armagh Planetarium in Northern Ireland is currently running a new interactive "green" show called Journey to Earth, featuring greenhouse gases and the ozone layer, as well as a comparison with other planets. The planetarium is also displaying new exhibits of the UOSAT, METEOSAT and NOAA satellites.

The Jodrell Bank Science Center has opened a spectacular new display of a rotating Earth. This is an interactive exhibit demonstrating day and night, seasons, time zones and solar energy.

The London Planetarium recently opened the Northern Lights Festival. The festival was launched in the new Space Trail exhibit with a 12-part radio series, The Canadian Mounties Band and a splendid Scandinavian breakfast provided by the Norwegian Embassy.

The London Planetarium also hosted a recent lecture by Patrick Moore on the Star of Bethlehem. 120 people braved the thick fog and chill to hear Patrick's less-than-orthodox fireball theory.

EUROPEAN ASSOCIATION OF PLANETARIUMS

No report. Dennis Simopoulos, representative.

GREAT LAKES PLANETARIUM ASSOCIATION (GLPA)

The Illinois state meeting will be held at the Adler Planetarium in Chicago on Saturday, May 2, 1992.

The Indiana state meeting will be held at the Marion High School Planetarium on Saturday April 25, 1992. The host for the meeting will be Bruce Brandle.

Dayle Brown recently completed a one year sabbatical and has returned to the classroom as a third-grade teacher at the Olive Township Elementary School. She is also busy with her company, Pegasus Productions, which presents travelling Starlab programs to students. Having attended the SPICA workshop this past summer, she is now qualified to conduct teacher training workshops and serve as a resource for local teachers.

The Ohio state meeting will be held at the Dayton Planetarium on Saturday, March 28, 1992. The Dayton Planetarium just recently opened its new 50-foot dome (Ohio's largest) which features a Digistar projector (Ohio's first).

The Fostoria High School Planetarium in Fostoria, Ohio has reopened after being closed for several years. The new planetarium director is Tony Michele.

The Middletown School Planetarium and the St. Clairsville School Planetarium, both in Ohio, have been
dismantled and sold to other school systems out of state.

The Wisconsin meeting will be held at the University of Wisconsin Planetarium in LaCrosse on Friday and Saturday April 24-25, 1992. The host will be Bob Allen.

Dave DeRemer of the Horwitz Planetarium in Waukesha reports the recent installation of a new LCD video projector and VCR.

The results of the GLPA election of officers are as follows: President-Elect David Batch, Abrams Planetarium; Secretary/Treasurer: David E. Parker, Tipton Planetarium; I.P.S. Representative: Dayle Brown, Olive Township Elementary School. At last fall’s GLPA Conference, four new “Fellows of GLPA” were awarded to the following persons: Dayle Brown, South Bend, Indiana; David Linton, Champaign, Illinois; Georgia Neff, Peoria, Illinois; and Barbara Williams, Merrillville, Indiana. Each new “fellow” has been an active member of GLPA for several years and has made significant contributions to GLPA and/or their own state planetarium organizations.

The 1992 GLPA Conference will be held at the St. Louis Science Center from October 21-24, 1992. The all-new $34 million facility, which has just opened, boasts a 228-seat planetarium equipped with a Digistar projector, 60,000 square feet of exhibit and programming space, a separate Omnimax Theater and Einstein’s restaurant. Director John Wharton will serve as conference host.

GREAT PLAINS PLANETARIUM ASSOCIATION

No report. Bruce Daniel, representative.

MIDDLE ATLANTIC PLANETARIUM SOCIETY (MAPS)

IMPORTANT NOTICE!! The dates for the 1992 Middle Atlantic Planetarium Society Conference have been changed due to a conflict with Astronomy Day. The conference will now be held April 29-May 2, 1992. The conference hotel will be the Holiday Inn in Greentree, a suburb of Pittsburgh, PA just 10 minutes from the new Carnegie Science Center. For additional information, contact Martin Ratcliffe, Planetarium Director or Laura Deines, Planetarium Specialist at (412) 237-3300.

The Education Committee of MAPS is considering a reprinting of Under Roof, Dome and Sky, a highly successful collection of astronomy projects, activities and programs for both the planetarium and the classroom. The book was published by MAPS in 1973 and has been in great demand ever since. In order to determine whether a new printing is viable, the committee would appreciate your feedback. Please contact Francine Jackson, Chairman, Maps Education Committee, P.O. BOX 353, Providence, RI 02901; (401) 722-5293, before March 15, 1992.

MAPS has also recently revamped its membership committee and is currently in the process of implementing several projects. A membership campaign will soon be undertaken to try to increase the number of MAPS members. MAPS currently has 173 members within a region that has over 450 planetariums. The membership committee is finishing up the new membership brochure and a new member packet. If you are interested in becoming a MAPS member, please contact Janet Russo, MAPS Membership Chairman, RD 1, Box 972, Cayuga, NY 13034. Other projects include a MAPS membership directory and printed proceedings of the 1991 conference held in Philadelphia. All of these projects will be implemented before the end of February.

Two new state planetarium groups were formed within the MAPS region during 1991. They were the New Jersey state group and the Maryland state group. The first New Jersey meeting was held at the Raritan Valley Community College Planetarium, Somerville, NJ hosted by Jerry Vinski and Lonny Buinis. Since then, other meeting were held at the Robert J. Novins Planetarium, Toms River, NJ hosted by Eric Zimmerman and at the New Jersey State Museum Planetarium, Trenton, NJ hosted by Richard Peery and Jay Schwartz. The next meeting will be held at the Fair Lawn High School Planetarium hosted by Tony Villano.

The Maryland state planetarium group met at the South Fredrick Elementary School Earth and Space Science Laboratory on October 14th hosted by Mark Bowman and Jeff Grills. The next meeting of the Maryland planetarium group will be on October 12, 1992 at the Southampton Planetarium in Bel Air, MD hosted by Stuart Chapman. For additional information, call Jeff Grills or Mark Bowman at (301) 694-1462.

The Dreyfuss Planetarium of the Newark Museum in Newark, NJ recently reopened after extensive renovations. The Minolta MS-8 instrument underwent some major repair and a new JHE automation system was installed.

Ted Williams, a Philadelphia Schools science teacher, has been appointed to fill the directorship of the Methacton School District Planetarium in Norristown, PA. That position was left vacant by the death of IPS President-Elect Jerry Mallon. Ted has been living in Trenton, NJ, and has planetarium experience at the New Jersey State Planetarium headed by Dick Peery.

Gloria Rall has left the Newark Planetarium to become director of the North Star Planetarium in North Brunswick, NJ.

Don Hall of the Strasenburgh Planetarium in Rochester, NY has announced the dates for the TENTH Production Techniques Seminar. The dates for the seminar will be from June 29 through July 2, 1992, just after the IPS conference in Salt Lake City, for the convenience of the many international planetarians who can plan to attend both events while in the U.S.A. For additional information, contact Donald Hall, Director, Strasenburgh Planetarium, Rochester Museum and Science Center, 657 East Ave., Box 1480, Rochester, NY 14603 or call (716) 271-4320 or FAX (716) 271-5935.
NORDIC PLANETARIUM ASSOCIATION (NPA)

Two new planetariums are planned to open in Sweden in 1992. The 6.5M 36-seat Stella Nova Planetarium within the Falun Science Center, will open on March 8th. Lars Broman is the new director. His staff will include Garan Back and Hans Carlson.

The 23M 325-seat Omni Theater in Stockholm will open in October. Kjell Engstrom is the director. Tom Callen, formerly of the Albert Einstein Planetarium at the Smithsonian Air & Space Museum is also on the staff.

The Nordic Planetarium Association is sponsoring an Astronomy in the Planetarium course to be held at Ransaster's Science Center in the Varmland region of Sweden during the second week in June and again during the third week in August. For more information, contact Per Broman at phone +46 3130 2837 or FAX + 46 3130 2825.

PACIFIC PLANETARIUM ASSOCIATION (PPA)

The new officers of the Pacific Planetarium Association are: Lonny Baker (Morrison Planetarium, San Francisco), President; Kenneth Adams (Schreder Planetarium, Redding, CA), Secretary/Treasurer; Alan Gould (Lawrence Hall of Science Planetarium), Past-President and continuing editor of PPA newsletter, Panorama.

A fantastic joint conference was held with the Rocky Mountain Planetarium Association in Bozeman, Montana September 25-29, 1991. (Please see Rocky Mountain Planetarium Association section for details).

PPA will hold a “mini meeting” during the International Planetarium Conference in Salt Lake City.

The 1992 PPA fall conference will be held at the Community College of Southern Nevada hosted by Dale Etheridge. Additional information will follow in the next edition of Regional Roundup.

The Griffith Observatory was clouded out for the sunset annular eclipse on January 4. The event generated an enormous amount of publicity.

Plans are underway to build a major planetarium facility at the Chabot Science Center in Oakland, CA. Mike Reynolds, formerly of the Alexander Brest Planetarium in Jacksonville, FL has recently joined the staff.

PLANETARIUM ASSOCIATION OF CANADA (PAC)

No report. Ian McGregor, representative.

ROCKY MOUNTAIN PLANETARIUM ASSOCIATION (RMPA)

The 1991 joint conference of the Rocky Mountain and Pacific Planetarium Associations was held September 25-29 at the Museum of the Rockies/Montana State University in Bozeman, Montana, hosted by the staff of the Taylor Planetarium. More than 90 delegates from 22 states and several countries attended.

The conference theme was “Legacy.” In addition to an assortment of first-rate papers, workshops, demonstrations and planetarium shows, several speakers were featured. Pat Leiggi of the museum's paleontology department discussed the fate of the dinosaurs; Dr. Bill Hiscock of the MSU physics department discussed the fate of the universe and brought the term “quantum tunneling” into the planetarium lexicon. Dr. Larry Kirkpatrick, also of the MSU physics department, talked of rainbows and the state of science education and how it can be improved.

Diversions included a scenic trip to historic Virginia City, Montana's capital in its gold rush days; a guided tour of Lewis and Clark Caverns, an underground cave system that fell prey to numerous “quantum tunneling” jokes; and a Montana-style evening barbecue at the foot of the Bridger Mountains, with entertainment provided by the unusual song stylings of Greg Keeler.

Following the traditional rocket launching session, the concluding banquet was held at the elegant Gallatin Gateway Inn, a restored railroad hotel once used by travelers to Yellowstone National Park, where the surprise featured speaker was none other than Albert Einstein (as portrayed by Arden Berkovitz of San Diego, CA), who spoke of our legacy as science educators, sprinkled generously with anecdotes of his life and times.

A post-conference tour to Yellowstone National Park on Sunday featured Old Faithful, thermal areas, the Grand Canyon and Falls of the Yellowstone River, close-up views of bison, elk, and deer, daredevil Martin Ratcliffe's (Pittsburgh city-slicker) memorable encounter with a bull elk in full rut, and a magnificent view of the untainted Montana night sky from the Paradise Valley.

RMPA will hold its 1992 meeting in conjunction with the IPS conference in Salt Lake City in June.

New officers for RMPA are: President, Jim Manning of the Taylor Planetarium/Museum of the Rockies, Bozeman, MT; Past-President, Mickey Schmidt of the U.S. Air Force Academy Planetarium, Colorado Springs, CO; Secretary/Treasurer, Katherine Becker of Buena Vista College, Omaha, NE. Mickey Schmidt was also appointed RMPA Historian. RMPA membership currently stands at 80.

During the 1991 business meeting, RMPA established two scholarships of $250 each to assist two members (to be selected) who might not otherwise be able to attend the IPS meeting in Salt Lake City. RMPA will also be forming two committees to consider practical ways in which the organization can offer “service to members” and “service to the profession,” respectively.

Irvin Bassett of the Summerhays Planetarium in Provo, Utah is retiring as editor of the RMPA newsletter. RMPA salutes his long and excellent service to the organization in his editor's role. The new editor will be Sheri Trbovich of the Hansen Planetarium in Salt Lake City, Utah. Bess Amaral of the Goddard Planetarium in Roswell, New Mexico, will serve as an associate editor.

( Please see Regional on page 76)
What's New

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

What's new from the solar system is that we didn't have to wait a year after all for a peek at the first true asteroid reconnoitered by a spacecraft from earth. Clever NASA scientists, managing to excise a single picture of tiny Gaspra from the data record of the right-on-target Galileo, have showed us what could pass for a cousin of Phobos and Deimos. And while they speculate about whether Gaspra really has a regolith and how it hangs onto it, and what the asteroid is made of, and whether it's indeed a chip off a differentiated "mother" asteroid, we probably will have to wait until next December to learn more—unless Galileo and its engineer-keepers can get its pesky main antenna unstuck.

Also, by the time this is read and if all has gone well, the doughty Ulysses—on a decidedly faster track than Galileo—should have had its encounter with Jupiter and become the first spacecraft to be flung—on purpose—significantly out of the plane of the solar system, studying the solar environment from new perspectives as it heads for its sun-rendezvous in 1994-95.

Important and useful stuff. But some astronomers are taking a bigger view of things—like the structure of the universe—as this column's second item attests. And as this installment's first item reveals, new things are also afoot in the structure our planetarium universes—at least as they come out of Germany.

Zeiss Unites

Late last year, I received a press release (as you probably did; it's reprinted on the next page) announcing that after 45 years of partition, the two Zeiss optical companies of former East and West Germany (Jenoptik or Jena Scientific as it is known in the United States, and Carl Zeiss, Inc.) are being reorganized into a single corporation called Carl Zeiss Jena GmbH. The new organization will be located in Jena, the historic home of the 145-year-old Zeiss organization before the partition of Germany at the end of World War II split the company and staff into two organizations centered in Jena and in Oberkochen.

To gain some insight into what this means for the planetarium divisions of the respective former Zeiss companies, I contacted Irv Toplin in the New York office of Carl Zeiss, Inc., and Pearl Reilly of Seiler Instrument & Manufacturing Company of St. Louis, which is an agent of Jena Scientific in the United States. What I learned was that the new corporation's planetarium projector production would be shifted exclusively to Jena, but as of January, neither Mr. Toplin nor Ms. Reilly could yet say how the projector lines of the two former companies—which overlap to some degree—might be consolidated, or exactly how sales and marketing offices would be reorganized.

The assumption at present is that for now (at this writing), the company will continue with all present planetarium models until there has been time for the companies to get together and review operations. They speculated that it's possible that choices between competing models may ultimately be made, or that some projector models may be combined to create new hybrid models. But nothing will be known for certain for a while. Ms. Reilly thought that by mid-year, more information would be available on how things are developing; I'd expect that we would be seeing new brochures and information on the new combined planetarium division and plans for its product line. Stay tuned!

Where the Galaxies Are—And Other Things, Too

One of the new products being distributed by the Astronomical Society of the Pacific this year takes a look at one of the largest things we know of: the large-scale structure of the universe. Where the Galaxies Are is an eight-minute videotape showcasing the work of Drs. Margaret Geller and John Huchra and the CfA Redshift Survey Group, who are mapping, in three dimensions, the distribution of galaxies out to 450 million light years from the earth—one monstrous slice at a time.

Written and narrated by Dr. Geller, of the Harvard-Smithsonian Center for Astrophysics, the videotape gives a brief explanation of the goals of the project and of the mapping procedures underway using the 1.5 meter telescope at Mount Hopkins near Tucson, Arizona. The program then displays an impressive 3-D map of the four "slices" of intergalactic space currently mapped, showing the soap-bubble structure created by great filaments of galaxies surrounding large voids. The climax of the presentation is a computer-animated trip around and finally through the map, showing the reconstructed galaxy patterns from a variety of viewpoints.

The video, which I've previewed, is very nicely done: clean and concise, with good visuals and music—an excellent way to introduce someone to current and exciting astronomical research. It would be a very good choice for your gift shop video shelf, although I wonder if its cost ($29.95 U.S. plus $3.00 shipping and handling within the U.S., $6.00 shipping and handling outside the U.S.) might seem like a lot for an eight-minute videotape to our average cost-conscious gift shop client. But the copyright state-
ment indicates that the videotape is also licensed for classroom use, and this is the sort of tape that every planetarium or astronomy teacher will want to have, I think, to insert strategically into astronomy classes. It would be perfect for such use.

*Where the Galaxies Are* also comes with a nontechnical article about the mapping project written by Dr. Geller, and an introductory bibliography on the origin and structure of the universe. It’s an excellent presentation of a fascinating project in modern astronomical research, and well worth having. For more information, contact the Astronomical Society of the Pacific, 390 Ashton Avenue, San Francisco, California 94112 U.S.A., telephone (415) 337-1100, fax (415) 337-5205, or check out its 1992 catalog.

Speaking of the Astronomical Society of the Pacific (A.S.P.) and its 1992 catalog, my copy arrived too late to get mentioned in the December issue. But if you haven’t got one, get one; it’s bigger and better than ever, and every year the Society finds new and interesting products to offer.

Some of the new items in the 1992 catalog have appeared in past “What’s New” columns—like Michael Lee Thomas’ *Voyager Grand Tour Suite* on compact disc, and Lynn Moroney’s *Feather Moon* cassette tape of American Indian sky myths—both of which were highly recommended. Other new offerings include a 20-slide set of some of the best Magellan images of Venus surface features with an accompanying information booklet; Ed Krupp’s fascinating tome *Beyond the Blue Horizon*, an exhaustive reference on sky legends from the world’s cultures; and videotapes on modern observatories, the July 11 eclipse from the top of Mauna Kea in Hawaii, and one called *Flying by the Planets: the Videos*, which includes Magellana videos of Venus plus Mars: *The Movie, Earth: The Movie*, a Galileo flyby film of earth and moon, and a slide show of Voyager images of Jupiter and Saturn. There are

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**NEWS RELEASE**

**Carl Zeiss: The End Of 45 Years Of Partition**

**Carl Zeiss Inc. in U.S. To Market Precision Instruments of New Company**

Thornwood, N.Y., November 11, 1991 — Precision optics company Carl Zeiss, once the corporate symbol of a Germany divided by the Cold War, now represents that country’s economic unification.

After nearly two years of negotiations between Carl Zeiss in Oberkochen, western Germany, and government agencies responsible for reorganizing former East German state-owned companies, a new corporation has been formed to manufacture precision instruments in eastern Germany under the Carl Zeiss name. Final agreements were signed November 7, 1991.

Carl Zeiss Oberkochen holds a majority 51% stake in the new company, Carl Zeiss Jena GmbH, whose medical and industrial instruments, microscopes, planetarium projectors and other optoelectronic products will be marketed throughout the world by the western Zeiss firm. A new state-owned company, Jenoptik GmbH, holds the remaining 49% interest in Carl Zeiss Jena.

Dr. Dieter Blennemann, president of Carl Zeiss, Inc. in the U.S., notes that the Jena operation is starting with a workforce of 3,000. “Carl Zeiss Oberkochen plans to invest more than $140 million in the next few years to provide the Jena facility with new technologies and production techniques. It is expected that Carl Zeiss Oberkochen will assume full ownership of the new company within several years, when Carl Zeiss Jena becomes self-supporting,” he added.

Jena is the historic home of the 145-year-old Zeiss organization. It was there in 1846 that young Carl Zeiss founded the optical workshop which grew to become one of the world’s most respected precision optics companies.

At the end of World War II, U.S. occupation forces transferred many Zeiss scientists from Jena just before the region was handed to the Soviets. Management reestablished the company in Oberkochen near Stuttgart, where it flourished. The original Carl Zeiss in Jena, meanwhile, was converted to a state-owned conglomerate by East Germany and sold the bulk of its products in eastern Europe and the Soviet Union.

For decades, the two Zeiss organizations competed for world markets and engaged in legal battles for the right to use the Zeiss trade name.

Ever since the merging of the two German economies in mid-1990, the Jena enterprise has faced a threat to its economic survival, even though it was one of the strongest firms in former East Germany. The combination of the decline in demand for scientific instruments in eastern markets and the requirement for working capital has placed the company under severe financial pressure.

The move to create one Carl Zeiss company in a unified Germany has been spearheaded by Dr. Horst Skoludek, chairman of Carl Zeiss Oberkochen, who spent four years in the U.S. in the late 1960s helping bolster the company’s sales organization in its largest export market.

Upon startup of the new company, Dr. Skoludek said, “It is with a strong sense of history that Carl Zeiss begins anew in Jena, our historic birthplace.”

Dr. Skoludek points out that the Zeiss group of companies have more than 17,000 employees and sales exceeding $1.4 billion worldwide. Operating in the U.S. since 1925, sales of Carl Zeiss, Inc. in North America represent more than 20% of the company’s global business.

The Carl Zeiss Group of companies is owned by the Carl-Zeiss-Stiftung, a foundation. The foundation will now have a second seat in Jena in addition to its seat in the western city of Heidenheim.
new computer software packages, new children’s books and tapes, “Hugg-A-Planet” pillows (earth in two sizes and Mars)—even earth earrings and the earth as a holiday ornament.

To look over these, other new items, and A.S.P.’s other slide sets, posters, videos, and merchandise, contact A.S.P. at the address, telephone number, or fax number given earlier.

Slides from Tersch

Tersch Enterprises, P.O. Box 1059, Colorado Springs, Colorado 80901 U.S.A., telephone (719) 597-3603, is offering several new slide sets. A 30-slide set on the July 11, 1991 total solar eclipse, shot mostly from San Jose del Cabo, Mexico, features a wide range of images (in color) from beginning to end. It sells for $24 U.S.; ask for Slide Set 230.

The new Slide Set 231 includes 15 color slides documenting the June, 1991 planetary conjunctions of Venus, Jupiter, and Mars in the evening sky, and costs $12 U.S. Slide Set 232 is called “Magellan’s Venus - Part II,” and includes 24 color and black-and-white images of the Venusian surface as seen by Magellan’s radar eye; it sells for $11.50 U.S., and complements Tersch’s first set of Magellan images (Slide Set 228, costing $12.60 and containing 28 black-and-white images.)

Over the years, Tersch has amassed quite a collection of slide sets, including a number on solar eclipses from as early as 1945. Contact them for a complete list of available sets, and ask them about their occasional sales.

Artis Music

From Govert Schilling of the Artis Planetarium in Amsterdam, The Netherlands, comes word that music composed specially for Artis Planetarium shows is now available on compact disk. The CD—entitled *Mirror of the Universe—Music from the Artis Planetarium*—is named after one of planetarium’s public shows, and contains music from four programs presented since 1988 when the facility opened. The music was created by Dutch composers Toon Vieijra and Kemal Ultanur.

I’ve listened to the CD, and this is wonderful music. The pieces are richly textured, often symphonic in character, and cover of wide spectrum of styles and moods. The Artis has stuffed 29 selections on the 59-minute disc, which means that they’re all fairly short—most are between one and three minutes in length. It makes the disc a feast for the ear, filled with little gems.

Here’s another excellent choice for your gift shop—and even your planetarium, if you inquire first about arrangements. If you’d like a copy of *Mirror of the Universe* (attractively packaged with a cover picture of a Zeiss star projector in orbit above an alien world), make out a check for 30 Dutch Guilders (about $15 U.S.) payable to NMB-Bank, Amsterdam-Centre, The Netherlands, and sent it to Mr. Adrie Warmenhoven, Artis Planetarium, P.O. Box 20164, 1000 HD Amsterdam, The Netherlands.

Spectrum Glasses

While some people are sometimes accused of looking at the world through rose-colored glasses, these days they can switch to diffraction gratings and see the whole spectrum! And several companies will help them out. Two such companies have come to my attention fairly recently.

One is Rainbow Symphony, Inc., 6860 Canby Avenue, #120, Reseda, California 91335 U.S.A., telephone (818) 708-8400, fax, (818) 708-8470, selling a product called “lazer viewers.” These viewers are made of transparent, cellophane-like, light-diffracting material mounted in cardboard glasses in bright, neon shades of color; you put them on and they create rainbow images of light sources, adding spectral highlights to fireworks and laser light shows. Such glasses have become increasingly common at such events in recent years. But they can also be great educational tools for demonstrating or studying the spectrum. I remember, when I first encountered these sorts of glasses several years ago at a fireworks display, that I actually had the most fun with them looking at assorted emission and absorption spectra from streetlights and security lights nearby.

These glasses can also be very good promotional tools, especially if you’re running a laser show. You can usually have them imprinted with your logo, and/or the logos of sponsoring organizations like radio stations that may be providing free or inexpensive publicity or underwriting of some sort for your event.

Rainbow Symphony’s lazer viewers are available in most any quantity, and sell for 40 cents U.S. apiece for quantities of 500, 35 cents apiece for 1,000, and at further discounted prices for larger quantities. Free imprints are available depending on quantities ordered.

Rainbow Symphony also sells other items, including “eclipse shades,” which are of similar design to the lazer glasses, with the diffraction “lenses” replaced with “neutral density 5” filters—aluminized mylar. These glasses are advertised as being safe for solar and solar eclipse viewing. Eclipse shades cost 75 cents U.S. apiece for 500, 50 cents apiece for 1,000, and again at discounted prices for larger quantities.

Other novelty items carried by Rainbow Symphony include pencils with pom poms made of strands of silvery diffracting material that shimmer with spectral colors, and conventional pencils carrying designs that shimmer similarly (say *that* five times in a row!). Pom pom pencils are $1 U.S. apiece, regular pencils, 35 cents; they are also available for imprinting. Colorful stuff, all good for promotion, with educational value depending on how you use them. Contact the company if you’re interested in more information; ask for Mark Margolis.

Another company that sent me samples and sells nearly identical-looking rainbow-making glasses (this time called
"lazer shades") is American Paper Optics, 1159 Union Avenue, Memphis, Tennessee 38104 U.S.A., telephone (901) 272-0721, fax (901) 272-0723. They come in similar neon shades and can also be imprinted. I didn't receive a price list; you can contact Andy Balogh at (800) 767-8427 for more information.

C-360 on the March

C-360, the non-profit educational film-making consortium that produced the award-winning The Space Shuttle: An American Adventure six years ago, is rolling the cameras once again. This time, their project is a 30-minute film entitled Voyages, a film celebrating the human spirit of exploration, according to a newsletter I received in early January.

The film, slated for a late 1992 release, asks the question "Why does Man explore?" and has been designated an Official Project of the United States Columbus Quincentenary Jubilee. It will feature sequences from aboard reconstructions of Columbus' three ships, a reenactment of Columbus' 1492 landfall, and scenes of 20th century space exploration including shuttle launches and shuttle footage on-orbit. The film will be shot in 70mm film with an 8-perforation frame, with downprints to 35mm, for presentation in C-360 member planetariums with 70mm or 35mm film capability. Minolta Camera Co., Ltd. is the film's major sponsor.

Staff from the Russell C. Davis Planetarium in Jackson, Mississippi, will head up the production team, with participation from staff from the Brevard Community College Planetarium in Cocoa, Florida, and the Fleischmann Planetarium in Reno, Nevada. A nearly four-minute preview of early footage was screened at Minolta's Administrative Center in Toyokawa, Japan last July. Award-winning film and television writer Edward C. Cohen has been commissioned to write the script.

I've seen The Space Shuttle: An American Adventure a number of times, and it's a very good film; I'll look forward to seeing Voyages, and I wish good luck to our colleagues involved in the project!

A New Look for "Odyssey"

The Zeiss companies won't be the only things sporting a new look in 1992; so will Odyssey, the children's astronomy magazine published since 1979 by Kalmbach Publishing, which also puts out Astronomy.

Late last year, Odyssey changed hands; the publication rights were acquired by Cobblestone Publishing, Inc., 30 Grove Street, Peterborough, New Hampshire 03458 U.S.A., telephone (603) 924-7209, fax (603) 924-7380. Cobblestone is a publishing firm specializing in magazines for young people (ages 8-14), also publishing magazines on U.S. history, world history, and world cultures. The main changes to Odyssey include a smaller, more compact size (7 by 9 inches, or about 18 by 23 cm), issues with a single theme for its main articles, and no advertising (Cobblestone thinks its distracting). But many of the regular magazine features will be kept—including the little space robot Ulysses 4-11—one of my favorite parts!

Odyssey is a good magazine for young stargazers, encouraging lots of contributions from its readers. It can also provide useful insight into how to present astronomical and space topics to older children. Regular-price subscriptions cost $19.95 for one year, $35.95 for two years; ten issues are published each year. For more information, contact Cobblestone Publishing at the above address.

A Planetarium/Observatory Sampler

Out since late last year is a new compendium dealing with our profession in the U.S.: a book entitled America's Planetariums & Observatories (A Sampling), written/edited by R. L. Beck with Daryl Schrader and published by Sunwest Space Systems, Inc., P.O. Box 20500, St. Petersburg, Florida 33742 U.S.A., telephone (813) 577-0629.

According to the preface, the idea for the book grew out of a Sunwest newsletter practice of asking planetariums to send in descriptions of their facilities and programs; the authors/editors decided to make a larger call for submissions and to turn the results into the book published in 1991.

The number of entries is relatively small: 57 planetariums and 26 observatories are included with written narratives from the institutions themselves, and often with black-and-white pictures of the facilities. But the book is true to its title: the planetariums range from the large, venerable, and earliest urban facilities, to small campus planetariums with 30-foot domes, with even a Starlab included. The observatories run the spectrum from smaller private and university facilities, to the U.S. Naval Observatory, the Mauna Kea observatories, and New Mexico's Very Large Array. It's a true sampling of American astronomical institutions, as described by the institutions themselves, and that's what makes it such intriguing reading.

Also included in the publication are interesting personal essays by the authors/editors on astronomy education and public events, astronomy versus astrology, the scale of the universe, and planetariums and observatories. America's Planetariums and Observatories (A Sampling) sells for $8.95 U.S. plus $2.50 for shipping and handling. Discounts are available for quantities of five books and up.

This is a great book for getting a sense of the variety and diversity of American astronomical institutions and "popular" astronomy especially. Consider it. Do similar publications exist for astronomical institutions in other countries? Please let me know, and I'll be sure to mention them in future columns.

Assorted Catalogs

Now and then, I come across company catalogs that I've not seen before, but which have wonderful science
applications and products. Some items relate to astronomy, some don’t—at least not directly. But they’re all interesting, and don’t they say that astronomy, in a way, encompasses all the other sciences? You never know what somebody may find useful. Two such catalogs follow.

The first is the 1992 catalog of Arbor Scientific, P.O. Box 2750, Ann Arbor, Michigan 48106 U.S.A., telephone (800) 367-6695, fax (313) 973-6258. The catalog contains a small section on “earth & space,” with a celestial globe and posters and a solar system mobile we’ve mostly all seen before. But what’s really fascinating are the other sections—on holography and lasers and optics, electricity and magnetism and superconductivity, the weather stations and “tornado tube” and the colorful periodic table chart. There’s even a “super slinky” that can stretch to ten meters; what more could you want to demonstrate wave theory? You can obtain a copy from the above address.

The second catalog—or catalog set—comes from Geoscience Resources, 2990 Anthony Road, Burlington, North Carolina 27215 U.S.A., telephone (800) 742-2677, fax (919) 227-3748. One of this company’s specialties is obviously maps; the catalogs even came in an envelope made from a topographic map of a location in Canada.

You need a map? Check with this company. They have a whole map catalog, and half of their general catalog is devoted to maps, too. They have a variety of maps for countries world-wide: geological maps, topographic maps, thematic maps, mineral maps, geophysical maps, satellite image maps, raised relief maps, political maps, city and travel maps, maps of terrestrial planets—this company has maps!

Geoscience’s general catalog is also a treasure chest for earth science and astronomy. They have rock, mineral, and fossil sets, gemstone kits, books, posters, sound filmstrips, and videotapes on earth science, geology, space science, and weather. They have landform puzzles; they have a continental drift earth model with continent fragments that can be positioned anywhere from the days of Pangaea to today; they have celestial globes, elementary planetariums (the mechanical solar system model kind), and charts of minerals, soils, fossils, the atmosphere, the geologic timetable, and the periodic table of elements. They have a lovely assortment of astronomy posters, geological models, computer software, lab equipment, binoculars, compasses, and field tools. They have map-of-the-world shower curtains and umbrellas, and an earth globe puzzle that works like a Rubik’s Cube. And of course, a wide selection of earth globes and atlases. Call or write to the above address, and have fun.

A mention of multi-purpose catalogs wouldn’t seem
complete without a passing mention of Edmund Scientific’s new 1992 “Annual Reference Catalog for Optics, Science, and Education.” It’s also filled with treasures for people like us, containing listings for Edmund telescopes and microscopes, optical components, tools, kits, do-dads and gee-gaws for all sorts of things scientific. For a catalog or ordering information, contact Edmund Scientific Company, 101 E. Gloucester Pike, Barrington, New Jersey 08007 U.S.A., telephone (609) 573-6250 or (609) 547-3488, fax (609) 573-6295. International orders are welcome; contact Joan Costa, manager of the International Department at the same address, telephone (609) 573-6263, fax (609) 573-6295 (U.S. country code is 1). Edmund also has a Far East office: contact Yoshio Tsutsumi, Vice President, Edmund Scientific Company Japan, AOI Building, 16-8, 1-Chome, Shiba Daimon, Minato-Ku, Tokyo, Japan 105, telephone 03-3432-0392, fax 03-3433-3569.

I hope you’re off to a good start in 1992. Have a pleasant spring, and until next time . . . What’s New?

IPS '92 - “Exploration: the Role of the Planetarium Past ... Present ... Future”

Greetings! The planetarians of Utah invite you to attend the International Planetarium Society’s biennial conference at the Snowbird Resort and Conference Center in Salt Lake City. Delegates from across the U.S. and around the world will gather from Tuesday, June 23 through Sunday, June 28 to discuss and demonstrate new ways of expanding our horizons through paper sessions, workshops, exhibits, and star parties.

The Snowbird Resort and Conference Center, surrounded by the beautiful Wasatch National Forest, is a short 35-minute drive from downtown Salt Lake City and will serve as the primary site for paper sessions and meetings. No one coming to visit the Salt Lake area should miss the majesty of the Rocky mountains. Powerful granite rock faces accented by pines and alpine wildflowers form a picturesque sculpture around Snowbird - inviting the naturalist within us to explore and discover. For the less adventurous, the scenery provides a relaxing backdrop for leisurely meals or conversations with colleagues in one of the center’s comfortable restaurants. During two days of the conference, delegates will venture into Salt Lake City where Hansen Planetarium will host a wide variety of star theater presentations from delegates and sponsors. A tour of the Evans and Sutherland facilities in University of Utah’s Research Park will treat delegates to an inside look at this innovative company’s many divisions including everyone’s favorite - flight simulation.

Salt Lake City, a mid-sized metropolis nestled protectively by the Wasatch Mountains to the east and the mineral-rich Oquirrhs Mountains to the west, provides a multitude of opportunities for the resident, the adventurer, and the sometimes tourist disguised as an IPS conference delegate. There will be plenty of “free time” opportunities for conference attendees to independently explore downtown Salt Lake City. Shopping malls offer a myriad of stores and eateries; or delegates may wish to immerse themselves in the many diversions provided by downtown restaurants and private clubs. The Utah Arts Festival, running throughout the days and into the nights during conference week, is a great chance for the art and music lover to delve into Utah’s celebration of culture. Temple Square is also within walking distance of the planetarium - where those interested in Mormon traditions, architecture, and music may catch a choir rehearsal or tour numerous sites depicting the unique and colorful history of Utah. In Salt Lake City during IPS Conference week, there will be no shortage of exciting and interesting things to do; the only challenge will be planning carefully so that one has enough time to do it all!

And don’t forget, the Post-Conference Archaeoastronomy Excursion will provide a rare firsthand experience of the legacy-rich environments of Hovenweep, Aztec Ruins, and Canyon de Chelly National Monuments, as well as Chaco Culture National Historic Park. Every element of this trip will balance scholarly investigation and leisurely enjoyment. The dates for the trip are June 28 - July 2. Since space on the tour is limited, be sure to get your deposits ($100 per adult and $50 per child) in early. For more information on the Post-Conference Archaeoastronomy Excursion, please call (801) 538-2104, ext. 447.

Whether it happens while conversing with colleagues, searching the night skies at a star party, attending a workshop, or studying the ancient history of the Southwest, this conference is designed to excite each delegate’s inner spirit of exploration. Join us for some Rocky Mountain fun and learning as we exchange ideas and share experiences.

Astronomy in England:
Stonehenge to Herschel
August 1-22, 1992, in Oxford

sponsored by West Chester University
Institute for Cultural Studies
with Dr. George Reed

Live and study for three weeks at Oxford University while learning of the challenges and discoveries of astronomers in England and the ways in which astronomy has influenced culture and how culture has contributed to the pursuit of astronomy. The course includes optional field trips to Stonehenge, Greenwich, and Cambridge.

For more information contact: Dr. Sterling E. Murray, Director, Institute for British Cultural Studies, 215-436-2284, or Dr. George Reed, Dept. of Geology/Astronomy, 215-436-3036, at West Chester University, Pennsylvania.
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Columbus In The Planetarium

While many planetariums build programs that demonstrate their multi-media technology, others work to maximize the educational potential of their theaters, a dichotomy that produces many interesting hybrids. Since the current trends in science education emphasize the involvement of the learner, some planetariums have specialized in participatory "shows" with great success. One of the premier facilities in this field is the Holt Planetarium at the Lawrence Hall of Science, University of California at Berkeley. We are pleased to have Alan Gould, Holt's assistant director, share with us an example of the participatory method applied to what has become a controversial topic in recent months.

A script for a participatory program has a different focus because it relies on a real-time interaction between lecturer and audience; a situation that requires careful attention to the logic of the program and the anticipation variable audience response. It is a valuable skill for a scriptwriter to develop and the descriptions of these two Holt Planetarium programs provide excellent models of participatory programming in addition to interesting approaches to the Columbus issue and its place in the planetarium. As Mr. Gould indicates, these two programs will be available as part of the PASS series of planetarium materials, a valuable addition to any planetarium library.

Astronomy of the Americas

In Astronomy of the Americas, we visit several Native American cultures with an eye toward how they view the heavens and the importance of living in harmony with all the elements of nature, whether they be plants and animals, mountains and rivers, or grandfather sun, grandmother moon, or stars.

First, we visit the Hupa who inhabit the Trinity River valley of northern California. In the Hupa village, there are three calendar stones. One of the stones is called the moon stone and it has shallow holes that are used to mark the passing phases of the moon. In keeping with our philosophy of developing audience participatory planetarium shows, visitors observe and record a lunar cycle, the most basic form of calendar keeping, practiced by the Hupa and many cultures around the world. On a handout sheet (see illustration, opposite), planetarium visitors draw successive phases of the moon in each circle. We know about the calendar stones from research conducted by Dr. Lee Davis at the University of California, Berkeley. In her research, Dr. Davis reconstructed the Hupa calendar keeping systems and rediscovered the use of the three stones. Unfortunately, in 1970, the moon stone was stolen, much to the
The Hupa Calendar Stones

The Moon Stone
Each shallow hole represents a 3 1/2 to 4 day interval. The eighth position is the time of the dark (new) moon. This moon is in the land of the dead and is underground, below the moon stone. The month begins at the first thin crescent moon and is marked in the far right shallow hole.

The Universe Stone
Shadows falling on the shallow holes may have confirmed key sunrise observations in the high country. The stone is divided into three parts representing the Sky, the Earth and the Underworld.

The Year Stone
There are 13 vertical bars. The bar at far right represents the first month after the Winter Solstice. This month begins with the first thin crescent moon after the Winter Solstice. Since 12 complete lunar cycles (29 1/2 days each) is less than a solar year, a short 13th month is used to adjust the lunar year to the solar year. The 13th month averages just 11 days.
shock and dismay of the villagers. It is a sacred stone, and as such, cannot be merely replaced with another stone similarly carved. They pray for its return. In the program, images of the three stones come from archival photographs taken in the early 1900's.

A second calendar stone is the Year Stone; it is divided into thirteen vertical bars which represent the number of moons observed during a solar year (see illustration, opposite). The Year Stone is used to mark the passing lunar cycles. As the Hupa knew well, thirteen bars are required, since there are over 12 lunar cycles in a year. The thirteenth Hupa "month" is a short month. Each lunar cycle is associated with certain activities and ceremonies. In the winter, men and women live separately. In the spring, fishing season begins: there is an eel run in the Trinity followed by the salmon run. In late spring, there is courtship and marriages; men and women live together for the summer. There is proper time for harvesting of grains and acorns, for hunting and fishing. Ceremonies and awareness of the cycles of sun and moon help the people maintain harmony with nature.

The Hupa begin a new calendar year at the first waxing crescent moon after the winter solstice tying together the lunar and solar years. To determine the day of the winter solstice, a spiritual leader, known as "world walker," has the task of going up into the high mountains above the village and observing the rising point of the sun on the horizon. On the winter solstice, the sun rises from behind Mt. Lassen, a small but distinct peak on the horizon. In this way, the lunar calendar is reconciled with the solar cycle and the people maintain harmony in annual cycles. Together, the lunar and solar cycles form the basis of the ecological, social and ceremonial calendar of events by which the Hupa regulate their lives.

In a second activity, visitors hang markers on the horizon to track the position of sunrise at twelve times during the year. The pattern of the markers shows the yearly cycle of the sunrise positions, with the extreme points at the summer solstice in June and the winter solstice in December.

We continue to explore the Native American knowledge of horizon astronomy at Medicine Wheel in northern Wyoming. Here, the visitors mark the sunrise and sunset positions at the summer solstice which align with the stone cairns. At over 10,000 feet elevation and snowbound in the winter, Medicine Wheel is only accessible from late spring through September. It is not surprising that there is no winter solstice alignment there.

Traveling south, our third site is Chaco Canyon. Here, we recreate the supernova of July 5, 1054 A.D. Visitors are asked to imagine that they are Native Americans observing the sky on the morning when the supernova first appeared next to a waning crescent moon. Visitors sketch their observations with colored chalk on black paper. Then, they compare their sketches with real petroglyphs from throughout the southwest and Mexico which are believed to represent the supernova. One Native American drawing contains the image of a rabbit, which commonly represents the moon in southwestern cultures. We illustrate the "rabbit in the moon" which is easier for most people to picture than a "man in the moon." The Mimbres Indian pottery (described by Dr. R. Robert Robbins, University of Texas) shows the rabbit moon and the star together.

At our fourth site, visitors learn that the planet Venus played a central role in the Mayan creation myth, the Popol Vuh. In parts of this creation story, Venus is represented as a ball in a ball game, as it alternately goes up and down in the east as the "morning star" and up and down in the west as the "evening star." The Mayans kept such accurate records of the cycles of Venus that they would have error of no more than 2 hours in 500 years. It is a great misfortune that in the Spanish conquest, nearly all of the Mayan books and records were destroyed. The "day keepers" who kept the records were forbidden to use their traditional language for record keeping and so they could only continue to keep writings in Latin which they learned from the conquerors.

The last site we visit in Astronomy in the Americas is Machu Picchu in Peru. Here there are also horizon alignments associated with the summer and winter solstices. Throughout the program, we illustrate the prevalence of horizon astronomy in Native American cultures — noting where the sun, moon and planets rise and set. Most cultures have used the clockwork of the heavens to keep their calendars. It is, after all, one of the most reliable clocks in existence. Beyond this rather mechanical view, Native Americans know the heavens to be one of many sacred elements in the natural world. The more one knows of the sacred elements, the more one can partake of the harmony all things.

Who Discovered America?

Our other planetarium show is Who Discovered America? We begin by asking visitors to respond to the very real question, "Who do you think discovered America?" Visitors always mention Columbus.

As we present Who Discovered America? we consider the real questions and conditions that led to Columbus' voyages and try to dispel a few myths. For instance, Columbus did not prove, as many today believe, that the world is round. Most intelligent people of the time knew that the world was a ball. The essential question for Columbus centered on the size of the world and whether or not it was possible to navigate westward across the great Ocean Sea without starving to death in the process. There was great economic incentive to acquire the highly valued goods...
Columbus’s World Map

North

THE INDIES

EUROPE

AFRICA

Modern World Map

North

ASIA

NORTH AMERICA

EUROPE

AFRICA

SOUTH AMERICA

ANTARCTICA

South

Record Latitude Here:

Spain:  
Canary Islands:  
Mystery Island:  
from the Indies, the Far East.

To understand how the size of the world affected Columbus’ plans, our planetarium visitors look at two globes (see illustration comparing world maps). One globe shows the smaller world that Columbus postulated with a relatively narrow ocean between the Indies and Spain. The other globe is about 50% larger corresponding to the more accepted size that had been known since the time Eratosthenes. With this larger globe, the ocean separating Spain from the Indies was dauntingly wide — if one did not know of the intervening continents — it was a three month voyage in a ship capable of holding only one month’s provisions! Columbus must have been a good salesman; he was funded by the Queen even though the academic community voted against him.

While voyaging with Columbus, planetarium visitors learn how European navigators of the 1400’s determined latitude by measuring the altitude of Polaris. Each person uses a small quadrant to measure Polaris’ altitude in the planetarium. Due to parallax variations, the first measurement places each visitor in a different part of Europe, anywhere between Spain and Norway! In a simulated voyage from Spain to the Caribbean, volunteers from the audience act as navigators to determine latitude and to adjust the “magnetic” compass, a special effects projector which simulates a ship’s box compass. A final set of readings is made on a “mystery island” where Columbus was marooned with his crew for over a year. The visitors are challenged to discover where in the world Columbus landed by determining the latitude and longitude of this “mystery island”.

Once in the Caribbean, visitors learn of Columbus’ interaction with the people he and his crew encountered. For many months the natives gladly supplied Columbus’ men with food. After a time, however, they wearied of this burden, and, as the story goes, Columbus said that if they did not continue providing food, his God would be displeased and make the moon rise blood red in color. Columbus’s son, Ferdinand, later wrote that when the lunar eclipse that Columbus predicted actually occurred, the natives were so frightened that they promised to resume supporting Columbus and his crew.

We point out that it is very likely that Ferdinand’s account is an exaggeration. Native people in the Americas knew the sky and were aware of eclipses. In fact, the Mayan day keepers on the nearby mainland had been able to predict eclipses quite precisely for centuries prior to Columbus’ voyage. We use the story mainly to launch a modeling activity on how eclipses occur. A light source in the center of the planetarium represents the sun and each visitor’s head is an “Earth,” and each “Earth” is provided with a Styrofoam ball “moon” to model lunar and solar eclipses.

Columbus attempted to determine his longitude by timing the eclipse. He compared his observations with the predicted time of occurrence in Europe to compute the number of “hours” he was west of Spain. To explain this concept to our planetarium visitors, we compare Columbus’s method with making a telephone call. A friend in California (at 8:00 p.m., PST) calls a friend in New York who reports the time being 11:00 p.m., EST; California is 3 hours west of New York in longitude. We do not confuse matters by introducing the concept of degrees as well. Of course Columbus had no phone, so he had to observe a celestial event that everyone in Europe could observe simultaneously, and then compare notes as to the time of the event after he returned to Spain. Visitors in our program use small hour glasses (sand clocks) to time the occurrence of a lunar eclipse (Sky-Skan special effect), much as Columbus did.

Now, visitors can determine the location of the mystery island from the latitude recorded earlier, and the “hours west” measurement of the lunar eclipse. By plotting the latitude and longitude on Columbus’s World Map (see illustration), visitors discover why Columbus thought he was near the Indies. Then, using the Modern World Map (see illustration), they locate Columbus in the Caribbean on the small island of Jamaica.

After we note the contributions of Amerigo Vespucci in accurately mapping the coast of South America, and determining longitude much more precisely than Columbus did, we return to the original question “Who discovered America?” It is odd, to say the least, to consider the Americas discovered by Columbus when they had already been inhabited for many thousands of years. We present evidence of others who came to America before Columbus: Chinese, Vikings, Irishmen, and Africans. Visitors record the voyages of the earlier “discoverers” on a map (see illustration). Of course, all of these voyagers are new comers when compared with the Native Americans. Certainly, the first people to migrate to this continent over the Alaska-Siberia land bridge many thousands of years ago discovered America in a fundamental sense. (See time line in illustration.) Yet all the subsequent visitors to this continent — Chinese, Africans, Vikings — discovered America in a different way. Columbus discovered something — that he could sail westward, make landfall, and return to Spain without dying of starvation, but he thought that he had sailed all the way to Asia! Vespucci realized that he was most certainly not in Asia, so his discovery included the realization that he was visiting a “new” continent (new to the Europeans). In final analysis, the question, “Who discovered America?” is not easy. It is our goal that visitors will come to realize that there is not a simple answer to this question. Fundamentally, all answers depend on how one defines discovery.

It is tragic that the contact between European and Native American cultures was so catastrophic and devastating to the Native American cultures. Within 50 years of contact, the tribe that happily welcomed Columbus was completely destroyed — no survivors. It is sad that we are
"Who Discovered America?"

Native Americans have lived in the Americas for over 15,000 years.

Negroid Africans traded with Natives in Central America for over 2,800 years ago.

Chinese missionaries visited the west coast of the Americas about 1,500 years ago.

Vikings built a settlement in Newfoundland about 1,000 years ago, and stayed 20 years.

Christopher Columbus sailed westward across the Ocean Sea 500 years ago. European colonization of the Americas began and changed the World.
so slow to learn lessons from our history. Human history is filled with clashes between cultures. Perhaps by increasing our awareness of the natural world, we can all share an appreciation of the common ground that connects all people and allows us to live in harmony with each other as well as the natural world. After all, aren’t we all looking at the same sky, seeing the same stars, watching the same sun, moon and planets?

Astronomy of the Americas and Who Discovered America? will be available as a part of the PASS (Planetarium Activities for Student Success) series, and in the 1492: Two Worlds of Science School Kit. Both publications will be ready in late spring of 1992. If you are interested in advance ordering information, contact:

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Lawrence Hall of Science
University of California
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fax: (510) 642-1055

SOUTHEAST PLANETARIUM ASSOCIATION (SEPA)
No report. Bob Tate, representative.

SOUTHWEST ASSOCIATION OF PLANETARIUMS (SWAP)

SWAP welcomes home Bow Walker of the Hudnall Planetarium in Tyler, Texas after his recent surgery. Jim Greenhouse, formerly with Science Place 2 Planetarium is now at the Don Harrington Discovery Center in Amarillo, Texas. John Cotton is now administering the duties at Science Place 2. Don Garland of the Fort Worth Museum of Science and History is relaxing after a tremendous six-month success with the SOVIET SPACE exhibit. Donna Pierce’s 35th Rice University Reunion was held at Houston’s Museum of Science, Burke Baker Planetarium.
Wayne Wyrick of the Kirkpatrick Planetarium in Oklahoma City recently ran “Geovator,” a multi-sensory trip to the center of the Earth. Sponsored by local oil and gas companies, this trip in time was a huge success.
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For further information contact:
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PLANETARIUMS
ONLY FROM THE MIND OF MINOLTA
I've collected gourds from a friend's garden again: props for the 2nd annual presentation of "Follow the Drinking Gourd" for 11th grade English students. I described the program in this column for June 1991 Planetarian. The basis for the program, as you will recall, is a poem whose author is unknown; the title refers to the navigational aspect of the Big Dipper. It appeared in slavery days in America and is an example of what Virginia Commonwealth University music professor Christopher Brooks calls a "map song," whose words gave instructions for escaping to the North without attracting the attention of slave owners. The response to that article prompts me to print the poem herein:

When the sun comes back and the first quail calls,
Follow the drinking gourd,
For the the old man is a-waiting for to carry you to freedom
If you follow the drinking gourd.

The river bank will make a very good road,
The dead trees show you the way,
Left foot, peg foot traveling on
Follow the drinking gourd.

The river ends between two hills
Follow the drinking gourd.
There's another river on the other side,
Follow the drinking gourd.

Where the little river meets the great big river.
Follow the drinking gourd.
The old man is a-waiting for to carry you to freedom,
If you follow the drinking gourd.

The "old man" may refer to a large river, perhaps the Mississippi. "Peg Leg" Jones was a well-known leader in the movement to facilitate slave escapes. This is also a song recorded by folk singers in the 1960's. If you would like a copy of the song, send me a blank audiotape and I will send it back with the song. Katherine Becker, IPS Executive Secretary from Omaha, Nebraska, has found two books dealing with the subject. One, The Drinking Gourd by F.N. Monjo, is a paperback children's book, and the other is Follow the Drinking Gourd by Jeanette Winter, ISBN 0-394-89694-7, Knopf, New York, 1988. She says the pictures in the second one are very good and would look good on a dome. Hey, if it looks good on a dome, then it has found a home. The word "poem" starts me rhyming ... sorry about that.

Overheard

-At Jane Hastings' planetarium in Richmond, Virginia, during a lesson on latitude and longitude for 4th graders

...Student: "My TAG (Talented and Gifted) teacher told me there were equators on the moon!"

-from planetarians who have recently ordered something from The Astronomical Society of the Pacific, "for the amusement of our customers": "... as responsible ... science enthusiasts, we join ... in a push for new laws that will mandate the ... placement of ... warnings on ... every product in every category offered for sale. Our suggested list of required warning appears below:

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IMPORTANT NOTICE TO PURCHASERS: The Entire Physical Universe, Including this Product, May One Day Collapse Back into an Infinitesimally Small Space. Should Another Universe Subsequently Reemerge, the Existence of This Product in That Universe Cannot Be Guaranteed."
If you've watched this space in the past few issues you've seen our advertisement depicting one of the beautiful David Malin deep space images (the Eagle Nebula, M-16) which Sky-Skan now offers as 6-frame All-Sky sets.

We thought you'd like to see what the same image looks like on the dome, and how insignificant is the shadowing caused by a star projector that isn't on an elevator. We've made up a stack of color prints, shot with a fish-eye lens directly off the dome. They're suitable for framing, or for inclusion in a funding proposal if you don't have an all-sky system. The picture is remarkable. One look will make you a believer. Call or write and we'll send you one.

Sky-Skan, Inc.

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Planetarium: Castellon, Spain.
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For more information on the planetarium system that makes an astronomical difference, contact: Evans & Sutherland, Jeri Panek, DIGISTAR Sales Manager, 600 Komas Dr., Salt Lake City, Utah 84108, Tel: (801) 582-5847

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