SOUTHERN SKIES

Journal of the Southeastern Planetarium Association

SUBMISSION GUIDELINES: Articles should be typed, double-spaced, one side per sheet. Computer printout (word processor) output is acceptable. Article should be accompanied by author's name, mailing address and phone number, as well as a statement to the Editor granting or refusing permission to reprint the article in other forms. Accompanying art must be labelled.

ARTWORK: Humorous original artwork will be used on a space-available basis. If artwork hs been published previously, a signed permission statement from the author must accompany the item, as well as permission from any other copyright holder.

DEADLINES: Submit all copy and artwork to the Editor in accordance with the following deadlines:

Spring Issue (No. 1)	January 1	Fall Issue (No. 3)	July 1
Summer Issue (No. 2)	April 1	Winter Issue (No. 4)	October 1

Your cooperation will insure the continued timeliness of Southern Skies.

Southern skies

SOUTHEASTERN PLANETARIUM ASSOCIATION

Vol. V, No. 3 September, 1985

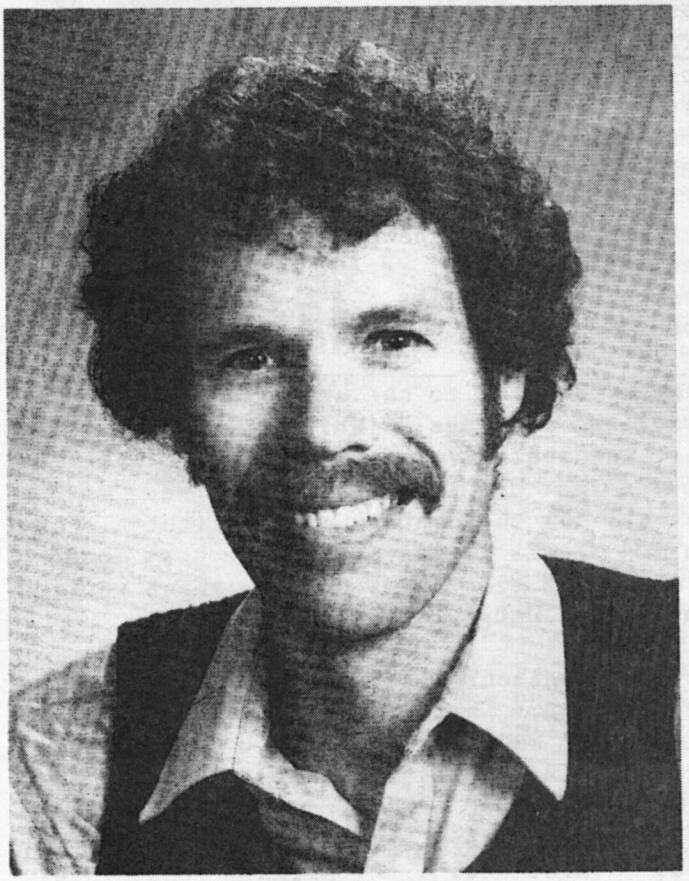
A Message From Your President

by John Hare

By observing the heavens, one can vicariously travel into the past. By visiting Ireland, one can literally travel into the past. It was my good fortune to represent SEPA at the recent International Planetarium Society Council meeting held in Armagh, Ireland on June 21 and 22. Our host, Terrence Murtagh, furnished those in attendance with a most enjoyable visit which included a trip to Birr castle where we were the luncheon guests of Lord Rosse and were afforded a tour of the remains of the "Leviathan", the famous 6' reflector erected in 1845.

The concerns that a meeting held off of the North American continent would not be well attended were for naught. Representatives from every affiliate except one were in attendance. The strength of the US dollar and the affordability it offered no doubt contributed to the large number of delegates in attendance.

Preliminary details of next year's IPS Conference scheduled for Tucson, June 30 through July 4, were made available. The host facility is the Flandrau Planetarium with delegates to be housed at the Double Tree Inn. Because of the proximity of Tucson to the many varied astronomical facilities in the area, the theme of the '86 meeting is Astronomy. Mount Lemmon and



Kitt Peak are among the sites to be visited!

If Tucson seems too far, despair not. Dr. Charles Smith and the staff of the Bijou (Universe) will be hosting the 1988 IPS meeting in Richmond, Virginia.

Now for the really exciting news. IPS has received an invitation from Borlange, Sweden for 1990. It is anticipated that an invitation will also be forthcoming from Paris, France. The Borlange invitation offered a rough meeting outline with a conclusion that knocked our socks off. The proposed that the meeting conclude in Bor-

lange on July 19, travel to Stockholm and visit the Omnimax Theater among other attractions on the 20th, board a cruise ship for Helsinki arriving on the 21st, and awake early on the 22nd to view the total solar eclipse! The IPS Council will reach a final decision on the site at next summer's conference.

More mundane council business occupied the remainder of the meeting including the appointment of Carolyn Petersen as Publications Committee Chairperson. IPS members should be aware that Don Hall, at the Strasenburgh Planetarium in Rochester, New York has a supply of back issues of the Planetarian as well as certain other special reports. Finally, a general call was extended to all IPS members to submit (much needed) articles to Jordan Marche for publication in the IPS Journal.

Not to be overshadowed by the IPS Council meeting was our recent SEPA conference hosted by Doug Gegan and the crew at Golden Pond, Kentucky.

What a contrast to the urban setting of the prior two meetings. While the weatherman was uncooperative at first, the clear sky on the last night of the meeting was without a doubt the conference highlight! For me and others it was one of the best observing nights ever. How do you manage to get any sleep, Doug?

My apprehensions over chairing the business meeting were happily put to rest as all items of business were dealt with in an orderly and concise manner. A dues increase to $15.00 per year was approved and will become effective beginning with the 1986 conference. The primary reason for the increase was to head off any shortcomings imposed by the increased costs of publishing the Journal. At present, approximately 75% to 80% of our dues go toward the Journal. With the dues increase we have assured that our publication can continue at its present high level of quality.

Frank Palma again wants to remind everybody to complete the survey form and return it to him ASAP! As of the conference, Frank had only received 17 surveys.

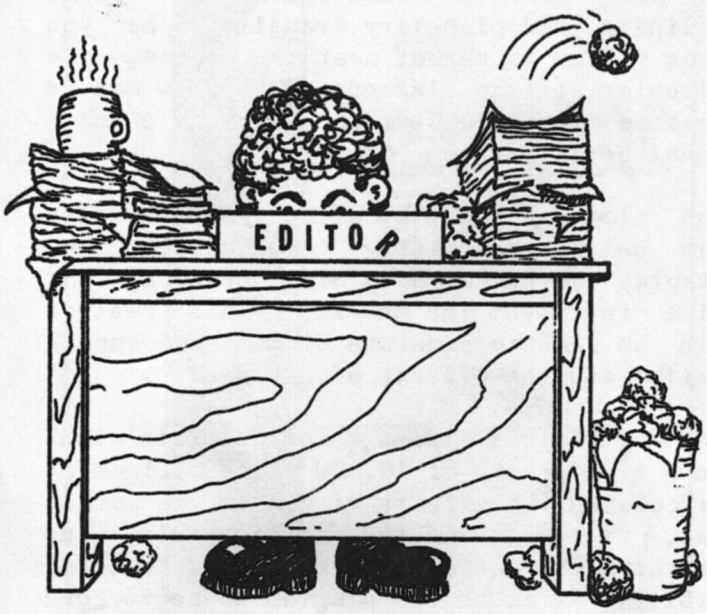
Jim Manning presented a humorous and informative look at next year's conference site, Chapel Hill, North Carolina. In keeping with SEPA tradition the membership enthusiastically picked up the chant of the host facility.

The choice for the 1987 meeting was Cocoa, Florida where Mike Hutton has promised us a shuttle launch. Looking ahead to 1988 a possible problem arises. With IPS meeting in Richmond, Virginia, SEPA could go three ways. We could meet completely separately, we could meet either before or after IPS in Richmond, or we could meet briefly during IPS. Each option has its advantages and disadvantages. A decision must be reached by next year's conference and the executive council will be deliberating at some length on the issue before then. Your input is essential so make your preference known to an officer before then.

Jack Fletcher has agreed to coordinate the efforts to establish a SEPA Archives. The purpose of the archives is to document the history of our organization and will include both printed and photographic information. Please support Jack in whatevery way you can.

Sue Griswold is chairperson of a new SEPA Membership Committee. Sue will be working with several other committee members throughout our regions to increase our membership size. The success of this committee will depend greatly on you and the individual. You can help by talking up the organization and by referring non-member individuals to the committee and vice versa.

With the conclusion of this President's Message, I plan to devote almost 100% of my efforts to what is probably the biggest event in astronomy since Apollo 11. No matter how spectacular it was in 1910 or how spectacular it may be in 2061, I will see it only in 1985-86, and this is true for almost all of the people that will see it in the coming months. Since Halley's Comet is almost literally a once-in-lifetime experience, the best time to see this comet is now! Use that fact to your advantage and help make the coming year one of the most memorable ever for the present generation of our planet's inhabitants.

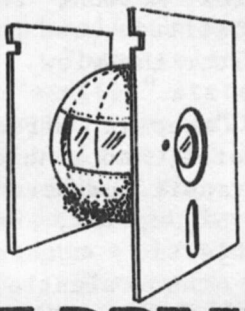


I want to acknowledge all of the positive response that I have been receiving to SOUTHERN SKIES lately, not only compliments on the final product, but the most important kind of response--your articles. If I make the Editor's job seem easy, it's because YOU have made it so. I rarely have to change a thing that's submitted to me. Not very many editors get to make that statement. Not unless they have such a talented pool of writers and artists to draw from as the members of SEPA. I salute you!

At the conference it was decided to print the current SEPA Constitution and By-laws as well as the Code of Ethics once each year in the journal issue immediately following the conference. The Constitution, By-laws and Code of Ethics will appear as a pull-out in the center of this issue.

We have added some new departments with this issue, Joe Tucciarone's cosmic comic strip DOMESBURY; and by popular demand, Richard McColman's SMALL TALK. I hope y'all like them!

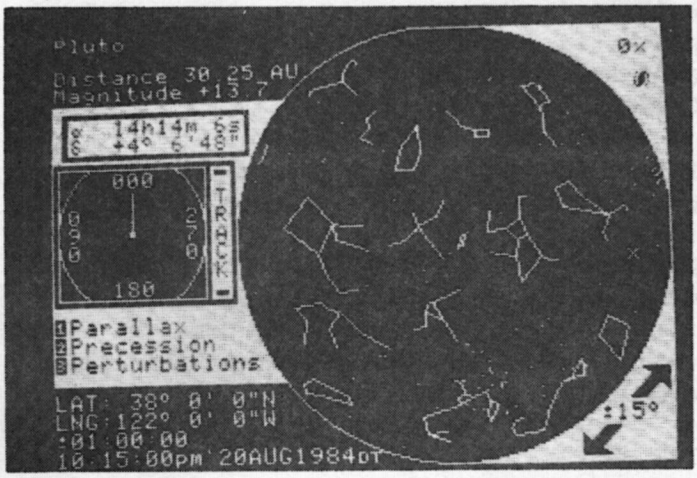
P.S.: For all of you who have some wonderful ideas but no time to write them down, Kathy Summers has volunteered to transcribe your articles from cassette to print for you! She'll even send your tape back! Talk about service....



THE DRIVING FORCE...A REVIEW OF ASTRONOMY COMPUTER PROGRAMS

Reviews by Duncan Teague
Craigmont Planetarium

THE OBSERVATORY
Lightspeed Software
2124 Kittredge Street, Suite 185
Berkeley, California 94704
Apple][e or Apple][+ with 16K RAM card; $49.95



What astronomical tool has the following characteristics?

1. It allow the viewer to look at the positions of lunar, planetary, stellar, galactic, and extra-galactic objects as they appear from anywhere on the face of the Earth; at any time of the day; and for any day in the past, present, or future.

2. It has diurnal motion, annual motion, azimuth, latitude, and precession controls to alter the view.

3. It shows "special effects" such as partial, total, and annular eclipses of the Sun; transits of Mercury and Venus; the moons of Jupiter; Halley's Comet; Messier objects; constellation outlines; and other celestial phenomena.

4. It allows mirror image, naked-eye, and magnified (up to 512X) views of a specific area of the celestial sphere.

5. It is entertaining as well as educational.

If you guessed that I'm describing a cross between a well-equipped planetarium theatre and a telescope with nine eyepieces, you are wrong outer space breath.

It's THE OBSERVATORY, a new (to me) astronomy software program for the 64K Apple Computer. Gary Lassiter, developer of the program, hasn't yet advertised in any astronomy journals. When he does, there's nothing his ad can say that will do justice to the sophistication and speed of this program.

If you're tired of waiting four minutes or more for your astronomy program to calculate the positions of a couple of hundred celestial objects, show you a limited, distorted view of the sky, and outline half a dozen constellation, you can look to THE OBSERVATORY for assistance.

THE OBSERVATORY displays the positions of over 400 stars, dozens of constellations, the major members of our solar system, the Messier objects, and other goodies. It's display is achieved with none of the distortion, in half the time, and at only about half the cost of other planetarium simulation programs.

THE OBSERVATORY allows rapid movement of a cross-hair cursor in eight directions. There are no pauses in movement while the computer reorganizes its memory before allowing you to continue. Once you have pointed the cursor at an object, simple keyboard commands allow you to identify the object, ascertain its position in equatorial and horizon coordinates, center the object in the display, zoom in close to it or dezoom to a greater distance.

This zoom function allows Jupiter's disk and its Galilean satellites to be revealed. It also provides simulations of solar eclipses and planetary transits. As you zoom in on an object near the ground, the circular horizon flattens. The view can be rotated by any angular increment to a more ideal position.

The time and location of your observation can be changed easily. In addition the display can be advanced or reversed by any time increment you choose. This feature can be used to simulate diurnal and annual motion and the effects of precession.

THE OBSERVATORY claims to be accurate within a time period of 10,000 years, since it calculates the effects of geocentric parallax, precession of the Earth's axis, and perturbation effects of the outer planets' orbits. I found the program to be in good agreement with published calculations of the positions of Halley's Comet in late 1985 and early 1986.

I have two objections. One is the lack of a function to save the currently displayed view to another disk for subsequent hard copy printout by a graphics utility. Another is the lack of a backup copy of the program. Both omissions are serious oversights which detract from the usefulness of THE OBSERVATORY.

What I like best about THE OBSERVATORY are the number of celestial objects whose positions are calculated, the natural looking graphics display, the speed of operation, and the easy-to-remember keyboard commands. The documentation is as down-to-earth as the program is heavenly.

THE OBSERVATORY, in the right hands, can be a powerful tool for astronomy education. For the planetarian, it could be a wonderful aid to carry with you on classroom visits, an exciting and easy to use lobby display, and a valuable research tool. THE OBSERVATORY is a winner!

ASTRONOMY SOFTWARE
Waterloo Amateur Astronomy Society
25 Bridgeport Road East
Waterloo, Ontario
N2J 2J4 CANADA
Apple][; Atari; Timex/Sinclair 1000
$10.00 - $15.00; Cassette or Disk

I once heard someone say that the timings of grazings and occultations and searching for new comets are the only areas of astronomy in which amateurs still play an important role. One area this person surely omits is the development of affordable astronomy computer software.

The Waterloo (Ontario, Canada) Amateur Astronomy Society members have put together a series of five different astronomy programs. They have been developed for several different types of computers, and they perform a variety of useful astronomical services and tasks.

The first program on the Apple disk is Solar System Almanac. This program calculates the positions o the Sun, the Moon, the planets, and five important comets (including Halley). From the year, month, and day the user supplies, the program calculates the Julian day number, the equitorial (an, optionally, horizon) coordinates, distance from Earth, angular size, phase, apparent magnitude, and rising, meridian transit, and setting times of the object selected.

You can also elect to retain the information just calculated for a ninety degree horizon display in any direction you specify. Other objects may be selected for processing, and all of them can ultimately be included in the display. The planets are denoted by their (upper case) initial letters. Mercury and the comets by lower case letters. The Sun and Moon are the symbols "*" and "(".

Astronomical Conversions is the second program on the disk. This program quickly calculates conversions between horizontal, equatorial, and galactic coordinates. It also prints out a table of Universal Times equivalent to local sidereal times, and it calculates the change in astronomical coordinates from one precession epoch to another.

Messier Catalog is the third program. It will search the catalog and give you a screen display or a hard copy printout of data on any one object or all objects within a two hour span of the southern meridian. The data presented are the common name of the object (if any), equatorial coordinates, the constellation in which it is found, the type of object it is, and its visual magnitude.

Cometary-Meteor Data Base is a combination calculator and catalog of related phenomena. The first of four menu options provides calculations of the equatorial coordinate positions, Earth and Sun distances, magnitude, and rising, meridian transit, and setting times of five important comets: Encke, Temple 2, Schwassmann-Wachmann 1 & 2, and Halley.

Two other options provide general information on significant meteor showers or detailed information on the most prolific meteor shower of a given month. Average frequency and radiant of the shower is given. The fourth option can be used to correlate two different locations' reports of the observed altitude and azimuth of a sighted meteor. The altitude of a single meteor or the average altitude of a meteor shower can be obtained.

The Moons Program is last. It calculates the magnitudes and dates of all lunar eclipses and the dates of full moons for a given calendar year. A third function calculates the positions of the major moons of Saturn. Angular distance from eastern or western elongation and radial distance from the planet are given. For some reason not apparent to me the same function is not provided for the moons of Jupiter.

The Solar System Almanac program sells for $15. The other programs are $10 each. The entire collection is priced at $25. I can only assume the prices asked are in Canadian currency. If so, they are a bargain at this time for U. S. purchasers.

While these five programs are not graphically showy, the collection is internally consistent and accurate. They offer an opportunity to start or add to your astronomy software collection at reasonable prices. They are also excellent in terms of their instructional value to a beginning or intermediate programmer who wants to develop his or her own astronomy programs.

SKYWATCHER'S ALMANAC, $13.00
LOCAL PLANET VISIBILITY REPORT, $15.00
Astronomical Data Service
3922 Leisure Lane
Colorado Springs, Colorado 80917

Last winter Spitz Space Systems discontinued a practice they had followed for all the previous years of my experience with

them. Instead of furnishing a copy of the new Astronomical Almanac to all their Preventive Maintenance Agreement (PMA) customers, they instead sent a copy of the "Comparative Ephemeris" published by the Astronomical Data Service. I was surprised, disappointed, and angry (in that order).

This new arrangement did have some positive aspects. The document they sent me had sufficient information to set the planet analogs on my 512. It contained some information about lunar, solar, and planetary phenomena. It was lighter than the Astronomical Almanac.

On the negative side, there was a lot of information this light-weight document omitted. The only planetary data was on the naked-eye planets. There was no information on the minor planets. There was no information on Halley's Comet. There was no data on astronomical/nautical/civil twilight. There were no Sun/Moon rise and set data. There were no astronomical constants to plug into my existing astronomy software programs to update them for 1985.

The purpose of this "review" is to tell you where some of this information missing from the "Comparative Ephemeris" can be found. Either it's in the "Skywatcher's Almanac" or it's in the "Local Planet Visibility Report," two more documents published by the Astronomical Data Service.

The "Skywatcher's Almanac" is a 40-page, soft cover, spiral bound "computer-generated Sun and Moon calendar and quick-reference guide to the predictable phenomena of the night sky." The report is custom produced for the purchaser's location. This means that information which must be extricated, interpolated, or extrapolated from the Astronomical Almanac is already calculated for you.

In the "Sun and Moon Calendar," ten neat columns contain the numerical day of the year, the date, the day of the week, Sunrise time, Sunset time, time zone (including standard and daylight considerations), Moonrise time, Moonset time, phase of the Moon, and percent of the Moon illuminated. All rise/set times are based on the twenty-four hour clock. These calculations are printed one page per month for an entire calendar year.

The circumstances of lunar eclipses, solar eclipses, and lunar occultations of both planets and stars are given in the next section. This is followed by a table of star proper names, designations, positions, visual magnitudes, and spectral types; four star maps, two equatorial and two polar; and planetary phenomena and visibility, including elongations, conjunctions, and oppositions.

Each selection of the report includes excellent narrative explanation of the basic considerations and assumptions made for the type of calculation made. Appropriate diagrams, equations, tables, charts, and definitions are furnished as an aid for the lay person interested in casual star-gazing and for the serious amateur/professional astronomy educator.

The "Skywatcher's Almanac" will save lots of time for the individual who wants accurate but basic astronomical information without having to hunt through a thick book to find it.

The "Local Planet Visibility Report" is also custom produced for the purchaser's locality, and it comes in a format similar to the "Skywatcher's Almanac." Its 24 pages include comprehensive data on the five naked-eye planets and a guide to help you interpret the data.

For the inferior planets the calculations are made every two days; for the superior planets, every five days. All calculations are made at varying times but for identical observing conditions. They are made for the middle of astronomical twilight, when the Sun is nine degrees below the horizon.

If a planet's altitude is greater at morning twilight, the time of that nine degree morning twilight is given as well as the time the planet rose. If the planet's altitude is greater at evening twilight, the time of that nine degree evening twilight is given along with the setting time of the planet.

In both instances the following additional data is given: the planet's position in horizon, equatorial, and heliocentric coordinates; its distance from the Earth and the Sun; elongation; angular diameter; phase; and visual magnitude. The guide explains the meanings of the different calculations.

The guide also explains some of the inferences that can be made based on the data. Some significant inferences include the following: aphelion, perihelion, and node crossing dates; periods of direct and retrograde motion and stationarity; and several Earth-Sun-planet configurations, such as greatest elongation, conjunction, opposition, and quadrature.

One additional table gives the positions, culmination times, and visual magnitudes of the three outermost planets. Because they move so slowly, the calculations are made once every ten days.

The "Local Planet Visibility Report" shows at a glance the ideal time for viewing the naked-eye planets. Its tabular form makes the inferences discussed in the guide easy to make. It is a document which would greatly aid the observational astronomer.

I sincerely doubt that the Astronomical Data Service could provide as much information at the same cost as the Astronomical Almanac. But what you get in convenience may be worth the extra money you'll have to pay to get the same type of information. Only time will tell how Spitz PMA customers react to this change. I haven't decided.

GIBBES PLANETARIUM
by Steve Morgan
Columbia, South Carolina

The space age in Columbia, South Carolina began on November 22, 1959 when the Gibbes Planetarium formally opened to the public. The planetarium has undergone some dramatic changes since then--changes that have kept our facility in step with advancing technology and public awareness over the past twenty-five years.

Nestled in the heart of historic uptown Columbia, only a short walk from the State Capitol building, the Gibbes Planetarium is adjacent to the Columbia Museum. The construction of the planetarium was made possible by a generous bequest from the late Dr. Robert W. Gibbes. Dr. Gibbes left in his will a considerable sum of money to fulfill his cherished dream of a museum where people would be made aware of their natural surroundings. Today the planetarium stands as a reminder of his great love of the science of astronomy.

The Gibbes Planetarium features a Minolta MS-10 star projector under a 26-foot dome with concentric bench seating for approximately 60 people. Some of you astute planetarians out there may be wondering what in the world we're doing with a big MS-10 in a little 26-foot dome. Well, it seems that when the MS-10 was installed in 1971 (to replace an aging Spitz instrument), the master plan called for the construction of a 40-foot dome in a couple of years. Somehow the 40-footer never materialized, so here we are.

But we're not complaining, mind you. The MS-10 has given us excellent service and reliability, and the starfield is incredibly bright and crisp compared to most I've seen. From an audience perspective, the MS-10 looks quite impressive, looming over the seats as it dominates the theater. The only problem is that sometimes, if we're not really careful, when we're running latitude the north star ball scrapes against the top of the dome a little. (Only kidding, of course! We get lots of jokes about this from other planetarians.)

Even though our physical plant is small, the Gibbes Planetarium prides itself on the quality of its programming. In the past year, nearly 30,000 people attended our programs--the highest total in the planetarium's history. Altogether, the planetarium staff gave 839 shows during the year--another new record for Gibbes. The schedule included six different weekend public shows and nine different graded school shows. The majority of these shows were written and produced entirely at Gibbes.

The planetarium operates seven days a week, offering a broad range of astronomy-related activities and events. On weekdays, the planetarium is available by reservation for schools and other groups. Our slate of shows runs the gamut from kindergarten level through college topics. On Saturday and Sunday afternoons, we give shows that are open to the public at 2, 3, and 4 p.m. It's enough to keep a staff of two very busy.

In addition, we teach lab courses in planetarium astronomy for hundreds of students each semester from the nearby University of South Carolina and Columbia College. We also conduct teacher workshops in astronomy for two local school districts in conjunction with the S. C. State Department of Education and NASA's Spacemobile Program. And, we maintain a small exhibit area in our Science Gallery. Our most recent exhibit, "Star Games," is a hands-on astronomy experience with real telescopes for visitors to use in a participatory indoor setting.

The coming year promises to be another exciting period of progress and challenge at the Gibbes Planetarium. We hope to take some concrete steps toward installing an automation system to control our projectors and special effects. We want to do everything possible to ensure our shows are more ambitious, entertaining, and realistic than ever. In this way, the Gibbes Planetarium will continue to serve as a unique cultural and education resource in Columbia for at least a quarter century more.

Finally, let me take this opportunity to extend an invitation to all SEPA planetarians to visit out facility. We're easy to find, being centrally located between New York and Miami! Seriously, if you're ever in our area, please feel free to stop in and say hello. We'd love to show you around and share ideas.

Minolta Infinium

by Kosuke Sasaki
Sasaki Associates

The New Generation MINOLTA INFINIUM, truly the most advanced planetarium in the world, has been successfully completed at the Minolta Planetarium Factory. This Epoch Making INFINIUM is now performing its extraordinary functions at THE 1985 INTERNATIONAL SCIENCE AND TECHNOLOGY EXPOSITION in Tsukuba, Japan, the first world exposition of its kind, in which the latest scientific advancements from nearly 50 countries have been brought together. The MINOLTA INFINIUM was selected by the Japanese Government as a new generation of opto-electro-mechanical technology and audio-visual media to be one of the highlights of the 1985 Exposition, demonstrating the high regard in which planetarium technology is held.

Men have been looking into space and pondering it since man was first man, but only very recently have we begun to obtain real knowledge about it. We are still just entering the informative age and in the 21st century the great dream of earth-bound man to know his unique position in the universe and to be acquainted with the space about him will continue to become an ever more concrete reality. This is clearly demonstrated by the increasing number of people involved in obtaining that knowledge. The stars to which we cannot go in the 21st century can be displayed and brought to us by means of this most excellent technology as we travel ever onward toward infinity.

Under the world's largest planetarium dome (25.6 meters or about 84 feet in diameter) audiences will be able to "leave" the earth through INFINIUM's unique capabilities and experience simulations of space as it would appear from any point in our solar system such as from a spaceship or a moving comet or another planet.

Inside the Exposition's COSMIC HALL the Minolta Infinium Theatre presents space dramas on a dome screen which is tilted 20 degrees. Seats rise at an equal angle beneath it to give a comfortable view from which the audience may look both up and down naturally into space and any other scenes that may be presented.

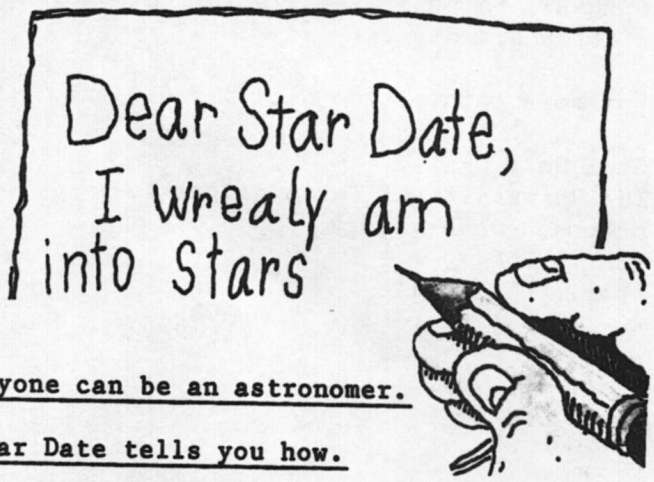
Although conventional planetarium functions may be performed in manual mode, the Computer Aided Planetarium Control System is a very powerful and "intelligent" system controlling the Star Projector, Solar System Projectors, Coordinate and Auxiliary Projectors, Special Effects, Lighting Systems and multi-channel Sound System with high accuracy and reliability. Many

simulations of space situations that are impossible to do manually may be accomplished using this computer.

The newly-developed interactive or dialogue-type input system permits easy communication with the computer so that even very complex programs may be readily entered and edited or modified to any degree without the difficulties often encountered on other systems.

Not only is this the world's largest planetarium, but the theatre is designed for multi-media use combining the MINOLTA INFINIUM, the world's first high-resolution wide-screen projection TV, Omnimax movies, and laser projections. Various sections of the dome open mechanically to "redesign" the theatre. At the base of the tilted dome is a stage behind which a larger section of the dome opens quietly to reveal the 16 x 27 foot rear projection TV screen, at the top of the dome another section slides aside so that a huge chandelier may be lowered, and other ports open for spotlights. The room may be lighted in any color (also under computer control) and these colors may be "played" along with music, etc.

The Tsukuba Exposition of the world's foremost scientific achievements will last from March 17 to September 16, 1985, after which the Tsukuba Expo Center's COSMIC HALL and Minolta's Infinium theatre will remain as part of this 21st century city, the foremost research and university city in Japan.



Anyone can be an astronomer.

Star Date tells you how.

Star Date is the daily astronomy radio series that lets people be astronomers. Since 1978, our announcer Joel Block has been telling people that learning some astronomy is as simple as going outside and looking up.

And people have been doing it. And they've been writing us by the hundreds of thousands to say how much fun it is.

It's fun to stand on a rooftop or in your backyard, see a point of light in the sky, and realize for the first time that you're seeing another planet. It's fun to go out in the country and see the hazy summer Milky Way. Or catch sight of the full moon as it's rising. Or watch a shower of "shooting stars."

In two minutes a day, with a different program every day of the year, Star Date alerts listeners to easy-to-see stars, planets, and other wonders in the night sky. But Star Date doesn't stop there. It reaches back into the history of astronomy, recounts early skylore, the space program, too--with regular reports on robot spacecraft, manned space travel and the future of people in space.

Star Date is now heard in 150 cities across the United States, its territories and Canada. And it's heard in Europe through the Voice of America.

Star Date is an original

Star Date originated in 1977 as a telephone recorded-message service--whose scripts were written by Deborah Byrd--the primary writer and producer for Star Date today. An Austin program director recognized the potential of these information capsules on astronomy, and asked to use them in a daily astronomy radio series.

The radio series instantly became very popular in Austin, and, with the help of the National Science Foundation, Star Date began airing nationally in late 1978. Two years of NSF funding gave the series more than 1,000 affiliate stations. People everywhere were hearing Star Date and liking it!

The next stage in the series' evolution began in early 1981, when federal budget cuts caused Star Date to begin asking stations to pay for airing the series. Today Star Date is going strong. It's heard all across the United States and Canada. And, with astronomy and space more popular than ever, we look forward to many more good years.

Star Date helps people feel at home on the Earth--and in the universe.

We don't just talk about astronomy and space. We tell people how to do astronomy.

When Star Date airs during the morning and afternoon drive times, listeners find out what's happening in the sky that night. Many stations air the program around dust, too--so listeners have that night's information fresh in their minds.

Star Date also gives people stargazing tools, with offers of free star charts and sky calendars in some programs. When listeners request these materials, they get a copy of the McDonald Observatory News, which features a monthly star chart and sky calendar, as well as articles and columns on astronomy and space.

Star Date is always positive

Star Date reflects the beauty and order of the universe. It has an alluring, hypnotic style that makes listeners feel good. Those feelings reflect well on any sponsor.

What's more, Star Date's immediacy is habit-forming. Listeners tune in to hear each day's program--so they can see what's in the sky that night.

Nature, computer, education and science-related businesses make good Star Date sponsors. Star Date is good for any sponsor that's looking for a long-term opportunity for regular, positive daily exposures.

And sponsors are impressed with the written feedback from listeners--copies of the many letters received from listeners--automatically sent back to each station.

Sponsors benefit not only from the daily airings of Star Date--but can be mentioned again in a customized promo recorded free for each station--and yet again in the free weekly teasers that come with each week's programming.

Outer space is the future--a hopeful future for all humanity. People like Star Date because it lets them stand on the Earth and gaze into space--an understand a little more about what they see. Star Date makes people feel good. It's entertaining, informative, positive, dependable and different every day.

Star Date is a winner.

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In 1981, the series won a Corporation for Public Broadcasting first place national award for excellence.

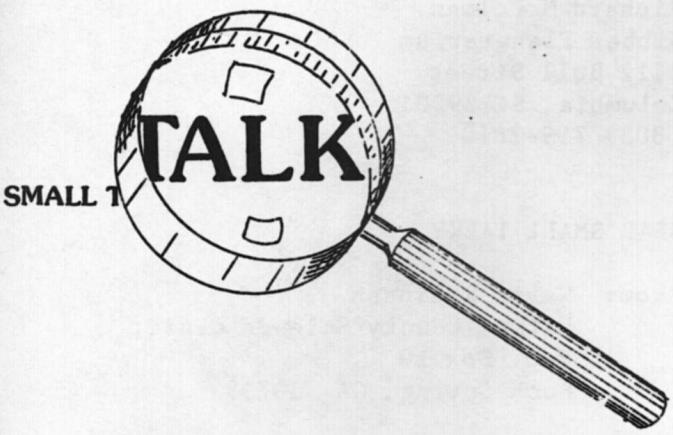
RATES:

Population	Quarterly Rate (90 programs)	Yearly Rate (365 programs)
400,000 and above	$318	$1,020
399,999 and below	212	680
Noncommercial	159	510

*The yearly rate is approximately a 20 per cent savings over the quarterly rate. Special rates are available for multiple station broadcasts.

For more information call 512-471-5285.

Star Date
The University of Texas at Austin
McDonald Observatory
RLM 15.308
Austin, TX 78712



by Richard McColman
Gibbes Planetarium

It became clear at the 1985 SEPA conference that a void exists. It takes the form of a lack of practical information available to "small planetarians." (Phil Groce is a "small planetarian," but we know what you mean.--Editor)

These heroic colleagues exhibit tireless enthusiasm and inventiveness daily in the face of abysmally sparse resources.

Frustration inevitably creeps in at conferences, as the large theatre "struts its stuff," swelling on the selection of computer graphics and video projection; while the modest facility ponders how to come up with a black hole projector on a shoestring.

How does the little guy deal with his everyday problems?

It is hoped that this column may, at least in some minor way, help to fill this void by acting as a "clearing house" for ideas and feedback, ranging from piggybank budgets to special effects for the layman.

Kodalith Headaches

Kodalith visuals and masks can be extremely effective devices in the planetarium. There's no substitute for "de-formatting" graphics and color slides to create and alternate reality in your theatre.

There's also nothing that can burn up the photography budget faster than shooting with this high-contrast menace. Many is the small planetarium left virtually penniless by "bracketing fever."

Since kodalith has zilch latitude, 1/2 stop either way from a good exposure can be critical. Accordingly, the usual response is to bracket like crazy...and PRAY!

Let's briefly concoct a "technical aspirin" to overcome this infirmity.

Most exposure difficulties at the copystand are attributable to the absence of a photographic "gray card." This 18% reflectance metering card (available at photo stores) is essential to success in doing copywork.

The following procedure uses a strict method, the (manual) camera meter, and the gray card to cut bracketing to a minimum:

1. Set up camera, copy stand, and lights as usual.
2. Set ASA (ISO) to 6, or to lowest number on camera.
3. Set shutter speed to slow setting (1 second preferred).
4. Frame up and focus on art or graphic.
5. Place gray card(s) over artwork, filling frame. Meter.
6. Adjust aperture accordingly.

For cameras that don't go down to ASA 6, you'll have to adjust exposure in step 6 as follows:

6a. For ASA 12, meter and open up 1 stop.
6b. For ASA 24, meter and open up 2 stops.

Finally:

7. Remove gray card and shoot.

Now process the film--kodalith developer, fixer, wash as usual. If your exposures are consistently off, this indicates a slight meter miscalibration, which can be compensated for with further aperture adjustment. Just run a couple of tests to nail this down.

Remember, graphics fading into black film indicates overexposure; lack of background opacity, underexposure.

Be careful when adjusting camera exposure between shots; refocusing will affect you

exposure density on kodalith. In other words, always re-meter after re-focusing.

Also, make sure lighting is even on the copywork, and always use art with good blacks and whites. Matte blacks, such as with construction paper are difficult at best, as the camera "sees" them as grays rather than blacks. We find that black and white glossy photographic paper, fogged and processed, makes great material for kodalith mask cutout art.

This procedure, if followed correctly, should yield good exposures from all but the most difficult graphics, and will greatly reduce film and chemistry costs. The steps may seem cumbersome at first, but hang in there, you'll soon be able to wiz through them.

You should recognize that your camera's meter may not be perfectly accurate. Tolerances for meter calibrations vary considerably. Determine your camera's degree of variance, if any, from the norm, and build a compensation factor into the metering procedure.

By the way, we use the same gray card metering for Ektachrome copywork as well. This eliminates the problem of under- or overexposure on slides taken from subjects with a predominance of light and dark areas.

For color transparencies, substitute the rated ASA of your film for that in step 2, and drop steps 6a and 6b altogether.

Through this procedure you can virtually eliminate problems of film waste in your productions.

Please feel free to contact us for further details or to iron out any difficulties. Also, let us know about any other problems you're experiencing. For further questions, ideas, or feedback write or call:

Richard McColman
Gibbes Planetarium
1112 Bull Street
Columbia, SC 29201
(803) 799-2810

DEAR SMALL TALK:

From: Wayne Robinson
Walker County Science Center
P.O. Box 10
Rock Spring, GA 30739

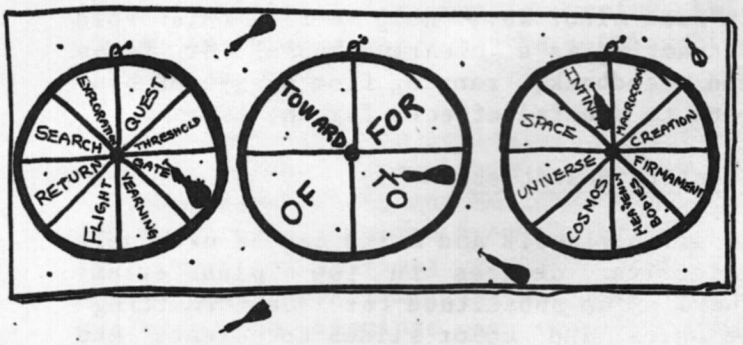
My Goto starlamp bulbs were purchased from C. & S. Assoc., P.O. Box 5625, 1717 Salono Way, Suite 11, Concord, CA 94520 at $7.50 each vs. $24.00 each from Viewlex the previous year. I have been able to purchase EXR lamps for my slide projectors at $9.03 each vs. $22.57 suggested retail from E. Sam Jones Dist., 1719 Marietta Blvd., N.W., Atlanta, GA 30318. He gives a 60 percent discount off retail to Georgia educational facilities (and perhaps others).

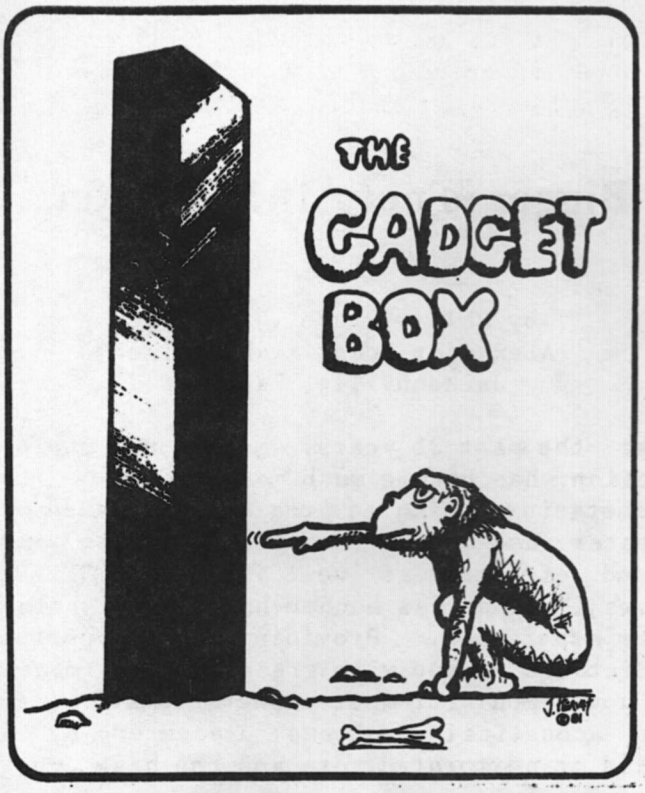
A column on bargains or common planetarium replacement materials found at reduced rates would be of great help for budget-crunched facilities. Obsolete bulbs, parts, etc. could also be mentioned in the column. Anyone having old unused bulbs, parts, etc. in planetarium A might just have what planetarium B has looked all over the world for. (I have a couple of strobes needing no longer produced bulbs now.) It's an idea worth considering.

(It sure is! Send in your listings to me for next issue!--Editor)

Scenes We'd Like to See

The unending quest for a unique star show title:





by Joe Hopkins
Bishop Planetarium

Strobe Tube Fever

Several types of equipment are almost universally found in planetaria; i.e. star projectors, carousel projectors, console operators, left-handed clumsy volunteers, and strobes. Since the last item seems to be the only one I have neglected so far in my musings for this journal, this article will cover (surprise!) strobes. Before we get into a discussion of how to build and service strobes, let's get a little background material about what strobes actually are and how they work, injected where it will do the most good.

The heart of a strobe unit is the flashtube. Flashtubes can be of many different shapes, sizes, and power capacities, but they all share a common design: a sealed glass tube, formed to a specific shape, filled with a pressurized inert gas (usually Xenon), with electrodes for the power supply inserted through the sealed glass tube into the internal gas supply. To complete a strobe unit we add a high voltage (200 volts or more) DC power supply and a trigger circuit.

But, how does a flashtube work? The principle is the same as that for a fluorescent or vapor lamp - passing an electrical current through a pressurized gas will excite electrons into higher levels in their own atom's electron shells or even into other atoms' shells. These electrons do not remain in the "excited" state long - less than 10 nanoseconds, typically. They then fall back to their normal place in the electron shell (where they may be "re-excited"). In so doing, the excess energy which must be given off is promulgated as light and heat. The difference between a flashtube and other gas-filled lights is that the ionization of the gas in the tube is very rapid and the magnitude of energy passed through the ionized gas is quite large, thus producing a short, intense burst of light rather than a steady glow.

The energy which is passed through the tube and transformed into light and heat is supplied by the DC power supply. The magnitude of the voltage required from this supply is a direct function of the length and pressurization of the flashtube being used. The longer and/or higher pressure a flashtube is, the more energy it can convert into light, but the farther apart (physically or in terms of electrical resistance) the electrodes are from each other and the higher the voltage potential needed to "jump" the gap between the electrodes. (This is typically between 200 and 400 VDC, but can be higher.) The current supplied by the DC power supply is directly proportional to the amount of energy we wish to be converted into light.

If we simply put the output of a DC power supply across the electrodes of the flashtube, no lighting will take place because the electrons of the atoms in the gas are in a "stable" state and no vacancies exist in the electron shells for "outside" electrons to enter. However, if we "excite" the electrons to higher energy levels, we then create space for the hordes of electrons waiting to enter from the DC power supply. This excitation (called ionization) is due to the action of the trigger circuit. The trigger circuit issues a short, very high-voltage (4,000 to 10,000 VDC) pulse which ionizes the gas in the tube and allows the charge from the DC power supply to be "dumped" into the flashtube. These extra electrons are themselves "excited" by the ionization trigger and the "collisions" with other electrons. All the electrons must, however, return to their "normal" valence level and the energy which must be lost for this to occur is given off as light and heat.

Sounds pretty simple so far, huh? Well, there are certain parameters which must be met for proper strobe design. For example, the trigger pulse must be of sufficient amplitude to ionize all the gas in the flashtube and of sufficient duration to insure that "charge dump" from the DC power supply takes place, and yet be brief enough to insure that the DC power supply storage capacitor is not drained completely (this creates a hardship on the power supply components). Attention must also be given to the maximum amount of power which can be safely applied to the flashtube and the length of time required to route that power through the tube. For example, 50 watts of power dissipated in 100 milliseconds equals 5 watt-seconds (or Joules). Maximum and recommended power levels and ionization potentials for a given flashtube will be presented in the manufacturer's specifications for that tube. Add to these considerations the question of the size of the storage capacitor needed to store the desired charge, the magnitude of the DC power supply voltage and the method of its generation and you will see that proper strobe design is fairly complex.

Well, why go to all this bother in the first place? Why not go out and but an off-the-shelf camera strobe (or some such)? It's been done repeatedly, but there are problems. With many of these you have to build or buy an adaptor to run the unit from the AC wall outlet, and the reliability and serviceability of such strobes is often open to question. Few individuals have the knowledge and/or parts sources to repair such units as they fail. If, however, you are operating strobes you have built yourself, repairs become much more feasible.

In the next issue we will cover strobe tube types, power-supply and trigger-circuit types, parts sources and availability, and circuit construction. We will culminate the discussion with a look at a good, all-purpose strobe that you can build with your own hot, greasy little hands. Then you can flash your whole audience (all at once) with your own equipment. What fun!

Bigger is not Always Better

by Philip Groce, Director
Alexander Brest Planetarium
Jacksonville, Florida

Over the past 25 years, good sound reproduction has become much more important to planetarium design an programs. Because of greater use of pre-recorded programs and sound effects, as well as music & light shows, "sound" has become half the planetarium experience. Providing clear powerful undistorted sound with great emotion impact is now a goal for most planetariums. Yet, the acoustical problems presented by a solid or perforated some and the high cost of powerful speaker systems have often precluded quality sound reproduction in many planetariums.

As a community donation, Phase Technology Corporation of Jacksonville, Florida attempted to solve these audio problems for the Brest Planetarium.

Their goals were (1) to produce, within + decibels, a flat frequency response from 30 Hertz to 15,000 Hertz and (2) to be able to sustain this frequency response at a maximum volume level of 105 decibels as measured at the center of the theater with (3) relatively even sound dispersal through-out the planetarium seating area.

Before the system was designed and implemented an acoustical analysis of the planetarium was completed by Phase Technology Corporation. From that analysis the following planetarium sound characteristics were identified: (1) That once a sound has entered inside the planetarium dome, sound wave cancellation and reinforcement caused by internal reflections often produced "drastic peaks and valleys' in the frequency response. (2) That "false speakers" or "hot spots" were common. This phenomenon is well known among planetarians. Our audiences often hear distant reflected sounds as if originating next to their ears. (3) That once a sound enters the theater, there is little difference between a solid dome and a perforated dome.

The speaker arrangement that best eliminated the "sound reflection" problem consisted of low frequency drivers located high behind the perforated dome. The separation of the low frequency drivers is possible because the human ear cannot determine the direction of a sound below a frequency of 100 Hertz. If the volume levels of the low frequency drivers are in balance with the upper frequency drivers, then the stereo separation and the imaging of the sound stage is completely determined by the upper frequency speakers.

For the first time in the history of planetariums, Phase Technology Corporation designed and built speaker drivers to respond to the unusual acoustical problems presented by a perforated planetarium dome.

The final speaker system design consisted of two components: a set of four compact satellite speakers placed 30 degrees high behind the dome and four matched subwoofers placed on the floor within the theater (see Figure 1).

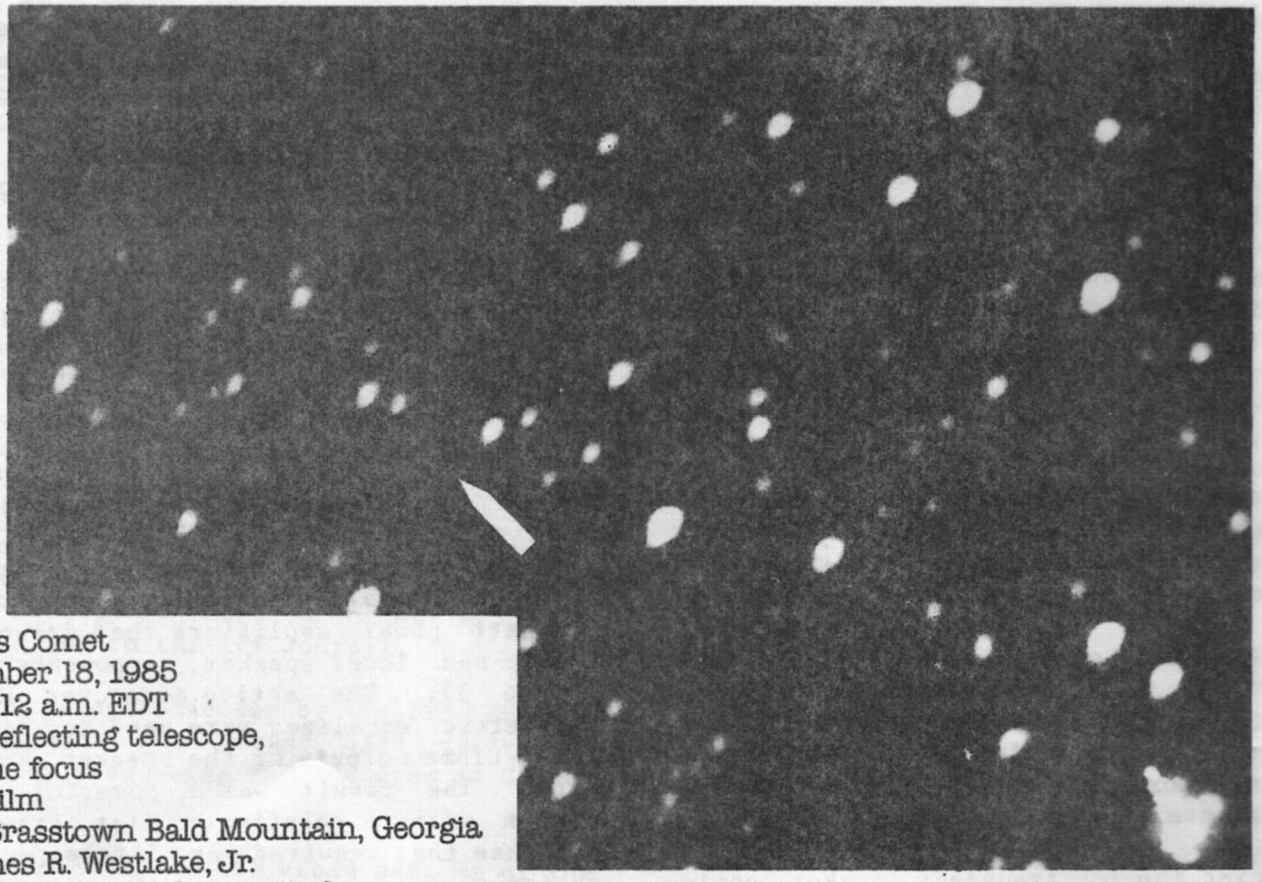
By placing the low frequency speaker cabinets within the theater, it eliminated the need for large speaker cabinets behind the dome. The high and mid frequency drivers require only enough cabinet volume to extend the drivers down to 100 Hertz. This size and weight reduction allowed the satellite speakers to be mounted directly to the dome structure. Bringing the speakers to the dome structure reduced the distance of the speakers from the audience, increasing the sound level within the theater. But more significant, bringing the speakers close to the dome increased the sound penetration through the perforated aluminum. The farther away a speaker is from the planetarium dome, the more the dome acts as a solid wall or an acoustical mirror.

To keep the number of audio "hot spots" to a minimum, Phase Technology elected to use wide dispersion dome high frequency drivers. These drivers were focused on the least reflective or "deadest" parts of the room: the audience (no pun intended), the seating and the carpeted floor.

However, Phase Technology discovered a gradual downrange sloping attenuation of sound starting in the upper mid-range frequencies. This roll-off in sound pressure levels increased significantly around 8000 Hertz. Interestingly, this dramatic roll-off would change in frequency depending upon the distance of the speaker from the back of the dome. Sound wave cancellations caused by reflections between the back of the planetarium dome and the speaker cabinet produced the sound loss (see Figure 2). This loss was greatly reduced by using sound absorption material (1 inch foam) around the speaker drivers. Phase Technology then designed high frequency drivers with an upward sloping frequency response to negate the remaining attenuating effects of the planetarium dome.

The electronics used to drive the speaker system consisted of an active crossover that separates the 100 Hertz and below signals from the upper frequency signals. These divided signals are then sent to two 500-watt power amplifiers that drive the upper and lower speaker components (see Figure 3). The active crossover and a parametric equalizer were used to balance the volume outputs of the speaker components. The result was a powerful sound system with a relatively flat frequency response that required very little equalization.

After more than a year of research and testing, the prototype system was unveiled in late September, 1984. Since then, it has been continually refined and improved. But more important, the new sound system has received rave reviews by our audiences. Without exception, visiting planetarians have been amazed at both the quality and small size of the system. From the rumble of a shuttle launch to the clarity of a violin concerto to the raw energy of a rock music performance, the new speaker system has added a wonderful new dimension to both school and public programs at the Brest Planetarium.



Halley's Comet
September 18, 1985
4:42-5:12 a.m. EDT
f/4 8" reflecting telescope,
prime focus
Tri-X film
from Brasstown Bald Mountain, Georgia
by James R. Westlake, Jr.
Brightest star is 5.2 magnitude
71 Orionis

SEPA 1985,
Land Between the Lakes

WANTED

PLANETARIUM CURATOR

Planetarium:

Spitz A3P under 12 m (40 ft.) dome. Automation, AZP zoom and many special effects.

Description of Position:

The Planetarium Curator will aid the Director of Science in the production and presentation of school and public planetarium shows as well as in the development of the planetarium facility. Work Wednesday through Sunday.

Qualifications:

Bachelors degree in related field and planetarium experience preferred, knowledge of astronomy, skills in electronics, optics and mechanical systems.

Salary Range:

$15,450 - $19,549, depending on experience.

Send Resume or Inquiries to:

Mrs. Nancy Anderson, Executive Director
Museum of Arts and Sciences
4182 Forsyth Road
Macon, GA 31210
(912) 477-3232

CODE OF ETHICS

CONSTITUTION AND BY-LAWS

of the

SOUTHEASTERN PLANETARIUM ASSOCIATION

Code of Ethics

Adopted: June 19, 1981

Commitment to Patrons

The professional planetarian knows that his position exists because people have a need to be served. In serving the needs of people to understand our universe, the planetarian understands that he is seen as an expert and responds by maintaining the highest standards of integrity.

In fulfillment of the commitment to patrons, the planetarian:

promotes and extends public knowledge of, and appreciation for astronomy, science, the scientific process, and the planetarium profession;

shall not on the ground of race, color, creed, sex or national origin exclude any patron from participation in or deny him benefits under any program, nor grant him any discriminatory consideration or advantage;

shall not promote subjects and opinions not grounded upon scientific principles;

shall make every reasonable effort to protect patrons from conditions harmful to learning or to health and safety;

shall respect the rights, beliefs, and sensitivities of the patrons;

shall not misrepresent an institution or organization with which he is affiliated, and shall take adequate precautions to distinguish between his personal and institutional or organizational views;

shall seek opportunities to be of constructive service in civic affairs and work for the advancement of the safety, health, and well-being of the community.

Commitment to the Profession

No planetarian can perform his duties in a professional way without interacting with others in the profession. This interaction with other planetarians nurtures both the professional and the profession, providing new developments and techniques. The professional planetarian recognizes the value of working with the professional organizations and deals equitably with others in the profession.

In fulfillment of the commitment to the profession, the planetarian:

continues professional development throughout his career;

should strive to increase knowledge within the profession and share developments with colleagues;

shall accord just and equitable treatment to all members of the profession;

shall admit and accept his own errors when proven wrong and refrain from distorting or altering the facts in an attempt to justify his position;

avoids any act tending to promote his own interest at the expense of the dignity and integrity of the profession;

shall not misrepresent his personal qualifications;

shall not knowingly distort evaluations of colleagues;

shall withhold and safeguard information acquired about colleagues in the course of employment, unless disclosure serves professional purposes;

shall not refuse to participate in a professional inquiry when requested by an appropriate professional association;

shall not use coercive means or promise special treatment in order to influence professional decisions of of colleagues;

shall give credit due to others for work, contributions, discoveries, or creations;

respects the rights of other artisans and professionals to collect just compensation for the fruits of their labors;

should actively support and participate in activities and programs of professional organizations;

should establish harmonious relations with other colleagues and members of other professions, and endeavor to inform members of related professions of services provided by the planetarium profession.

Employer-Employee Relations

While maintaining his position in order to serve patrons, the planetarian is rewarded with working conditions and compensation which allow him to devote his energies to his job. The ethics of dealing with one's employer is a two-way street and corporation and institutional members of the society as well as individual members are enjoined to abide by the Code of Ethics.

In fulfillment of the employer-employee agreement, the planetarian:

shall adhere to the terms of a contract or appointment, unless these terms have been legally terminated, falsely represented, or substantially altered by unilateral action of the employing agency;

shall apply for, accept, offer, or assign a position of responsibility on the basis of professional preparation and legal qualifications without discrimination on the ground of race, color, creed, sex, or national origin;

shall not delicate assigned tasks to unqualified personnel;

shall not knowingly withhold information regarding a position from an applicant or misrepresent an assignment or conditions of employment;

shall apply for a specific position only when it is known to be vacant and shall refrain from underbidding or commenting adversely about other candidates;

shall uphold the principle of appropriate and adequate compensation for those engaged in the profession;

shall use time granted for the purpose for which it is intended;

shall not accept outside employment to the detriment of his job;

shall not use equipment, supplies, laboratory, or office facilities of his employer to carry on outside private business activities without consent.

Constitution and By-Laws of the Southeastern Planetarium Association, Inc.

STATEMENT OF PURPOSE

1. To promote the spread of knowledge of astronomy and related disciplines in the school curriculum and among the general public at all levels of age and interest.

2. To encourage planetarium and educational institutions in planning the development of the planetarium as an effective educational and cultural medium.

3. To seek to improve professional standards among our members, and to provide assistance to those wishing to improve their knowledge and skills in this field.

STATEMENT OF METHODS

1. To provide a forum for the exchange of ideas at an annual meeting to be held at a convenient location.

2. To issue periodic newsletters dealing with current ideas and issues within our profession.

3. To provide information and encouragement to those interested in establishing new planetariums.

RATIFICATION

This document was ratified by a majority of members of the Southeastern Planetarium Association on the 9th day of June 1977 in Atlanta, Georgia.

BY-LAWS

ARTICLE ONE

Name of Association, Situation of Offices, and Seal

Section 1. Name - Southeastern Planetarium Association Inc. (SEPA). Our name shall hereafter be called the "Association."

Section 2. The Association shall be a non-profit organization.

Section 3. Situation of Offices - The head office of the Association shall be the Gibbes Planetarium, 1519 Senate Street, Columbia, South Carolina 29201 and any other Offices designated by the President.

Section 4. Seal or Insignia - The President, Vice-president, Secretary-Treasurer, or other such officer of the Association as the Council may appoint, shall have the authority to affix the Seal of the Association to any document requiring the same.

ARTICLE TWO

Members and Dues

Section 1. Conditions of Membership - The members of the Association shall consist of:

A. Full membership is extended to persons engaged in the administration, professional, educational or technical activities at a planetarium in Kentucky, West Virginia, Virginia, North Carolina, South Carolina, Tennessee, Georgia, Florida, Louisiana, Mississippi, Alabama, and all U. S. Territories off the southeastern coast of the U. S.

B. Associate status can be granted to those persons or institutions interested in the aims of the Association but who do not fulfill the above requirements.

C. Patrons - Individuals not necessarily in the planetarium field whose interest and support is beneficial to the Association.

Section 2. Election of Members - Applications for all classes of membership shall be subject to approval by the Council. The Council shall review the membership roll annually and shall exclude institutions or individuals which no longer meet the requirements of membership.

Section 3. Dues - Annual dues shall be an amount determined by a majority vote of the membership at the Annual General Meeting.

Section 4. Privileges of Membership - All members shall be entitled to all benefits of the Association, but only those individuals described in paragraph A of Section 1 shall be entitled to vote and to hold office.

Section 5. Use of Funds - All dues and monies received by the Association shall be used to accomplish the statement of purpose and methods as set forth herein.

Section 6. Dissolution - In the event of dissolution, the residual assets of the Association shall be turned over to an organization which is exempt from federal income tax under Section 501 of the Federal Internal Revenue Code as amended from time to time, which organization appears most likely to carry out the purposes of this Association.

ARTICLE THREE

The Executive Council of the Association
Section 1.

A. Councillors - The Council shall consist of three or more persons. The President, the Vice-president, the Secretary-Treasurer, the Past President, (hereinafter referred to as the "Officers") and any other members designated by the President.

B. All members of the Council shall be elected for a two-year term ending on the 31st of December of even numbered years. The Vice-president, however, shall serve as President for the following two years. No member, except the Secretary-Treasurer, is eligible for re-election to the same position for a consecutive term.

C. The affairs of the Association shall be managed by the Council, who shall exercise all such powers of the Association not delegated to the general meeting.

D. The Council shall have power to authorize expenditures on behalf of the Association from time to time.

E. Transfer of a member of the Council out of the geographical areas designated in Article Two, Section 1, paragraph A, or transfer to an occupation not described in Article Two, paragraph A of Section 1 shall terminate that member's Council for the remainder of the term.

F. In preparing a slate of officers, the Nominating Committee shall insure that at least two planetariums are represented.

G. Meetings and Notices

(1) Immediately after the Annual General Meeting of Members in each year there shall be held a meeting of the Executive Council provided they shall constitute a quorum, without further notice, for the purpose of transacting such business as may come before the Council.

(2) Meetings of the Council shall be called by the President at his discretion, or by written request of two Council members. Meetings may be held by telephone or through the mail, if all Council Members are polled on each issue.

(3) A quorum of Council shall be three members, one of whom must be the President or Vice-president.

(4) Questions arising at any meeting of the Council shall be decided by a majority vote of those present.

H. Remuneration of Council Members - Members of the Council as such, shall not receive salary for their services.

Section 2. President - The President shall preside at all meetings of the Association and of the Council and shall have the second or casting vote in the event of a tie vote upon any resolution. The President shall represent SEPA on the Council of the International Planetarium Society, if possible. The President will appoint a representative to the IPS Council if the President is not able to serve. He shall, jointly with the Secretary-Treasurer, sign all written contracts made in the name of the Association.

Section 3. Vice-president - The Vice-president shall in the absence or demise of the President, perform the duties of the President, and when so acting he shall have all the powers and be subject to all responsibility hereby given to or imposed upon the President.

Section 4. Secretary-Treasurer

A. The Secretary-Treasurer shall attend to and record the minutes of all proceedings of the Association, shall give and service all notices of the Association and Council and shall be the custodian of all records.

B. The Secretary-Treasurer shall be responsible for the proper keeping of the books of account and such other records as may be prescribed by law and as may be required by Council; shall deposit any funds of the Association in a bank or banks approved by the Council, and shall not invest them without due authorization by the Council. The Secretary-Treasurer shall, in advance of the General Meeting, provide an audited statement of accounts for the perusal and approval of the Members of the Association.

C. The Secretary-Treasurer shall be the Custodian of the Seal of the Association.

ARTICLE FOUR

Annual Meeting

Section 1. The Annual Meeting of the Members of the Association shall be held at such place and at such time as may be fixed from time to time by resolution of the

Section 4. All the necessary tax returns; corporate forms and any other necessary returns or information shall be filed in their proper and respective places.

ARTICLE SIX

Contracts, Checks, Drafts and Bank Accounts

Section 1. Contracts - Any and all deeds, documents, investments and writings signed for and on behalf of an in the name of the Association by the President or Vice-president and Secretary-Treasurer with the authorization of the Council, shall be binding upon the Association. Save as aforesaid or as otherwise stipulated in the By-Laws, no Officer, agent, or Member shall have any power or authority to bind the Association by any contract or engagement or to pledge its credit.

Section 2. Checks and Drafts - All checks, bills of exchange or others orders for the payment of money, notes or other evidences of indebtedness issued, accepted or endorsed in the name of the Association shall be signed by the Treasurer. Only the Treasurer or Council Member approved by the President may arrange, settle, and balance all books and accounts between the Association and its bankers and may receive all paid checks and vouchers and sign all the bank's forms of settlement of balances and release or verification slips.

Section 3. Deposits - All funds of the Association shall be deposited from time to time to the credit of the Association in such banks or trust companies as the Council may approve.

ARTICLE SEVEN

Section 1. Authority - The Council may appoint by resolution such committees as may be required from time to time.

Section 2. Terms - All Committee memberships shall terminate at the Annual Meeting. It shall be the duty of Council to reconstitute such committees as required.

ARTICLE EIGHT

Amendment. These By-Laws may be amended by a majority vote of the voting members present at any regular meeting, if the proposed amendment has been sent to every member at least thirty days prior to the meeting at which it is to be voted upon.