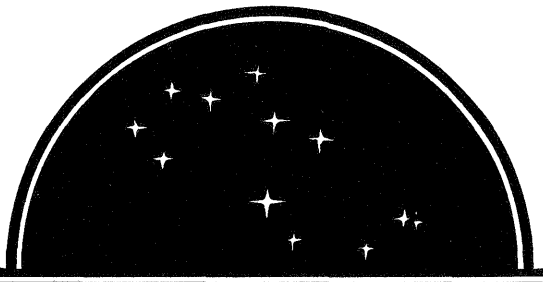

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Journal of the International Planetarium Society

Vol. 17, No. 1, March 1988

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Vol. 17, No. 1
March 1988

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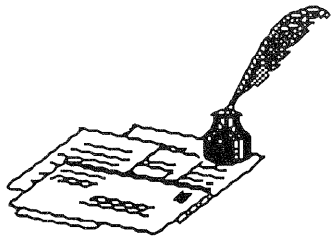
Letters to the Editor



The first three letters here deal with Christmas star shows and with the questions raised in the last issue. Letters are printed in the order they were received.

I have been on the fringes of and devil's advocate for Carl Wenning's argument against the traditional program. I prefer to respond to my "gut" reaction rather than to the questions.

We planetarians express to the public that the scientific process is one that is open and self-correcting when new information is discovered. The Christmas Star debate continues to be an example that the scientific process is just as closed-minded as the rest of society. Those who propose planetary conjunctions (including yourself), simply prefer to ignore the facts. Nothing astronomical moves the way Matthew describes.

We continue to present traditional Christmas Star programs touting the predictive powers of astrology for six weeks, and then push "real science" for the other 46. We mislead the public and confuse our patrons with this misleading "show."

I believe that Carl Wenning's point is well-taken: Change your planetarium show to present all the possibilities or don't present it! (I think many people are close-minded or too lazy to revise this show to include all the possibilities. Sherm may have forgotten the laziness factor.)

IPS, as a professional organization (that's why I continue to pay the membership dues, so that the organization will show leadership on sensitive topics), needs a position statement about how the star should be presented ethically to the public.

Jeffrey Hunt
Aurora, Illinois

(If I may comment, if ***conjunctions*** *is not both a plausible and a scientific explanation, what is? A "manifestation of the presence of God," as advocated by Wenning? And your argument "to present all the possibilities or don't present it!" is hardly scientific. That argument is used to justify the inclusion of creationism in school science textbooks. —JM)*

I must take issue with your recent editorial characterization of Dr. Sherman Kanagy of Purdue University as the "Jeremy Rifkin" of the planetarium community. I believe that the comment is inappropriate and entirely unfounded.

Perhaps I know Dr. Kanagy better than anyone else in the planetarium field. We spent many long hours discussing scientific and philosophical issues while he filled a three-year temporary position at Illinois State University from 1979-83. During this time I found him to be intelligent, open minded, intellectually honest, and fair almost to a fault.

Because of his deep interest in the true nature of the mysterious Star of Bethlehem, Dr. Kanagy has turned up the heat on the simmering cauldron of ideas used to explain the nature of the "star." Deep and prolonged study of this issue will, I feel, shed new light on the Star of Bethlehem question. Rather than thinking of Dr. Kanagy as a pariah of this community, I like to think of him as its conscience—needling us and making us feel uncomfortable with unresolved issues.

The editor has a deep personal interest in the Star of Bethlehem mystery and has contributed significantly for which he is to be commended. I would encourage him to continue work in this effort. I would suggest, however, another venue for dealing with the heat created by Dr. Kanagy. Criticize his techniques, hound his interpretation of data, attack his underlying assumptions. But please, refrain from character assassination!

Carl J. Wenning
Normal, Illinois

(I suspect that Jeremy Rifkin, who also sees himself as

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the conscience of the discipline upon which he has chosen to inflict himself, would object to your term "character assassination." The comparison might be taken as a compliment. It was intended to be purely descriptive. —JM)

Dear Sherm:

1) Earnest churchgoers desperately want science to confirm their expectation that the Star was not only a miracle, but a verifiable event. Regardless of such expectations, however, my understanding is that the magi probably *were* astrologers. Consequently, they would have known about upcoming conjunctions, and there were several—not just the single Jupiter/Saturn encounter that you refer to in your letter—that might fit into the window between the time that Joseph and Mary were summoned to Bethlehem and the death of Herod.

2) It is emphatically *not* true that all astronomy educators present astrology merely as an outdated, superstitious belief. Many of us consider astrology to be a parent discipline of astronomy, and although today it is not considered a science, at one time it was a highly respected profession. Likewise, it is emphatically *not* true that all astronomy educators present the conjunction hypothesis as fact. Perhaps the wording of your question was intended to provoke a response, but frankly I resent the implications regarding my own ethics and those of my colleagues.

3) Most Christmas shows I have seen are very careful to separate facts from hypotheses. Furthermore, the particular omission you mention is by no means a deception. Assuming for the moment that the conjunction hypothesis is correct, it is entirely possible that the magi, who were astrologers, were aware that the Star was a conjunction of two or even three stars; but Matthew was not because he was not an astrologer. This seems a trivial point to make in a short program for the lay public.

4) This point really disturbs me. Please re-read your own letter. On page 1 you say that planetarium instructors typically present astrology as actually "working" to produce the Christ child, and one page 2 you say that they end their program by saying it did nothing of the kind. You can't have it both ways either. The important issue, I believe, is how appropriate is it to say that we really don't know the answer to the question "What was the Star of Bethlehem?" And that the failure of modern scientists to answer that question should not detract from the beautiful sentiments expressed in the bible. In my view, both parts of the statement are an entirely appropriate way to end a planetarium show on this topic.

Let me close by suggesting that you publish a statement of your own views in *The Planetarian.*

Cary Sneider
Berkeley, California

(A concise statement by Dr. Kanagy of his views and of what he would have us do would be welcome. —JM)

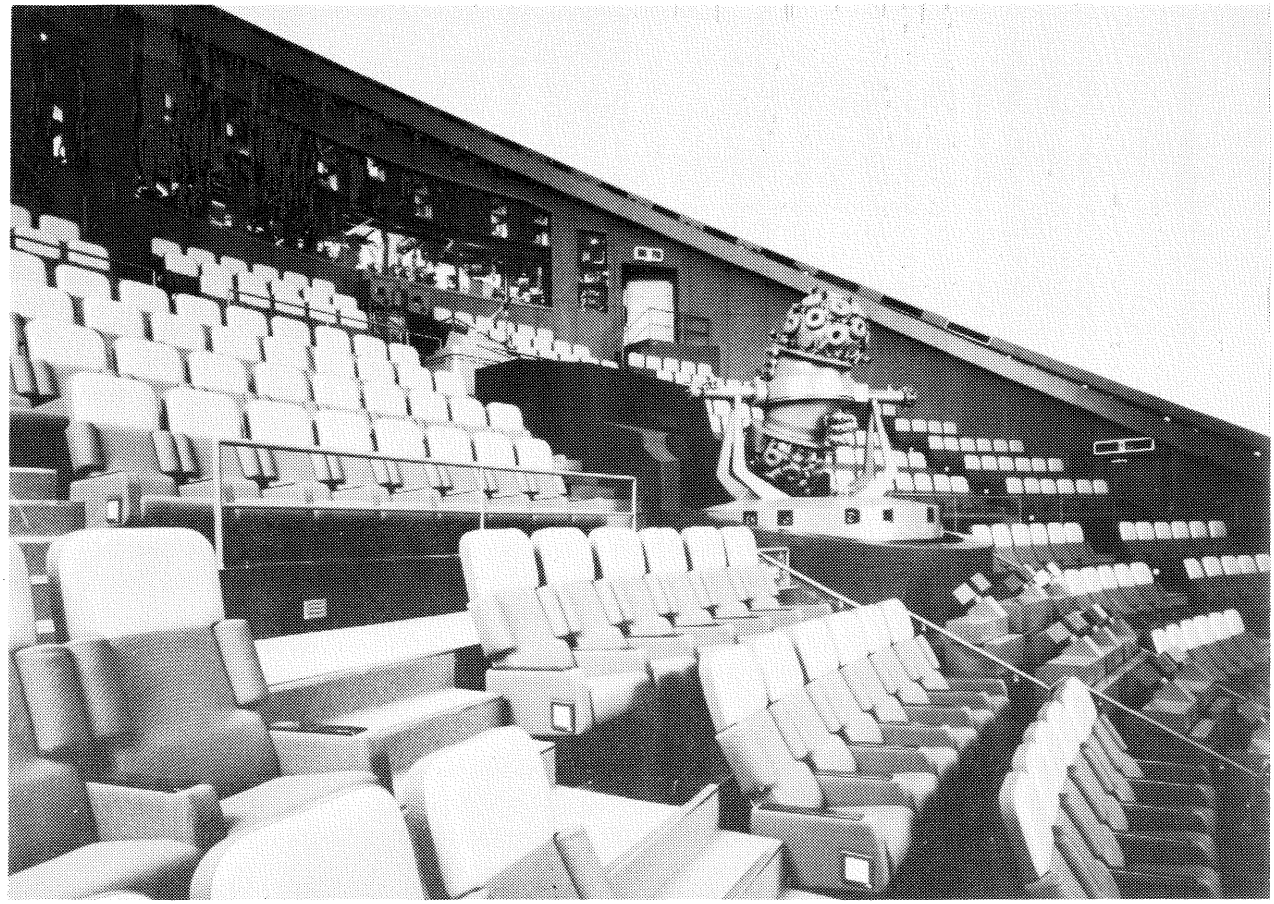
Planning NewPlanetariums

Most planetarians have worked with, or are familiar with, planetariums that suffer from poor design and/or inadequate construction. Indeed, hardly a meeting of our profession goes by without the sharing of "horror stories" of inadequate electrical wiring; lack of proper production space; inadequate dome clearances and rear dome access; improper light and sound insulation; and so on. Often, I believe, many of these problems are due to sheer ignorance and/or lack of experience on the part of the architects, consultants and/or planners that plan, design, and often virtually complete the construction of new planetariums before an experienced planetarian is even hired for the facility. And, ultimately, we as professional planetarians are the ones who must live with the results. Therefore, I feel we owe it to ourselves to do all we can to prevent such blunders—before concrete is poured and wires are connected.

At the most recent meeting of the IPS Council in Cocoa, Florida, I proposed that the IPS compile and publish a set of suggestions, recommendations and guidelines for planning and designing new planetariums of various types. This publication would attempt to compile general truths about proper planning and design of new planetariums based on our collective wisdom and experience. It would also warn of the all-too-common pitfalls to avoid. When completed, this publication would be made available to and promoted among architectural and planning circles.

The IPS Council approved this proposal and set up a committee to prepare this publication. I agreed to serve as acting chairman. My first task is to solicit members for the committee. If you would like to help prepare this new publication by serving on the committee, please write to me. I hope that we can have our first committee meeting at the upcoming IPS conference in Richmond. If you don't feel you have time to serve on the committee but do have comments, suggestions, horror stories, etc., please jot them down and send them to me. And, I'm certain that, as the work of the committee progresses, we will be soliciting future input from the planetarium community at large.

Ken Wilson
Ethyl Universe Planetarium/Space Theater
2500 West Broad Street
Richmond, Virginia 23220



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From the Editor's Keyboard

If this issue seems late, that's because the publishing dates were adjusted last autumn. *The Planetarian* now bears cover dates of March, June, September, and December—the equinoxes and solstices—with **final** deadlines for all material now being the 21st of the second month preceding the publication date (ie., January 21 for the March issue, April 21 for June, July 21 for September, and October 21 for the December issue). The theory is that I will complete the layout by the end of the deadline month and take it to the printers the following week, and that it will go to the mailing service about three weeks later. Hopefully, you will have the magazine in your hands sometime during the cover month.

Each issue fills up early, so please submit your articles well in advance of the deadline if it needs to appear in a specific issue. And potential authors should check the revised guidelines printed on page 74.

Issues are sent to subscribers outside of North America by air mail. I'd like to know of excessive delays in receiving issues. If you haven't received the March issue by the end of April, that's excessive.

Jordan Marché, our Associate Editor for scripts, reports that he has selected three referees to judge the Eugenides Foundation Script Contest: Lee Ann Hennig and Walt Tenschert, both of Alexandria, Virginia, and Ian McGregor of Toronto, Canada. All are long-standing I.P.S. members and recently appointed Fellows with plenty of experience in program production. There were 14 entries. These should provide for a fair contest and may permit the revival of the I.P.S. script bank. We're all eagerly awaiting the results.

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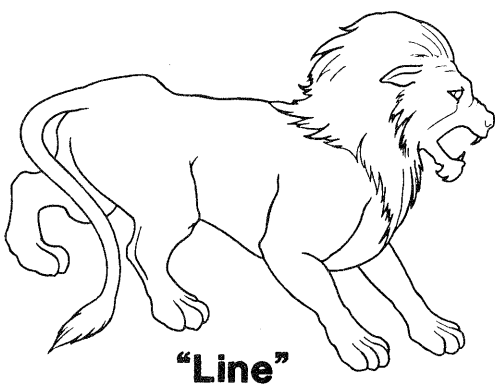

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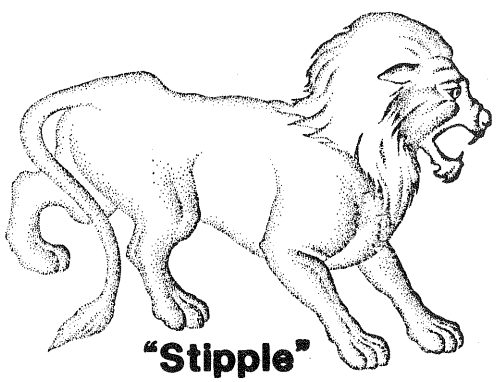

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Technical Standards for Planetariums

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In recent years much has been said and written about the future of the planetarium, with some proclaiming it a dinosaur, marked for extinction, and others convinced that new technology will save us from the unemployment lines.

My own thoughts on the subject run along different lines. I still have faith that the planetarium is a unique facility in any community. Often we feel in competition with motion picture theaters, light shows, and who knows what else in the entertainment field. But stop and think... who did they call to find out about Halley's Comet? Apparently we still have something to offer society after all.

Many of our problems are a result of our own haphazard adoption of new planetarium technology. Twenty-five years ago any program could be run in any planetarium since all planetariums were similarly equipped, having a lecturer to read the script, a slide projector to show graphics, and the planetarium projector to make the stars and planets and to show motions. Things don't work like that now, as a glance at Table 1 will show.

...how much would you pay to see someone's home movies?

Perhaps a little myth will help to illustrate the situation. There once was a marvelous new invention which appeared in a very large city. It was called the motion picture projector and people came from far and wide to see the moving images made by this marvelous invention and to be entertained by it. Some of the people who came to see the movies wanted people in their communities to experience this new educational and entertaining invention, so each of them, upon returning to his own community, marched down to the nearest

Table 1

Typical Planetarium Equipment (circa 1961)	Typical Planetarium Equipment (1988)
1. Star projector	1. Star projectors
2. One slide projector	2. 1-20 slide projectors
3. A few special effects (meteors, constellation outlines, etc)	3. Zoom projector
4. Record player or tape player	4. Slew projector
5. Lecturer with projection pointer	5. Horizon system
	6. All-sky system
	7. 16mm motion picture
	8. 35mm motion picture
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	10. Projection video
	11. 1-8 track tape player
	12. Rotators
	13. Anamorphic rotators
	14. Atmospheric effects
	15. Strobes
	16. Lasers
	17. Dissolvers
	18. Computer systems
	19. Other special effects
	20. Lecturer with pointer

machine shop and described what he had seen at the marvelous new entertainment facility in the big city.

With only a description of the end result, each machinist designed his own version of the motion picture projector for the local community. Along with these projectors, cameras were also designed and built by the machine shops. Small chemical factories in each community were employed to produce film stock which could run on the new camera and projector, and each theater went out to make its own movies on topics of interest to the local citizens.

Some of the movies made by the local theaters were quite good, but since every theater had its own format of film and its own design of projector, none of which ran at the same speed or used the same size film, the movies could not be shared from one city to another. The good movies could only be seen in the theaters which had produced them.

But most of the movies weren't particularly well made, nor were they exciting and entertaining to the local citizens. Unfortunately, funding was not available for each film crew to travel all over the world to make interesting movies. Expert writers, producers and photographers could not make a living working for the small theaters. Once the local citizens had seen a few of the low-budget local productions, they saw little reason to return, and the local theaters faltered, slowly slipping into disuse.

But can you blame the patrons? After all, how much would you pay to see someone's home movies?

Could the planetariums of this nation profit by standardizing operations and equipment?

We in the planetarium production game are producing home movies. Some of them are good, some aren't, and for good reason. Tens of millions of dollars are spent on the production of each block buster movie. This expenditure can be justified because literally tens of thousands of theaters all over the world will be showing these movies. The reason they will be showing them is because the motion picture industry has a set of standards so that all theaters are equipped with compatible projectors and sound systems which can be used to show every movie made.

Could the planetariums of this nation profit by standardizing operations and equipment? I think so. In the sixty or more years that planetariums have been in operation, less than 100 programs have been offered for sale or trade. The reason more programs aren't available is that they tend to be performed on only one set of equipment in one planetarium. On my shelves are about a dozen planetarium programs which I did not produce. Since my equipment isn't normally set up to show these programs, I rarely use them in any form and I have never run one exactly as it was designed to run.

If, however, all these programs had been written with some standard projection format in mind, then once I had set up my equipment to show one of these programs, I could show all of them merely by changing one tape and a few slide trays!

Further, if 500 planetariums in this country were all set up with the same projector fields, had compatible control systems, and similar sound equipment, then these 500 planetariums could pool funds to hire the best writers, the best artists, the best musicians, and produce fantastic planetarium programs which would run perfectly in every one of the 500 planetariums.

The program would arrive in a big box, with opaqued slides already in their proper trays, with unique special effects projectors ready to plug in and with an audio tape ready for the recorder. Set up would be a snap! We could easily compete with motion picture theaters because we would have a really top-notch product to offer to the public rather than "home movies".

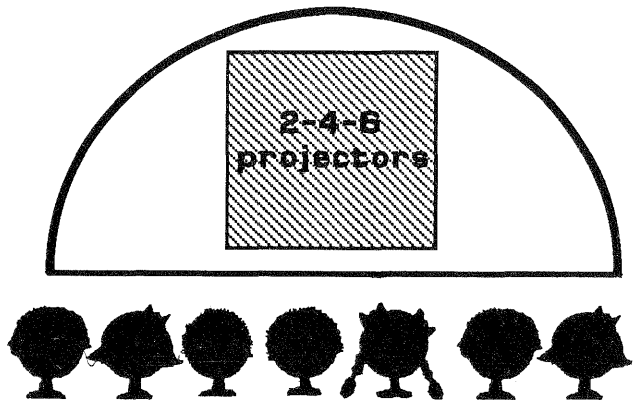
All this will never happen until we agree on a set of technical standards and commit ourselves to implementing them in every planetarium.

How To Implement Standards

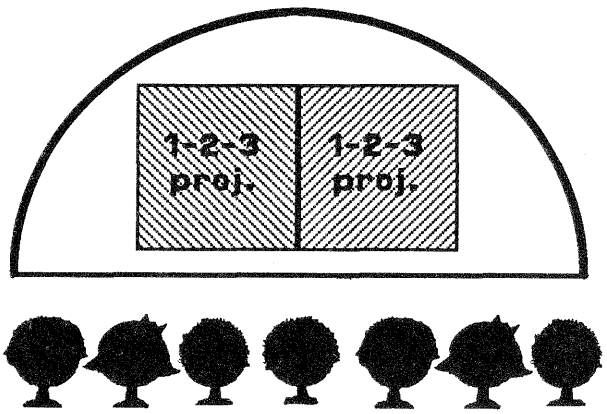
In most industries, when standards are set, it is done in one of two ways. First a professional organization of some sort meets, recognizes the need and forms a study committee to write standards. Fortunately, we don't even have to think about how many threads per inch there are on the bolts we buy at the hardware store, or the size of tape we need for our recorders, or the number of sprocket holes in a roll of 35 mm film, since all of these items meet standards set by some professional standards committee.

Often in the absence of a professional standards committee, the standard is set by industry itself. Right now home video players come in Beta and VHS formats. These two formats are battling it out in our domestic market and VHS seems to be pulling ahead, but the dust is yet to settle. At some point, a standard will have to be specified for home video.

Center Projector Field



Side Projector Fields



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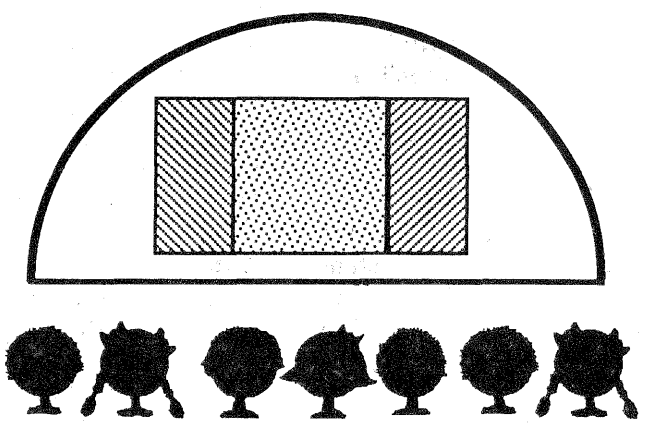


In our planetariums there seems to be no way to have a committee settle on a set of technical standards. At one time, a standards committee formed by the I.P.S. looked at the problem and decided there was no solution. Since I.P.S. has as its only purpose the improvement of communication among planetariums, this failure is not surprising. Since I.P.S. produces no needed product, there is no incentive for planetariums to give up their diversity to accept technical standards.

While we may recognize the need to standardize our facilities, without a good incentive, few of us will actually do it. Incentive could come in easy ways, however. If the Strasenburg Planetarium had specified a set of projector formats and audio tape standards when it first offered a program for sale, then anyone who had ever shown a Strasenburg program would be on their standard. Other planetariums selling shows would probably have adopted the same standards.

Our incentive, therefore, can come from the groups who are producing and distributing planetarium programs. *If three or more major distributors of programs would agree to produce their programs along a standard format, then within a year nearly every planetarium would be set up to show hundreds of planetarium programs, as planetariums on the standard started producing their own shows.*

A set of standards should contain the following:

1. A standard field format for slide projectors
2. A standard audio tape format
3. A list of standard special effects projectors
4. A standard plug configuration for special effects projectors
5. A standard writing format for the script pages.

Once these are defined then everyone would know how to arrange their planetarium equipment so that it would rarely need any changes or new set-ups regardless of what program is being run.

Shortages in equipment would immediately be spotted, and priority could be given in the budget process to "raise the planetarium up to specified standards".

Since I don't sell programs I'll leave the actual standards to the program producers. Enclosed, however, is a sample of what such a set of technical standards might look like. I invite the producers and sellers of planetarium programs to meet jointly and establish a set of technical standards. Once this is done, all new programs will be produced to meet the standards.

Agreeing on standard formats, etc. doesn't require that you follow them in your theater if you don't want to,

just that all shows that are shared from one dome to another would be on the standard. Naturally our uniqueness is a necessity, and some of us want to experiment with all-sky projectors while others like to play with video. That's fine, but we should, at the minimum, be compatible with each other in the basics of our operations.

Sample Planetarium Standards

Definition: A planetarium is a theater with a domed projection screen used to study and display the environment and containing the following equipment:

1. A projector to show the relative positions of stars and solar system objects as seen from various locations on the earth at various times.

2. A set of slide projectors as specified below.

3. Additional effects projectors as specified below.

4. A sound system as described below.

Slide Projector Fields

Slide projectors shall be oriented in the dome to produce a center field with a left field and a right field which overlap the center field, so that the left and right fields touch at their common edge. This produces a 50% overlap of the center with the left and right fields. Projectors are to be assigned to fields in configurations as listed below depending on the total number of projectors available.

Total	Left	Center	Right
3	1	1	1
4	1	2	1
5	1	3	1
7	2	3	2
8	2	4	2
12	3	6	3

Special Effects Projectors

The standard configuration planetarium will have available the following special effects projectors:

1. A slide projector with zoom lens either mounted on an x-y platform or projected onto an x-y panning mirror to provide coverage over a major portion of the dome.

2. One or more rotating image projectors.

3. One or more distortion (ripple) projectors.

4. A projection orrery.

5. A partial-pan horizon projector system with three projectors and wide-angle lenses in adjacent fields.

6. Etc.

Sound System

The planetarium will be equipped with a four-track reel to reel recorder capable of running at 7½ and 15 inches per second.

Voice, music, and sound effects are to be recorded on channels one and two for stereo reproduction and control signals for dissolvers or computer control systems are to be recorded on channel four.

Script Format

Scripts are to be reproduced with the following information on each page:

1. Show title, author, or origin
2. Page number
3. Line numbers
4. Time codes
5. Event codes
6. Text

A sample is printed on page 15.

Projector Plug Configurations

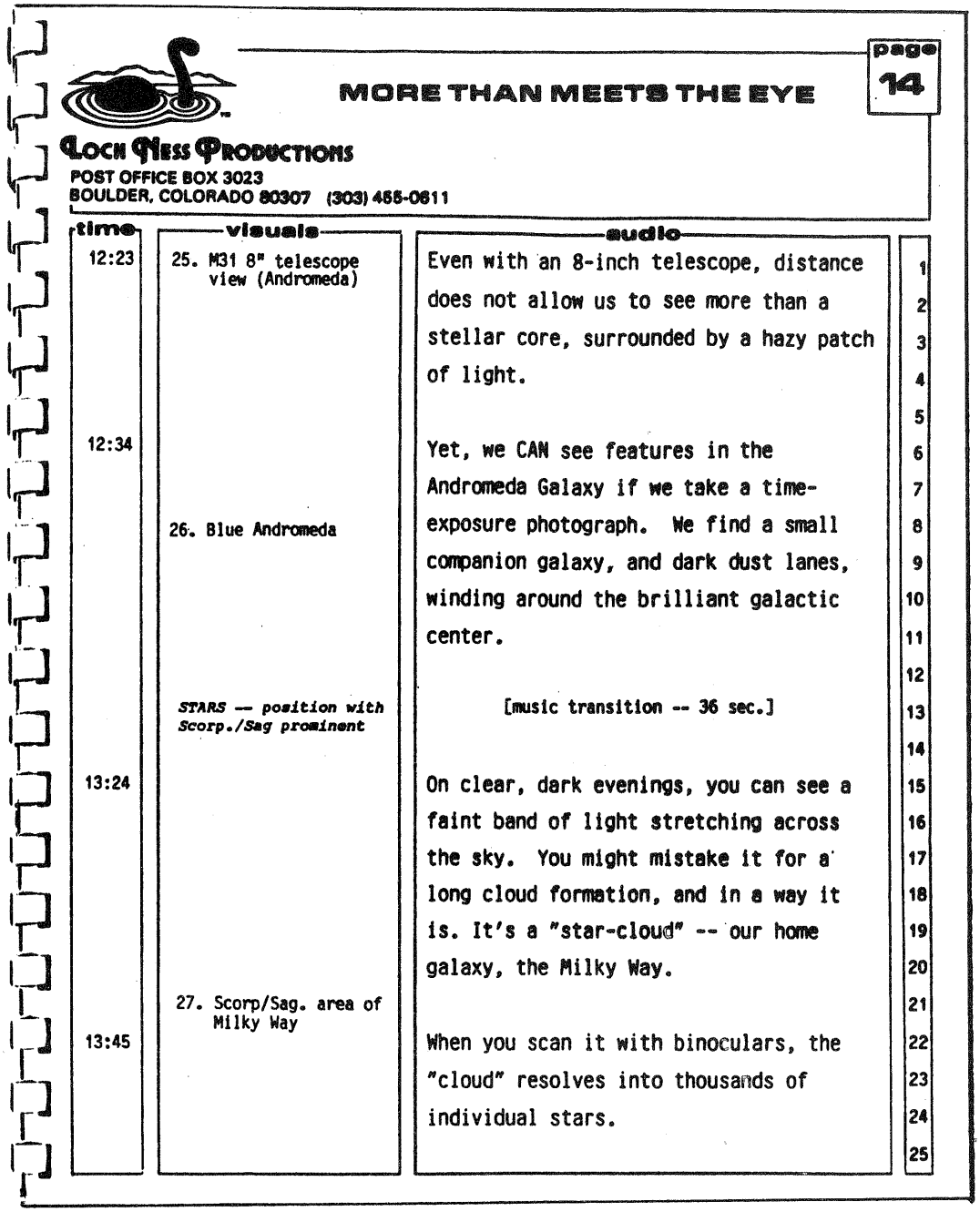
Special effects projectors, where possible shall be wired with the following specifications:

1. 120 volt a.c. lamps, fans, and special effects motors

2. All connections to the projector will be by the use of six pin Cinch-Jones type plugs with the following pin assignments:

Pin	Wire
1	120 volt common
2	fan (high 120 volt)
3	effects motor (high 120 volt)
4	lamp (high 120 volt)
5	ground
6	-

The "standard format" for scripts should contain 1) Text with line numbers, 2) Page numbers, 3) Title block, 4) Time cues, 5) Visuals indicators, 6) Machine sets and movements, 7) Music indicators, 8) Spiral Binding.



MORE THAN MEETS THE EYE

page 14

LOCH NESS PRODUCTIONS
POST OFFICE BOX 3023
BOULDER, COLORADO 80307 (303) 465-0611

time	visuals	audio	
12:23	25. M31 8" telescope view (Andromeda)	Even with an 8-inch telescope, distance does not allow us to see more than a stellar core, surrounded by a hazy patch of light.	1 2 3 4 5
12:34	26. Blue Andromeda	Yet, we CAN see features in the Andromeda Galaxy if we take a time-exposure photograph. We find a small companion galaxy, and dark dust lanes, winding around the brilliant galactic center.	6 7 8 9 10 11 12
	STARS — position with Scorp./Sag prominent	[music transition -- 36 sec.]	13 14
13:24		On clear, dark evenings, you can see a faint band of light stretching across the sky. You might mistake it for a long cloud formation, and in a way it is. It's a "star-cloud" -- our home galaxy, the Milky Way.	15 16 17 18 19 20
13:45	27. Scorp/Sag. area of Milky Way	When you scan it with binoculars, the "cloud" resolves into thousands of individual stars.	21 22 23 24 25

This page, courtesy of Loch Ness Productions, illustrates a good format for scripts.

SPIN Group Promotes Popularization of Astronomy

James Cornell
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60 Garden Street
Cambridge, Massachusetts 02138

In January 1984, at the invitation of the Kitt Peak National Observatory, a group of about a dozen public information specialists representing some of the country's major observatories and research institutions met in Tucson, Arizona, for two days of informal discussions about problems and programs of mutual concern.

The experience proved both profitable and promising, since many of the topics covered by that first session touched on some of the more troublesome aspects of information dissemination: copyright restrictions on certain astronomical photographs; sales, rental, and reproduction fees; announcements of multi-author/multi-institutional research; coordination of journal publication and news release dates; the development of broader national press coverage for astronomy; and the efficacy of using volunteers and amateur astronomers in observatory public programs.

The Tucson attendees vowed to meet again the following year, this time widening the base of potential discussants to include other institutions and individuals—indeed, inviting anyone with an interest, either personal or professional in the popularization of astronomy.

So was born the Science Public Information network, or the SPIN group, as it has been dubbed. (Other possible acronyms, including NUTS and PEST, were considered and rejected.)

Informal, unstructured, and unofficial, SPIN takes a certain pride in its complete lack of officers, dues, by-laws, and membership requirements. In fact, the only sign of organizational management is a mailing list maintained on the computer of the Smithsonian Astrophysical Observatory and used occasionally throughout the year to send news of interest or assistance to astronomy information specialists. Still, despite having none of the normal trappings of bureaucracy, the group has managed to hold three subsequent and very successful meetings; the second, again in Tucson in January 1985, under the aegis of the Smithsonian's Whipple Observatory; the next in January 1986 at the McDonald Observatory of the University of Texas, Austin; and, most recently, January 1987 at Caltech in Pasadena, California.

These annual gatherings, which usually involve a day and a half of free-wheeling roundtable discussions on a variety of topics combined with a couple of social events, are designed to promote the sharing of ideas and resources on a national basis. For the one-person PR office of a small observatory, the workshops are particularly valuable in providing tips on techniques for increasing the effectiveness of public programs without substantially increasing costs. But even for the representatives of larger institutions, the opportunity to meet with colleagues from other parts of the country has fostered better cooperation and coordination between offices representing the diverse interests of various researchers. This is especially helpful in an age of multi-institutional research programs, when the sharing of costs and efforts does not always result in equal treatment by the news media.

The Pasadena meeting was typical in its wide-ranging scope. SPIN members were briefed on new educational programs being planned by the Astronomical Society of the Pacific, got a status report on the Keck Telescope under construction on Mauna Kea, and heard about information efforts at the Mt. Wilson and Whipple Observatories, including plans for a new Visitors Center at the latter. A representative of AT&T International described the use (and costs!) of 900 telephone lines for public information services. The draft of SPIN's proposed "Astronomy Resource List" (sources of information, photos, and educational services for astronomy personnel) was distributed to attendees. And, reporters for the *Los Angeles Times* and the *Washington Post* described the needs of the popular media for astronomical news.

The highlight of the two-day meeting, however, was a trip to Palomar Mountain to tour the 200-inch Hale

*(Please see **SPIN** on page 23)*

Imax/Omnimax: Fad or Trend?

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It's been called the most dramatic breakthrough in cinematography since ***The Birth of a Nation****. It's the Imax/Omnimax phenomenon, and it's rapidly becoming one of the biggest audience draws in museums around the world. Where did it come from? And is it just a fad, or is it here to stay?*

In 1970, a newly formed Canadian company introduced a revolutionary motion picture system to the world. Called "Imax" (for maximum image), the 70-mm system projected a spectacular image of great clarity and impact onto a giant screen. The first film, *Tiger Child*, was shown at the *Expo 70* World's Fair in Osaka, Japan. It drew 30,000 people a day.

That was the beginning of the Imax and Omnimax phenomenon that has since captivated visitors at museums, amusement parks, world's fairs, and other locations all over the globe. By the end of 1987, there were 55 such theaters with an annual attendance exceeding 20 million—and the numbers are expected to double within five years.

Nearly two-thirds of the Imax and Omnimax theaters are operated by museums, planetariums, and cultural centers. The films are usually devoted to science and technology, space, and natural history. The theaters are found at such institutions as the National Air and Space Museum in Washington, D.C., the Yokohama Science Centre in Japan, the American Museum of Natural History in New York, the City of Science and Industry in Paris, the Science Museum of Minnesota in St. Paul, the Monterey Cultural Center in Mexico, the Museum of Science in Boston, and the Museum of Science and Industry in Chicago.

Museums are using the big-screened theaters to attract new audiences, increase revenues, and add a new dimension to their offerings. The super 70-mm Imax/Omnimax films frequently are extensions of exhibitions—particularly in the science and space fields—or they help to fill voids in exhibitions and programs. At other times, they provide unforgettable entertainment value to a fascinated public.

Nearest Thing to Being There

In the Imax system, the image is projected onto a giant screen which can be 10 times the size of a conventional motion picture theater screen. For instance, the Imax screen at the National Air and Space Museum is 48 by 75 feet (14 by 23 meters). An Omnimax theater uses a fish-eye lens to project the image on a tilted domed screen, virtually surrounding the audience visually. Most of the Omnimax theater domes have diameters in the range of 76 feet (23 meters), although they can run as small as 40 feet or as large as 85 feet (12 to 24 meters). Of the 34 institutional theaters, 11 use the Imax system and 23 employ the Omnimax technique.

Theater capacity is comparable with today's motion picture theaters. The Imax theater with the smallest capacity is the Edmonton Space Sciences Centre in Canada with 220 seats; the largest is at the Taman Mini Park in Jakarta, Indonesia, which has 758 seats. The International Space Hall of Fame in Alamogordo has the fewest Omnimax seats with 92 and the Fort Worth Museum of Science and History has the most seats with 358.

... is this explosion of theaters and the stampede to the box office a short-term fad or a long-term trend?

Key to both systems is the super 70-mm film and the unique "rolling loop" film movement. The film is 10 times the size of a standard 35-mm frame and three times the conventional 70-mm frame. The larger film size gives better picture quality. The rolling loop advances the film horizontally through the projector. Each frame is positioned on fixed registration pins and the film is held firmly against the rear element of the lens by a vacuum. As a result, picture and focus steadiness are far above normal standards.

The shutter also transmits one-third more light than conventional projectors, producing a brighter picture. Both systems incorporate a six-track stereo sound

system, with four screen channels and two surround channels. This gives the films their high-fidelity sound.

The films—usually 30 to 40 minutes in length—deal with diverse subjects: space exploration, the Grand Canyon, the thrill of flying, cultural history, undersea exploits, energy sources, transportation, animal life, the sun and the planets. A few are short features on computer graphics, volcanoes, and other topics. In general, the films tend to be documentary or experiential in nature.

When Robert Crippen, commander of two of the three Space Shuttle flights during which "The Dream Is Alive" was filmed, saw the first 70-mm film shot in space, he called it "the nearest thing to being there." It is this big-screen realism that impresses audiences, who feel they are experiencing the film action.

Film critics, writers, and viewers have been overwhelming in their praise of Imax and Omnimax. The *Los Angeles Times* said it was "a mind-rocking avant-garde motion picture system." The *Toronto Star* referred to it as "a panorama of sound and color." An article in the *Reader's Digest* used words like "colossal" and "stupendous" to describe the impact. Viewers have called the experience "magical," "breathtaking," "extraordinary."

Boost to Attendance and Revenues

Success stories are numerous. The Samuel P. Langley Theater (Imax), for instance, has contributed to making the National Air and Space Museum the most popular museum in the world, with an annual attendance of nearly 10 million. The William L. McKnight-3M Omnitheater at the Science Museum of Minnesota was largely responsible for increasing the St. Paul museum's membership from 3,000 to more than 28,000 since the theater opened in 1978. The Omnimax Theater at the Museum of Science and Industry's Henry Crown Space Center boosted the Chicago museum's overall attendance by more than 500,000 during its first six months of operation.

There have also been a few disappointments. For example, the American Museum of Natural History's Naturemax Theater (Imax) simply could not compete with New York's many attractions, and decided to focus on "capturing" visitors already in the building. In Los Angeles, the California Museum of Science and Industry's Mitsubishi Imax Theater initially had a difficult time attracting the public in the nation's movie capital, but attendance has picked up in the last year. Seattle has an Imax theater (Pacific Science Center's Eames Imax Theater) and an Omnimax theater (Omnidome Theater at Pier 50 Waterfront Park), and both have a tough time in the competitive market. Pacific Science Center theater sales, however, have increased considerably in the last few years.

In general, museums are pleased with their investments in Imax and Omnimax theaters, which usually run from $3 to $6 million. In most cases, the theaters give museums higher visibility in their communities, attract more museum-goers and members, increase the revenues, and enhance the visitors' museum experience.

"We are selling out nearly every show," stated John W. Jacobsen, associate director and head of theaters and marketing at Boston's Museum of Science. "The Omnimax theater has had a positive impact upon direct revenues, ancillary income, and membership."

Mike Day, director of the Science Museum of Minnesota's Omnitheater, echoed the opinion: "The Omnitheater absolutely has paid off for the museum. It serves as a resource center, audience builder, membership stimulant, and publicity vehicle. We expected interest to wane after about 10 years, but it continues to grow."

Short- or Long-term Trend?

An increasing number of museums have jumped on the Imax/Omnimax bandwagon. Since 1980, theaters have opened at museums, planetariums, and cultural centers—making a total of 34 Imax and Omnimax theaters (not counting those at 21 theme parks and entertainment centers). Fifteen additional have been presented at world's fairs and expositions. The total theater attendance keeps increasing at the rate of about 2 million a year.

But is this explosion of theaters and the stampede to the box office a short-term fad or a long-term trend? That is the question facing many museums that are trying to decide whether or not to take the plunge.

When Imax first appeared on the scene in 1970, the emphasis was on world's fairs and theme parks. The market changed, however, when the San Diego Hall of Science opened the Reuben H. Fleet Space Theater—the first Omnimax theater—in 1973. The basic Imax system was adapted to a dome configuration to encompass the audience and to permit the presentation of planetarium shows in the same theater.

Michael Sullivan, who was executive director of the San Diego Hall of Science at the time and is now an Imax/Omnimax consultant, stated then: "For some time now, it has been known that a new planetarium design was needed. This need is due in part to a growing

sophistication on the part of the planetarium audience, the expanded use of media in planetarium programs, and the desire of planetarium directors to diversify by offering programs not only in astronomy, but in related fields as well."

"Imax/Omnimax has had a longer life than most of us expected – and the future will be even better as the film base is expanded."

In the years that followed, most museums went the Omnimax route rather than Imax mainly because of the "sky show" possibilities. Imax and Omnimax equipment runs about the same (around $1 million), but the Omnimax dome construction is nearly double that of an Imax theater. Some museums favor Imax because of the lower investment and because of its sharper picture—a result of direct rather than fish-eye projection.

Today, museums constitute the biggest Imax/Omnimax expansion market, according to Graeme Ferguson, president of Imax Systems Corporation, which developed both systems and produces all of the equipment and many of the films.

"The number of Imax/Omnimax theaters and films will double by 1992," he believes, "with about the same split in types of theaters." Theaters and films have been doubling every five years, and he sees no reason for a slackening of the growth pace.

"It's not a passing fancy," asserted Jeffrey W. Kirsch, director of the San Diego Hall of Science and Reuben H. Fleet Space Theater. He believes Imax/Omnimax theaters are "a valuable part of any major institution's public programs." In addition to being entertaining, he said, "they stimulate thinking about the world around us."

Don M. Muchmore, executive museum director, California Museum of Science and Industry, stated, "Imax/Omnimax has had a longer life than most of us expected—and the future will be even better as the film base is expanded."

Kirsch points out that Imax and Omnimax theaters may face difficulties if they operate within markets that have a population of less than 1 million. That, and inadequate marketing and advertising usually explain failure in growth. Linda Johnson, associate director of programs at the Fort Worth Museum of Science and History, is a firm believer in the need for marketing; intense marketing has been instrumental in the Omnimax theater's success in Fort Worth, where the museum's attendance has increased 150 percent to more than 1 million since the theater opened in 1983.

Spawned by World's Fairs

The Imax idea had its origin in 1967 when three

TABLE I

American Museum Imax and Omnimax Theaters

Institution and City	*Opened*	*Type*	*Seats*
Alabama Space and Rocket Center, Huntsville	1982	Omnimax	277
American Museum of Natural History, New York	1982	Imax	598
California Museum of Science and Industry, Los Angeles	1984	Imax	420
Denver Museum of Natural History, Denver	1983	Imax	441
Detroit Science Center, Detroit	1978	Omnimax	250
Fort Worth Museum of Science and History, Fort Worth	1983	Omnimax	358
International Space Hall of Fame, Alamogordo, N.M.	1980	Omnimax	92
Kansas Cosmosphere and Discovery Center, Hutchinson	1980	Omnimax	107
Kennedy Space Center's Spaceport USA, Cape Kennedy	1984	Imax	442
Maryland Science Center, Baltimore	1987	Imax	422
Museum of Science, Boston	1987	Omnimax	334
Museum of Science and Industry, Chicago	1986	Omnimax	334
National Air and Space Museum, Washington	1976	Imax	483
Pacific Science Center, Seattle	1979	Imax	382
San Diego Hall of Science, San Diego	1973	Omnimax	350
Science Museum of Minnesota, St. Paul	1978	Omnimax	335
Science Museum of Virginia, Richmond	1983	Omnimax	280

Canadian film-makers—Roman Kroitor of the National Film Board and two independent producers, Ferguson and Robert Kerr—talked about utilizing new technology in motion picture production. Kroitor had just coproduced the film *Labyrinth* and Ferguson hand Kerr collaborated on *Polar Life*—both hits at Montreal's *Expo 67*.

They wanted to produce big-screen entertainment without the cumbersome multiple-projector systems used at the world's fair. What they needed was a single projector capable of sending 70-mm film through the machine at 24 frames per second without tearing, yet powerful enough to project sharp images on a screen larger than any other in cinema history.

The trio formed Multiscreen Corporation (now Imax Systems Corporation), and began working on an early version of the Imax system. Then they heard about a key invention by Ron Jones, owner of a small machine shop in Brisbane, Australia. Fascination with cinematographic equipment led Jones to the development of the "rolling loop," a mechanism that pushes film through the projector in gentle, caterpillar-like waves.

It is still too early to determine the ultimate success of Imax/Omnimax. But every sign points to continued expansion...

The Canadian partners bought the patent rights and invited William Shaw to join the team as director of development. An Imax projector was developed by Shaw and his colleagues; Jan Jacobsen, a Norwegian designer of specialized film equipment, constructed the first Imax camera. The Canadian Department of Industry, Trade, and Commerce assisted with the funding of the projector development.

The trigger for the rush development was an invitation from Japan to premiere the new Imax system at Osaka's 1970 exposition. Donald Brittain, a leading Canadian documentary film director, agreed to write and direct *Tiger Child*—a sensitive look at people around the world. It was coproduced by Kroitor and Kiichi Ichikawa, and shown in the Fuji Group Pavilion at the fair.

The Imax system was an instant success at *Expo 70*. The experience was repeated a year later when Ferguson's eye-catching *North of Superior* was shown at Ontario Place's Cinesphere in Toronto. In the years that followed, Ferguson and Kroitor produced other films, always exploring Imax's potential and refining the technique. In 1973, the Omnimax system was introduced at the San Diego Hall of Science and Reuben H. Fleet Space Theater. *Newsweek* called it "the ultimate trip."

The Imax team continued to design and build new Imax/Omnimax cameras and projectors, and to produce super 70-mm films for showing in the expanding number of theaters. In 1986, Imax Systems Corporation received the Academy of Motion Picture Arts and Sciences' Scientific and Engineering Award for the Imax system and rolling loop projector.

Need for High-Quality Films

That's how it all began. It is still too early to determine the ultimate success of Imax/Omnimax. But every sign points to continued expansion, especially in the museum field. There are now 55 Imax and Omnimax theaters in 14 countries, and more are on the way.

The biggest obstacle is software—the need for high-quality films. About 50 Imax/Omnimax films currently are available, but nearly three-quarters are too old or of poor quality. However, a surge of film-making now under way could change the picture.

The number and quality of films are a function of the marketplace—the number of theaters. In the 1970s, only a few Imax/Omnimax films were available for showing in the handful of theaters. The first five museum theaters—in San Diego, Washington, D.C., Detroit, St. Paul, and Monterey, Mexico—were forced into producing films to have something new or appropriate to show.

The most popular Imax film ever produced came from this period. *To Fly!* —which takes viewers from the gas balloon to the moon landing—has been seen by more than 40 million people at Imax and Omnimax theaters. It was the result of a three-way partnership—the National Air and Space Museum (its first film), Conoco, Inc. (which underwrote the film), and Francis Thompson, Inc. (producer). Greg MacGillivray and James Freeman directed and photographed the 27-minute blockbuster, which has been showing (along with other films) at the Washington Museum since it opened in 1976.

The current favorite, *The Dream is Alive*, was seen by more than 10 million people in the first 18 months, and could overtake *To Fly!* It also came from the National Air and Space Museum. The film, produced and directed by Imax Systems Corporation, with assistance from the National Aeronautics and Space Administration, was funded by Lockheed Corporation.

Both the San Diego Hall of Science and the Science Museum of Minnesota produced films separately and as part of a joint venture with the Detroit Science Center and the Alfa Cultural Center in Mexico. The cooperative effort in producing *Atmos* (a film about weather) failed miserably. It turned out to be a film produced by committee, without any institution being willing to give up control of the film's content.

"The result of this undertaking was a minor disaster," according to Wendell A. Mordy, president of the Science Museum of Minnesota at the time. "The problem with our joint venture procedure in producing films was that there was no way to resolve questions involving differences in taste and judgement."

High Cost of Producing Films

This ill-fated joint effort was a response to the accelerating cost of film production, distribution, and rental—another roadblock to Imax/Omnimax films. Some of the early films were produced for $100,000 to $250,000. Now, production costs have soared into the $1 to $3 million range. Kirsch of the San Diego museum said the film cost per minute typically is around $65,000, with $50,000 going to production and $15,000 for prints and distribution. Average rental of a new film for six months is about $90,000, he estimated.

That is one of the reasons some museums are giving collaborative Imax/Omnimax film-making another try. Other reasons are the lack of educational content in many films and the need to build a film library for school groups and repeat showings. Currently, a museum pays $15,000-plus for the making of a rental print, but usually must return the print to the distributor after the contracted period. It is costly and impractical to recall the print for special showings.

In 1985, five science museums (Boston, Chicago, Detroit, Richmond, and San Diego), six other museums planning Imax/Omnimax theaters, and WGBH/Nova public television from Boston formed the Museum Film Network to produce entertaining educational Imax/Omnimax motion pictures.

The group's first effort, titled *To the Limit*, is now in production and will be released next summer [1988]. It deals with the body and human performance through scenes of skiing, dancing, mountain climbing, and other activities. Rather than using the committee approach, WGBH is serving as executive producer and MacGillivray-Freeman Films, Inc. is the producer. In return for their $75,000 annual dues, full members will get to use and keep the film at no additional cost. Other theaters will be able to rent the film at normal rates. Revenues from rentals will go into a film production fund. The network hopes to produce one to two films a year.

To help cover film production costs, the Museum Film Network is seeking sponsors—which has worked successfully for the National Air and Space Museum and a

TABLE II

Foreign Museum Imax and Omnimax Theaters

Institution and City	*Opened*	*Type*	*Seats*
City of Science and Industry, Paris, France	1985	Omnimax	357
Edmonton Space Sciences Center, Edmonton, Canada	1984	Imax	220
Hong Kong Space Museum, Kowloon, Hong Kong	1980	Omnimax	318
Matsuyama Cultural Centre, Matsuyama, Japan	1986	Omnimax	274
Monterrey Cultural Center, Monterrey, Mexico	1978	Omnimax	300
National Museum of Natural Science, Taichung, Taiwan	1986	Omnimax	300
National Museum of Photography, Film, and Television, Bradford, England	1983	Imax	349
Omiya Information and Cultural Centre, Omiya, Japan	1987	Omnimax	300
Omniversum, The Hague, Netherlands	1983	Omnimax	300
Park of the Future, Poitiers, France	1987	Imax	398
Parry City West Space Centre, Perth, Australia	1987	Omnimax	200
Puebla Planetarium, Puebla, Mexico	1985	Omnimax	271
Singapore Science Centre, Singapore	1987	Omnimax	280
Tabasco Planetarium, Villahermosa, Mexico	1981	Omnimax	294
Taman Mini Park, Jakarta, Indonesia	1984	Imax	758
Tijuana Cultural Center, Tijuana, Mexico	1982	Omnimax	316
Yokohama Science Centre, Yokohama, Japan	1983	Omnimax	286

few other film producers. Among the companies and agencies that have underwritten all or part of Imax/Omnimax films are Conoco, Inc., Johnson Wax, Marriott Corporation, McDonald's, Lockheed Corporation, Control Data Corporation, and the U.S. Department of Commerce.

The pool of Imax/Omnimax film producers and cinematographers has been increasing steadily, bringing new talent and ideas to the field. In addition to Imax Systems Corporation, Francis Thompson, Inc., and MacGillivray-Freeman Films, Inc., motion pictures have come from National Film Board of Canada, Graphic Films Corporation, Nanouk Films, Inc., Canticle Films Ltd., World Cinemax Productions, and others.

In some cases, planetarium shows have suffered from the success of the Imax/Omnimax theaters. Fewer sky shows and smaller attendances have resulted from the theater competition.

Criticism of Museum Theaters

The Imax/Omnimax trend in the museum field has been criticized. The large investment required to construct and operate such theaters has been called a diversion of funds from more traditional museum activities. Among the recent capital costs for Imax/Omnimax theaters have been: Fort Worth Museum of Science and History, $8.5 million; Alabama Space and Rocket Center, $3.5 million; California Museum of Science and Industry, $3 million, Chicago's Museum of Science and Industry, $6 million; Science Museum of Minnesota, $3.5 million; and Boston's Museum of Science, $6 million. Some of these theaters are standalone buildings or additions, while others include exhibit halls (as in Chicago's $12.5-million Henry Crown Space Center) or other facilities (as in Boston's $24 million new wing).

It is debatable if the theater capital funds would have been available for other purposes. From an operational standpoint, Imax/Omnimax theaters generally have attracted more visitors to museums and produced revenues beyond the cost of theater operation, thereby helping to support other museum activities. In most instances, the theaters also have been responsible for increases in food, store, and membership sales.

In some cases, planetarium shows have suffered from the success of the Imax/Omnimax theaters. Fewer sky shows and smaller attendances have resulted from the theater competition. Many school groups and families now go to the more spectacular Imax/Omnimax performances instead of the planetarium. Among the planetarium programs that have been affected adversely are those in Richmond, St. Paul, and San Diego.

On the whole, Imax/Omnimax theaters give more than they take. They provide a new dimension for learning as well as entertainment.

Some critics believe that Imax/Omnimax theaters are inappropriate for museums and distort their missions. They claim the shows have little educational value and draw visitor attention away from the heart of a museum—its collections and exhibitions. This may be partly true, but the films are becoming more educational and compatible in their content. They frequently present visual images that supplement and make it easier to understand and appreciate a museum's other offerings.

On the whole, Imax/Omnimax theaters give more than they take. They provide a new dimension for learning as well as entertainment. Many of the films are extensions of the collections, exhibitions, and educational programs of museums. They attract new audiences, provide additional revenues, and give greater exposure to museums at a time of increasing competition from other cultural institutions and leisure-time activities.

A Promising Future

The future looks bright for Imax/Omnimax theaters in the museum environment. Although most theaters currently are located at science, space, and natural history museums, look for art and history museums to explore the possibilities—especially as new films are produced with artistic and historical themes.

Jacobsen of Boston's Museum of Science sees movement developing in the art field, while Kirsch of San Diego's Hall of Science believes new artistic and cultural films will be forthcoming with a considerable impact on art and history museums.

Day of the Science Museum of Minnesota in St. Paul is optimistic about the future of Imax/Omnimax theaters. "I see no competitive threat on the horizon," he said. "It took two decades to build and achieve stability for Imax/Omnimax, and it will take at least as long for any system to replace them."

Among the other film techniques now being used or considered at museums are: multimedia shows (several projectors and/or screens); Showscan (70-mm, five-perforation, 60-frames-per-second system on a normal curved screen); Vistascope (a mini-max projection system with an oversized screen); and Cinema 360 (circle theater).

More new developments are on their way for Imax/Omnimax theaters, explained Ferguson of Imax Systems Corporation. They include such things as 3-D theaters, convertible Imax/Omnimax theaters, Imax and Omnimax theaters back to back, theaters in shopping centers, digital sound, longer films, more short features, and greater collaboration in the making of films.

A new 3-D Imax system was introduced at Vancouver's *Expo 86*. The format was developed jointly by Imax Systems Corporation and the National Film Board of Canada. The 3-D images for the *Transitions* film premiered at the Canadian Pavilion were achieved by filming the same image with two cameras to approximate the way human eyes see the image. The resulting two film frames were then projected simultaneously onto the screen with lenses polarized at right angles to each other. The viewer wears glasses with polarized lenses to reintegrate the two images into one three-dimensional image.

The bad news is that Imax/Omnimax film production costs have been doubling every five years, and Ferguson expects the pattern to continue as even more emphasis is placed on quality. Imax and Omnimax theaters, films, and operating costs will continue to grow—but it is expected that attendance and revenues will also grow.

Imax/Omnimax can be a financial drain when the circumstances are not right. The planning, funding, and building of such theaters is only the beginning.

Imax and Omnimax theaters have much to offer museums, but they do require considerable investment, extensive marketing, effective management, and a sizable market. Such theaters can be a bonanza—increasing exposure, attendance, membership, and revenues; complementing collections and exhibitions; and enhancing the educational mission of museums.

Imax/Omnimax can be a financial drain when the circumstances are not right. The planning, funding, and building of such theaters is only the beginning. The key to success is how Imax and Omnimax theaters are operated, promoted, and used by museums to pay off at the box office and to achieve institutional goals.

Note

1. Imax and Omnimax are trademarks of the Imax Systems Corporation.

Reprinted from ***Museum News****, August 1987, with permission. Victor J. Danilov is president emeritus of the Museum of Science and Industry in Chicago. Now retired, he lives in Boulder, Colorado, where he also runs the University of Colorado's summer museum management program.* ***Museum News*** *is published six times a year by the American Association of Museums.* ❑

(SPIN, continued from page 16)

Telescope and the 48-inch Schmidt camera now involved in a new all-sky survey.

While originally intended as a forum for the public affairs/media liaison staff of research centers, the SPIN meetings have occasionally attracted representatives of local planetaria. Indeed, anyone responsible for presenting current astronomical information to the general public may find the gatherings helpful. (Certainly, science popularization presents many of the same challenges to all practitioners, whether their media be press releases or concave domes.) Most important, perhaps, the SPIN group represents a resource pool into which the planetarium staffer may dip for advice, counsel, and current concepts, not to mention script ideas and illustrative material in the form of slides, photos, and video tapes. Indeed, the informal "directory of contacts" at major observatories throughout the country, as represented by the SPIN membership list, may be the group's most valuable asset. The SPIN group welcomes participation by planetarium staffers.

For the past three years, the SPIN group has scheduled its annual meeting to coincide with the January meeting of the American Astronomical Society, primarily so information professionals can sample the latest in research results presented there.

Anyone wishing more information about the 1988 meeting, or who would like to be added to the informal "membership" list, should write to SPIN, c/o The Publications Department, Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, Massachusetts 02138. ❑

The 35mm Film Alternative: A Significant Refinement

James Horn
Morehead Planetarium
University of North Carolina
Chapel Hill, North Carolina 27514

The Desire

In 1985, Morehead Planetarium had the desire to take advantage of the success of the Cinema 360° film *The Space Shuttle: An American Adventure.* This film's success is due to a small group of dedicated individuals headed by Richard Knapp, the director of the Jackson, Mississippi, planetarium. What Morehead lacked

We wanted a large, impressive image that would, as closely as possible, mimic the all-dome fisheye projection we had seen.

was the ability to show films. With a traditional 68-foot-diameter non-tilted dome, whose center was dominated by a Zeiss Mark VI Planetarium, with circular seating, and with no elevator, the situation could not have been more dismal. It was obvious that what had become the standard for such installations—the Radian System projector using an 8mm fisheye lens in the center of the theater—would not be possible. Also, we had no source of funding. Some such installations had been subsidized by the Gannett Foundation, whose generous gifts had funded the production of films as well. Gannett, however, had no properties in North Carolina and thus little to gain from an association with Morehead. With regret, they declined to help. This left us in the situation of having to recoup whatever costs were incurred in that same year.

The Alternative

Our first thought was to consider renting a 35mm projection system, but this is very expensive. Rates of $5,000 for setup plus $500 to $1,000 per month were common. We were clearly concerned about our ability to break even. Second, we contacted local vendors to explore the purchase of a 35mm projector. The difference between purchasing and renting was surprisingly small. The logic then was, if we can acquire a system and pay for it with the showing of the Shuttle film, it will have been worth it even if we don't use it again—and our audience will have had the experience of seeing this fine film.

We wanted a large, impressive image that would, as closely as possible, mimic the all-dome fisheye projection we had seen. We settled on a rebuilt Century projector with a new Eprad 4500 watt lamphouse. These would sit on a heavily modified pedestal to achieve a tilt angle of 36°, and the entire mess would be located in the cove area of the dome. We had a perfect location because our control room, almost entirely vacated by automation, was available. The only equipment remaining in the control room was the sound system, and we needed access to that anyway.

The real difficulty was in finding a suitable lens. We wanted a very large image, but it would be difficult to achieve focus on the constantly curving and converging dome as seen from the cove. The compromise was a Scheider 1.2 inch focal length primary lens (the shortest commercially available for 35mm) and an attached

Just five months after starting to show films, we recouped the entire cost of equipment installation, Cinema 360° membership, and printing costs on the Shuttle film..

Buhl Optical Company virtual image doubler. The resultant focal length was 0.79 inch and the image achieved was 110° horizontal and 100° vertical flat field. It's hard to describe, but it covered almost half the dome. The lens cost $390. The total cost of the projector, lamphouse, pedestal, lens, etc., was just under $15,000. In September of 1985, we opened *The Space Shuttle: An American Adventure* to enthusiastic, if not huge, audiences. On January 6, 1986, we crossed a threshold I had been waiting for. Just five months after starting to show films, we recouped the entire cost of

equipment installation, Cinema 360° membership, and printing costs on the Shuttle film; all this while the films represented less than 15% of our overall business. We continued to run the film until June while the profits rolled in.

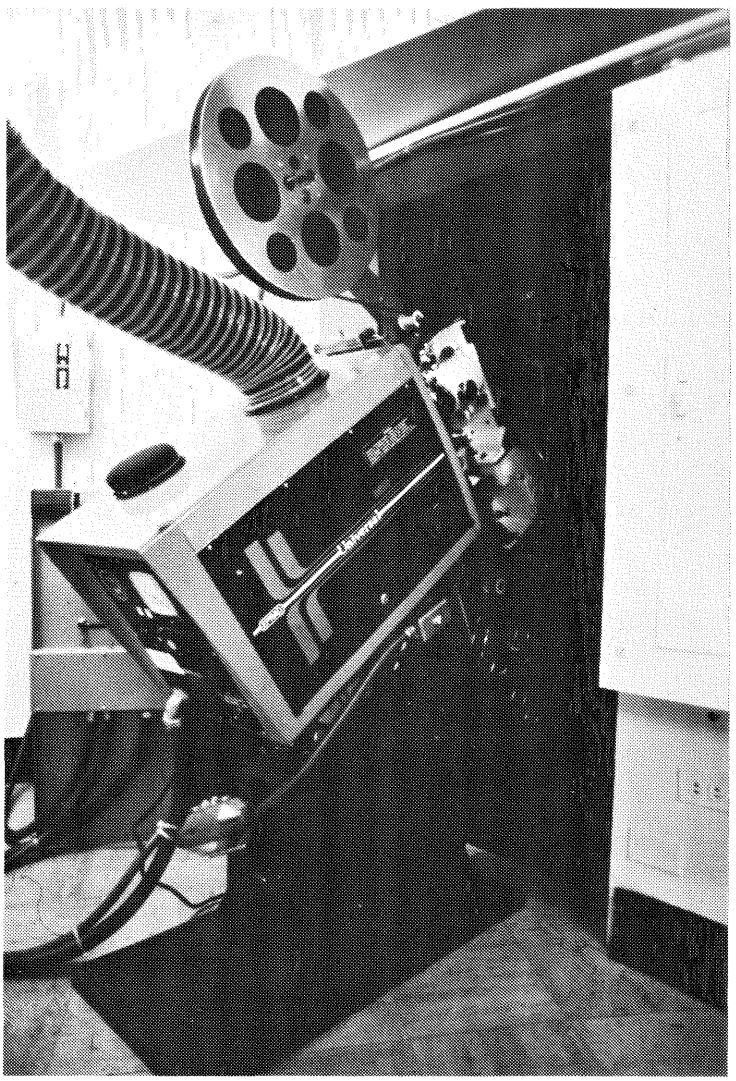
The Refinement

We had already been considering what to do next, and had decided on offering *To Fly* if a reasonable contract could be negotiated. We completed the negotiations in June and opened *To Fly*; we held the Shuttle film for school show audiences in the fall. Our half-dome projection concept worked very well for *To Fly*. This Imax film translated well, and the audiences liked the film. The lens system, however, continued to disappoint us. The image was fuzzy. During the fall, I stumbled across a possible lens replacement and acquired it on loan. It was a 70mm flat field Isco 654335 lens of 0.83 inch focal length and with extraordinary depth of field. It substantially improved the quality of our projected image. There was a small size reduction—less than 5°—but the increase in clarity was well worth the trade off. I have contacted Isco to find out if this lens is still available, and it is, at a mere $18,000 each. This, of course, more than doubles the total cost, but it improves the projection to such an extent that it should be considered a part of any subsequent proposal. It removes the objection of poor image quality from consideration in this 35mm system.

The Logic

The decision to use an alternative 35mm technology was born purely out of a sense of expedience. We had no real idea of whether the system would provide an adequate alternative to the traditional full-dome approach. Having used it, however, has evoked some interesting logic. We originally recognized that there are a limited number of films available for 35mm. There are fewer films with any educational value or of more than regional interest. What is interesting is how few of the films are ideally suited to the 8mm focal length, all-dome concept. Only the Shuttle film is specifically designed for this format, and it is heavily cut with flat field footage. Almost all of the other products are Imax and Omnimax down-prints. What we expected in evaluating these offerings is that Imax would translate well to flat field projection. What we also discovered, however, is that Omnimax films are often shot to translate to Imax, and, as such, are generally taken with lenses 1.0 inch in focal length or greater. They also translate surprisingly well to a wide-angle flat field. This, coupled with the increased image clarity of the Isco lens, provides an excellent image.

Other major considerations are planetarium design and planetarium philosophy. There has been somewhat of a shift back to a more traditional design for planetariums, returning us to the horizontal dome concept. These designs are reflected in new facilities such as those in Champaign, Illinois, and Jacksonville, Florida. Both facilities, however, want the diversification that films can bring. This alternative technology allows for an installation that is far less invasive, not to mention less expensive, than the full-dome, project-from-center design. Dr. Lee Shapiro, the Director of Morehead Planetarium, feels strongly that, given the choice of experiences he would have for his audiences, he would prefer that they see a planetarium show primarily, and offerings like films would be an adjunct. This feeling is shared by many who consider the planetarium experience to be unique and regret it



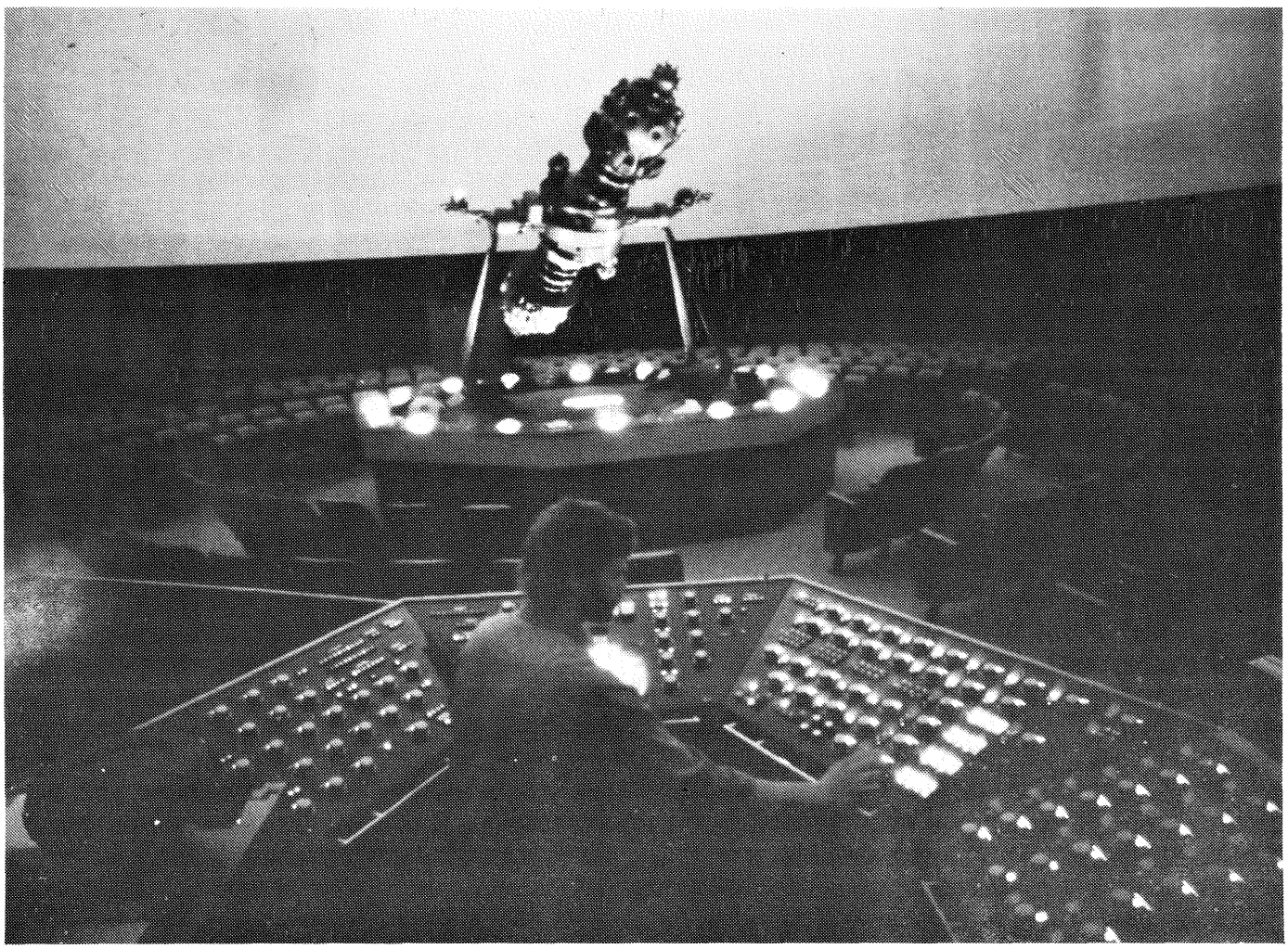
The projector installation tucked neatly into the old control room of the Planetarium. Its noise is soundproofed from the theater.

being relegated to "second fiddle." We at Morehead have set our scheduling and price structure to give precedence to the planetarium show, and this has produced relative percentages that we are pleased with.

Finally, we have to question of how many films will continue to be available in 35mm format. Educational media is moving from 35mm and 16mm to video at an incredible rate. The Imax/Omnimax consortium is less and less willing to allow its members to market down-printed films because of their own growing number of theaters. All of these factors combine to question the large scale financial and philosophical commitment to wide-angle 35mm film in the design of a planetarium. There may literally not be films for us to show.

Dr. Lee Shapiro ... feels strongly that, given the choice of experiences he would have for his audiences, he would prefer that they see a planetarium show primarily, and offerings like films would be an adjunct.

Do all these considerations mean that a new format,or a new lens is the answer? Of course not. All of the objectives met in our own design were by accident. It simply represents an alternative to 35mm full-dome projection. We cannot ignore the fact that 35mm all-dome projection is impressive. Is it so impressive that it transcends the arguments about distortion, clarity, design philosophy, and future product availability? Possibly! But for those of us who are limited by some of these constraints, a new 35mm projection format is at least one answer.



The Planetarium still retains its traditional environment, free from the normally invasive film projector in the center of the dome.

Table 1

Cost of Installation in 1985

Rebuilt Century Projector	$ 4,400
Lamphouse and lamp	6,493
Pedestal, rewind bench, splicer	910
Sound interface	300
Projector venting	350
Projector lens and expander	390
Installation @$225 per day	550
Physical Plant	300
Contingencies	500
	$ 14,193
Cinema 360° Membership	$ 1,200
Film Printing @$950 ea.	1,900
Shipping and Contingency	500
	$ 3,600

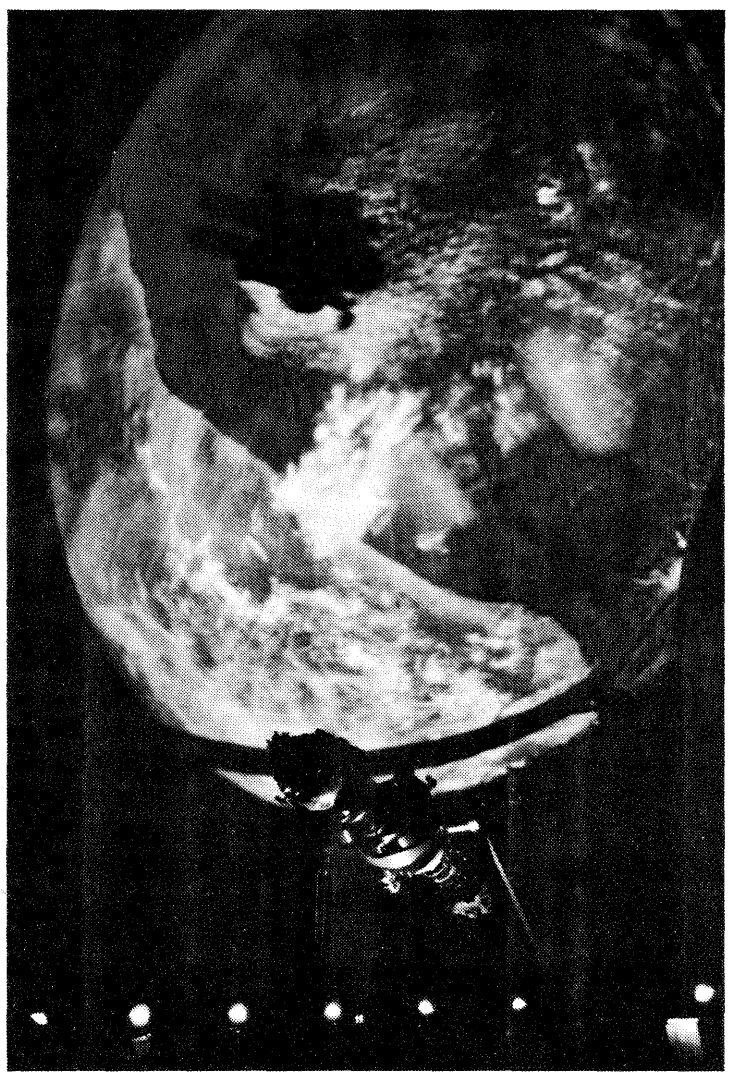


Table 2

Attendance and Revenue Figures for Films

1985-86

Film Attendance, School Shows	7,407
Total Attendance, School Shows	61,808
Percentage Film Attendance, School Shows	11%
Film Attendance, All Shows	16,928
Total Attendance, All Shows	126,743
Percentage Film Attendance, All Shows	13%
Total Revenue, Films	$ 37,316
Total Revenue, All Shows	$ 234,709
Percentage Film Revenue	15%

1986-87

Film Attendance, School Shows	5,351
Total Attendance, School Shows	40,484
Percentage Film Attendance, School Shows	13%
Film Attendance, All Shows	14,989
Total Attendance, All Shows8	84,938
Percentage Film Attendance, All Shows	18%
Total Revenue, Films	$ 25,921
Total Revenue, All Shows	$ 192,094
Percentage Film Revenue	13%

1987-88 To Date

Film Attendance, School Shows	39
Total Attendance, School Shows	321
Percentage Film Attendance, School Shows	12%
Film Attendance, All Shows	4,847
Total Attendance, All Shows	15,900
Percentage Film Attendance, All Shows	30%
Total Revenue, Films	$ 8,709
Total Revenue, All Shows	$ 36,821
Percentage Film Revenue	24%

Scene from ***The Space Shuttle: An American Adventure*** *on the 68-foot dome at Morehead Planetarium.*

Inquire Within on Everything: Encyclopaedia Galactica

An Exhibition at the Armagh Planetarium, College Hill, Armagh, Northern Ireland

Nigel Henbest
c/o *New Scientist*
Commonwealth House
1-19 New Oxford Street
London WC1A 1NG, England

Thirty years ago, the very word "planetarium" represented a passport to an Aladdin's cave, where a glittering panoply of stars paraded over a dark vault, and the speeded-up planets played tag among the heavens.

In the 1980s, however, television, video and home micros have taken over. Now that the key words are "action," "excitement," and "involvement," the visiting public finds the traditional planetarium a rather tame affair. In response to this pressure, too many planetariums around the world have sold out. While keeping a rudimentary star show for schools and the remaining (loss-making) public performances, they make their money by using the big dome as a super-wide screen—for "360-degree" films and, especially, for laser shows.

Planetariums have been surprisingly reticent, or perhaps unimaginative, when it has come to using the new technology to put astronomy across. The one notable exception is the Armagh Planetarium.

Ironically, interest in astronomy itself has not diminished during this period—as shown, for example, by the number of people who stood outside in sub-zero temperatures to see the faint blob of Halley's Comet or stayed up till the small hours to watch the pictures from Giotto.

Planetariums have been surprisingly reticent, or perhaps unimaginative, when it has come to using the new technology to put astronomy across. The one notable exception is the Armagh Planetarium. This planetarium has an international reputation. Indeed, its director has just become the first British president of the International Planetarium Association. Ironically, it is comparatively unknown to British people living outside Northern Ireland.

Armagh Planetarium already has a number of "firsts" under its belt, including the first use of video projectors in a planetarium. This year it has chalked up two further achievements.

The *Encyclopaedia Galactica* stands in the exhibition area, adjacent to the planetarium dome. It's a place where Dr. Who would feel at home. In the blacked-out corner, all that is visible is a cobweb of metal struts that support computer keyboards and TV screens—and a crowd of children fighting over the keyboards. The first thing that strikes you about the *Encyclopaedia Galactica* is that it is certainly compulsive.

First, choose your terminal. Twelve keyboards cover nine different topics, ranging from constellations and planets to spaceflight and the shuttle. Then select an item from the menu: the constellation Orion, perhaps, or sputnik. And you'll be treated to a display that is either a short video sequence, or a series of stills. At the end, you have a choice. You can repeat the sequence, return to the main menu, or select a related subject from the short menu displayed.

The Pioneer MSX computers are all autonomous, and each is linked to its own Pioneer laser-disc machine. The Armagh Planetarium claims that the exhibit incorporates the largest use of computer and laser-disc technology in Britain. The material comes from a variety of sources. Much is from a commercially available Optical Date Corp. astronomy disc, some from the ITV Spacewatch programme, and some from the video tape the "Graphic Guide to the Heavens," made by the Armagh Planetarium. All is fascinating viewing.

Exhibit area at Armagh Planetarium, College Hill, Armagh.

So, is it an encyclopaedia? My feeling is that it isn't. An encyclopaedia may or may not entertain, but its main function is to impart information on topics selected by the user. The Armagh version is weak on information. Select Jupiter's moons, for example, and you'll find a wealth of colourful Voyager pictures but precious little information. For an educational exhibit, I'd also take exception to such masterpieces of spelling as "quarentine," "space taxies," and "shepard moons."

As a taster to get children more interested, however, it is difficult to fault this exhibit. There's certainly enough material to provide hours of entertainment for the kids and for the adults who manage to get a look in!

Up in the planetarium itself, another innovation is taking shape: a hands-on planetarium show. After installing the original innovatory pair of video projectors, the planetarium's director, Terence Murtagh, has increased the number to five; they project four images around the dome, and one overhead. Murtagh pulled off another coup last year when he projected images from Giotto *live* onto the planetarium dome.

Now, Murtagh is installing a system that will allow the audience to control the show. Each seat is equipped with a handset, which has three illuminated buttons. The planetarium lecturer projects a multiple-choice

(Please see ***INQUIRE*** *on page 35)*

FORUM

Lonny Baker
Morrison Planetarium
Golden Gate Park
San Francisco, California 94118

For this issue of FORUM, a number of IPS officers, regional officers, and IPS Affiliate Representatives were asked to respond to the following question:

The International Planetarium Society "shall support and ... strengthen the activities of existing and future planetarium...oriented groups..." (IPS by-laws, 1983). How do you perceive the relationship between IPS and the regional affiliates? Can you suggest ways to strengthen this relationship?

To open the discussion, a number of topics were suggested: combining membership dues (IPS plus one regional affiliation), the difficulty of finding commercial funding for so many regional conferences, IPS acting as an umbrella organization with respect to legal issues, and who do IPS Affiliate Representatives represent?

In addition to the letters printed below, Von Del Chamberlain's reflects his thoughts on this matter in his "President's Message" on page 38. Many views have been expressed, some in disagreement with others. Ideally, the discussion will continue on many levels, both regionally and internationally.

As this column was conceived to promote dialogue among colleagues, readers comments would be most welcomed and will be published in the next issue of ***The Planetarian.*** *Please submit your views on IPS and/or the regionals to L. Baker by 4 April 1988.*

* * * * *

Combining membership dues doesn't work logistically. Several regionals tried it, but some treasurers would forget to forward the dues. Some regionals do not have calendar-year memberships, as does IPS; people complained that they were members for only half a year, or a year and a half, etc. Some people may choose to join only a regional or only IPS. No good; forget the subject was mentioned.

Finding commercial funding for so many regional conferences is not really an IPS problem. Regionally, it's just a perceived difficulty—there are only so many vendors, and you can only go to the well so often. I think most conferences get incredibly good vendor support—so much so that attendees get spoiled by all the sponsored meals, cruises, receptions, etc. The support is almost taken for granted—if it's not there, people grouse about having to pay for meals out-of-pocket. Recent conferences have been extremely lucky because major planetarium manufacturers have been generous with donations.

IPS acting as an "umbrella" organization, with respect to legal issues, is also logistically impossible. We're the **International** Planetarium Society, and our members are ruled by different governments. For example, the unworkable idea of IPS members getting a "blanket ASCAP license": U.S. copyright laws don't apply outside the U.S., just as another country's laws don't apply here. Simply put, why should our Canadian members' dues be spent for anything that would benefit only American planetaria? Should U.S. members pay for lobbying efforts in Parliament to change British laws? There was a movement a while back to have an American Planetarium Association (for dealing with U.S. issues, etc.)—it died.

In fact, IPS has made a concerted effort to increase its international scope. In some countries it's difficult or impossible to obtain U.S. funds for an IPS membership. However, multinational banks can transfer funds, so IPS is now accepting VISA/MASTERCARD for membership payment. Efforts are also being made to establish "sister city/planetarium" cooperation between East/West planetaria.

Who do IPS Affiliate Representatives represent? "Only IPS members in their region" would be a sensible answer, but no IAR knows the membership status of any

given "constituent"—I'm the only one who knows for sure. So, I guess IARs represent their region. Unless they have polled the membership on a specific issue, a vote is made on a representative's gut feeling about how his/her region might feel— like the U.S. Congress. In practice, IARs represent themselves.

The regionals are independent of IPS. If IPS ceased tomorrow, the affiliates would still be going strong, with their own by-laws, dues, publications, etc.

In summary, I don't think that IPS is doing much to "support and strengthen the activities of existing and future planetarium oriented groups." Who wrote that into the by-laws, anyway?

Mark Petersen
IPS Treasurer and Membership Chairman
Loch Ness Productions
Boulder, Colorado

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The problem that American planetariums face is that we still do not have an organization that represents us as a national party. IPS cannot effectively lobby Congress, represent us on copyright legislation, even lobby for a commemorative postage stamp since it does not represent a national constituency. IPS is a wonderful organization and I'm proud to be a member, but until some official subgroup is formed between the international level and regional level, it will be difficult to serve all the needs of the (U.S.) affiliates.

However, under the current organization there are a few things that IPS can do to help:

1) Organize Workshops - Have IPS sponsor workshops at the regional meetings on such topics as show production, script writing, legal issues, etc., similar to the way national museum organizations do. IPS could sponsor the workshop leader's travel expenses.

2) Travel Grants - Sponsor one or two planetarium interns or students with an interest in entering the planetarium field to attend an affiliate conference.

3) Information Dissemination - Have available at nominal cost audio cassettes of papers, workshops and panel discussions of past international meetings.

4) Exhibits - Most planetariums have an exhibit area or lobby for exhibits. Perhaps IPS could sponsor certain traveling exhibits by helping to cover the shipping costs. This would help institutions that could not normally afford such items.

5) A Help Package - So many times I hear at affiliate meetings, especially in school planetariums, "I have just been assigned to teach in the planetarium and I've never been in one before." Perhaps IPS could create a basic "how to get started" package of teaching material, a list of people close by to consult, even basic material on service of projectors. (Contact Gerry Mallon. I'm sure he can whip one up).

David A. Dundee, Treasurer
Middle Atlantic Planetarium Association
Fernbank Science Center
Atlanta, Georgia

* * * * *

I was not in on the formation of ISPE, but joined four years after its inception. I can only guess what happened: fear by the regionals of being usurped by the now IPS. Clearly, that has not happened. At one time you could pay your IPS dues to your regional. (In GLPA we no longer encourage that as our year is different from IPS's year). Many of our members belong to more than one regional. In fact, GLPA has members from every regional and some foreign countries, so sending in dues to IPS plus the regional's would be a logistical nightmare, but one that could be conquered.

In the past GLPA has acted independently of IPS in trying to solve many problems. This seemed to be either at the suggestion of IPS and/or by the lack of action on the part of IPS. At one time I was told that IPS wanted to be more international—that addressing some of the questions FORUM raised would only benefit the American members and therefore should be left to another group (for example, the regionals). GLPA is currently working on ways to increase revenues, not only for conference support, but also for support of the many other activities it's engaged in.

We are publishing booklets of interest to all planetarians, not just GLPA members. We are negotiating with American Society of Composers and Publishers for blanket rights to utilize music in our planetariums and barring that, we are starting to negotiate with copyright holders of specific music and albums for use by GLPA members.

As for the question of who the IPS representative represents, I think the answer to that is obvious. The IPS representative is elected and financially supported by all GLPA members, not just ones who are members of IPS. This person is a member of our governing body and has a large say, not only in IPS, but GLPA as well. He or she represents all GLPA members. Even GLPA members who are not members of IPS have a vested interest in the activities of IPS.

Perhaps we should turn around the question of what

IPS could do for GLPA. Is there something GLPA could do for IPS? GLPA has always been, and will continue to be, supportive of IPS. Besides financially supporting our IPS representative, we have recently made several of our members responsible for sending additions and corrections to the IPS directory.

Gary E. Tomlinson, President
Great Lakes Planetarium Association
Chaffee Planetarium
Grand Rapids, Michigan

* * * * *

I have a somewhat fuzzy feeling about the exact relationship between IPS and the regionals. Perhaps as I address the specific issues, my impressions of the relationship will become clearer.

1) Combining membership dues: The situations in which many of our members find themselves are so diverse that I feel it would be counterproductive to try to force everyone into an "all-or-none" mold. Although we all hope that membership in both organizations is important to everyone, financial constraints (and possibly other considerations) may force some to make a choice. Often that choice is based on which conference can be attended. The feedback which I've received suggests that conference attendance is the principal benefit which motivates membership. The sharp decrease in IPS membership during off years supports this contention. In GLPA we've considered this problem and as a result have placed a special emphasis on membership benefits for those who can't attend conferences, such as publishing the proceedings of each conference for distribution to all members. Although we can't be sure this is the cause, our membership has increased 50% over the past few years.

2) Difficulty in finding commercial funding: Whether there is one organization or ten to be funded, will have little effect on the number of regional conferences that will be held (and therefore funded). I'd be inclined to think that funding for regional conferences would decrease if there was one donation to IPS which would be distributed to the regionals (not to mention the potential "hot potato" of an equitable distribution).

3) IPS acting as a legal umbrella: Since IPS is truly "international," many "legal" issues could not be handled. For example, the health and dental insurance programs which GLPA has available to its members, and the liability insurance carried by our organization, are restricted to residents of the USA. IPS would be ineffective in these situations.

4) Who do I, as an affiliate representative, represent? As I understand it, I represent the Great Lakes Planetarium Association as an organizational entity (only in that sense do I represent all members of GLPA) and the regional members who belong to IPS.

All things considered, I believe the relationship between IPS and the regional affiliates is as it should be. If something is to be strengthened, it would have to be the way IPS serves those who don't attend the conferences, although publishing the last conference's "proceedings" in the *The Planetarian* goes far in this direction. In fact, many of the projects initiated at the last meeting (script contest, Universe in the Classroom sponsorship) further strengthen our commitment to this segment of our membership.

Sheldon Schafer, IPS Representative
Great Lakes Planetarium Association
Lakeview Museum
Peoria, Illinois

* * * * *

My perception of the relationship between IPS and the regional affiliates is that it's about as strong as the individual IPS reps and members wish to make it. IPS is not the "congress" of the planetarium world, with representatives and senators making up the membership. The IPS Council shares members with IPS and the regionals. The regionals fare pretty well on their own, without interference or encouragement from IPS. IPS fares pretty well on its own.

As for strengthening the relationship, I think it's pretty strong already. This year, as president of RMPA, I suggested that RMPA donate an individual membership to IPS as a door prize at a recent meeting. IPS reps, regional presidents and I are always strongly urging folks to join IPS. If there's any strengthening to be done, it's probably from the standpoint of IPS using its resources to target non-members and make them aware of regional activities. I've taken so many phone calls from folks who are planetarians—or planetarians-to-be—who are completely unaware that other planetariums exist in their state or region. What resources can IPS bring to bear on this? IPS maintains a database of planetarium facilities worldwide. Not everyone at those facilities is a member of IPS. There's probably food for some action there, if someone wants to take that action.

Who IPS reps represent varies from region to region. Some reps make a good effort to poll their members when it comes to voting issues. Others don't have much to do with their members, and others know their members well enough to guess what their members would say on specific issues. I think it makes little difference

whether their members are IPS members or not.

Pooling dues presents profound impracticalities. Since the organizations are really separate entities, pooling IPS and regional dues would be like having members of the AMA pay their dues through the PGA, since members of both groups use golf courses.

IPS has enough legal issues of its own to deal with, let alone try to represent some 500 planetariums around the world. Any legal issues that IPS could possibly tackle for members are in the area of salary negotiations, equipment liability and performance, personal injury, and defamation. I say "could", but are these really issues that IPS "should" be involved in? The bigger question is: why would an "international" organization get involved with what are clearly local jurisdiction questions?

IPS is an international organization of planetarium professionals. As such, it is a broad-based group of people who work in a unique environment. At best, IPS—and the regionals—function as self-help groups. To take them beyond that would be to invite more headaches for the few people who **volunteer** their time, effort, and equipment to keep the organizations running.

Carolyn Collins Petersen
President, Rocky Mountain Planetarium Association
Loch Ness Productions
Boulder, Colorado

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I think the differentiation of IPS and the affiliates is a healthy one. The affiliates can and should look after specific local needs while IPS handles both general professional interests and liaison among affiliates.

Some people do not join both organizations, so I would not merge dues. Individual decision-making is something planetarians value. Since I pay a united dues fee for educational organizations, I've seen how the images of different groups within the structure become blurred. The goals and projects of each organization are not communicated well.

I agree that it's a problem to find commercial support for so many planetarium conferences. Perhaps this could be discussed at an IPS Executive Meeting. If affiliates are willing to abide by an IPS agreement reached on this subject, everyone might be better off.

I think each affiliate must decide who its representative represents. One representative told me that "I represent just myself." The regional that he represented didn't view his participation as representative of them. I do not think IPS should dictate to the affiliate who the representative represents.

As for strengthening ties, each affiliate should be giving newsletter space and meeting time for IPS reports and discussions. Perhaps an IPS committee could prepare some "recommendations for communication of IPS news" to be used by affiliates.

As an overall philosophy, I think the affiliates and IPS should remain autonomous.

Jeanne E. Bishop
Past President, IPS
Westlake Schools Planetarium
Westlake, Ohio

* * * * *

Editor's note: The following letter was written in response to the topic discussed in the last issue of FORUM: The International Star Registry. As the intention of FORUM is to stimulate dialogue among colleagues, special thanks to Andy Fraknoi for his comments.

The analogy I like to use in explaining the International Star Registry to the public involves the naming of bridges.

It might be argued that just as ISR claims that astronomers have missed a big opportunity by not giving stars sexier names, so local governments have missed a bet by not naming bridges around the country after people in all walks of life.

And so an organization might come along that would promise to name a bridge after a person of your choice for only $35 and send you a beautiful certificate. Yet few people would believe that the inhabitants of San Francisco would then wake up one day and hear the morning traffic reports discuss the tie-ups on the John Smith bridge (even if John Smith's relatives have the fancy certificate framed for his birthday).

This usually gets people thinking a bit about whether they might not spend the $35 in a better way.

Planetarians should also note that there are several other star naming organizations (one of them was in a law suit with ISR, last we heard). Thus it's quite likely the same star could be sold to several people...

Andrew Fraknoi, Executive Officer
Astronomical Society of the Pacific
San Francisco, California

Spatial Ability and Planetarium Education

Mark S. Sonntag
Angelo State University
San Angelo, Texas 76909

I have in the past reported on the apparent importance of the spatial ability construct in planetarium education (*The Planetarian*, Vol. 11, No. 1 and Vol. 15, No. 2), and now some additional research appears to strengthen this claim. This most recent study was published in the *Journal of Research in Science Teaching* ("A Look At Spatial Abilities In Undergraduate Women Science Majors," Thomas R. Lord, *JRST*, Vol. 24, No. 8, pp. 757-767). I will summarize this research and discuss possible implications for planetarians.

In Lord's study, spatial ability was defined to be "one's ability to mentally juxtapose, manipulate, and rotate an object and to create structures in the mind from written or verbal directions." His review of the literature suggests that aptitude in spatial ability is important for success in mathematics and science and that men outperform women on tasks requiring spatial ability. In addition, recent studies indicate that spatial ability may be improved when students are subjected to carefully designed activities. These research results formed the bases for the study reported here.

In his study, Lord attempted to answer the following questions: 1. Are women collegiate science majors higher in spatial ability than women nonscience majors? 2. Do women science majors develop spatial abilities at the same rate as their male colleagues? The study was conducted at a two year college.

The population of 250 college undergraduates was used to test the first question. Approximately half of the students were men and half women. Additionally, half were science majors and half nonscience majors. None of the groups were found to be significantly different on math or verbal ability. All the subjects were given a battery of standardized spatial ability (spatial orientation, spatial visualization, and flexibility of closure) tests at the onset of the semester. A two factor analysis of variance (gender and academic major factors) was run on the pretest spatial ability scores. This analysis showed statistically significant differences between males and females and science and nonscience majors, with the males and science majors scoring highest on the measure of spatial ability. Further multiple comparisons showed that the men science majors ranked highest with the women science majors next. The female science majors were statistically and significantly higher than the male nonscience majors and the female nonscience majors (Table I).

TABLE I

SPATIAL ABILITY PRETEST SCORES

	Science Major	Nonscience Major	Total
Male	25.99	24.64	25.32
Female	24.70	22.23	23.46
Total	25.34	22.44	

The second part of this study attempted to determine if women's spatial ability could be developed through interactive exercises and to compare this development with their male colleagues. The 120 science majors were randomly divided into three groups (experimental, placebo, and control). The three groups were found to be similar in math, verbal, and science competency and spatial ability. Two of the three groups received treatments. The experimental group received a 30 minute interactive exercise each week in which each subject imagined the bisection of a three-dimensional geometric solid and predicted the shape of the newly cut surface. The placebo group heard a 30 minute presentation each week on the historical significance of pursuing laboratory investigations.

At the conclusion of the winter semester all the science majors were given the second version of the same battery spatial ability tests as a posttest. The results on the posttest were analyzed using a two factor analysis of covariance with the pretest used as the

covariate and gender and group (experimental, placebo, and control) as the main factors. This analysis showed that the experimental group had significantly improved in their scores on the spatial ability aptitude tests (Table II).

TABLE II

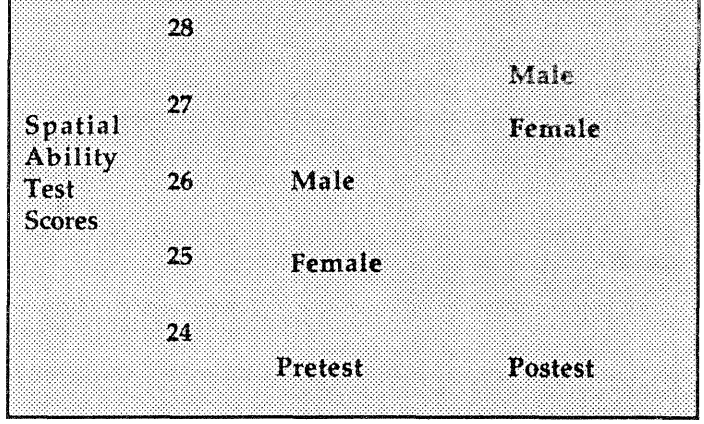
SPATIAL ABILITY POSTTEST SCORES

	Experimental	Placebo	Control	Total
Male	27.271	26.20	26.21	26.56
Female	26.80	25.03	25.00	25.61
Total	25.99	24.59	24.80	

When the improved test scores were examined according to sex, it was found the the women improved at a greater rate than the men, showing an interaction between these factors (Figure 1).

FIGURE 1

INTERACTION BETWEEN TREATMENT AND GENDER



This study supports the claim that there are important and statistically significant differences in spatial ability between science and nonscience majors and between men and women in college. In one sense, that is the bad news. But the good news is that, at least for science majors, students can improve their spatial ability given the appropriate instruction, and that women can close the spatial ability gap between them and their male counterparts.

From a purely theoretical perspective, these results support the concept that sex differences in spatial ability are a product of differential training in the sexes and not from some biological trait. And on the practical side of this issue, it means that we can do something about it.

These results are important for all teachers. For planetarians, who are often involved in teacher in-service training, these results take on a double significance. Planetarians are not only involved directly in astronomy education, but also indirectly through teacher in-service workshops. Since many of the topics presented in the planetarium and elementary school curriculum (seasonal changes, phases of the moon, etc.) require a fairly high level of spatial ability, and many elementary school teachers (typically female, nonscience majors) may be from a group that has been found to be low in this ability, planetarians need to be especially sensitive to the development of teacher education materials that take spatial ability into account. Those of us involved in planetarium education have an opportunity to not only improve a teacher's content background, but perhaps even spatial ability. Such an improvement in teachers could have important side benefits in science education in elementary schools. ❑

(INQUIRE, continued from page 29)

question on the dome, and members of the audience press the appropriate button. A histogram of the answers builds up on the dome.

For a schools' show, this is a magic way of involving the children and keeping their attention. "How many planets are there in the Solar System: 9;7;11?"—and if a substantial proportion get it wrong, the lecturer can explain what the right answer is, and why.

The potential for public shows goes further. The first will involve a guided tour of the Solar System. Above our heads, the planetarium "sky" becomes the observation dome on our spaceship, complete with a head-up display of where we are and our possible destinations. Would the audience like a visit to Mars; or perhaps a trip to the warmer climate of Venus or Mercury? The choice is ours, and a majority verdict wins.

A Pioneer MSX computer and laser disc once again accomplish the miracle. The disc contains sequences for all possible outcomes of each question, and the computer picks out the sequence that corresponds to the audience's decision. It's a case where the disc wins over videotape, because the machine can gain access to sequences on a disc almost instantaneously.

With these two new innovations, the Armagh Planetarium has kept up to the reputation it has won in recent years, of being second to none in the world. It has also proved that planetariums can have a viable future—in astronomy.

This article originally appeared in New Scientist, August 20, 1987, and is reprinted by permission.

An Introductory Mars Bibliography

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In the fall of 1988, Mars approaches unusually close to Earth and there will probably be a significant upswing of interest in the red planet. The list below is designed to assist planetarians in researching shows, lectures, visuals, and activities.

1. Historical Books About Mars

Cantril, H. *The Invasion from Mars: A Study in the Psychology of Panic.* 1940, Harper Torchbook.
Cooper, H. *The Search for Life on Mars.* 1980, Holt, Rinehart & Winston.
Ezell, E. & L. *On Mars: Exploration of the Red Planet 1958-1978.* 1984, NASA Special Publication 4212.
Hoyt, W. *Lowell and Mars.* 1976, U. of Arizona Press.

2. Historical Articles About Mars

Ashbrook, J. "Asaph Hall Finds the Moons of Mars" in *Sky & Telescope,* July 1977, p. 20.
Moore, P. "Mars—Then and Now" in *Mercury,* Mar/Apr 1980, p. 23.
Ordway, F. "The Legacy of Schiaparelli and Lowell" in *The Journal of the British Interplanetary Society,* vol 39, p. 19 (Jan 1986)

3. Selected Books About Mars As We Understand It Today

Abell, G., Morrison, D. & Wolff, S. *Exploration of the Universe,* 5th ed. 1987, Saunders. (Chapter 15 is an excellent summary of our understanding of Mars.)
Batson, R., et al. *The Atlas of Mars.* 1979, NASA Special Publication 438. Detailed maps and photomosaics.
Burgess, E. *To the Red Planet.* 1978, Columbia U. Press.
Carr, M. *The Surface of Mars.* 1981, Yale U. Press. Slightly technical, but very authoritative.
Carr, M. & Greeley, R. *Volcanic Features of Hawaii: A Basis for Comparison with Mars.* 1980, NASA Special Publication 403.
Chapman, C. *Planets of Rock and Ice.* 1982, Scribners.
Horowitz, N. *To Utopia and Back.* 1986, Freeman. On the search for life on Mars with the Viking lander instruments.
Mutch, T. & the Viking Lander Imaging Team. *The Martian Landscape.* 1978, NASA Special Publication 425. Includes many photos plus a 3-D viewer.
Preiss, B., ed. *The Planets.* 1985, Bantam. Has a nice chapter on Mars by M. Carr.
Sagan, C. "Blues for a Red Planet" in *Cosmos.* 1980, Random House. (An eloquent chapter introducing Mars.)
Spitzer, C. & the Viking Orbiter Imaging Team. *Viking Orbiter Views of Mars.* 1980, NASA Special Publication 441. Includes many photos plus a 3-D viewer.
Washburn, M. *Mars At Last.* 1977, Putnam's.

4. Articles About Mars As We Understand It Today

Arvidson, R., et al. "The Surface of Mars" in *Scientific American* Mar. 1978.
Beatty, J. "The Amazing Olympus Mons" in *Sky & Telescope,* Nov. 1982, p. 420.
Beatty, J. "Vikings Rest During Mars' Conjunction" in *Sky & Telescope,* Dec. 1976, p. 404. (Throughout 1976, *Sky & Telescope* had good coverage of the results from the Viking mission.)
Carr, M. "The Surface of Mars: A Post-Viking View" in *Mercury,* Jan/Feb 1983, p. 2.
Carroll, M. "The Changing Face of Mars" in *Astronomy,* Mar. 1987, p. 6.
Cordell, B. "Mars, Earth, and Ice" in *Sky & Telescope,* Jul. 1986, p. 17.
Goffin, E. & Meeus, J. "Mars' Closest Approaches to Earth" in *Sky & Telescope,* Aug. 1978, p. 106.
Gore, R. "Sifting for Life in the Sands of Mars" in *National Geographic,* Jan. 1977.
Haeberle, R. "The Climate of Mars" in *Scientific American,* May 1986.
Hartmann, W. "Viking on Mars: Exciting Results" in *Astronomy,* Jan. 1977, p. 6.
Leovy, C. "The Atmosphere of Mars" in *Scientific American,* Jul. 1977.

Morrison, D. & N. "The Mysterious Moons of Mars" in *Mercury*, May/June 1978, p. 62.
Schuta, P. "Polar Wandering on Mars" in *Scientific American*, Dec. 1985.
Turner, R. "Modeling and Mapping Phobos" in *Sky & Telescope*, Oct. 1978, p. 299.
Veverka, J. Phobos and Deimos" in Scientific American, Feb. 1977.
Veverka, J., et al. "The Puzzling Moons of Mars" in Sky & Telescope, Sep. 1978, p. 186.

5. Some Books and Articles About Future Mars Missions

Boston, P., et al, eds. *The Case for Mars*. 1984, Univelt/American Astronautical Soc. Proceedings of a conference.
Carroll, M. "The First Colony on Mars" in *Astronomy*, June 1985, p. 6.
Chaikin, A., et al. "Mars or Bust" in *Discover*, Sep. 1984, p. 12. (About ideas for a manned mission.)
Cordell, B. "The First Martians" in *Astronomy*, Mar. 1983, p. 6.
Friedman, L. & Zakharov, A. "New Robot Missions to Mars" in *The Planetary Report*, Jul/Aug 1986, p. 16.
McKay, C., ed. *The Case for Mars II*. 1985, Univelt/American Astronautical Society. Another conference proceeding.
Oberg, J. *Mission to Mars*. 1982, Stackpole Books. Discusses options for a manned mission and future exploration.
Powers, R. *Mars: Our Future on the Red Planet*. 1986, Houghton-Mifflin.

6. Some Books About Mars for Youngsters

Asimov, I. *Mars, the Red Planet*. 1977, Lothrop. Junior high and high school.
Darling, D. *The Planets—The Next Frontier*. 1984, Dillon. Elementary school.
Moche, D. *Mars*. 1978, Watts. Elementary school.
Taylor, G. *Volcanoes in the Solar System*. 1983, Dodd Mead. Elementary school and junior high.
Vogt, G. *Mars and the Inner Planets*. 1982, F. Watts. Elementary and junior high.

7. Lab Activities About Mars

Culver, R. "The Atmospheres of Mars and Venus" in *An Introduction to Experimental Astronomy*. 1984, Freeman.
Gingerich, O. "The Orbit of Mars" in *Sky & Telescope*, Oct. 1983, p. 300.
Holzinger, J. & Seeds, M. "Retrograde Motion of Mars" in *Laboratory Exercises in Astronomy*. 1976, Macmillan.
Icke, V. "The Orbit of Mars" in *Astronomical Experiments*, 3rd ed. 1983, Burgess.
Waxman, J. "The Age of the Martian Surface" in *A Workbook for Astronomy*. 1984, Cambridge U. Press.

8. Selected Audio-Visual Materials About Mars

Blues for a Red Planet (Part of the Cosmos series; 1980, Films, Inc., 55 min., color)
Mars (20 slides, 1987, Planetary Society)—a new slide set with computer enhanced images.
Mars: Chemistry Searches for Life (On the Viking life-science experiments; 1978, Modern Learning Aids, 26 min., color)
Mars Kit (6 slides, 1987, Astronomical Society of the Pacific)—some newly processed images and a detailed captions and activities booklet.
Mars Minus Myth (On our post-Viking view of Mars; 1977, Churchill Films, 22 min., color)
Planet Mars (On Viking results; 1979, NASA Film HQ-283, 29 min., color)
The Solar System Close-up (Three slide sets with captions by Dr. David Morrison; 1982-4, Astronomical Society of the Pacific)
Viking I and II: Landings on Mars (20 slides; MMI Corp.)

9. Some Good Science Fiction About Mars

Hippolito, J. & McNelly, W., eds. *Mars, We Love You*. 1971, Pyramid books. An anthology of Mars science and fiction.
Pesek, L. *The Earth is Near*. 1970, Dell paperback. About the first scientific expedition to Mars and their problems.
Pohl, F. *Man Plus*. 1976, Random House. About bioengineering human beings so they can live on Mars unprotected.
Varley, J. "In the Hall of the Martian Kings" in *The Persistence of Vision*, 1978, Dell paperback. Ingenious story about Mars adapting to Earth colonists. ❑

Jim Loudon, 1944-1988

Word arrived as this issue was going to press that Jim Loudon of Ann Arbor, Michigan, died on January 25. Jim was 44. He worked at the University of Michigan planetarium since 1969.

Jim was well-known to planetarians and to astronomy buffs throughout the Great Lakes region through his innumerable popular talks. He was one of the more creative thinkers about the popularization of science, and he will be missed by many friends.

President's Message

Von Del Chamberlain
Hansen Planetarium
15 South State Street
Salt Lake City, Utah 84111

Recently Lonny Baker wrote to me with the request that I send her comments for use in her column FORUM. When I finally started to work on the material she asked for, I realized that I wanted to comment in greater detail than she probably intended and that I wanted to make this the topic of my message fo the IPS membership. I beg Lonny's understanding and hope that what I say here can be viewed as part of her column which simply appears in a different place in the journal. She is the source of whatever inspiration follows and I give her full credit for it, while reserving to myself any blame for any offence anyone might find herein.

It is my opinion that the guideline that the IPS "shall support and strengthen the activities of existing and future planetarium oriented groups" is both important and appropriate. These words were formulated with the belief that IPS (ISPE as it was then known) should exist to coordinate efforts of interest to all planetarians. The most notable example of such functions is the effective communication of ideas throughout the entire planetarium field. Paralleling this was the belief that the strength of working very closely together as smaller teams, which could more easily and more frequently meet, having common ties stemming out of geographical and cultural relationships, should remain primarily with the "regional" groups. It was the belief of those involved in setting to paper our original statements of purpose and procedures that the international organization would carefully act to maintain such strengths within the "regions" rather than to become an organization which might compete with its affiliates in these ways.

My primary concern is the many indications that IPS affiliates either do not completely agree with this philosophy, or that they have unintentionally taken steps which are contrary to it. It is ironical to note that IPS affiliates seem to be threatening the foundations of IPS rather than, as we might fear, the other way around.

In certain ways it seems to me that the affiliates are competing with each other, and with IPS, to see which can draw the greatest number of planetarians from outside their regions to their meetings and which can boast about the largest boundaries represented by their membership. Wouldn't it be more significant to find pride in the degree to which they are able to attract full participation from all planetarians within their logical boundaries and to clearly focus upon items which are of greatest common concern within these boundaries?

All of this reminds me of what happens when a new planetarium is coming into being. Instead of starting with an intense analysis of what the facility could and should do within its special communal or academic setting, the planners are prone to attempt to fit within the mold of what other planetariums seem to be. This tends to even out what is viewed as "The Planetarium Purpose," rather than to discover new and more exciting avenues of what functions planetariums can provide within the special contexts of their communities. If we all want to be like each other, none of us will be special and unique and audiences will be justified in saying, "Why should I want to visit X planetarium when I am within its city when we have one just like it back home."

It seems to me that IPS affiliates have fallen into the trap of planning meetings which look very much like what they want IPS conferences to be. More and more, they even combine into joint meetings in order to create events which even more closely resemble the international gatherings. Instead of concentrating primarily on topics of greatest concern within their regions—topics such as becoming leaders in science curriculum development within communities, states and regions—the themes of meetings tend to be those broad ones which might well be reserved for IPS focus. Of course, such meetings would be incomplete without acquiring the financial sponsorship of the limited members of commercial organizations which can logically be approached. Each of them is approached for every conference whether it be regional or IPS and this is making it very difficult to obtain the major support needed to host an international conference.

Does this mean that regional groups are not really desirable? Should they disband in preference for annual IPS conferences and centralized work on all of the issues to be addressed? I hope that we will all agree that this would be a great mistake and that we will recognize that there are very important items

which are, indeed, best worked on by people drawn together into highly functional, efficient and effective teams possessing all of the channels necessary to maintain services which are greatly valued in their sections of the universe. IPS can never have the avenues to most effectively address local issues, but with proper support it can provide services which relate to our common purposes.

A recent example of the type of competition which I think tends to weaken rather than strengthen our profession came across my desk in two regional news letters. This was the announcement that GLPA has published a very desirable book of astronomical poems. Having collected such materials for many years, I was immediately interested in acquiring this item. Then I read on. "Only GLPA members can receive GLPA publications." I must join GLPA, a regional group very far away from Salt Lake City, in order to obtain a wonderful item developed by some of my planetarium colleagues. Should I join all of the regional groups? How many professional organizations can I afford to belong to? Shouldn't I have the greatest incentive to concentrate my financial and other resources upon the affairs of the region I reside in? I can much more easily support and attend its functions and I should have every reason to want to do so. Certainly we should be involved in those things which are of particular importance within our homelands. Then, in addition, we should be able to support the efforts of the one other organization which attempts to address the concerns of the entire planetarium profession. Wouldn't it be nice if items of general interest, such as the above mentioned book of poems, be made available to all of us through the bonds of IPS and its affiliates? Such bonds lie at the foundations of IPS.

I hope that the officers and other members of each IPS affiliate will carefully consider their purposes— even redefine purposes, if necessary— and concentrate their major efforts upon special, local affairs. We can be strong both locally and internationally. Let us fully participate in our local meetings where we can join forces with neighbors to become powerful influences and provide carefully designed and monitored services. Let us also continue to bring into existence and be functionally part of a viable and recognized world-wide network of professionals capable of grasping and sharing the enjoyment and excitement of scientific discovery with everyone. ❑

IPS 1988 Conference Update

Ken Wilson, Director
Ethyl Universe Planetarium/Space Theater
2500 West Broad Street
Richmond, Virginia 23220

Plans for the 1988 biennial conference, which will be held from **June 29 through July 4**, are progressing well. By now all IPS members should have received a complete information and registration package by mail. Please remember the deadlines. **All paper registrations must be received by April 15, and all conference registrations must be received by May 31.**

If you have not received the conference mailing, perhaps it is because you have not renewed your IPS membership, or we may have an incorrect address for you. If you need to renew, please send your renewal to Mark Petersen, PO Box 3023, Boulder, Colorado 80307, at once. Remember, you must be a current IPS member to attend the conference. If you are but still have not received the conference mailing, please contact us at the Ethyl Universe Planetarium/Space Theater (804-367-0211) and we will send you one.

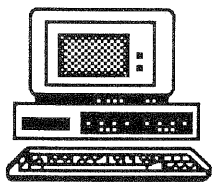
If you have not yet made your travel arrangements to Richmond, please remember that USAir/PSA and Piedmont Airlines are the official airlines for the 1988 IPS Conference. They have graciously offered attendees a 5% savings off any published Piedmont or USAir/PSA promotional round trip fare for travel within the continental United States, providing all rules and restrictions are met. For attendees unable to meet the restrictions for promotional fares, they are offering a 40% discount off the standard round trip coach fare for travel within the continental United States. For attendees traveling from Canada, Piedmont will offer a 25% discount. Check with the individual airline for details and restrictions regarding these special fares. If you are booking a flight on Piedmont, please use (or have your travel agent use) one of the following 800 numbers:

From Continental USA: 1-800-334-8644

From North Carolina and Canada: 1-800-251-5720, extension 2224

Make sure to ask for the IPS discount. If you are flying USAir/PSA, you or your travel agent should call 1-800-428-4322 and use the following special reservation code: AC612F.

See you in Richmond!



Computer Corner

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CompuServe ID 73260,1674

Much of the specialized software we planetarians use in the course of our work was created with some facet of astronomy in mind. There are, of course, exceptions, and John Pogue has found a gem that should interest those of us in the educational arena.

Crossword Magic

reviewed by John C. Pogue
Grand Prairie ISD Planetarium

Crossword Magic, a commercial computer program from Mindscape, Inc., has addictive qualities, but once one slows in "playing around" with it, the educational applications sprout forth.

Instructors of almost anything, and the sciences in particular, know the value of vocabulary building. In introductory science courses, astronomy included, the students must learn the "language" as well as the "territory" being studied. We have the impressive nature of our planetariums to assist with the latter. Finding stimulating ways to drill students in vocabulary is not so well fortuned, however.

Word-search type puzzles (there are programs to produce these, too) are fine as "time fillers" or for timed competition. But students soon tire of them, and their value in vocabulary building is minimal at best. My own children are well prepared for finding words whose meanings they probably don't know hidden in a jumble of random letters, should life or career ever demand it. They have even brought the damned things home as credit assignments!

Crossword puzzles provide a way to make the relation between words and their meanings an almost recreational activity, but have you ever created many of these on your own? Crossword Magic uses the memory and juggling power of the personal computer to "crunch" words for you. You feed in words (related by theme or topic of study, perhaps) and the computer fits them together, saves up the ones that won't fit until other words provide the opportunity, lays out the grid, keeps track of across and down numbering, and lets you provide your own unique clues (definitions).

A manual mode allows the puzzle creator to insert "filler" words to give the puzzle more complexity or balance of appearance while the computer automatically updates the word numbering.

The printout features options regarding filling in the blank boxes (or leaving the puzzle open framed), numbering the boxes, printing a key or theme word onto the blank puzzle, providing an accompanying list of puzzle words, number of copies, and printing an answer key.

I found it helpful to input larger words first and to use the "relocate" option to move them around to make the most letters accessible for later word connections. The printout is rather large, so access to a reducing photocopier is nice to produce one-page versions for students.

Crossword Magic is available for Apple, Atari, Commodore, and IBM-PC computers from Mindscape, Inc., P. O. Box 1167, Northbrook Illinois 60065.

* * * * *

John submitted examples: one a simple open-frame puzzle, and a more challenging one created especially for planetarians. I have included the latter for your amusement here. If you think you have solved it, don't send it to me. I recommend that everyone send John a copy of your solved puzzle, and let him award the first prize: a sho'nuff honest Texas jalapeño.

Not all software is expensive. Some of the most creative programs are done by crazy hackers who simply love to invent useful stuff, and don't bother charging for their creations. Two examples, both for the Macintosh, were sent my way by Jim Rusk of Mesquite, Texas.

The first is **Star Chart 2.0** by Tim Wentworth. This is a basic (but not *in* BASIC) star-chart program, in case you hadn't guessed from the title. It's actually an implementation of Stars.bas, a BASIC program by Richard Berry.

The program is easy to use. You choose your desired right ascension and declination, and the size of the viewing angle you wish to see. The program takes about a minute to produce the plot. Stars down to fainter than 4th magnitude and all the Messier objects are shown. The star symbols are well chosen to produce a good-looking representation.

After the plot is completed, you can click on any star or Messier object, and information about position, magnitude, and color index are displayed. If a star has an "Arabic" name, both that and its Greek-letter designation are shown. The Greek letters are often abbreviated oddly: Aldebaran is "ALPTAU."

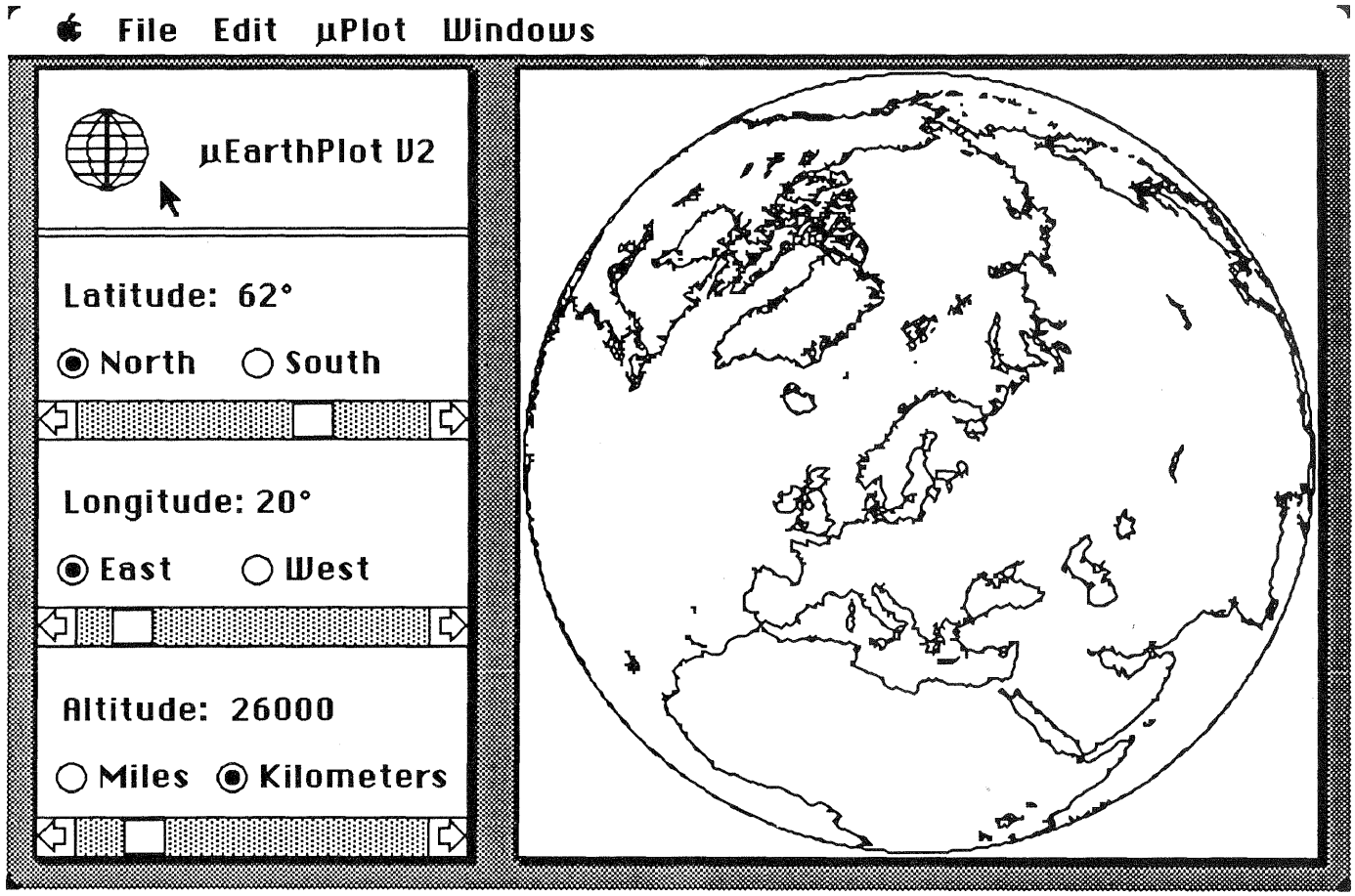
You can choose to add a labelled coordinate grid. I'm not sure at what epoch the grid is drawn, but at this resolution, it probably doesn't matter much. You can also draw additional straight lines with the mouse, to show constellation outlines, for example.

µEarth Plot V2 is another example of a non-astronomical program that could be useful to planetarians in some applications. Written by Michael Peirce with improvements by Marsh Gosnell, this program allows you to plot a map of the Earth.

You can choose the latitude and longitude for the center of your plot, and the altitude from which you wish to observe, from 1000 to 160,000 miles. The program takes about half a minute to plot a reasonably detailed outline map of the continents. If you choose to include coordinate lines, the time is greatly increased.

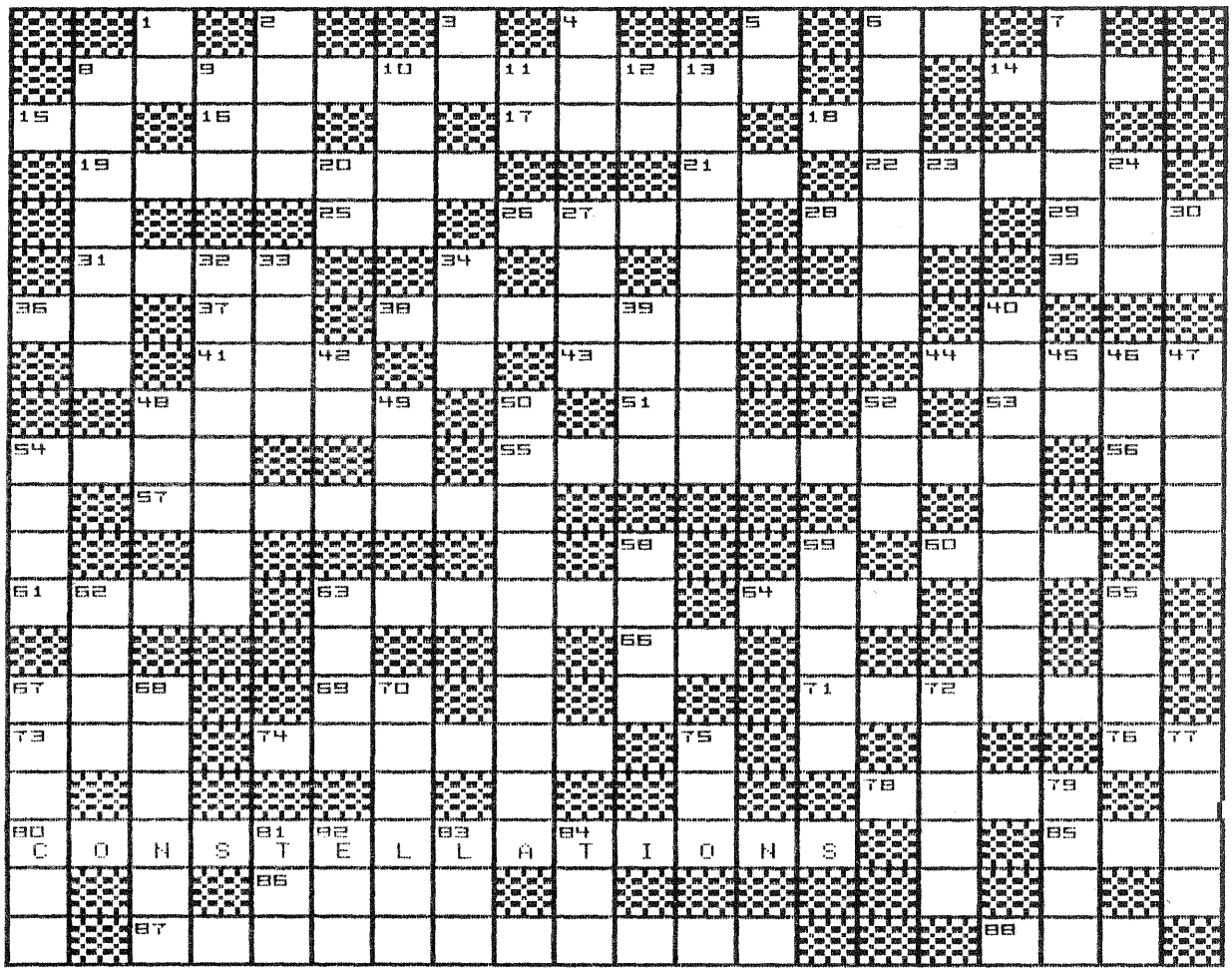
Since this is a standard MacPaint™-type bitmapped graphic, you can save it to disk directly. Then you can use MacPaint or any other graphics program to alter the plot. For instance, you can fill in the continents' interiors with a pattern (or, presumably, a color on the Mac II). You could add the path of totality for a solar eclipse, or shading to represent a particular phase of the Earth.

Both Star Chart 2.0 and µEarth Plot are public domain programs, so you might run into them in users' group libraries. If you can't find a copy of one you want, mail me a disk and I'll provide one. ❑



The earth from 26,000 kilometers above latitude 62° north, longitude 20° east, as charted by ***µEarth Plot.***

John Pogue's Constellated Puzzle, created with Crossword Magic.



Reprinted from ***The SWAP Newsletter****, Autumn 1987.*

ACROSS

6. What Andromeda might call Cepheus around the house.
8. No humps, but a long neck!
14. A dipper and a dog are this size.
15. Northeast (abbr.).
16. Chemical symbol for aluminum.
17. Bernice's is in the sky.
18. Either.
19. This horse flies!
21. An abbreviation for south.
22. Opposite of north.
25. Third person verb form of be.
26. Source of summer night's celestial music?
28. Oh, come on! It's the abbreviation for a celestial navigator's instrument.
29. Said to be naked if no optical device is used with it.
31. Direction in which celestial objects seem to rise.
35. Rodent.
36. There is one of these between the Earth and the Sun.
37. Cobalt or county (abbr.).
38. A celestial fish.
41. Star map abbreviation for the hunter.
43. No transgression if one uses this in trigonometric calculations.
44. Probably has dragon breath!
48. This shape is also a swan.
51. Negative response.
53. What Aquila would do.
54. Perseus might be this to a Scotsman.
55. Had a whale of a time, and WOW!, that hard rock!
56. 3.14159..., etc., etc., etc.
57. What the celestial bears are usually called today.
60. Paid to have a star named for you? Not without their approval!
61. The crane.
63. Flies the summer night skies.
64. What a Vulpecula!
66. It's not quite 6 trillion miles.
67. Far! Just a second! (of parallax).
69. Point (abbr.).
71. He's a lot of bull!
73. Inches per year? That's slow!
74. Hard to say, but looks like a kite.
76. Ernie Ford's postal abbreviation?
78. What Lyra might do if nagging.
80. Freebie. Subject of puzzle.
85. American Astronomical Society.
86. Even when round it's square!
87. Arrow-shootin' centaur.
88. Kind of sky CMaj might have.

DOWN

1. What the little bear may call the big bear.
2. Must have been a sail sale!
3. Certain California clothes have this.
4. "Altar" ego?
5. There's "them" and this.
6. Polished his shield and got a-head!
7. Brighter stars but colder nights.
8. Probably called his wife Cassie and his daughter Andy.
9. Short name for shiny wheels or a star's brightness.
10. A musical composition.
11. Expression of satisfaction.
12. Prefix meaning twofold.
13. Probably has a little roar.
20. Yes in Jaurez.
23. Bovine beast of burden.
24. Abbreviation for the water snake.
27. What you might hear a lot of from Canis Minor.
30. He really wanted to phone home!
32. When looking at him, don't step on his earthly relatives!
33. What Taurus is to U.S.'s neighbors to the south.
34. The strong man's abbreviation, but don't say it to his face!
39. This part of Taurus is missing.
40. Also Charles' Wain.
42. Form of to be.
45. Letters found on instruments from American Optical.
46. Abbreviation for the goat.
47. This big guy faces a lot of bull!
49. An arrow's abbreviated name.
50. This queen has her ups and downs.
52. Just a big pussycat?
54. Cepheus' rank.
58. This season sees a setting triangle and rising square.
59. Area of perpetual apparition can be found in this direction.
62. A course file.
63. Dogfood, or an association of lunar and planetary observers.
65. Direction where things seem to set.
67. A fishy duo!
68. Flies in the Milky Way!
70. Cepheus' other "throne" could have been this.
72. Friendly sky to the Greeks?
75. A stinger's abbreviation.
77. U.S. "spacey" administration.
79. Proud as a peacock.
81. If a city dweller, Canis Major would have had to wear one.
82. Celestial river's abbreviation.

Planetarium Usage for Secondary Students

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INTRODUCTION

The following lesson was developed by J. Lawrence Dunlap, Education Director, Flandrau Planetarium, University of Arizona, Tucson, Arizona 85721. This lesson complements another one created by the same author ("Tracking the Planets"), which appeared in the July 1987 issue of *The Planetarian* (Mallon, 1987). Both programs offer secondary students the opportunity to observe the positions of planets over an extended period of time, and to make various predictions about them. This lesson invites the students to estimate the relative distances to the planets, from the sun, after they have made observations of their synodic periods. Larry reports that this activity has been used by approximately 1,000 high school and community college students in Tucson.

Although it could be argued that this lesson could be accomplished without a planetarium (by working directly from tables of planetary figures), the planetarium allows the students to complete the activity in substantially less time and also adds a touch of "concreteness" to the list of "numbers." Larry shares his experiences with conducting the lesson both ways. "I started doing the activity in a physical science class around 1970, without a planetarium, by working directly from tables of planetary longitudes. Dull and time consuming, it took my students about a week to do what can be done in the planetarium in an hour! But that was before personal calculators were available, and the students had little appreciation of how the longitude numbers related to the night sky. The planetarium observations were self-evident, they reduced the time spent crunching numbers, and the students seemed to enjoy using a little algebra, geometry, and trig to find the distance to planets—a seemingly impossible task for a mere high school student! Of course the answers are not very accurate, but they are no worse than the results of most other high school labs."

This lesson would be an excellent lab activity for students in Physics, Astronomy, Earth Science, Algebra, or Social Studies* classes. Readers are invited to try this lesson with their students, and to communicate their reactions to Larry.

Please note, your submissions are needed and appreciated!

Readers are reminded to please send any comments on this lesson, as well as submissions of other lesson plans for the secondary level (grades 7-12) to me. In submitting lesson plans, please remember to use the following format: Title, Purpose, Objectives, Materials, Preparation, and Procedure. Thank you!

DISTANCE TO THE PLANETS

A Planetarium Lesson by

J. Lawrence Dunlap

Introduction: Laboratory activities in the planetarium are quantitative exercises that use the planetarium to simulate the motions of the sun, moon and planets over extended periods of time. Students are required to observe objects in the controlled environment of the planetarium and to record their measurements. The activities involve a series of observations, which, if carried out in the real sky, would take months or years to complete and are therefore not included in a standard course of study. However, the observations can be completed in the planetarium in less than an hour. Computations and analysis must be done afterwards, either in class or as a take-home assignment. These activities have been locally developed and have been

*those studying Copernicus and Kepler.

used successfully by high school physics and astronomy classes from schools throughout southern Arizona. They illustrate how measurements, assumptions, mathematics, and laws of nature are used to convert observations into new information about celestial objects.

Purpose: To determine the relative distances from the sun to the planets assuming a heliocentric solar system and circular planetary orbits. This activity clearly illustrates how observations (synodic periods) combined with a fruitful hypothesis (heliocentric solar system) lead to new knowledge (sidereal periods and approximate sizes of the planetary orbits). This lesson is recommended for students in Physics (especially Project or PSSC) or Astronomy. Some trigonometry is useful (definition of functions in right triangle).

Behavioral Objectives: By the end of the lesson, the students should be able to:

1. Describe planetary configurations as seen in the earth's sky and as seen from an external perspective.

2. Infer that the sun's apparent motion on the ecliptic could be due to the earth's orbital motion.

3. Infer that the planetary orbits are nearly co-planar because the planets are close to the ecliptic as seen from the earth.

4. Measure the synodic periods of an inferior and a superior planet.

5. Compute the sidereal periods of an inferior and a superior planet.

6. Determine the relative distance from the sun to an inferior planet.

7. Determine the relative distance from the sun to a superior planet.

Materials: Worksheets, pencils, slides or transparencies, orrery projector (if available), red (or dim) lights for data recording.

Preparation: It is recommended that students spend a class period before the planetarium activity discussing how to measure the "period" of a planet's motion. This should bring out the difference between the synodic period (the time to return to the same configuration relative to an earth-sun sight line), the zodiacal period (the time to circle through the zodiac and return to the same constellation) and the sidereal period (the time to complete one cycle along a heliocentric orbit fixed in space). Students can also discuss how to derive a relationship between the synodic period and the sidereal period for an inferior planet and for a superior planet assuming the orbits are circular and the motion is uniform. (While neither of these assumptions are true, they lead to respectable results, considering that the observations are naked eye).

Use the *Astronomical Almanac* "Diary of Phenomena" to determine the date of the last greatest elongation of Venus to occur shortly before the current opposition of Jupiter.

Sample Dates of Planetary Phenomena

(computed with synodic periods and 1987 configurations)

Projector settings for distance to planets.

Mercury Inferior Conjunction (1)	28 Oct 1987
Mercury Inferior Conjunction (28	21 Feb 1988
Venus Greatest Eastern Elongation	2 Apr 1988
Jupiter Opposition (1)	20 Nov 1988
Jupiter Opposition (2)	23 Dec 1989

Then, find the next two earlier inferior conjunctions of Mercury. Note these dates and set your projector to the first inferior conjunction of Mercury. (This may sound like the rule for determining the date of Easter, but it eliminates wasted time in the planetarium chamber searching for the next apparition. Use your own choice of dates if you prefer!)

The planetarium preparation consists of setting the projector to the starting date. (If your class has never attended the planetarium nor seen a demonstration of retrograde motion, it is recommended that you back up an extra four months or so and spend 15-20 minutes demonstrating clearly the daily motion of the celestial sphere, and then the annual motion of the sun and Mercury for several months, with the daily motion off. Use your orrery projector to illustrate how the apparent eastward motion of the sun and the east and west motions of Mercury can be explained by the orbital motion of the earth. This gives students the opportunity to see the configurations, to distinguish the effects of the rotation/revolution of the earth, and to see that one cannot directly "observe" the sidereal period of a planet from a moving earth without knowing "a priori" the size of the orbits of the earth and the planet.)

Procedure: Explain the purpose of the lesson to the students. Stress the use of the planetarium as an analog computer of sky phenomena, and the ability to collect observations in an hour that would take several years to gather from the real sky. Normally, observations of the positions of the planets would be made as a function of time as indicated by an accurate clock. In the planetarium, we will use the sun as a clock hand and the ecliptic as the dial. The location of the sun on the ecliptic gives the time to the nearest day.

Demonstrate the difference between daily motion and annual motion, and point out that they can be separated in the planetarium. (Time can be made to speed up without making the earth rotate faster.) Demonstrate how to tell the date, using the sun's position on the ecliptic. Discuss how to distinguish planets from stars.

1. Observations of Mercury. With the sun west of the meridian, use the annual motion to bring Mercury to an inferior conjunction (recognized by retrograde motion) with the sun. Note the date on the ecliptic. Run annual motion forward to the next inferior conjunction of Mercury. Record the dates and define the interval as the synodic period. (See Table 1 on Student Worksheet) The problem for later is to calculate the sidereal period from this observation. Set the projector to the next date (40 days before the greatest elongation of Venus) while the students record the dates on the worksheet.

2. Observations of Venus.

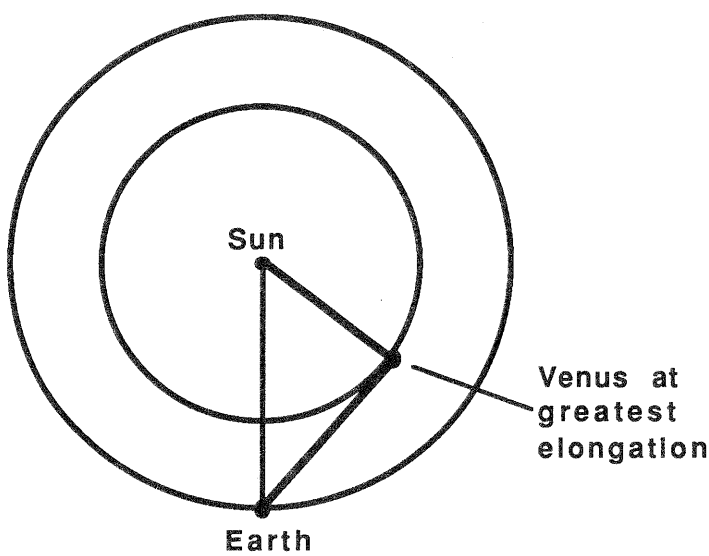

Figure 1: An inferior planet at greatest elongation. With the assumption of circular orbits, the line of sight from Earth to Venus makes a right angle with the line joining Venus to the sun.

a) Project a slide of inferior planet configurations. Discuss the slide briefly. Show how elongation changes near a point of greatest elongation as a function of time.

b) Project a slide of the triangle formed by the Earth-Planet-Sun when the planet is at greatest elongation. For circular orbits, note the right angle at the planet between the line of sight and the radius of the orbit. (See Figure 1.)

Recall that given one other angle and one side, this triangle can be solved. Define the hypotenuse as "1 AU (Astronomical Unit)." Ask the students how they could find the length of the side from the sun to the planet.

Set the sun on the horizon and define the elongation of a planet from this perspective. Measure the elongation of Venus (along the ecliptic, or use an astrolabe). Record the date and the elongation angle.

Advance the time by 20 days and repeat the observations.

Advance the time another 20 days and repeat.

Advance the time another 20 days and repeat.

(The elongation should pass through a maximum which can be found by inspection of the data or by plotting a graph of elongation as a function of time. Then find the distance of Venus from the sun in A.U.'s) Set the projector to the next date (sometime before the beginning of Jupiter's retrograde motion) while the students are recording their data. Use this time to also discuss with the class what they are to do later.

3. Observations of Jupiter.

a) Project a slide showing the configurations for a superior planet. Define opposition as occurring during the middle of the retrograde motion.

b) Project a slide of the right triangle formed by the Earth-Planet-Sun at quadrature. (See Figure 2.)

Note the problem of measuring an angle whose vertex is not at the earth. Explain how to do this by observing the time between opposition and quadrature and by knowing the sidereal periods of both planets.

c) Find the date of Jupiter's next opposition. (Run through an entire retrograde loop, note the angular width of the loop and back up to the

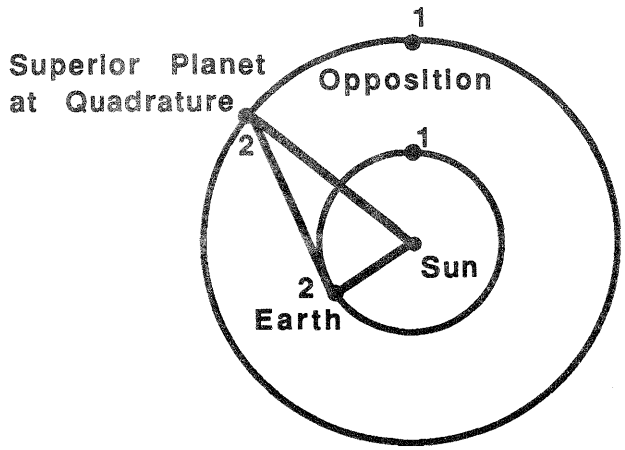

Figure 2. Positions of the earth and a superior planet at opposition (1) and at quadrature (2). For circular orbits, a right triangle can be drawn as shown when the planet is at quadrature. Notice that the vertex of the right angle is at the earth.

mid-point.) Check the date by putting Jupiter on the meridian and "flying over the north pole" to see the Sun at noon on the other side.

d) Run the annual motion forward to the next opposition of Jupiter, obtain the date and record it. Later compute the sidereal period of Jupiter from this interval.

e) With Jupiter visible, run forward to quadrature and record that date. (If measuring on the ecliptic, allow about 91 days for 90 degrees from the position of Jupiter. A small error in the time interval becomes a large error in distance.) The time interval (T) x 360/365 gives the angle swept out by the Sun-Earth line during this time. (T) x 360/(Jupiter's sidereal period in days) gives the angle swept out by the sun-Jupiter line in the same time. The difference between these angles gives the angle at the sun in the right triangle needed to find the Sun-Jupiter distance in A.U.s. (See Figure 2.)

4. Conclusion. Discuss the significance of finding periods that increase with distance from the sun, and the difficulty Kepler had in showing that the orbits were not circular. Discuss how the telescope was used to obtain the length of an A.U. in miles (or kilometers) (See Figure 3), and how radar has been used today to achieve the accuracy required to send a spacecraft to Neptune by 1989.

References

Mallon, Gerald L., "Planetarium Usage for Secondary Students," ("Tracking the Planets," by J. Lawrence Dunlap), *The Planetarian*, Vol. 16 No.3, July 1987, pp. 47-50.

Sample Solutions

Distance to the Planets

Mercury: Inferior Conjunction(1) 28 Oct 1987
Inferior Conjunction (2) 21 Feb 1988
Time Interval 116 days = Synodic Period (p)
p (years) = 116/365 = 0.317 year

Venus: Greatest Elongation = 46°, 2 Apr 1988
Sin (46) = x/1 (See Figure 1)
x = 0.72 a.u.

Jupiter: Opposition (1) 20 Nov 1988
Opposition (2) 24 Dec 1989
Time Interval 399 days = Synodic Period (p)
p (years) = 399/365 = 1.093 years
1/x = 1 - 1/p; 1/x = 0.0852
x = 11.73 years = 4284 days
Quadrature 25 Mar 1989

Time Interval 91 days
Earth: (91/365) x 360 = 89.7°
Jupiter: (91/4284) x 360 = 7.6°
Difference = 82° x/1 = tan(82) (See Figure 2)
x = 7.2 a.u.

Note: The large error is due to the errors in measuring the precise time of quadrature and in assuming circular orbits (constant orbital speeds) of Earth and Jupiter.

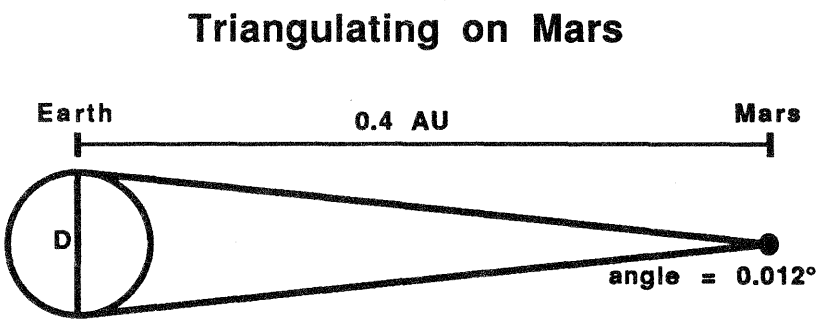

Figure 3. Measuring the astronomical unit.

DISTANCE TO THE PLANETS

A Planetarium Laboratory Activity

Student Data Sheet Name _____

PROBLEM. Observe the positions of the visible planets relative to the sun at particular times as directed. Assuming a heliocentric model of the solar system and circular orbits for the planets. find the orbital sidereal periods of the planets and determine their relative distances from the sun.

DATA TABLES.

TABLE 1. Observations of Mercury and Jupiter.

Mercury		Jupiter	
Date of:	yr/mo/da	Date of:	yr/mo/da
* first inferior conjunction	_____	* first opposition	_____
* second inferior conjunction	_____	* next opposition	_____
Synodic period: days	_____	Synodic period: days	_____
years	_____	years	_____
Sidereal period	_____	Sidereal period	_____

TABLE 2. Elongations of Venus.

* Date	* Elongation
_____	_____
_____	_____
_____	_____
_____	_____

Greatest elongation of Venus _____

TABLE 3. Observations of Jupiter

* Date of opposition	_____
* Date of quadrature	_____
Days from opp. to quad.	_____
Earth angle (E1-S-E2)	_____
Jupiter angle (J1-S-J2)	_____
Angle in triangle (J2-S-E2)	_____

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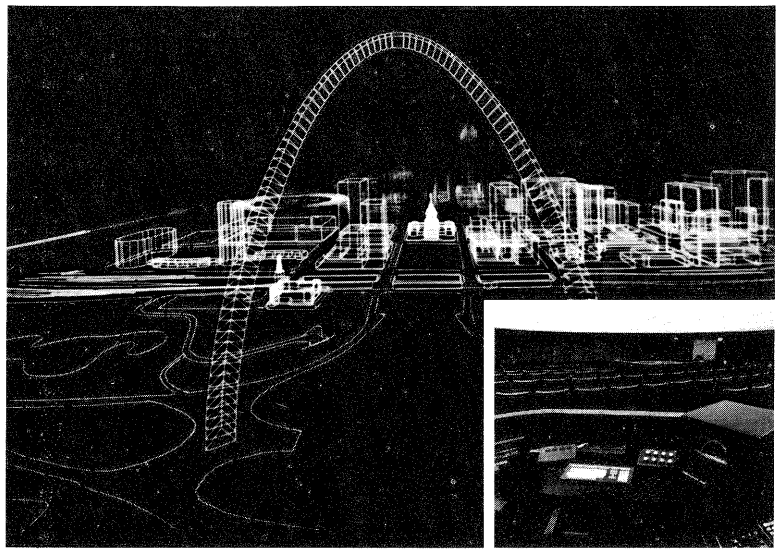
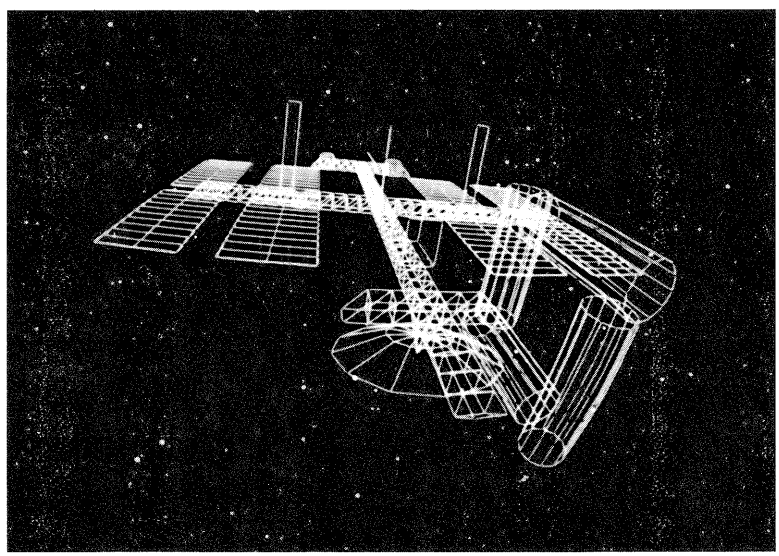
▲ *An interior view of the Omniversum Space Theater in The Hague, Netherlands. The DIGISTAR projector is located in the center of the star theater, permitting an unobstructed view of the entire dome and providing maximum seating capacity.*

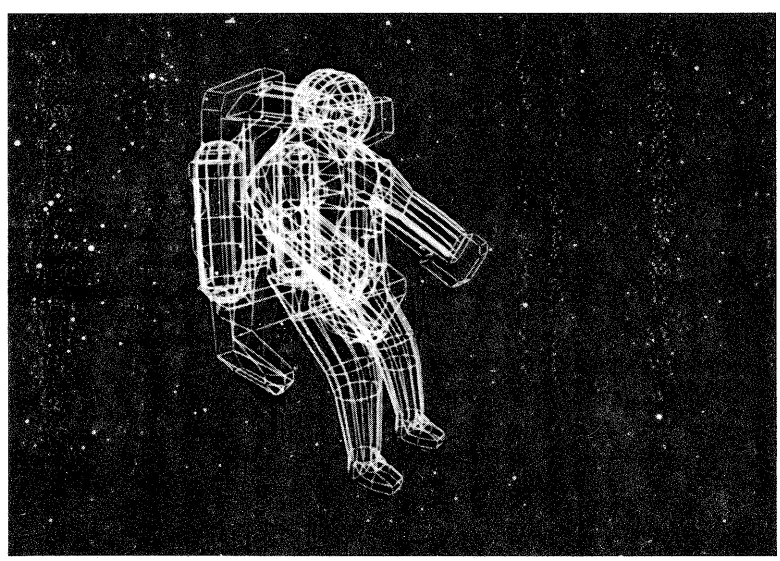


◀ *The St. Louis skyline presented by DIGISTAR. With DIGISTAR, your planetarium visitors can fly through a computer data base of your city or through the DIGISTAR universe. Created by HOK Computer Service Corp., St. Louis, Mo.*

◀ *The DIGISTAR installation at the McDonnell Star Theater at the St. Louis Science Center. The DIGISTAR projector lens can be seen in the projection pit in the center of the star theater and always projects from below the springline of the dome.*



◀ *Line drawing of a proposed NASA space station created on DIGISTAR.*



◀ *Manned maneuvering unit (MMU) used by NASA astronauts to perform a variety of tasks in space.*

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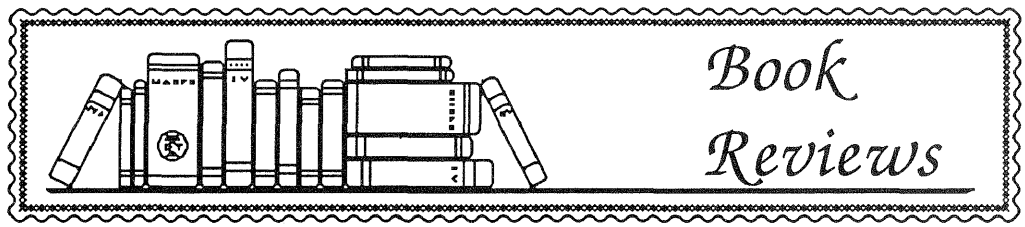


Carolyn Collins Petersen
P.O. Box 3023
Boulder, Colorado 80307

A Note From the Publications Chair

IPS is planning an ambitious publications schedule for 1988. You can count on quarterly publication of *The Planetarian*. Editor John Mosley welcomes your submissions, so take a moment to check out his new publication deadlines printed on pages 8 and 74. We are also planning to put out another directory after the second quarter of 1988. Last, but certainly not least, we are planning on reprinting George Reed's very popular *Naked I Astronomy*—a collection of his essays and newspaper columns.

IPS members can expect to receive that publication sometime in mid-year.

New Special Effects Handbook

For 1989, IPS is planning to redo the *Special Effects Handbook*, the first version of which was published several years ago. This new version will feature (we hope) updates of the more popular effects in the old book, in addition to effects utilizing newer technologies. For this book to be a success, however, it needs *your input!* If you have found a new way to wrap baling wire around a bulb and recreate the universe—Special Effects Handbook Editor **Rick Pirko** wants to know about it! This is your chance to share those arcane mysteries with other planetarians. Send your ideas, with description, construction plans and instructions, with any camera-ready illustrations and/or photos, to:

Richard Pirko, Special Effects Handbook Editor
c/o Ward Beecher Planetarium
Youngstown State University
Youngstown, Ohio 44555

For more information, write to Rick, or call him at (216) 742-7278. Submission deadline is November 30, 1988. All materials will be returned upon request from their contributors.

Linking Planetarium Shows with Museum Exhibits

This seems to be the grand age of the Traveling Museum Exhibit. In recent years, various cities around the U.S. have played host to such exhibitions as "King Tut," "Blood of the Maya," "Crossroads of the Ancient World" and other collections of archaeological treasures. In most cases, the museums involved mount large PR campaigns, offer classes, sell trinkets, and in general, do a lot of fan-dancing to get people to come and see these collections. I've often wondered what the museum *planetariums* do when their building is inundated with artifacts from another culture. Continue with their own plans, seemingly oblivious to the hoopla going on elsewhere? Or might they try to do a program supporting the exhibit?

Recently, the Denver Museum of Natural History has been going through Egypt-mania as it mounts one of the most important exhibitions of its tenure—the "Ramses II" collection. The museum built a new three-story addition to house the Egyptian artifacts. A Middle Eastern bazaar has pitched its tent within the walls of the museum, and local companies have all vied to put their name on some part of the exhibit as the "official" airline/grocery story/car dealership/etc. of Ramses II.

In the midst of all this to-do, over in one corner of the museum, the Gates Planetarium is showing its RAMSES show—Stars of the Pharaohs—and doing boffo biz. Director Bob Wallace and his crew have recreated the inside of Ramses' tomb within their dome. "Gold leaf" covers the interiors of the exit doors, and painted over that leaf are hieroglyphs.

Leading into the theater, attendees pass under "stone" archways carved with other Egyptian figures. Vaguely Eastern music plays as you walk into the theater. Suddenly, the doors slam shut, and the theater darkens to reveal stone pillars soaring up to infinity. This pillared all-sky effectively sets the scene for a disembodied voice of Ramses to welcome us to his time and to a study of his skies.

The entire 50-minute show deals with the stars and constellations of Ramses' time—and the tales of love, creation, hate, battle, and politics that the Egyptians told when they spoke of the sky. It ends with one of the most effective visuals I have ever seen—a re-creation of sunrise at Abu Simbel, using a special effects "square" projector to trace the path of the sun as it travels down the narrow corridor and illuminates the sitting statues of Thoth and Ramses.

Between the closing of his tomb, and the reopening at the end of the show, a very believable Ramses (played by a Denver actor who lived in the Middle East for many years) tells his tale, aided by professionally-done planetarium special effects and visuals. It is one of the most well-executed presentations at Gates planetarium, and a tribute to the many hours and dollars that the staff spent to get the details just right.

The kicker about this presentation is that it really isn't just a planetarium show. Yes, it does talk about the stars, and use the instrument at the appropriate times. And yes, it is done in the dome. But, it exploits the uniqueness of the dome to create an atmosphere—and to take the audience to another place in space and time. And, the show is the only audio-visual presentation in the museum that successfully places Ramses in his time and place. The Ramses II visitor would be well advised to visit the planetarium before embarking on a tour of Ramses' artifacts.

The show (which closes on March 31, 1988) is a good example of the kind of coordination between exhibit and planetarium show that can really work. It will be interesting to see if this museum/planetarium complex—or others—will ever coordinate an exhibit based on a planetarium show. July 1989 might be a good time to test this—it will be the twentieth anniversary of the first manned landing on the moon—an ideal subject for the planetarium. Any museums out there want to help their planetariums next year?

* * * * *

Book Reviews

Quasars, Redshifts and Controversies, Halton Arp 1987, Interstellar Media, Berkeley, California ISBN: 0-941325-00-8 (no price listed).

Reviewed by Carolyn Collins Petersen.

Most of us, at one time or another, have been accosted by someone claiming that he/she/it has figured out the solution to one of the great questions of the universe, but that a) the solution costs money to prove; b) they'd tell us what it is, but they're afraid someone will steal their idea; or c) the scientific establishment is suppressing the solution because it conflicts with established scientific theory. Quite often, these folks are crackpots, and we dismiss them as such. In fact, just the mention of a threatened 'scientific suppression' is usually enough to cause my eyebrows to raise in a cynical arch. I tend to view the discussion with the proverbial jaundiced eye, such as many of have done with the "Anomalous Martian Features" controversy.

It was with such a jaundiced eye that I approached Arp's book. Discussions among colleagues at work, as well as on CompuServe had prepared me for either a) a crackpot theory, or b)a fairly well-reasoned disagreement with current theories of red-shift and quasars. With a few minor exceptions, I found Arp's book to be that well-reasoned disagreement. Beyond that, it's an interesting look at the arcane world of cosmology, and the arguments that go on behind the scenes.

Arp's theories state that quasars are not the most distant objects in the universe, and that they are quite likely associated with relatively nearby galaxies. Some galaxies, Arp says, show redshift anomalies related to quasar's redshifts.

In addition, he feels that he has proof that the enormous redshifts associated with quasars do not arise from the expansion of the universe, but are properties of the quasars themselves.

Arp's troubles, of course, stem from the fact that his theories clash with accepted views of cosmic objects. Some of those troubles have manifested themselves in the usual ways: suppression of papers at conferences, refusal of journal editors to print his submissions—or worse, alteration of his papers by editors to fit the established view. Arp also claims that he has been denied the telescope time he needs to prove his claims.

The book is reasonably written, with only a little of the wailing that so often characterizes writers who claim that they are being suppressed. It isn't clear that Arp's theories are so wild as to merit the kind of treatment he claims he's getting.

While Arp does take the time to explain the really difficult concepts, his book is not coffee-table reading. If you're looking for a unique look at the way cosmologists work, you might check this one out.

* * * * *

Laboratory Experiments in Astronomy, Johnson & Canterna, Saunders College Publishing, 1987 (no price listed).

Reviewed by Carolyn Collins Petersen.

Review a lab book? Why not? This one showed up in the mail a while back, and while I haven't finished working through all of the lessons, I thought I'd take the time to say a few words about it. The authors, Paul Johnson of University of Wyoming, and R. Canterna, of Colorado College and University of Wyoming, have put together a little manual that is useful in introductory astronomy classes that do not require calculus or physics as a prerequisite. The authors tried to approach each activity with a sense of how that activity would teach the student about the way "real" astronomers work. Modern astronomy is emphasized, with a balance of planetary, stellar, galactic and extragalactic topics.

The labs are clearly written, and place emphasis on learning beyond what a text might require. You have to get your hands dirty doing these labs—and it's one of the few lab books where I didn't feel the need for a textbook to help me along. Even if you don't do labs, it might be a nice addition to your reference shelf.

* * * * *

Astronomy Reprints from Archival Facsimiles Ltd., Alburgh, Harleston, Norfolk, IP20 0BZ, England or 230 East Ontario, Chicago, Illinois, 60611.

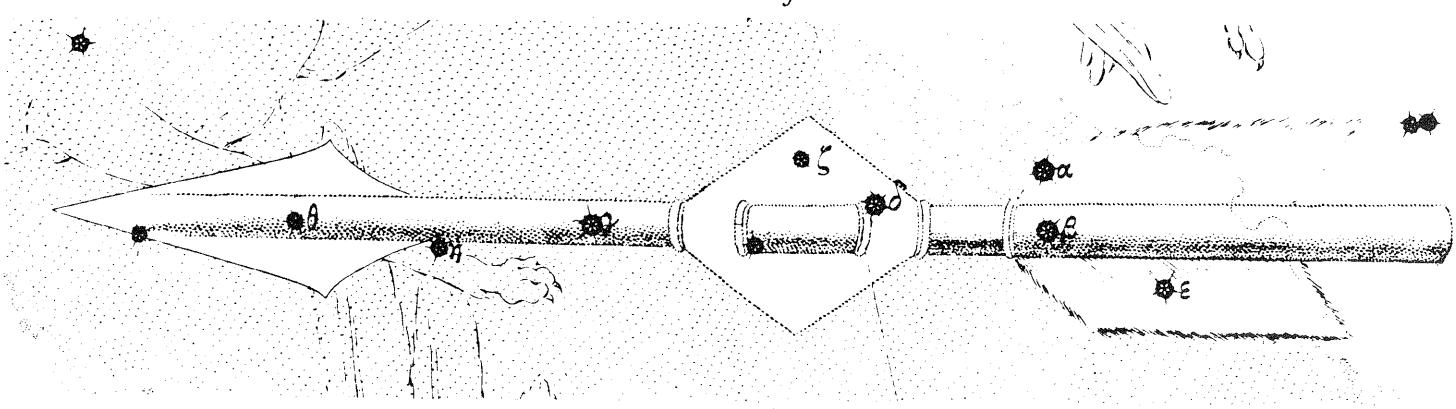
Reviewed by John Mosley.

One thing that is truly astronomical is the cost of an original copy of a book such as Galileo's *Sidereus Nincius* or Cellarius' *Atlas Coelestis*. They're priced at a year's salary or more. Few of us will ever *handle* one, let alone take a copy home and examine it at our leisure. Yet these are the classics of astronomy, and its a shame not to be able to get to know them.

Last year Archival Facsimiles Ltd. began a three-year program to reprint about a dozen of the rarest and most valuable astronomy books and atlases. (See page 63 in the October 1987 issue of *The Planetarian* for a description of the first year's selection.) I like old astronomy books—especially antique star charts—so I ordered a set. They're pretty nice. The books look modern on the outside, and they're printed on archival-quality white paper. They don't have the "look and feel" of the originals, so you're not going to fool your friends and neighbors into thinking that you scored big at the antiquarian book show. They're essentially high quality bound photocopies (in color where appropriate). But they are well done. An authority at the British Museum said he "could find no major faults," and that is a high compliment from a lofty source.

I thoroughly enjoyed leafing through books that previously I had only seen bits and pieces of as illustrations in other books. The *Atlas Celeste* by John Bevis (printed in 1745-50) is a wonderful blend of classical and modern. And the *Atlas Coelestis* by Cellarius, generally considered the most beautiful star atlas ever

Below: The constellation Sagitta, reproduced full size, as it appears in ***Atlas Celeste*** *by John Bevis, reprinted by Archival Facsimiles Ltd.*



made, is a wonderful collection of astronomical images. You could easily lose yourself for an evening in its 29 double color pages.

It's a pity that Archival Facsimiles did not include (in most cases) an introduction by a modern authority. I know that I'm missing a lot because I don't have the historical background to fully appreciate and understand what I'm looking at. It would be grand to have guidance that points out what to look for and that puts each work in the context of the period in which it appeared. George Lovi's wonderful introduction to the new *Uranometria 2000.0* quickly comes to mind. Someone could surely write a few dozen pages about the images in the borders of the Cellarius atlas alone.

I bought a set because I know that I'll never have the opportunity to browse at my leisure through the originals. I expect that few individuals will chose to afford them, but they have an important place in astronomy libraries. The originals are vanishingly rare, and for most of us these facsimiles are as close as we are going to get to some of the most important and beautiful astronomy books ever printed.

* * * * *

The Craft of Scientific Writing, Michael Alley, Prentice-Hall, Inc., Englewood Cliffs, New Hampshire, 1987.

Reviewed by John Mosley.

As a new editor, I'm paying more attention to what people write and to how they write it. For most of us, I suspect, high school and college English and composition classes were important, but we've developed our writing styles since then. We're largely self-taught, and there's room for improvement. Reading this book is one way to improve.

Michael Alley has put together a compact and enjoyable book that is a must for anyone who takes his or her writing seriously. His primary audience is authors of technical papers, but the book is really for anyone who wishes to write clearly and precisely. Subtopics such as Eliminating Redundancies, Avoiding Arrogance, Using Analogies, Avoiding Pretentious Words, Defining Unfamiliar Words, and Avoiding Overspecification show that the book is not for scientists only.

The Craft of Scientific Writing is fun to read. It's informal and unpretentious. Above all, it's relevant. The author is not dogmatic about minor grammatical rules, and he spends little time on them. He's more concerned about needlessly complex prose and about lack of clarity. He uses more than 100 examples from research papers to show the difference between strong and weak writing.

Three chapters are about the types and goals of illustrations. He writes, "First, you must make your illustrations *precise*. Precision dos not mean having the most accurate illustrations.... Too often in scientific writing, illustrations confuse rather than inform. Clarity demands not only that your illustrations be understood, but also that they not be misunderstood....you should anchor your illustrations in the *familiar*." His guidelines apply to museum exhibits as well as to illustrations in *The Planetarian*.

The last third of the book is about the structure of writing. It's about how to begin, how to present, and how to conclude. His advice applies as well to a planetarium script or museum exhibit as to a research paper.

I recommend *The Craft of Scientific Writing* without reservation to contributors of *The Planetarian* (hint, hint). Here's how to read it. Don't plough through it in one or two sittings. The 21 chapters average 10 pages each, and each chapter takes only a few minutes. Read one chapter each morning and mull it over for the rest of the day. I've taken my own advice; I enjoyed it, and I've certainly learned from it.

* * * * *

And finally, this news note:

The International Astronomical Union is holding its Colloquium #105—The Teaching of Astronomy—July 27-30, 1988. It will be held at Williams College, Williamstown, Massachusetts. The program includes all aspects of the teaching of astronomy to the public and to science and non-science students in schools, universities, and other institutions in all parts of the world, using both traditional and alternative approaches and technologies. Poster papers and a limited number of oral papers will be accepted for presentation, subject to review by the Scientific Organizing Committee. The proceedings of the colloquium are to be published by Cambridge University Press. For more information, contact Professor John R. Percy, Department of Astronomy, University of Toronto, Toronto, Ontario, Canada M5S 1A1. ❑

Secretary's Notepad

Gerald L. Mallon, Ed.D.
IPS Executive Secretary
204 Haws Avenue
Norristown, Pennsylvania 19401

As a member of the International Planetarium Society, your input and participation is absolutely necessary to make a strong and healthy organization. At the past Council meeting, various projects and tasks were proposed which could offer you a vehicle for your participation. Please review the following items and get involved with as many of them as you can. The addresses of the officers mentioned are listed on page 4. Thanks.

1. A host is sought for the 1989 meeting of the IPS Council. Last year SEPA and the Brevard Community College Planetarium (under the direction of Mike Hutton), were gracious enough to host the session. Any affiliate organization, or individual planetarium willing to extend an invitation for the 1989 meeting, should contact President-Elect Terence Murtagh. The decision on the proposed site is slated to be made at this year's Council Meeting. (We are really very nice guests.)

2. The Elections Committee will soon be soliciting nominations for officers of the IPS. Rather than wait to the last minute, consider the members of the society that you know, and contact Elections Committee Chair Tom Stec now with your nominations.

3. The Awards Committee is continuing to compile nominations for "Fellows of the International Planetarium Society." A list of the current fellows and the criteria for selection is printed on the next page. Take a moment and look over the list; consider other members of the Society who may be worthy of this great honor and send your nominations to Awards Committee Chair Bruce Dietrich.

4. The search continues for a permanent site for the IPS Archives and someone to manage the collection. If you have any suggestions on either of these points, please contact IPS President, Von Del Chamberlain.

5. Planning Continues for the 1988 IPS Conference to be held in Richmond, Virginia. June 29-July 4, 1988. All members will shortly be receiving specific information on the event, and a request for papers/workshops. Please plan *now* on attending this important function, and offer to share your ideas by your active participation as a presenter.

6. On the topic of conferences, please note that there are two proposals for the 1992 IPS Conference. They are: Edmonton, Alberta (Canada) and Salt Lake City, Utah (USA). The difficult decision between these two excellent choices will be made at this year's Council Meeting, therefore, *please* let your representative know your thoughts on this subject before the meeting. If possible, all affiliates are urged to discuss the matter at their annual meetings, or somehow poll their members prior to the Council meeting. (For those of you who are members of the IPS but not members of a local affiliate, please drop me a note and as your secretary and I will attempt to represent your thoughts on the matter.)

7. The Council has been exploring the issue of "Liability Insurance" for the Council Members, the editor of *The Planetarian* and/or the Society. If anyone has any expertise or thoughts on this manner (types of insurance, pros and cons, suggested carriers, etc.) please contact the Executive Secretary (me).

8. As was mentioned in one of the past columns of the President's Message, the IPS Council is attempting to explore methods of encouraging non-U.S. membership in the Society. For some institutions, particularly in developing nations, the biggest obstacle is money. For example, a one year membership in the IPS for a planetarium in India could cost approximately the same as a one month salary for a staff employee. (How many of you would continue to be members if it were to cost your entire month's salary?) If you would be interested in sponsoring a "Sister Planetarium" in another country, through a gift membership, please contact your Treasurer, Mark Petersen. If enough interest is shown, we will then be able to contact such planetariums with our offer. Please think about. Also, if you have other suggestions to help this process, please send your thoughts to me.

In closing, I thank you again for your concern and support. As a fellow member of the society, I look forward to gaining from your active participation. ❑

Fellows of the International Planetarium Society

Bruce L. Dietrich
Awards Committee Chairman
Reading School District Planetarium
1211 Parkside Drive South
Reading, Pennsylvania 19611

In order to be named as a Fellow, a member must meet one of the following qualifications:

a) Continuous active membership in good standing in the Society for at least ten years.

b) Continuous active membership in good standing in the Society for at least five years, and substantial contributions in at least two of the following respects:

1) Serving IPS in elective office, diligent and devoted committee work, and the organization of conferences and meetings.

2) Relevant and significant publications, and/or conference presentations.

3) Cooperation with professional societies, organizations, and groups which bring attention to the importance of planetariums' existence.

4) The development of new methods and media in planetarium presentations.

Baker, Lonny
Ballantyne, Robert J.
Batch, David
Bishop, Jeanne E.
Blain, Auray
Broman, Lars
Calvird, H. Richard
Campbell, Paul B.
Carr, Claire
Carr, Everett Q.*
Chamberlain, Joseph M.
Clarke, Thomas
Cotton, John
Dietrich, Bruce L.
Doyle, Robert J.
Dumas, Jacques A.
Dundee, David A.
Dunn, Jack A.
Engle, Paul R.
Fairman, Rita
Friedman, Alan J.
Hagar, Charles F.
Hall, Donald S.
Hamilton, George
Harber, Hubert
Hare, John
Hastings, Jane Geohegan
Hennig, Lee Ann
Hoffman, David
Hooks, James A.
King, Henry C.
Knappenberger, Paul
Levine, Mark J.
Lowry, William H.
Mallon, Gerald L.
Marche, Jordan D., II
McGregor, Ian
Melenbrink, Eric
Mosley, John E.
Muñoz, Gabriel
Murtagh, Terence
Peery, Richard A.
Peters, William T.
Petersen, Mark C.
Petersen, Carolyn Collins
Pitluga, Phyllis
Pogue, John A.
Reed, George
Reede, Roger J.
Schafer, Sheldon
Seltzer, Allen
Simopoulos, Dennis P.
Sperling, Norman
Starr, Eileen
Stec, Tom C.
Sumners, Carolyn
Tenschert, Walter
Toy, Larry
Tuttle, Donald E.
Wharton, Walter
Wieser, Sig
Zimmerman, R. Erik

* deceased

Gibbous Gazette

John Wharton
McDonnell Star Theater
St. Louis Science Cneter
5050 Oakland Avenue
St. Louis, Missouri 63110

Those of you who have followed these ramblings for the last few years might be amused to learn that the smug look of self-righteousness is now gone from my face: We just finished running an "SOB" show here in St. Louis.

You may recall that I am not a fan of Xmas shows. I'm still not, but I had a higher authority (not **the** authority, but high enough) to answer to. I still think the topic has to be stretched too far to be a comfortable fit under the dome. However, it could not be denied that the topic is popular with a fairly large segment of the community. So, while the Xmas show has limited validity with regard to content, it is a magnet.

From the moment we found out we were to do an Xmas show, we didn't have much development time. Fortunately, Strasenburgh's latest Xmas effort lent itself well to editing, for time and content constraints (we did have some leeway, and so eliminated all mention of a "miracle" as a possible explanation).

And so, the show has now come and gone. It did well (predictably outdrawing our main feature on SETI), we had no complaints on the missing word "miracle," and through survey work in conjunction (no pun intended) with Strasenburgh, found that some "miracle" believers were swayed to a scientific explanation, with many indicating the show was non-partial.

I haven't changed my mind—I'm still not thrilled with the idea of doing a Xmas show. But, a **responsible** Xmas show is not as hard to swallow as I thought.

SHOW NETWORK ON THE AIR

After several years of consideration and informal discussion, the Planetarium Show Network is a reality. By the end-of-year deadline established in the fledgling group's by-laws, ten North American facilities kicked in $10,000 each as the first-year commitment for two years of membership. The group's goal is to pool resources in contracting for the production of a show, the cost of which could run to $250,000. The group has now begun a bid process to contract with a production house or planetarium for the first PSN show. (Member institutions to date are the Adler, American Museum-Hayden, Charles Hayden-Boston Museum, Alberta Science Center, Edmonton Space Sciences Foundation, Franklin Institute, Fleet Space Theater, Science Museum of Virginia, St. Louis Science Center and the MacMillan-Vancouver Centennial Museum.)

CLASS IS IN SESSION

Preliminary information has been received on the Strasenburgh Planetarium's Eighth Production Techniques Seminar, to be held July 5-9, just after the IPS Conference. Per-person costs for the Seminar are expected to be about $275, plus housing and meals. For more information, contact: Strasenburgh Planetarium / Rochester Museum & Science Center / Box 1480 / Rochester, New York 14603 / U.S.A.

JOINING THE FOLD

The William M. Staerkel Planetarium at Parkland College in Champaign, Illinois opened in October and, according to the facility's director, Jim Manning, the residents of the college towns of Champaign-Urbana (University of Illinois) have found the planetarium to be a popular addition to the community. Housed under the 15-meter dome is North America's first Zeiss M1015.

BRING A DATE TO THE DOME

A StarDate, that is. The nationally syndicated 2-minute radio series on popular topics in astronomy is now being made available for exclusive play in the planetarium. One year of under-the-dome programming would run $129.50. For more information, contact: Art Keller, Marketing Manager / StarDate / McDonald Observatory / RLM 15.308 / The University of Texas at Austin / Austin Texas 78712 / USA.

CONTACT A CONTACT CONTACT

Dr. Peter Backus has made an open offer to the planetarium field to assist in providing information and/or advice related to SETI. The SETI project scientist has recently scripted a show on the topic ("Alien Whispers" for the St. Louis Science Center) and delivered a talk at the 1987 GLPA Conference. Contact him at: SETI Institute / Mail Stop 229-8 / NASA Ames Research Center Moffett Field, California 94035 / USA.

STAR TRAILS

Word has arrived of the death this past summer of **Everett Q. Carr** who, with his wife Claire, guided the Herkimer (New York) BOCES Planetarium for 15 years. Just a year ago, the Carrs had taken early retirement.

In October, **Jim Nakashita** died from complications related to a heart attack, according to those who spoke with his daughter, Grace. Jim had been the long-time U.S. sales representative for Goto Optical, through C & S Associates in Concord, California.

(My apologies for the sketchy details related to these losses. I would appreciate hearing from friends of Quint and Jim, or the appropriate affiliate newsletter editors, so that we might better acknowledge the accomplishments of these colleagues.)

*[Late Note: please see page 37: **Jim Loudon.**]*

David Menke has left the Copernican Space Sciences Center in New Britain, Connecticut to take the position of executive director of the Buehler Planetarium at Broward Community College in Fort Lauderdale, Florida. Joining David as assistant director at the Buehler is **Gary Lazich**, who had been at the South Carolina State College planetarium in Orangeburg; **Susan Barnett**, formerly with the New York Hall of Science in Flushing, is the Buehler's new producer.

Sharon Parker has been appointed planetarium director for the Digistar-equipped facility under development by the Children's Museum in Indianapolis, Indiana. Sharon had been director of the Hopkins Planetarium at the Science Museum of Western Virginia at Roanoke.

Bob Doyle has become director of the Taylor Planetarium, being built at the Museum of the Rockies in Bozeman, Montana. He had been with the astronomy department at Frostburg State College in Maryland.

Diane Trainque retired last year from her teaching position at Waverly Middle School in Lansing, Michigan, and is now a negotiator for the Oregon Education Association. At last word, the planetarium at Waverly had been mothballed.

Digistar Project Manager **Mike Hasson** has been promoted to another department at Evans & Sutherland; **Alan Fletcher** is the replacement.

In January, **Don Hall** celebrated his 20th year at the Strasenburgh Planetarium. Congratulations Capt. Science!

THE 1987 "CASEY AWARDS"

Although the adjustments to *The Planetarian's* publication schedule have thrown me off somewhat, I will still mark the end of the year with some editorial ramblings, celebrating some high—and low—planetarium-related distinctions of 1987.

The Future Shock Award to Arthur C. Clarke, who in his third "Space Odyssey" installment, *2062*, features a visit to the Hong Kong Planetarium 40 years hence, where a digital dome surface has replaced any kind of projector. (Gee, just when we getting used to the idea of Digistar.)

The P.T. Barnum Award to The Planetary Society, whose fall mailing of a survey of vital importance to the future course of our country's space exploration efforts ended up as a cleverly-worded sell job on a Society membership. But, the immediate importance of the survey was diminished with repeat mailings of the survey two months later.

The Most Congenial Award to Company Seven of Laurel, Maryland, for the telescope dealer's ***C-VII Journal***. Rarely has advertising been more fun and educational!

The Class Act Award to Dayle Brown of Hudson Lake Elementary School in New Carlisle, Indiana, who inspired commendation from GLPA's Executive Committee. And, speaking of advertising, the exclusive catalog house of Hammacher Schlemmer & Company gets **The "How'd You Open The Dome" Award** for their ad for a $5,900 rotating home observatory enclosure, which (quoting from the ad) "allows for continuous tracking of celestial objects even during rain showers."

Most Dubious Promotion Of A Planetarium Award to television producer Jay Tarses, whose "The Days and Nights of Molly Dodd" on NBC in the States featured a running plotline where Molly's jazz saxophonist exhusband had just landed a composing and recording contract for a planetarium show at the New York Hayden. Halfway through the recording session, however, he becomes bored with the "gig," and walks away from his fellow jazz musicians and the project. No hard feelings, Bill G? Can we keep the retainer?

Finally, one last award, most serious and heartfelt: **Planetarian Of The Year.** Quite a few colleagues contacted me with their recommendations for what has become known as the Warm Fuzzy P.O.T.Y., and nearly all of them spoke with admiration and respect for the person responsible for the most readable, professional, timely (and on time!) Journal you hold in your hand—*The Planetarian* Executive Editor **John Mosley.** ❑

PLANETARIUM LIFELINE:
The Origin & Evolution
of the Planetarium and Planetarians

Arthur L. Draper and the Buhl Planetarium

David H. Menke
Buehler Planetarium
Broward Community College
Ft. Lauderdale, Florida
CompuServe ID 76266,2224

Many citizens of Pittsburgh were watching with keen interest as planetariums in Chicago, Philadelphia, Los Angeles, and New York were opened to the public. During their first year of operation, each of these four planetariums had attendance ranging from 170,000 to almost one million. Pittsburgh had hoped to become America's fifth city to host a planetarium, but that distinction belongs to Springfield, Massachusetts, which opened the Seymour Planetarium in 1937 (see *The Planetarian*, July 1987).

The Adler Planetarium was a gift to the people of Chicago from Max Adler; it includes a science museum. The Fels Planetarium was Samuel Fels' gift to Philadelphia and is an integral part of the Franklin Institute. The Griffith Observatory was a result of a bequest in the will of Griffith J. Griffith to the City of Los Angeles. New York's Hayden Planetarium came as a gift from Charles Hayden to the American Museum of Natural History.

Up until the opening of the Buhl Planetarium and Institute of Popular Science (BPIPS) in 1939, Pittsburgh had no major science museum. As one of the nation's most prominent cities, a major planetarium-science center was a high priority.

As in many planetariums and science museums, the BPIPS came as a result of the gift of a wealthy individual—Henry Buhl, Jr. However, his gift was somewhat indirect, in that it was the foundation that he created in his will, the Buhl Foundation, that actually made the BPIPS a reality. Max Adler, Samuel Fels, and Charles Hayden were very much alive when the planetariums that bore their names opened to the public. Henry Buhl died some 12 years before the opening of his planetarium. We may remember from a previous issue that Griffith J. Griffith left money in his will to construct a public astronomical facility; he had died about 17 years before it opened.

Henry Buhl, Jr. lived the American dream. Born at Buhl's Mill, Butler County, Pennsylvania to Henry and Christine Buhl on March 23, 1848, he attended a country school in nearby Zelienople. Later he earned a degree from Duffs Business College in Pittsburgh, and met another enterprising young man named Russell H. Boggs. In 1869 they formed a partnership and founded the very successful Boggs & Buhl Department Store. Buhl served as vice-president until 1922 when he succeeded Boggs as president. During his tenure as president, the department store had annual revenues of $10 million.

Buhl married Louise Miller on November 4, 1880. They had no children. Henry Buhl, Jr., was known as a warm and compassionate person who was greatly concerned about the welfare of his fellow man. However, his personality was rather reserved. For recreation, Buhl enjoyed horse racing, theater, golf, and water sports.

During the latter part of his life, Buhl served as a member of the board of directors of the Dollar Savings and Trust Company, the Pennsylvania Underground Cable Company, the National Union Fire Insurance Company, Allegheny General Hospital, Grove City College, and the Pittsburgh Flood Commission.

Henry Buhl, Jr., died in Pittsburgh on June 11, 1927. In his will, he left $12 million to set up the Buhl Foundation. The purpose of the Foundation was to promote religious, charitable, educational, and cultural projects within Allegheny County, where he had made his

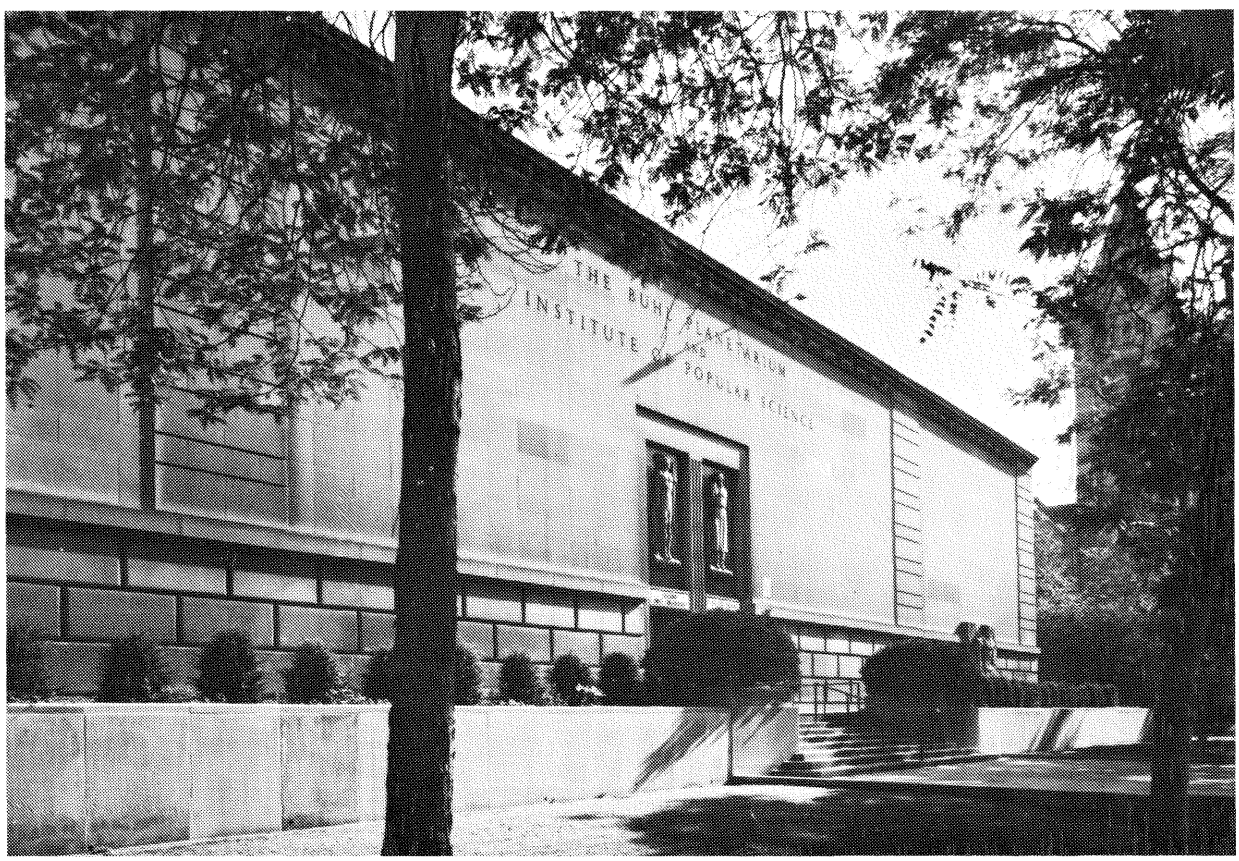
fortune. A man by the name of Charles F. Lewis had been picked by the board of directors of the Buhl Foundation to be its executive director.

For the ten years following Buhl's death, the Foundation donated money to schools, colleges, civic organizations, and other agencies to promote learning and culture. During this period, the Foundation's board of directors began thinking of an appropriate memorial to Henry Buhl, Jr., and in fact, seriously considered the idea of a planetarium as a fitting monument. One afternoon, Pittsburgh city councilman George Evans dropped into Charles Lewis' office and suggested using the site of an old city building for a new planetarium. Evans told Lewis that the city would raze the old building and donate the land if the Foundation would erect a planetarium. Some time later the Foundation's board agreed, and Pittsburgh Mayor Cornelius Scully accepted a gift of $1.1 million for the construction of the Buhl Planetarium and Institute of Popular Science. Ground breaking occurred on April 14, 1938.

In 1933 Charles Lewis hired an old friend, C.V. Starrett, as his associate director. Starrett became a source of energy and inspiration for the construction and growth of the new planetarium facility. Under Starrett's guidance, the BPIPS was to become similar to the Franklin Institute and the Deutches Museum.

The Buhl Foundation hired James Stokley, then director of the Fels Planetarium and associate director of the Franklin Institute, to become the first director of the BPIPS. Mr. Stokley began his new job in Pittsburgh on April 15, 1939. Regarding his new duties, Stokley said, "Astronomy is no dry as dust subject when there is a planetarium....At the Buhl Planetarium and Institute of Popular Science we plan to present a new kind of dramatic entertainment, with the stars and planets as the actors and the universe as the stage." (Further information regarding the distinguished career of James Stokley can be found in the July 1987 issue of *The Planetarian*.)

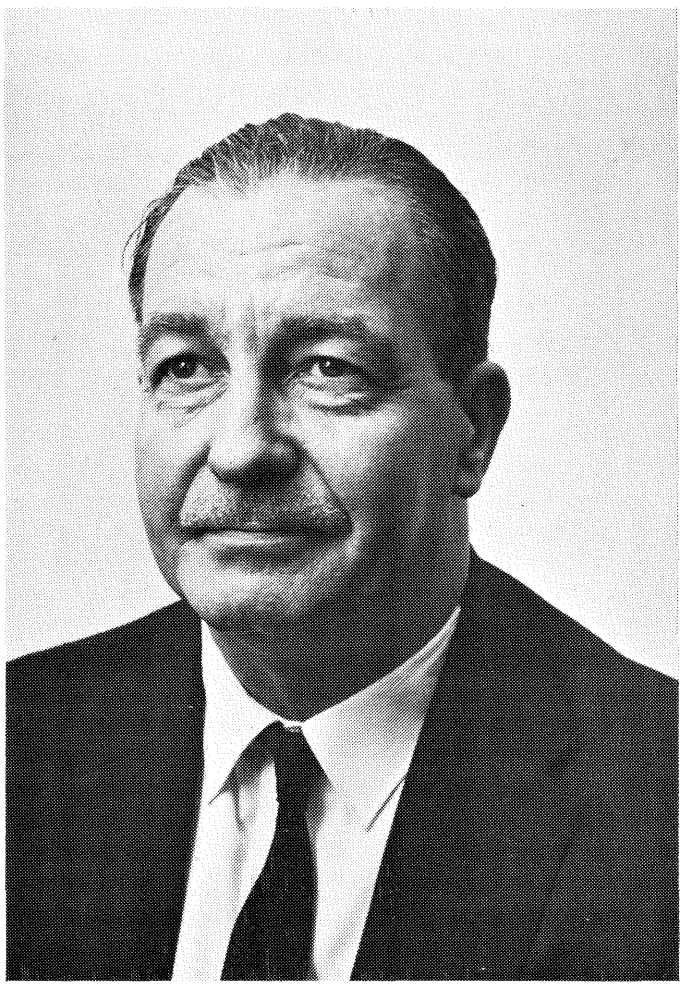
The Buhl Planetarium was to be the fifth Zeiss planetarium in the United States, with a Mark II instrument. In fact, it was the last American-bought Zeiss before the war halted trade with Germany. The planetarium projector had a most interesting journey from



The Buhl Planetarium and Institute of Popular Science

the Jena factory to the planetarium in Pittsburgh. All the parts were padded and hermetically sealed in zinc boxes, and packed in 22 wooden cases with iron bands and large hoist rings before being loaded on to a train bound for the sea port. The ocean liner Europa carried the Zeiss cargo to New York City where it was unloaded and sent by truck to Grand Central Station. On a train again, the crates were taken on an 8-hour ride to Pittsburgh where they were stored in a warehouse until the planetarium building was ready to receive them. On June 6, 1939, the 22 cases were transported by four large trucks to the planetarium building where 12 strong men unloaded the precious instruments. Zeiss technicians spent the following two months installing the instrument, then Mr. Stokley and his staff spent two more months testing and running the new equipment before the Buhl Planetarium and Institute of Science opened to the public on October 25, 1939.

The BPIPS had 15,000 square feet of surface area on two levels, including exhibit space and the planetarium theater. There were exhibits on physics, chemistry, and other sciences, a hall of light, and a public observatory. The telescope was a 10- inch Fecker refractor built by the Brashear Optical Company. Planetarium shows were daily at 3:00, 8:00, and 9:00 PM. Saturday had two additional shows at 11:00 AM and 4:00 PM, and Sunday added an extra show at 4:00 PM.



Arthur Draper, 1905-1973
Planetarium Director 1940-1970

Stokley and his assistant, Roy K. Marshall, who had joined him from the Fels, remained at the Buhl for about a year. In the fall of 1939, the Foundation appointed C.V. Starrett as "science coordinator" of the facility. As a result of a disagreement with the Buhl Foundation, James Stokley and Roy Marshall both left the Planetarium in May 1940. Stokley was replaced by Arthur L. Draper, who then reported to C.V. Starrett.

C.V. Starrett was born in Monaca, Pennsylvania in September 1898. He served in the U.S. Army in France during the first world war, and then enrolled at the University of Pittsburgh, earning a bachelor's degree in English in 1924. His specialization was creative writing and literature. While he was a senior in English, Starrett married University of Pittsburgh English professor Agnes Lynch in 1923. They had two children and ten grandchildren.

After college, Starrett landed a job with the advertising firm of Ketchum, MacLeod, and Grove, where he did writing, worked with accounts, bought printing, and supervised productions. He got the job there by offering to work for free for six months so he could learn the trade. The firm was so impressed with the quality of his work, that they put him on the payroll after just two months.

Starrett was hired in 1928 by University of Pittsburgh Chancellor John Bowman to be the editor of the Pittsburgh Record. In 1933, Charles Lewis selected Starrett to be his associate director. Starrett remained in his post until 1964. Over the next six years Starrett labored long hours to make the Buhl Planetarium a reality.

C.V. Starrett served as science coordinator from 1939 to 1960, when his job title was changed to executive director of the Buhl Planetarium and Institute of Popular Science. He retired as executive director on June 1, 1964.

During his career, Starrett was honored as "Pittsburgh Man of the Year in Education" in 1958, served as a science education representative of the U.S. State Department to South America in 1960, and received an honorary doctor of science degree (D.Sc.) from Waynesburg (Pennsylvania) College in March 1961.

Dr. Starrett was known to have said, "You can't make a scientist in two afternoons a year, but we can kindle that first spark of interest and the kid will usually take it from there." Further, he remarked, "Behind every good student is a good teacher. All we can do is provide the exposure."

During the past 48 years there have been just two directors: Arthur L. Draper and Paul Oles. These two dedicated individuals must surely have loved their jobs.

Concerning the Buhl Planetarium and Institute of Popular Science, he coined the motto "No Stuffed Owls." Starrett stated, "Too many museums like to display things because they are old, or related to somebody famous. Well, you won't find Galileo's spectacles here."

After his retirement, Dr. Starrett served as president of the Historical Society of Western Pennsylvania for ten years. He currently resides with his daughter in Cleveland.

Arthur L. Draper followed Stokley as planetarium director, and held that post for thirty years. It is possible that Draper holds the record for longevity as planetarium director.

Draper was born in New York City in 1905 and earned his bachelor's degree in astronomy from Cornell University. From 1935 to 1940 he was assistant chairman of the Hayden Planetarium and a curator of the American Museum of Natural History in New York.

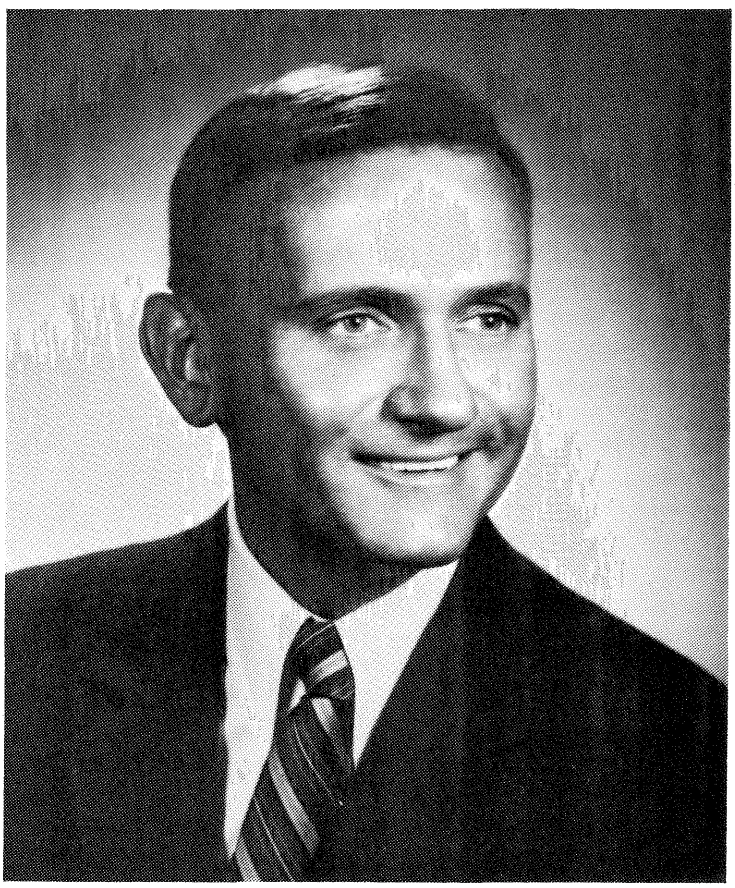
During his tenure as Buhl director, Draper authored a book entitled Wonders of the Heavens, and co-authored The Story of Astronomy and The Earth Among the Stars. He also wrote numerous newspaper and magazine articles on astronomy, and was a radio commentator in science. Draper even had his own radio program for years, "Planetarium Parade," on WCAE, each Thursday evening at 6:45 PM.

Draper married and had two sons. His wife died relatively young and he never remarried. He generally kept his personal life to himself and discussed only astronomy and related matters.

An excellent planetarium lecturer with a deep, resonant voice, Draper was a well-known figure in the astronomical community. He commanded great respect from his colleagues—both from those who worked for him and from those whom he reported to. There was a certain "aura" about this kind, gentle, and intelligent man. Draper never seemed to have an ego to bruise and was always diplomatic when dealing with his staff or his superiors.

Draper suffered a heart attack in 1970 at the age of 65 and retired shortly thereafter. He died in 1973.

Another major planetarian at the Buhl was Carl F. Wapiennik. Born in Donora, Pennsylvania in 1926, Wapiennik earned a certificate from the U.S. Naval School of Electronics in 1944 and served as a radar specialist aboard the U.S.S. Randolph during the Second World War. Following the war, Wapiennik enrolled at the University of Pittsburgh and earned a bachelor's degree in physics in 1953. Upon graduation, he worked for R.C.A. for a while, then became a research physicist for the Naval Research Laboratory in Washington, D.C., where he earned a reputation as an expert in fluid dynamics.



Paul J. Oles, 1945-
Head, Planetarium Department, 1970-present

(Please see **BUHL** *on page 73)*

What's New

Arthur Barton
Tombaugh Space Theater
P. O. Box 53
Alamogordo, New Mexico 88310

Buying a Star Projector?

I was going to deal with CD's in this outing, but two pieces of news came across my desk recently. They were just too tasty to ignore. The news involves Zeiss planetarium projectors.

First is from the Zeiss works in Jena, East Germany. They are beginning a marketing campaign here in the States. Seiler Instrument & Mfg. of St. Louis, Missouri will be marketing a line of three planetarium instruments. If you haven't received a mailing from them the address is: 170 East Kirkham Ave., St. Louis, Missouri 63119.

Three projectors for small, medium & large theaters are available and prices start at about $150,000 U.S. and go upward from there.

Next is the news that Zeiss, Oberkochen will shortly commence development on the successor to the Mark VI machine. This latter tidbit is all the more fascinating when you consider the fact that, just a few years ago, some owners of new Mark VI's were saying that no further improvements could be made, that the design was perfected.

The new projector has been given the working designation of the Model VI-TD. The TD is shorthand for tilt dome. It looks as though Spitz, Minolta & Goto are going to have some competition in the Space Theater market.

And while we are on the subject of competition I have a small complaint for all four of the above. Why are there no smaller less expensive versions of these big theater projectors available for the smaller tilt dome theaters?

Digital Audio

Much has been written about CDs and Digital audio. Many of the analog purists feel that digital is "dreck." They claim that the sampling rate is simply too low to accurately reproduce the sound. Then there are those who have leaped into the new technology feet first. These latter wonder how they made do with analog for so long. I am one of the latter... with reservations.

Now that CD players are available for under two hundred dollars there is no reason for any planetarium not to be able to afford them. Even if you don't have an extra two hundred dollars in your budget you can still probably talk some civic minded community member or organization into buying one for you. If you can't convince anyone to buy you one you've got real problems.

Even if the sound on CD's was less than ideal there is still a really good reason for using them. They carry a time code. Most, if not all, players will display the run time in minutes and seconds and this comes in quite handy when you are editing. Be ye from the cut and splice or multi-track school of editing, most of us know that a lot of time is spent getting things timed right and blended well when using analog discs. With regular records I have oftentimes spent an hour getting just the right fade from one piece of music to another. Added to this is the fact that records scratch quite easily.

With digital you play with the digits instead. Once you've decided where you want to exit a piece of music you display the time and note minutes and seconds. You do the same for the music you fade to (if you have two players). Then you do your editing by the numbers. Our under two hundred dollar model can bring us in on selected notes in the music. Put simply they will allow you to repeatedly get to the exact spot where you want to be in the music. It takes out a lot of the by guess and by gosh that we used to have in editing and doesn't scratch the disc.

To get the full benefit of the claimed 96 db signal to noise ratio it is recommended that you use a noise reduction system like a Dbx unit with your reel to reel deck. The Dbx system is like a commander: it COMpresses the incoming signal so that the signal to noise ratio does not exceed your deck's capabilities and then on playback it expANDS the output from the deck just prior to sending it to the amplifiers. That way a reel-to-reel unit with a 65 db signal to noise ratio can capture nearly the entire range of the CD and give you no tape noise to boot.

What about the discs themselves? The quality of CDs ranges from "God that was awesome" to "that was Godawful." A lot depends on the sound engineer. An

early complaint was that CDs had a "thin" sound. All of that has changed. We have some that would make you swear that the performers were sitting behind the dome. We have others that sound as though they were recorded at the bottom of the Grand Canyon. It's strictly Caveat Emptor.

Add in the fact that CDs are not cheap. Some of the more rapacious of our CD selling friends can attempt to hit you up for as much as nineteen bucks. If you are smart you will have befriended at least one of your local dealers and will know what wholesale costs are to him. Most are in the eleven to fifteen dollar range. They tie up a lot of his money, the costs are nearly double what he pays for analog discs. Purchase ten or more at a time and he may be willing to cut the price.

CDs have a very high production cost. They must be fabricated under clean room conditions and a substantial number of them are rejected because they fail to meet the rigorous quality control standards. Initially there were just a few plants capable of manufacturing them, but more plants are now on line and they are becoming more widely available. Tests are now underway on a new manufacturing process which, it it proves out will cut down manufacturing time and costs. If it works as well as they hope perhaps the record companies will be able to knock a few dollars off our costs.

Since CDs represent a higher initial investment, you don't want to get stuck with the East Flattonia Symphony playing inside Fingal's Cave and sounding like a bunch of kazoos. Consult the Schwann CD catalog and look through their ratings of new recordings. Magazines like *High Fidelity* and others, review most new CD releases. You can also try sampler discs.

Most companies release the sampler discs whenever they put out a new batch of CDs. The excerpts on the samplers give you a fair idea of what the sound quality of the entire work will be. They are normally significantly cheaper than the discs that they are plugging. Do take umbrage if someone wants you to pay seventeen ninety-five for a sampler.

In sound recording a new reproducing process often replaces an old one. 78's replaced the cylinder recordings, 33's and 45's replaced the 78's, stereo replaced mono, etc., etc. In the commercial marketplace what makes money is what gets made. And with this in mind, it should be remembered that if analog discs go the way of the passenger pigeon, some musical pieces are not going to survive the cut. Most recordings are archived, but the non-sellers will likely remain in that archive and not be available commercially. If you've got a favorite analog disc that it still available get it now so you won't be stuck if it doesn't make the cut.

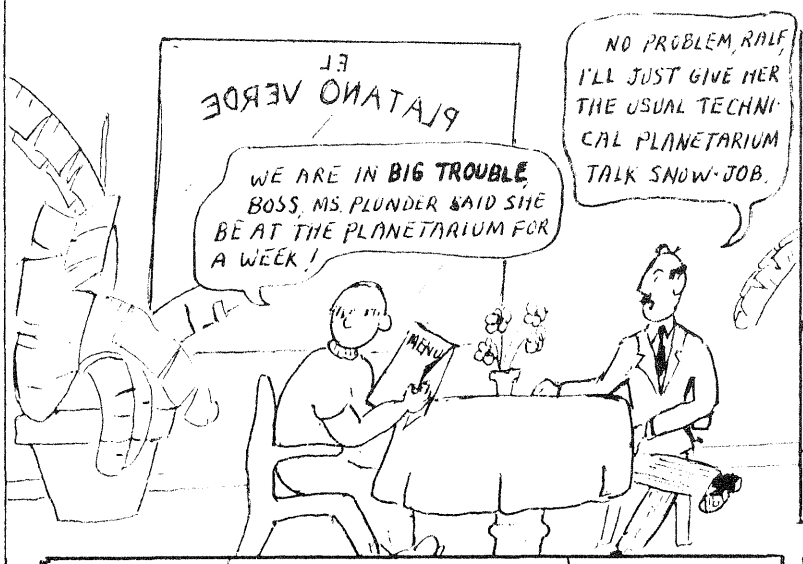
My own personal experience in this area has been reassuring. A previously out of print recording of Weill's *Threepenny Opera* released in the fifties is now available on CD. CMS has re-released an album of Christmas music that was out of print and the CD adds a new dimension to the analog version. Look at imports too. They aren't always listed in American catalogs and on a recent record-buying trip to Los Angeles I found a CD of the soundtrack from *How The West Was Won*. The quality was not super, but it was at least better than the original analog recording.

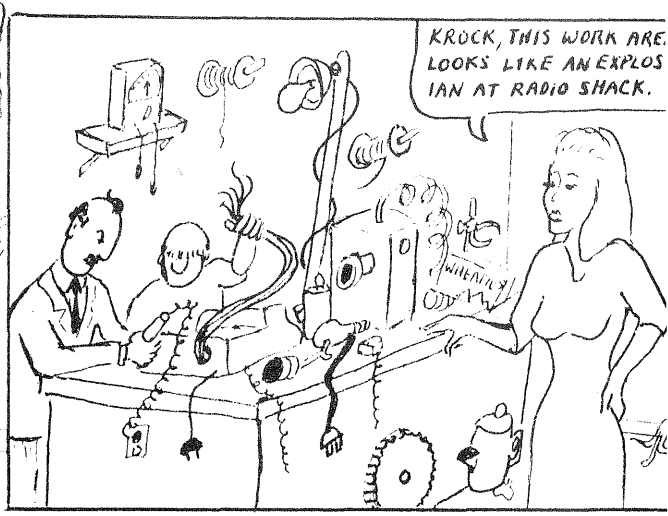
I regard CDs as archival storage with a difference. With analog discs each playing degrades them significantly. To maintain their top quality it is best not to play them. Some studies say that CDs do degrade. If true they do it at a far slower rate than analogs. They are more tolerant of mishandling. With CDs I know that I don't have to worry about dust accumulating in the grooves or one of my staff members ruining it by playing it with a blunt needle.

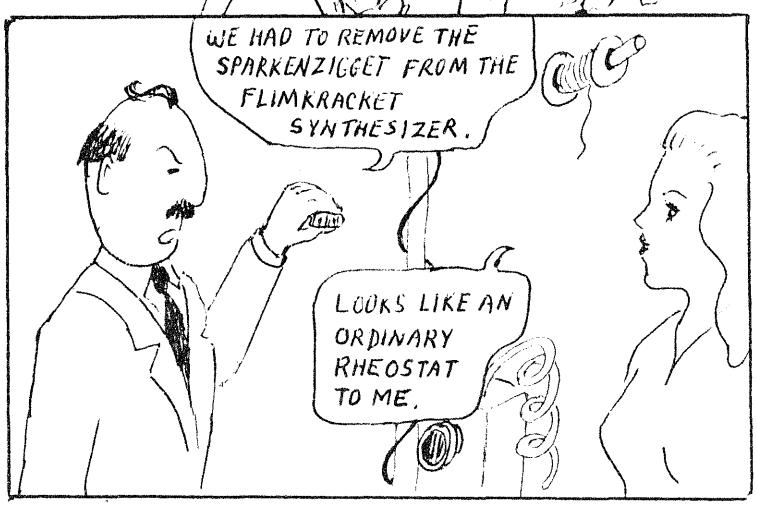
The author strongly recommends that you respect all holders of copyrights. ❑

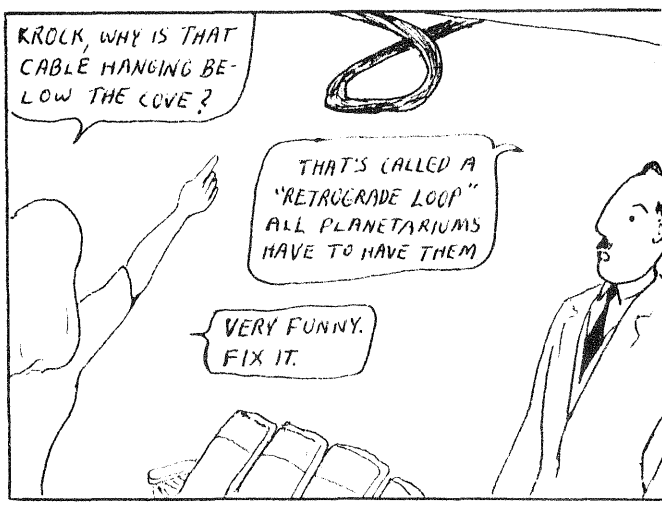
DR. KROCTER OF PLUNDER PLANETARIUM

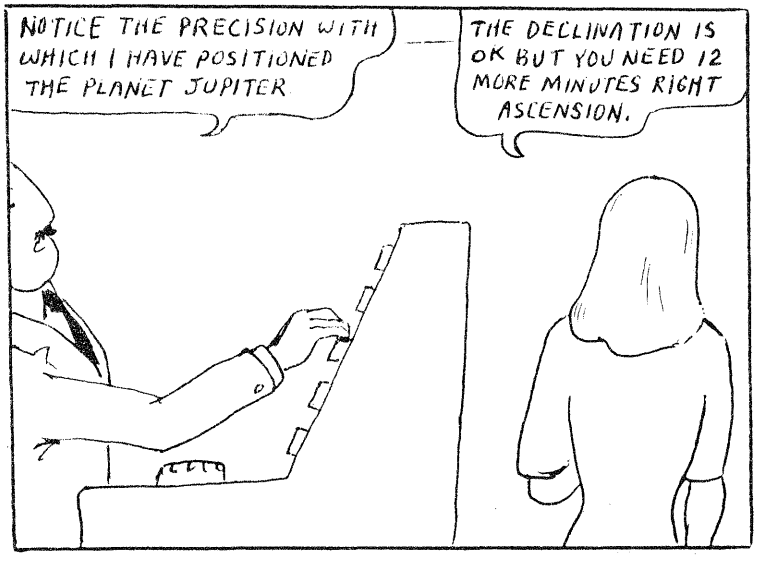
by Norm Dean
P.O. Box 669
Bel Air, Md. 21014

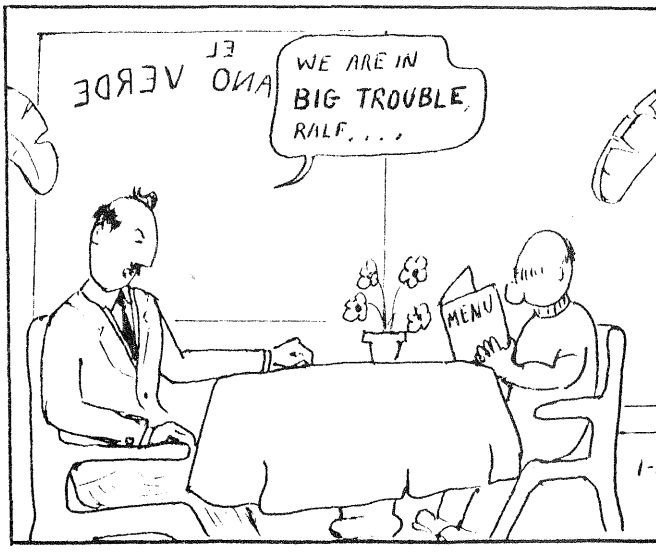












Regional Roundup

Steven Mitch
Benedum Natural Science Theater
Oglebay Park
Wheeling, West Virginia 26003

News, events or interesting material from your region is always welcome. If you have anything you would like mentioned in the Regional Roundup, please forward it to me at the above address. The next deadline for material is Monday, April 4th. Please mark your calendars accordingly. Thank you for your continued contributions and support.

MIDDLE ATLANTIC PLANETARIUM SOCIETY (MAPS)

MAPS will break with the traditional spring conference this year. They will meet this fall in Durham, New Hampshire, from October 13th through 15th. Ellie Milliken (who recently retired as the director of the Oyster River High School Planetarium) will be the hostess for the conference. The last time that MAPS met in the fall was ten years ago, at Ellie's facility. Those who were in attendance at that conference hope that the breakfast buffets haven't changed.

The MAPS Board also broke with tradition last fall by meeting via a "conference call" rather than at the site of the upcoming conference. The conference call was arranged because too many of the officers and board members could not break away during that busy time of year. The call lasted one hour and worked extremely well as all business matters were taken care of effectively.

The State of New Hampshire will have a new planetarium, with construction scheduled to begin this spring. The new planetarium will be a memorial to Christa McAuliffe, a native of New Hampshire. It will be located next to the New Hampshire Technical Institute in Concord, and will house a 120 seat, 40-foot diameter dome with an accompanying auditorium for large meetings and lectures. It will also have several classrooms, exhibit space, a separate Science Discovery Room and a NASA teachers' resource center. The multi-million dollar facility will be funded through donations from private and public sources within New Hampshire and across the nation. The New Hampshire legislature is committed to a first-class project, one that touches the future through teaching.

The Lunar Samples Certification Conference was held at the Goddard Space Flight Center in Greenbelt, Maryland on December 4th. Attendance at the conference certified the attendees to be able to receive lunar samples at their respective institutions.

The New Jersey State Museum Planetarium recently underwent a major renovation. The old Spitz STP was placed in storage and replaced by a Minolta MS-10, the 5th such instrument in the U.S.

Another old Spitz STP was recently retired from the Andrus Planetarium in Yonkers, New York. That instrument was purchased by the Bishop Planetarium in Bradenton, Florida to be dismantled for spare parts for their STP. The Andrus Planetarium reopened to the public in November with a new Zeiss 1015, the 3rd such instrument in the U.S.

Steve Mitch of the Benedum Natural Science Theater in Wheeling, West Virginia, has found an answer to the annual "to-do or not-to-do" the Star of Bethlehem question. He trashed it altogether. It was replaced by a non-religious, good time and fun-for-all holiday LASER program. The Benedum Theater recently installed a Rainbow 2000 LASER system from Laser Fantasy, Inc. of Redmond, Washington. The program for the holiday season was the *Nutcracker Fantasy*, produced by Laser Fantasy. The program shattered every attendance and revenue record since the facility opened ten years ago. More than 50,000 persons attended the program between November 16th and January 31st.

John and "BB" (Alison) Meader have pulled up stakes at the Malcolm Science Center in Easton, Maine and have migrated to southern Maine with a portable StarLab planetarium. They will offer planetarium programs to schools and public in the mid-coastal and central Maine region.

The IAU is organizing a colloquium on Teaching in Astronomy on July 27—30th in Williamstown, Massachusets. It is the first IAU event of its kind to be devoted entirely to the teaching of astronomy, and teachers and planetarians from all over the world will attend. It promises to be a very exciting and instructive few days. Further details can be obtained from:

John R. Percy, Dept. of Astronomy
University of Toronto
Toronto, Ontario
Canada, M5S 1A1

GREAT LAKES PLANETARIUM ASSOCIATION (GLPA)

The GLPA meeting in Merriville, Indiana, October 28—31, was hosted by the Merriville Community Planetarium. Over half of GLPA's 206 members were in attendance. Featured speakers included Dr. Kerry Mark Joels, Senior Consultant for Education for Challenger Center, and Dr. Peter R. Backus, a radio astronomer for the SETI Institute (under contract to NASA to study the search for life). The Armand Spitz Lecturer was Jack Spoehr, Marketing Representative for Imax Systems. In addition to 20 papers, 11 different workshops were presented, and a panel discussion of "Religion and Astronomy in the Planetarium" was held. New officers were elected during the meeting for the next term. They are: President, Steve Bishop of the Crown Space Center, Chicago, Illinois; President-Elect, Dan Goins, Martinsville High School Planetarium, Martinsville, Indiana; Secretary/Treasurer, Dave Parker, Tipton Community Schools Planetarium, Tipton, Indiana; and IPS Representative Sheldon Schafer, Lakeview Museum Planetarium, Peoria, Illinois.

The 1988 GLPA Conference will be in Bowling Green, Ohio, from October 19th through 22nd. The host will be Dale Smith, Director of the Bowling Green State University Planetarium.

The Lakeview Planetarium has recently completed a bibliography of K-6 Astronomy books for a traveling astronomy library, under a grant from the VM Slipher Fund Committee. Anyone wanting an abbreviated copy of the bibliography should contact Sheldon Schafer. The full data base is available on a 50K Appleworks Data base, available in the GLPA software bank. Contact Jerry Mansfield at the Allen Planetarium, 3737 S. 7th Street, Terra Haute, Indiana 47802, for details.

The Lakeview Museum Planetarium also recently received a grant from the Illinois Humanities Council to produce a show on the cultures which existed 1000 years ago at Cahokia, Illinois and Chaco Canyon, New Mexico.

GREAT PLAINS PLANETARIUM ASSOCIATION (GPPA)

GPPA's new officers were recently elected at the fall conference in St. Louis. They are: President, Alinda Campbell, Grout Museum Planetarium, Waterloo, Iowa; President-Elect, Terry Walker, Sanford Museum Planetarium, Cherokee, Iowa; Secretary, Susan Petersen, Kansas City Museum, Kansas City, Missouri; Treasurer, James Gilbert, Longview Community College, Lee's Summit, Missouri; and Katherine Becker was elected to the position of Board Member. Laura Kyro of the McDonnell Star Theater in St. Louis is now the newsletter editor.

The 1988 GPPA Conference will be held from October 6th through 8th at the University of Wisconsin-La Crosse Planetarium. Director Bob Allen will serve as conference host.

The McDonnell Star Theater is distributing a new show kit entitled "The Little Star That Could." It's available for only $75.00 (licensing fee). For additional information, write: Little Star Kit, McDonnell Star Theater, St. Louis Science Center, 5100 Clayton Road, St. Louis, Missouri 63110.

SOUTHEAST PLANETARIUM ASSOCIATION (SEPA)

No report.

ROCKY MOUNTAIN PLANETARIUM ASSOCIATION (RMPA)

The Fiske Planetarium in Boulder, Colorado will be opening a new show, "Outbound: The Planet File," written by Carolyn Collins Petersen and with a soundtrack by Mark Petersen. The program will be on-line in February.

The 1988 RMPA Conference will be held October 23rd through 25th at the Tombaugh Planetarium in Alamogordo, New Mexico. The host for the conference will be Director Art Barton.

The Air Force Planetarium is currently running a program on the history of flight that uses over 1300 visuals! That certainly beats Jack Horkheimer's previous record for "Starbound."

SOUTHWEST ASSOCIATION OF PLANETARIUMS (SWAP)

The 1988 SWAP Conference will be held in Corpus Christi, Texas from April 7th through 9th. For further information about the conference contact Bob Wollman,

King High School Planetarium, 5225 Gollihar Road, Corpus Christi, Texas 78412.

Wayne Wyrick of the Kirkpatrick Planetarium, Oklahoma City, Oklahoma was quoted by the Associated Press last fall concerning a spectacular re-entry of a Soviet spacecraft. Many thought they were seeing a UFO, but Wayne, along with Wendi Cowger of the planetarium staff, set the record straight.

PACIFIC PLANETARIUM ASSOCIATION (PPA)

J. Lawrence Dunlap, Educational Director at the Flandrau Planetarium in Tucson, Arizona, has received the Distinguished Community Service Award from the Arizona Chapter of the National Science Teachers Association, "in recognition of the facility's outstanding educational programs."

Dan Zirpoli has become the Director of the Arizona Museum of Science and Technology in Phoenix, Arizona.

PLANETARIUM ASSOCIATION OF CANADA (PAC)

No report.

NORDIC PLANETARIUM NETWORK (NPC)

No report.

MEXICAN ASSOCIATION OF PLANETARIUMS (AMPAC)

No report.

BRITISH ASSOCIATION OF PLANETARIUMS (BAP)

The first 1988 meeting of the BAP was held on Saturday, February 13th, at the Armagh Planetarium, Armagh, Northern Ireland. Terence Murtagh was the host for the meeting.

The BAP now has an official newsletter comprised of information about the respective member planetariums in London, Liverpool, Greenwich, Armagh, and the Mills Observatory.

The London Planetarium is currently running a program written by Heather Cooper on the secret lives of the stars.

The London Planetarium is in desperate need of a *good* zoom lens. If you can help, drop them a note.

The Armagh Planetarium is progressing on the construction of the "Eyes of the Universe" exhibition scheduled for opening in early 1988. A strong Australian flavor will be found in the display (1988 is Australia's bicentenary), which includes a full scale model of the AAT (all done with mirrors, or at least three-quarters of it is), and a special interactive disc in the Encyclopedia Galactica exhibit that is devoted to the Anglo-Australian link (see page 28). The exhibition will help to convey the many different techniques astronomers use for studying the universe, from gamma rays to radio waves.

December 28th sees the start of the new interactive star show "Odyssey." An interplanetary cruiser is ready for departure, and the audience is the crew for the journey around our solar system. The trip is directed by the audience, who uses response buttons installed on each seat. Stephen Armstrong, one of the Planetarium's technicians, built most of the hardware for this system. Three laser discs run simultaneously to provide the smoothest of switching between each disc. More detail will be presented at the BAP meeting in February.

EUROPEAN ASSOCIATION OF PLANETARIUMS (EMPA)

The Second Conference of European Planetariums will be held on May 7th and 8th at the Center for Science and Industry of la Villette Paris. The annual meeting of the A.P.L.F. (Association des Planetariums de Langue Française) and A.D.P. (Arbeitsgemeinschaft Deutschsprachiger Planetariums) will be held concurrently with the la Villette event. For further information contact:

2éme Colloque des Planetariums Européeans
Planetarium
Cité des Sciences et de L'Industrie
75930 Paris CEDEX 19
France

Kodalith Corner

Tim W. Kuzniar
Producer, Artist
Ward Beecher Planetarium
Youngstown State University
410 Wick Avenue
Youngstown, Ohio 44555

Welcome. An announcement to all readers: submissions are coming in slow, emphasize **slow**!

Remember, this is your column. If you have any artwork, graphics, or prints suitable for kodalith reproduction that you are willing to share, please send them to me. As thrilled as some may be to see my artwork, this column is about sharing, and that means everyone. So lets see some penwork.

Submission can be duplicates, photocopies, or original art. (In the case of originals, please send a SASE if you want it back.)

Size and format does not matter since I invariably have to generate another copy for layout purposes. Quite often I also have to re-ink parts to maintain density for a quality printing. Rest assured that in these cases touch-ups are kept to a minimum and every effort is made to maintain the style of the artist's work.

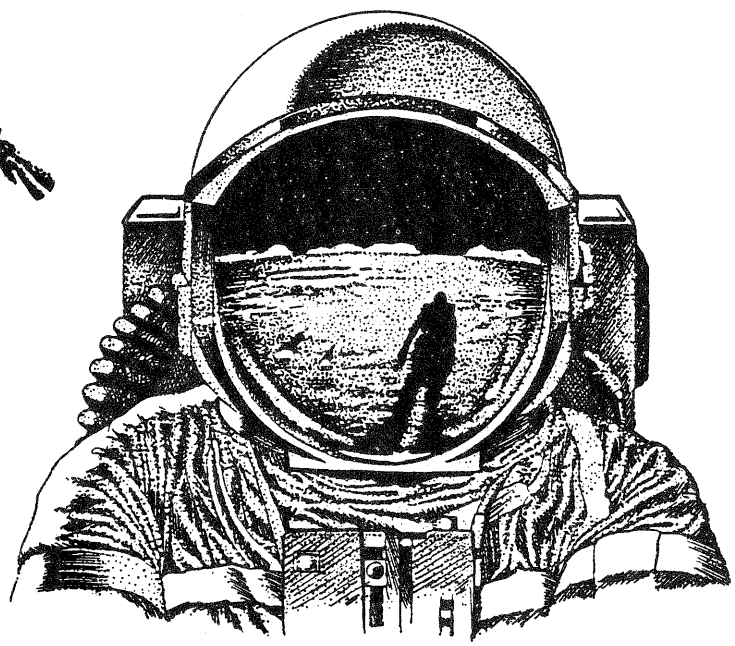
Contributions must be limited to either non-copyrighted material or to material that is submitted as copyright-free by the artist. Of course, credit will be given to all artists and contributors.

Suggestions and comments are also welcome, and if you have ideas for original artwork or preferences for what you would like to see here, send them along also.

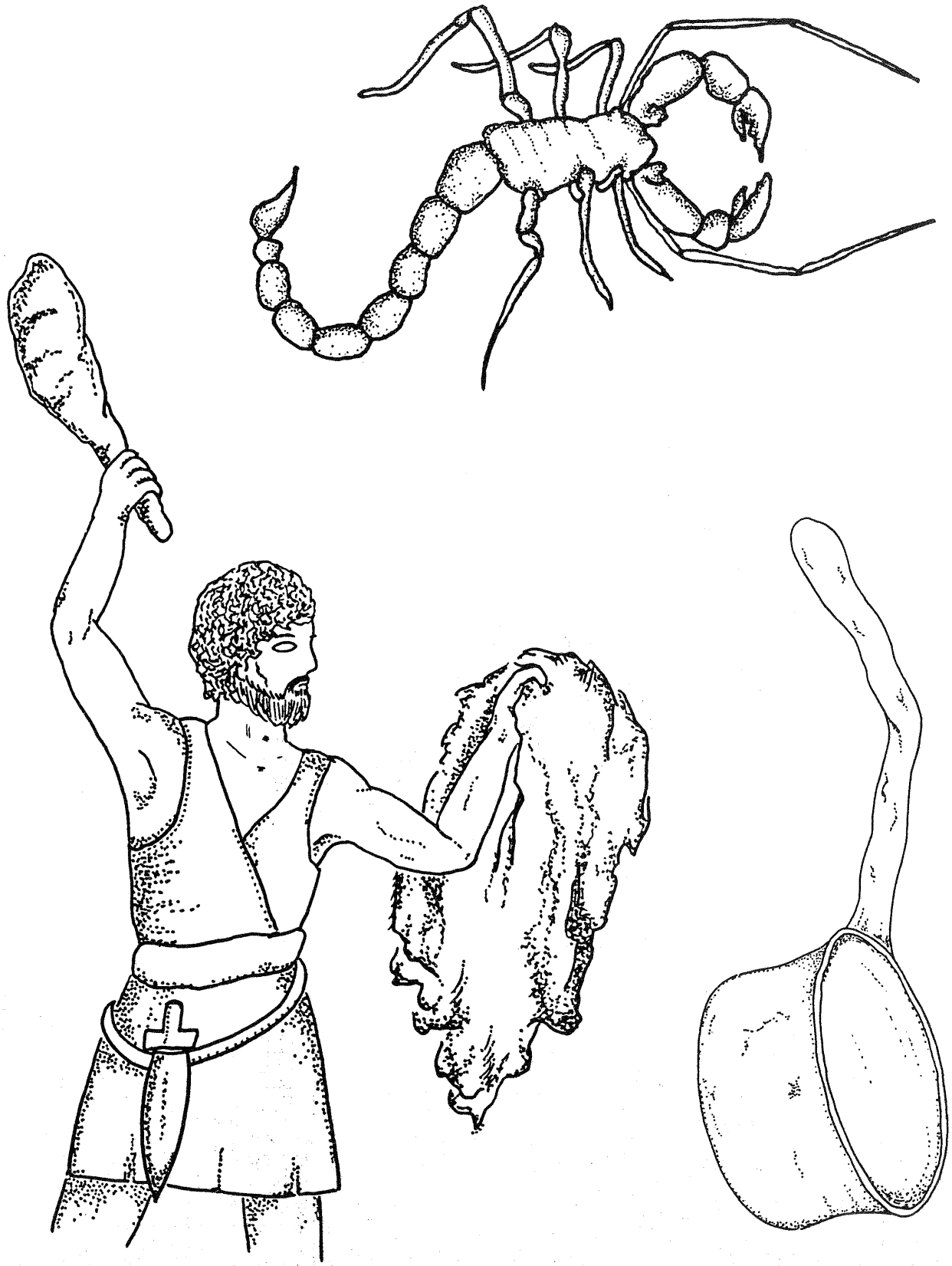
In this issue we have a page of constellation outlines (p. 69) from the pen of Roberta Burnes at the Cincinnati, Ohio, Museum of Natural History.

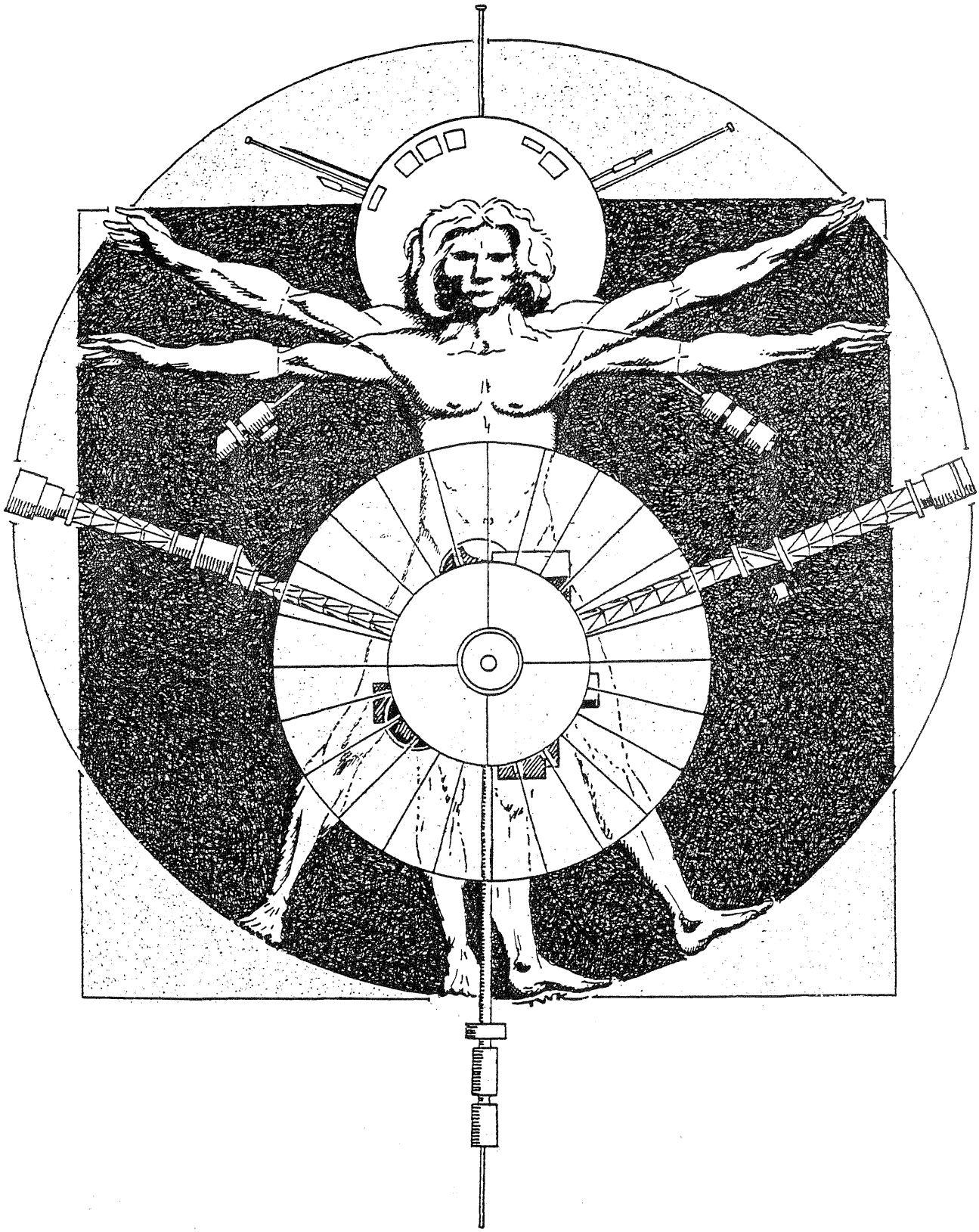
Also included is a Space Age restatement of DaVinci's "Man, the Measure of All Things." The reach of man now extends across the solar system as his technological surrogates, the spaceprobes, carry his quest to the far shores of space. In addition is a constellation outline for Aries and an astronaut (below). All of these are by yours truly.

Once again, the artwork in Kodalith Corner is made to be photocopied, enlarged, reduced, cut-and-pasted, rearranged, and in general used for whatever comes to mind, from programming to public relations.

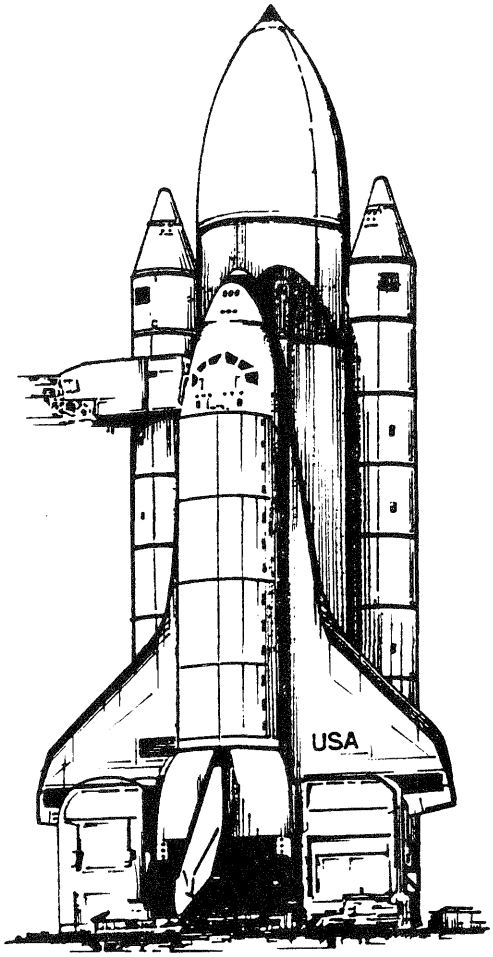


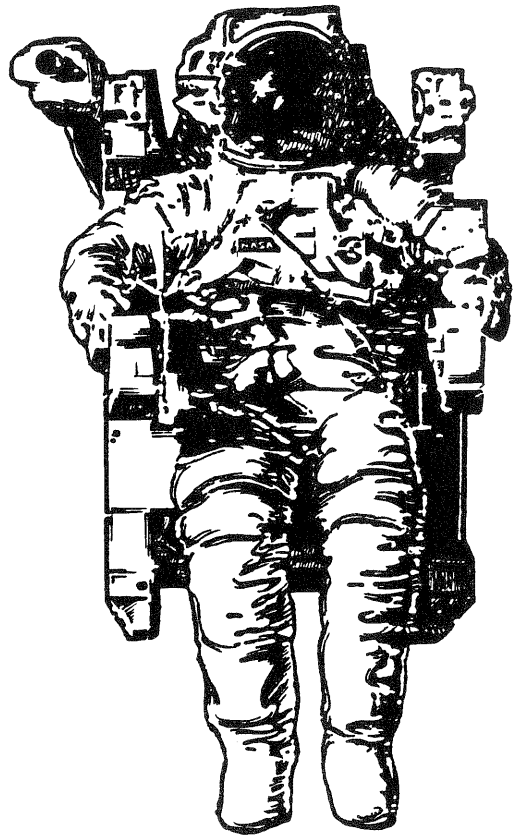
artwork by Roberta Burnes
Cincinnati, Ohio.

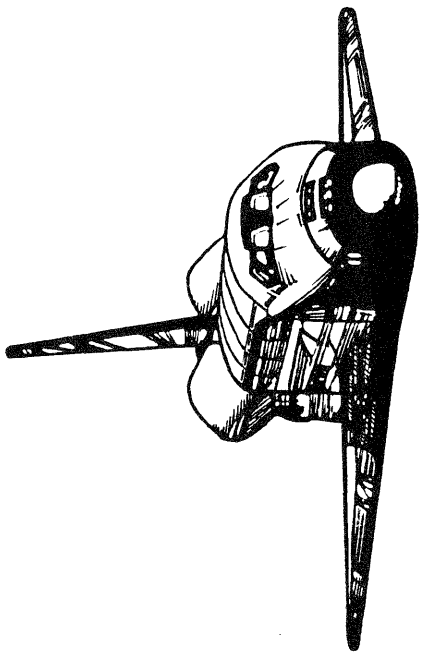


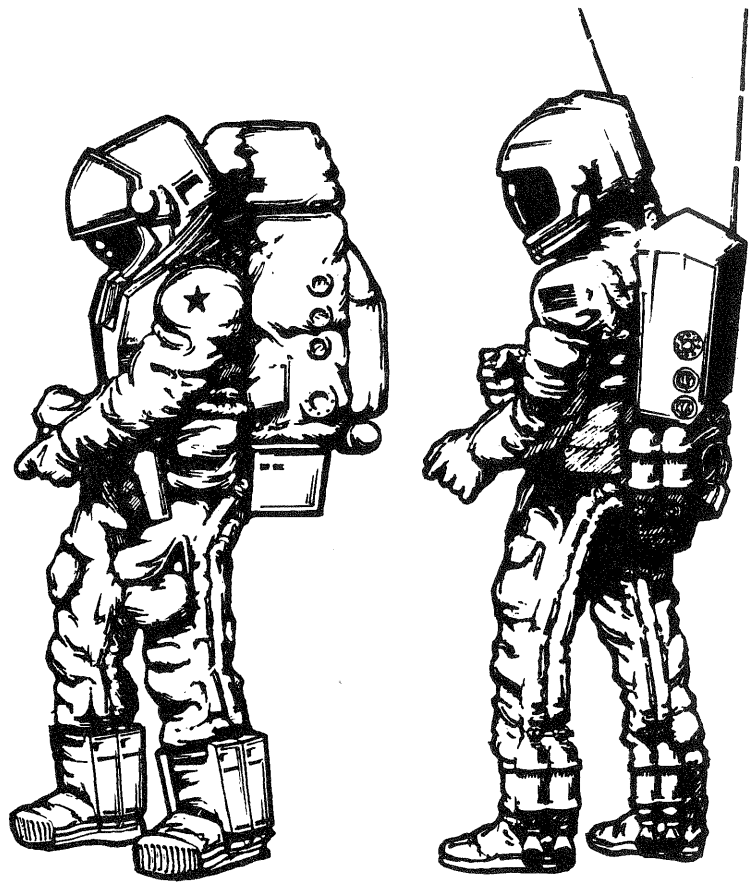


artwork by Tim Kuzniar,
Youngstown Ohio









artwork by Tim Kuzniar, Youngstown Ohio

JANE'S CORNER

Jane G. Hastings
Thomas Jefferson Planetarium
4100 West Grace Street
Richmond, Virginia 23230

When I walked up to the great man at the dais to ask for his autograph, I was so nervous that I knocked over the glass of wine at his place. Well, that's one way to gain entry into the ranks of the unforgettable! Autograph? I haven't scurried up to famous people for an autograph since teen years. And make no mistake, I did not pretend to be getting it for "my niece, who thinks you are wonderful and has (seen, read, bought) all your (movies, books, albums)." No, I wanted it for myself!

Hey! I wasn't the only one! Grown men tried to break in line ahead of me. As I sit here remembering the feeling of awe I experienced in his presence, I can look up at the autograph on my bulletin board. It gives me a smile every time I notice it.

He was featured speaker at the SEPA conference at Cocoa Beach in the summer of 1987. But he was a surprise! Mike Hutton, conference director, did not tell the conferees until just before the banquet. But I already knew by then. Mike had come up to me earlier and said, in his impish I've-got-a-secret-Na-Na-Na-Na-Na-Na way: "Guess who our speaker is. If you're right, I'll tell you." Knowing Mike's proximity to "The Cape", I imagined that he had made quite useful contacts in the space world, and so I said, "Is it an astronaut?"

"Yes", he said, still feeling smug because he knew there were *lots* of astronauts.

"Well," I said, "I'll start at the top. Dare I hope it's my favorite astronaut...?"

"You're right!" He beamed proudly when I guessed, like a kid at a birthday party whose present is the very best.

"When the conference committee met, we talked about getting an astronaut. Linda Hare (of Bradenton, Florida, Bishop Planetarium) pushed for this one and wouldn't let us quit until we got him. She is ecstatic about his agreement to speak to us."

And well she might be. Mike, as a special surprise to her, seated her next to the great man at the banquet.

Stop! Don't read ahead to find out who it was! Guess first! Of all the astronauts, who is your favorite? I'll be surprised if you *don't* select the same one we did. Not just Linda and me; overwhelming numbers of SEPA people have a special admiration for this man. It's as if we planetarians and other "space buffs" have a secret that we share.

And, as it turns out, it's a well-kept secret as far as the general public is concerned.

In the beginning of each school year, at a general meeting for elementary principals and administrators, I discuss planetarium lessons for the year while I give out brochures which describe the lessons. To spice up my presentation (and to make sure they are awake), I also give a prize for answering an astronomy or space-related question, i.e., "What's that bright planet we've been seeing in the early evening sky?"

This year, they missed my question completely. I asked them to identify the astronaut who had been on the Gemini and Apollo missions, and the first Space Shuttle mission. Not only did they miss it on first try, they kept guessing astronauts and never did get it. When I told them the answer, there was no flicker of recognition on their faces; they did not know who he was.

But you know: Astronaut John Young, a man with the "pilot personality" so deftly exposed by author Tom Wolfe, a man who seems baffled by all the fuss we make over him. After all, as he said, "I was just doing my job."

There is a quality about this unassuming man who drawled his way through his space mission slides that night in Cocoa; a quality I really admire. Instead of being sad that my principals and administrators had never heard of him, I shall go ahead and enjoy my little secret... I mean *our* little secret.

Overheard: Our Favorite Astronaut

"Astronauts are self-starters; it's hard tryin' to manage 'em, boy. It's like managin' lightning bolts: you'd say 'strike over [here]' and they'd already struck over there."

"I'm gonna have a slide show here. You might dim the lights a little bit so the people in the back can sleep. Astronauts spend an awful lot of time in planetariums. When we were going to the moon we had to know all the major stars and all the major constellations so we could point the telescope to line our platform so we'd be able to get there and back. Back: that's the important part."

"More than 250,000 people were devoted to getting us to the moon and back in Apollo days. Back is still the important part."

"In Apollo days, doing the right thing was more important than doing things as fast as possible."

"[On Apollo 16 lift-off], the smoke the noise and the vibration was tremendous. There was so much vibration that I couldn't even tell if my knees were shaking or not."

"If you're on the moon, and you hold up your thumb, you can cover up the earth. And if that doesn't worry ya, nothin' will."

"The hill in the background [on the moon] is over 2 miles away, but you can't tell it because there aren't any telephone poles on it."

"[On the moon with Apollo 16], we knew that there were about 200 ways that the lunar module ascent rocket engine could fail to start. Think of it: 200 ways to become the first permanent manned lunar base"!

"[You can see our footprints here in this picture]. We're told our [footprints] will last for millions of years. But I reckon in less than fifty years, someone will want to build a lunar freeway, right through here."

"On [the first Shuttle flight, in Columbia], there was a lot of noise, but not nearly as much vibration. I mean I knew for sure it was my knees shakin' on this baby."

"They have a great technology transfer program in Russia. They transfer our space technology to their space program." ❑

(BUHL, continued from page 61)

Wapiennik joined the staff of the Buhl in 1954 as a physicist. Among his various duties at the planetarium, Wapiennik became curator of exhibits and designed layouts for galleries, designed and built a 360-degree panorama system for the planetarium, made many special effects, and installed a new planetarium control console.

Upon C.V. Starrett's retirement in 1964, Wapiennik became executive director of the Buhl Planetarium and Institute of Popular Science. He remained in that post until his retirement in 1982. In 1970, Wapiennik was voted "Man of the Year in Science" by the Jaycees. He is currently the head of his own company, Work-O-Art Miniatures, and lives in the Pittsburgh area.

In the planetarium field it is quite remarkable for a major planetarium facility to have so few planetarium directors over such a long span of time. However, this is just the case for the Buhl Planetarium. During the past 48 years there have been just two directors: Arthur L. Draper and Paul Oles. These two dedicated individuals must surely have loved their jobs.

Paul Oles was born in Pittsburgh in 1945 and earned a bachelor's degree in meteorology from Pennsylvania State University in 1967. Shortly thereafter he joined the staff of the Buhl Planetarium as a lecturer and worked for three years very closely with Mr. Draper. When Draper suffered a heart attack in 1970, Oles served as acting director. Oles was subsequently appointed director in 1971—when he was only 26 years old. In 1982, the facility was reorganized as the Buhl Science Center, and Oles became head of the Planetarium Department.

In January 1987, the Buhl Science Center merged with the Carnegie Institute. Current plans are now in motion to construct a new 140,000-square-foot science center with an Omnimax theater and a separate 50-foot planetarium housing a Digistar projector. There is strong local support for the new science center and planetarium. Ground breaking for the new facility is scheduled for spring 1988.

Special thanks go to Paul Oles of the Buhl Science Center, Carol Stephen of the Carnegie Institute Library, Carl Wapiennik, and Elaine McGahee of Broward Community College Library for contributing to this article. ❑

The Planetarian

Guidelines for Contributors

Articles: *The Planetarian* (ISN 090-3213) welcomes articles on astronomy that would be of interest to planetarium educators. Preference is given to articles that closely relate to the philosophy, management, technical aspects, and history of planetariums, and to ideas that can readily be incorporated into planetarium programs.

Text: *The Planetarian* is prepared on a Macintosh computer and LaserWriter printer. Text ultimately needs to be in computer-readable form and can be submitted in these ways:

1) mailed on a Macintosh disk (most preferable); 800k disks OK; MacWrite, Microsoft Word 1.05/3.0, FullWrite, and unformatted text are acceptable;
2) over the telephone lines to CompuServe as electronic mail; send to John Mosley, ID# 74156,473, as *unformatted* text; end the article with "The End;"
3) mailed as *unformatted* text on an IBM or compatible disk (please strip out control characters); double-sided disks OK;
4) mailed as *unformatted* text on Apple II Prodos disks;
5) mailed as double-spaced typed or printed copy on paper (please send **two** copies).

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Deadlines: *The Planetarian* is published quarterly with cover dates of March, June, September, and December (the equinoxes and solstices). The final deadlines for *all* submissions, including advertisements, are January 21, April 21, July 21, and October 21 respectively.

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